EUROPEAN NETWORK FOR RESEARCH, GOOD PRACTICE AND INNOVATION FOR SUSTAINABLE ENERGY

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DELIVERABLE 2.5

PRODUCTION OF 30 NATIONAL SUMMARY BRIEFS

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TABLE OF CONTENTS

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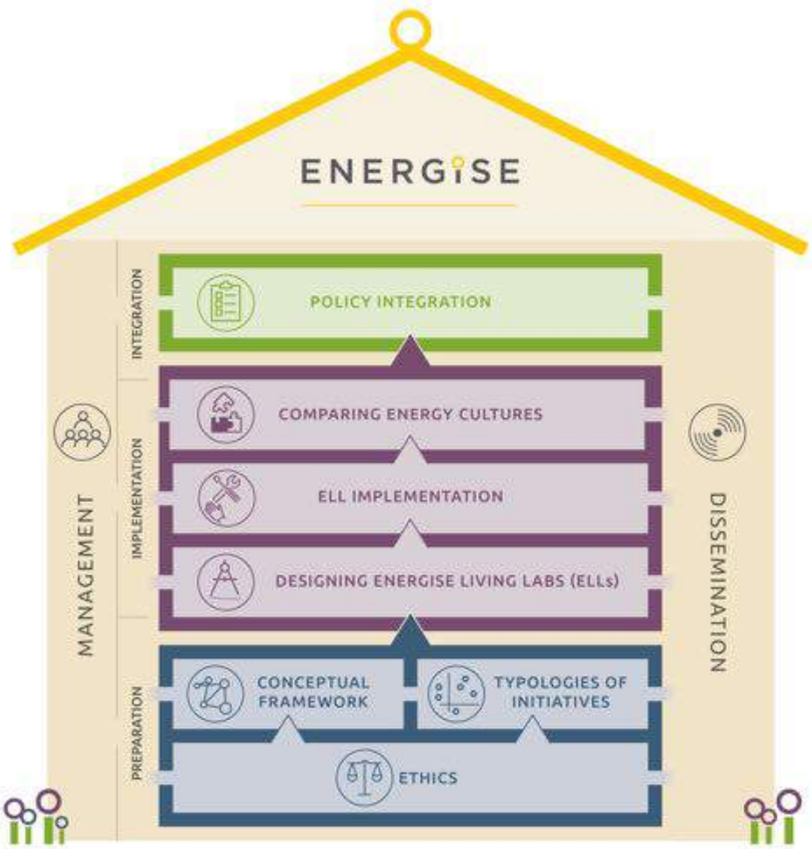
ENERGISE PROJECT

ENERGISE is an innovative pan-European research initiative to achieve a greater scientific understanding of the social and cultural influences on energy consumption. Funded under the EU Horizon 2020 programme for three years (2016-2019), ENERGISE develops, tests and assesses options for a bottom-up transformation of energy use in households and communities across Europe. ENERGISE's primary objectives are to:

- **Develop an innovative framework** to evaluate energy initiatives, taking into account existing social practices and cultures that affect energy consumption.
- **Assess and compare the impact** of European energy consumption reduction initiatives.
- **Advance the use of Living Lab approaches** for researching and transforming energy-related practice cultures.
- **Produce new research-led insights** into the role of household routines and changes to those routines towards more sustainable energy.
- **Encourage positive interaction** between actors from society, the policy arena and industry.
- **Effectively transfer** project outputs towards the implementation of the European Energy Union.



ENERGISE
EUROPEAN NETWORK FOR RESEARCH, GOOD PRACTICE AND INNOVATION FOR SUSTAINABLE ENERGY

EXECUTIVE SUMMARY

This document (ENERGISE D2.5) provides an overview of national energy and supply dynamics across 30 European countries. The Deliverable encompasses reviews of the current state of the art and existing trends in national energy policies, energy systems and energy campaigns in each of the 30 countries. To enhance accessibility and engagement with the material, the information gathered is presented in 30 independent National Briefs. This format also permits follow on cross country comparison. For example, an analysis of the data presented in this comprehensive document reveals large variations across Europe in relation to final energy consumption for households (MWh/capita), shares of fuel in final residential energy consumption and residential final energy consumption by type of end-use. However, there are also interesting similarities across the continent, i.e. in energy consumption patterns for space heating.

This collection of national briefs is an extremely useful resource for researchers and policy makers alike. In addition to providing an overview of the quantitative data per country, this collection delves deeper and provides relevant context and discussion which can assist when exploring how these variations and similarities occur. Specifically, the briefs provide contextual overviews of particular socio-material aspects at play in each country that may influence energy consumption levels, as well as insights into national (and in some cases regional) energy policies, including how energy consumption is understood and targeted.

Finally building on from work conducted as part of Deliverables 2.1 and 2.4, this collection includes 30 case study examples, overviewing one sustainable energy consumption initiative (SECI) from each country. These in-depth examples were selected as they have been identified as cases which highlight understanding energy consumption as an outcome of everyday life dynamics and complex interactions between multiple actors, institutions and infrastructural aspects. These SECIs will provide good practice examples for those interested in firstly understanding socio-material aspects of energy consumption and subsequently incorporating these aspects into future targets and strategies.

1 INTRODUCTION TO DELIVERABLE D2.5

This document provides a collection of 30 national briefs, demonstrating key aspects of national energy supply and demand dynamics. Each brief is comprised of five sections:

Section 1 summarises the energy profile of the country. The section provides basic quantitative information of demand demographics and usage profiles, market trends and energy supply profiles, as well as qualitative reflections on current national energy policy. ***For all the briefs, the quantitative information is derived from ec.europa.eu/eurostat (2015 data), eea.europe.eu (2015 data), and climate-zone.com, unless otherwise stated.***[1] The qualitative reflections are based on a literature reviews and desk-research. References for the literature review and the desk-research are provided in footnotes or in section five.

Section 2 summarises the nationally based sustainable energy consumption initiatives (SECIs) that have been identified as part of ENERGISE WP2 framework (Jensen, 2017). Each SECI has been coded according to the Problem Framing Typology developed in ENERGISE WP2 (Jensen et al, 2017b).

Section 3 provides a *good practice* example of a national SECI that corresponds to category 3: “Changes in Everyday Life” or 4: “Changes in Complex Interactions” in the Problem Framing Typology. Please refer to Jensen (2017) and Jensen et al (2017b) for more information on the way the data for the good practice SECIs has been researched and documented.

Section 4 provides a brief summary of major nationally specific trends and their implication for energy consumption policies.

Section 5 provides an overview of sources used for qualitative assessments, and can be used as inspiration for further reading.

The national briefs provide contextual socio-material information for the further work to be carried out in Work Package 4, Work Package 5 and Work Package 6 in ENERGISE.

1.1 WP2: TYPOLOGIES OF ENERGY INITIATIVES

ENERGISE WP2 is a systematic criteria-guided review and classification of existing sustainable energy consumption initiatives from 30 European countries (EU-28, Switzerland, and Norway), which provides a comprehensive European database of energy initiatives involving households, and related typologies of sustainable energy consumption initiatives. This extensive synthesizing work guides the selection of Living Lab design elements for ENERGISE and future energy consumption research, policy and practice.

[1] Some piecharts will be empty, as no information is available.

This is done in order to

- Construct innovative typologies of sustainable energy consumption initiatives that can inform further research and action.
- Identify key success factors and related indicators, focusing on individual-level, collective, organizational, institutional and societal aspects of energy consumption, which will inform subsequent WP 3 (Designing Living Labs), WP 4 (ENERGISE Living Labs) and WP 5 (Capturing Energy Cultures).
- Progress the goals of the European Energy Union by creating a publicly archived open access dataset of sustainable energy initiatives across 30 countries in Europe.

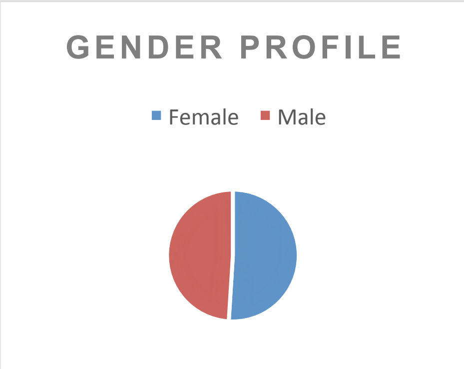
2 NATIONAL SUMMARY BRIEFS OF ENERGY SUPPLY AND DEMAND

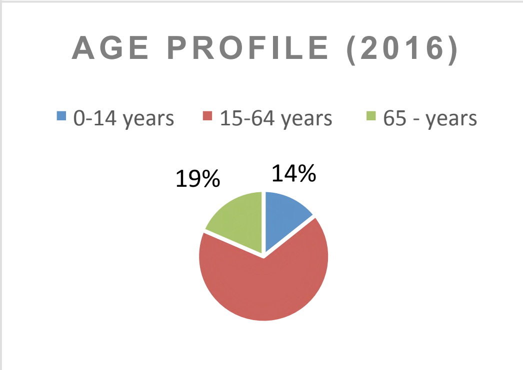
In the remainder of this section, the collection of 30 national briefs is provided. The briefs are presented in alphabetical order.

AUSTRIA

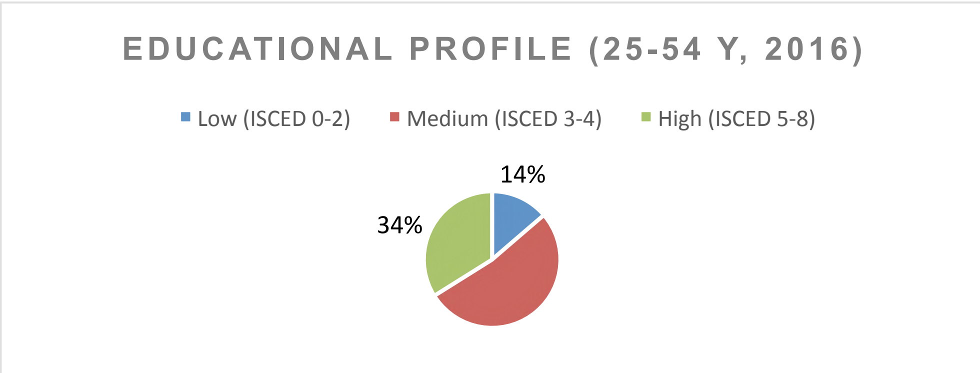
Authors: Marko Hajdinjak, Desislava Asenova

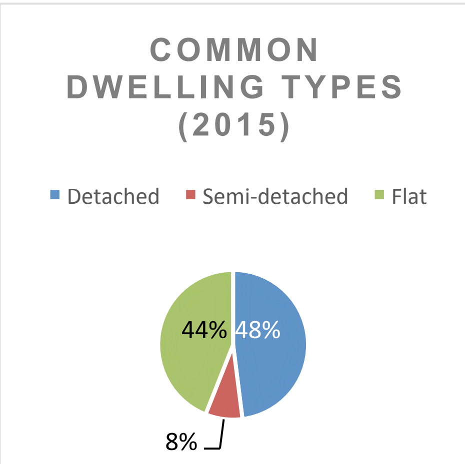
DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY

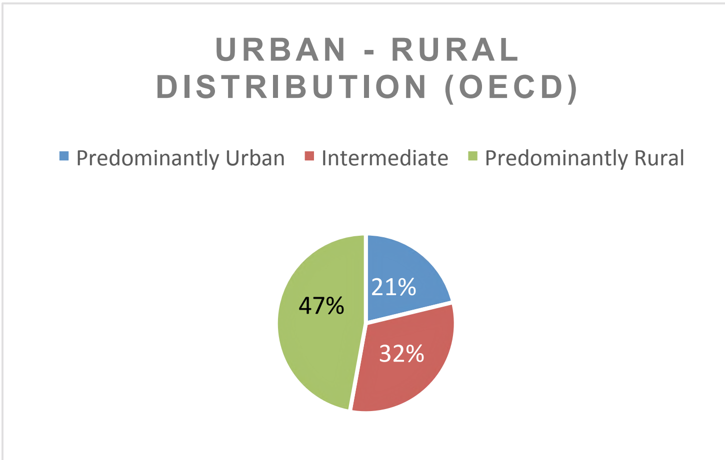


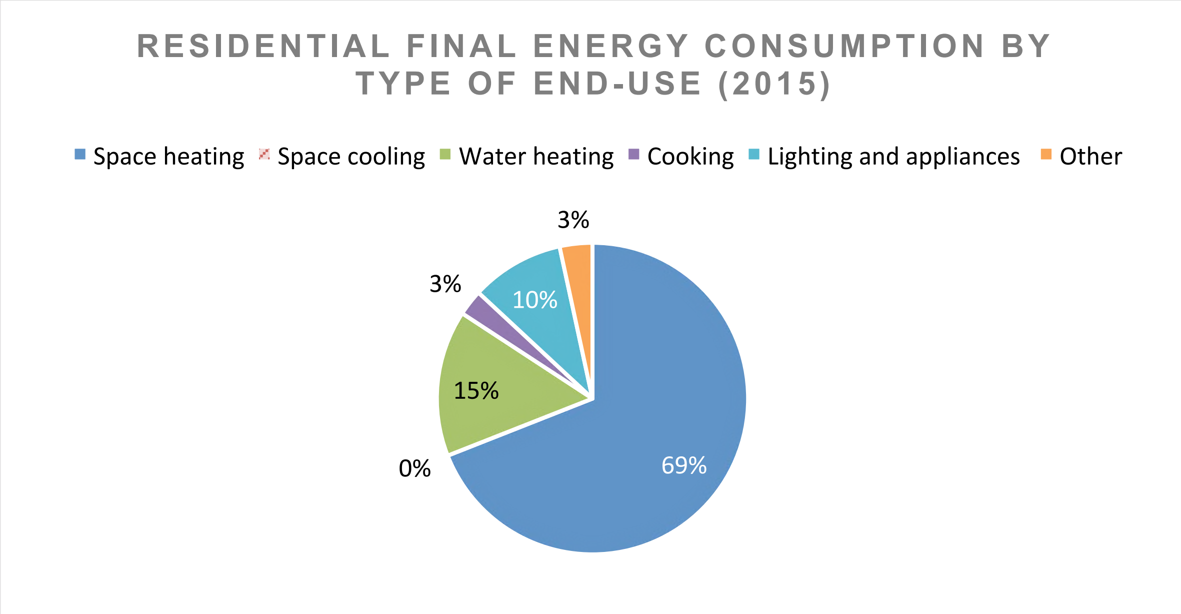


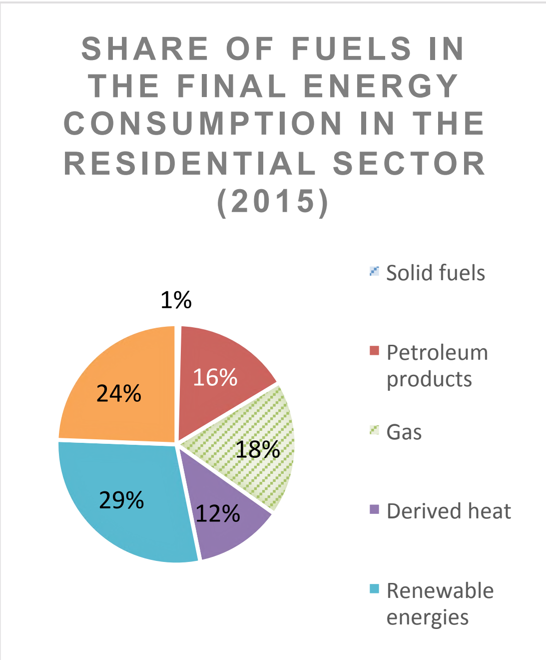
CLIMATE: temperate; continental, cloudy; cold winters with frequent rain in lowlands and snow in mountains; cool summers with occasional showers

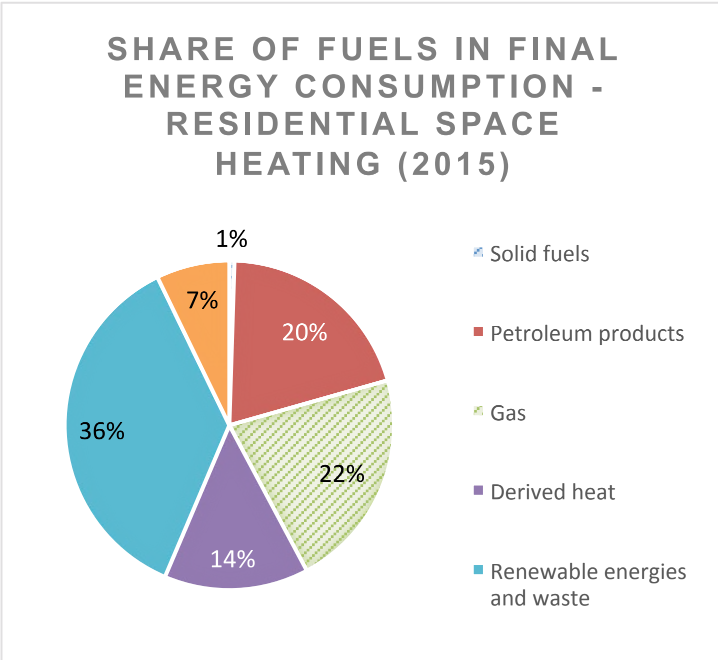












FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

8.053 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

Energy supply mix in Austria was in 2016 comprised of 36.4% oil, 29.5% renewable energy, 21.1% gas, 9.0% coal and 2.2% combustible waste. The remaining about 2% were covered by net imports of energy from abroad. Production of nuclear energy has been banned in Austria since 1978. The biggest share of renewable energy is produced by hydropower (34.7%). Biomass is also exploited in high amounts. Other sources are wind energy, geothermal energy and solar energy.[2]

Austria has a central position in the EU electricity network due to its geographical location. It is connected to all its neighbouring countries except Slovakia. The Austrian electricity market was fully liberalised in 2001, way ahead of the EU regulation in this regard. However, the market remains in the hands of a few large suppliers.[3]

The largest electricity supplier is Verbund AG, which accounts for approximately half of all electricity production in the country. Most of the energy generated by Verbund AG originates from hydropower. Other segments where Verbund AG is a leading producer are thermal power and wind power. The company is also the largest provider of district heating in Austria. Energie Allianz is the second-largest electricity company. It is owned by two federal states and the city of Vienna. Another big electricity producer and transporter is EVN Group.[4]

OMV AG, which is 31.5% state-owned, is the largest Austrian petroleum company that undertakes varied activities domestically and internationally, including petroleum exploration and production, refining, wholesale and retail sales. The company is most active in Austria and Romania. It also operates Austria's only refinery in Schwechat and is responsible for the operation of three natural gas storage facilities in the country.

Natural gas in Austria is mainly imported from Russia (over 50%), Norway and Germany. The main importers are EconGas and Russian Gazexport. EconGas is the largest Austrian gas supplier and is 50% owned by OMW AG. The Austrian gas grid is operated by three transmission system operators (TSOs GAS Connect Austria GmbH, BOG GmbH and TAG GmbH) along with 22 distribution system operators. Overall, there are 35 gas suppliers in Austria. The gas market was fully liberalised in October 2002, but it could be claimed that there is no real competition on the market. The share of sales of the three largest suppliers in 2012 was 72% with one supplier alone (Energieallianz) accounting for 60% of the gas market.[5]

Particular socio-material aspects that influence energy consumption

Electricity accounts for 24.7% of overall energy consumption of households. Being the most popular bio fuel in the last decade, wood has a share of 19.7%, while natural gas is third with 17.5% of overall consumption of households. The share of renewables in the overall energy consumption of

[2] Starlinger, T., Trenkwalder, A. and Kubr, E. (2018). *Energy 2018. Austria*. Available at: https://www.globallegalinsights.com/practice-areas/energy-laws-and-regulations/austria

[3] OECD (2016). *Austria. Fossil Fuel Support Country Note*. Organisation for Economic Co-Operation and Development. Available at: http://stats.oecd.org/fileview2.aspx?IDFile=3d0fee0c-fc32-4a5e-b988-ac98bc5c48ca

[4] Wikipedia (2018). *Verbund*. Available at: https://en.wikipedia.org/wiki/Verbund ;
Wikipedia (2018). *EVN Group*. Available at: https://en.wikipedia.org/wiki/EVN_Group

[5] OECD (2016). *Austria. Fossil Fuel Support Country Note*.;
OECD/IEA (2014). *Energy Policies of IEA Countries. Austria*. Available at: https://www.iea.org/publications/freepublications/publication/Austria2014.pdf

households in 2015-2016 was 4.7% which considerably exceeds the share of coal (0.3%).

The largest share of annual electricity consumption of households goes to heating (23%) followed by cooling and freezing (13%), water heating (10%), cooking (9,6%), dishwashers (5,7%), kitchen and domestic appliances (4.2%), laundry washing (4.1%) and others.[6]

The overall consumption of district heating in Austrian households increased by 2.7% (comparing 2013/2014 and 2015/2016) and the consumption of renewables increased by 15.9% in the same period.

Electricity price for households in 2017 was 19.5 euro cents per kWh which is slightly lower than the EU average for the same period (20.41 euro cents per kWh).[7]

Energy poverty has not been widely discussed in Austria but still it exists. Rising fuel prices, energy inefficient housing and falling incomes could be claimed to be the reason behind the emergence of energy poverty. In 2011, around 12.6% of the Austrian population were at risk of income poverty. According to the European Union Statistics on Income and Living Conditions, in 2011 219,000 people (2.6% of the population of Austria) claimed that they were not able to keep the entire apartment adequately warm. However, since there is no official definition of energy poverty in Austria, specific quantitative data on the issue is still scarce and further research in the field is needed in order to draw some general conclusions.[8]

Current Trends in Energy Policy

Austria has set a target to increase energy efficiency by 20% by 2020. Furthermore, with the adoption of the National Renewable Energy Action Plan in 2010 the country aims to increase the share of renewable energy in final energy consumption to 34% by 2020 and to raise the share of renewables in electricity consumption to 71% by 2020. Another target set in the Energy Strategy of Austria is to achieve 16% reduction of greenhouse gas emissions in non-ETS sectors and 21% reduction of greenhouse gas emissions in ETS sectors by 2020.

Since household sector accounts for approximately 31% of national energy consumption, the energy saving measures are mainly focused on buildings. By 2020, Austria aims to achieve the thermal renovation of all buildings constructed between 1950 and 1980. For that purpose, the country provides funding for housing support programmes, including building renovations and subsidies for energy-efficient or renewable heating systems.

With the adoption of the Electricity Industry and Organisation Act (EIWOG) in 2010, smart meters and informative billing were introduced in Austria. The mandatory timetable for the rollout of smart metering services in Austria was set with a decree of the Ministry of Economy from 2012. The decree says that by 2019 all electricity network operators in Austria have to equip at least 95% of all

[6] Statistics Austria (2018). *Energy Consumption of Households*. Available at: http://www.statistik.at/web_en/statistics/EnergyEnvironmentInnovationMobility/energy_environment/energy/energy_consumption_of_households/index.html

[7] Statista (2018). *Electricity Prices for Households in Austria from 2010 to 2017*. Available at: https://www.statista.com/statistics/418108/electricity-prices-for-households-in-austria/

Statista (2018). *Electricity Prices for Households in the European Union from 2010 to 2017*. Available at: https://www.statista.com/statistics/418049/electricity-prices-for-households-in-eu-28/

[8] Berger, T. (2012). *Energy Poverty – From a Global Perspective to Austria*. Available at: http://erscp2012.eu/upload/doc/ERSCP_Full_Papers/BergerT_ERSCP_2012_fullpaper.pdf

metering points. According to estimations, by 2015 around 300,000 electricity customers have already been equipped with smart meters.[9]

Trends in national campaigns

In 2012, the Austrian Federal Ministry of Economy, Family and Youth introduced and started a support programme for thermal modernisation of private houses and companies. Subsidies of €70 million were allocated for the private residential buildings and €30 million for the corporate sector for the installation of outer shells of buildings and the purchase of new boilers and windows. In result, in 2012 approximately 12,000 buildings were modernised using only 77% of the originally assigned budget. It was estimated that a reduction of CO_2 emissions by 3.3 million tonnes was achieved as a result of the measures applied. Along with the thermal modernisation programme, different trainings and instructions are also organised addressing energy saving measures.

The Federal Ministry of Agriculture, Forestry, Environment and Water Management also launches programmes for the implementation of the Austrian climate strategy. An example of such initiative is Klima:active. It is Austrian national climate protection initiative that started in 2004 and includes several programmes aimed at different target groups of the household sector. Its objective is to reduce heating costs and CO_2 emissions in buildings through modernisation of large residential buildings, support for passive housing and information campaigns directed at households. Klima:activ has introduced a building standard for residential and office buildings, for new buildings and for renovations.[10]

Some national programmes and initiatives aimed at coping with energy poverty in Austria and increasing the energy efficiency of low income households have also been implemented. Examples are: i) RedEn – Reduction of Energy Poverty Through Building Renovation with the Participation of Residents; ii) Combating Energy Poverty; iii) EC-LINC; iv) Request2Action. All these programmes and initiatives are mainly focused on energy counselling of the inhabitants for energy efficiency in appliances and behaviour and are mostly a combination of financial support and obligatory energy counselling to increase the energy efficiency on the behavioural level.[11]

[9] (2011) *Austria. Energy Efficiency Report.* Available at: https://library.e.abb.com/public/00e3b8735587fad9c12578aa004bb3c1/Austria.pdf;
Jellinek, R. (2015). *Energy Efficiency Trends and Policies in Austria.* Available at: http://www.odyssee-mure.eu/publications/national-reports/energy-efficiency-austria.pdf

[10] Velten, E. K., Donat, L., Prahl, A. and Banasiak. J. (2014). *Assessment of Climate Change Policies in the Context of the European Semester. Country Report: Austria.* Berlin: Ecologic Institute and eclareon GmbH. Available at: https://www.ecologic.eu/sites/files/publication/2014/countryreport_at_ecologiceclareon_jan2014_0.pdf;
(2018). *Klima:active website*. Available at: https://www.klimaaktiv.at/english/about_klimaaktiv.html ;
(2011). *Austria. Energy Efficiency Report.* Available at: https://library.e.abb.com/public/00e3b8735587fad9c12578aa004bb3c1/Austria.pdf

[11] Athavale, S. (2017). *Energy Poverty in Austria.* Austrian Energy Agency. Available at: http://www.anre.ro/download.php?f=fq59gg%3D%3D&t=wOutwdHbn8%2BcmLPfvrrV5ps%3D

OVERVIEW OF NATIONAL SECIS

Below please find a list of Austrian SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country.

Energiesparcheck für den gesamten Haushalt	Changes in Individuals' Behaviour
Der 'grünste' Haushalt im "Ökoenergieland"	Changes in Individuals' Behaviour
Die Umweltberatung	Changes in Individuals' Behaviour
TopProdukte	Changes in Technology
Förderungsaktion thermische Sanierung für Private	Changes in Technology
SMERGY	Changes in Individuals' Behaviour
Grüne Zone	Changes in Individuals' Behaviour
Österreich spart Energie	Changes in Individuals' Behaviour
klima:aktiv Energiesparcoach	Changes in Individuals' Behaviour
Initiative Energiberatung Niederössterich	Changes in Technology
Niederösterreichische Energiespar-Initiative	Changes in Individuals' Behaviour
EVN Energieberatung	Changes in Individuals' Behaviour

Energiesparen zum Weitersagen	Changes in Individuals' Behaviour
Ich tu's	Changes in Individuals' Behaviour
Sanierungswegweiser	Changes in Technology
Wir leben 2000 Watt	Changes in Complex Interactions
Sonnenkraftwerk Zwentendorf	Changes in Technology
Kostenloser Stromsparcheck der Caritas	Changes in Technology
Haushaltsgerätetausch	Changes in Individuals' Behaviour
Energiebewegung NÖ	Changes in Complex Interactions
Rette deine Insel	Changes in Individuals' Behaviour
Energie-Fuehrerschein	Changes in Individuals' Behaviour
R.U.S.Z	Changes in Everyday Life Situations
Sanierung Wohnanlage Johann-Böhm-Straße in Kapfenberg	Changes in Individuals' Behaviour
Autark leben	Changes in Technology
Energieampel auf „Grün“	Changes in Individuals' Behaviour
Energiechecker im Sprengel	Changes in Individuals' Behaviour

Energiepartner von nebenan	Changes in Individuals' Behaviour
Stromsparmeister/Stromsparbuch	Changes in Individuals' Behaviour
klimaaktiv Maker Challenge	Changes in Technology
Kreative Restekueche	Changes in Everyday Life Situations
Passivhausdorf zum Probewohnen	Changes in Technology
Der Haushalt als Aktionsfeld – Gute Ernährung und Nachhaltiger Konsum für Klimaschutz und Energieeffizienz	Changes in Individuals' Behaviour
Gruppenthermographien als Motivationsfaktor für CO2 sparende Maßnahmen in der Sanierung	Changes in Technology
POWER HOUSE NZC: Powerhouse Nearly Zero Challenge	Changes in Technology
USmartConsumer project	Changes in Individuals' Behaviour
SMARTER TOGETHER: Smart and Inclusive Solutions for a Better Life in Urban Districts	Changes in Complex Interactions
EEPLIANT: Energy Efficiency Compliant Products 2014	Changes in Individuals' Behaviour
iBROAD: Individual Building (Renovation) Roadmaps	Changes in Technology
IN-BEE: Assessing the intangibles: the socioeconomic benefits of improving energy efficiency	Changes in Individuals' Behaviour
PRO.MOTION: Creating liveable neighbourhoods while lowering transport energy consumption	Changes in Individuals' Behaviour
EGS: Energy, Education, Governance and Schools. A European school panel for involving local communities in energy efficiency programs	Changes in Complex Interactions

TRIBE: TRaIning Behaviours towards Energy efficiency: Play it!	Changes in Individuals' Behaviour
TOPTEN ACT: Enabling consumer action towards top energy-efficient products	Changes in Individuals' Behaviour
EL-EFF REGION: Boosting efficiency in electricity use in 8 European regions	Changes in Individuals' Behaviour
EC-LINC: Energy Check for Low Income Households	Changes in Individuals' Behaviour
COMEON LABELS: Common appliance policy – All for one, One for all – Energy Labels	Changes in Individuals' Behaviour
ESD II: European Solar Days II	Changes in Technology
TRENDY TRAVEL: Emotions for Sustainable Transport	Changes in Everyday Life Situations
INTENSE: From Estonia till Croatia: Intelligent Energy Saving Measures for Municipal housing in Central and Eastern European Countries	Changes in Individuals' Behaviour
Windkraft	Changes in Technology
Responsible Cooling	Changes in Everyday Life Situations
SPIRIT: Energising Faith Communities	Changes in Individuals' Behaviour
TOGETHER on the move: Energy Efficient Transport training for immigrants	Changes in Everyday Life Situations

‘GOOD PRACTICE’ EXAMPLE OF AUSTRIAN SECI

The Repair and Service Centre (R.U.S.Z.)

Description

The Repair and Service Centre was founded in 1998 in Vienna as a socio-economic company and converted into a company with limited liability in 2007. Since then, it has been managed as a social enterprise. RUSZ provides employment to people who were unemployed for a long time. Broken household appliances are repaired, improved and/or made less energy-consuming.

Contextualization

The Repair and Service Centre operates as a social enterprise, pursuing social and ecological goals. In this sense, it is not a profit-orientated enterprise, but aims only at earning enough to cover its operational expenses. RUSZ is a pioneering company in the field of community economy. A vital part of its social mission is hiring and training of long-term unemployed people. The ecological mission of RUSZ is to protect the environment by preventing or decreasing the amount of electronic scrap. Instead, broken or malfunctioning household appliances are repaired, recycled and reused. Those that cannot be repaired are properly dismantled and disposed of. RUSZ is also very active in trying to raise public awareness and influence the decision-makers at national and EU level regarding the resource protection, obligatory commitment to longevity and the Circular Economy. In this sense, RUSZ has become a competence centre for resource protection in relation to electrical appliances.

RUSZ co-operates with the City of Vienna, the Austrian Ministry of Environment, the social partners, scientific institutions and the media. The Repair and Service Centre is an interesting example of a social enterprise, which helps people to make a positive impact on the environment by repairing different products that would otherwise be discarded. Not many other initiatives included in the ENERGISE Grid focus on repairing products as a measure for saving energy and avoiding CO2 emissions.

Aims and objectives

The main aim of RUSZ is to reduce the amount of electronic waste – old or broken household appliances are repaired and reused. Most appliances repaired at RUSZ are “upgraded” to become more energy efficient.

Methods for Intervention

The Repair and Service Centre gives its costumers the possibility to decide for themselves whether it pays off to repair an old device by giving them a cost estimate and a reliable prediction about how long the device could still be used after being repaired. The favourable prices for RUSZ's quality repair services generated a massive demand for the most diverse repair services. RUSZ repairs almost all devices working on electricity. This includes all types of domestic appliances, entertainment electronics, lamps, air conditioning, heaters, sports equipment, electric tools, electric toys, garden tools, and other devices. The repairs are not conducted only in the Centre. RUZS technicians can visit costumers in Vienna and the surrounding area at home or in the office to repair household appliances, which costumers cannot bring to the Centre or which are too sensitive or valuable to risk the transportation.

Since 2005, RUSZ is operating (in cooperation with Ö3 – one of the nationwide radio stations, and Caritas Österreich) the Ö3-Wundertüte, a highly successful mobile phone collection system. Since 2010, RUSZ has also been implementing the project “Donate your old washing machine,” in which old washing machines are given new life for the second-hand market. “Rent a washing machine” is another service provided by RUSZ. Instead of having to buy a device, clients can rent one by paying a one-time deposit and a monthly flat rate. If the machine needs to be repaired, the cost of repair is included in the rent, and if the appliance cannot be repaired, RUSZ replaces it with a new one. In addition to the repair shop, RUSZ also runs a second-hand shop, where repaired and upgraded household appliances (washing machines, electric cookers, dishwashers, etc.), coffee makers, audio-visual equipment and other devices can be purchased. All devices were tested and have a one year warranty. RUSZ was a co-founder of the European umbrella organisation for social economy enterprises - RREUSE, with its own office in Brussels. It is also a co-founder of the Austrian umbrella organization RepaNet Austria.

Steps of implementation

1998:	Founded in 1998 as a socio-economic company for repairs of electrical appliances.
1999:	The favourable prices for RUSZ's repair services generated a massive demand for the most diverse repair services. The management decided to set up the repair network in Vienna in 1999 with involvement of small repair companies.
Since 2005:	Together with Ö3 and Caritas Österreich, RUSZ developed the Ö3-Wundertüte, a highly successful mobile phone collection system.
2007:	The originally socioeconomic enterprise was privately operated from 2007 onwards and developed into a successful social enterprise it is today, while maintaining its original principles.
Since 2010:	Since 2010, RUSZ has been implementing the project “Donate your old washing machine.” Old washing machines people no longer need are repaired and then sold in the second-hand shop.
2015:	As a result of media campaign and lobbying by RUSZ and its partners, in December 2015 the EU Commission adopted the Action Plan for the Circular Economy, creating an important momentum to support the transition towards a more circular economy in the EU. The Plan included legislative proposals on waste, with long-term targets to reduce landfilling and increase recycling and reuse.

Results/outcomes

Attractive prices and good quality of RUSZ's repair services attract a constantly growing number of clients, which means that less electronic waste is generated and less energy consumed for production of new electronic appliances.

A customer survey, which RUSZ conducted together with Vienna University students, showed that more than 80% of customers are very satisfied with services provided by RUSZ. Over the years, more than 400 long-term unemployed people worked at RUSZ.

The role of the households

Households are involved as customers of RUSZ. They either have their appliances and devices repaired, or leave them at the Centre to be repaired and sold in its second-hand shop.

Location

The Repair and Service Centre is located in Vienna.

Was/is the initiative successful

Under the presidency of RUSZ Managing Director Sepp Eisenriegler, European network RREUSE achieved its largest lobbying success within the framework of EU legislation (Waste Electrical and Electronic Equipment Directive). RUSZ has won several prizes for its social and ecological commitment: the City of Vienna's Environment Award 2013, the ENERGY GLOBE Award 2007, the 2009 Climate Protection Prize and the first place in “Ideas against Poverty” in 2009.

Textual and communicative aspects of initiative

The ecological aspect of the work of the RUSZ is based on preservation of the resources and protection of the environment through reuse of electrical appliances that can be repaired, and through responsible dismantling and disposing of old equipment that cannot be repaired. The energy consumption is seen through the prism of consumer protection, social economy and sustainability. This means that the initiative is pursuing simultaneously social objectives (helping consumers and providing employment to people from the margins of the labour market), environmental objectives (nature protection through conservation of resources and waste reduction) and economic objectives (job creation, supply of resources through improving efficiency and recycling). In addition to its repair services, RUSZ also operates as a competence centre for consumer protection, social economy and sustainability.

The physical/technological aspects of the initiative

RUSZ efforts are not directed only at improving the energy efficiency of the appliances they repair. By giving old and/or broken appliances new life, RUSZ “saves” energy and emissions that would be spent for the production and transport of new devices. RUSZ has developed its own “Washing machine tuning” technique – a used washing machine is transformed into an energy-efficient machine that fulfils the highest energy efficiency standards of machines manufactured today. The technical innovation "Washing machine tuning" has resulted in a water saving of 30% and an energy saving of 20% (with the same cleaning performance). The technique can also be adapted for dishwashers. Together with the Austrian Standards Institute and other partners, the RUSZ has developed the eco-design label for long-lasting and easy-to-repair designed electronic devices: ON-rule ONR 192102 and ONR 192102: 2014.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

Austrian national energy policy is focused on increasing energy efficiency and enlarging the share of renewables in the national energy mix. Two other priorities of the country underline the technological aspect of energy conservation – thermal insulation of old apartment buildings and introduction of smart metering. The ENERGISE team analysed 54 SECIs implemented in Austria. Due to the limited resources (time constraints and language barriers), the mapping of European SECIs cannot be regarded as comprehensive, and undoubtedly numerous local initiatives across the continent remained undocumented. Nevertheless, the high number of SECIs identified in Austria shows that this country is well above the EU average when it comes to number and diversity of energy-saving projects.

The Austrian SECIs were classified as follows:

- Changes in Technology: 14 (26%)
- Changes in Individuals' Behaviour: 31 (58%)
- Changes in Everyday Life Situations: 5 (9%)
- Changes in Complex Interactions: 4 (7%)

If we look at the ways these initiatives try to achieve the goal of better energy efficiency, we can quickly notice that providing tips and information is by far the most frequent approach. Twenty-three SECIs use different ways for providing user-friendly advice to households – ranging from information on how to purchase more efficient domestic appliances and other energy-consuming products, to innovative ideas about how to reduce the amount of energy used for cooking, lightning, heating and cooling. Four SECIs include an element of comparing and/or competing with other households in terms of achieved energy savings, while three focus on exchange of good practices among citizens. Five projects are closely related to the national policy of renovation of old buildings – as a final outcome of few of them, old apartment buildings or detached houses were transformed into energy plus buildings. Finally, a small number of projects target vulnerable households, using low-cost measures to improve the energy efficiency and bring down the energy costs in low income households.

Although energy poverty in Austria is not such a problematic issue as in many countries in Eastern and Southern Europe, it is a concern for a growing number of households due to the rising energy costs in combination with stagnating incomes. Many people are therefore attracted to the idea of repairing, reusing or sharing resources, which explains the success of the Vienna-based 'Repair and Service Centre,' described in more detail in section 3. RUSZ is inspiring because it operates as a social enterprise, which is not profit-oriented, but facilitates the transition towards a circular economy, helping the Vienna residents to reduce their environmental footprint by repairing and reusing different products that would otherwise be thrown away. The focus on 'repair and reuse' differentiates RUSZ from most other SECIs in the ENERGISE Database. Most often, initiatives that promote measures for saving energy and avoiding CO_2 emissions through a different use of domestic appliances prioritise purchasing of more efficient products or put emphasis on the energy that could be saved by turning the appliances off rather than leaving them in stand-by mode. RUSZ therefore represents a good model to be followed on the grass-root level, but also a valuable resource for policy-makers, as testified by the Action Plan for Circular Economy adopted by the European Commission.

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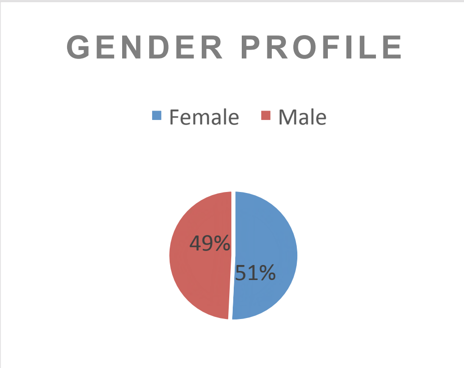
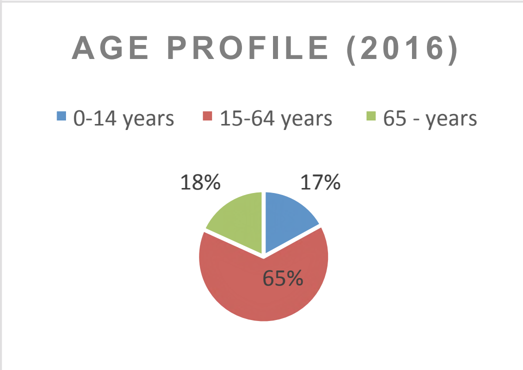
BELGIUM

Authors: Mathias Claeys Bouuaert, Tomislav Tkalec, Lidija Živčič

DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY





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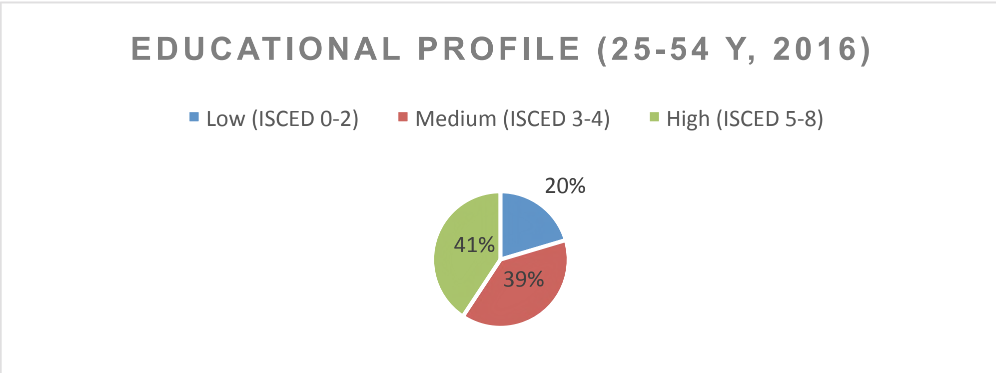
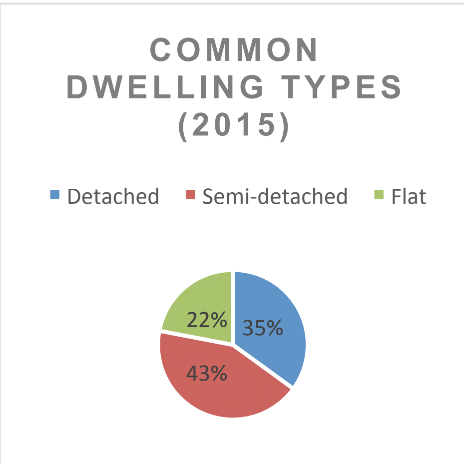
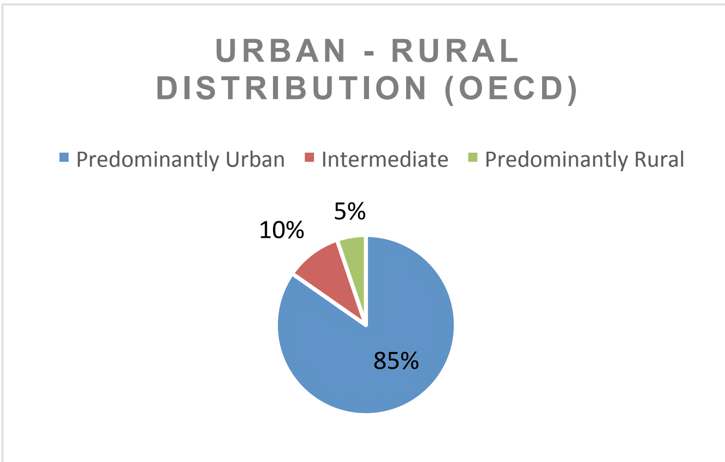
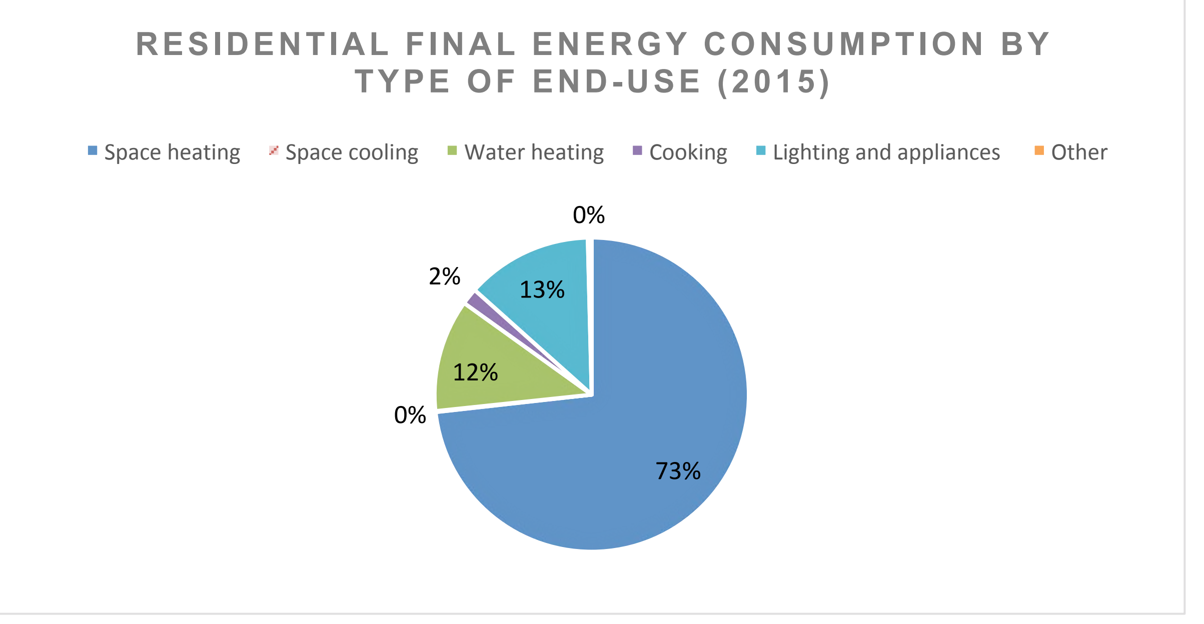
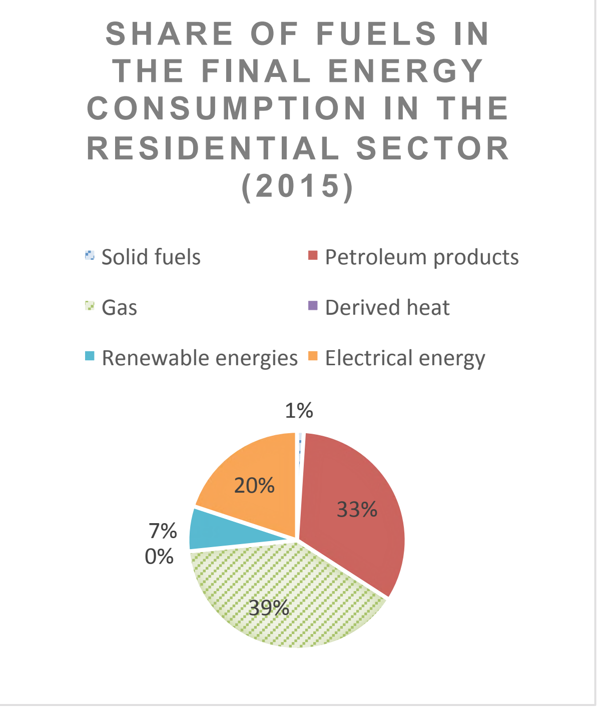
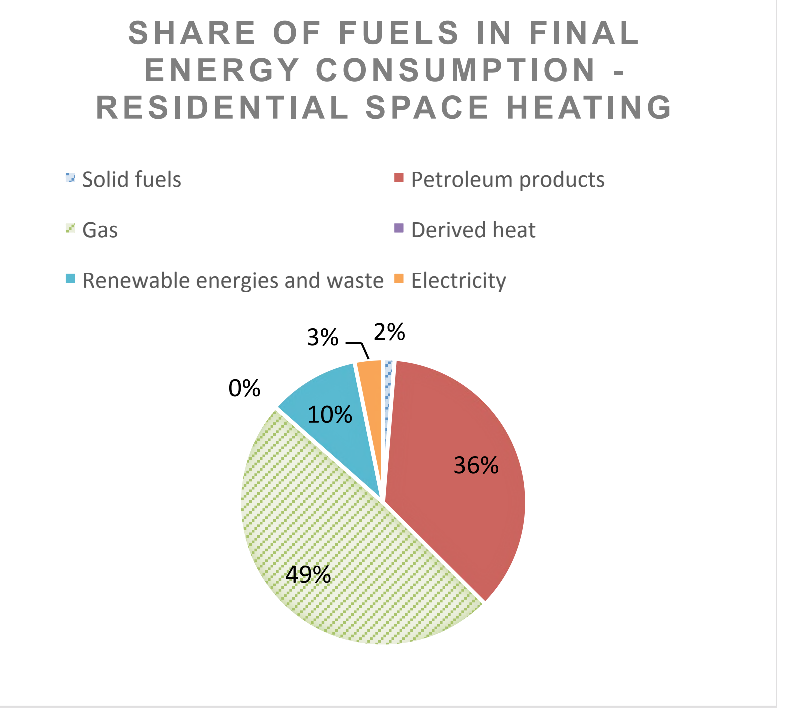












FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

8.392 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

The highest share in primary energy consumption in Belgium is secured by oil (40%), followed by gas (25%) and nuclear energy (20%). Biofuels account for 7%, coal for 5% and wind for 1%. In recent years Belgium's own energy production account for about 25%, however this is mostly due to nuclear power generation, which by convention is counted as domestic production despite the uranium being imported. Renewable energy sources account for the rest of domestic production.

Historically, up until 1992, coal was mined in Belgium, but in 2010 majority of it was imported from the US (39%) and Australia (22%). Crude oil is imported mainly from Russia (44%) and OPEC countries (23%), while Norway (37%) is the largest supplier of natural gas, followed by the Netherlands (29%) (data for 2010).

Electricity generation in Belgium by power source in 2016 was 53% nuclear, 29% fossil (26% gas, 3% coal and 0,1% oil), and 18% renewables (9% biofuels, 6% wind, 4% solar and 0,4% hydro). Belgium is a highly nuclear dependent country where the share of renewable electricity is low.

Belgium has 2 nuclear power plants (Doel NPP with four reactors and Tihange NPP with three reactors).

Electricity production is concentrated, and dominated by two main incumbents: Electrabel, owned by GDF, SUEZ, and SPE-Luminus, majority owned by EDF.

Elia, a public company is the only electricity TSO in Belgium. Publi-T, a cooperative company representing Belgian municipalities and inter-municipal companies, owns 45,2% of Elia's shares. The Belgian electricity distribution system is mostly owned by the municipalities. Only recently there have been talks about privatisation, which have been shot down by most political parties. Due to the specific political situation in Belgium there are specific differences in energy policy between the different regions. The overall energy policy is made at federal level.

Between 2000 and 2010, energy consumption grew by 3% and started decreasing in 2011 (+8% between 2011 and 2013).

Source: https://en.wikipedia.org/wiki/Energy_in_Belgium

https://en.wikipedia.org/wiki/Electricity_sector_in_Belgium

https://www.iea.org/media/countries/Belgium.pdf

https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Energy-and-Resources/gx-er-market-reform-belgium.pdf

Particular socio-material aspects that influence energy consumption

Belgian regulation on the usage of company cars encourages individual driving and usage of the company car also for personal purposes. On the other hand that means that significant proportion of population is using cars instead of public transport, which means energy use for transport is significantly higher than it could be.

A high percentage of non-adaptable nuclear power plants have meant that the Belgian government invested in a lot of lighting along the roads.

As a critical hub for chemicals and plastics, Belgium is very attractive to the chemical industry. Its share of chemicals and plastics in the economy is almost twice the EU27 average, and its chemical trade balance increased by nearly 50% between 2002 and 2012. A developed chemical industry means high energy consumption in the industry sector.

Current Trends in Energy Policy

Belgium is among the most energy-dependent EU countries, which means they are working on their energy security. Recently they have taken measures to enhance the security of supply in various energy sectors, particularly electricity and gas.

Current nuclear plans include phase out of nuclear power by 2025. Several scenarios exist on how this phase-out can occur, but it is also possible that the government will replace the law as Belgium Commission for regulation of Electricity and Gas, as well as other authorities, concluded that Belgium faces security issues due to low electricity production capacity in the face of rising demand.

According to the National Renewable Energy Action Plan Belgium has 13% RES target for 2020, up from 2% in 2005. In 2016 share of RES in the energy mix was around 8%. Electricity from RES will represent the largest share of RES in 2020 (20,9%). Even if the 20-20-20 European targets apply to Belgium, climate and energy policies are mostly implemented at the regional level.

The overall targeted primary energy savings fostered by existing and planned policies amount to 9,6 Mtoe by 2020 (18% reduction in primary energy consumption by 2020, compared to a baseline projected scenario for 2020 in PRIMES 2007), but it is not clear whether Belgium will be able to reach its 2020 energy efficiency target.

There has been a previous incentive scheme by the government for renewable energy which led to a deficit. After a few years the government stopped with this scheme. Instead Belgium implemented a system of green certificates, which can be traded on a dedicated market. Electricity sellers are required to have a share of their sold electricity produced from renewables.

On energy efficiency the Belgian government has started a policy that all new public buildings have to be passive buildings.

Source: https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Energy-and-Resources/gx-er-market-reform-belgium.pdf

Trends in national campaigns

National programs and campaigns focus mainly on energy efficiency measures for various target groups. Non-state actors are running campaigns for energy transition and there is a strong grass-roots movement of community energy initiatives and energy cooperatives.

As the last coal power plant has closed there are no campaigns against coal use. Most of civic society campaigning is on the 2 nuclear power plants. There is, among others, pressure from the Netherlands and Germany to close them. There were a few plans for large-scale biomass plants, but these have mostly been stopped by public opinion. There is not a lot of campaigning on gas, which is an important economic sector. Belgium has a habit of a strong civil society, so campaigning is done by local, regional and national NGOs. Most NGOs only operate within their specific language area.

OVERVIEW OF NATIONAL SECIS

Below please find a list of Belgian SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). *The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country*.

POWERHOUSE NEARLY ZERO CHALLENGE (POWER HOUSE NZC)	Changes in Technology
REScoop Wallonie	Changes in Technology
Wikipower	Changes in Individuals' Behaviour
Rues en Transition (Streets in Transition)	Changes in Individuals' Behaviour
Power4you : A pooling of consumers to benefit from advantageous energy tariffs	Changes in Individuals' Behaviour
Michamps4b : To become an active participant in one's energy consumption	Changes in Individuals' Behaviour
CLEAR Consumers to Learn about, Engage with and Adopt Renewable energy technologies	Changes in Individuals' Behaviour
Energy Challenge	Changes in Individuals' Behaviour
Le Prêt vert bruxellois	Changes in Technology
B.L.E.D.	Changes in Everyday Life Situations
Energic'a brac: an educational and playful tool to better understand the energy market in Belgium.	Changes in Individuals' Behaviour
FRCE Fonds de Réduction du Coût Global de l'Energie (French: Global Energy Cost Reduction Fund; Belgium)	Changes in Individuals' Behaviour

Les passeurs d'energie Network	Changes in Individuals' Behaviour
About EnergizAIR The renewable energy weather forecast - Europe	Changes in Technology
ecobuild.brussels THE NETWORK OF BRUSSELS' SUSTAINABLE CONSTRUCTION AND RENOVATION ACTORS	Changes in Complex Interactions
La maison de l'habitat durable	Changes in Individuals' Behaviour
Energivores	Changes in Individuals' Behaviour
TRIME	Changes in Individuals' Behaviour
SMARTER TOGETHER	Changes in Complex Interactions
EEPLIANT : Energy Efficiency Complaint Products 2014	Changes in Individuals' Behaviour
STEP_BY_STEP	Changes in Individuals' Behaviour
iBROAD : Individual Building (Renovation) Roadmaps	Changes in Technology
SAVES2 : Students Achieving Valuable Energy Savings 2	Changes in Individuals' Behaviour
2gether4vulnerability	Changes in Complex Interactions
START2ACT	Changes in Everyday Life Situations
TOPTEN ACT : Enabling consumer action towards top energy-efficient products	Changes in Individuals' Behaviour
DOMINO - Connecting Europe, Saving Energy	Changes in Individuals' Behaviour

Boosting efficiency in electricity use in 8 European regions (EL-EFF REGION)	Changes in Individuals' Behaviour
Energy Check for Low Income Households (EC-LINC)	Changes in Individuals' Behaviour
Persuasive force of children through education (FEEDU)	Changes in Individuals' Behaviour
Common appliance policy – All for one, One for all – Energy Labels (COMEON LABELS)	Changes in Individuals' Behaviour
Eco n' Home or how to reduce energy consumption in Household (ECO N' HOME)	Changes in Individuals' Behaviour
European Solar Days II (ESD II)	Changes in Technology
Sun chart Flanders	Changes in Complex Interactions
Renovation bonus	Changes in Technology
Frigoslag - Fridge event	Changes in Technology
SPIRIT - Energising Faith Communities (SPIRIT)	Changes in Individuals' Behaviour
Creating Actions among Energy Conscious Children (KIDS4FUTURE)	Changes in Individuals' Behaviour
Integration of Active Learning and Energy Monitoring with School Curriculum (ACTIVE LEARNING)	Changes in Individuals' Behaviour
Residential Monitoring to Decrease Energy Use and Carbon Emissions in Europe (REMODECE)	Changes in Individuals' Behaviour

The Energy Path: an e-learning platform for education of the new generations in the sustainable energy field (ENERGY PATH)	Changes in Individuals' Behaviour
TOGETHER on the move - Energy Efficient Transport training for immigrants (TOGETHER)	Changes in Everyday Life Situations
Adopt your LED lamp	Changes in Technology
European fuel Poverty and Energy Efficiency (EPEE)	Changes in Technology
EPORE - Energy Poverty Reduction in Eastern Europe	Changes in Individuals' Behaviour
Refurb	Changes in Technology

‘GOOD PRACTICE’ EXAMPLE OF BELGIAN SECI

Together on the move – Energy efficient transport training for adult immigrants

Introduction

Working with specific target groups and stakeholders to deliver tailor-made training that seeks to enhance the quality of life of immigrants, to facilitate social inclusion as well as conserving essential energy sources for future generations. TOGETHER has a sharp focus on the community added value of setting up, implementing and promoting energy efficiency training and learning material for immigrants.

Brief Description

Together on the move (an IEE project) offers energy efficient transport training for adult immigrants through the development and promotion of ‘ready to use’ teaching and training materials for walking, cycling, public transport and greener car use. The training is to be delivered by language teachers and professionals who work in the field of education, transport and energy. Furthermore, opinion leaders from immigrant institutions and associations will be encouraged and trained to implement the issue of mobility in their formal and non-formal integration courses and activities. These project activities seek to enhance the quality of life of immigrants, to facilitate social inclusion as well as conserving essential energy resources for future generations.

Contextualization

In times of globalization and increasing immigration, sustainable mobility and access to different transport modes is a precondition for finding work, feeling socially included and successfully integrating into a new society. This growing importance of social equity and equal access to transport systems is a driving force for the project consortium to develop new, but necessary support for immigrants.

Aims and objectives

The initiative offers more than raise awareness of the applied target groups. It develops and applies existing knowledge in a way that motivates, facilitates and reinforces rational and responsible mobility behaviour. Together on the move:

- developed, adapted and implemented energy efficient transport modules for immigrants and accompanying didactical tools for teachers of adult education,
- establishes successful mobility training in formal and non-formal adult education,
- generates a broader awareness raising and learning process through widely disseminated learning materials targeting additional immigrants,
- wants to change attitude towards and to increase use of more sustainable modes,
- raises awareness on energy efficient mobility behaviour and its impact on integration and social inclusion to a wide and diverse target group, stakeholders and key actors,
- exchange experiences and good practices between countries,
- formulates policy recommendation.

Methods for intervention

The initiative tries to develop and implement energy efficient transport training for immigrants. The training focuses on providing immigrants with advice on energy efficiency in transport as well as providing them with essential skills in how to travel using sustainable modes.

Steps of implementation

Initiative offers mobility trainings for immigrants related to the five training modules:

- energy saving and sustainable transport
- safe walking
- safe cycling
- public-transport use
- eco-driving.

The training is held by mobility experts.

The role of the households

The initiative is focusing on adult immigrants and through them on their families. They are to attend the training activities in formal or non-formal adult education and learn about energy efficient transport.

Location

Initiative was implemented in Flanders, Belgium.

Textual and communicative aspects of initiative:

The initiative has developed textual teaching and training modules that are accessible also on-line.

The physical/technological aspects of the initiative:

The initiative is focusing on soft measures in order to support migrants and all stakeholders in being able to develop sustainable mobility behaviour.

Source: http://www.together-eu.org/index.php?id=50

CONCLUDING REMARKS AND POLICY IMPLICATIONS

Belgium is among the most energy-dependent EU countries, depending mainly on oil and gas imports. Electricity is mainly produced by nuclear power plants, while share of renewable electricity is low. As current nuclear plans include phase out of nuclear power by 2025, government tried to incentivise renewable energy, but the scheme lead to budget deficit. On energy efficiency the Belgian government has started a policy that all new public buildings have to be passive buildings. National programs and campaigns focus mainly on energy efficiency measures for various target groups.

These trends are to some extent reflected in the identified SECIs. The most visible link of policy and SECIs in in the field of sustainable construction and renovation of buildings. There are rather numerous SECIs working on sustainable buildings, ranging from promotion of nearly zero energy buildings among housing professionals, to networks of sustainable construction and renovation actors, renovation bonuses and zero interest rate energy loans, information centre for sustainable housing and general awareness raising on (zero) energy renovation. There are also numerous SECIs oriented towards energy efficiency awareness raising and change of behaviour, from e-tools and games (energy consumption platform, visualizing the path of energy, calculation module, e-learning platform) to eco-labelling of products or energy audit systems. Energy behaviour SECIs work with a variety of target groups, for example students, faith communities, offices/workplace, families, neighbourhoods. The identified SECIs actually have a rather strong community element and quite a few of them focus on groups of people/families, streets and neighbourhoods, local communities. Such SECIs try to work in peer-to-peer manner mostly, but sometimes they are also based on challenges and competitions or pooling people's power for benefiting from advantageous energy tariffs. This might be the result of non-state actors running campaigns for energy transition and community energy initiatives and energy cooperatives.

Another prominent place is reserved for energy poverty SECIs, all of them targeting energy poor households, be it by home audits and advising or by offering financial support or policy change. A notable share of SECIs also focuses on children, from educating them, to using them as a channel that reaches out to wider circles.

In the field of renewables SECIs are rather scarce, mainly focusing on general awareness raising (e.g. Sun chart Flanders, renewable weather forecast, European Solar Days, raising consumers capacity to take informed decisions). This might be related to the fact that governmental program for support of renewables provided a strong stimulant, so citizens needed more information on renewables, which SECI provided.

In terms of targeting particular socio-demographic profiles, or specific aspects of energy use, the identified SECIs almost completely fail to address the major challenge, which is the Belgian regulation on the usage of company cars that encourages individual driving and usage of the company car also for personal purposes. There was only one identified SECI focusing on sustainable mobility, for the rest the issue of transport sector is not tackled.

The majority of identified SECIs focus on changes in individuals' behaviour (28), then some on changes in technology (10), while focus on changes in complex interactions and changes in everyday life situations is scarce (4 and 3 respectively). Majority of SECIs (29) are run at a cross-national level. In spite of Belgium’s strong division into regions, the SECIs do not reflect this regional focus as only 6 of the identified SECIs are focused on regional level. 7 SECIs are national level oriented and 5 local.

The emphasised SECI provides energy efficient transport training for adult immigrants. Its focus on a enhancing the quality of life of immigrants and facilitating social inclusion is the most interesting aspect of the SECI, which is also an important lesson of this SECI in terms of informing energy policy: working with immigrants call for different awareness raising approaches, but on the other hand has the additional positive side-effect, which is to facilitate social inclusion.

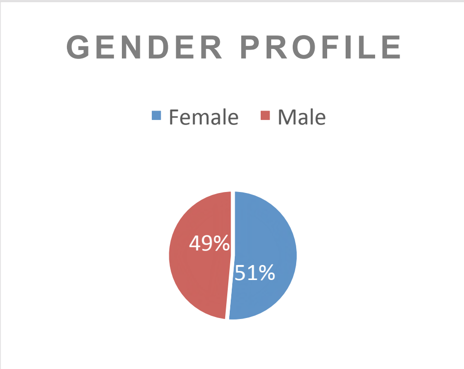
REFERENCES

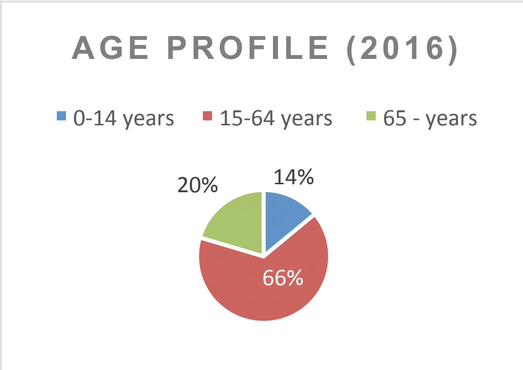
For references, please see individual sections.

BULGARIA

Authors: Marko Hajdinjak, Desislava Asenova

DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY





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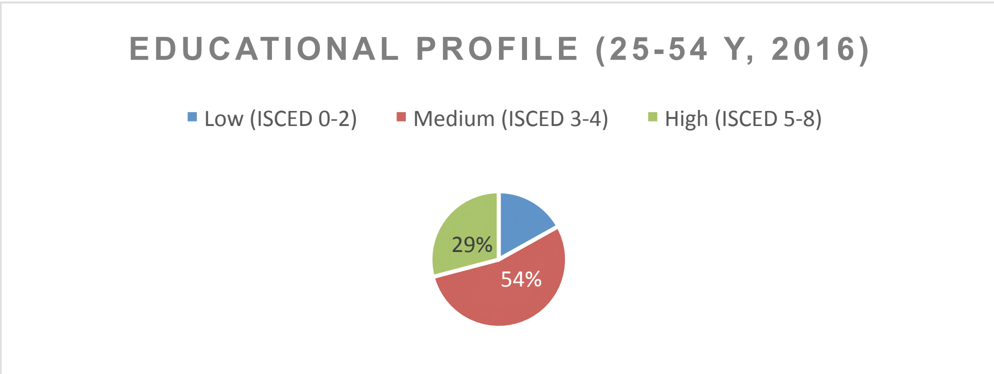

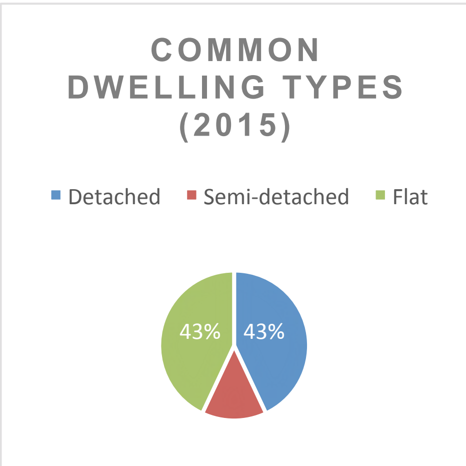

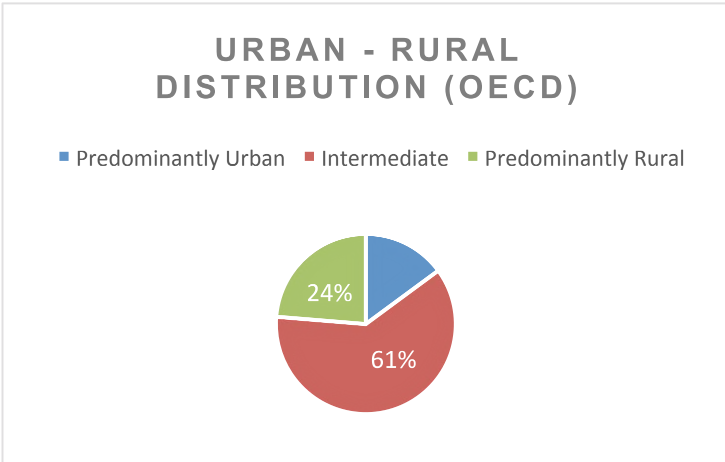

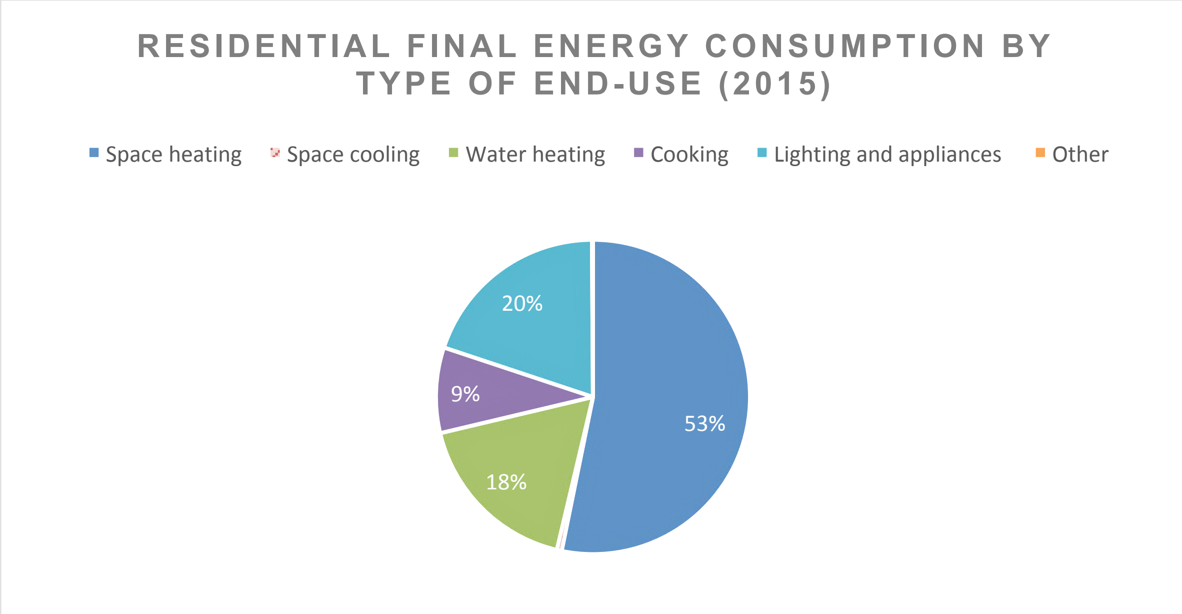

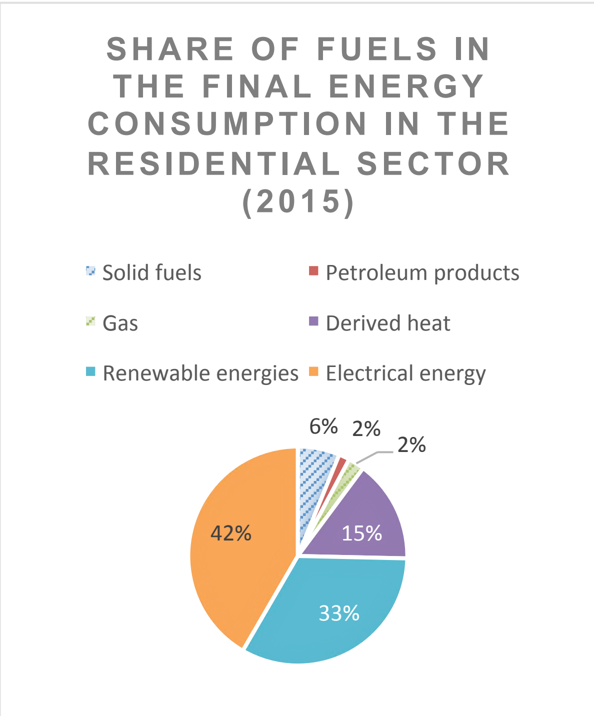

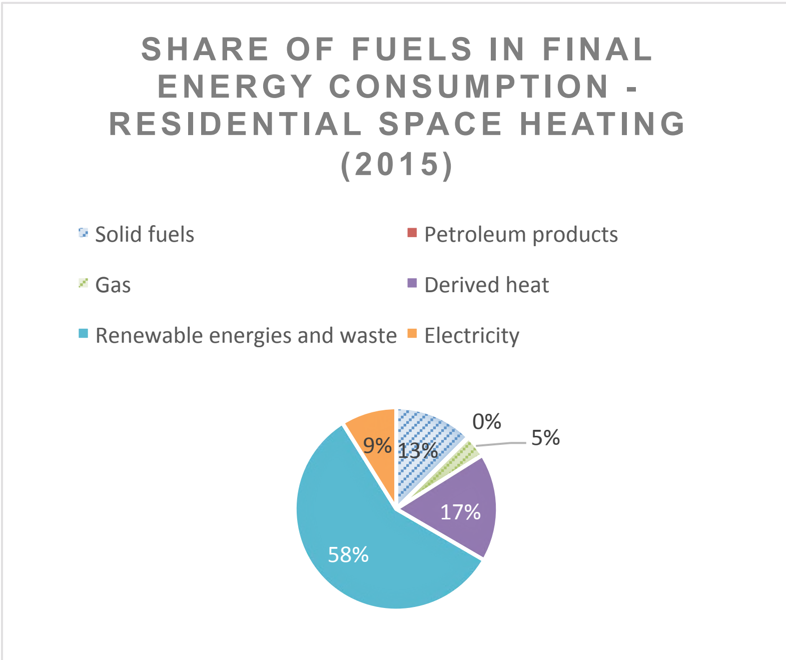

FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

3.556 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

The energy sector of Bulgaria is diverse and well-developed, and Bulgaria is one of the main exporters of electricity in Southeast Europe. The domestic electricity market is highly regulated with only one licensed supplier in each geographical region – CEZ Group in Western Bulgaria, ENERGO-PRO in North-East Bulgaria and EVN in the South. The three distribution system operators are internationally-owned. CEZ Group and ENERGO-PRO are Czech companies and EVN is an Austrian company. In early 2018, CEZ announced that it was selling its Bulgarian assets to a little-known and relatively small private Bulgarian company Inercom, causing considerable controversy and concerns about Inercom's ability to finance and operate energy distribution to over 3 million customers.

The Bulgarian wholesale electricity market is dominated by the state-owned Bulgarian Energy Holding (BEH) and its subsidiaries: the National Electricity Company, Electricity System Operator, Kozloduy Nuclear Power Plant and Maritsa East 2 (the largest thermal power plant in the country). BEH together with the National Electricity Company hold generation assets representing 45% of the installed capacity. The National Electricity Company is the single buyer from the energy producers on the high voltage grid and is the sole electricity supplier at regulated prices for end users. It is also responsible for purchasing electricity from combined heat and power plants (CHP plants), renewables and industrial producers at regulated prices. Electricity System Operator (ESO) is the owner and operator of the country's high and medium voltage electricity transmission grid, which in practice means that all electricity producers and consumers use ESO's transmission system.

The retail electricity market is highly concentrated with a low level of competition and fixed energy prices, determined by the State Energy and Water Regulatory Commission. Energy generation is dominated by nuclear energy (Kozloduy NPP provides more than one third of the total annual electricity output) and solid fuels (about one half of electricity is generated through burning of coal). Renewable energy sources have in recent years became increasingly important, and now represent 20% of Bulgaria's electricity production.[12]

Liberalisation of the electricity market has been proceeding at a very slow pace since 2007 (after entering the EU) and Bulgaria remains one of the last countries in the EU without a fully liberalised market. In 2018, there are still two types of electricity prices in use: flexible prices on the liberalised market and fixed prices on the regulated market, which are determined by the Energy and Water Regulatory Commission. In theory all Bulgarian companies and households have the right to purchase electricity from the liberalised market, but in reality it is very difficult for consumers to buy electricity on the free market. The incentives to do so are also quite limited, as the prices on the regulated market are lower. Full market liberalisation remains a hot social and political issue, as the retail-market and end-user price deregulation would not only increase suppliers' competition and give consumers greater choice, but could also lead to greater price volatility, possibly provoking protests and strikes against price increase.[13]

The gas market depends on a single source of gas supplied through a single route – Russia. The market experiences some issues with establishing connection between domestic gas transmission system and the transit system as well as with delays in developing interconnections with neighbouring countries.

[12] Export.gov (2017). *Bulgaria – Power Generation.* Available at: https://www.export.gov/article?id=Bulgaria-Power-Generation-Oil-and-Gas-Renewable-Sources-of-Energy-and-Energy-Efficiency;
BNT (2018). *Power Supply Company CEZ Sold its Business to Inercom Bulgaria*. Available at: https://www.euscoop.com/en/2018/2/26/cez-sold-suspicious
The National Electricity Company (2018). *Official Website*. Available at: http://www.nek.bg/index.php/bg/za-nas

[13] The World Bank (2016). *Bulgaria Power Sector: Making the Transition to Financial Recovery and Market Liberalization. Summary Report*. Available at: https://www.me.government.bg/files/useruploads/files/wb_ras_i__summary_report_en.pdf

About 60% of Bulgarian gas market is controlled by a single company – Overgas Inc, AD. The largest natural gas importer in Bulgaria is Bulgargaz EAD, which is part of BEH. According to statistics, natural gas prices for household consumers in Bulgaria in the first half of 2017 were among the lowest in the EU – around 0.03 euro per kWh.[14]

The district heating networks exist in 12 Bulgarian cities, serving in total about 600,000 households. All district heating companies are local monopolies. Most use natural gas as fuel, but some are still using coal.

Particular socio-material aspects that influence energy consumption

Households are the third largest sector in terms of final energy consumption (2,261,000 toe in 2016), after transport and industry, and ahead of services and agriculture. The distribution of electricity consumption of Bulgarian households depends mainly on the heating source they are using – electricity, natural gas, coal, wood or other fuels. In 2015, the electricity consumption of Bulgarian households was distributed as follows: 46% was used for water heating; 20% for lightning and small appliances; 16% for cooling (refrigerator use); 8% for cooking; and 10% was used for other purposes.[15]

Various sources studying energy efficiency behaviour of Bulgarian households show that energy poverty is a serious issue in the country. According to statistics for 2013, 46.6% of the total population of Bulgaria cannot maintain adequate thermal comfort in their households. Energy poverty is defined as "*a situation in which a household must allocate more than 10 % of its income in order to achieve a satisfactory level of heating in their home*".[16] According to the data of the EU Energy Poverty Observatory, Bulgarian households are among the most vulnerable in this regard in the EU. The rising electricity and district heating prices in the last years have forced many households towards using coal and wood for heating, which further worsens air and living quality. The electricity prices for households in Bulgaria have increased from 8.13 euro cents per kWh in 2010, to 9.55 euro cents in 2017.[17] Although the prices are still the lowest in the whole EU, around 444,000 households are claimed to be highly vulnerable to increases in electricity prices, while another 149,000 households are income-poor and could quickly become energy-vulnerable in case energy prices increase further.[18]

It is estimated that with only 5% of Bulgarian homes being built after 2000, most Bulgarian homes do not meet contemporary requirements for energy efficiency. Furthermore, energy comfort of Bulgarian households is threatened by the trend of energy prices rising at a faster pace than household incomes. A widespread practice of under heating in order to reduce energy consumption and energy bills at the expense of energy comfort is also observed. Measures such as providing households with new energy efficient windows, wall insulation, energy-saving appliances should be taken in order to increase energy efficiency in the country.

[14] European Commission (2014). *Bulgaria 2014 Country Report*. Available at: https://ec.europa.eu/energy/sites/ener/files/documents/2014_countryreports_bulgaria.pdf;
Eurostat (2018). *Natural gas price statistics.* Available at: http://ec.europa.eu/eurostat/statistics-explained/index.php/Natural_gas_price_statistics#Natural_gas_prices_for_household_consumers
[15] REACH Project (2015). *Ръководство за енергийни одитори на домакинства*. Available at: http://reach-energy.eu/wordpress/wp-content/uploads/2015/01/D3.8-Training-module-for-other-schools-EAP.pdf;
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[16] Center for the Study of Democracy (2017). *Пътна карта за развитието на българската електроенергетика до 2050 г.: основни жалони*. Available at: http://www.csd.bg/artShowbg.php?id=18059;
Kulinska, E. (2017). 'Defining Energy Poverty in Implementing Energy Efficiency Policy in Bulgaria.' *Economic Alternatives*, Issue 4, pp. 671-684. Available at: http://www.unwe.bg/uploads/Alternatives/11_EAlternativi_english_4_2017.pdf
[17] Center for the Study of Democracy (2017);
Statista (2018). *Electricity prices for households in Bulgaria from 2010 to 2017, semi-annually (in euro cents per kilowatt-hour)*. Available at: https://www.statista.com/statistics/418072/electricity-prices-for-households-in-bulgaria/
[18] Export.gov (2017). *Bulgaria – Power Generation.*

Current Trends in Energy Policy

According to the last version of the Bulgaria's energy strategy, main efforts in the field of developing the energy sector are directed towards energy efficiency, energy self-sufficient buildings, electric road vehicles, renewable energy and building of Smart Grids. The smart grids are expected to improve the quality of services and contribute to more flexible energy demand.[19] The main financial source for replacement of ordinary power transmission networks with smart grids will be EU funds.[20]

Energy efficiency could be considered as an integral part of Bulgaria's energy policy. The Energy Architecture Performance Index Report for 2017 notes that Bulgaria has improved its energy efficiency in the last few years.[21] However, the rising levels of households' "energy poverty" is among the biggest challenges for the sustainable energy efficiency policy.[22]

In order to comply with the EU Directive 2012/27/EU that aims to establish a common framework to promote energy efficiency within the EU, Bulgaria has developed National Energy Efficiency Action Plan 2014-2020. The national 2020 energy savings target at final energy consumption level is 716 ktoe/year. In order to achieve this target Bulgaria has introduced measures such as: i) energy taxes or carbon dioxide taxes that aim to reduce final energy consumption; ii) financing schemes and instruments or fiscal incentives that lead to the application of energy-efficient technology or techniques and have the effect of reducing end-use energy consumption; iii) standards and norms that aim at improving the energy efficiency of products and services; iv) training and education in the field of energy efficiency. The plan also introduces financial mechanisms to promote measures for energy efficiency improvement that include national funds and programmes and operational programmes such as: Energy Efficiency and Renewable Sources Fund; Operational Programme "Innovation and Competitiveness 2014-2020; National programme for energy efficiency of multi-family buildings; National Trust Ecofund – Investment programme for climate and others.[23]

Trends in national campaigns

National energy campaigns in Bulgaria are mainly focused on cutting down household energy consumption, stimulating energy savings, reducing greenhouse gas emissions, promoting green transport, and introducing more energy-efficient habits among consumers. They are organised by varied range of actors including government, municipalities, NGOs, communities and business. Many of them are implemented as part of EU funded projects. The largest initiative in the field of energy efficiency is the National Programme for Energy Efficiency of Residential Buildings, which provides grants for renovation of multifamily residential buildings and thus contributes to improving the energy efficiency of multi-household residential buildings. The programme targets over 2,000 buildings in Bulgaria, which equals over 100,000 households.[24]

[19] Ministry of Economy, Energy and Tourism (2011). *Energy Strategy of the Republic of Bulgaria till 2020: For Reliable, Efficient and Cleaner Energy*. Available at: https://www.me.government.bg/files/useruploads/files/epsp/23_energy_strategy2020%D0%95ng_.pdf
[20] Export.gov (2017). *Bulgaria – Power Generation.*
[21] World Economic Forum (2017). *Global Energy Architecture Performance Index Report 2017*. Available at: http://www3.weforum.org/docs/WEF_Energy_Architecture_Performance_Index_2017.pdf
[22] Kulinska, E. (2017). 'Defining Energy Poverty.'
[23] Ministry of Energy (2017). *National Energy Efficiency Action Plan 2014-2020*. Updated 2017. Available at: http://www.seea.government.bg/documents/TRA%20BG%20NEEAP%202017%20EN.pdf
[24] Ministry of Regional Development and Public Works (2015). *Energy Efficiency of Multi-Family Residential Buildings National Programme*. Available at: http://www.mrrb.government.bg/en/energy-efficiency/energy-efficiency-of-multi-family-residential-buildings-national-programme/

OVERVIEW OF NATIONAL SECIS

Below please find a list of Bulgarian SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country.

FIESTA - Burgas	Changes in Technology
FIESTA - Vratsa	Changes in Technology
FIESTA - Pazardzhik	Changes in Technology
European Citizens Climate Cup (ECCC)	Changes in Individuals' Behaviour
POWERHOUSE NEARLY ZERO CHALLENGE (POWER HOUSE NZC)	Changes in Technology
DESIREE GAS (Demand Side Residential Energy Efficiency Through Gas Distribution Companies In Bulgaria)	Changes in Technology
Solar roof	Changes in Technology
3e-HOUSES	Changes in Individuals' Behaviour
STACCATO project	Changes in Technology
Aha!Car platform	Changes in Complex Interactions
National Programme for Energy Efficiency of Residential Buildings	Changes in Technology
Residential Energy Efficiency Credit Line (REECL)	Changes in Complex Interactions

Thermal insulation of a residential building through Energy Efficiency and Renewable Sources Fund (EERSF)	Changes in Technology
REACH	Changes in Complex Interactions
ACHIEVE	Changes in Individuals' Behaviour
EnerGbg	Changes in Individuals' Behaviour
Warmth for the Children	Changes in Technology
SHELTER	Changes in Technology
DOMINO	Changes in Individuals' Behaviour
DEHEMS	Changes in Individuals' Behaviour
Energy Neighbourhoods 2 (EN2)	Changes in Individuals' Behaviour
Union of Homeowners Associations	Changes in Individuals' Behaviour
REMODECE	Changes in Individuals' Behaviour
BAMBINI	Changes in Everyday Life Situations
ENERLIN	Changes in Technology
European Dimensions of District Heating in Sofia	Changes in Individuals' Behaviour
FRESH	Changes in Complex Interactions

To save our common home - the Earth	Changes in Everyday Life Situations
Children and energy	Changes in Everyday Life Situations
iBROAD : Individual Building (Renovation) Roadmaps	Changes in Technology
SAVES2 : Students Achieving Valuable Energy Savings 2	Changes in Individuals' Behaviour
IN-BEE : Assessing the intangibles: the socioeconomic benefits of improving energy efficiency	Changes in Individuals' Behaviour
START2ACT	Changes in Everyday Life Situations
PRO.MOTION - Creating liveable neighbourhoods while lowering transport energy consumption	Changes in Individuals' Behaviour
Energy, Education, Governance and Schools. A European school panel for involving local communities in energy efficiency programs (EGS)	Changes in Complex Interactions
Energy-Conscious HOuseholds in ACTION (ECHO ACTION)	Changes in Complex Interactions
Sustainable Energy Communities in Historic URBan Areas (SECHURBA)	Changes in Individuals' Behaviour
Energy Self Supply in Rural Communities (ENSRC)	Changes in Technology
European Young Energy Manager Championship (EYEMAN CHAMPIONSHIP)	Changes in Individuals' Behaviour
More biking in small and medium sized towns of Central and Eastern Europe by 2020 (MOBILE2020)	Changes in Everyday Life Situations
TRENDY TRAVEL - Emotions for sustainable transport	Changes in Everyday Life Situations
From Estonia till Croatia: Intelligent Energy Saving Measures for Municipal housing in Central and Eastern European Countries (INTENSE)	Changes in Individuals' Behaviour

Creating Actions among Energy Conscious Children (KIDS4FUTURE)	Changes in Individuals' Behaviour
Integration of Active Learning and Energy Monitoring with School Curriculum (ACTIVE LEARNING)	Changes in Individuals' Behaviour
EPORE - Energy Poverty Reduction in Eastern Europe	Changes in Individuals' Behaviour

‘GOOD PRACTICE’ EXAMPLE OF BULGARIAN SECI

Children and Energy

Description*:*
“Children and Energy” was an educational and awareness campaign organized by the largest electricity distribution company on the Bulgarian market – CEZ. It targeted children from grades 3 to 4 (9-10 years old) from 10 Bulgarian cities, but indirectly also their parents. Children learned what electricity is, how it is brought to their homes and how to use it in efficient and sustainable way.

Contextualization
CEZ Bulgaria EAD was founded in 2005, when the international energy company CEZ Group entered the Bulgarian electricity market, purchasing from the Bulgarian state several electricity distribution companies supplying electricity to customers in the North-West Bulgaria, including the capital Sofia. Becoming the largest electricity distributor in the country, CEZ Bulgaria had to face considerable public distrust (a foreign-based electricity distributor was a novelty for the country) and opposition to its periodic demands for the increase in electricity prices. One of the measures CEZ undertook as a response to this situation was its Social Responsibility Programme (SRP). SRP includes varied activities – from supporting arts and culture, organisation of sport activities, initiatives aimed at protection of nature and environment, to educational campaigns for consuming less energy.

The international CEZ Group has a relatively long history (over two decades) of engaging in comprehensive information and education programmes for energy efficiency aimed at young people. Learning events such as debates with students, seminars for teachers, school clubs and competitions in energy saving are among the most popular methods used to teach children and indirectly also their families to reduce their energy consumption. Another crucial issue that needs to be mentioned in order to fully understand the importance of this initiative is the energy poverty. As already discussed in Section 2, Bulgaria has the largest share of households living in energy poverty or being at risk of energy poverty in the EU. Many Bulgarian families try to cut their electricity bills at the expense of their comfort and health. Teaching children how to use less energy without jeopardising their comfort is therefore an important tool for mitigating the risk of energy poverty.

Aims and objectives
The main aim of the initiative was to inform children and through them influence and change the way families use electricity. Children learned how electricity is produced, they were acquainted with the principles of energy efficiency, and were introduced to several practical ways for consuming less electricity at home. The underlying objective was to change the energy behaviour of parents as well, as children would inevitably share what they have learned with their families.

Methods for intervention

At the first stage of the initiative, a booklet was produced. Its title was “About children and energy” and its purpose was to inform elementary school children (third and fourth grades) how they can save energy at home. Information in the booklet was presented in the form of curious facts, tasks and crossword puzzles. The booklet was disseminated during specially organised classes in selected schools in 10 Bulgarian towns in North-West Bulgaria (the region where CEZ is the sole electricity provider). CEZ employees (experts on energy efficiency) visited schools, delivering lectures and answering children’s questions. The information was presented in a way that kept children engaged and interested, and was easily understandable for them. Numerous illustrations were used for visualising the information. Classes were divided into two modules – ‘Discussions with students on energy efficiency and reasonable use of electricity’ and ‘Lessons on safe use of electricity.’

Steps of implementation
The process of implementation – from the first idea for the concept of the lesson to a successful conclusion – lasted less than a year. The initiative can be divided into the following steps:

- The initial idea and further elaboration of the concept.
- Drafting the content of the lesson and arranging it in a way that would be engaging and understandable for children.
- Development, design and printing of the booklet “About children and energy.”
- A lesson on energy efficiency, conducted in class by a qualified expert from CEZ and in presence of the class teacher.
- Giving the booklet and other informational materials to children.

Results/outcomes
Lessons were conducted in all third and fourth grades in selected schools in 10 towns located in North-West Bulgaria. 1500 copies of the booklet “About children and energy” were printed and distributed to children attending the lessons. No follow-up survey or measurements were conducted to establish the actual effect of the campaign and there are no means available to verify whether the initiative resulted in actual change in energy-consuming practices and a decrease in the energy consumption.

The role of the households
Households were engaged indirectly, as the main role was played by the children, attending the special energy efficiency class in their schools. The rationale was that the children would share what they have learned in school with their parents.

Location
20 schools in 10 towns located in North-West Bulgaria.

Was/is the initiative successful?
The most important outcome of the initiative and the reason to evaluate it as successful was that it provided an opportunity to children not just to learn how to save energy at their homes, but also to voice their concerns about environment and strengthen their skills to effectively participate in energy related decision-making processes in their families,

neighbourhoods and schools. The lessons on energy efficiency also represented a step towards integration of sustainable energy education in the Bulgarian school life.

Textual and communicative aspects of initiative
Households with children are a special group of energy consumers that are in general rather conservative in their energy behaviour and less inclined to take steps towards cutting their electricity consumption due to concerns that such actions might jeopardise the well-being of the family, and in particular the children. At the same time, households with children are average to high electricity consumers. Their energy consumption practices are largely defined by the most important priority of the parents – comfort, health and development of children. Low energy literacy and engagement, unpredictable daily routines, and lack of time and resources to consider more sustainable and efficient market opportunities and technological solutions also deter families from active and meaningful control of their energy consumption. One potentially very effective way to reach such households and create preconditions for behaviour change is to engage them through children.

Shared understandings related to initiative
The initiative corresponded well with some of the goals outlined in the Bulgarian Energy Efficiency Act. Among Energy Efficiency Improvement Activities and Measures described in Article 29 is also "raising awareness among households." Article 25 speaks about measures to be implemented as a priority in households affected by energy poverty.
The initiative was supported by the Bulgarian Ministry of Education and Science.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

Of 45 sustainable energy consumption initiatives (SECIs) examined and described in the frame of ENERGISE project, 14 have been classified as 'Changes in Technology,' 19 as 'Changes in Individual Behaviour,' 6 as 'Changes in Everyday Life Situations' and 6 as 'Changes in Complex Interactions.' The objectives of the largest group of initiatives implemented in Bulgaria are therefore to influence attitudes and choices related to energy efficiency and potentially change the energy consuming behaviour of individual households or household members, while the second largest group of initiatives does not even try to change consumption patterns of households, but rather aims at achieving energy savings through introduction of energy efficient technical measures. Only a minority of initiatives target more complex solutions that necessitate active involvement of a community of people who do not necessarily know each other and are willing to act and interact for the common good, and not only to reduce the energy costs of their own household.

Another curious feature of Bulgarian SECIs is that most of them (32) are implemented as part of the international projects – mostly EU funded. Only a few of the initiatives are true grass-root projects developed and implemented by the household residents themselves. An interesting observation from the analysis on international projects is that Bulgarian householders are often very eager and active participants in top-down initiatives (in many projects, especially the ones involving a competitive dimension of energy saving, Bulgaria archived higher than average levels of participation and some of the best results), but are very reserved when it comes to self-organisation and cooperation with their neighbours and co-citizens. Additional reason why Bulgarian households rarely take measures aimed at increasing energy efficiency is the widespread perception that ordinary citizens cannot change anything as the energy sector is completely controlled by the state and energy monopolies. Substantial legislative barriers and regulatory burdens further discourage Bulgarian households from taking action – a case in point is the SECI 'Solar Roof.' Households from a 15-storey apartment building in Sofia united to install 120 solar panels on the roof of the building. While the purchasing and installing the panels took two weeks, obtaining the considerable number of different permits took almost two years.

Finally, there is the crucial issue of low incomes and widespread (risk of) energy poverty. The main priority for most households is therefore not cleaner energy and protection of environment, but lower energy expenses for the households. It is not surprising that a considerable number of initiatives aims at lowering the energy expenses of households, mostly through measures like retrofitting and thermal insulation of multi-storey residential buildings (typically through grants provided by the Bulgarian state and EU funds). The strong focus on technological solutions and retrofitting is also a consequence of the old age and poor state of repair of the Bulgarian building stock, which mostly dates from the socialist period, when energy was cheap and plentiful. Technological measures also dominate the national energy policy and strategic documents like Energy Efficiency Act and National Energy Efficiency Action Plan 2014-2020. One of the few non-technical measures is education in the field of energy efficiency – an objective that corresponds well with the SECI described in Section 3 (Children and Energy). This initiative recognised that children have the right to voice their opinions regarding issues that concern their well-being, health and comfort. Engaging them in the period when their personalities, values and views are most actively and intensively formed can unlock their full potential to participate in the family decision-making processes and can lead to genuine and lasting changes in the way households consume energy. If shown and taught how to use energy in a sustainable and responsible way, these children will mostly likely grow up into ecologically aware energy consumers.

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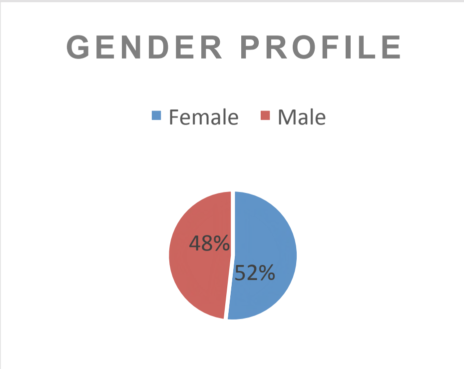
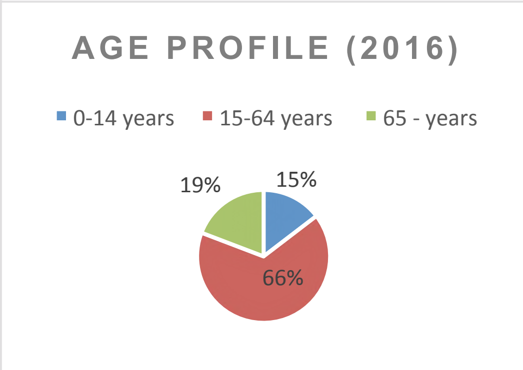
CROATIA

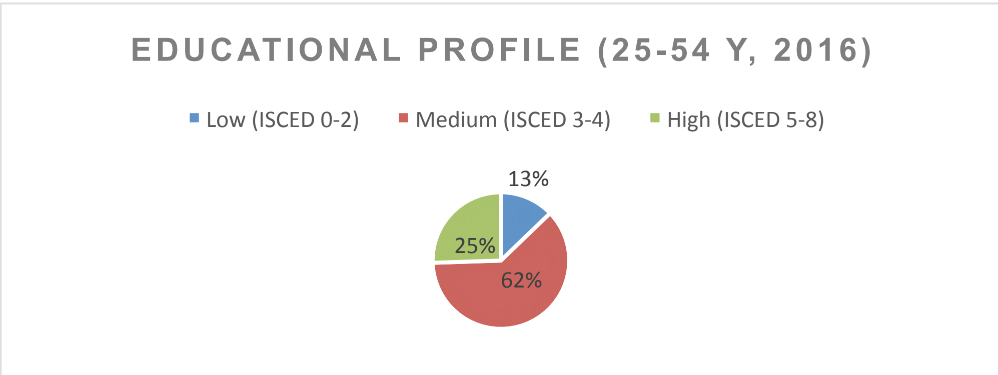
Author: Tomislav Tkalec

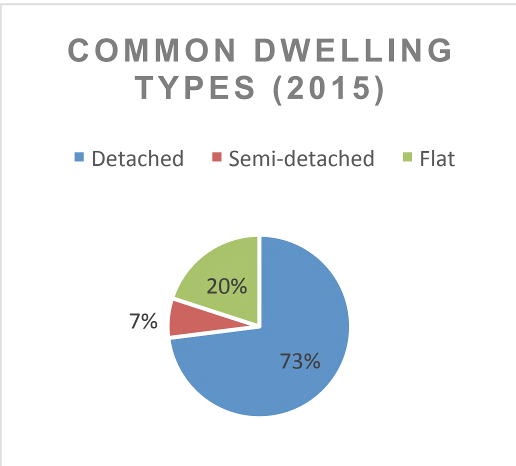
DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY

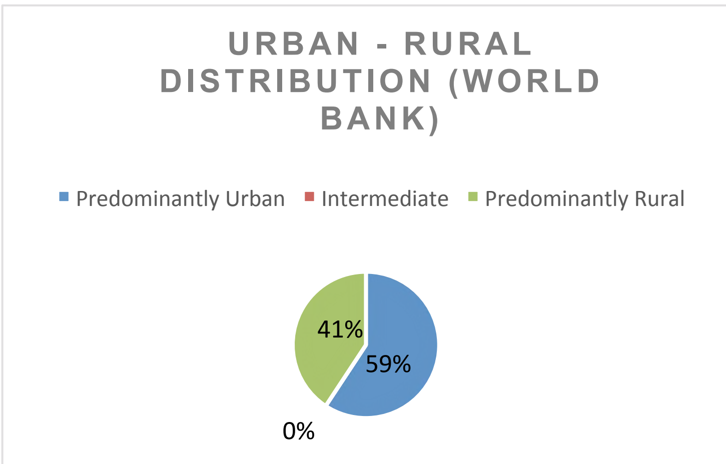


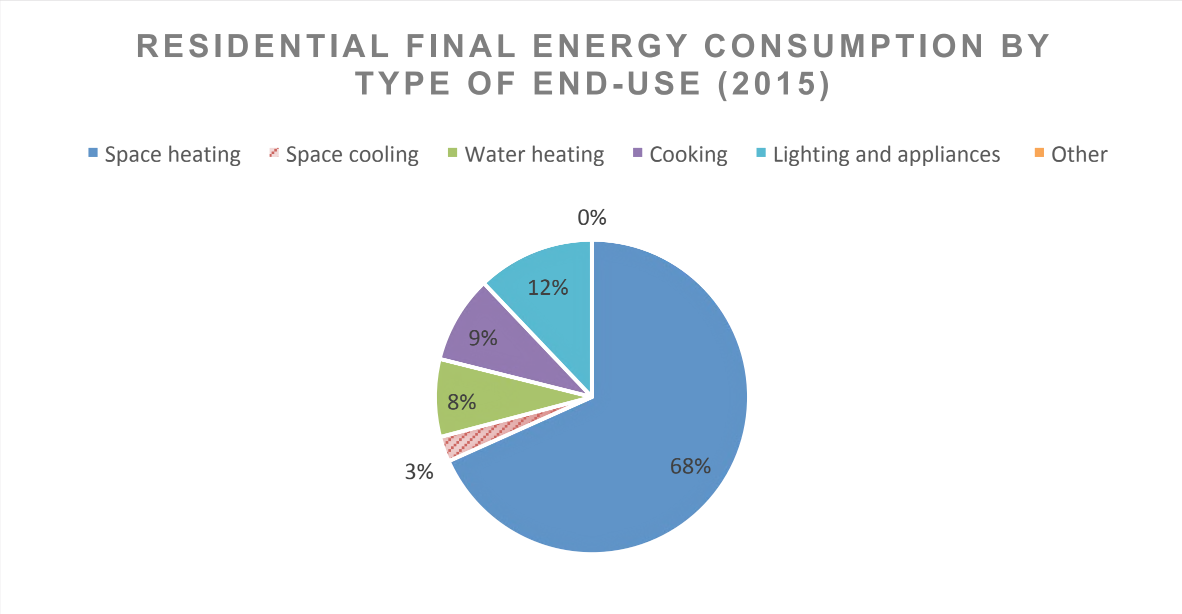


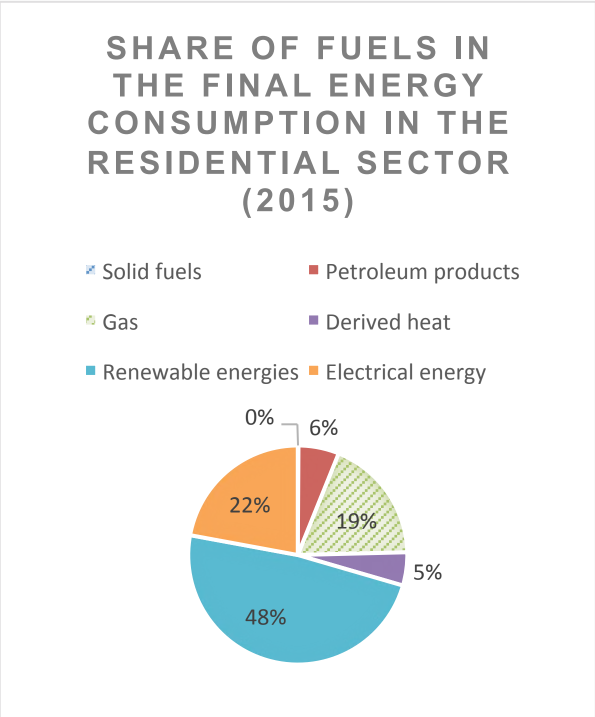
CLIMATE: Mediterranean and continental; continental climate predominant with hot summers and cold winters; mild winters, dry summers along coast

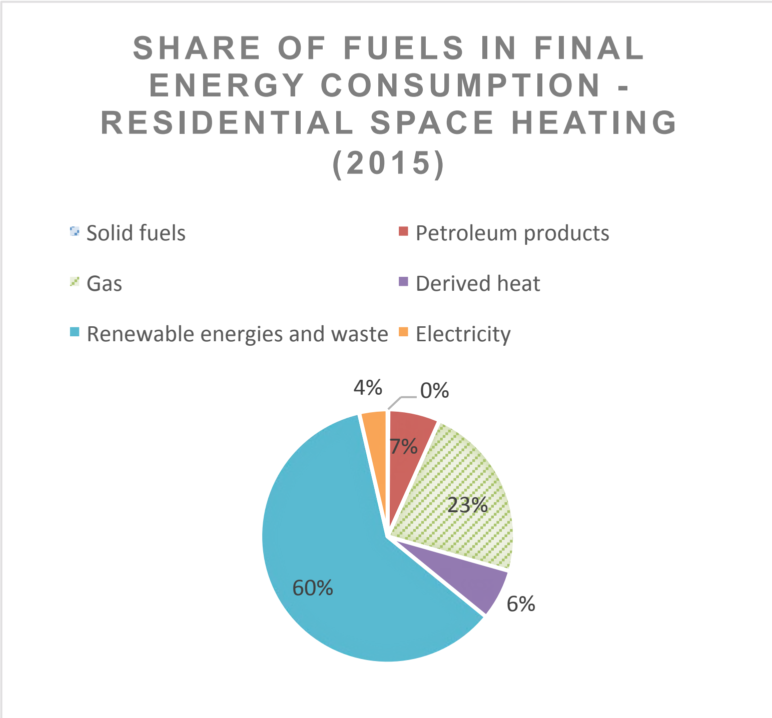












FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

6.683 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

Croatia imports about 50 % of the total of about 350 PJ (petajoules) of energy consumed annually. It imports 80 % of its oil needs, 40 % of gas, 35 % of electricity, and 100 % of coal needs. As a member of the European Union (EU) since July 1, 2013, Croatia has adjusted its energy sector regulations and development plans to enable smooth integration into the European energy market and to ensure diversified and sustainable supply of energy resources and improved energy efficiency.

Croatia satisfies its electricity needs largely from hydro and thermal power plants, and partly from the Krško NPP, which is co-owned by Croatian and Slovenian state-owned power companies. Hrvatska elektroprivreda (HEP) is the national energy company charged with production, transmission and distribution of electricity, and although the electricity market is liberalised, HEP still have more than an 80% share in it.

Total installed capacity of generating objects built in Croatia amounts to 3745 MW, 2079 MW of which is hydro-power’s share, and 1666 MW comes from thermal power plants. There are 25 hydroelectric power plants and 7 thermal power stations, 3 of which also generate heat for industry and heating in cities. Also, 338 MW is available from the co-owned Krško nuclear power plant, and 210 MW from Plomin 2 coal power plant.

In 2014, domestic production amounted to 12.182 GWh, which was 67.9% of total domestic demand. The remaining 32.1% was covered through trade. Domestic electricity is produced mainly from hydro-power (68,3%) and coal (17,5%), gas and oil cover for 6,5%, and other renewables (biomass, solar, wind) for 6,7% of the generated electricity. Total consumption is around 18.000 GWh.

Source:
http://www.cigre.org/var/cigre/storage/original/application/0f9a2e00204472e1a8c1ecb425e39fba.pdf

Particular socio-material aspects that influence energy consumption

Housing stock is old and mostly energy inefficient. However, the improvement in insulation for buildings are usually concentrated to the better off parts of the population, while the less well-off parts of society are not able to invest into improving energy efficiency of their dwellings.

For the reason of low energy efficiency of buildings in combination with high percentage of ownership of housing stock (more than 95% people live in their own flat/house) and low incomes there is significant percentage of households living in energy poverty. In remote parts of the country, people live even in severe energy poverty (without access to electricity grid).

Because of the warm climate and climate change there is stronger need for energy for cooling in the coastal regions. In the summer time these regions are also full of tourists, which produces more pressure on various resources, especially energy and water.

Current Trends in Energy Policy

Implementation of the Energy Strategy adopted in 2009 has not been quick, primarily due to the 2009-2015 economic recession in Croatia. The new coalition government elected in October 2016 reassigned responsibility for the energy sector from the Ministry of Economy, Entrepreneurship, and Crafts to a newly-created Ministry of Environmental Protection and Energy. The new Minister announced a revision of the Energy Strategy, switching its focus to environmentally friendly technologies (especially solar) that would be based on a sustainable feed-in tariff system. The Minister also expressed support for a few planned major projects, including a floating LNG terminal at the Island of Krk, the Ionian Adriatic Pipeline, and a system of hydro-power plants on the Sava River. However, the governing coalition broke down in May 2017 and the revision of the strategy and the implementation of the new projects is likely to slow down. Currently there is no financial support scheme for RES electricity generation.

Source: https://www.export.gov/article?id=Croatia-Energy

Trends in national campaigns

National campaigns are run mainly through national Environmental Protection and Energy Efficiency Funds. The fund has programs and financial aids for EE measures (energy refurbishment of buildings, replacement of old inefficient heating systems, waste management, air pollution, subsidies for electric cars). The fund's target groups are households, municipalities, regional authorities, companies and other institutions and organisations.

The fund is also active in campaigns for cleaner air that is targeting air pollution from wood burning. Other non-governmental stakeholders and actors run campaigns on RES projects, civil society has campaigns on community (RES) projects and energy cooperatives, energy efficiency, energy poverty and sustainable mobility. There is especially a strong push from the civil society on the topic of energy cooperatives, and also on energy poverty.

Civil society is also active in campaigns against fossil fuels (Plomin and Ploče coal power plants), drilling for oil and gas in the Adriatic sea, LNG terminal on Island of Krk and nuclear power plants in neighbouring countries.

OVERVIEW OF NATIONAL SECIS

Below please find a list of Croatian SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). *The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country*.

REACH	Changes in Complex Interactions
START2ACT	Changes in Everyday Life Situations
FIESTA	Changes in Technology
Instigating Simple Energy Efficient Behavioural Practices in Schools (FLICK THE SWITCH)	Changes in Individuals' Behaviour
Common appliance policy – All for one, One for all – Energy Labels (COMEON LABELS)	Changes in Individuals' Behaviour
European Network of Information Centres promoting Energy Sustainability and CO2 reduction among local COMmunities (ENESCOM)	Changes in Individuals' Behaviour

More biking in small and medium sized towns of Central and Eastern Europe by 2020 (MOBILE2020)	Changes in Everyday Life Situations
Solar maping (Solarno mapiranje)	Changes in Technology
South East Europe Sustainabile Energy Policy (SEE SEP)	Changes in Complex Interactions
Awareness and education in rebewable energy sources (AWERES)	Changes in Individuals' Behaviour
Local Eneregy Dialog (LED)	Changes in Complex Interactions
Wit knowledge to a warm home (Znanjem do toplog doma)	Changes in Complex Interactions
Citizens4EnergyTransition	Changes in Individuals' Behaviour
Laboratory for "do-it-yourself" sustainability	Changes in Everyday Life Situations
School of Sustainability	Changes in Complex Interactions
Energy Cooperative "Island Krk" (Energetska zadruga "Otok Krk")	Changes in Complex Interactions
Energy Cooperative Lug (Energetska kooperativa Lug)	Changes in Complex Interactions
Energy Cooperative Sunny Hvar (Energetska zadruga Sunčani Hvar)	Changes in Complex Interactions
Energy Cooperative Kaštela (Energetska zadruga Kaštela)	Changes in Complex Interactions
Energy advisers for energy poor households	Changes in Individuals' Behaviour
Solar energy for households in rural areas	Changes in Technology
Promotion of Energy Efficiency in Croatia	Changes in Individuals' Behaviour

Project Energy Cooperatives	Changes in Complex Interactions
CITIZENERGY	Changes in Individuals' Behaviour
Energy efficiency advisors for low-income households	Changes in Individuals' Behaviour
Wise Power - Fostering Social Acceptance for Wind Power	Changes in Complex Interactions
Days of Passive House in Croatia	Changes in Technology
EUpeR - With energy efficiency against energy poverty	Changes in Individuals' Behaviour
SUSTAINCO (Sustainable energy for rural communities)	Changes in Individuals' Behaviour
Video - Manual for energy efficiency	Changes in Individuals' Behaviour
Electricity supply	Changes in Individuals' Behaviour
Energy refurbishment of family houses and multiapartment buildings	Changes in Individuals' Behaviour
Co-financing of purchase of energy efficient A+++ domestic appliances	Changes in Individuals' Behaviour
National portal for energy efficieny: Advices for sustainable home	Changes in Individuals' Behaviour
Kids and wind	Changes in Everyday Life Situations

'GOOD PRACTICE' EXAMPLE OF CROATIAN SECI

Project Energy Cooperatives

Introduction: Increasing renewable use by promotion of knowledge about current possibilities and models of energy cooperatives.

Brief Description

The main goal of this project is to promote renewable energy by promoting energy cooperatives and ownership by local communities and citizens. The project was run by UNDP Croatia and included activities such as workshops for citizens, where they would gain knowledge about energy cooperatives and how to form or start your own, writing a manual on how to form and start an energy cooperative in Croatia, implementing 10 workshops for citizens about energy cooperatives.

Contextualization

Energy cooperatives are associations of local people that have joined their financial and material resources in developing locally owned renewable energy facilities. In this sense, renewable energy sources are becoming a backbone of sustainable development by addressing not only energy aspects but also economic, social and environmental aspects of community development.

Aims and objectives

The main goal of this project is to promote renewable energy by promoting energy cooperatives and ownership by local communities and citizens. Specific objectives of the project is to:

- develop a knowledge base on existing energy cooperative models in Germany, Denmark, Austria and other countries that have developed energy cooperatives tradition,
- organize 10 local seminars on the topic,
- write a manual on setting up an energy cooperative in Croatia,
- pilot between one and three selected energy cooperatives that will later on serve as models for other potential cooperatives to follow.

Methods for intervention

The project will inform the general public about cooperatives through participating in related conferences and developing a project web site. Producing a manual on developing energy cooperatives in Croatia will enable us to educate both the policymakers and prospective energy cooperatives members. Apart from this, future cooperative trainers will be educated. Disseminating knowledge about energy cooperatives and their benefits is crucial for achieving the overall project objective.

Besides targeting the general public, the project will organise 10 seminars for potential future energy cooperative members. This will be done throughout Croatia, in locations where an initial potential for the development of cooperatives exists. The seminars will target the core beneficiaries of the project - prospective energy cooperative members - with the aim of familiarizing them with benefits of developing cooperatives. These events will also foster a dialogue between multiple project stakeholders. Following this, three pilot cooperatives will be selected and their activities will be supported.

Steps of implementation

This project will educate the general public and stakeholders about energy cooperatives and their benefits. Ten local seminars, aimed at specific target groups – such as potential future cooperatives members – will be organised. The seminars will gather members of the financial industry, technology providers, policymakers and locals. During these events the project hopes to foster a collaborative dialogue between these groups of stakeholders. Following this, three cooperatives will be selected and developed further with the aid of UNDP Croatia and project partners. The cooperatives will receive legal, financial and technical support from the project team. In specific, local renewable energy potentials will be evaluated using the Material Flow Analysis methodology. This is a resource management methodology aimed at investigating the best renewable energy projects in a region. After conducting field research, multiple or single projects are evaluated in terms of their pre-feasibility.

Results/outcomes

The project helped in development of 3 energy cooperatives, educating the locals, policy makers, members of the financial community and other stakeholders about energy cooperatives through 10 seminars across Croatia, and publishing a manual for setting up cooperatives.

The role of the households

Households can become members of energy cooperatives and were addressed in this way. In that way they can be engaged in local development and changes that address economic, social and environmental aspects of the traditional energy systems. When locals invest financial resources into such projects, greater added value is circulated within the community. Locals' skills and work is employed more, while projects are developed to address local environmental issues.

Location

Republic of Croatia

The physical/technological aspects of the initiative:

The initiative was focused on developing or bringing in new modes of organising and operating – in the form of energy cooperatives, rather than on technical and physical aspects of the energy topic. Technical aspect was included in form of technical knowledge support for three selected cooperatives.

Shared understandings related to initiative:

Shared understanding of included actors is crucial for the success of this initiative. The economic potential of RES-cooperatives is in locally-owned investments, creation of new jobs and new income for local communities; it brings more energy stability (less energy-import) from locally-available sources, at a price that could be adjusted if necessary, to prevent energy poverty which comes with high prices of uncontrollable and/or imported energy.

Source:
http://www.hr.undp.org/content/croatia/en/home/operations/projects/environment_and_energy/energy_cooperatives/

CONCLUDING REMARKS AND POLICY IMPLICATIONS

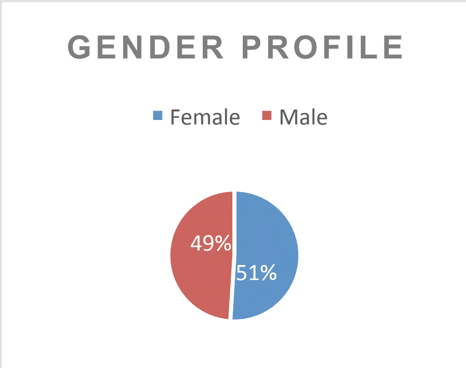
Croatia imports about 50% of the total energy consumed annually. Majority of electricity generation comes from hydropower, followed by thermal power plants and nuclear. Trends in Croatian energy policy include reflection on energy transition, with focus on environmentally friendly technologies. But quite some number of big ‘dirty’ projects, including a LNG terminal on the coastline, new gas pipelines, and new coal power plants are in different stages of their development. Currently there is also no support scheme for RES deployment. For that reason energy initiatives, run by non-governmental actors, have started searching and implementing innovative financial mechanisms for new RES projects, among others energy cooperative models. That is also the focus of the highlighted SECI. Socio-material aspects in Croatia include old, inefficient housing stock, problem of energy poverty and high need for cooling in the summer in the coastal regions. National campaigns are focusing on these problems, especially on various energy efficiency measures, governmental campaigns also on air pollution, resulting from wood burning for heating. Other actors are focusing also on RES projects, community energy projects and energy poverty. Especially on the latter two, there is a strong push from civil society and non-governmental actors, as these topics are mostly neglected by the national authorities.

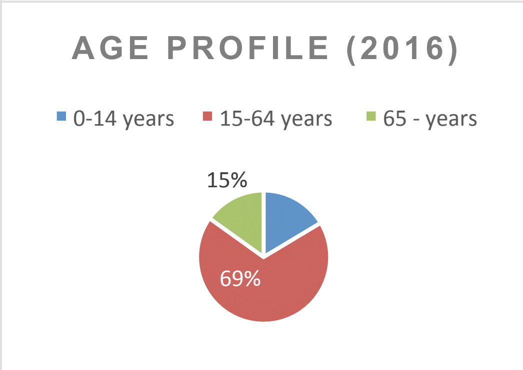
The majority of identified SECIs focus on changes in individuals' behaviour (16), quite a high number of them focus on changes in complex interactions (11), while initiatives that focus on changes in technology and changes in everyday life situations are not that common (4 of each). SECIs are run at a cross-national (12) and national level (10), 7 of them on regional and 5 on local level. Within the identified SECIs, governmental programs are rather scarce; an important part of the action comes from EU projects and environmental NGOs. Surprisingly, there are 5 local initiatives that originated bottom-up, either by the citizens themselves or by the whole communities. Actions are mostly not targeted to specific socio-demographic groups, although there is quite high number of initiatives targeting low-income households, which shows that energy poverty is recognised as an important issue by some of the actors. The SECI in focus shows an example for increasing renewable use by promotion of knowledge about current possibilities and models of energy cooperatives. It focuses on building of energy communities and inclusion of citizens and communities into cooperative or community owned local RES projects. This good practice example shows relevant stakeholders how they can start their own community energy initiative and educates these stakeholders, communities and policy-makers on the topic of community energy and energy cooperatives. It brings in new (but in a way old or forgotten) mode of organising and operating – cooperatives – to the energy sector, which is dominated by big commercial enterprises. It also shows how these initiatives can create new jobs and how local RES facilities can become a backbone of sustainable development in the community, by addressing not only energy aspects but also economic, social and environmental aspects of community development. This is a lesson to be learned, and it is also important for the decision-makers, as it shows new possibilities for part of the energy sector and inclusion of citizens, while at the same time it provides decision-makers with proposals for policy changes.

CYPRUS

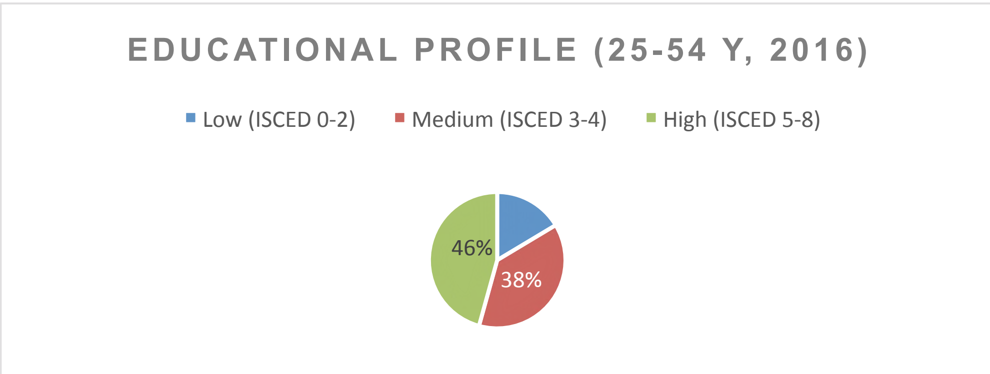
Authors: Marko Hajdinjak, Desislava Asenova,

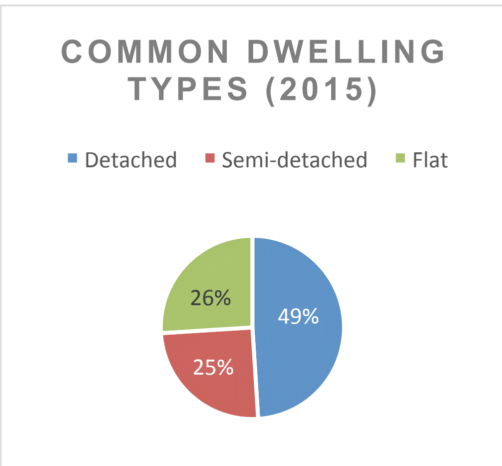
DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY

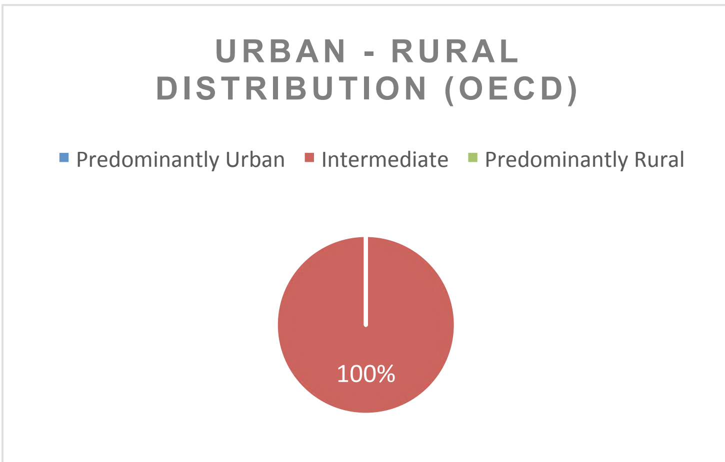


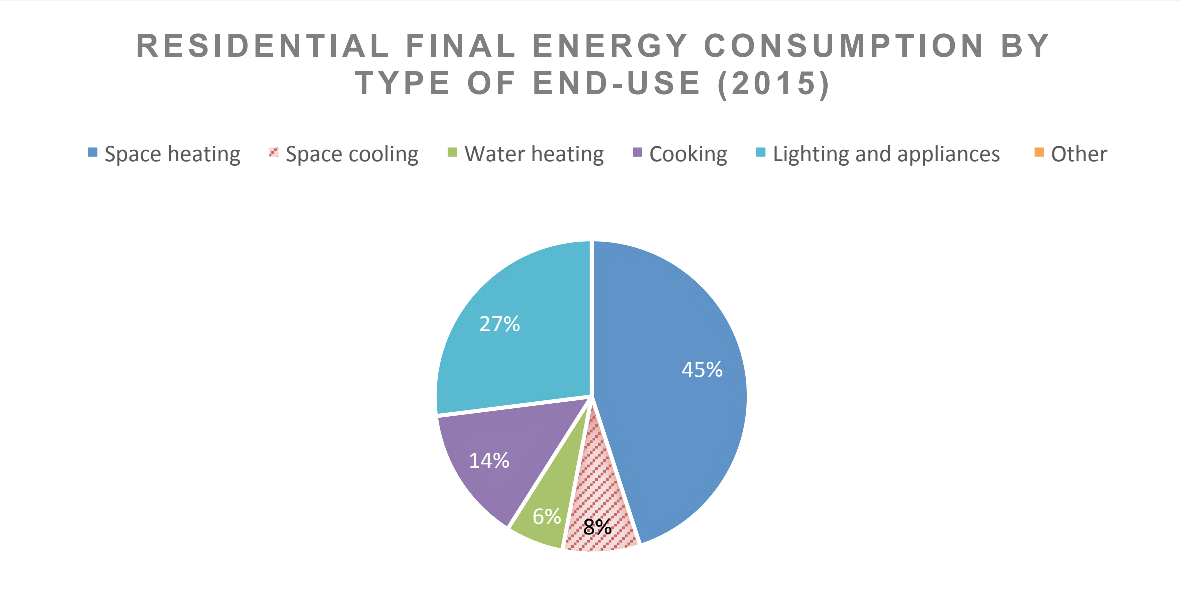


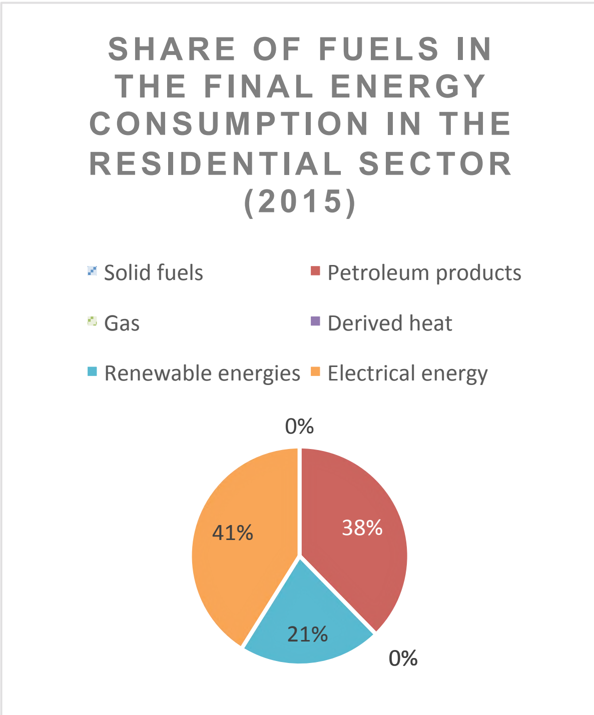
CLIMATE: Subtropical climate; very mild winters (on the coast) and warm to hot summers.











FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

4.350 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

Cyprus has an isolated energy system with no electrical or natural gas interconnections with other countries. Besides renewables, the country is not producing any primary sources of energy. The dominant source of energy in all sectors are imported petroleum products. Around 91.6% of generated electricity is produced from imported petroleum products. This makes Cyprus one of the most vulnerable countries in the EU in terms of energy dependency and security of energy supply.

The electricity market of Cyprus is dominated by the state-owned Electricity Authority of Cyprus (EAC), which is in 2018 still the sole generator, and supplier of electricity. The process of liberalisation of electricity market started in 2004 after the EU accession – first for certain categories of industry consumers. By 2014, all consumers obtained the right to choose their electricity supplier. However, the EAC remains the only supplier of electricity since no other company has entered the electricity market yet.

The natural gas market is regulated by the Cyprus Energy Regulation Authority (CERA). It is expected that the current monopoly of the state-controlled Natural Gas Public Company (NGPC) in the supply of natural gas will continue in the next few years. NGPC is responsible for the internal gas market and network development. It is in charge of the import, storage, distribution, transmission, supply and trading of natural gas and the management of the distribution and supply system of natural gas in Cyprus.

By 2020, Cyprus aims to satisfy 13% of its national energy needs through renewable sources. In order to achieve this, in 2010 the government prepared a National Renewable Energy Action Plan according to which 16% of electricity should be produced by renewables in order to meet the 13% objective in the entire energy system in Cyprus. By the end of 2015, the country was on the right track towards achieving this objective with 8% of total electricity generation coming from renewable energy sources including biomass/biogas, wind power, solar photovoltaics and concentrated solar thermal power.[25]

Particular socio-material aspects that influence energy consumption

Fuel poverty is claimed to be a serious issue in Cyprus. In order to address this issue, a Ministerial Decree introduced measures such as reduced prices on electricity tariffs, financial incentives for participating in a plan for installing a photovoltaic system at houses and grants for upgrading the energy efficiency of houses.[26]

Another issue is the poor thermal performance of the typical Cypriot houses. A survey from 2016

[25] Aloupa, Ch. and Damianos, M. (2018). *Energy 2018. Cyprus*. Available at: https://www.globallegalinsights.com/practice-areas/energy-laws-and-regulations/cyprus
Cyprus Energy Regulatory Authority, CERA (2015). *Electricity Prices in Cyprus. Regulatory Measures in Relation to Electricity Prices*. Available at: https://www.cera.org.cy/Templates/00001/data/raek/omilies-parousiaseis2015/2015/_04-parousiasi.pdf
Zachariadis, T. and Hadjikyriakou, C. (2016). *Social Costs and Benefits of Renewable Electricty Generation in Cyprus*. Available at: http://www.ec.gov.cy/environment/environment.nsf/All/1F2ED18A1C2E7651C225802B001B84FD/$file/%CE%9A%CE%BF%CE%B9%CE%BD%CF%89%CE%BD%CE%B9%CE%BA%CE%AC%20%CE%BA%CF%8C%CF%83%CF%84%CE%B7%20%CE%BA%CE%B1%CE%B9%20%CF%89%CF%86%CE%AD%CE%BB%CE%B7%20%CE%B1%CF%80%CF%8C%20%CF%84%CE%B7%CE%BD%20%CF%80%CE%B1%CF%81%CE%B1%CE%B3%CF%89%CE%B3%CE%AE%20%CE%B1%CE%BD%CE%B1%CE%BD%CE%B5%CF%8E%CF%83%CE%B9%CE%BC%CE%BF%CF%85%20%CE%B7%CE%BB%CE%B5%CE%BA%CF%84%CF%81%CE%B9%CF%83%CE%BC%CE%BF%CF%8D%20%CF%83%CF%84%CE%B7%CE%BD%20%CE%9A%CF%8D%CF%80%CF%81%CE%BF.pdf
[26] European Commission (2015). *Commission Staff Working Document. Country Factsheet Cyprus*. Available at: http://data.consilium.europa.eu/doc/document/ST-14015-2015-ADD-7/en/pdf

found that due to lack of heating or air conditioning, 80% of participants feel cold in winter and 87% feel hot in summer in their homes.[27] However, another source claims that the installation of air conditioners and home electric appliances have increased in the recent years, considerably increasing the electricity consumption of households. At the same time, the share of renewables – mainly solar thermal water heaters – has gone up as well.[28] In 2017, Cyprus became one of the highest users per capita in the world of solar water heaters in households, with over 90% of households equipped with solar water heaters.[29]

In 2012, Cypriot households paid among the highest electricity prices in Europe - 29.09 Euro cents per kilowatt-hour. By 2017, the price decreased to 18.63 Euro cents per kilowatt-hour. The reason behind this decrease are CERA regulatory decisions that led to reduction of the final electricity bill – removing the extra charge on the final bill of the consumers, recalculating the fuel adjustment clause, and reducing fuel prices.[30]

Current Trends in Energy Policy

Cyprus makes efforts to introduce smart grids in the national network in order to tackle the energy related obstacles the country is facing – lack of interconnections to the trans-European electricity networks, limitations to the amount of intermittent renewable energy that can be connected to the electricity system, lack of renewable energy sources installations with storage capacity. The country looks for projects that could facilitate energy storage and ventures that have production on a 24-hour basis.

Smart meters have already been installed in selected public buildings in order to collect more and precise data for buildings that will be renovated through public funds or through energy performance contracting. The aim is to equip all public buildings with smart meters by 2020.[31]

The Joint Research Centre of the EC for Smart Electricity Systems and Interoperability along with the EC's Structural Reform Support Service and DG Energy support Cypriot government to establish a comprehensive policy for the inclusion of renewable energy in the electricity system. Two projects are carried out in order to achieve this goal. The first one aims to assess the current state of the transmission and distribution electricity systems and to propose solutions for increasing the RES penetration in the electricity system. The second project is a continuation of the first one and aims to complement its system analyses and to conduct more detailed evaluations on the power distribution system performance and regulations.[32]

Gross energy efficiency index of households in Cyprus has improved by 32% for the period 2000 to 2013. The main reason is the accession to the EU that has led to introduction of policies and measures in energy efficiency resulting in energy savings. Energy savings were also generated through the introduction of efficient electrical appliances, free compact fluorescent (CFL) lamps and solar water heaters.[33]

[27] Ozdenefe, M. and Dewsbury, J. (2016). 'Thermal performance of a typical residential Cyprus building with phase change materials.' *Building Services Engineering Research Technology*, Vol. 37 (I) 85-102. Available at: http://journals.sagepub.com/doi/pdf/10.1177/0143624415603004
[28] Ministry of Energy, Commerce, Industry and Tourism (2015). *Energy Efficiency Trends and Policies in Cyprus*. Available at: http://www.odyssee-mure.eu/publications/national-reports/energy-efficiency-cyprus.pdf
[29] East Med Energy Centre (2017). Available at: http://www.cyprusprofile.com/en/sectors/energy-and-environment
[30] Cyprus Energy Regulatory Authority, CERA (2015). *Electricity Prices in Cyprus*.
[31] East Med Energy Centre (2017).
[32] EC Joint Research Centre (2017). *The Cyprus Power System and Market Changes*. Available at: https://ses.jrc.ec.europa.eu/cyprus-power-system-and-market-changes
[33] Ministry of Energy, Commerce, Industry and Tourism (2015). *Energy Efficiency Trends and Policies in Cyprus*.

Trends in national campaigns

In 2013, the Cypriot government announced and implemented support schemes promoting electricity generation using RES. One of the schemes provides state grants to vulnerable households for installing 2,000 photovoltaic systems of 3kW each and their connection to the grid via net metering. Households' electricity bills were calculated by deducting the electricity generated by their photovoltaic systems from their overall electricity consumption. Thus, each participating household saved 80% of its electricity bill. Another scheme of installing additional 3,000 photovoltaic systems of 3kW each (but without a grant) was also implemented in 2013. Similar support schemes for the installation of photovoltaic systems for vulnerable households as well as for commercial or industrial units were announced and implemented in 2014.[34]

Another campaign related to households achieving energy savings was promoted and subsidised by the Cypriot government and included the free distribution of 1.5 million CFL lamps with the payment of the utility bill. There were also governmental financial support schemes for energy efficiency improvements in existing dwellings including thermal insulation, double-glazing, solar thermal water heaters and geothermal heat pumps.[35]

With regard to the public sector, a governmental policy of appointing Energy Saving Officers in each building that is used for services of the public sector was implemented. The role of those officers is to ensure that energy-saving measures are implemented in the buildings. They are also responsible for preparing annual Report on Energy Consumption and Actions related to their building. Special trainings for ES Officers are organised on annual basis by the Energy Department. Furthermore, officers of the Energy Institute and the Energy Department organise inspections in buildings and provide advice on energy saving. If needed, they also make presentations on energy savings and renewable energy sources.[36]

OVERVIEW OF NATIONAL SECIS

Below please find a list of Cyprus SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country.

FIESTA	Changes in Technology
ELIH MED - A Euro-Mediterranean Program to Fight Energy Poverty	Changes in Technology
SAVES2: Students Achieving Valuable Energy Savings 2	Changes in Individuals' Behaviour

[34] Aloupa, Ch. and Damianos, M. (2018). *Energy 2018. Cyprus*.
[35] Cyprus Institute of Energy (2012). *Energy Efficiency Policies and Measures in Cyprus*. Available at: http://ktisis.cut.ac.cy/bitstream/10488/4339/2/cyprus_nr.pdf
[36] Ministry of Energy, Commerce, Industry and Tourism (2015). Energy Efficiency Trends and Policies in Cyprus.

ERACOBUILD - Countdown to Low Carbon Homes	Changes in Technology
ActiveAccess	Changes in everyday Life Situations
T.aT. - Today and Tomorrow "Students Today Citizen Tomorrow" (T.AT.)	Changes in Individuals' Behaviour
Students Achieving Valuable Energy Savings (SAVES)	Changes in Individuals' Behaviour
EURONET 50/50 MAX	Changes in Individuals' Behaviour
Eco Village - Tris Elies	Changes in Complex Interactions
SCORE- Sustainable Construction in Rural and Fragile Areas for EE	Changes in Technology
High energy efficiency schools in Mediterranean Area (TEENERGY SCHOOLS)	Changes in Individuals' Behaviour
preserVe tradItiOnal buiLdings through Energy reducTion - VIOLET	Changes in Technology
A Focussed Strategy for Enabling European Farmers to Tap into Biogas Opportunities (GERONIMO II-BIOGAS)	Changes in Technology
SMILEGOV project	Changes in Complex Interactions

‘GOOD PRACTICE’ EXAMPLE OF CYPRUS SECI

Eco Village “Tris Elies”

Brief Description

Ecovillage Tris Elies (which means three olive trees) is a small but growing community of people wishing to take responsibility for their own well-being and to live respectfully towards nature and one another. It was established in 2015. The community is based on the principle of self-sustainability, and its daily life is carried out creatively and with minimal impact on the environment. It is located in the Troodos mountains in Cyprus along the terraced hillsides on the “Dragon” river. Village has few full time residents, but many regular visitors come to engage with them in activities such as restoration of overgrown fields and orchards, organic cultivation based on permaculture principles and educational events.

Brief Contextualization

The village of Tris Elies is located in beautiful mountainous region of Cyprus. The village is several hundred years old and consists primarily of traditional buildings. Over the past decades, it has been depopulated and now has only a few permanent inhabitants. In recent years, a small group of people brought new life to the place, creating a project that caters for a healthy and sustainable lifestyle. The group consists of individuals with knowledge and experience in diverse fields such as agriculture, tourism, education, biology, architecture, environmental engineering and business management. Links to the local community and its infrastructure are also vital to the success of this project.

Aims and objectives

The Tris Elies community is dedicated to natural, healthy living, and responsible use of nature and its resources. All activity in the village is based on principles of cooperation and sharing. The community tries to spread its messages and experiences to the wider community as well, educating the target population and promoting sustainable and environment-friendly lifestyle.

Methods for intervention

Tris Elies community strives to satisfy its needs for food, water, housing and energy in ways that respect the cycles of nature. This means that everyday life of community members should be led in a way that increases biodiversity and regenerates ecosystems, giving the people a chance to experience their interdependence with systems and cycles of nature. Sources of water need to be kept clean and regularly replenished. All food is locally grown through organic agriculture. Waste is treated as a valuable resource and used for composting or reused. Old, unused materials are recycled and put to new use (for example, old wooden planks and other pieces of wood were 100% recycled to make roadside signs, flower pots, waste bins and benches). The community is also trying to obtain as much as possible of the energy it uses from renewable sources. In all these activities, the community combines traditional heritage and knowledge with the wise use of modern technology and resources. For example, soap, toothpaste, body cream, deodorant and similar are also made locally and from 100% organic products.

Results/outcomes

The experimental and innovative treatment of resources has produced numerous positive results and lessons that can be replicated in other eco-communities in Cyprus and other Mediterranean countries, and with some modification also elsewhere. The eco-community has brought life back to a village, which was practically abandoned, despite being located in a place brimming with life and blessed with clean water and rich soil. Tris Elies is a successful attempt to bring people back to a depopulated village, where nature is not exploited, but its resources are used responsibly and sustainably.

The role of the households

All households / members of the community must live and work according to the principles of the re-use, re-think and recycle philosophy, respecting the environment and natural resources, sharing them with all other living beings. Everyone in the village (resident or visitor) participates in the work and in decision-making. All households are expected to maintain the land, putting back as much as they take from it. While the original idea was developed by a very small group (3-4 people), now all members (over 30 people) actively participate in further developing the village, participating in different activities and bringing forth new ideas and approaches.

Volunteers and short time visitors are also welcome and can be accommodated in the village. In exchange, they need to engage in daily tasks like farming and gardening, dehydrating fruit, tending the animals (mostly chickens), cooking, cleaning and babysitting (there are some small children in the community).

Location

The village is located in the Troodos Mountains in central part of Cyprus.

Was/is the initiative successful?

It is difficult to assess a recent and ongoing initiative, which is not pursuing any quantifiable and measurable objectives. According to information on its websites, initiative can be definitely evaluated as successful, because its participants are managing to live as planned – in close contact with the nature and with minimum impact on environment, reusing and recycling resources and materials, and using energy (for lighting, cooking, cooling, washing, etc.) in a way that leaves behind the minimal carbon footprint.

Shared understandings related to initiative

There is a very strong sense of community and all households are very devoted towards the common objective – living sustainably and with full respect of the nature.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

Although the overview of sustainable energy consumption initiatives (SECIs) in section 2 should not be regarded as comprehensive, it provides a good indication about the place of these initiatives in the national energy policy. Almost all initiatives were conducted as part of international projects funded by various EU programmes, and they predominantly focus on achieving energy savings through employment of technological solutions or changing the behaviour of individual consumers. This corresponds well with the national policies that strive towards improvement of poor thermal characteristics of typical Cypriot dwellings and introduction of measures that would harness the RES potential of the country – above all the use of solar and wind energy. A special attention has been given to vulnerable consumers, to whom grants for purchasing photovoltaic systems were provided.

Overall, it can be concluded that in general, the national policy trends and the implemented initiatives try to decrease the household energy consumption – especially energy produced from conventional sources, while increasing the use of renewable energy sources and of more energy-efficient heating and cooling systems (heating and cooling are responsible for over 50% of the final energy consumption in households). Some of the initiatives, for example FIESTA, ELIH-MED and SCORE focus on testing different cost-efficient technical solutions, sustainable construction techniques and innovative financial mechanisms for improving energy efficiency in households. Special attention is often given to vulnerable households and people residing in rural and socio-economically disadvantaged regions.

Another group of SECIs (SAVES, SAVES2, T.aT., EURONET 50/50, TEENERGY SCHOOLS) targets schools and universities, raising energy awareness of the school building users (children, staff, parents) and actively involves them in energy–saving measures. Some SECIs introduced a competitive element, engaging energy consumers (households, but also students residing in dormitories) in a competition for the most successful energy savers. A third significant group of SECIs has a goal to change mobility behaviour of Cypriots, encouraging them to use public transport and bicycles, or to walk on shorter distances, instead to use carbon-intensive means of transportation like private cars.

Finally, there are two SECIs, which experiment with different approaches to change complex interactions and that could serve as models for self-sustaining communities, able to live with a minimal impact on the environment. This is of crucial importance for the island countries with an isolated energy system and high dependence on imported carbon energy sources, such as Cyprus. In this sense, the example of Tris Elies might not be very representative and replicable on the wider European scale, but could be a very good model to follow in more specific settings – mountainous rural areas, island communities and socio-economically deprived regions with high rate of vulnerable consumers.

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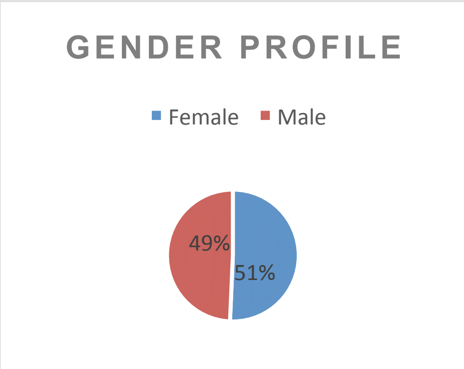
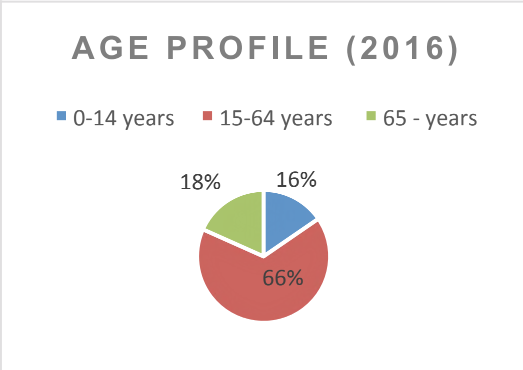
CZECH REPUBLIC

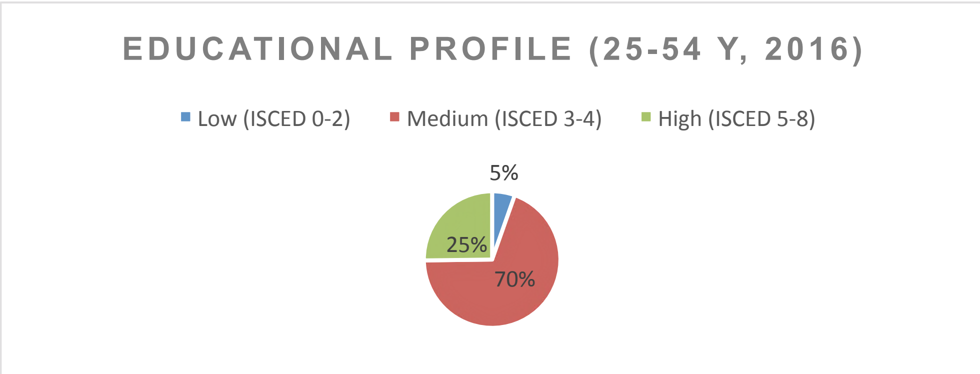
Authors: Renda Bellmallem, Tomislav Tkalec, Lidija Živčič

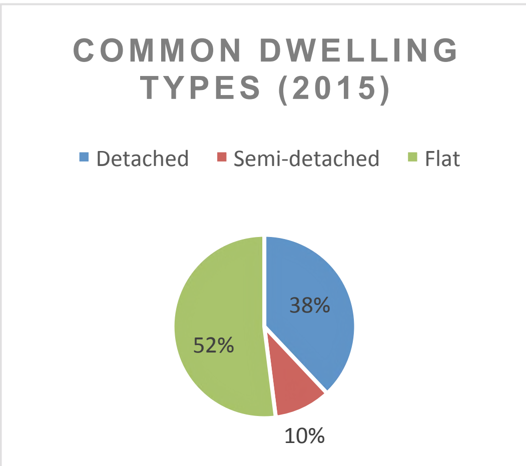
DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY

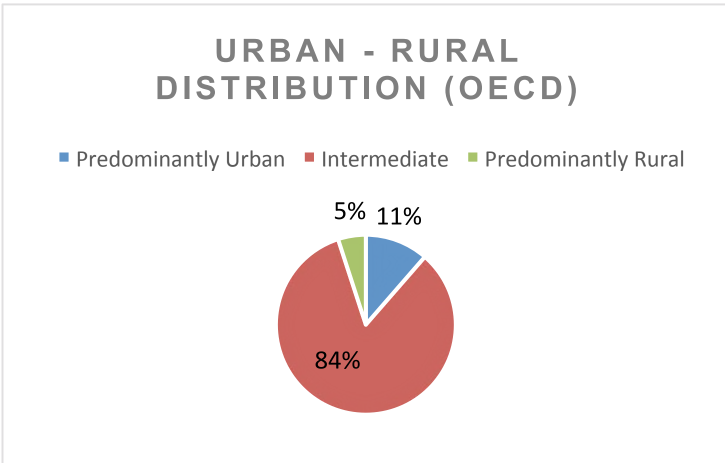


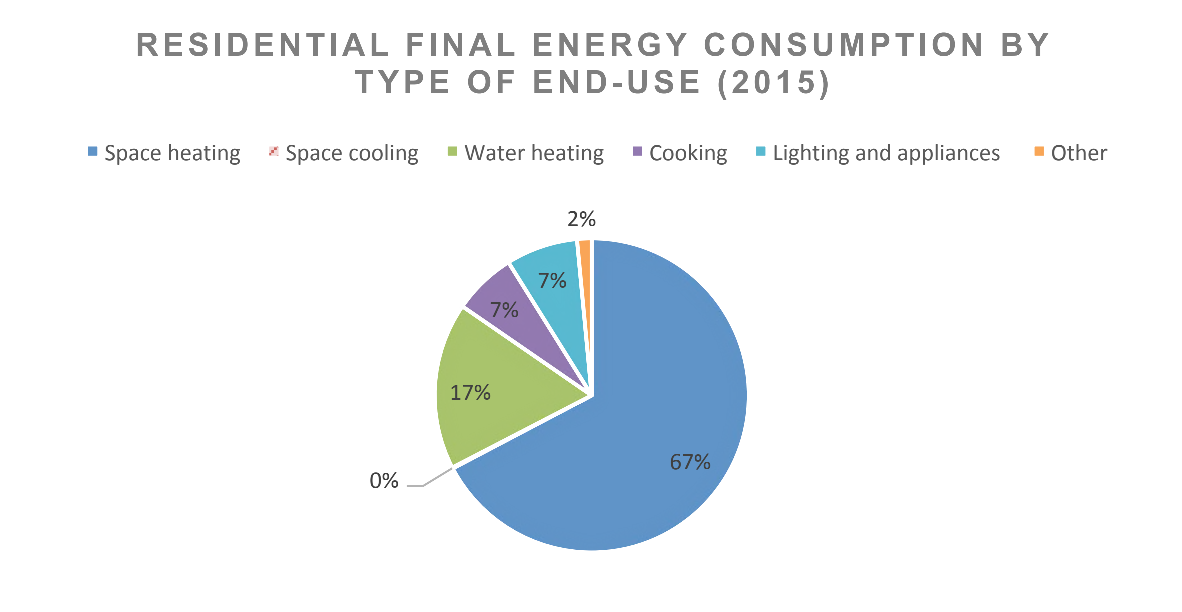


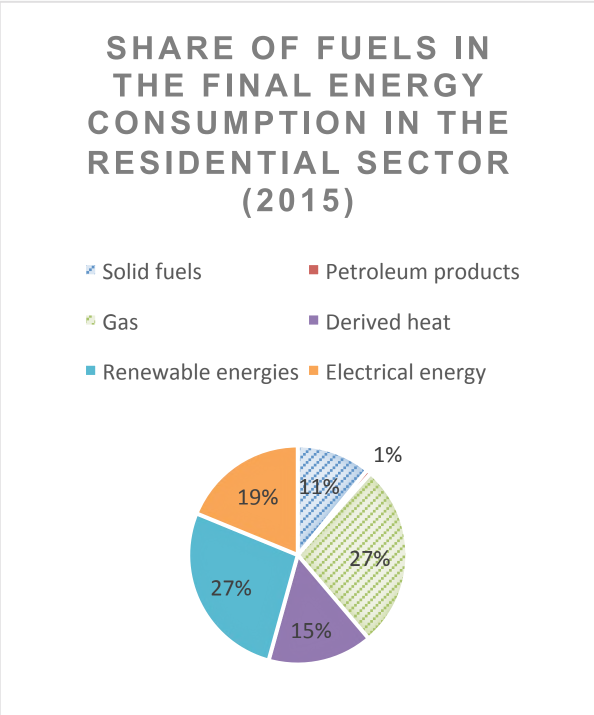
CLIMATE: temperate; cool summers; cold, cloudy, humid winters

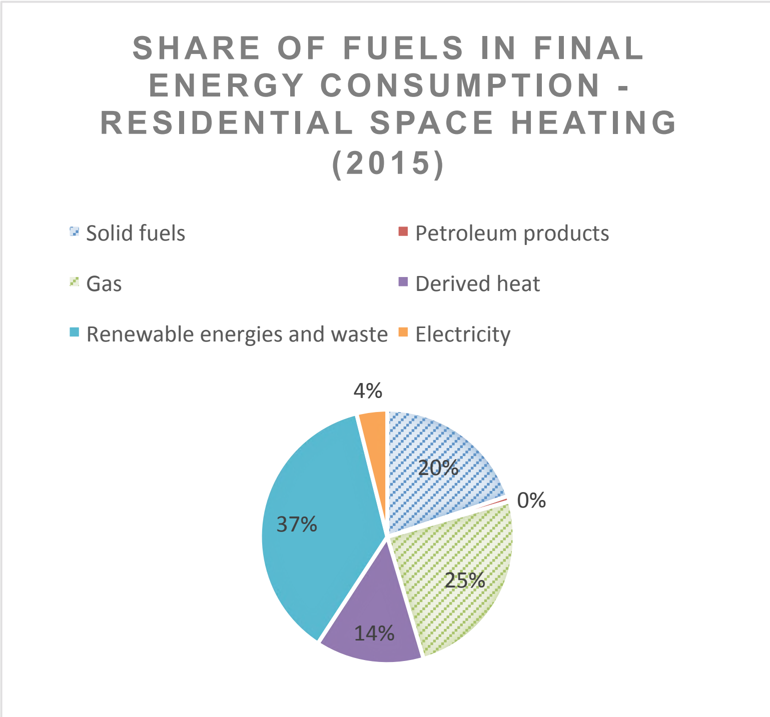












FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

7.380 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

The Czech Republic favours domestic resources (black coal, lignite) in order to limit its energy dependence. Fossil fuels are dominant in the energy mix (75.1%), because the economy is driven by industry (38% of GDP). But their share tends to decrease in favour of nuclear energy and renewables. The country is a major producer and small exporter of coal on the European scene, despite a steady decline in its production (46 million tonnes in 2015). EPH is a Czech production and distribution company of electricity founded in 2009.

Coal plants produce 60% of the country's electricity. They are mostly located near the deposits. The most powerful, with around 1,500 MW, is the Prunéřov thermal power plant near the German border. Oil production is limited to thousand barrels/day, with some wells in the south-east of the country. The country imports the majority of its oil, mainly from Russia. Production is also limited for natural gas: the country meets about 2-3% of its needs for these two fuels (oil and gas). The rest of the natural gas is supplied by Russian Gazprom. Natural gas plants play a secondary role, but there is a political will to expand them. Nuclear power accounts for almost one fifth of the energy supply, about 30% of the country's electricity. Czech nuclear power is produced by ČEZ. Two nuclear power plants exist at Dukovany (four VVER reactors of 440 MW each) and Temelín (two reactors of the same sector of 900 MW each). The electricity grid is highly interconnected with neighbours, and the country is the third largest net exporter of electricity in the European Union, after France and Germany.

In terms of renewable energy, there is the presence of hydroelectricity, with dams, but they contribute very little to the production of electricity. Wind energy is little developed, with only 280 MW installed at the end of 2015. On the other hand, photovoltaic energy has developed very rapidly: non-existent in 2005, the fleet reached 2150 MW at the end of 2015, contributing 2.3 TWh to electrical production. Renewable energy increased by 42% between 2010 and 2014, with a preponderance for solar and biofuels. The energy market has been open since 2005, and consumers can choose their energy supplier individually. But most Czechs were at ČEZ before liberalization, and very few have changed suppliers.

Particular socio-material aspects that influence energy consumption

Although there are programs and financial aid for energy refurbishment of homes, there are still a lot of energy-inefficient dwellings, which means that a lot of energy is used for heating of homes. In some cases that also leads to the problem of energy poverty. The history of the country has impacted the strategies and developments in terms of energy choice. The Czech Republic was part of the Eastern bloc, and after the end of the Cold War, the choice to liberalize and privatize a large part of the energy was in opposition to the Soviet past. In the early 1990s, Prague initiated a strategy to diversify its supplies, particularly to Norway and Germany, with the rest coming from Russia. In 2010, the country imported 67.63% of its gas from Russia, 20.47% from Norway, and 8.78% from Germany. In 2015, the share of Russian gas decreased to 54.22%, while the share of gas from Germany increased to 25.1% and that of Norwegian gas decreased to 5.14%; these data are however to put into perspective since the gas coming from Germany and Norway is actually Russian gas re-exported.

Current Trends in Energy Policy

Due to the European commitments on greenhouse gas reduction targets on the one hand, and the rising cost of extracting domestic mining resources on the other hand, the Czech energy strategy updated in May 2015, confirms the decrease of the share of coal in the energy mix and its compensation by nuclear, as well as, to a lesser extent, gas and renewables. For the moment, coal remains the most important component of the energy and electrical mix. The Czech Republic plans to respect its commitment to energy-climate policy, with a 13% share of renewable energy in final energy consumption by 2020, revalued at 15.3% by the Government in early 2016. These measures aim to decrease the share of fossil fuels in the energy mix from nearly 75% to 66% in 2030 and 56% in 2040. It should be noted, however, that the Czech Republic is one of the European countries with one of the highest levels of greenhouse gas emissions, and ecological issues are not political priorities. This can be explained by structural features: the weight of energy-intensive sectors, ageing power plants and heating units, dependence on road transport, the large number of energy-inefficient dwellings. Furthermore, the government is questioning the idea of developing renewable energy because it is more expensive and more uncertain. This future transition is a major social issue, threatening thousands of jobs in the east and north-west of the country where the major mining basins are located. By way of illustration, the bankruptcy of OKD, the largest black coal operator in the country, based in Moravia-Silesia, could lead to the loss of 12,000 jobs in the region already hard hit by unemployment. The government wants to extend the life of Dukovany NPP. A National Action Plan on nuclear development was adopted in June 2015 detailing the details of nuclear projects. Regarding waste management, the country is considering the construction of a deep layer landfill for storing the most hazardous waste (faces local opposition of pre-selected sites).

According to the Czech energy strategy, electricity produced in 2040 will come from domestic sources (lignite and black coal, nuclear, renewable and secondary energies), 80%, compared to 70% in 2015. The electricity mix should be mainly composed of de-carbonized, nuclear and partly renewable energy. About two-thirds of the oil imports go to the transportation sector, and diesel is used a lot. 78.1% of the oil consumed by the Czech Republic is consumed by the transport sector. But, with the goal of increasing renewable energies, prospective national programs are developing in favour of electro-mobility.

Trends in national campaigns

National programs and campaigns are supporting investments in energy savings in both renovation and new construction, as well as installation of heating sources that utilise renewable energy. There are several of the initiatives that are focusing on renewables – also in the form of showing best practice examples. In terms of the scale and number of the initiatives, they are mostly focusing on energy efficiency (in various forms and measures), followed by renewables and sustainable mobility.

Campaigns and initiatives are run by different stakeholders: national institutions, research institutions, NGOs and other actors, and can be divided in national/regional programs, European projects and local initiatives. Initiatives that were identified by the ENERGISE team are partly reflecting the trends from energy policies, especially related to energy efficiency, while support for RES is represented in the initiatives (that are mainly run by non-governmental actors), while it is lacking in the main national policy orientation.

OVERVIEW OF NATIONAL SECIS

Below please find a list of Czech SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). *The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country*.

START2ACT	Changes in Everyday Life Situations
Accelerated Penetration of Small-Scale Biomass and Solar Technologies (ACCESS)	Changes in Technology
TOPTEN ACT : Enabling consumer action towards top energy-efficient products	Changes in Individuals' Behaviour
Boosting efficiency in electricity use in 8 European regions (EL-EFF REGION)	Changes in Individuals' Behaviour
European Smart Metering Alliance (ESMA)	Changes in Technology
Common appliance policy – All for one, One for all – Energy Labels (COMEON LABELS)	Changes in Individuals' Behaviour
The Panel Scheme	Changes in Technology
Green light schemes	Changes in Technology
European Network of Information Centres promoting Energy Sustainability and CO2 reduction among local COMmunities (ENESCOM)	Changes in Individuals' Behaviour
European Solar Days II (ESD II)	Changes in Technology
More biking in small and medium sized towns of Central and Eastern Europe by 2020 (MOBILE2020)	Changes in Everyday Life Situations
From Estonia till Croatia: Intelligent Energy Saving Measures for Municipal housing in Central and Eastern European Countries (INTENSE)	Changes in Individuals' Behaviour

Green Household	Changes in Individuals' Behaviour
SPIRIT - Energising Faith Communities (SPIRIT)	Changes in Individuals' Behaviour
E.ON Energy Globe Competition	Changes in Everyday Life Situations
Integration of Active Learning and Energy Monitoring with School Curriculum (ACTIVE LEARNING)	Changes in Individuals' Behaviour
Residential Monitoring to Decrease Energy Use and Carbon Emissions in Europe (REMODECE)	Changes in Individuals' Behaviour
The Green Savings programme	Changes in Technology
Hostetin Centre for Sustainable Rural Development, Czech Republic	Changes in Technology
Sluňákov : The Olomouc center for ecological activities	Changes in Complex Interactions
EPORE - Energy Poverty Reduction in Eastern Europe	Changes in Individuals' Behaviour
Renovujdum	Changes in Technology
Program Effect	Changes in Individuals' Behaviour
Renewable decade (Obnovljivi desetletji) competition	Changes in Individuals' Behaviour

'GOOD PRACTICE' EXAMPLE OF CZECH SECI

START2ACT
Engaging European Start-ups and Young SMEs for Action for Sustainable Energy

Brief Description

The initiative (a H2020 project) wants to help young SMEs and start-ups save energy and cut costs at work by introducing simple yet effective energy efficiency measures into their daily routines. To achieve this, free-of-charge mentorings and training activities are offered in nine European countries, among them in Czech Republic.

Contextualization

Even though each start-up and SME consumes relatively small energy amounts, the collective environmental impact of 20 million SMEs in the EU is massive, contributing to 64% of environmental impact. Active engagement of start-ups and young SMEs is essential in order to reach the 20-20-20 EU goals and there is market potential for almost all enterprises to cost effectively reduce their energy consumption. START2ACT will unleash the potential of energy savings at European start-ups and young SMEs via a set of innovative educational and capacity building measures.

Aims and objectives

START2ACT aims to reduce residential energy consumption in the EU via changing the behaviour of consumers in their everyday lives by approaching them at their workplace. With a focus on European start-ups and young SMEs, the project aims at triggering action by young entrepreneurs and their emerging enterprises as well as by the owners and staff of young SMEs to introduce energy efficiency measures within their daily routines.

Methods for intervention

The initiative is focused on providing free-of-charge knowledge and know-how transfer on implementing energy efficiency measures. A key area of intervention to increase energy efficiency through behavioural change is office equipment, the fastest growing energy user in the business world, consuming 15% of the total electricity used in offices, which is expected to rise to 30% by 2020. START2ACT aims to trigger the use and uptake of the many available tools and solutions offering a great potential for energy and money savings, yet not adequately used due to lack of understanding of how to use them in practice and due to insufficient engagement of people towards changing behaviour in everyday life. START2ACT aims also to trigger sustainable procurement of office equipment, including the selection and furnishings of premises (HVAC, lighting, etc.), and goods and services. In so doing, START2ACT will sow the seeds of a sustainable energy culture in start-ups and young SMEs.

Steps of implementation

Activities of the initiative include:

- business breakfast for energy efficiency: START2ACT's experts provide the costumer with several energy saving tips at workplace while they enjoy their coffee and network with the other participants.
- on-site consulting for SMEs: a series of 3 free-of-charge training units at young SMEs. START2ACT energy expert trainers are visiting companies and developing a

tailor-made training with and for them. The pre-set but flexible modular structure guarantees high training efficiency.

- energy efficient mentoring for start-ups
- platform for Q&A on energy efficiency, administered by energy experts.

The role of the households

The initiative is more focused on entrepreneurs and staff of young SMEs at their office and their energy related behaviour in their working place, but at the same time it introduces energy efficiency measures within the daily routines of households of the targeted young entrepreneurs.

Location

Initiative is implemented in 9 countries and is not focusing only on one locality in the country. It is focusing on SMEs and start-ups in whole of the country.

Textual and communicative aspects of initiative:

Communication and dissemination activities are focusing on young entrepreneurs, young SMEs and start-ups and less on other target groups. In that way they are not focusing directly on households and their energy use at home.

The physical/technological aspects of the initiative:

START2ACT aims to reduce residential energy consumption in the EU via changing the behaviour of consumers in their everyday lives by approaching them at their workplace. It is focused on providing free-of-charge knowledge and know-how transfer on implementing energy efficiency measures, mostly in working place.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

The weight of energy-intensive sectors, ageing power plants and heating units, dependence on road transport and the large number of energy-inefficient dwellings should be the stimulation for Czech Republic to work towards energy transition, yet this is not the case. Environmental issues are not political priorities and the government is questioning the idea of developing renewable energy because it is more expensive and more uncertain. There are various programs and financial aid for energy refurbishment of homes. This is reflected to some extent in the SECI. When it comes to energy efficiency measures, there are quite many initiatives. When it comes to renewables, there are but a few. Many SECIs are focused on refurbishment of the buildings – from governmental programs and subsidies for thermally insulating multi-family prefabricated houses or individual housing to program on energy efficiency in municipal housing or platforms for efficiency refurbishment. Some SECIs focus on behaviour change for saving energy, be it by promotion of good practices, energy advising / information centres, competitions and learning in schools or by engaging faith communities in changing behaviour. Efficiency standards for appliances are an important issue, as well as some activities on stand by consumption and smart metering.

In the field of renewables there are a few SECIs, promoting small-scale biomass and solar and offering support for heating installations utilising renewable energy sources. Energy poverty is highlighted as one of the socio-material aspects, but this is not highly reflected in SECIs, as there is only one identified SECI dealing with the issue of energy poverty. National policy works also towards electro-mobility, but this is not reflected in the identified SECIs, just two of which focused on mobility issue (one on working with local communities and one focused on biking).

The majority of SECIs focus on changes in individual's behaviour (12 of them), some less on changes in technology (8), even less on change in everyday life situations (3) and only one is addressing change in complex interactions. Most of the SECIs (14 of them) are cross-national, there are 8 national and 2 local. The SECI in focus offers support to young SMEs and start-ups to save energy and cut costs at their workplace, and at the same it introduces energy efficiency measures within the daily routines of households of young entrepreneurs. Mentoring and training activities are offered to young SMEs, a key area of intervention being the increase of energy efficiency through behavioural change is office equipment. The initiative aims also to trigger sustainable procurement of office equipment, including the selection and furnishings of premises and goods and services. The lessons learned are a few. Tackling energy consumption where it is felt the most – in the costs of the company – is a good starting point for tackling energy use in all other aspects of life. Offices, as an important trigger for increased energy use, can be a strong place also for reducing energy use, especially through energy efficient procurement. Young SMEs and start-ups are estimated to be a good target group to work with, because they are susceptible to new things and on a lookout for reducing their business costs. As for the informing of policy, the most relevant is the lesson that offices or workplaces in general, as major generators of increased energy use, are an important point where energy efficiency measures can be put in place, because there is the motivation of reducing costs; at the same time, workplace can trigger wider effects, such as change of behaviour in domestic life of employees and being the driving force for energy efficient office equipment.

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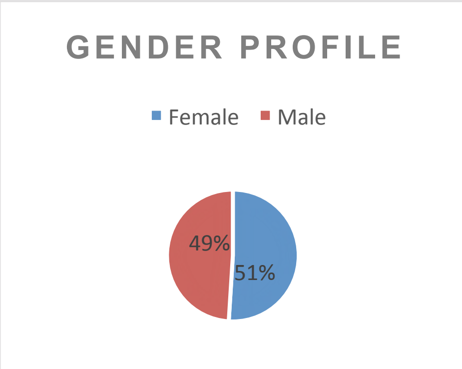
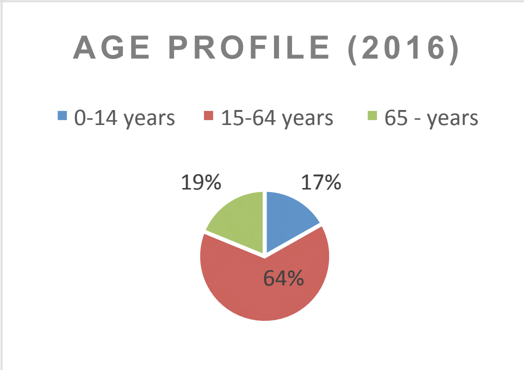
DENMARK

Authors: Inge Røpke, Charlotte Jensen

DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY





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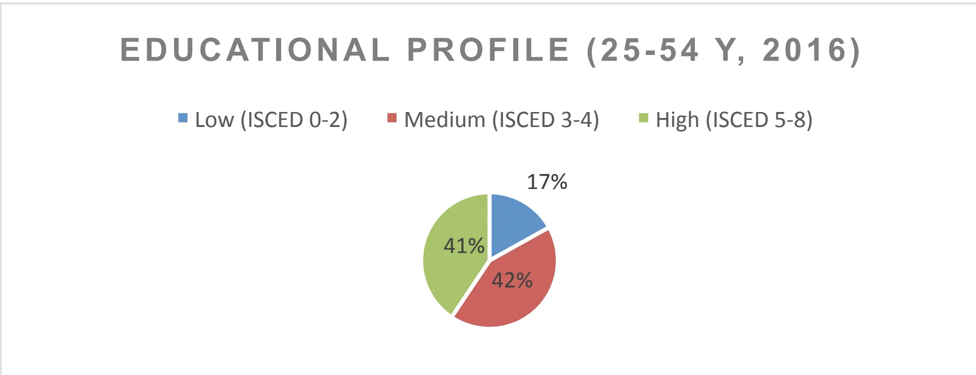

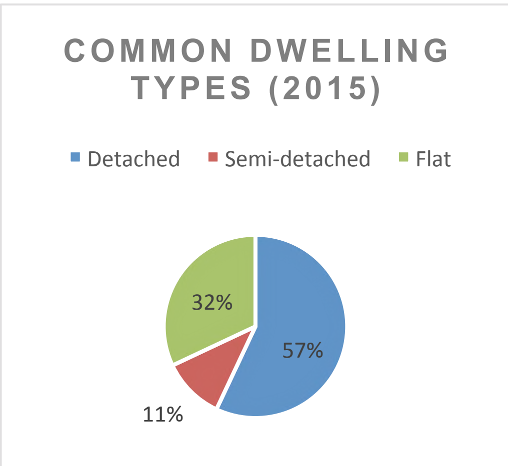

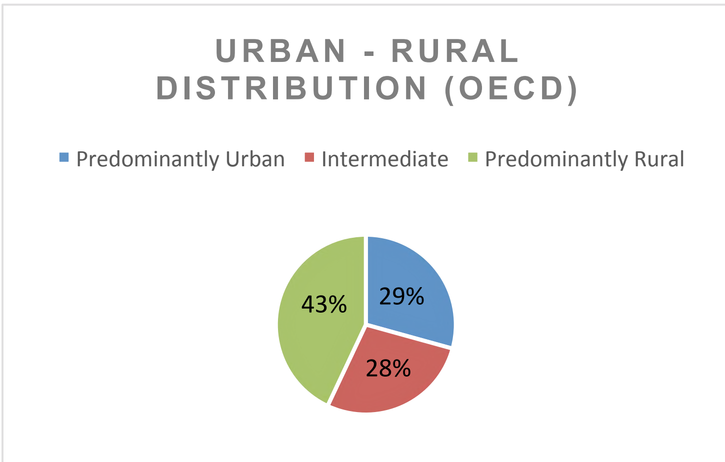

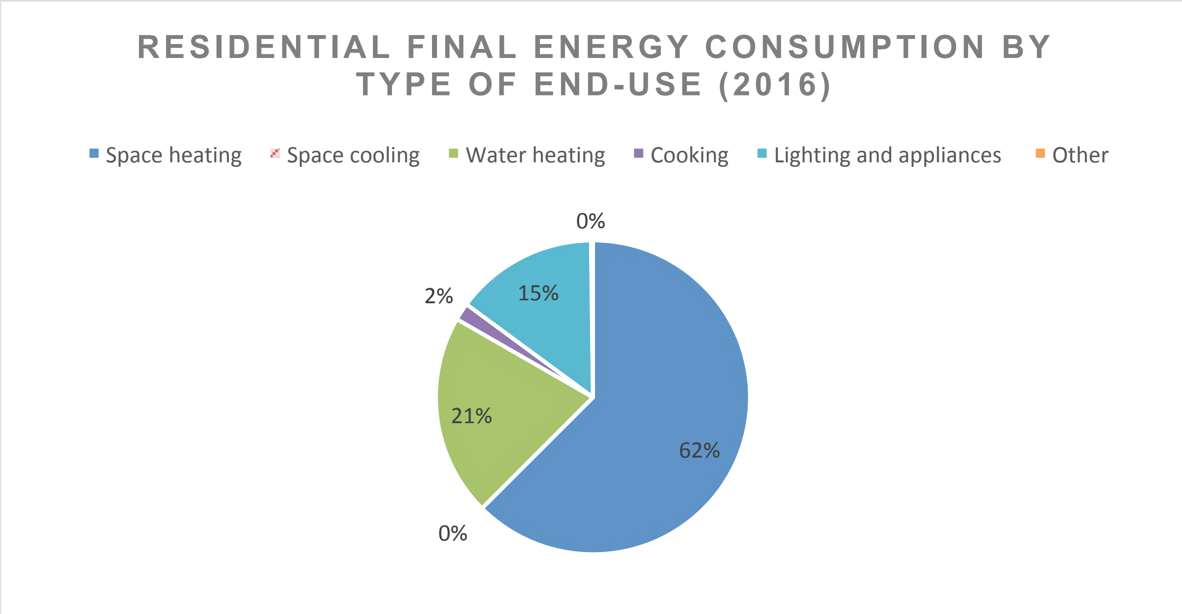

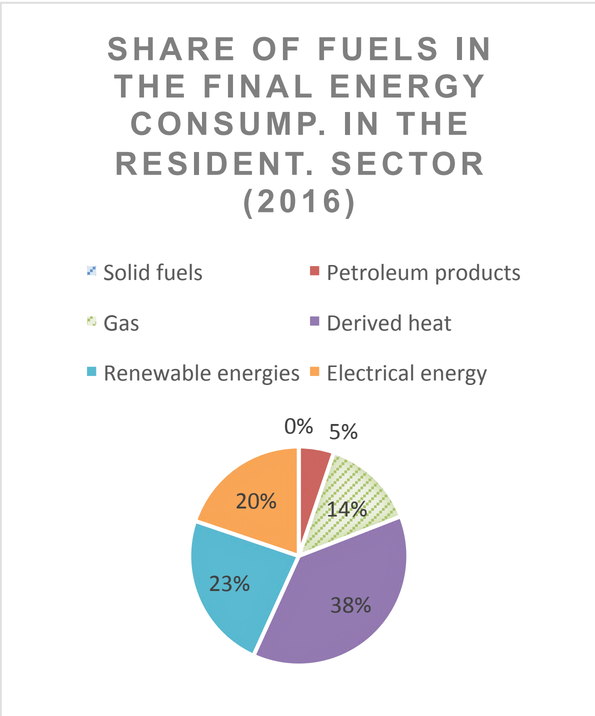

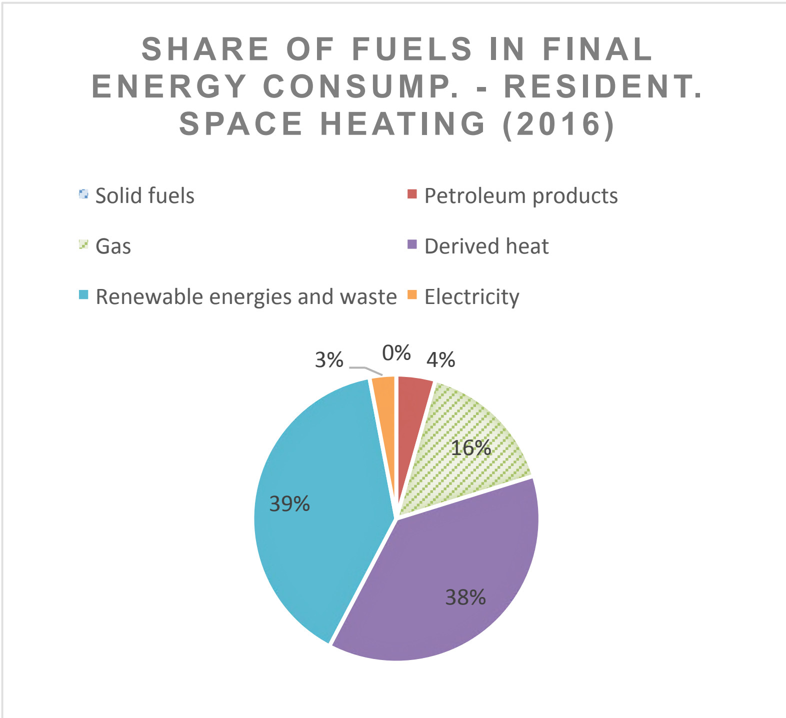

FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

8.705 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

Following the oil crises in the 1970s, the Danish energy system was radically changed. Since the country was dependent on oil imports and already had a large balance of payment deficit, the increase in oil prices sparked considerable efforts to save energy and reduce the dependency on oil imports. The introduction of nuclear power had been considered for some time and was promoted as a solution, but the public resistance was too strong, and the plans were shelved. Apart from replacing oil with coal in power generation, the most immediate and significant results on the supply side were achieved through improved energy efficiency based on heat planning. Due to a previous centralization process, nearly all electricity was produced by large central power stations, which were gradually converted to co-generation to provide district heating to larger cities. In addition, existing local district heating plants were converted to also generate electricity, and the number of decentralized CHP plants increased considerably. The number of local CHP plants today is about 400 (Dansk Fjernvarme 2018).

When the crises hit, the extraction of oil from the Danish part of the North Sea had just started. The production was small, but it was decided to establish a system that could make use of the related natural gas to replace oil in residential heating. Two collective pipe-based systems were thus established: direct provision of natural gas to households (and other sectors) and district heating based on CHP. Heat planning stipulated which areas should be supplied in which way. Both the electricity system and the CHP plants were by and large collectively owned by consumers or municipalities until about the year 2000 (Hvelplund 2007). Combined with legislation that allowed municipalities to commit consumers to connect to the collective systems, this form of ownership enabled a remarkable transformation to a more rational energy utilization. While about 25% of households were connected to district heating in 1975, the combination of district heating and natural gas to households grew to 43% in 1985 and 80% today: about 65% of households use district heating, while 15% are heated with natural gas (Wistoft el al. 1992: 204, Energistyrelsen 2018).

Encouraged by the oil crises, pioneers and popular movements took the first steps towards a modern utilization of wind power. This endeavour played a limited role in the first decades and met with considerable resistance from the incumbents, but from the 1990s wind power gained an increasingly important role in the system. In 2016 wind energy provided 37.5% of Danish electricity production (41.8% in 2015 and 1.9% in 1990), and this share is expected to increase significantly within the next few years (Energistatistik 2016). While wind power reduced the use of fossil fuels in electricity generation, oil still plays a key role in transport. The dependency on imports, however, fell as the oil production from the North Sea increased. The degree of self-sufficiency in total energy use grew from 5% in 1980 to 52% in 1990, and in 1997 Denmark became self-sufficient (Dietrich and Morthorst 2016). At the top in 2004, the degree of self-sufficiency reached 155%, but since then the production of oil and gas has fallen, and the degree of self-sufficiency fell to 83% in 2016 (Energistatistik 2016).

Security of supply was the main concern in the wake of the oil crises and encouraged conversion from oil to coal in power plants. When climate concerns later intensified, the phase-out of coal emerged on the agenda. Local CHP plants developed the use of a variety of fuels including wood pellets, waste, straw, natural gas and biogas, and more recently, large power plants increasingly converted from coal to biomass. In 2016 43% of the biomass was imported (Klimarådet 2018).

In parallel with the technical transformation of the energy system, organizational changes have taken place. As in other EU countries, the system has undergone liberalization and privatization. Parts of the system are still owned by consumers or municipalities, but pressure on local budgets may lead to further privatization. To sum up, specific characteristics of the Danish energy system today are: the relatively high degree of self-sufficiency in energy, a high share of district heating based on co-generation, a high share of wind power, no nuclear power, considerable use of imported biomass.

Particular socio-material aspects that influence energy consumption

Considering the demand side of the energy system, the oil crises led to several initiatives. Regarding households, campaigns aimed at making people lower the temperature in dwellings and turn off lights. Considerable subsidies were given for thermal insulation and double-glazing, and building regulations were tightened. Later, compulsory energy labelling of appliances was introduced, and campaigns to shut off standby consuming appliances were carried out (Christensen et al. 2007). In spite of all the initiatives over the years, energy consumption has only stagnated and not directly decreased. Both population and living standards have increased, implying increased car ownership, more square meters per person, more appliances, more leisure travel etc. A specific Danish issue might be the relatively large housing stock from the 1960s and 1970s in need of thermal improvement. Due to globalization, part of the energy consumption related to Danish living standards has been outsourced. Interestingly, an opposite trend may be emerging, as Denmark presently attracts large datacentres because the high share of wind power serves to legitimize electricity use.

Current Trends in Energy Policy

Due to the relatively high share of wind power, smart grid solutions and flexible demand have attracted considerable interest since 2010, involving research and experiments. The smart grid concept concentrates on the electricity system, but it is increasingly acknowledged that this focus is too narrow. A low carbon transition must involve the coevolution of several other systems such as heating, mobility and agriculture. The discourse thus tends to change towards smart energy systems (Lunde et al. 2016). Across the political spectrum it is agreed that Denmark should be independent of fossil fuels in 2050. There are, however, many controversies regarding the strategies and policies needed to achieve this goal. Some of the controversies emerge from the private commercial interests that play an increasing role in the system. Examples of controversies are: How fast should the expansion of wind power take place? To which extent and how should government encourage the domestic use of electricity by promoting electric cars (Denmark has a very low penetration) and heat pumps? How important are energy savings, when the share of wind and solar power increases? Should the government subsidize energy savings? Is it acceptable to reduce electricity prices to encourage the use of electric cars and heat pumps, when this also increases electricity consumption for other purposes? Can electric cars and heat pumps be promoted in a more targeted way? To which extent should government promote investments in cable connections to other countries? Is it acceptable that Denmark uses so much biomass, which is a limited resource globally? For which purposes is it acceptable to use biomass? To which extent is planning necessary to ensure a rational transformation of the energy system? Does it make sense to let wind power and solar power compete, or are both needed to balance the system? Should the duty to connect to collective systems be abolished? Should government invest more in research and development of smart energy technologies, e.g. storage?

Trends in national campaigns

For a long time, households have had access to various subsidies for energy savings, installation of solar panels and replacement of oil burners with heat pumps. However, the present right-wing government suggests to remove subsidies to households and concentrate on energy savings in business. At the time of writing (May 2018), the shape of the future energy agreement is not known.

OVERVIEW OF NATIONAL SECIS

Below please find a list of Danish SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). *The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country.*

Fløng: Neighbour-to-neighbour	Changes in Individuals' Behaviour
ProjectZero - SpareKuffert	Changes in Individuals' Behaviour
Eco-Life Høje Taastrup	Changes in Individuals' Behaviour
Munksøgaard Community	Changes in Everyday Life Situations
Insero Live Lab	Changes in Individuals' Behaviour
Energy on Venø	Changes in Individuals' Behaviour
My Climate Plan Middelfart	Changes in Complex Interactions

Esco Light Middelfart	Changes in Complex Interactions
Andelssamfundet i Hjortshøj (AIH)	Changes in Complex Interactions
Innovation Fur	Changes in Technology
AGA - elspare konkurrence	Changes in Individuals' Behaviour
SpareFamilier	Changes in Everyday Life Situations
For Enden Af Vejen	Changes in Individuals' Behaviour
DIY for Boiligejerer	Changes in Individuals' Behaviour
KlimaFamilier	Changes in Everyday Life Situations
KlimaLandsbyen Studsgaard	Changes in Complex Interactions
Kursus for Invandrerer og Flygtninge	Changes in Individuals' Behaviour
AGA Energibesparelser for Indvandrere	Changes in Individuals' Behaviour
Økosamfundet Dyssekilde	Changes in Complex Interactions
Bydelsmødre Kolding	Changes in Individuals' Behaviour
Samsø (and the energyacademy)	Changes in Complex Interactions
BedreBolig Rådgivning	Changes in Individuals' Behaviour

Svanholm (Hornsherred)	Changes in Complex Interactions
ProjectZero - ZeroHomeModel	Changes in Technology
Vækst via Energirenovering	Changes in Individuals' Behaviour
SEAS NVE Grøn Forskel (social media)	Changes in Everyday Life Situations
GrønPuls	Changes in Complex Interactions
SAVE-E	Changes in Individuals' Behaviour
RoskildeLampen	Changes in Individuals' Behaviour
TransTownFuresø	Changes in Complex Interactions
Model Søpassagen	Changes in Everyday Life Situations
MCHA project	Changes in Individuals' Behaviour
PSO 2003 standby consumption	Changes in Everyday Life Situations
PSO 2006 Feedback	Changes in Everyday Life Situations
Grundfos Living Lab	Changes in Technology
Project Zero - ZeroFamily	Changes in Individuals' Behaviour

'GOOD PRACTICE' EXAMPLE OF DANISH SECI

Klimafamilier Ballerup is characterized as a 'Changes in Everyday Life type of intervention'. This is due to its (attempted) focus on co-creation and targeting multiple everyday life situations, within which families were challenged to change (performances of) practices. The SECI draws on several mechanisms related to 'changing behaviours', but, perhaps incidentally, practices were targeted.

Brief Description

This initiative ran in 2009, and the scope and aim was for 20 families to live as 'climate-friendly' as possible. The experiment was conducted over a year [8], but only effectively for 5 months in that period (Case, 2017). Some of the families continued after the experiment had officially ended. The initiative had a broad range of focus areas, such as transportation, food consumption, heating and waste, and included energy- and water consumption in general. The initiative included 20 families comprised of people from different age-groups in Ballerup Municipality, where the main type of housing was 'one-family houses'. 4 out of 20 participating households were tenants, the rest owner-occupiers. An important aspect of this initiative is that families/residents were very active in designing the methods of the initiative, but this was only the case in the second half of the initiative. Ballerup Municipality financed the project (Information, 2014)

Contextualization

The SECI was established as part of Ballerup Municipality' engagement in the 'Green Cities' cooperation (Papazu, 2012). In 2009 they had committed to reducing the citizens co2 emissions by 26% and they have a history of promoting sustainability within the municipality as well as the local businesses (Ballerup Bladet 2016). This SECI seems to target 'way of life' rather than targeting energy and water consumption as something in itself. The citizens/families involved in the initiative were however already committed to wanting to do something for the environment, and may therefore not represent the average of the Danish population.

Aims and objectives

It was an aim to involve families that would represent the general configuration of citizens in Ballerup. This is explained as possible due to the fact that tenants (feel that they) have less control over the households energy-use (Case, 2017). The goal was to target residents' everyday life and routines and thus what they could themselves change in their everyday life. It seems that these behaviours were targeted by addressing what could be conceptualized practices (and practices are also mentioned as the target for change), but only the performance of these practices seem to have been targeted (food-related practices, mobility, practices that generate waste). The goal was to engage the involved citizens in reaching the municipal goal of a 26% reduction in citizens' CO_2 emissions.

Methods for intervention

The initiative had 2 phases; in the first phase, the families should work with changing habits in terms of energy consumption, and they were given energy saving equipment, which included LED bulbs, 'shower-alarms' (to monitor the length of the shower), tools for measuring energy consumption, and energy saving power strips (Papazu, 2012). The families who further worked with mobility received a bike trailer, and the families who worked with food, received vouchers to a local organic food supplier (Papazu, 2012). All families received an energy-assessment of their homes, based on which they were advised about how they could change certain habits related to their energy use (Case, 2017). The families were asked to measure their consumption every week. By the end of the first half year, the families had reduced their consumption within their target areas 20%, almost the target of the municipality (Papazu, 2012). The second half year of the project, half of the families continued, and in this phase of the project, the families were to co-create the projects scope and aim, and in this phase, heating and waste were added as target areas. Apparently, this phase was confusing, as it had not been clear to the families that they were to develop parts of the project themselves (Papazu, 2012). The families developed various advices for energy saving based on their experiences and they actively contributed to developing an electronic sheet for registering energy consumption. They also arranged for 'study trips' to waste incineration plant, and made a cookbook. 'Klimafamilier's' approach is characterized as one of many in the emergent tendency to design object- and project based climate initiatives in DK, rather than solely basing campaigns on information (Papazu, 2012).

Steps of implementation

First Phase (½ year): energy assessment and different energy-saving tools + monitoring of consumption every week. Everyday life and practices related to water and energy consumption was targeted, as well as food and mobility. Families reduced CO_2 emissions by 20% after that period of time. Families enrolled from beginning, but in 1 phase mostly in terms of time and engagement. Second phase (½ year): families co-designed next phase in terms of scope and methods. Heat and waste foci were introduced here, and families made a cookbook and disseminated their experiences to other citizens. There is no record of what this resulted in (energy consumption and co2 emission wise). The project ran in 2009. In 2012, 7 families were still active, but with low and hesitant engagement (Papzu, 2012).

Results/outcomes

The families obtained a 20% reduction in their CO2 emissions after the first half year. Some families obtained a 25% reduction in the energy consumption. The family's engagement with bike-trailers, shower-alarms, electricity consumption measuring tools etc has helped this reduction. Levels of consumption (energy and water) were reported on. It is not known if changes representations of everyday life happened. But it must be presumed that (some) families managed to shower for shorter intervals, and food sources for meal preparation and maybe even configuration of meals have changed (ie the access to organic food, and the resulting cookbook). Notably it was only some of the municipality's most resourceful families who stayed in the experiment for the longest time (Papazu, 2012). No official evaluation or consultancy reports were developed (Papazu, 2012). The project was also closed in 2012, and it is not known whether families stayed on track with lower consumption levels.

The role of the households

20 families were involved in the initiative, including people ranging from the age of 2-74 years. The families were actively involved in the initiative, and the second part of the initiative focused on having the families co-designing objectives and methods. Several activities were included in the initiative, such as challenging shower time, energy efficiency in general, promoting biking and dealing with matters of heating, waste and food. The families did not (have to) contribute financially. As the families co-designed the 2 phase of the initiative, the families' inputs mattered a lot in the design and development of the initiative. The families were however a bit confused about the 2 phase, as it had not been clear that they were to take part in the development of the project. Further the project was

not evaluated (Papazu, 2012). The initiative included a lot of material to help challenging routines. Although not a precondition for being enrolled in the project, a lot of the families had environmental concerns already prior to the project (Papazu, 2012).

Location

The initiative took place in Ballerup Municipality, located close to Copenhagen. The initiative was initiated by the municipality's' technical and environmental administration, due to the municipalities engagement in the Green Cities network. It seems that the local framework/scale of the initiative was important to some of the families, more so than the climate/environmental dimension of the project (Papazu, 2012).

Was/is the initiative successful?

The families almost reached the target for lowering CO_2 emissions through the 1 phase of the project. In that case, the initiative must be regarded as a success according to the set target. The project was however dissolved, and the remaining families showed hesitant engagement towards the end. The families, who saw the enrollment in the initiative as a matter of saving money, left the initiative after the 1 phase, where the objectives had been meet (Papazu, 2012).

Textual and communicative aspects of initiative

Families who left the initiative were termed 'defector-families' (Papazu, 2012). Some of the families had monitored their energy consumption, prior to enrollment in the initiative, but for monetary reasons. After enrollment in the project, it became about 'co2 emissions' and 'saving the planet'. It seems that the municipality/the project coordinator is problematizing and challenging the nature of everyday life, through which the families became heavily involved in experimenting with and showcasing different versions of everyday life. Some families saw their engagement as a means to reduced costs. They left the project, when monetary goals were reached. Families, who remained part of the initiative, for other reasons than monetary reasons, still used monetary results as a pedagogical tool to reach other citizens. CO2 reductions and the need for these reductions were heavily communicated by project-leader. There seem to be a notion of 'us and them' – both in terms of differences in knowledge and experience between the Klimafamilier and the rest of the citizens, when the families try to share their experience in a wider audience. Also, it seems that people outside of the project found it a bit 'funny' or they don't really take it seriously. Also, the project coordinator seemingly rejected the idea of turning the Klimafamilier into a network or association/club – which was something that some of the families would have liked. The project coordinator seemed to think that there were no grounds for doing that (implying that a potential socially shared engagement would be tiresome and not in fact productive) (Papazu, 2012).

The physical/technological aspects of the initiative

The tool for registering energy and water consumption was a key tool, and became an important material element in the initiative, but some families found it inappropriate, since it was not clear what was measure; e.g. numbers of flushes in the toilets were to be accounted for, but it was not clear what that meant in terms of litres of water. That discouraged some participants, where others found it motivating that the registration sheet was complicated and had to be complete (Papazu, 2012). Several material elements were introduced, such as bike-trailers, LED bulbs, energy saving power strips, shower alarms. The materiality of the initiative seems to have been important. It does however mostly seem like participants were asked to reduce certain things, and not to stop using certain things. Yet, in terms of mobility and food, practices seemed to change, at least for a while, due to the material interventions (bike-trailer and access to organic food, through vouchers). The size of the household does not seem targeted. No big changes in physical layouts, and it does not seem that that there was focus on repairing and/or sharing.

Shared understandings related to initiative

In this SECI it seemed that a lack of shared understandings had important implications; the project coordinator/the municipality's focus on citizen involvement contrasted why many of the families enrolled in the project – to do something. A lot of the resourceful families were used to a different way of approaching a project, primarily from their own work-cultures, that contrasted the municipality's focus and 'softer' facilitation and attention to make sure that families attended meetings, according to source (Papazu, 2012). The contrasting ways of viewing the intention with the project almost killed the participating families engagement. This goes to show that initiatives may really have to take point of departure in where participants 'are' and what they want to do, from the beginning.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

The Danish SECIs, showcased in section 2, reflect a range of aspects from the historical development in national energy policy and socio-material aspects of energy consumption. Indeed, they show tendencies in how energy consumption has been understood and targeted as part of national and local policy initiatives over time. Most of the showcased SECIs reflect tendencies in targeting behaviours related to lighting and heating, such as turning off light you are not using, or turning down the temperature at home. Some SECIs promote energy efficiency through refurbishing, or by choosing energy efficient products. Some of these SECIs are traditional in terms of informing and enabling the householder towards more energy efficient homes; an approach which to a large extent was initiated in the 70ies in relation to the oil crisis. Examples of these are AGA Elspare Konkurrence and For Enden af Vejen. Other SECIs, with a more 'systemic' approach reflect current trends in smart grid and smart city developments, such as Eco-Life Høje Tåstrup, MCHA Project, Insero Live Lab and Grundfos Living Lab. These trends are in some cases reflected in national energy policy visions, but as smart-grid ideas are still mostly experimental and research-based, they are not yet explicitly included in national energy policy. Lessons learned from some of these initiatives, however, seem to be included in broader visions within energy policy, where the 'consumers' are expected to be flexible in the way they use energy, but other than this, the householder is becoming less and less 'visible' in plans for energy savings. Subsidies to home-renovations are threatened by cuts, and national policy seems to go more in the direction of systemic and business savings.

Interestingly, most of the Danish SECIs reflect more local policies in relation to energy and climate change. In Denmark, all municipalities have local plans for energy and climate, and several of the SECIs reflect projects related to these. This includes several of the eco-communities, Klimafamilier Ballerup, Sparefamiler, My climate plan Middelfart, Project Zero and SAVE-E. Several of these SECIs are partly research based, partly local initiatives. These SECIs often involve householders actively in various ways. Some of these SECIs, including the 'good-practice' SECI described (KlimaFamilier) target everyday life activities, or complex interactions between several people and practices. This often includes other kinds of resource consumption such as food, water, and waste generated, and not only energy consumption. Most local SECIs are very different in approach and scope, and where some enable alternative ways of living (Munksøgaard, Svanholm, AIH), others reorganize existing professional practices within local banking, craftsmanship and energy renovation (My Climate Plan Middelfart), and others again target particular aspects of everyday life within the households and between a selection of households (Model Søpassagen, Sparefamilier, Klimafamilier).

Common for these ‘local’ SECIs are that they are much ‘broader’ in their scope and approach, than national energy policy. Although it is difficult to say anything about the success of these SECIs (in quantitative and qualitative terms), as they are evaluated very differently, if at all, it seems that several of the local SECIs (particularly those that systematically address and rearrange particular aspects of everyday life across practices (also professional practices) are rather successful in arranging new partnerships and reducing energy consumption. Particularly the eco-communities have significantly lower co2 emissions in comparison to the average Danish emission in ton/capita/year (Nyt Fokus, 2015). Common for them, though, is that they often run into problems with nationally induced legislation and standards that make systemic change difficult. Therefore, local SECIs are not always offered the needed support from national policy. A focus on a stronger relationship between national policy and municipal strategies might be favorable, and money and time set aside for properly evaluating projects seems to be needed. This includes funding for researching and establishing grounds for developing appropriate evaluation schemes.

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ESTONIA

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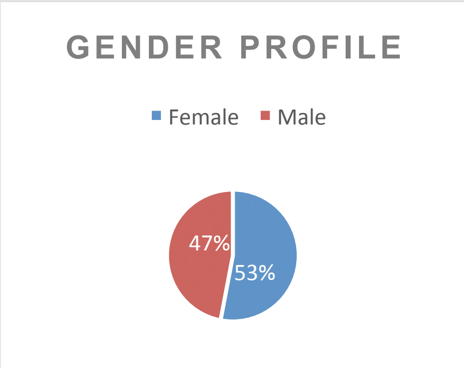
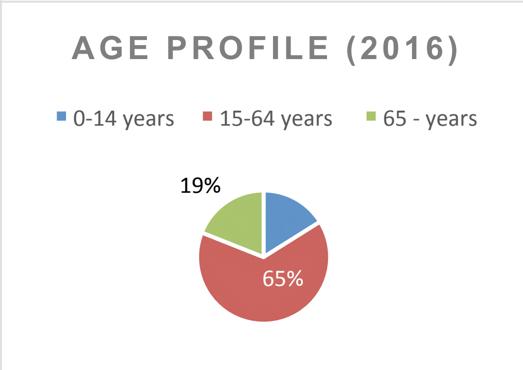
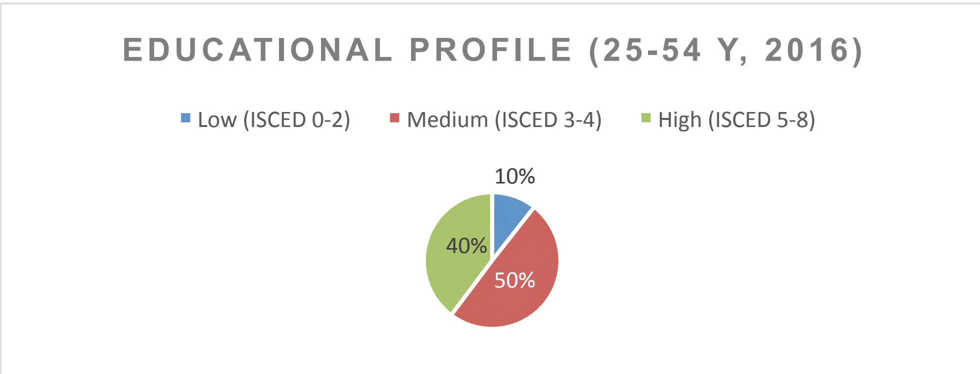
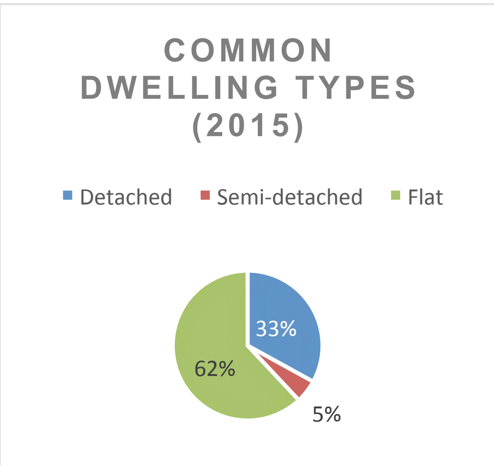
DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY

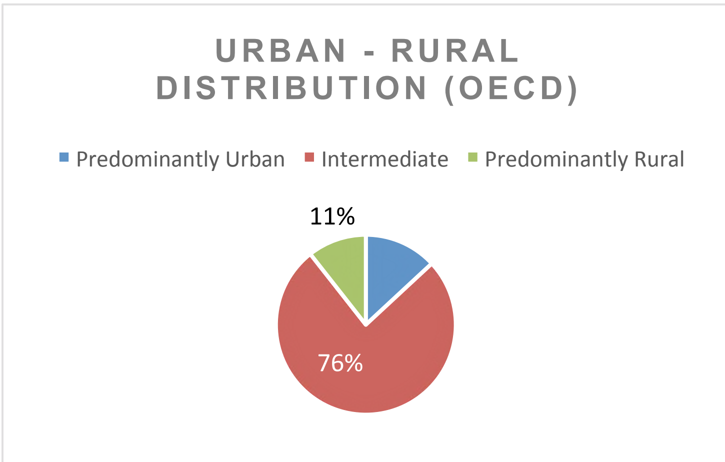


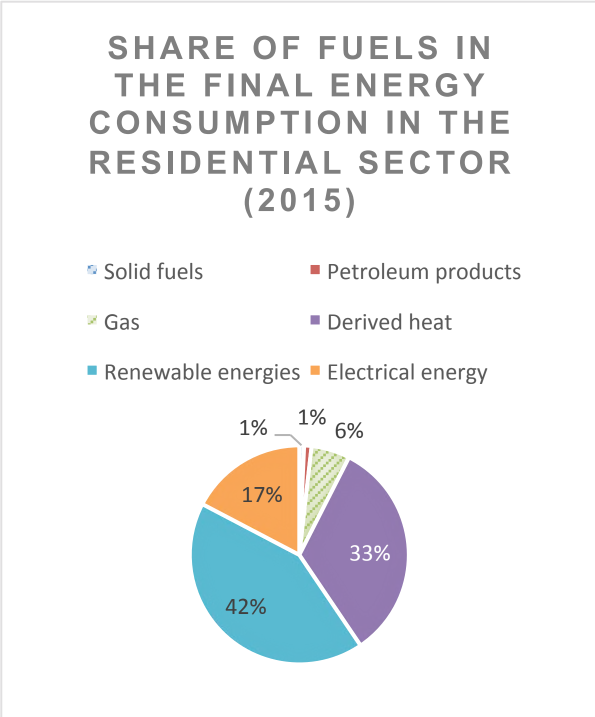


CLIMATE: maritime, wet, moderate winters, cool summers









FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

7.586 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

What is unique about the Estonian energy sector is that it is dominated by one primary source of energy – oil shale. Because of its large domestic oil shale reserves, the country could be considered as relatively independent in energy. About 70% of the total energy supplies are generated by domestic energy production. The other 30% are ensured through imported energy resources (including natural gas, gasoline and diesel fuel).

In order to diversify electricity supply, the government of Estonia is planning to invest in renewable energy sources. The highest potential is accounted to biomass, biogas, wind and hydropower. Smart grid solutions are also on the agenda.[37]

Electricity production in Estonia is dominated by Eesti Energia, which is a state-owned company holding the largest share of electricity sales – 82.9% of sales in 2012. Other players in the retail market of electricity are Imatra Elekter AS (holding 2.7% of the sales for 2012), VKG Elektrivõrgud OÜ (holding 2.6% of the sales for 2012), which are both private companies. The remaining 10% of sales are distributed among 39 smaller electricity retailers.[38]

Estonia has an isolated gas market. The country's major supplier of natural gas is Gazprom, and the sole wholesaler is AS EestiGas. There are two other companies with a license for the gas market – AS Nitrofert and Baltic Energy Partners OÜ – but they obtain gas only for their own needs. It could be claimed that there is no competition between the sellers and traders in the gas market in Estonia and therefore there is no organised gas hub.[39]

According to statistics, 60% of the population in Estonia uses district heating, which is among the highest percentage in the EU. Estonian district heating sector has been in the focus of the Estonian National Development Plan of the Energy Sector Until 2030, setting that the sector will use local fuel as much as possible, not relying on expensive and imported fuels in the production portfolio and will ensure efficient operation without requiring any additional investment support from the state.[40]

A partial liberalisation of the Estonian electricity market began in 2010, when the large-scale electricity consumers became obliged to buy electricity on the free market. In 2013 the market was fully lliberalised and became open for small and household consumers as well.[41]

Particular socio-material aspects that influence energy consumption

95% of residential dwellings in Estonia were built before 1991, in accordance with the Soviet Union and pre-war building standards that were not focused on energy saving. Almost half of the country's residential housing stock represent multi-flat panel blocks that have very thin outer walls and poor quality windows, resulting in high thermal losses. All these factors cause lavish energy use in the

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[38] European Commission (2014). *Estonia*. Available at: https://ec.europa.eu/energy/sites/ener/files/documents/2014_countryreports_estonia.pdf
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[40] Ministry of Economic Affairs and Communications (2016). *Possibilities of Efficiency in Heating and Cooling in Estonia. Assessment of Heating and Cooling Potential of Estonia*. Available at: https://ec.europa.eu/energy/sites/ener/files/documents/Art%2014%281%29%20Estonia%20EN.pdf
[41] Schneider, T. (2013). *Energy Policy in Estonia. A Comparative View on Party Positions*. Available at: http://www.kas.de/wf/doc/kas_33609-1522-2-30.pdf?130222203647

residential sector. It is estimated that around 80% of the total energy used in the residential sector goes for space heating and hot water.[42]

The energy consumption habits of Estonians were formed during a period when the topics of resource depletion and sustainable energy consumption were still not on the agenda. Moreover, the introduction of new technologies and developments in the country has led to the growing use of products and services, which in turn resulted in increased demand for energy. Consequently, Estonia's share of household energy consumption in total energy consumption is one of the largest in the EU. Keeping in mind that household energy consumption depends not only on geographical location and income level but also on cultural background and traditions, it is assumed that a lot of educational work needs to be done in order to make Estonians change their energy usage habits and customs.[43]

Recently, overheating in summer has become an issue, especially in modern buildings, which are typically with larger windows. The average room temperature in these buildings is higher than in the old buildings, which makes the dwellers use more energy to cool their homes.[44] According to the results of a survey among 7,000 households conducted in 2011, more and more residents pay attention to the indoor climate of dwellings. About 80% of the respondents indicated that they enjoy normal indoor climate in the heating season, while 15% considered their dwellings to be too cold and only a few percent replied that their dwelling was too warm or too damp.[45]

With regard to electricity prices, Estonia has among the cheapest average price of electricity for household consumers and for industrial consumers. In the first half of 2017, the Estonian household consumers were paying 12.07 euro cents per kilowatt hour of electricity, while the average electricity prices for households in the EU for the same period was 20.41 euro cents per kilowatt hour.[46]

Current Trends in Energy Policy

Two strategy papers give direction to the Estonian energy policy agenda. These are the Development Plan of the Estonian Electricity Sector until 2018 and the National Development Plan of the Energy Sector until 2020. The objective of the two documents is to move electrical energy production in Estonia from oil shale to other energy sources and thus to balance the overall energy mix. According to the papers, it is expected that each of the available energy sources such as wind, potential nuclear energy, timber, gas and liquefied fuels should account for a share of 20% of energy production in the very near future.[47]

Current trends show an increased efficiency in the use of energy and local resources. More than 600 apartment blocks were renovated by 2015 through financial incentives provided by the national government or by EU structural funds for the renovation of living stock. There were also activities towards the introduction of nearly zero buildings.[48]

[42] INFORSE-Europe (2011). *Sustainable Energy Vision for Estonia. A Path to Make Estonian Energy Independent and Sustainable by 2050*. Available at: http://www.inforse.org/europe/pdfs/Estonia-note.pdf
[43] INFORSE-Europe (2011). *Sustainable Energy Vision for Estonia*;
Raudjärv, R. and Kuskova, L. (2013). 'Energy Consumption in Households.' *Quarterly Bulletin of Statistics Estonia*.
[44] Maivel, M., Kurnitski, J. and Kalamees, T. (2014). 'Field Survey of Overheating Problems in Estonian Apartment Buildings.' *Architecture Science Review*, Vol. 58, Issue 1.
[45] Raudjärv, R. and Kuskova, L. (2013). 'Energy Consumption in Households.'
[46] Statista (2018). *Electricity Prices for Households in Estonia from 2010 to 2017*. Available at: https://www.statista.com/statistics/418080/electricity-prices-for-households-in-estonia/;
Statista (2018). *Electricity Prices for Households in European Union (EU-28) from 2010 to 2017*. Available at: https://www.statista.com/statistics/418049/electricity-prices-for-households-in-eu-28/
[47] Schneider, T. (2013). *Energy Policy in Estonia*.
[48] Leppiman, A. (2015). *Estonia's Energy Strategy: Directions and Priorities*. Available at: http://www.lsta.lt/files/events/2015-10-15_Valstybes%20konf/17_Leppiman.pdf

Household energy consumption efficiency in Estonia has started to improve also as a result of the renovation of building envelopes – additional thermal insulation of outer walls, replacing windows, etc. Heat and water metering devices were also introduced, which gave households incentives to save energy and to limit excessive water consumption. As a result of the more strict thermal standards that apply for new buildings, the specific heat consumption in new dwellings decreased.[49]

Trends in national campaigns

In 2003 the Estonian State support programme for the renovation of multi-apartment buildings started being implemented. The programme was administered by Estonian Credit and Export Guarantee Fund (KredEx) and continued until 2009. It included activities such as energy audits, preparation of building design documents and technical supervision, and renovation of multi apartment buildings.

Another investment support programme for reconstruction of public sector buildings started in 2011. It was coordinated by State Real Estate Ltd. which is an Estonian company engaged in real estate development and management. The programme targeted state agencies and local authorities and planned reconstruction of 480 public sector buildings.[50]

[49] Tallinn University of Technology (2012). *Energy Efficiency Policies and Measures in Estonia*. Available at: http://www.odyssee-mure.eu/publications/national-reports/energy-efficiency-estonia.pdf

[50] Bremere, I., Indriksone, D. and Aleksejeva, I. (2013). *Energy Efficient and Ecological Housing in Finland, Estonia and Latvia: Current Experiences and Future Perspectives*. Available at: http://www.ecohousing-project.eu/wp-content/uploads/2014/02/Energy-efficient-and-ecological-housing-in-FI-EE-and-LV1.pdf

OVERVIEW OF NATIONAL SECIS

Below please find a list of Estonian SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country.

Powerhouse Nearly Zero Challenge (POWER HOUSE NZC)	Changes in Technology
More biking in small and medium sized towns of Central and Eastern Europe by 2020 (MOBILE2020)	Changes in Everyday Life Situations
Intelligent energy saving measures for municipal housing in Central and Eastern Europe (INTENSE)	Changes in Individuals' Behaviour
Encouraging active travel for short trips to improve health and the local economy (ACTIVE ACCESS)	Changes in Everyday Life Situations
EuropeaN Efficient Residential Lighting INitiative (ENERLIN)	Changes in Technology
Promotion of the Passive House Concept to the North European Building Market (NORTHPASS)	Changes in Technology
Raising awareness on renewable energy developing agro-energetic chain models (RADAR)	Changes in Complex Interactions
Renewable Energy and Building Exhibitions in Cities of the enlarged Europe (REBECEE)	Changes in Technology
RES and RUE Stimulation in Mountainous - Agricultural communities towards sustainable development (MOUNTAIN-RES/RUE)	Changes in Technology
Social Housing Action to Reduce Energy Consumption (SHARE)	Changes in Individuals' Behaviour

'GOOD PRACTICE' EXAMPLE OF ESTONIAN SECI

Raising awareness on renewable energy developing agro-energetic chain models (RADAR)

Brief Description

RADAR was an international project conducted in rural areas of 7 European countries. In Estonia, it was implemented on the territory of five rural municipalities (parishes) in South-East Estonia (Seto region), near the border with Russia. The main goal of the project was to raise awareness about possibilities for the use of renewable energy by setting up Rural Sustainable Energy Communities. These pilot projects involving the local communities were envisaged as starting point for facilitating the adoption of renewable energy and energy efficiency measures on a larger scale across the country. The creation of Rural Sustainable Energy Communities enabled the use of a bottom-up approach, and an adjustment of the activities according to the needs of the concerned areas. A pig farm Kimeko Ltd had a crucial role for the realisation of Estonian agro-energetic chain model based on conversion of pig waste into biogas and energy. In addition to pig manure, herbaceous biomass supplied by Kimeko fields and local farmers was also used to produce heat and electricity for the local use. The entire agro-energetic chain was operated by local actors.

Brief Contextualization

All electricity consumed in Seto region is produced and distributed by Estonian national electricity company Eesti Energia (Estonian Energy Ltd). As discussed in Section 2, almost all energy in Estonia is produced from oil-shale (95%), while the remaining 3% are obtained from the use of natural gas and only 2% from different renewable resources (wind, hydro, biogas). When the RADAR project started, the country had only two biogas stations – one located on an island off the Western shore of Estonia and fuelled by agricultural waste, and the second in the capital Tallinn, using city sludge for biogas production. A few more biogas plants were in the process of development. In 2018, there are already a total of 17 biogas plants (five agricultural biogas plants, seven sewage and industrial waste water treatment plant and five landfill gas production units).[51] The successful implementation of RADAR project could be therefore seen as a very important stimulus for further expansion in the production and use of biogas, increasing the share of energy from renewable sources in Estonia. The project has also revitalised the economy in Seto region, bringing new sources of revenue to local farmers, and reducing the energy costs for the local residents.

Aims and objectives

The central aim of RADAR project was to establish a biogas agro-energetic chain that would use local resources like agricultural waste (manure) and herbaceous biomass (green silage) supplied by local farmers. A biogas plant, producing heat energy and electricity, was constructed on the territory of Kimeko farm, which is also the main source of biofuel. Electricity is sold to the national grid, while the produced heat is used for heating

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[51] Information from Estonian Biogas Association webpage. Available at: http://eestibiogaas.ee/

the local greenhouses and households in the nearby villages. Digestion material is also put to a good use as fertilizer for herbaceous biomass fields surrounding Kimeko farm.
Another important objective of the project was to engage the local actors in all stages of the chain operation – from supply of the biofuel, through production of energy, and finally the use of the energy.

Methods for Intervention
Promoting the energy citizenship by setting up Rural Sustainable Energy Communities and adoption of renewable energy and energy efficiency measures by local communities.

Steps of implementation
Agro-energetic biogas chain included three main steps:
1. The growing and stocking of raw material (manure and herbaceous biomass in the form of silage).
2. Harvesting and transportation of raw material and digestion waste.
3. Conversion of raw material into energy (heat and electricity) and fertilizer.

Results/outcomes

Type of Biomass	Total biogas production	Power production	Electrical capacity	Heat production	Thermal capacity
	m3	MWh	MW	MWh	MW
Pig manure from Meremäe Village	479,388	1,202	0.15	1,217	0.15
Pig manure from Obinitsa Village	516,265	1,295	0.16	1,310	0.16
Cow manure	81,320	204	0.03	206	0.03
Silage from Kimeko farm (140 ha)	646,800	1,622	0.20	1,642	0.21
Silage from rented land (210ha)	970,200	2,433	0.30	2,462	0.31
Summary	2,693,973	6,756	0.845	6,837	0.855

RADAR project was the pioneer in Seto region, bringing new knowledge into the community and establishing a new energy producing plant, based on the use of renewable energy sources. The project added an estimated 10% of renewable energy to the energy mix of the area.

The role of the households
Local households benefit from the biofuel combined heat and electricity plant as final users of heat produced by the plant. In winter, they use it for heating their homes and in summer for heating water. Since during the summer months plant produces more heat energy than needed by the local households, the surplus heat is used at the auxiliary business unit – a dryer of wood pellets. Successful implementation of the project has increased the awareness of the local residents about the necessity to reduce energy consumption. After seeing that waste can be used for producing energy, households have also become more sensitive towards protection of the environment.

Location

The biogas plant is located in the Meremäe village, where Kimeko pig farm is located, but other municipalities are also involved (Mikitamäe, Misso, Värska and Vastseliina) mainly as suppliers of biofuel, but also as users of the heat produced by the plant. The availability of sufficient capacities for the usage of heat produced by the CHP plant in Meremäe was a very important precondition for the project implementation. A higher concentration of farms and possibilities for development of greenhouses for vegetable production was a decisive factor for constructing the plant in Meremäe. In winter months, the heat produced by CHP station is also used for heating residential houses and public buildings in Meremäe village.

Was/is the initiative successful?

The initiative was successful – not just in the sense that the CHP plant was established and started producing renewable energy, but in several other important aspects as well. RADAR contributed to:

- Better planning of the balance of the biomass demand and supply possibilities.
- More efficient use of the biomass resources
- Successful introduction of new sorts of biomass (herbaceous biomass, residues from food processing, farm manure) into energy production.

The physical/technological aspects of the initiative

The biogas plant works on the principle of fermentation of raw materials during the anaerobic mesophilic process (35-37°C). The fermentation process lasts 24-28 days. The methane content of the biogas obtained is between 53 and 60%. Conversion efficiency of the plant is 84%. The bio-energy chain is based on pig and cow manure and silage from crops – all supplied by Kimeko Ltd. farmland and from local farmers. The capacity of CHP plant is 0.845 MW electricity and 0.855 MW thermal energy. Around 30% of produced heat is used by the plant itself for heating a fermentation tank, while the remaining 70% is used for heating greenhouses and the local households.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

Given the overwhelming dependency of the Estonian energy sector on oil shale, it is not surprising that the main national documents outlining energy strategy focus on diversification of the energy mix. Special focus is given to the increase of the use of renewable energy sources.

The largest share (50%) of SECIs analysed by ENERGISE team concentrate on technological solutions for better energy efficiency (renovation of old apartment buildings, construction of passive houses, more efficient heating and lightning in households), followed by initiatives that try to influence people to change ways in which they consume energy – either inside their homes or in transportation. Two SECIs, however, reflect well the above stated goal of national strategy documents: 'Raising awareness on renewable energy by developing agro-energetic chain models (RADAR)' and 'RES and RUE Stimulation in mountainous and agricultural communities towards sustainable development

(MOUNTAIN-RES/RUE).' Similarly to RADAR, described in more detail in section 3, MOUNTAIN-RES/RUE aimed to stimulate the use of renewable energy sources in rural communities, helping them to become self-sufficient in energy.

Both SECIs (RADAR and MOUNTAIN-RES/RUE) targeted households located in rural communities, where energy consummation is influenced by a set of rather specific circumstances. To begin with, rural residents typically live in detached houses, where heating costs can be substantially higher than in the multi-apartment buildings (longer heating season, external walls on all sides of the housing unit, individual heating systems). Rural dwellers are on average less informed and less conscious regarding energy efficiency, and somewhat less concerned about environmental protection (it needs to be noted, as discussed in section 1.2, that in general, energy consumption practices of Estonians are rather wasteful as a result of the patterns established in the Soviet period, when energy was exceptionally cheap – electricity prices in Estonia remain among the lowest in EU even today). Finally, people residing in villages usually produce an abundance of biofuel (manure, silage, wood waste), but have no capacity to use it for generating energy.

The successful integration of the biofuel electricity and heat plant into the social-economic and energy landscape of the village Meremäe shows that such projects can not only revitalise deprived and poor local communities (new jobs, new income for farmers providing biofuel, reduced heating costs for the local residents), but can also contribute to the national targets regarding reduction of greenhouse gasses and increase in the share of the RES in the energy mix.

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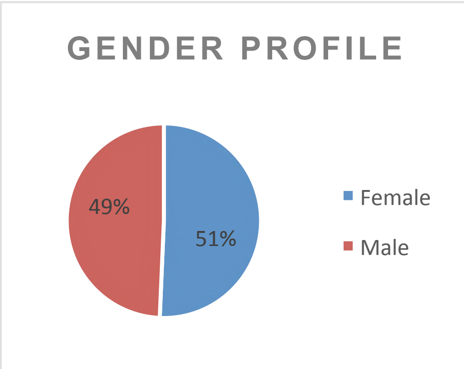
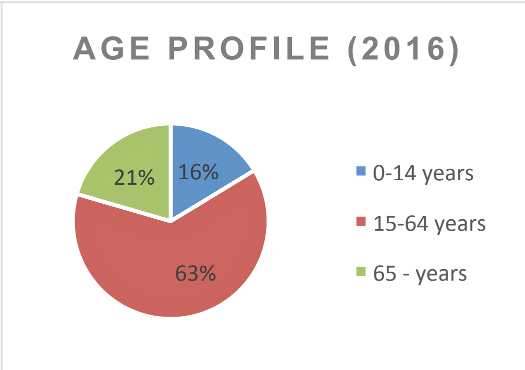
FINLAND

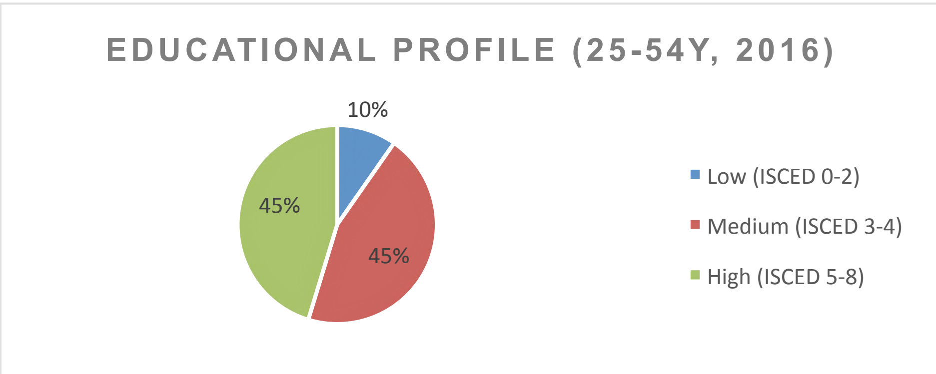
Authors:
Eva Heiskanen, Senja Laakso, Jari Kolehmainen, Eeva-Lotta Apajalathi

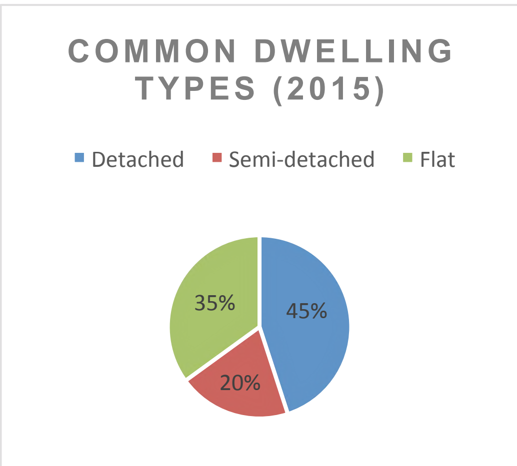
DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY

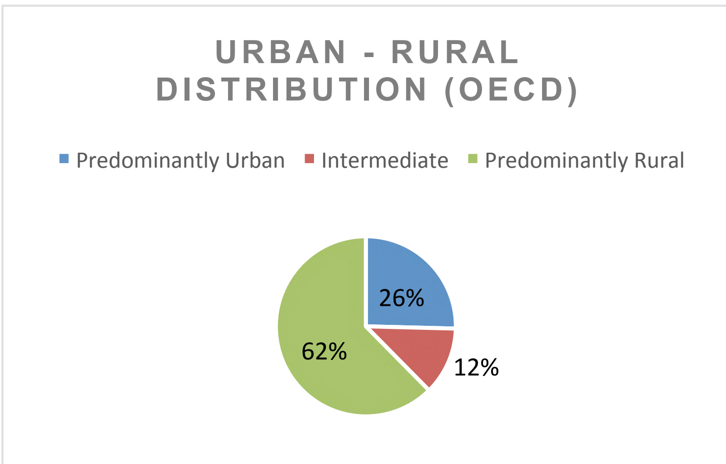


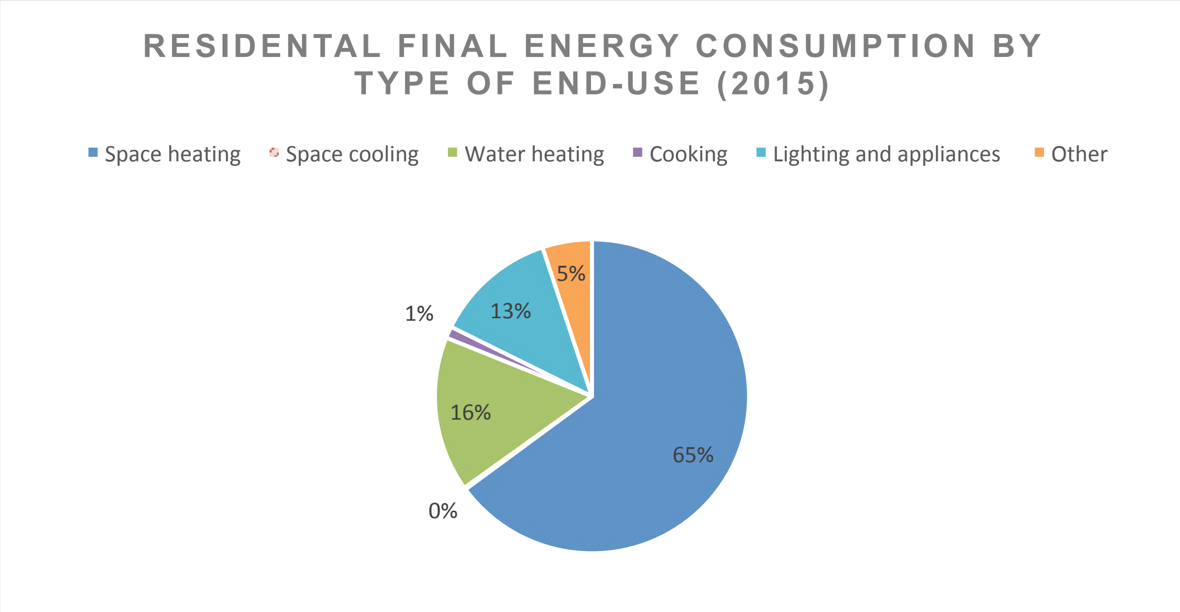


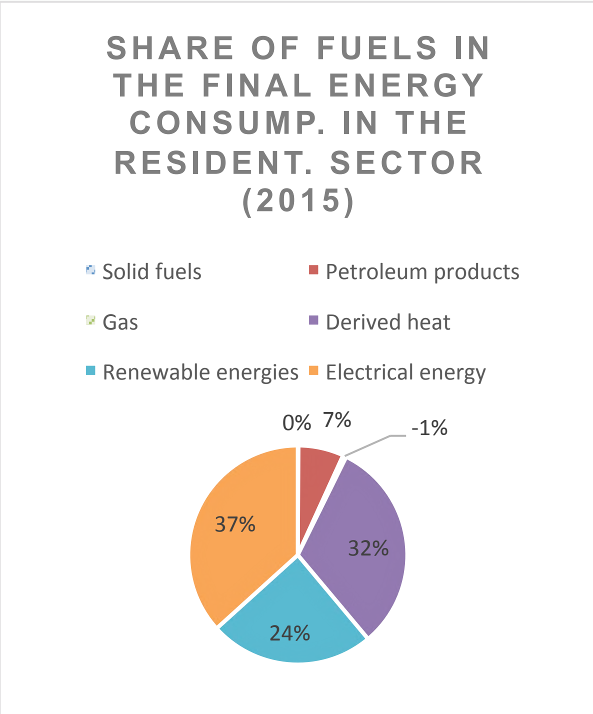
CLIMATE: Cold temperate, partly subarctic.

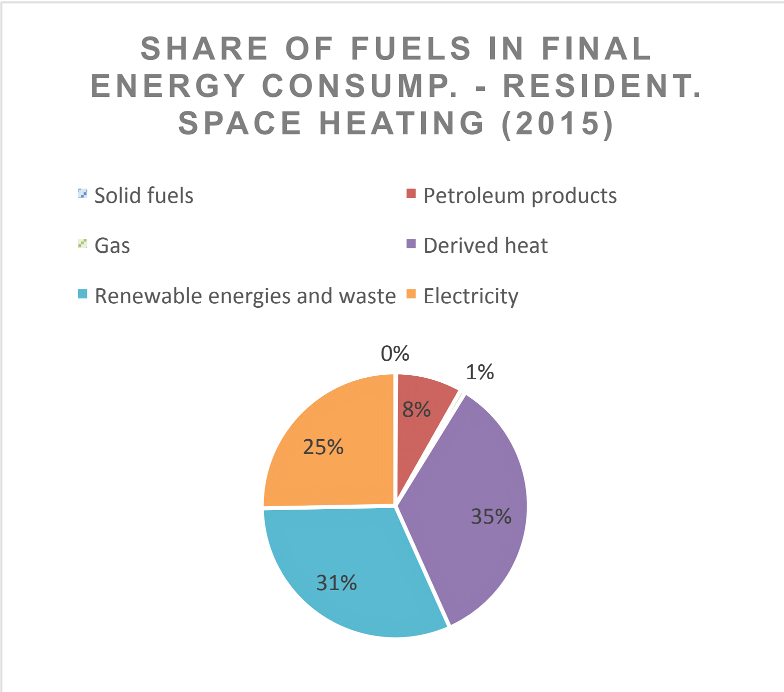












FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

10.396 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

Finnish electricity distribution grids were originally developed by municipalities or local industries. Most of the about 80 distribution grids in the country are still owned by municipalities, but a few larger companies have acquired a number of distribution grids as well. All distribution grids are connected by a transmission grid owned and managed by Fingrid, a company with majority state ownership. Electricity markets were liberalized in 1995/1997. About 120 companies produce electricity for the retail market and many of them are still owned by municipalities (Finnish Energy Industries, www.energia.fi).

The gas grid only extends to parts of the country, and serves mostly industry and energy companies.

District heating networks are local monopolies. There are more than 100 units producing district heat for 166 municipalities and their residents. About 2/3 of the district heat is produced with combined heat and power production (CHP) (Finnish Energy Industries (www.energia.fi).

Particular socio-material aspects that influence energy consumption

Like other Nordic countries, indoor temperatures are rather high (about 21ºC) in Finland. Finns are accustomed to stable indoor environments and well-functioning, rather automatized systems. Finns are also rather keen on adopting technological novelties (like heat pumps and LEDs).

Officially, there are about 2 million saunas in Finland. Unfortunately, individual saunas have become a standard feature also in apartments, though this trend might be declining in cities due to space constraints. In Helsinki, public saunas have made a comeback, so perhaps the individualizing trend is ending.

Household electricity has been relatively cheap in Finland, hence concerns about electricity costs are limited to people with direct electric heating, mostly outside the large cities. People living in apartment buildings also do not pay individually for heat (and usually not even for hot water, but a fixed, monthly charge of about 20 euros/person), and district heat is relatively cheap in cities due to the widespread use of CHP. Because of this, city dwellers in particular are not too concerned about energy use.

Current Trends in Energy Policy

Smart energy systems and smart grids gained momentum in Finland around 2010. Virtually all Finnish electricity consumers have automatic meter reading installed. There is interest in developing products (e.g. IoT, building automation, smart controls) also for export markets. There are also several developments ongoing in developing smart district heating systems. Demand response (flexible use of heat and power depending on supply and demand) has become a hot topic in quite recent years.

There is also a strong interest in smart cities. There are more than 20 pilots ongoing in different parts of the country, in particular, attempting to integrate smart and sustainable aspects into new districts.

There is a strong rhetoric supporting energy efficiency, but actual measures are relatively limited. Partly this is because Finns believe they are already world leaders in energy efficiency. Some of this may be true: Finnish energy-intensive industry is relatively energy efficient because energy costs are such a large share of costs. Buildings are relatively energy efficient because about 75% of them (by building area) were built after the 1970s (Statistics Finland 2018b). Gradually, Finnish energy policy is recognising that energy demand is stabilising, but there are still few policies or measures to actually reduce energy demand, apart from informative and fiscal policies (energy taxation). A voluntary agreement scheme for energy audits and improvements has successfully engaged large energy users, but does not extend to households expect insofar as some rental housing providers are involved.

Refurbishment of buildings is gaining increasing attention, since a large share of buildings are approaching their first major renovation. There has been small (10-15%) financial support available for apartment buildings, but this has been cut due to overall budget cuts. When major renovations are undertaken, the building code prescribes energy efficiency improvements.

Energy community is not a strong topic in Finland. There are some programmes and pilots, more in the countryside, where for example, there has been a development of “heat entrepreneurship” in which forest owners supply heat to e.g. municipalities. Carbon-neutral municipalities is a programme currently (2017) involving 33 municipalities that have committed to reducing their greenhouse gas emissions by 80% from 2007 levels by 2030. In general, however, energy is considered to be the domain of experts and large companies, and official policy has not made a large effort to engage citizens.

Finnish energy policy has for a long time been focused around the needs of industry, which consumes more than 40% of all the energy used in the country. Since the share of households is relatively small in international comparison, they have not been a major focus of energy policy. The share of renewable energy has grown steadily since the late 1970s, but much if it still comes from black liquor and other forest residues used by the pulp and paper industry. However, Finnish Energy policy has gradually grasped that other renewable energy sources than bioenergy need to be developed, and increasing support has been directed to the development of wind power. Renewable energy amounted to 36% of the total energy production in 2017 (Statistics Finland 2018c). Energy efficiency is considered important in official energy policy, but we have no quantitative targets, though the ideal scenario is for energy demand to stabilise. There is no feed-in-tariff for small-scale energy production, indeed, no support at all for renewable energy investments by households (apart from a tax deduction from labour costs). The current government aims to increase renewable energy sources to more than 50% and increase domestic energy provision to more than 55% by 2030. Additional, Finland aims to phase out coal and halve the use of mineral oil and increase the renewable share in transport fuels to more than 40% by 2030 (MoEE 2017). Two Finnish companies are also trying to build nuclear power plants. The official energy scenario (MoEE 2017) envisages that 29% of total energy demand will be produced by nuclear power in 2030, when the current share is 19%.

Trends in national campaigns

Finnish national energy campaigns are mainly organised by Motiva, a state-owned company promoting energy efficiency, renewables and materials efficiency. Campaigns have not been a strong focus in recent years, rather the provision of locally targeted practical advice and engagement. This advice focuses on sensible use of energy, i.e., auditing, metering, automation, adjusting controls, refurbishment and renewable energy – and, most recently, demand response. Energy Saving Week is one of the nation-wide campaigns for homes and workplaces, but it focuses more on bottom-up pledges by e.g. workplaces, where the participants select their own measures and targets.

OVERVIEW OF NATIONAL SECIS

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Micro-ESCOs	Changes in Complex Interactions
Open Homes Energy Walks	Changes in Individuals' Behaviour
Carbon neutral residential area Skaftkärr	Changes in Everyday Life Situations
Evaluating heat pumps	Changes in Technology
Carrotmob	Changes in Everyday Life Situations
Environmental Agents	Changes in Everyday Life Situations
Billing feedback trial	Changes in Individuals' Behaviour
Energy Expert	Changes in Individuals' Behaviour
HEAT '07	Changes in Technology
Green Office	Changes in Individuals' Behaviour

Motivoittaja	Changes in Technology
ENEOKO Energy and heating system information for detached houses	Changes in Technology
Ilmari Climate education project	Changes in Individuals' Behaviour
Climate communication campaign	Changes in Individuals' Behaviour
Wattitalkoot	Changes in Individuals' Behaviour
Energy efficient student housing	Changes in Everyday Life Situations
HSY:n aurinkoenergian ja hukkalämmön karttapalvelu (Map service for waste heat and solar potential)	Changes in Technology
Tarmo+	Changes in Complex Interactions
EUGUGLE	Changes in Complex Interactions
Jyväskylän Energian Talo a	Changes in Technology
Smart Kalasatama and Hima application	Changes in Complex Interactions
ECOHOME Education, training, tools and services to enhance sustainable household consumption	Changes in Complex Interactions
Heat promise (Helenin lämpölupaus)	Changes in Individuals' Behaviour
Climate Info (Ilmastoinfo)	Changes in Individuals' Behaviour
Climate Street (Ilmastokatu)	Changes in Complex Interactions

Balance your house (Tasapainota Talo)	Changes in Technology
Anticipatory quality training in building inspection (Rakennusvalvonnan ennakoiva laadunohjaus)	Changes in Complex Interactions
Solar collector self-building courses	Changes in Everyday Life Situations
Green doors (Vihreät ovet)	Changes in Individuals' Behaviour
HSL new customer procurement (uusasiakashankinta)	Changes in Everyday Life Situations
Towards Resource Wisdom (Kohti resurssiviisautta)	Changes in Complex Interactions
Resource wise housing (Resurssiviisas asuminen)	Changes in Individuals' Behaviour
Wisely-lighted housing association (Viisaasti valaistu taloyhtiö)	Changes in Technology
The bus leap (Bussiloikka)	Changes in Everyday Life Situations
Future Household	Changes in Everyday Life Situations
Kangas	Changes in Complex Interactions
PiggyBaggy	Changes in Everyday Life Situations
Carbon-free May (Vähähiilinen huhtikuu)	Changes in Everyday Life Situations
Ilmankos	Changes in Individuals' Behaviour
Kierrätyskeskus, 4V (Care, Affect, Enjoy, Flourish - Helsinki Metropolitan Area Reuse Centre project to promote an environmentally friendly way of life and community solidarity)	Changes in Everyday Life Situations

HOAS Laboratorio	Changes in Everyday Life Situations
Climate Diet (Ilmastodieetti)	Changes in Individuals' Behaviour
Energy Thriathlon	Changes in Individuals' Behaviour
Handyman About Town	Changes in Everyday Life Situations
Negawatti	Changes in Technology
Carbon neutral Harakka	Changes in Technology
Language tree (Kielipuu)	Changes in Individuals' Behaviour

'GOOD PRACTICE' EXAMPLE OF FINNISH SECI

The Smart Kalasatama and Hima Application[52] is a Finnish SECI that appears to take on the understanding of energy consumption being a result of everyday life dynamics, and thus changing energy consumption patterns mean understanding and targeting how everyday life is organised. In the following sections, the Smart Kalasamata and Hima application is introduced, described and discussed.

Brief Description

The new Kalasatama area of Helsinki is an experimental innovation platform to test and co-create various solutions, such as smart urban infrastructure and services. Smart Kalasatama is a large living lab initiative in which new technologies are tested and developed in real life through piloting, in close co-operation with residents, companies, city officials and other stakeholders. The construction of the area started in 2013 and will continue until 2030's. The project is coordinated by Forum Virium Helsinki. In 2015–2017, the Smart Kalasatama project is run as part of a six-city smart city programme. The Hima pilot is one of the pilots. It is about smart energy monitoring and control with a system developed by Helen (municipal energy company) and ABB. The application is tested as part of Smart Kalasatama in two apartment houses. Other projects include, for instance, sharing spaces for joint use, sharing of electric cars and smart lighting. An agile piloting programme tests new ideas fast and affordably with small inputs from the city (1,000-8,000€).

Contextualization

To boost new sustainable urban solutions, the Helsinki City Council decided 2013 to make one of the new area construction sites, the Kalasatama harbor area, a model district of Smart City development. By 2030 the area will house about 25,000 residents and offer jobs for 8,000 people. Currently, there are about 2,000 residents. It was originated by a consortium including the local energy company and other large companies to develop new 'smart grid thinking' based business. Later, the City of Helsinki and Tekes joined the project and Kalasatama was turned into 'smart city' area with more diverse aims (Heiskanen et al. 2018).

Aims and objectives

Finland wants to be a forerunner in supplying sustainable and clean technology innovations, and Helsinki wants to address carbon neutrality aims by 2050[53]. Kalasatama provides a platform to co-create smart urban infrastructures and services. The aim is also to create a city district that saves one hour of residents' time per day. The idea is that Kalasatama is a real-life testbed for new services to be scaled up elsewhere.

Methods for intervention

Smart Kalasatama is based on the utilization of different technologies and solutions that all use ICT and open data. Several hundred participants – large and small companies, research, public sector, and citizens – are already involved in developing Kalasatama as a

[52] Further examples of Smart Kalasatama's pilots and projects are available at http://fiksukalasatama.fi/2153/ and information on Hima at https://hima.helen.fi/#/howto.

[53] https://forumvirium.fi/en/introduction/building-an-open-and-smart-helsinki/;https://eu-smartcities.eu/place/helsinki; https://fiksukalasatama.fi/en/the-test-lab-of-a-smart-city/

smart district. Helen, together with partner organisations, develops smart grid and services such as electric car network and battery energy storage. The focus is on experimenting with new solutions at varying scales in real life with residents (Mustonen et al. 2017). The Developers' Club gathers all businesses in the area, city administration and resident associations together four times a year to discuss the development of Kalasatama[54]. This has been a completely novel way to cooperate at the city district level in Finland.

Steps of implementation

Smart Kalasatama was funded by Smart City programme of Tekes in 2013-14 and from 6Aika in 2014-20. 6aika is funded by the European Regional Development Fund (80 meur) and European Social fund. The experimentation in the area began already in the planning phase of Smart Kalasatama program with short-term public library services and food club pick-up services. Since 2015, several pilots have been made in collaboration with the city, private companies and residents. The residents have participated in stakeholder workshops, tested individual services (such as 'mobility as a service'), replied to surveys and been partners in Smart Kalasatama projects (such as opening housing companies' clubrooms to public use). The agile piloting program (2016-2017) has arranged three themed open calls for companies to apply for a small 1,000-8,000€ seed money to test their services. The idea of agile piloting has also spread in Helsinki (Heiskanen et al. 2017). The Hima home automation pilot started in 2015. The home automation infrastructure is built-in in the two apartment buildings participating in the pilot[55].

Results/outcomes

Each round of agile pilots is evaluated by an outsider organisation, and so far the results have been mainly good. The participating companies and organisations have gained new information on customer requirements and preferences and have been able to adapt their services. Agile pilots have produced applications and digital services that improve e.g. food and waste management, as well as a neighborhood aid platform (Hämäläinen & Tyrväinen 2016). The two apartment buildings participating in the Hima pilot are new and therefore quite energy-efficient already. Almost all of the participants used the on-off switch of the built-in home automation infrastructure. Additional services, such as the HIMA web portal for monitoring usage and the almost real-time information on energy consumption has led to more personal insight for residents on their household's consumption habits (Linkola 2016). This shows for example as switching off heat lamps on the balcony and using sauna less often, according to resident's own opinions. Also some residents use dishwasher during the night hours when electricity is cheaper.

The role of the households

Households have suggested and tested new solutions and the aim of the whole project is to engage residents. The residents in Kalasatama have been active in experimenting, especially in the case of agile pilots. The residents also have several Facebook groups. The role of households especially for the diffusion of quick, grassroots experiments to other areas in the city has been crucial. Most of the residents that have moved to the area were aware of the smart and experimental nature of the district when making the decision to move in – some of them have even considered unfortunate that there are not more radical experiments to participate in. For the home automation pilot Hima the participating households have given feedback actively. They did not participate in the design phase, but the piloting process has been crucial for further development of the service.

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54 https://fiksukalasatama.fi/en/building-blocks/innovators-club/

55

Location

Smart Kalasatama is geographically limited within the new residential area of Kalasatama. The smart district idea was built around an energy company consortium, which was already working in the area on smart grid business. The built-in home automation infrastructure in apartment buildings in Kalasatama is required in the land transfer conditions, which encourages building and piloting the Hima home automation monitoring service. The agile pilots programme running in Kalasatama has successfully spread to other districts.

Was/is the initiative successful?

The initiative has been successful in testing new ideas and technologies and residents have been satisfied with Hima (Heiskanen & Matschoss 2015). Some of the new solutions have been scaled up in the city. However, as the stakeholders' expectations towards the Smart Kalasatama are high, the level of ambition has not reached all expectations, but some would have wanted even more ambitious experiments in terms of environmental sustainability, such as greater energy efficiency, green roofs and solar panels. The city administration has not been able to work as fast as expected, and not all new technologies or services have scaled up as the entrepreneurs had hoped. In the case of agile pilots, the time frame of experimentation has proved too short to gain enough knowledge on the functionality of new services (Heiskanen and Matschoss 2018). However, the current funding of Smart Kalasatama program only ended in late 2017, and therefore a final evaluation cannot be made yet.

Textual and communicative aspects of initiative

Energy consumption is framed as a challenge to be solved by smart solutions – not only by actions of individual households, but especially by changes in ways of energy provision and of organising services. Reduction in energy use seems to be a positive side product of Smart Kalasatama, which has incorporated energy consumption into the promise of "one hour more free time in a day" for the residents. Energy consumption in seen as a wider issue, to which the experiments made in the area might partly respond. Households are not required to use energy in certain manner, but rather encouraged to pay attention to the topic. The city of Helsinki communicates the experimental nature of the area locally and at Smart City events abroad in a proud and positive manner. As the Kalasatama district is rather compact geographical area, there is quite strong "Kalasatama identity" related to the project. Communication is nurtured, e.g. in the Developer's Club meetings, Facebook groups and agile pilots in which the residents participate.

The physical/technological aspects of the initiative

ICT and open data have a significant role in Kalasatama. Many solutions, such as Hima application, have been developed from the beginning in Kalasatama, which has been important for Helen to gain knowledge on how people use the new services. The automatization of energy use and demand side management aim at cutting the peaks in energy demand. The idea is that experiences and critical mass created by experimenting might enable changes in energy system also on a larger scale. The land transfer conditions related to the plan of the area enable pushing solutions and technologies, such as the home automation system.

Shared understandings related to initiative

In Kalasatama the goal for saving residents' time one hour per day by using smart services is commonly acknowledged. However, as always, there are also diverse understandings and expectations. The reduction of energy usage is embedded in using the smart services and manifests as a positive side effect; the reasons for using smart services is about saving both time/effort and energy with an emphasis on the ‘smart’. Smart Kalasatama aims to optimise the current ways of using energy, rather than seeking any extreme or radical changes in everyday energy use.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

The Finnish SECIs reflect Finnish energy policy insofar as they are largely locally based, combine energy saving with other concerns, and aim to develop combinations of technical and social solutions from the bottom up. Older SECIs are more focused on technology or individual behaviour change, whereas newer ones focus more on everyday practices and complex interactions between households and systems of provision. There is a development toward more living lab types of approaches (testing technologies in real-life contexts) and toward integrating energy projects in broader sustainability, liveability and innovation contexts.

Many of the SECIs are not so much reflections of national energy policy, but rather complements to it. Several municipalities have their own climate targets and have engaged in developing new or renovated residential areas where energy conservation is included in the planning targets and attempts are made to involve residents. Because heating is such a large share of residential energy use, many SECIs focus on reducing heat demand or promoting residential-scale renewable energy. Many of the newer SECIs also focus on technology development, but with the engagement of users, their everyday practices and sometimes even addressing the complex interactions between technologies.

This emerging tendency is reflected in the Smart Kalasatama case. Energy saving is becoming part of a broader tendency in urban planning to promote sustainable lifestyles. In this way, energy considerations are embedded in wider urban planning targets. And on the other hand, urban planning – at its best – is not seen merely as physical infrastructure planning. It is also about a redistribution of power, where conventional ways of infrastructure development are challenged, new networks among diverse players are forged, and new solutions are sought for via experimentation. On the other hand, in such a diverse ‘smart city’ context, energy and resource conservation may have to compete with other agendas, such as the development of new technology and commercial services. In this sense, Smart Kalasatama is typical of other such developments, with the same strengths and weaknesses. For example, there might be a need for more assessment of whether ‘smart’ solutions – or in general new technical solutions – deliver the promised environmental benefits.

An important policy implication is that local governments are close to citizens and can influence many of the conditions for energy saving and sustainable consumption. However, local governments might lack the resources and also the power to innovate, to evaluate projects and in particular, to scale up innovative practices. Because of this, central governments and the EU might offer more funding for such innovative projects, but also require more and better evaluation and diffusion.

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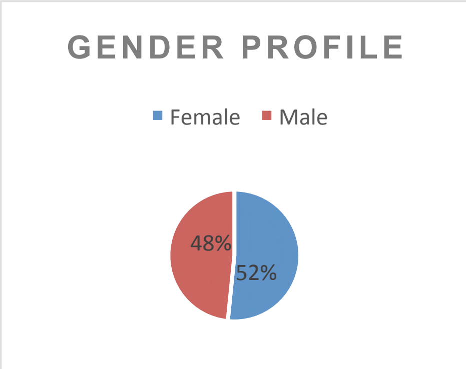
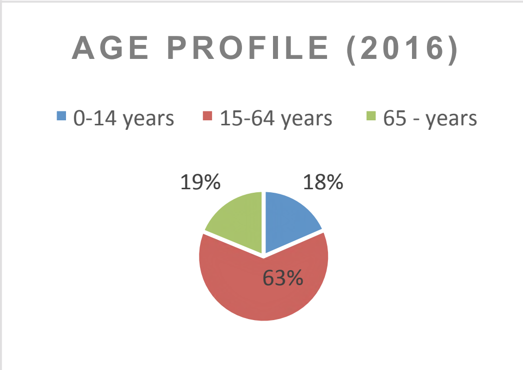
FRANCE

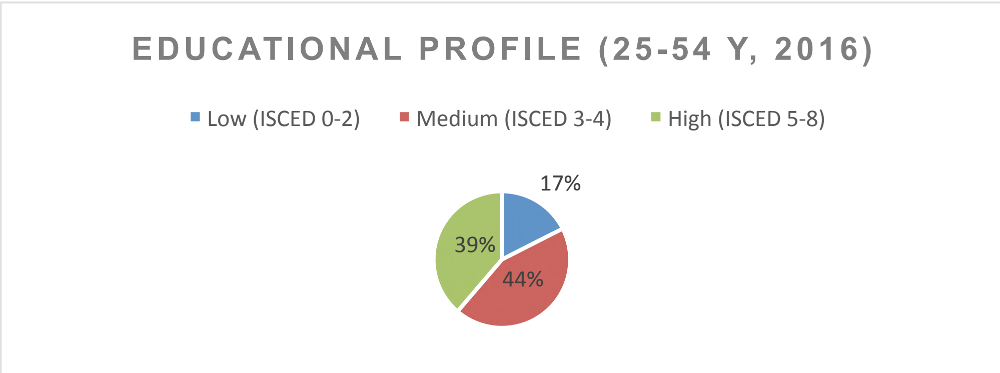
Authors: Laure Dobigny, Camille Gomes, Tomislav Tkalec, Lidija Živčič

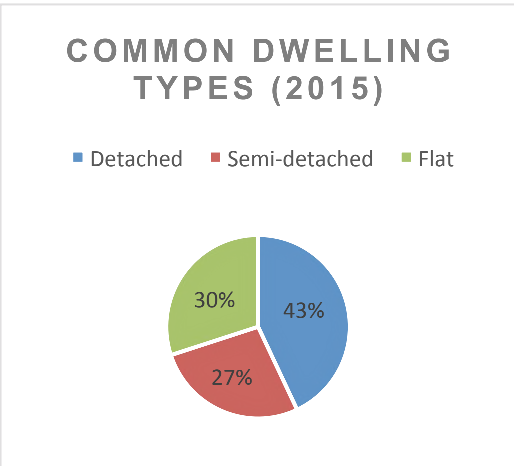
DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY

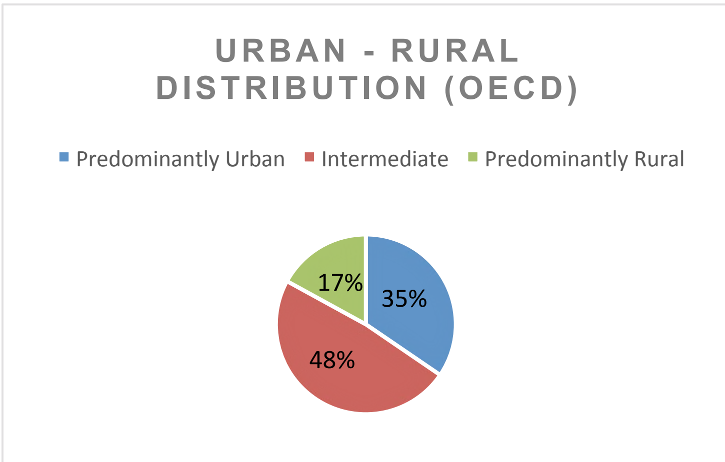


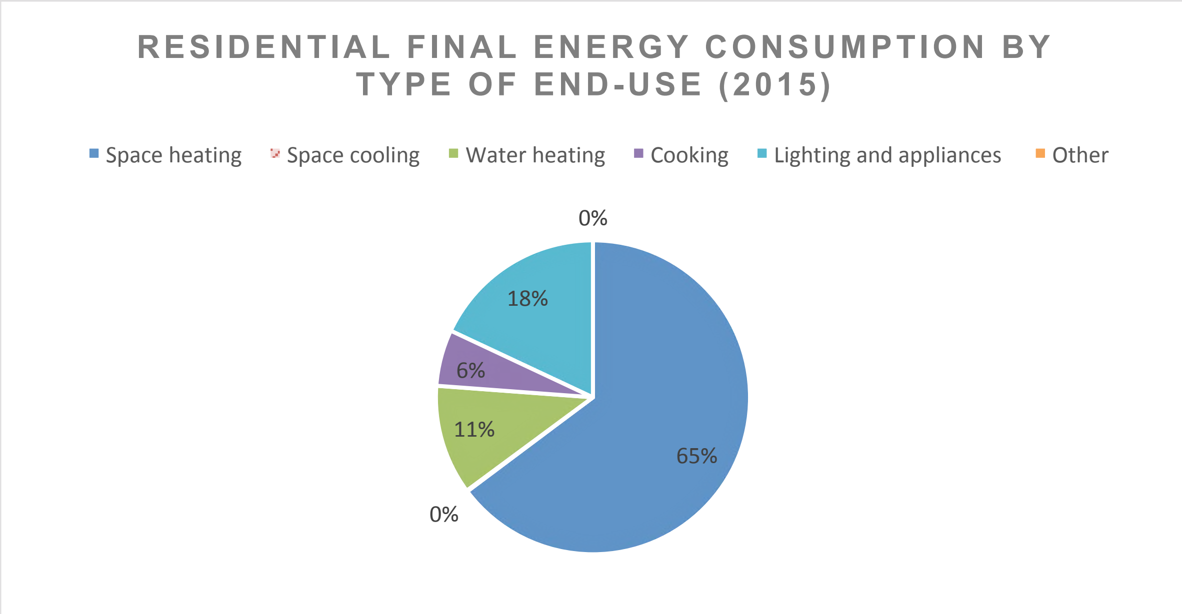


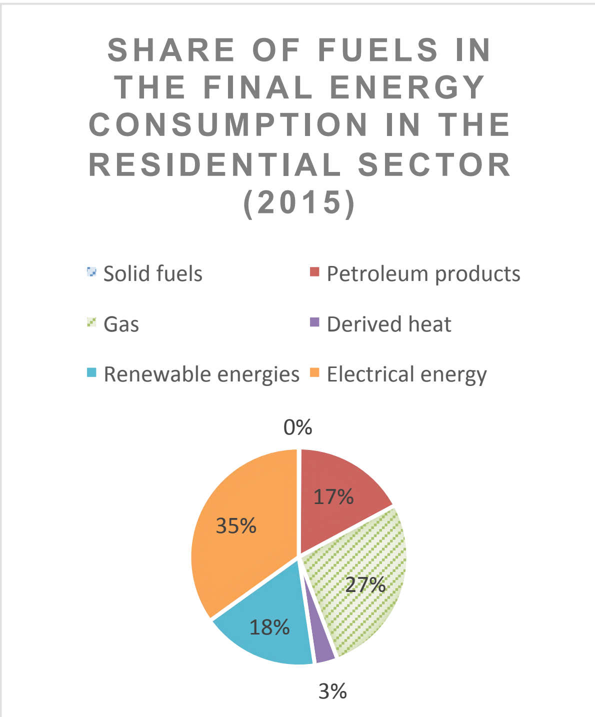
CLIMATE: generally cool winters and mild summers, but mild winters and hot summers along the Mediterranean; occasional strong, cold, dry, north-to-northwesterly wind known as mistral

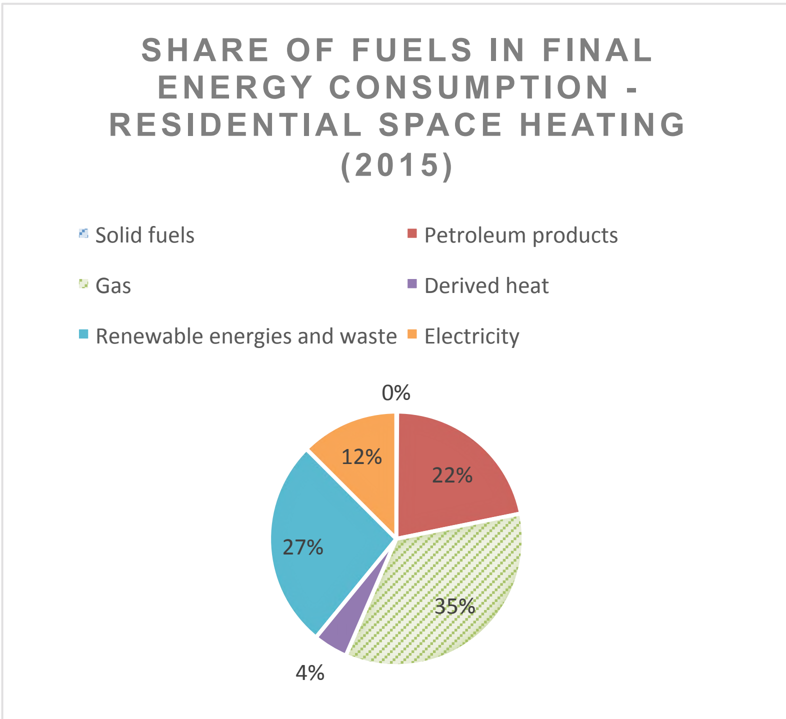












FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

6.574 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

French electricity production and distribution were originally developed and led by local actors (municipalities, group of local stakeholders, businesses or farmers, cooperatives, etc.). After the Second World War, there has been the nationalisation of energy production and distribution (electricity and gas) under the nationalisation Law of April 8th 1946. Only companies who decided to keep their independence in 1946 have the right to produce and distribute energy, since 1946 until today. 158 local companies of energy distribution still exist today (in which all or a majority of the capital is publicly owned), but they distribute only 5% of electricity in France. The monopoly of energy production is led by two national companies (one originally): Electricity of France (EDF) and Gas of France (GDF). Nevertheless, the Law of February 10, 2000 (according to the liberalisation of energy decided in the EU in 1996) allows municipalities or company to produce, sell and distribute energy. In fact, a new company or municipalities can only produce and / or sell energy. While the energy grids are owned by municipalities, the creation of a new company for energy distribution isn't possible. So, since 2000 the energy sector is liberalised (for energy production and sale) but the monopoly of state companies is still high. The gas and electricity distribution is always a state monopoly; nevertheless the implementation of new local grids like district heating (with biomass or methane energy) led by public or private actors is possible. The French energy system is a poly-centralised system (mostly large energy production units, like nuclear plants or hydroelectric plants) and characterised by a large nuclear production (almost 77% of electricity production). EDF generation capacity is higher than the needs in the country, so France is exporting a lot of electricity to neighbouring countries. EDF was partly privatized in 2004, but the French state still possesses 85% of the capital.

Sources: Laure DOBIGNY, 2016. “Quand l’énergie change de mains. Socio-anthropologie de l’autonomie énergétique locale au moyen d’énergies renouvelables en Allemagne, Autriche et France”, Thèse de doctorat de sociologie, Université Paris 1 Panthéon-Sorbonne.

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Particular socio-material aspects that influence energy consumption

The state monopoly in the energy sector, the centralisation, and the large nuclear programme developed in the mid 20th century have a great influence on energy practices and representations in France. Due to the large nuclear production, the consumption of primary electricity represents 42.50% in France and is frequently used for heating space and water, cooking, final electricity, etc. Because of over capacity of generation units, the French government encouraged end consumers to heat their home and businesses with individual electricity heaters.

Energy bills are always individualised (heating and electricity, but in some case electricity could be the only energy provides at home). Due to the share of electricity heating, and the bad efficiency of this energy to provide heating, combined with low energy efficient buildings (insufficient insulation), energy poverty is a real concern in France.

Source: http://www.statistiques.developpement-durable.gouv.fr/fileadmin/user_upload/Datalab-13-CC-de_l-energie-edition-2016-fevrier2017.pdf

Current Trends in Energy Policy

Despite the announcements of previous and current government, the share of nuclear in the French energy production hasn't diminished, and not one nuclear plant has been closed. And while there is development of renewable energies, its share in the final consumption is only 9%. Energy policy promotes efficiency: since the thermal regulation 2012, all new buildings must be an efficient building ("Bâtiment Basse Consommation d'énergie" (BBC) label). French energy policy also promotes energy refurbishment, with financial aids and incentives for owners (like RE feed-in tariffs, tax credit, etc.), or regulations and legal obligations to renovate social housing buildings, for example. The French energy policy and vision stay centralised and systemic with adoption of legal regulations in favour of refurbishment, energy efficiency and efficient buildings, the development of large RE plants in some areas (and not small, local and decentralised plants), and smart energy system to regulate energy consumption (e.g. electric peak demand, due to a large use of electric heating).

Source: http://www.statistiques.developpement-durable.gouv.fr/fileadmin/documents/Produits_editoriaux/Publications/Datalab/2017/Datalab-8-CC-des-energies-renouvelables-edition-2016-fevrier2017.pdf

Trends in national campaigns

National campaigns reflect current energy policy and mainly focus on energy efficiency: efficient appliances (like led bulbs, efficient gas boiler, etc.), refurbishment (promotes by financial aids, tax credit, etc.) and individual "eco-actions". To a lesser degree, RE plants for households are also promoted (help by tax credit and financial aids). National campaigns are mainly led by the French Environment and Energy Management Agency (ADEME).

Source: ADEME : http://www.ademe.fr

OVERVIEW OF NATIONAL SECIS

Below please find a list of French SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). *The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country.*

POWERHOUSE NEARLY ZERO CHALLENGE (POWER HOUSE NZC)	Changes in Technology
ACHIEVE	Changes in Individuals' Behaviour
TicElec « Technologies de l'information pour une consommation électrique responsable ».	Changes in Individuals' Behaviour
Thermo'Kit	Changes in Individuals' Behaviour
Smart-up project	Changes in Individuals' Behaviour
Ideas Laboratory	Changes in Individuals' Behaviour
Au bon logement	Changes in Individuals' Behaviour
Ma maison pour agir	Changes in Technology
CONSOTAB	Changes in Individuals' Behaviour
participatory workshops in Pyrenees Orientales	Changes in Individuals' Behaviour
SLIME (Service Local d'Intervention pour la Maîtrise de l'Energie) du département du Lot	Changes in Individuals' Behaviour
ClimaKit	Changes in Individuals' Behaviour
Pacte énergie solidarité	Changes in Technology

Energy solidarity	Changes in Complex Interactions
La Réunion: Awareness-raising in SIDR neighborhoods equipped with solar water heaters	Changes in Individuals' Behaviour
Synergie Habitats	Changes in Technology
The Eco-gestes workshops of the town of Aubervilliers	Changes in Individuals' Behaviour
EMPOWERING, how to better involve citizens in collective efforts to control energy demand	Changes in Individuals' Behaviour
"Réfelxénergie" Project in the Urban Community of Dunkirk	Changes in Technology
Visits to "example houses"	Changes in Technology
Energy Apertifis For Energy Sobriety	Changes in Individuals' Behaviour
Mission Bud-G: a guide to a fun awareness campaign on energy saving	Changes in Individuals' Behaviour
ECO-LOGIS Project: Experment with a participative, collaborative and innovative process	Changes in Individuals' Behaviour
Guide to inform young tenants on the use of energy in their homes	Changes in Individuals' Behaviour
CoachCopro: a web platform to help property co-owners with the process of energy renovation work	Changes in Technology
Famille à energie positive	Changes in Individuals' Behaviour
Appart'éco et Maison'éco	Changes in Individuals' Behaviour
Strengthen the commitment of a group of exemplary citizens	Changes in Complex Interactions

ELIH MED - A EURO-MEDITERRANEAN PROGRAM TO FIGHT ENERGY POVERTY	Changes in Technology
ASSISTING CONDOMINIUMS ENERGY RENOVATION IN FRANCE	Changes in Technology
ENERGY INFORMATION CENTER - MARSEILLE PROVENCE	Changes in Individuals' Behaviour
FINANCIAL AND SUPPORT INSTRUMENTS FOR FUEL POVERTY IN SOCIAL HOUSING IN EUROPE (FINSH) FRANCE, UNITED KINGDOM, GERMANY, ITALY, POLAND	Changes in Individuals' Behaviour
positive energy operation 54-unit pilot project in Brétigny-sur-Orge	Changes in Individuals' Behaviour
Chanteloup-en-Brie (77): A pilot operation of 35 houses in wood and hemp	Changes in Complex Interactions
Workshop to raise awareness of energy saving among public in precarious energy	Changes in Individuals' Behaviour
TRIME	Changes in Individuals' Behaviour
SMARTER TOGETHER	Changes in Complex Interactions
STEP_BY_STEP	Changes in Individuals' Behaviour
Creating liveable neighbourhoods while lowering transport energy consumption (PRO.MOTION)	Changes in Individuals' Behaviour
Energy, Education, Governance and Schools. A European school panel for involving local communities in energy efficiency programs (EGS)	Changes in Complex Interactions
TRIBE : TRaIning Behaviours towards Energy efficiency: Play it!	Changes in Individuals' Behaviour
TOPTEN ACT : Enabling consumer action towards top energy-efficient products	Changes in Individuals' Behaviour
Rescoop	Changes in Technology

Boosting efficiency in electricity use in 8 European regions (EL-EFF REGION)	Changes in Individuals' Behaviour
Persuasive force of children through education (FEEDU)	Changes in Individuals' Behaviour
Eco n' Home or how to reduce energy consumption in Household (ECO N' HOME)	Changes in Individuals' Behaviour
European Network of Information Centres promoting Energy Sustainability and CO2 reduction among local COMmunities (ENESCOM)	Changes in Individuals' Behaviour
European Solar Days II (ESD II)	Changes in Technology
FRESH	Changes in Technology
Promotion of energy efficient appliances (PROMOTION 3E)	Changes in Individuals' Behaviour
SAVE@Work4Homes - Supporting European Housing Tenants in Optimising Resource Consumption (SAVE@WORK4HOMES)	Changes in Individuals' Behaviour
SPIRIT - Energising Faith Communities (SPIRIT)	Changes in Individuals' Behaviour
Evaluation of Energy Behavioural Change Programmes (BEHAVE)	Changes in Individuals' Behaviour
Integration of Active Learning and Energy Monitoring with School Curriculum (ACTIVE LEARNING)	Changes in Individuals' Behaviour
Residential Monitoring to Decrease Energy Use and Carbon Emissions in Europe (REMODECE)	Changes in Individuals' Behaviour
The Energy Path: an e-learning platform for education of the new generations in the sustainable energy field (ENERGY PATH)	Changes in Individuals' Behaviour
European fuel Poverty and Energy Efficiency (EPEE)	Changes in Technology
EPORE - Energy Poverty Reduction in Eastern Europe	Changes in Individuals' Behaviour
Loos Rehab	Changes in Individuals' Behaviour

‘GOOD PRACTICE’ EXAMPLE OF FRENCH SECI

SMARTER TOGETHER
Smart and Inclusive Solutions for a Better Life in Urban Districts

Introduction

The European lighthouse cities Vienna, Munich and Lyon, the follower cities Santiago de Compostela, Sofia and Venice, and the observer cities Kiev and Yokohama come together to improve citizens’ quality of life. The project is preparing ground for large-scale replication and ensures an in-depth knowledge transfer about setting up of smart city business models and user-centric innovation in order to contribute to positive societal dynamics.

Brief Description

SMARTER TOGETHER’s overarching vision is to find the right balance between smart technologies and organisational/governance dimensions in order to deliver smart and inclusive solutions and to improve citizens’ quality of life. It is focusing on citizens & stakeholder engagement, data management platform & smart services, electric-renewable energy sources, holistic refurbishment projects, and e-mobility projects.

Contextualization

Sustainable development builds on people in integrated, inclusive societies that develop in partnership and foster dialogue among all parties – being ‘smarter together’. It equally builds on modern technologies and constant innovation as key ingredients at the service of people, societal development and economic transformation.

Sharing these fundamental values and philosophy, SMARTER TOGETHER is a joint project that aims to improve citizen’s quality of life in nowadays transforming cities. The project will focus on finding the right balance between ICT technologies, citizen engagement and institutional governance to deliver smart and inclusive solutions.

Aims and objectives

The initiative will deepen the knowledge and know-how in the fields of data management, eco-refurbishment and e-mobility through large-scale demonstration activities, user-centric innovation and sustainable smart city business models. Research and business stakeholders will benefit from the in-depth transfer of the results, which will prepare the ground for a large-scale replication of successful solutions in other cities, contributing to positive societal dynamics in European countries and beyond.

Large-scale replication will be prepared; 1) in the Lighthouse cities; 2) the Follower cities, which already selected their target area; 3) A Club of 15-20 cities, associate to intensify its roll-out, ensuring a broad geographical and climate coverage. Commercial exploitation is enhanced by the development of new business models for widespread use by the stakeholders. Contributions to open data are expected to create business opportunities as well as inputs to standardization work.

Methods for intervention

Together, Lyon, Munich and Vienna aim to adopt a pioneering role for many critical issues relating to the future of cities – by implementing urban labs as testing grounds to think about how technological innovation should be managed for the benefit of the citizen and with the citizens. Six neighbourhoods in different European countries will experiment with innovative smart city components, including co-creation processes and high-quality refurbishment measures to explore new ways of adding value in urban societies.

The initiative strives to:

- demonstrate large-scale smart city solutions in six districts under various urban and governance conditions covering the European diversity

- develop new business models to turn the demonstration activities into economically sustainable and replicable solutions for other cities

- foster user-centric innovation by involving even more people and stakeholders in the co-creation and design of new services and solutions

- experiment with low energy districts providing energy-efficient buildings with local renewable heat and electricity

integrate existing data networks into citizen-oriented open data platforms to deliver new services to locals

implement new e-mobility solutions for local citizens and companies.

Steps of implementation

Munich, Lyon and Vienna (the three lighthouse cities) will implement the main demonstration activities in specific districts, monitor the results and up-scale solutions at city level. Santiago de Compostela, Sofia and Venice (the three follower cities) will replicate the key findings from lighthouse cities in targeted areas, implementing them in different urban and institutional environments. Kiev and Yokohama (the observer cities) will increase the outreach of the project whilst bringing in the perspective of cities from East Europe and Asia.

Results/outcomes

Expected results are: 1) >143,067 m2 of refurbished housing estate with an energy and CO2 reduction of 50%; 2) 17.2 MW of newly installed renewable capacity in the districts; 3) 15 new e-mobility solutions for saving 95,5 T/year of CO2; 4) 1,500 newly created jobs, 130 M€ investments, all deployed with support of integrated ICT solutions and in dialogue with the inhabitants.

The role of the households

Households are included in different phases and activities of the initiative. They are included in co-creation and design of new services and solutions for better living in the cities, in projects of energy refurbishment of multi-apartment buildings, in providing input in the phase of development and testing of citizen-oriented open data platforms to deliver new services to locals in the cities, and in project of implementation of new e-mobility solutions for local citizens.

Location

SMARTER TOGETHER gathers the European Lighthouse cities Lyon, Munich, Vienna, the Follower cities Santiago de Compostela, Sofia, Venice and Kyiv and Yokohama as observer cities bringing the perspective of East Europe and Asia.

The physical/technological aspects of the initiative

SMARTER TOGETHER is demonstrating how the European 2020 targets on energy and climate protection can be achieved in an integrated way in three urban districts with specific contexts, by using modern technologies, on one hand, and fostering cross-sectoral governance approaches and learning, on the other.

The initiative includes various aspects: data management, eco-refurbishment, e-mobility, large-scale demonstration activities, and sustainable smart city business models.

Shared understandings related to initiative:

Cities included in the project are complemented by business partners from energy, mobility and ICT sectors, leading European research and academia organizations, and the European city network. From the various combinations of the different selected Light House areas, multiples opportunities to learn are offered.

Source: https://www.smarter-together.eu/

CONCLUDING REMARKS AND POLICY IMPLICATIONS

The French energy system is characterised by a large share of nuclear electricity production, which, in spite of governmental announcements about reducing it, remains the core of national energy policy. Apart from that, the energy policy promotes renewables and energy efficiency through a variety of measures, such as standards for efficient building, energy refurbishment with financial aid and incentives for owners, legal obligations to renovate social housing buildings, development of large RES production and smart energy system to regulate energy consumption. These measures are to a good degree reflected in the identified SECIs. Many of the identified SECI target building refurbishment, especially with a focus on social housing and energy poor households, while there are also plenty of SECIs promoting energy efficient and nearly zero energy buildings. The refurbishment programs can be general (e.g. platform on energy renovation) or focused, for example thermal renovation programs. The energy efficient buildings are mainly promoted through sample houses, which can be visited. One visible characteristic of SECIs is targeting energy poor households, as many of them work with such households in variety of manners, from working towards energy retrofits, to providing home audits, energy advising, awareness raising, understanding of energy and heating bills, participatory workshops on energy saving, providing financial support and other support measures. One SECI is even working towards improving the situation of energy poor households through smart metering. The later, smart metering, is also a focus of several SECIs, from studying smart metering's impacts on energy consumption to providing kits for monitoring real-time consumption. There are also several, although not plentiful, SECIs focused on renewables. They offer general awareness raising on renewables, but also offer specific measures, such as installing solar water heating systems or showing renewables potential along with the weather forecast. One of the SECIs focuses on renewables cooperatives.

There are many SECIs dealing with awareness raising on energy efficiency, such as energy measurement kit provision, provision of advice and tips, booklets and guides, family challenges for reducing energy use, energy information centres, energy certificates, e-learning platforms and education in schools, through which also the wider community is reached. Mobility SECIs are rare, only two of the identified SECIs are working on sustainable mobility issues. There is some attention paid in SECIs to the socio-demographic specifics of energy use. For example, as due to the large nuclear production, electricity is frequently used for heating space and water, cooking, etc., so several SECIs address specifically electricity consumption and use of smart metering to manage peak demand. Also energy poverty, which is an outstanding issue in France due to high share of electricity heating and low energy efficiency of buildings, is visibly addressed by the identified SECIs.

The majority of the identified SECIs focus on changes in individual behaviour (41 of them), while changes in technology (13 SECIs) and changes in complex interactions (5 SECIs) are less represented. Many SECIs work at a cross-national level, the national level actions are rather rare (only 5 of the SECIs), but then there are more activities focused on local and regional level.

The highlighted SECI is focusing on setting up of smart city business models and user-centric innovation. It aims to find the right balance between smart technologies and organisational/governance dimensions in order to deliver smart and inclusive solutions and to improve citizens' quality of life. It tries to deepen the knowledge and know-how in the fields of data management, eco-refurbishment and e-mobility through large-scale demonstration activities, user-centric innovation and sustainable smart city business models. The important lesson from the initiative is the looking for the right balance between smart technologies and organisational/governance dimensions, which is something that is generally not linked (technology experts tend to focus on technology, while organisational aspects tend to be ignored, or vice versa). This is a relevant input for policy making, as linking the processes of introducing new technologies and governance of those attempts is of utmost relevance.

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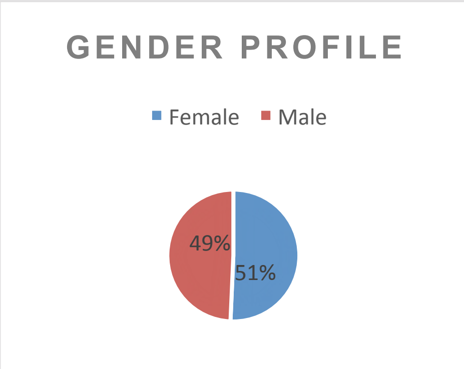
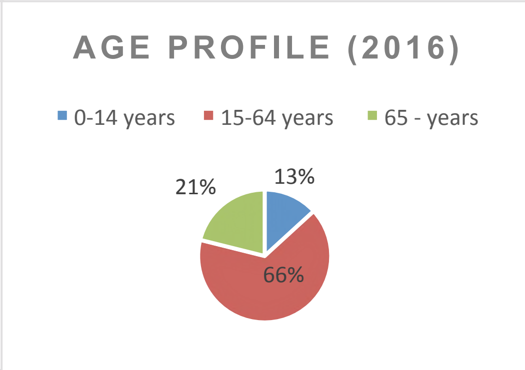
For references, please see individual sections.

GERMANY

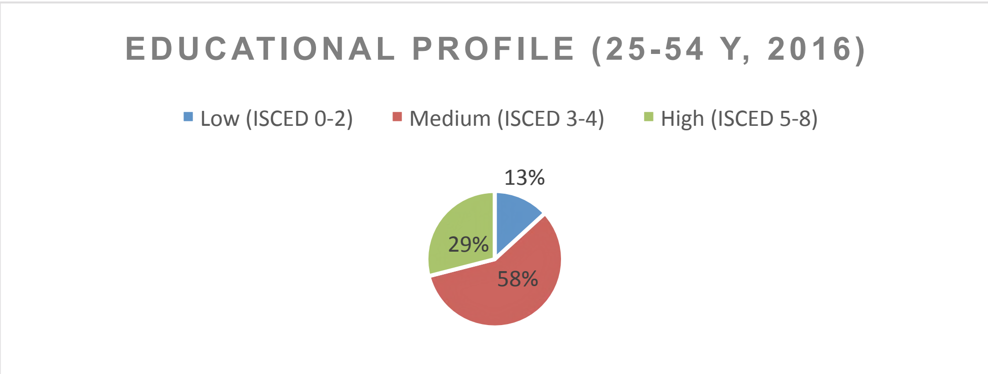
Authors: Eoin Grealis, Annika Musch, Henrike Rau

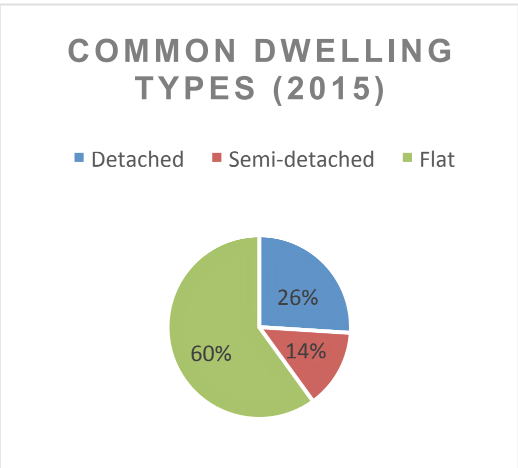
DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY

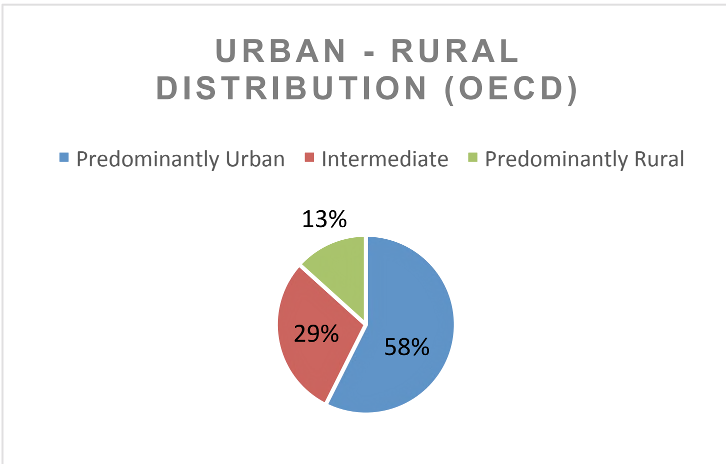


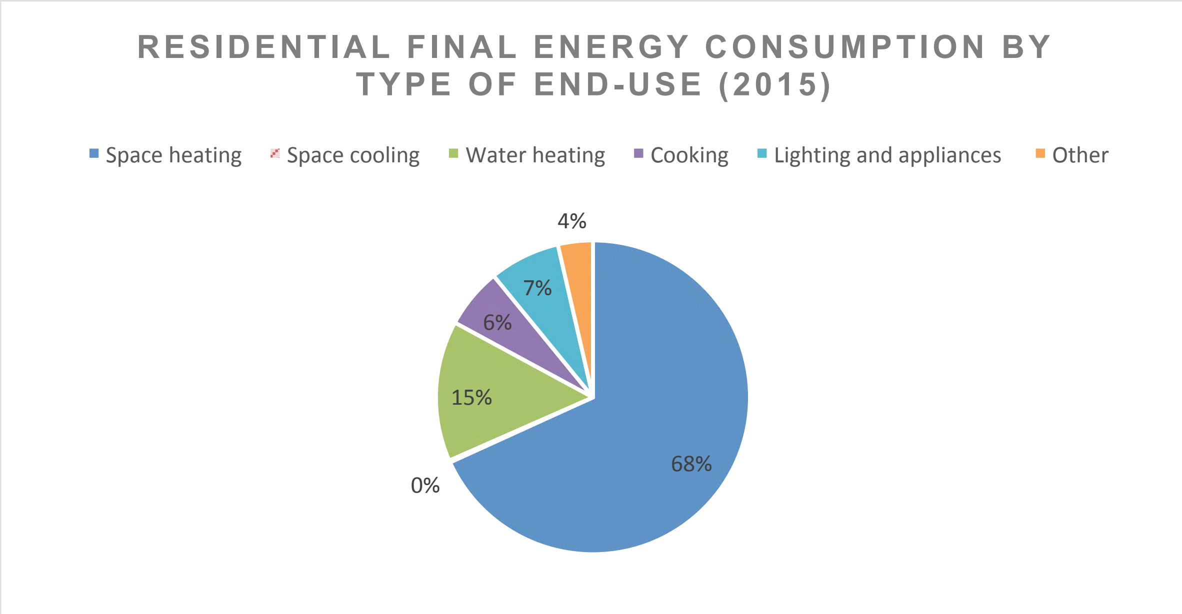


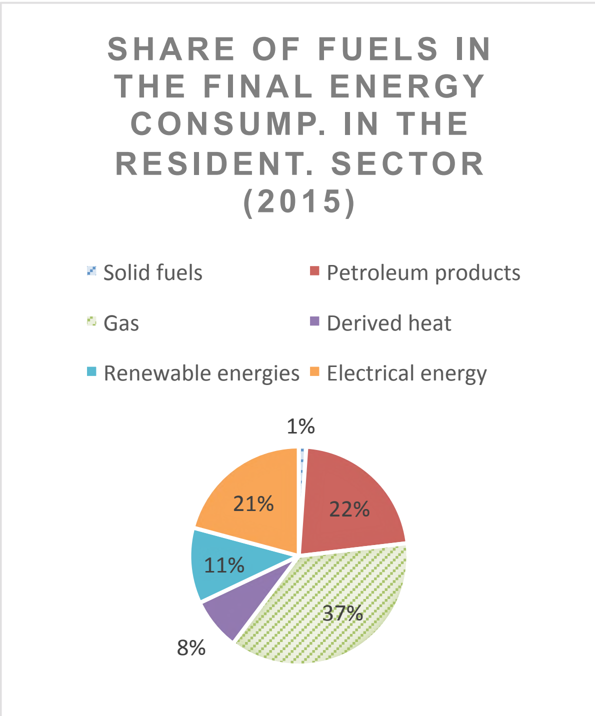
CLIMATE: temperate and marine; cool, cloudy, wet winters and summers; occasional warm wind

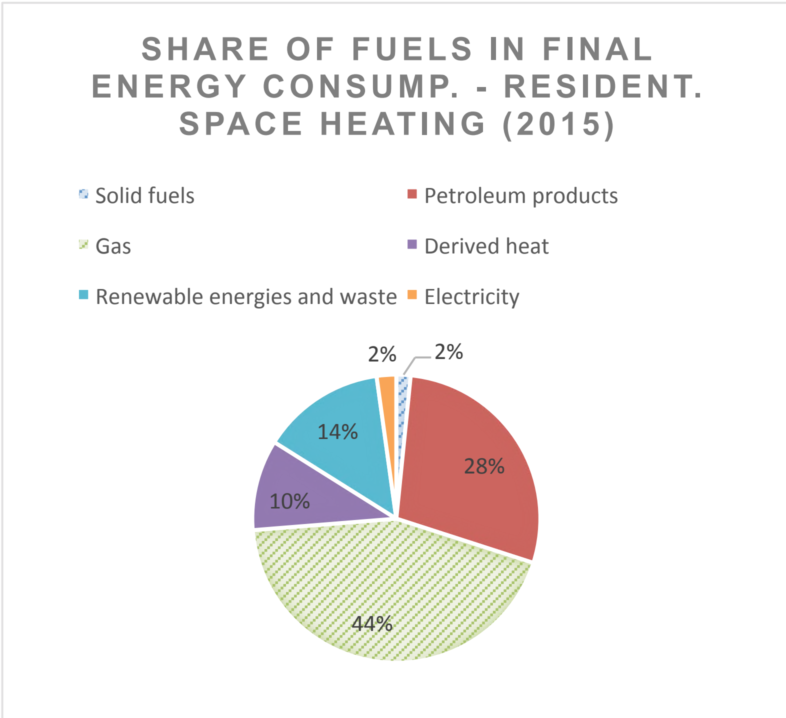












FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

7.570 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

There are four private transmission systems operators (TSOs) in Germany operating in non-contiguous areas namely; 50Hertz Transmission GmbH, Amprion GmbH (RWE), Tennet TSO GmbH and TransnetBW. There is also a separate electricity system for the rail network. In recent years, various sections of the network were compulsorily sold in order to comply with EU competition policy designed to ensure that the network operators did not hold conflicts of interest with their generation subsidiaries (European Parliament 2017).

Particular socio-material aspects that influence energy consumption

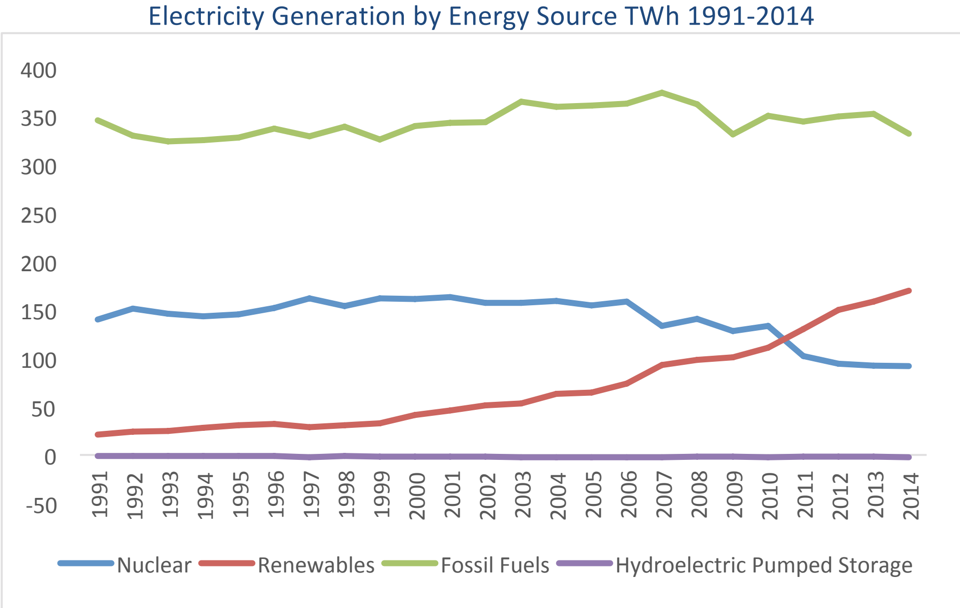
With its origins in the anti-nuclear protest movements of the 1970s, climate protection remains a high priority issue for the German people. There is a high level of social consciousness (at least publically) relating to environmental issues and pro-environmental values are seen as important and/or an admirable trait. There are, however, other aspects of German culture and/or norms that objectively may in conflict with those values but are perhaps seen as the basics/essentials or "the norm" and are less palatable for discussion or negotiation. In particular, there is a strong mobility culture within Germany with above average levels of car ownership and the presence of a historically influential auto-manufacturing industry lobby. The holiday culture is also quite strong in Germany with foreign travel and more broadly being widely travelled seen as a normal and highly desirable pursuit with Germany ranking 3rd in terms of outbound tourism expenditure (both in total figures and on a per capita basis) and 2nd in total number of international departures globally in 2015 (UNWTO 2016). There are also high levels of house proudness in Germany with high levels of investment from both a financial and time perspective dedicated to making a house into a home. Another area of note is the organics industry. The organic or "BIO" sector in Germany is very popular with consumers with a high levels of organic penetration in the market (International Federation of Organic Agriculture Movements 2016), however the consumption of meat and in particular pork has a strong cultural tradition in the south of Germany in Bavaria in particular.

In terms of electricity consumption Germany ranks 6th out of the EU 28 in terms of per capita consumption of electricity with the International Energy Agency reporting an average consumption of just over 7,000 Kwh per annum in 2014 (IEA 2014).

Current Trends in Energy Policy

Historically Germany's energy supply mix was primarily dependent on domestically mined coal reaching a peak in the mid-1950s (Storchmann 2005). In 1950 coal accounted for almost 90% of Germany's primary energy consumption (Renn and Marshall 2016). Since that time Germany energy policy oversaw the rise of nuclear power in the 1960s; the brief resurgence of coal during the oil crisis of the 1970s, the fall in public confidence and trust in nuclear power (post Chernobyl in 1986 and Fukushima in 2011 (Rehner and McCauley 2016) and the commitment to the *Energiewende,* the energy transition (Joas et al. 2016). Despite these dramatic shifts and a steady decline in domestic production, coal still accounts for the greatest source of energy production in Germany today and considerable challenges lay ahead for the successful implementation of the recently affirmed “Klimaschutzplan 2050” which confirms Germany’s commitment to reduce greenhouse gas emissions to between 80-95% of their 1990 levels by phasing out the majority of fossil fuel use by 2050 (Federal Ministry for the Environment Nature Conservation Building and Nuclear Safety 2016a).

Germany’s energy policy has experienced significant change over the last 20 years and has become increasingly influenced (at least outwardly) by domestic environmental objectives and broader international commitments to combating climate change. Recent policy changes have been predominantly preoccupied with achieving the aims of the *Energiewende* (Hake et al. 2015), however the decision to expedite the decommissioning all nuclear power plants by 2022 following the Fukushima disaster in 2011 has had a significant impact on Germany’s long term goal of reducing emissions to between 90-95% of 1990 levels by 2050 with the shortfall being accounted for (at least in the short-medium turn) with an increase in the use of coal for electricity production (Renn and Marshall 2016).



(Source:Energy Information Administration 2016).

National and EU policies such as renewable energy feed-in-tariffs and priority grid access have resulted in the level of installed renewable generation capacity increasing significantly since the late 1990s. However, while the general level of public acceptance and support for the *Energiewende* and wider sustainability issues could be regarded as quite high relative to other countries the abandonment of nuclear energy and the subsequent consequences for both energy prices and fossil fuel use has presented a number of significant challenges as environmental policy becomes increasingly political (Pegels and Lütkenhorst 2014, Joas et al. 2016).

In 2014 the German government, responding to increasing public resistance to the implementation of local energy transition projects and the required upgrading and expansion of the electricity grid, agreed to slow down the expansion of renewable energy projects and limit further expansion to “development corridors” as well as revising the aims of the Renewable Energy Act (Bundesministerium für Wirtschaft und Energie 2014). While the primary focus had up to this point been on the accelerated decarbonisation of energy used to create electricity, recent developments are beginning to shift attention towards demand side policies (Warren 2014, Sorrell 2015, Kuzemko et al. 2017).

The Climate Action Plan 2050 sets out the primary principles and long term goals of Germany Energy policy (Federal Ministry for the Environment Nature Conservation Building and Nuclear Safety 2016b). The plan provides guidance to achieving the domestic climate targets set out in the Paris Agreement. The energy, buildings, transport, trade and industry, agriculture and forestry sectors have been earmarked for specific strategic action with the following principles outlined in the document:

- Long-term targets: based on the guiding principle of extensive greenhouse gas neutrality in Germany by the middle of the century
- Guiding principles and transformative pathways as a basis for all areas of action by 2050
- Milestones and targets as a framework for all sectors up to 2030
- Strategic measures for every area of action
- Establishment of a learning process which enables the progressive raising of ambition envisaged in the Paris Agreement

In addition, the action plan lays out (among others) the following strategic measures:

- road map towards an almost climate-neutral building stock
- review to be carried out on ways to gradually further develop Germany's tax system with a view to achieving the climate targets for 2050

Trends in national campaigns

To date, national campaign trends have tended to focus on and prioritise technical supply side solutions with the primary future vision for a successful Energiewende reliant on improved technical innovation, improved energy efficiency, passive/carbon positive housing, improved energy transmission and high-tech grid management in order to enable greater proliferation of renewables (Bundesministerium für Wirtschaft und Energie 2018). This trend is also evident, even in those campaigns aimed at changing behaviour with the focus on encourage individuals to make smarter consumer choices in terms of more efficiency lighting, heating and household appliances. Technical efficiency and smart consumption solutions are generally prioritised in such energy saving campaigns with reduction of use strategies less evident.

Smart Systems

Due to the planned phase out of nuclear by 2022, the German government has planned to upgrade the electricity grid substantially over the next few years with over 7,500km of lines to be either optimised, reinforced or newly built in order to ensure that the increased renewable penetration will translate into real emissions savings as power is transmitted from less populated renewable energy sites to the centres of population (Bundesministerium für Wirtschaft und Energie 2017a).

In relation to the concept of Smart cities, in contrast to recent developments in Asia where opportunities exist to build new smart cities from scratch, the focus in Germany lies on integrating smarter technologies in the everyday life of already existing cities (Frankfurter Allgemeine Zeitung 2016). There is evidence to suggest that the concept of Smart cities is gaining momentum in

Germany with major cities such as Berlin (Senate Department for Urban Development and the Environment 2015), Munich (Smarter Together 2017), Mannheim (Grid Innnovation Online 2013), Hamburg (Hamburg Port Authority 2017) implementing smart strategies on various aspects of city life. In May 2017 the Federal Institute for Research on Building, Urban Affairs and Spatial Development released a Smart city charter with the goal of providing normative guidelines for a sustainable digital transformation of municipalities, as well as concrete recommendations for the implementation (Bundesministerium für Umwelt 2017). However, it should be noted that these are merely guidelines on how cities should proceed rather than a prescriptive strategy.

Energy Efficiency/Community
One of the largest current active campaigns by the German government is the “Deutschland macht’s effizient” initiative where energy efficiency is the primary focus (Bundesministerium für Wirtschaft und Energie 2017b). The campaign focuses on providing information and consultations as well as administrating financial incentives in the form of grant aid for households, companies and municipalities who undertake steps to improve their energy efficiency. There are also numerous government aid projects focuses at improving the energy efficiency of the housing stock with the Federal Development Bank, financing the construction and purchase of energy-efficient buildings as well as providing substantial subsidies for energy-related refurbishment (CO2 Online 2017).

OVERVIEW OF NATIONAL SECIS

Below please find a list of German SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). *The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country*.

Hochhaus an der Bugginger Straße 50	Changes in Individuals’ Behaviour
Energieberatung für ALG II-Haushalte	Changes in Individuals’ Behaviour
Bremer Stromsparwette	Changes in Individuals’ Behaviour
Gut zu wissen: Energie sparen in Bayern	Changes in Individuals’ Behaviour
Dämmen lohnt sich	Changes in Technology

Eco TopTen	Changes in Technology
NECKARSULM-AMORBACH Solar	Changes in Technology
European Energy Award	Changes in Individuals' Behaviour
Climate Protection Heidelberg 3 Education: E-Team Project	Changes in Individuals' Behaviour
Interaktive Energiesparratgeber für München	Changes in Individuals' Behaviour
Förderung von Mini-KWK-Anlagen	Changes in Technology
Heizspiegel	Changes in Individuals' Behaviour
Initiative EnergieEffizienz Private Haushalte	Changes in Technology
Zukunft Haus	Changes in Technology
Sanierungshelden	Changes in Individuals' Behaviour
Gut fürs Geld, Gut fürs Klima	Changes in Technology
Heizungs-Check/Pellets-Check	Changes in Technology
Mobicheck	Changes in Individuals' Behaviour
SchoEDL	Changes in Individuals' Behaviour
EiMap	Changes in Complex Interactions

Solar-Checks	Changes in Technology
Bitte lächeln: Fotowettbewerb zu energieffizienten Elektrogeräten	Changes in Everyday Life Situations
Klima sucht Schutz	Changes in Individuals' Behaviour
Holen Sie mehr aus Ihrer Heizung	Changes in Technology
Klimaschutz. In unserer Hand.	Changes in Individuals' Behaviour
Verbraucher aktiv - Klimakompetent heizen	Changes in Everyday Life Situations
Sanieren 60plus	Changes in Everyday Life Situations
Münster packt's!	Changes in Individuals' Behaviour
Energiekarawane gegen den Sanierungsstau	Changes in Technology
Das Saarland voller Energie	Changes in Individuals' Behaviour
COzwo und Co	Changes in Technology
Energiesparmeister (SWM)	Changes in Individuals' Behaviour
Energieeffizienz im Haushalt	Changes in Individuals' Behaviour
Energie und Klimaschutz in Vierkirchen	Changes in Complex Interactions
Das 10.000 Häuser Programm	Changes in Technology

clever heizen!	Changes in Individuals' Behaviour
Grüne Hausnummer	Changes in Complex Interactions
Gut beraten: Energiesparen!	Changes in Technology
Solarenergie auch für ihr Haus? Machen Sie den Solar-Check	Changes in Technology
Hessische Energiesparaktion	Changes in Individuals' Behaviour
Hamburger Energiepartnerschaften	Changes in Everyday Life Situations
Klimaklicker	Changes in Complex Interactions
Avu-Bürgersolaranlage	Changes in Technology
Bielefelder Initiative für Zukunftsenergien und Energieeffizienz	Changes in Technology
Klimatisch Bielefeld	Changes in Complex Interactions
Stromsparcheck für einkommensschwache Haushalte	Changes in Individuals' Behaviour
KlimaAlltag - CO2-arme Lebensstile in der Null-Emissions-Stadt	Changes in Complex Interactions
Klima-Coach	Changes in Individuals' Behaviour
Eigenstromversorgung Hamburg-Barmbek	Changes in Technology
Energiesuffizienz	Changes in Complex Interactions

Deutschland macht's effizient	Changes in Individuals' Behaviour
Various offers of the municipal company Munich Stadtwerke	Changes in Individuals' Behaviour
Energie(spar)ausweis	Changes in Technology
PC game for children from the municipality company Munich	Changes in Individuals' Behaviour
Volltreffer für den Klimaschutz	Changes in Individuals' Behaviour
Energieatlas Bayern	Changes in Individuals' Behaviour
LaVidaVerde	Changes in Complex Interactions
Energiesparberatung incl. Abwrackprämie für alte Kühlschränke	Changes in Individuals' Behaviour
Faktor 10 Sanierungsprogramm	Changes in Technology
Solare Wärme - einen Schritt voraus	Changes in Technology

‘GOOD PRACTICE’ EXAMPLE OF GERMAN SECI

Energiesuffizienz

Brief Description

The project “Energiesuffizienz” (energy sufficiency) was carried out between 2013 and 2016 and was based in an urban environment. The project’s authors defined the term energy sufficiency as a strategy to reduce energy consumption to a sustainable level by three approaches:

a. Quantitative reduction of sizes, features, usage times of devices etc.
b. Substitution of technical equipment in households by e.g. urban services.
c. Adjustment of technical services delivered by appliances to utility needed and desired by users

Aims and objectives

The project listed the following research questions:

1. What is the driving economic, paradigmatic, infrastructural, societal, cultural, gender and political factors and dynamics for the expansion of energy use related needs and how can they be addressed?
2. Which sufficiency strategies exist already?
3. How do energy relevant products, services and infrastructures need to be designed to allow or improve energy sufficiency
4. How can households be involved in this process?
5. What policy measures are necessary?

Methodology

The approach concentrated on three elements: households, appliances as well as urban infrastructure and services in municipalities. A criteria based analysis was conducted that examined action and measurement options for energy sufficiency in the distinct areas of living and building as well as individual barriers and framework conditions that influence/hinder the implementation of energy sufficiency. Based on this theoretical framework empirical studies were carried out which included transdisciplinary methods.

Households represented the core subjects of investigation in the project. In a representative survey of 600 households the research team enquired as to how energy-sufficiency practices are currently perceived and evaluated, what sufficiency practices are already employed and how other sufficiency practices may be accepted in the future. Additionally, there were interviews with several actors at the municipal level to analyse existing measures and approaches to improve energy sufficiency.

The Neighbourhood Labs drew on five local communities of practice (youth group, local co-op, a group of degrowth activists, senior citizens club and a Christian seniors group). The research team then used cultural probes to get to know the participants and their performances of practices also within the group and held co-creation workshops to counter conflicts with handling sufficiency strategies.

Results/outcomes

Through interviews and focus groups, the authors found (among other aspects) that energy sufficiency practices:

- Can be found in numerous households and are already regarded as normal.
- Can be made possible and facilitated with the design of structures, processes and facilities in the household.
- Are not correlated with financial endowment and can be implemented irrespective of incomes.
- Are less acceptable in leisure activities than during core household duties.
- 1/3 of the 600 participants of the questionnaire stated that they could see themselves living in a flat share or in a smaller apartment when they grow older.
- Energy sufficiency can play a large role when it comes to efforts to reduce energy.
- At the municipal level, in the fields of food, consumption and building/living there is a lack of research and measures that link energy sufficiency with climate protection.
- Interviewees noted that they wanted to quickly finish the work in their household even though it is not urgent/necessary (e.g. a half full dishwasher being switched on just for the sake of the work being done, tumble dryer used because the process of drying is done quicker than on a clothesline).
- However, interviewees did partake in energy sufficient practices if these practices were adapted to certain routines or structures (e.g. the non-use of a tumble dryer was seen as more likely if the household possessed an aesthetically pleasing clotheshorse).
- Playing on people environmental consciousness or guilt tripping people into action are not necessarily helpful strategies for promoting sufficiency 'behaviour'.

Through the open innovation workshops, the project design guide also provided detailed and specific ecodesign sufficiency recommendations relating to the ***reduction*** (e.g display and adjustability of cooling temperature, instead of an abstract scale in refrigerators and freezers), ***substitution*** (supporting the change practices and routines towards energy and resource conservation through innovative design of the appliances e.g. washing with low temperatures, measured laundry dosing), and ***adjustment*** of appliances (e.g. equipment should be designed such that functions and features only consume energy, when they are in use).

Was/is the initiative successful?

As this was a research initiative and not a targeted energy saving initiative, any statement on the success or otherwise of the project would be a subjective view of the values of the output. It could be said that further discoveries about the nature and likelihood of the application of energy sufficiency measures in households and the output of the design innovation workshops were successful outputs from the project.

Textual and communicative aspects of initiative

In this project, energy was considered as a consumer product which held very little day to day interest for consumers due (in addition other aspects) to the distance consumers experience from costs and consumption levels on a day to day basis. The focus on energy sufficiency as a key pillar of success when it comes to sustainability goals was a novel aspect and approach to the problem.

The physical/technological aspects of the initiative

Due the nature of the sufficiency project the technological aspects in terms of interventions were negligible for the field test part of the study. However, the open-innovation workshop resulted in the conceptual imagining of appliances where sufficiency was the central goal and which contained significant changes in the technical characteristics of products, conferring greater control in the hands of users to reduce, substitute and adjust energy use based on their own needs.

Shared understandings related to initiative

The project team framed energy as a consumer product that in and of itself held little interest for households in their day to day lives and that energy sufficiency measures should be developed in such a way that consumers become aware of which needs and wishes are important for a high quality of life (and conversely which are not). They also state that sustainability goals will only be successful by combining energy sufficiency with energy efficiency and consistency (extension of existing techniques for using renewable energy).

Contextualisation

The authors argue that the existing policy measures that foster the “Energiewende” (energy transition) in Germany concentrate primarily on improving energy efficiency and that they ignore energy sufficiency strategies to a large extent (European Commission 2008). They note that while energy efficiency in many sectors has been consistently improved, total energy use has remained stable. They further note that efficiency is only one factor of total energy use and point to the fact that the technical characteristics (size, features etc.), use patterns and total number of appliances have a significant bearing on overall energy use. The authors further argue that energy efficiency improvements are being eaten up by higher levels of consumption, and/or rising expectations of comfort (rebound effect). Consequently, the authors argue that as there are technical-economic limits on energy efficiency, energy sufficiency is an important part for designing a long-lasting sustainable energy use and attempt to show that energy sufficiency can have a significant role to play in the energy transition.

This project could not be considered as being framed in traditional policy interventionist styles. However, it does not neatly fit into the practice perspectives categorized by Spurling et al. (2013) either. While it recognizes the role of practices in energy use, the focus on sufficiency inverts the problem on its head. Instead of re-crafting, substitution or changing the relationship of practices to reduce energy use while maintaining similar levels of consumption/improve existing social or economic outcomes the approach attacks the optimization orthodoxy. It could be argued that the project draws on elements of all three of Spurling et al.’s listed practice perspectives but the innovative approach forces us to consider that in fact the project involves more than a re-crafting/substitution/change of interlock of practices but in fact stimulates a revaluation of the goals of the practices themselves in terms of their desirability.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

To date, the majority of SECIs in Germany closely mirror current trends in national policy, with their focus on changing technology and individuals' behaviour. To a large extent national policy concentrates support in the area of technical innovation or efficiency measures and tries to nudge individual behaviour to smarter purchasing decisions and behaviours (e.g. to switch to renewable energy providers, to consume more energy-efficient products, to embrace smarter homes and improve efficiency through retrofitting). The focus remains on smarter or more efficient consumption rather than any re-evaluation of whether or not such consumption is necessary.

In terms of individual or household-level participation, most SECIs address the entire population, due to the sensitive political nature and limited public acceptability of aiming specific initiatives at any particular socio-demographics profiles or target groups. Many SECIs do however attempt to tap into community action through the targeting of cities, regions, villages, or neighbourhoods. There is also significant stratification when it comes to particular targeted areas of energy use/efficiency, with many initiatives targeting one particular aspect of energy use such as retrofitting, information campaigns targeting behaviour, potential analysis, and/or energy saving and emission saving competitions.

The large number of SECIs profiled demonstrates a general commitment to improving environmental awareness and the willingness to contribute to energy saving and climate protection; however, the emphasis on saving (energy and/or money) and other participatory incentives reveals that there is a current expectation that SECIs should provide "added value" for participants. Certain basics/essentials or cultural consumption norms would appear to be less palatable for discussion or negotiation (e.g. addressing car ownership, extensive travel, meat consumption) and are not particularly targeted in SECIs related to energy initiatives.

Significant lessons may be learned from the experiences of the Energiesuffizienz project. Its authors argue that energy efficiency improvements are being eaten up by higher levels of consumption, and/or rising expectations of comfort (rebound effect). They assert that as techno-economic limits on energy efficiency exist, energy sufficiency is an important component in designing a long-lasting sustainable energy use strategy and an essential component of a successful energy transition. Energy was perceived as a consumer product that in and of itself held little interest for households in their day to day lives and that energy sufficiency measures should developed in such a way that consumers become aware of which needs and wishes are important for a high quality of life (and conversely which are not).

While delivering lower unit/per use costs, the current efficiency-focused policy strategies are unlikely to deliver the anticipated reductions in overall energy use. Without complementary sufficiency thinking, households are likely to simply rebound and either enjoy higher levels of energy use and comfort at the same cost or simply increase consumption in other areas. This requires a change both in the way we approach energy reduction strategies and in how we evaluate anticipated or expected outcomes.

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GREECE

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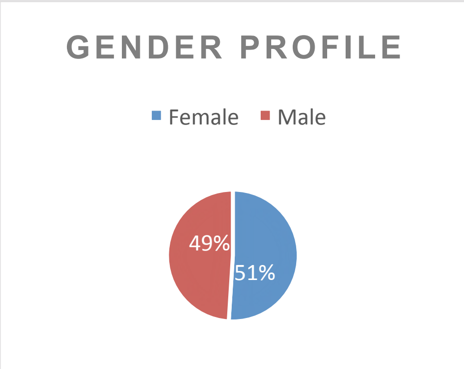
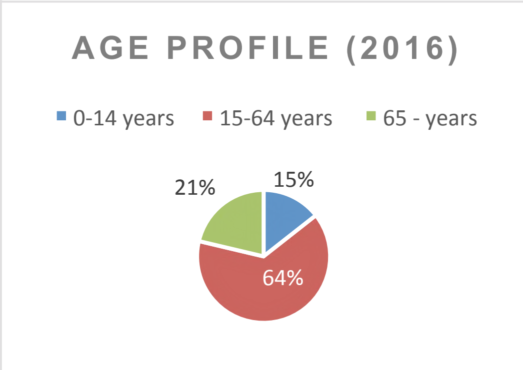
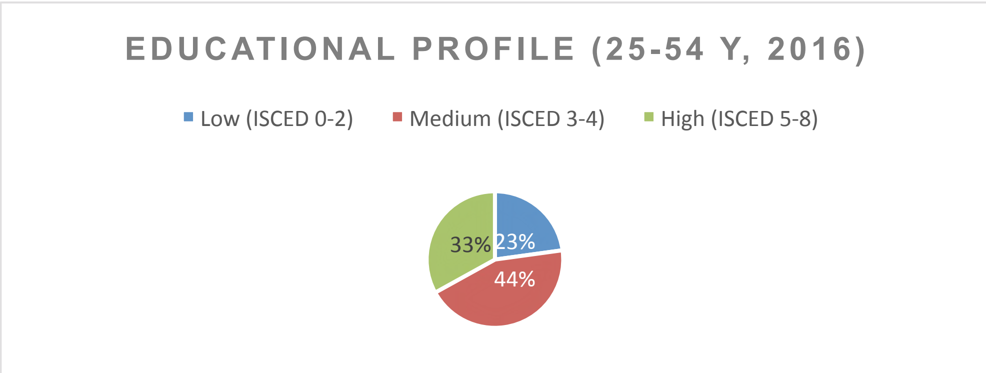
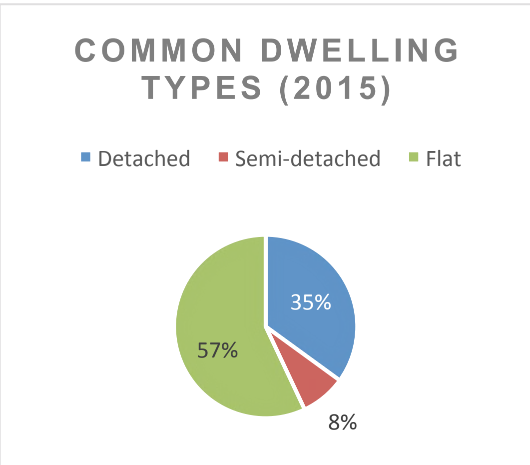
DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY

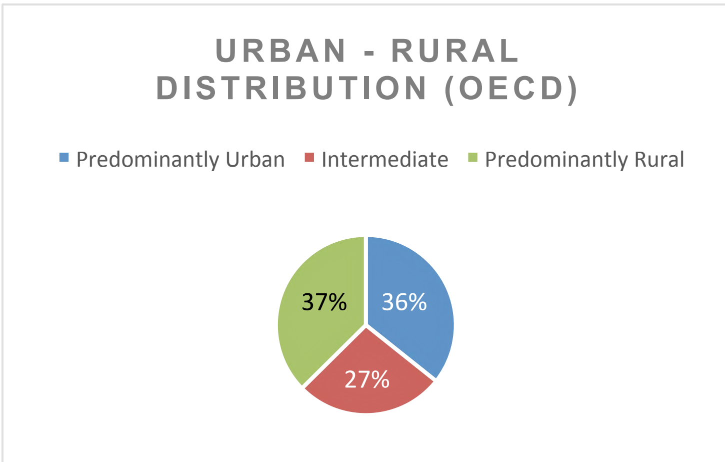


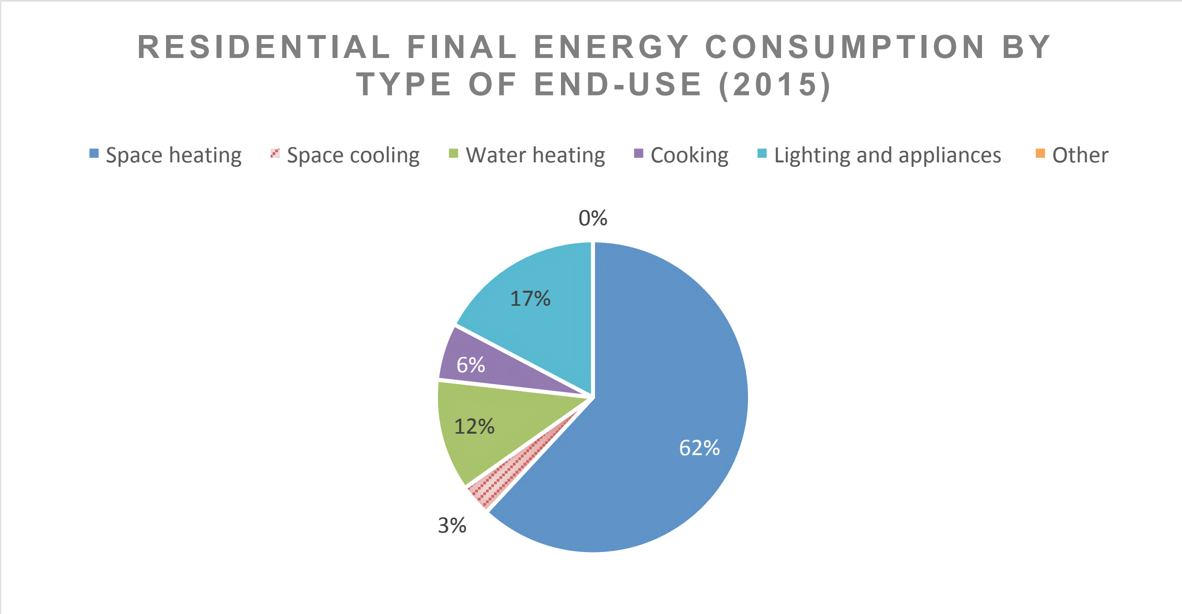


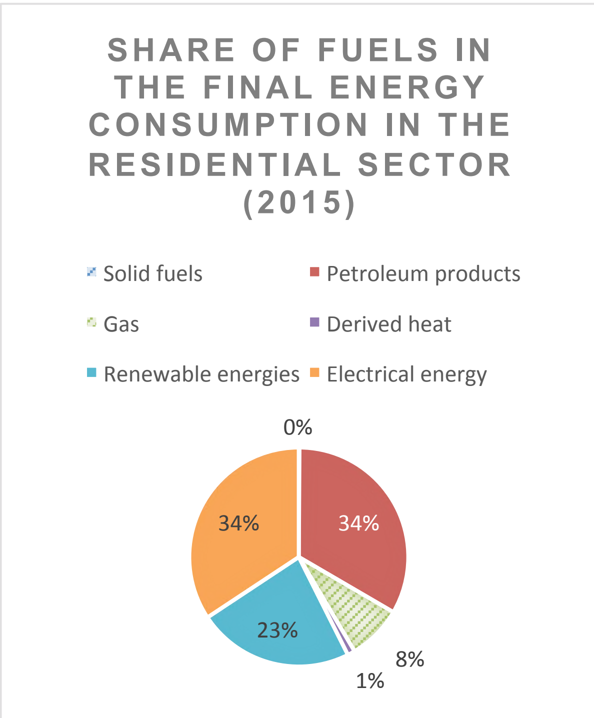
CLIMATE: Temperate, mild and wet winters, hot and dry summers

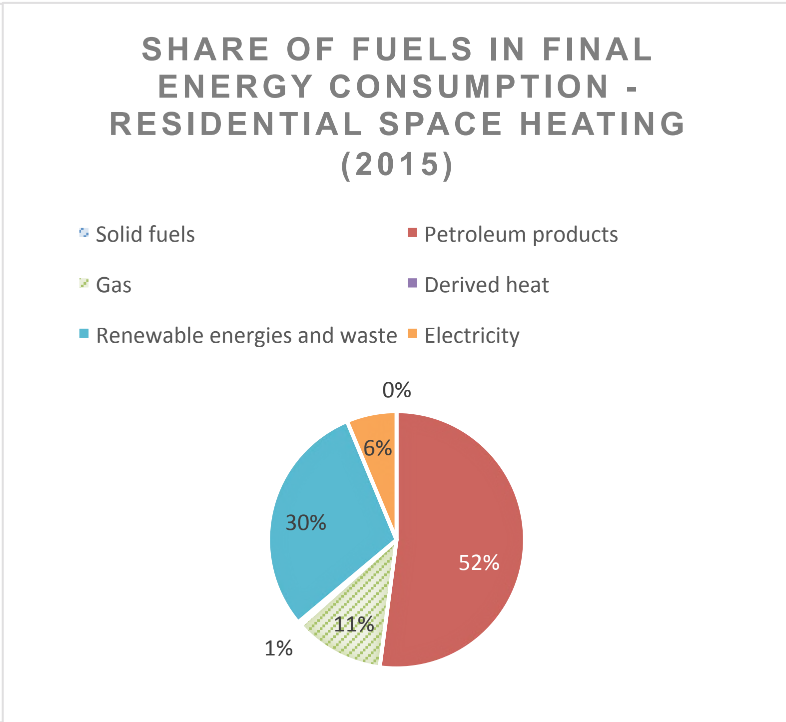












FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

4.730 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

The Greek energy sector is highly dependent on fossil fuels, most of which are imported. Around 60% of Greece's primary energy supply comes from imports, while the remaining 40% are covered through domestic energy sources that include lignite and renewable energy sources (mainly hydro-power, wind, solar energy and biomass).[56]

The main electricity producer and supplier is the Public Power Corporation (PPC). It owns almost 75% of the installed capacity of thermal power plants in the country, including lignite, hydropower, petroleum, gas and renewable energy stations. The PPC has three subsidiaries: i) Independent Power Transmission Operator (IPTO S.A.); ii) Hellenic Electricity Network Distribution Operator (HENDO S.A.); iii) PPC Renewables S.A. The IPTO S.A. is responsible for the management, operation, development and maintenance of the Hellenic Electricity Transmission System. The HENDO S.A. is responsible for the management, development, operation and maintenance of the Hellenic Electricity Distribution Network. The PPC Renewables S.A., in turn, is responsible for the management of the renewable energy sources.[57]

Greece relies entirely on imports for covering its natural gas requirements. The natural gas is distributed to customers through three entry points connected to the country's transportation system: i) Sidirokastro on the Greece-Bulgaria border; ii) Kipoi on the Greece-Turkey border; iii) Agia Triada that is the connection with the neighbouring Revithoussa LNG terminal. The public natural gas supply corporation in Greece is called DEPA. In order to liberalise the gas market, a fully owned subsidiary was created (called DESFA SA) in 2005 to transport natural gas within Greece. There are three regional gas distribution/supply companies that operate on the market called EPAs (EPA Attikis, EPA Thessaloniki, EPA Thessaly). They hold the exclusive right to plan, design, construct, operate and exploit the distribution network in the area they operate in as well as to supply gas to small consumers in the same area. It is important to note that small consumers connected to the distribution grid of a certain EPA cannot switch to alternative gas suppliers.[58]

Particular socio-material aspects that influence energy consumption

Since large part of the Greek building stock has been constructed before the introduction of the Thermal Insulation Regulation in 1979, most of the buildings do not contain any external envelope insulation, which affects the thermal energy performance of buildings and increases energy consumption for heating the space. Poor boiler maintenance also influences the consumption of energy.

Energy price is another factor that influences energy consumption of households. The electricity prices for household end users have increased from 11.81 euro cents per kWh in 2011 to 19.36

[56] Energypedia (2017). *Greece Energy Situation*. Available at: https://energypedia.info/wiki/Greece_Energy_Situation#Energy_Supply
[57] Kastis, S. and Kitsios, V. (2017). *The Energy System of Greece. A Techno-economic and Environmental Approach*. Available at: http://www.diva-portal.org/smash/get/diva2:1088651/FULLTEXT01.pdf
[58] Giamouridis, A. (2009). *Natural Gas in Greece and Albania. Supply and Demand Prospects to 2015.* Oxford Institute for Energy Studies. Available at: https://www.oxfordenergy.org/wpcms/wp-content/uploads/2010/11/NG37-NaturalGasInGreeceAndAlbaniaSupplyandDemandProspectsTo2015-AnastasiosGiamouridis-2010.pdf;
DEPA (Public Gas Supply). Available at: http://www.depa.gr/ ;
Katsivelis, P. S. (2013). *Energy in Greece. Basic Information and Figures*. Rosa Luxemburg Stiftung Brussels and Athens. Available at: https://rosalux.gr/sites/default/files/report_katsivelis_rozalux_0.pdf

euro cents for kWh in 2017. The increasing electricity prices in combination with the constantly rising oil prices and taxes for oil space heating, along with decreasing income levels of households, had led to reduced energy consumption.[59]

As part of an EU funded project called the PEPESEC (Partnership Energy Planning as a tool for realising European Sustainable Energy Communities) a research on energy consumption behaviour of citizens in the Municipality of Amaroussion was conducted. The main findings of the research showed that most citizens of Amaroussion are not informed about environmental and energy saving issues, which reflects on their energy consumption habits: i) most of the citizens are not aware of the energy classes (A+, A++, etc.) and do not consider them when buying new appliances; ii) citizens very often leave doors open when air conditioning is on or leave lights turned on in empty rooms; iii) most citizens do not fully load the washing machine. The results of a questionnaire among citizens of Amaroussion showed that they have a positive attitude towards applying energy conservation in their everyday routine, but the lack of adequate information and the high cost of related technologies are seen as main barriers in this regard. According to citizens, education of children at school as well as implementation of pilot projects in the field of energy efficiency could help increase awareness on local level and move towards greener energy habits of population.[60]

Current Trends in Energy Policy

The main objective of the Greek national energy policy is to ensure and manage energy resources in a way that secures uninterrupted, reliable and affordable energy supply for all users. It also aims to secure energy stocks through alliances and alternative energy sources.

The country has set a national target of 20% renewable energy sources share in gross final energy consumption by 2020 (which exceeds the national target of 18% set by the EU Directive from 2009). The overall target is to be achieved through a combination of measures in the fields of electricity production, heat supply and transport sector. By 2015 the target for RES heating and cooling share of 20% was surpassed and stood at 25.9%.[61]

The further penetration of RES in the interconnected system in Greece will be ensured through the upgrade of networks to smart grid and metering systems along with the introduction of intelligence automation and control systems.[62]

The Ministry of Environment and Energy is responsible for the integration into the national legislation and the implementation of the EU Directive 2012/27/EE on energy efficiency (EED). Other ministries and organisations (such as the Ministry of Infrastructure, Transport and Networks and the Ministry of Economy, Development and Tourism; the Centre for Renewable Energy Sources and Saving) are also involved in the formulation of energy efficiency measures as well as in various initiatives regarding the EED implementation. In order to comply with the EED focus on the importance of the energy upgrade of buildings and the significance of a long-term consideration of the investment required for renovating the building stock, the Greek Ministry of Environment and

[59] Davaki, M. (2011). *Analysis of Energy Use in Typical Greek Residential Buildings and Proposed Retrofit Strategies*. Georgia Institute of Technology Available at: https://smartech.gatech.edu/bitstream/handle/1853/44922/davaki_maria_201108_mast.pdf.pdf; Statista (2018). *Electricity Prices for Household Consumers in Greece from 2010 to 2017*. Available at: https://www.statista.com/statistics/418083/electricity-prices-for-households-in-greece/
[60] PEPESEC PROJECT - Energy planning for sustainable communities (2009). *Research Conducted on Energy Consumption Behavior of Amaroussion Citizens*. Available at: http://www.cres.gr/pepesec/ereyna_uk.html
[61] Energypedia (2017). *Greece Energy Situation*.
[62] Kastis, S. and Kitsios, V. (2017). *The Energy System of Greece*.

Energy developed a long-term strategy for mobilising investment in the renovation of the national stock of residential and commercial buildings, both public and private. The first version of the strategy was completed in 2014. It presents existing measures and policies to boost renovation of building stock in Greece and proposes future-oriented prospects based on energy renovation scenarios.

The existing measures and policies to boost renovation of building stock in Greece include: i) The Regulation on the efficiency of buildings (KENAK); ii) the “Savings at Home Programme”; iii) Mandatory installation of solar thermal systems in new buildings; iv) “Allazo KLIMAtistiko” (changing air conditioning); v) Upgrade of public buildings.

The document concludes that the energy upgrade of residences and tertiary and public sector buildings could result in actual and substantial recovery in the construction and real estate markets. Further benefits are energy savings and reduction in the energy dependence.[63]

Trends in national campaigns

The Greek government aims at improving energy performance of existing buildings through different projects such as the “Exikonomo” project (in English – “Energy saved at home”). The aim of the project is to provide owners with free or low-interest loans and grants for external or roof insulation, replacement of heating oil or gas boilers, the installation of solar collectors and installation of solar systems for hot water.[64]

There are also efforts to develop energy saving habits among children in Greece. The “Changing Behaviour” project aims to teach children how to use energy in an efficient way, to raise awareness on RES and on efficiency in transport. Thus, reduction of energy use in school buildings and in homes could be achieved. The main outcome of the project was the development of an educational package on active learning and energy monitoring that was tested in 10 primary schools in Greece. It was estimated that in result of the implementation of the active learning and energy monitoring, 10-14% of energy savings were achieved.[65]

OVERVIEW OF NATIONAL SECIS

Below please find a list of Greek SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country.

European Citizens Climate Cup (ECCC)	Changes in Individuals’ Behaviour

[63] NEEAP (2014). *Report on long-term strategy for mobilising investment in the renovation of the national stock of residential and commercial buildings, both public and private*. Available at: https://ec.europa.eu/energy/sites/ener/files/documents/GreekReportBuildingsArticle4_en.pdf

[64] Davaki, M. (2011). *Analysis of Energy Use in Typical Greek Residential Buildings and Proposed Retrofit Strategies*.

[65] Vasilis, P. and Malamatenios, C. (2009). *Active Learning: Teaching Children to Use Energy in Greece*. CHANGING BEHAVIOUR project. Available at: http://www.energychange.info/downloads/doc_download/354-cbcase27greeceactivelearning

ELIH MED: A Euro-Mediterranean Program to Fight Energy Poverty		Changes in Technology
iBROAD : Individual Building (Renovation) Roadmaps		Changes in Technology
SAVES2: Students Achieving Valuable Energy Savings 2		Changes in Individuals' Behaviour
ACCESS: Accelerated Penetration of Small-Scale Biomass and Solar Technologies		Changes in Technology
enCOMPASS: Collaborative Recommendations and Adaptive Control for Personalised Energy Saving		Changes in Individuals' Behaviour
SECHURBA: Sustainable Energy Communities in Historic URBan Areas		Changes in Individuals' Behaviour
PROMISE; Promoting best practices to support energy efficient consumer behaviour on European islands		Changes in Technology
EYEMAN CHAMPIONSHIP: European Young Energy Manager Championship		Changes in Individuals' Behaviour
FEEDU: Persuasive force of children through education		Changes in Individuals' Behaviour
COMEON LABELS: Common appliance policy – All for one, One for all – Energy Labels		Changes in Individuals' Behaviour
ENESCOM: European Network of Information Centres promoting Energy Sustainability and CO2 reduction among local COMmunities		Changes in Individuals' Behaviour
PROMOTION 3E: Promotion of energy efficient appliances		Changes in Individuals' Behaviour
SAVES: Students Achieving Valuable Energy Savings		Changes in Individuals' Behaviour
REMODECE: Residential Monitoring to Decrease Energy Use and Carbon Emissions in Europe		Changes in Individuals' Behaviour
P.E.E.S.: Pattern of Energy Efficiency in the Schools		Changes in Everyday Life Situations

KIDS4FUTURE: Creating Actions among Energy Conscious Children	Changes in Individuals' Behaviour
BEHAVE: Evaluation of Energy Behavioural Change programs	Changes in Individuals' Behaviour
ACTIVE LEARNING Integration of Active Learning and Energy Monitoring with School Curriculum	Changes in Individuals' Behaviour
ENERGY PATH: An E-learning Platform for Education of the New Generations in the Sustainable Energy Field	Changes in Individuals' Behaviour
RES and RUE Stimulation in Mountainous - Agricultural Communities towards Sustainable Development (MOUNTAIN-RES/RUE)	Changes in Technology
ERACOBUILD: Countdown to Low Carbon Homes	Changes in Technology
ELE.C.TRA: Electric City Transport	Changes in Individuals' Behaviour
AD PERSONAM: A Direct Marketing program for Public Transport	Changes in Individuals' Behaviour
10ACTION: Actions to Increase Energy Awareness and Improve the Sustainable Behaviour of European Citizens	Changes in Individuals' Behaviour
BAMBINI: Socialisation towards Clean and Energy Efficient Transport	Changes in Everyday Life Situations
ENERGY AMBASSADORS: Campaign to Fight against Fuel Poverty and Raise Awareness on Energy Efficiency and Energy Savings	Changes in Individuals' Behaviour
Energy Neighbourhoods 2 - The Energy Challenge (EN2)	Changes in Everyday Life Situations
Energy BITS – Young people and media for a low energy footprint (E-BITS)	Changes in Individuals' Behaviour
SAVE AGE: Strengthening Energy Efficiency Awareness Among Residential Homes for Elderly People	Changes in Individuals' Behaviour

‘GOOD PRACTICE’ EXAMPLE OF GREEK SECI

P.E.E.S.: Pattern of Energy Efficiency in the Schools

Brief Description

P.E.E.S. was an educational project for increasing the energy awareness of secondary school students, but their teachers were also actively involved. The initiative was implemented by DEMEKAV, a non-profit agency of the Municipality of Volos, established to develop and implement municipal policy regarding urban development. The general goal of the initiative was to change the behaviour of energy users, and to promote a sustainable consumption of energy. Teenage students (15-18 years old) and their teachers represented the main target groups, but the messages of the project influenced also the behaviour of other members of their households. The project also had a technological aspect, as meters for reading and auditing energy consumption within school buildings were installed. Selected workgroups of students and teachers cooperated with the technicians of DEMEKAV (Volos Municipal Enterprise for Urban Studies, Construction & Development).

Brief Contextualization

Volos is located in central Greece. It is the capital of Magnesia province, and has a population of 85,000. Volos is a very important commercial centre and a home to the third largest port in Greece. The city also features a university and a vibrant cultural scene. Volos municipality has adopted its Local Action Plan on Climate Change 2010-2020. Recognising the climate change as the major global environmental problem, the municipality pledged to take action in several roles:
(a) as a consumer and service provider,
(b) as a planner, developer and regulator,
(c) as an advisor and motivator and
(d) as a producer and supplier.
The overall objective of municipalities’ activities is to substantially reduce greenhouse gases (GHG) emissions, promote awareness, provide training on climate change and its mitigation, and initiate different actions with the active participation of citizens. P.E.E.S. initiative can be seen as an element of this wider context.

Aims and objectives

The main objectives of the P.E.E.S. were:
- contribution to the forming of a “energy consciousness” among the students
- organisation of educational activities
- development of instruments and skills for analysis and evaluation of energy consumption
- common methodology for the calculation of energy consumption
- teaching students and teachers how to monitor their own daily “energy behaviours”.

Methods for Intervention

The main target group of the initiative were students of the secondary schools aged between 15 and 18, as well as their teachers. A secondary target group were families,

relatives and friends of students directly involved in the activities. Involved students were used as “energy ambassadors”. The initiative produced a didactic methodology that combined theoretical and experimental aspects with the objective of informing the students and raising their awareness about energy efficiency. Methodology was divided in two main steps.
1) “General Educational Schedule”, which provided the main information about proper everyday energy behaviour.
2) “Technical Educational Schedule”, which aimed at producing relevant changes in the energy behaviour and energy consciousness by offering knowledge about more technical and scientific topics.
The energy agency tasked with the implementation of the initiative conducted energy audits in three pilot schools in cooperation with a group of about 30 students and 3 or 4 teachers (“Energy Teams”) in each involved school. The energy audits were realised with the help of a specially designed “P.E.E.S. software,” consisting of a group of interlinked spreadsheets, which calculated the annual energy consumption (electrical and thermal) of the school buildings.

Steps of implementation
Implementation started in October 2007. In the first phase, DEMEKAV developed an educational programme about energy and environmental issues, including information booklets and lesson plans. In the central phase of the initiative, the General and the Technical Educational Schedules were implemented in the pilot schools, focusing on the implementation of a methodology for monitoring the energy consumption in schools. In each pilot school, students and teachers were trained and then formed the “Energy Teams,” consisting of 3 teachers and 10 students. These Energy Teams were responsible for conducting the energy audit of their school. The teams were supported by DEMEKAV’s technicians to properly use the specially developed software to calculate the energy consumption, to identify any critical issues, and to plan the potential corrective measures according to the criteria of energy efficiency. In the final phases of the project, numerous dissemination activities were realised, involving thousands of students and hundreds of teachers from 30 schools in the area of Volos.

Results/outcomes
The implemented activities have resulted in reduction of CO2 emissions in the pilot schools. During the dissemination phase, more than 5000 booklets and 90 models of renewable energy parks were distributed in most of the schools of the area of Volos.

The role of the households
Households as such were not directly involved in the initiative. Rather, by involving students as local “energy ambassadors,’ P.E.E.S. tried to change and improve the energy behaviour of the citizens of Volos, and thereby influence in a positive way their environmental and energy awareness. Students, especially the ones trained for participation in the Energy Teams, also had a potentially large impact on their parents, friends and relatives, bringing a more energy conscious thinking into numerous households in Volos.

Location
Schools in Volos, the capital of Magnesia province, located in central Greece.

Was/is the initiative successful?
According to the feedback from different actors (teachers, students, politicians and the general public), the initiative attracted considerable interest and approval. Numerous schools made inquiries and expressed desire to implement the initiative as well. As all the methodologies and materials developed during the lifetime of the initiative have been successfully tested, they can be easily used and implemented in other schools across Greece.

Textual and communicative aspects of the initiative:
The tools created by P.E.E.S. project can be easily applied in other schools across entire Greece, helping them to influence their students to become more aware of energy and environmental issues, save energy and money and reduce CO2 emissions of their schools. These tools include:

- A didactic methodology combining theoretical and experimental aspects for the education of teachers and students on basic issues in the fields of energy and environment.
- "Sheet of Environmental and Energy Values" – a report pointing out significant changes in the energy behaviour and energy knowledge.
- Energy Balance for school buildings.
- "Words for Energy" dictionary.
- Methodology for energy audit conducted by students and teachers.

The physical/technological aspects of the initiative
DEMEKAV agency was actively involved in helping the pilot schools with the Energy School Management (ESM) system. Its technicians trained students and teachers and provided all necessary technical assistance during the energy audit process. DEMEKAV also installed the necessary equipment in schools and developed the special software for measuring the energy consumption. "P.E.E.S. software" was designed specifically to correspond to the requirements and skills of young people. The software used the data provided by the Energy Teams to present the evolution of the energy consumption from year to year and to calculate the efficiency of the school building in terms of energy and CO2 emissions.

Shared understandings related to the initiative
Being an educational project, P.E.E.S. relied strongly on the shared and common understanding that increased energy awareness among students and teachers could contribute considerably to achieving relevant changes in the behaviour of energy users. The project was based on several shared assumptions regarding the energy consumption:
1) Buildings are among the largest end users of energy (about 40% of the final energy demand in EU countries).

2) Market and policy solutions are insufficient to overcome cultural and behavioural barriers.
3) Environmental education and energy saving education can be easily integrated into several school subjects (physics, chemistry, geography, biology, home economics and social sciences).
4) Young people can play a strategic role in the development of a new environmental awareness.
5) Only dissemination of the knowledge is not sufficient. To achieve deeper changes in the energy behaviour of people, proactive methods of involvement are necessary.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

Greece is a country that has been traditionally heavily dependent on imported fossil fuels to cover its energy needs, despite excellent geographical preconditions for large-scale production of energy from renewable sources. Not surprisingly, the most important objective of the national energy policies is to increase the share of RES, and in the recent years, Greece has made substantial progress. In 2015, the 20% target for 2020 was already surpassed and renewable energy sources covered 25% of the final energy consumption. The second major priority area is the renovation of old building stock, which is a reason for large energy consumption in winter (heating) and summer (air conditioning). Finally, the national policies also address the need to change the energy consumption behaviour of the population, which has traditionally not been overly concerned regarding wasteful use of resources and energy, but has been in recent years forced to adopt a new approach because of a sharp increase of energy prices.

SECIs examined by the ENERGISE team reflect well this necessity to change energy consuming behaviour – 21 out of 30 focus on different measures that try to induce Greek households to consume less energy or to do it in a more efficient way. Six of the initiatives can be positioned within the first two priority areas – accelerated uptake of renewable energy sources (biomass, solar power, wind power) or thermal insulation of old buildings. Some initiatives from both groups target vulnerable households, as energy poverty is becoming an issue in Greece in recent years. For example, ELIH MED tested innovative cost-efficient technical solutions for improving energy efficiency in low-income households, and ENERGY AMBASSADORS tackled energy poverty by helping vulnerable groups to manage their water and energy consumption through the intervention of specially trained social workers. SAVE AGE encouraged measures in energy efficiency in residential homes for elderly people. School children and students are at the heart of quite a few initiatives. The opinion that Greek society can become more responsible towards energy and resources tomorrow only if proper education and training are undertaken today seems to be widely shared. In addition to P.E.E.S. project described in detail in Section 3, the following SECIs deserve attention:

- ENERGY BITS used interactive web tools and games to stimulate behavioural change regarding efficient and sustainable use of energy among young people.
- ACTIVE LEARNING introduced energy education into classes of children aged 6-12, changing their attitudes towards energy use and achieving actual energy savings in the schools and homes of the children.

- KIDS4FUTURE targeted pilot schools with a common energy story, events and websites for children, creating enthusiasm for energy saving and sustainable future.
- Various games, competitions, debates and workshops were organised by 10ACTION project to promote awareness about renewable energy, energy efficiency, and responsible use of energy among children, teenagers and students.
- FEEDU aimed at teachers and pupils of primary schools, popularising renewable energy sources, rational use of energy and sustainable mobility.
- Three projects targeting young people had a competitive aspect as well. EYEMAN CHAMPIONSHIP united teachers and students in an energy saving competition at their schools and homes, while SAVES and SAVES2 involved students living in university accommodation (dormitories) – students from different dormitories competed which dormitory would achieve the highest cuts in the quantity of energy used.

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HUNGARY

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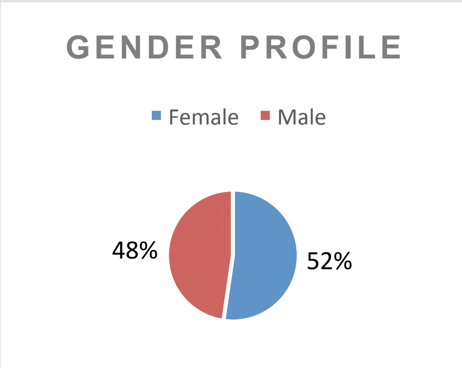
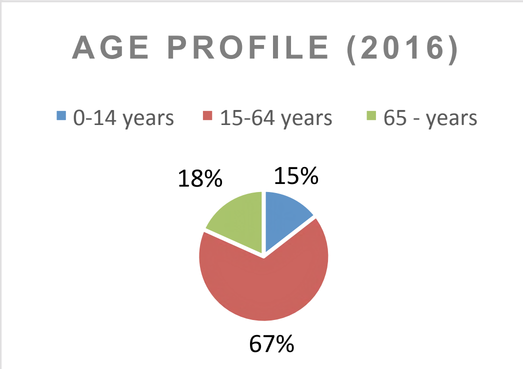
DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY





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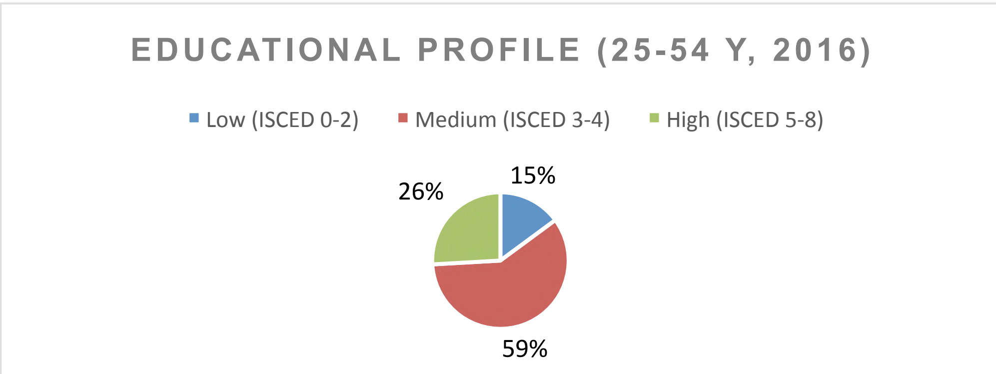

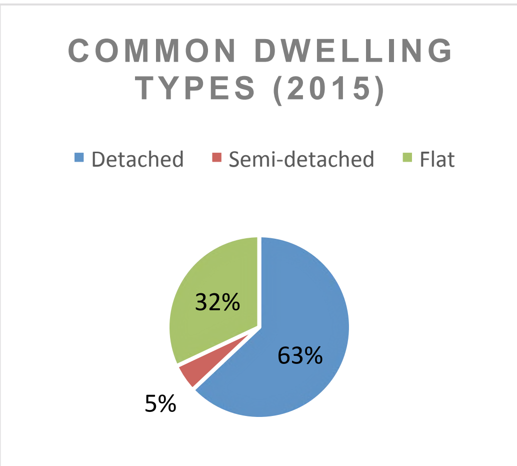

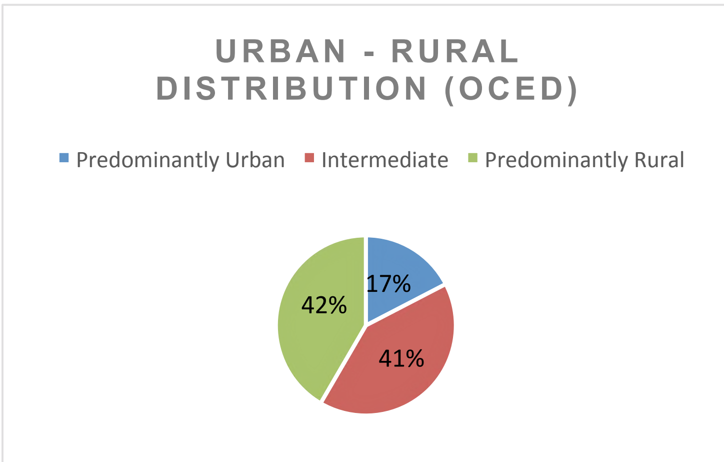

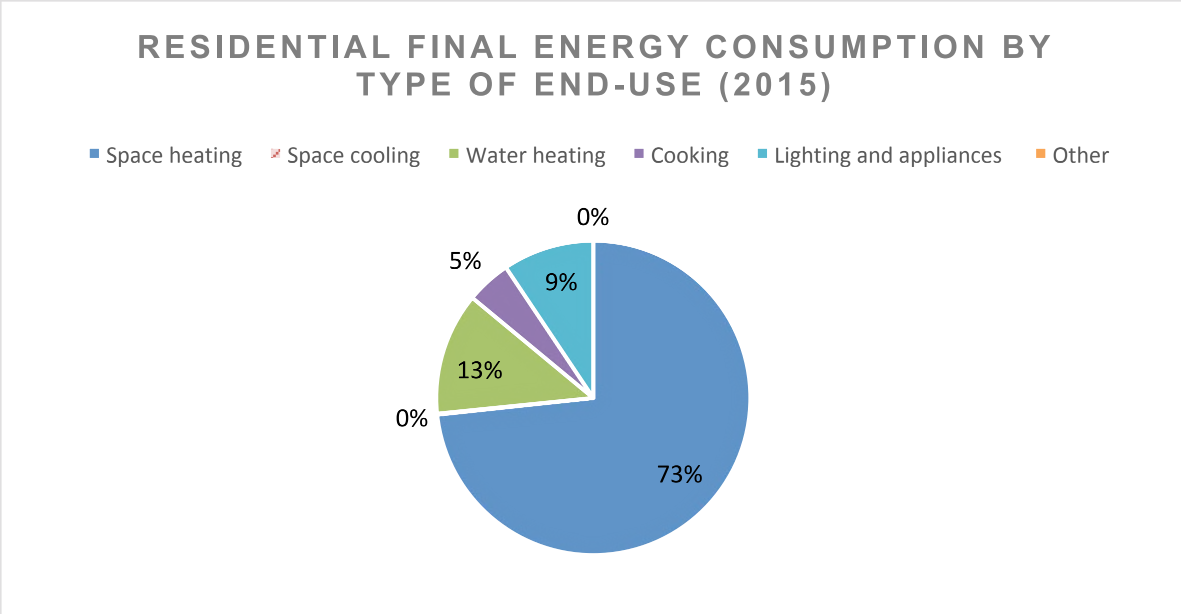

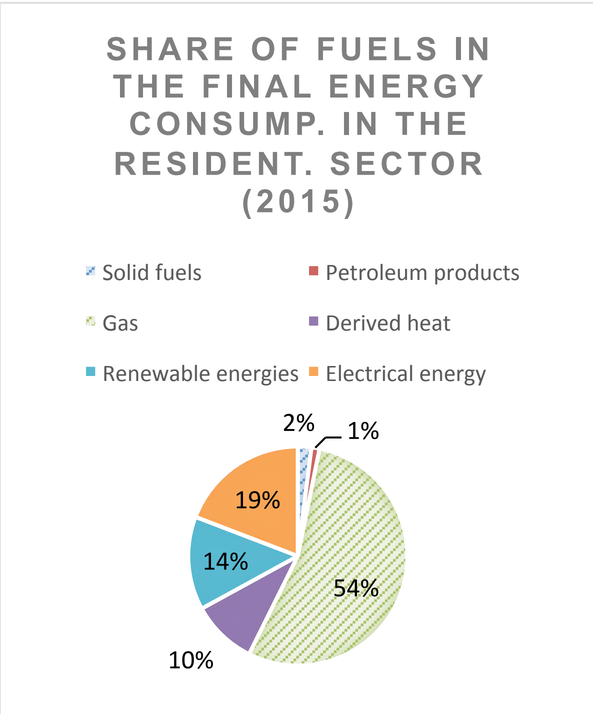

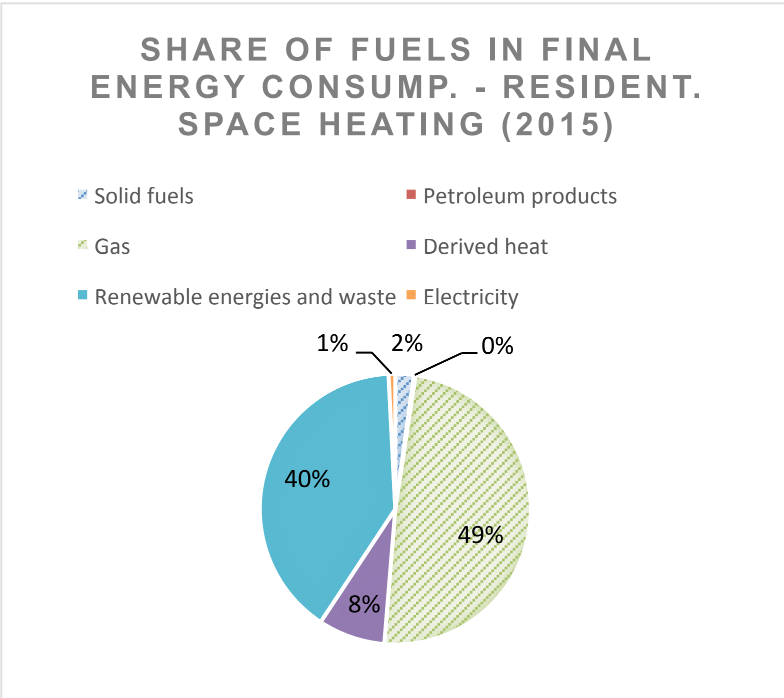

FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

7.037 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

In Hungary, at present, six regional grid operator companies and four universal energy provider companies are on the market ("universal" providers serve the household and small-consumers sectors) ('Magyar energiapiac szereplői' n.d.), Gaps and controversies in the governance of energy policies in Hungary are major issues in the national context. With regards to ownership structures, there is an explicit policy by the government to establish a state-owned, centralized infrastructure as the main means for the provision of energy for the household sector.

Particular socio-material aspects that influence energy consumption

A considerable share of the society (around 35%) live under the "subsistence" levels[66] and 21% in fuel poverty (Fülöp and Lehoczki-Krsjak, 2014). Thus the affordability of energy is a major issue and the popular policy of the government is to regulate the price of energy. The level of consciousness is low (the majority of the households do not follow their energy consumption data) ('Meg se nézzük a számlát – energiatudatlanságban a háztartások' 2013) and the household appliances stock is outdated and inefficient on a large scale (APPLiA Hungary n.d.).

Private ownership of residential properties is high (about 86%). Around 63% of the population (6.5 million people) live in detached houses, which means 2.5 million households (flats). Households in detached houses often use a mix of fuels for heating (e.g. natural gas and wood), but firewood and even household waste (despite legal restrictions) have considerable, and recently even growing importance ('Sokan térnek vissza a fafűtéshez' 2016). About 20% of the population (2 million people) lives in blocks of flats built by industrial technologies. Implications include: energy efficiency measures require decision at the community level, the energy efficiency of the relevant building stock is low due to technological reasons, etc. The use of district heating and other joint/community solutions are hindered by negative social attitudes towards public or joint ownership schemes.

Current Trends in Energy Policy

The important goals of Hungarian energy policy (MND, 2012) are, most of all, the provision of affordable energy, long-term sustainability, supply security and economic competitiveness. Special emphasis is put on **tackling the energy dependency** of the country by the means of i) energy savings, ii) increasing the share of renewable energy sources, iii) safe nuclear energy and the electrification of transport based on this, iv) creating a bipolar agriculture (food production and energy-geared biomass production), and v) better integration to the European energy infrastructures. To implement these several **thematic strategies, action plans,** etc. have been developed and approved in harmony with but also to meet legal obligations of the EU.[67]

In the context of **energy saving and efficiency**, the main focus is put on the household sector and the buildings stock (for a summary of relevant policies, e.g. national approach to the implementation of the EED, relevant targets, see Slezák et al., 2015). However, during the last few years relevant policy support has been volatile (e.g. relevant policies had been announced and then re-called), sporadic, and actual incentives have targeted the public rather than the household sector.

A characteristic feature of the recent energy policy is the **pivotal role of the government**. In this context such important measures were taken by the Government as setting up a 100% state-owned National Public Utility Company with the goal of ensuring the security of energy supply and

[66] No official governmental statistics is available anymore. For press information see e.g. 'A lakosság jó harmada él a létminimum alatt' 2017, 'A magyarok harmada él a létminimum alatt él' 2017

[67] II. CCS 2015 (currently in the process of Parliamentary endorsement), III. NEEAP 2015, EEOP 2015, Act No. LVII of 2015, Government decree No. 122/2015, Renewable Energy – Republic of Hungary National Renewable Energy Action Plan 2010-2020 (2011), NBEPS 2015, Government Resolution No. 1487/2015, ECARAP 2015. The National District-heating Development Plan is under finalization.

providing cheap energy to the Hungarian economy. (Slezák et al., 2015)

An explicit policy of the government is to **keep energy prices low**, especially in terms of tackling the "utility burden" of citizens. Related measures implemented have included the appointment of a governmental commissioner and the regulation of utility prices for the household sector (Slezák et al., 2015).

Hungarian governments have always been politically committed to **nuclear power generation**. The lifetime of the Paks Nuclear Power Plant (Paks NPP) reactors have got extended, while in January 2014 the government signed an agreement for the construction of two new reactors.

It is an ambition to become a regional leader in terms of **E-mobility** (MNE, 2015). The Jedlik Ányos Plan, the relevant strategy and action plan adopted in 2015, contains both financial and non-financial incentives for market extension and the spread of electrified transportation (Government Resolution No. 1487/2015). The strategic objective is to put into operation 30 thousand electric vehicles in the country by 2020 (MND, 2017).

The development of **Smart Energy Systems/Smart Grids** (My Smart Energy Initiative n.d.): though no central governmental strategy is dedicated to it, it is one of the goals of the 2010-2020 National Renewable Energy Action Plan. The **Smart Cities** concept has been supported both by the central and local governments ('Izgalmas konferencia: élhetőbb városok' 2010, Lados and Horváthné Barsi, 2011). The capital, as well as other major cities, have worked out their Smart City visions/concepts/strategies (for further information see: Debrecen Smart City n.d.; Kiss, 2015; Smart City Budapest n.d.; Szeged City, 2016). However, at present these are in an initial phase of implementation (Kulcsár, 2016; Merényi, 2017). In addition, some cities have exceptionally high ambitions for the development of their energy infrastructure (see e.g. Végh, 2017).

Gaps and controversies of the recent energy governance are major topics in the country (see e.g. Koritár, 2017). It is claimed that the potential for energy saving is higher than the scenario proposed by the government calculates with, thus national plans are not ambitious enough (Slezák et al., 2015). The expected growth rate of energy consumption is also questioned, and alternative estimations argue that the planned capacity enlargement of the Paks NPP is not necessary in view of the country's potential for energy efficiency improvements (see e.g. Lechtenböhmer et. al., 2016). The regulation of household energy prices is also disputed. It took place without any differentiation (e.g. according to income levels), price reductions have been introduced without effective improvements in the production and distribution of energy, and this way the energy/utilities sector requires cross-subsidization. Finally, lower energy prices disincentivize energy efficiency investments (see e.g. 'A rezsicsökkentés önmagában részmegoldás, elengedhetetlen a magyar otthonok energiahatékonyságának javítása is' 2017).

Finally, it needs to be noted that in line with EU requirements, the process of developing the Integrated National Energy and Climate Plan[68] has begun. It is expected that the Plan, once adopted, may bring some changes in the policy context.

Trends in national campaigns

The governmental energy-related campaign has been dominated in the last years by the "war on utility costs" – an overall populist price policy of the government (Slezák et al., 2015) Besides, in line with the Energy- and Climate Awareness-Raising Action Plan of Hungary, relevant policies have been supported by certain awareness raising activities, even if with lower weight.

Regarding monetary incentives the main financial instrument managed by the central government to promote investments aimed at furthering energy efficiency in households is the so-called "Warmth of the Home Programme" grant scheme. Set up in 2014 it has provided financial support, already in several phases, for instance for the replacement of inefficient household appliances, inefficient doors and windows, etc. However, the available funding has always been sourced out within a very short time (sometimes in a day!), and this fact indicates not only a high interest and need on behalf of the

[68] See more about this process and requirements at https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/governance-energy-union

household sector, but also the insufficient level of governmental support. (Energiaklub, 2013; Fülöp and Kun, 2014)

In addition, soft loans (without interest rate) for energy efficiency improvements are available both for the household ('Már igényelhető a nulla százalékos, lakossági energiahatékonysági hitel' 2017) and for the SME sectors. Some municipal governments also provide various incentives for households within their authority for energy efficiency renovations, especially for apartment blocks (Slezák et al., 2015).

The central government has recently launched the concept and investment programme "Modern cities" that embraces and provides funding for energy-related developments (Governmental resolution 1038/2016, February 2016). The concept, however, is broader, with focus on the infrastructural development of regional capital cities in general (e.g. with regards to public service infrastructure, etc.).

The promotion of energy communities is not amongst the explicit objectives of governmental policies. The concept, however, is implicitly supported in the context of the promotion of renewable energy, as well as via some sporadic policy support aimed at improving the energy efficiency of housing cooperatives. (FoEH n.d.)

While the National District-heating Development Plan is currently under finalization (Papp, 2016), at the practical level several demonstration projects have been implemented recently (BioFuel Region AB, 2015).

OVERVIEW OF NATIONAL SECIS

Below please find a list of Hungarian SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). *The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country.*

EnergyNeighbourhoods programme (EnergiaKözösségek program)	Changes in Everyday Life Situations
E.ON EnergyNeighbourhoods programme (E.ON EnergiaKözösségek program)	Changes in Everyday Life Situations
Large Family - Small Footprint campaign (Nagy család - Kislábnyom program)	Changes in Individuals' Behaviour
Small Footprint campaign (Kislábnyom program)	Changes in Individuals' Behaviour
EcoTeams programme (ÖkoKörök)	Changes in Everyday Life Situations

Energy Check for Low-Income Households project (Csekkcsökkentő projekt)	Changes in Individuals' Behaviour
Szekszárd Climate Club (Szekszárdi Klímakör)	Changes in Everyday Life Situations
Energy Experience (EnergiaKaland)	Changes in Individuals' Behaviour
DIY door and window insulation programme (Szigetelés fillérekből)	Changes in Technology
Biomass briquettes programme (Biomassza brikett program)	Changes in Technology
Wekerle Energy Brigade programme (Energia Brigád/ later Wekerlei Szigetelési Brigád)	Changes in Technology
Passive House Open Door Days (Passzívház Nyílt Napok)	Changes in Technology
Social Electricity Online Platform	Changes in Individuals' Behaviour
Insulation of Homes in the region of Vác (Lakásszigetelés Vác térségében)	Changes in Technology
Spinning Grumbler's World programme (Forgó Morgó)	Changes in Individuals' Behaviour
Washing machine exchange program (mosógépcsere program)	Changes in Technology
Warmth of the Home Programme (Otthon melege program)	Changes in Technology
LED energy saving programme (LED energiatakarékossági program)	Changes in Technology
Programmes for households by ELMŰ-ÉMÁSZ energy provider company (Energy Money-box, Energy Points, enHome GreenLine)	Changes in Individuals' Behaviour
Insulation demonstration project (szigetelési mintaprojekt)	Changes in Technology

Climate ticket (Klímajegy)	Changes in Technology
Renovations are Imminent (Küszöbön a felújítás)	Changes in Technology
Nearly Zero Energy Buildings (NZEB) Open Doors Days (Hatékony Ház Napok)	Changes in Complex Interactions
Solar Days (NAPOS napok)	Changes in Technology
Campaign promoting sustainable lifestyles (fenntartható életmódot ösztönző kampány)	Changes in Individuals' Behaviour
GreenHome demonstration, training and community centre (ZöldLak Bemutatóközpont)	Changes in Complex Interactions
Gödöllő Climate Club	Changes in Complex Interactions
Community Power (Friends of the Earth Hungary)	Changes in Complex Interactions
Staccato Project - "Village House"	Changes in Technology
Carbonarium	Changes in Individuals' Behaviour
Community wind turbine in Vép	Changes in Complex Interactions
Community biomass heating plant in Pornóapáti	Changes in Technology
"Jövő/Menő Erőnyerő"	Changes in Technology
Masonry heater building workshop in Ete	Changes in Technology
Smart metering multi utility pilot project	Changes in Individuals' Behaviour

Smart Synergy Project	Changes in Individuals' Behaviour
"Lakcímke" (Energy Certificate)	Changes in Individuals' Behaviour
The Geoterm Vácrátót project and "How big is your footprint" exhibition	Changes in Technology
Livable Future Park	Changes in Technology
Green Block	Changes in Individuals' Behaviour
Panel 2050	Changes in Complex Interactions
Energy efficiency information office in the 14th district of Budapest	Changes in Individuals' Behaviour
Living Well interactive website (Jól lakni)	Changes in Individuals' Behaviour
Green Walk	Changes in Technology
Passive Social Housing in Budapest	Changes in Technology

‘GOOD PRACTICE’ EXAMPLE OF HUNGARIAN SECI

Gödöllő Climate Club

Brief Description

The Climate Club[69] members live in or around Gödöllő, a town in Central Hungary. The Club was formed in 2009 by GreenDependent Association, a local nonprofit organisation, as part of the Changing Behaviour FP7 project[70]. The Club started as a pilot project, but is ongoing to this day (May 2018). The core activity of the Club is its monthly meetings where members discuss climate change, energy-related and environmental issues, ideas and concerns in an informal setting. Alternatively, Club members invite experts to have a discussion/ give a presentation on a given topic of interest. There have been 10-30 core members in the Club, who have regularly attended the meetings, and another 200-250 people and organisations on the club mailing list.

Contextualization

The Climate Club was established in order to raise awareness of climate change issues in households, establish links between climate change and household consumption, and create a sense of responsibility for consumption and lifestyle-related emissions in households (GreenDependent, 2009a). In the Europe Union households are on average responsible for 25.4% of energy use[71]; however, the figure for Hungary is higher: 31.6% (IEA, 2017).

As the findings of the above-mentioned research project about motivating behaviour change related to energy use pointed towards the importance of small groups, when initiating the club (Heiskanen et al., 2010), GreenDependent decided to experiment with an informal group format using the inspiring examples of EcoTeams, Carbon Rationing Action Groups and transition town initiatives. The table below summarizes how small groups, and in particular the climate club, can help overcome barriers to behaviour change.

Capacities	Description	Barrier to behaviour change	How the Climate Club can help overcome barrier
Personal	Individuals understanding of the issue, their willingness and ability to act, their values skills and enthusiasm	Lack of knowledge and understanding, lack of willingness and skills, helplessness	Sharing and creating knowledge Providing advice, skills, motivation and encouragement Members can see that ’others are doing their bit’ Assurance that being `green` is normal
Infrastructural	Facilities and structures enabling sustainable living available in the community	Current socio-technical infrastructures	Creating knowledge network on the carbon intensity of lifestyles and the low-carbon solutions available in the community Limited impact on ‘hard’ infrastructure at the moment
Organizational	Values held by formal organizations in the community	Social conventions, helplessness	Challenging existing institutions Changing taken-for-granted beliefs about modern life and creating a supportive environment for problematizing current lifestyles
Cultural	Legitimacy of sustainability and low-carbon living in the community	Social dilemmas, helplessness	Creating a community of individuals prepared to change their lifestyle and promote these changes to others and by doing so creating legitimacy for sustainable and low-carbon values and living

Source: Vadovics − Heiskanen, 2010

[69] You can find out more about the Gödöllő Climate Club at http://klimaklub.greendependent.org/en.html
[70] More information about the Changing Behaviour project is available at http://www.energychange.info/
[71] Source: Eurostat, Consumpiton of energy, data for 2017: http://ec.europa.eu/eurostat/statistics-explained/index.php/Consumption_of_energy (Last access: 26 April 2018)

The Climate Club was part of an informal network of similar initiatives in Hungary (called KLIKK or Climate-friendly Small Communities); and as a result to this day has links with transition town initiatives in Hungary. The Climate Club also has a twin club in the UK: the Fownhope Carbon Reduction Action Group. Both of these contacts played a great role in establishing and strengthening club identity as well as inspiring action.

Aims and objectives

The choice of objectives was first of all motivated by low awareness of households about the link between every day behaviour and practice and climate change.

The most important aims of the Gödöllő Climate Club are (GreenDependent, 2009b):

1. to raise awareness of climate change issues in households, establish links between climate change and household consumption, create a sense of responsibility;
2. to draw on existing methodologies for measuring household consumption and carbon emissions, adopt the most suitable one in the context of Gödöllő town and test it;
3. to involve households in a carbon emission reduction programme;
4. to create a supportive community for change at the household and community level.

Methods for intervention

In the Changing Behaviour research project successful and less successful demand-side management programmes were studied in an effort to establish general success factors (Mourik et al., 2009; Vadovics − Boza-Kiss, 2013). An attempt was made to plan the methodology for the Gödöllő Climate Club to incorporate many of the success factors in order to create lasting change.

As people's knowledge, experience and interest can have a wide spectrum, and they are motivated by a number of different factors, methods and tools were developed to allow for flexibility, for household-specific intervention and for increasing attractiveness, too. Besides, many different types of communication channels were used. Creating a community has always been important so that participants do not feel alone in their efforts, besides, they can share experience and learn from each other, too.

Steps of implementation

There have been two main phases in the history of the Climate Club: its establishment in the framework of the Changing Behaviour project, and its operation afterwards. During the establishment phase besides the regular monthly meetings, a variety of tools and materials were also created, and their use thoroughly evaluated (GreenDependent, 2009b). This phase lasted from May 2009 to June 2010.

Following this, since September 2010, activities primarily mean the monthly Club meetings and occasional participation in local events (i.e. seed swaps). Some members continue to keep a record of their energy consumption and/or started participating in the Small Footprint[72] and/or EnergyNeighbourhoods programmes[73] organized by GreenDependent.

From September 2010 onwards until today the Climate Club was funded by GreenDependent Association, its members and the local municipality, the latter mostly through providing meeting space free of charge.

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[72] See more at http://www.greendependent.org and http://www.kislabnyom.hu

[73] More information about these programmes is available at http://intezet.greendependent.org/en/node/120 and at http://intezet.greendependent.org/en/node/297

The role of the households

The Climate Club is a small group of dedicated individuals who appreciate the additional knowledge and the sense of community as a primary value provided by the monthly meetings. It is also clear that most members feel closely associated with the group, and have a feeling of ownership, which seems to be increasing with time. (Vadovics − Boza-Kiss, 2013). Households were not involved in the design phase of the pilot project, as it was based on 'best practice methodology' identified in the Changing Behaviour project. Apart from this, however, they are invited to take an active role:

- The monthly meetings provide a chance to discuss progress together, exchange ideas and experience. The result of these discussions is an input for planning future activities.
- Participation in local events is also decided by the members, and they also assist with organisational matters.
- Members also contribute in the form of homemade foods and drinks for the meetings.
- Finally, the Club provides space for information exchange and visits to members' retrofitted homes.

Results/outcomes, success of the initiative

Because of its more informal nature, there was no comprehensive study done on the carbon footprint reduction or energy saving achieved by the Gödöllő Climate Club members, but there are indications that most members achieved at least 10% reduction in energy use since they joined the Club. (Vadovics − Boza-Kiss, 2013)

Overall, the initiative is considered to be a success story by GreenDependent Association. It started as a one-year pilot project, and is still running after 9 years, because Club members wanted to continue meeting and discussing environmental and energy issues, as well as to take action. Moreover, its methodology formed the basis of several larger-scale campaigns, such as the Small Footprint and EnergyNeighbourhoods programmes. At the same time, it is felt that members could be somewhat more active, that is take the initiative more often. Moreover, the pool of regular Club members could be wider. (GreenDependent, 2009c and 2010)

Shared understandings related to initiative

There is a shared understanding between the initiator and the Club members that low-carbon living is good and desired. Energy saving is put into the global context of climate change. It has become customary among members to say *“since I started coming to the Club, I’ve stopped using... I’ve given up... I’ve saved...”*, so success in saving and being proud of it has become part of the Club identity (Vadovics − Boza-Kiss, 2013, p.15). This was reinforced by awarding membership certificates. Low-carbon living is also manifested at the meetings, to which members are bringing homemade cakes and drinks with preferably local, seasonal and/or raw ingredients. No disposable cups, plates, cutlery are used. The carbon footprint of the Club events was also calculated and the results shared with members between 2009-2014.

At the same time, it should also be noted that the initiators do not propose one single route to low-carbon living, instead emphasize that there are many different ways to reach it, depending on the households' unique circumstances. The variety of tools provided by GreenDependent at the beginning also served the purpose of a 'menu' from which households can pick the tools best fitting their situation. The emphasis on diversity has helped to attract people, but at times makes communication challenging.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

The Hungarian SECIs reviewed in the ENERGISE project are very diverse in terms of their objectives and target groups, the type of organizations implementing them, the methods they apply, their funders, etc. They are diverse also in terms of to what extent and how energy policies at the time of their conception and implementation have had an impact on them.

On the one hand, energy policies define SECIs as support and funding available for SECIs is to a great extent determined by policy objectives. Also, some SECIs are specifically created to help the implementation of policies, or prepare various stakeholders for the implementation of a particular policy. Good examples of this kind of SECIs are the *"Lakcímke" (Energy Certificate)* project which educated the general public about the energy certificate when its use became mandatory, or the *Nearly Zero Energy Buildings (NZEB) Open Doors Days (Hatékony Ház Napok)* project which prepared the general public, architects as well as members of the media for the introduction of the Energy Performance of Buildings Directive. There are also less technology-oriented projects in this category that are intended to bring about attitude and behaviour change to more generally prepare the general population or specific target groups for the impacts of climate change and motivate more sustainable energy use patterns. Such projects were the *Small Footprint campaigns*, the still ongoing *EnergyNeighbourhoods* programme or the *Green Block* campaign.

On the other hand, SECIs also often respond to needs that are not met by policy, want to go beyond what is requested by policies and even challenge policies. Consequently, these kinds of SECIs are often funded from sources other than the national government: from private foundations, companies or local governments (municipalities), from European frameworks, and less often from community funding (e.g. crowdfunding). Examples of this type of SECIs include the *Biomass briquettes programme* created to provide an alternative, environmentally-friendly fuel source as well as employment opportunities for a community living in energy poverty, the *Wekerle Energy Brigade programme* that taught and helped households insulate their doors and windows themselves, partly using community resources, or the very innovative *Climate ticket (Klímajegy)* initiative that made it possible for individuals and organizations in a specific region to voluntary compensate their carbon footprint through supporting local sustainable energy projects (e.g. installing solar panels, planting trees).

The example of the *Gödöllő Climate Club* discussed in more detail above is a SECI which is interesting for various reasons. First of all, it was conceived as a pilot project in a European research project. The methodology that was piloted and evaluated in the project was later used for the development of larger (national and international) projects, for example for the *Small Footprint campaigns* and the *EnergyNeighbourhood projects* also described in the ENERGISE database. Then, since the Climate Club is still active after 9 years, it is a good example of how a pilot project can turn into a continuous project, partly run by the community, and partly by the organization that piloted it originally. An important lesson learnt is that well-planned projects with impact can continue successfully beyond the pilot stage. However, this continuation was fully dependent on the organization managing it, and there was no support provided by either the national government or the European Commission, the original funder.

Finally, bearing in mind that the SECIs collected and reviewed in Hungary are not the only examples to be found in Hungary, it is still worth noting that the majority (around two thirds) of them focus on the more technological aspects of sustainable energy consumption, for example creating more efficient buildings, lighting and electronic equipment, and only around one third of them deal with the social aspects of energy consumption such as how energy is used, what it is used for, and the communities in which energy is used. Thus, there seems to be a more general need for policy to take this into consideration for both the development of new policies and funding provided for initiatives.

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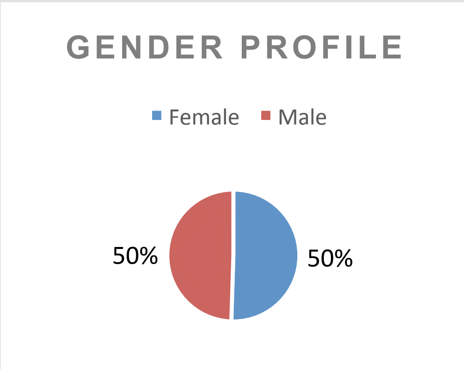
http://www.klimaklub.greendependent.org/en.html (page of the Gödöllő Climate Club, containing a wealth of materials and a description of its history)

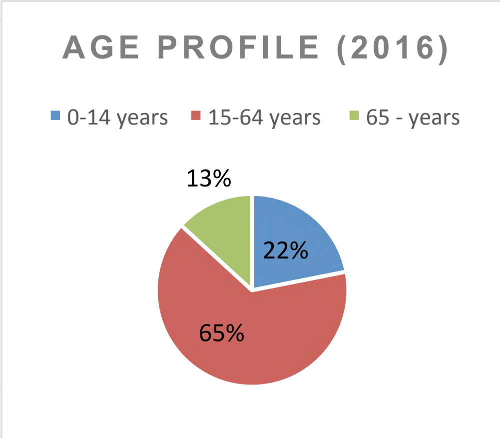
http://www.energychange.info/ and http://www.energychange.info/six-best-practice-pilots (website of the Changing Behaviour FP7 project)

IRELAND

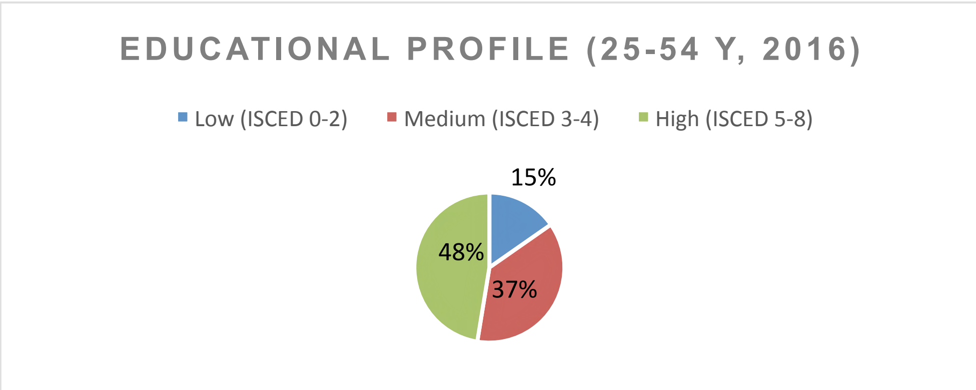
Authors: Gary Goggins, Eimear Heaslip, Frances Fahy

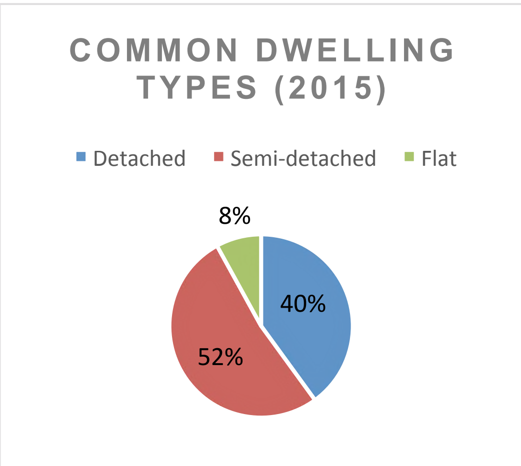
DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY

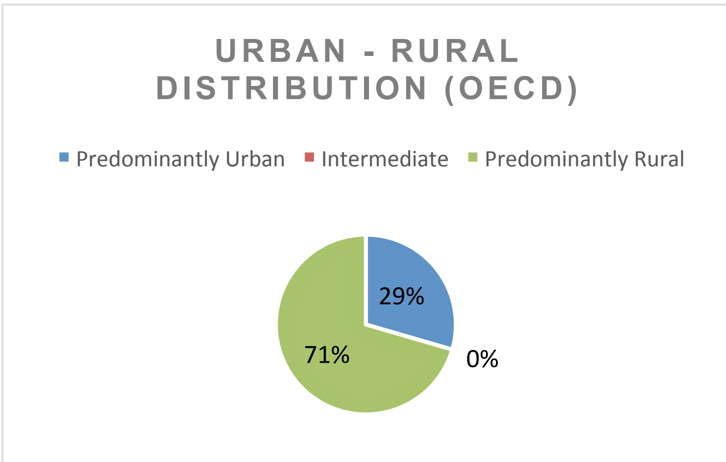


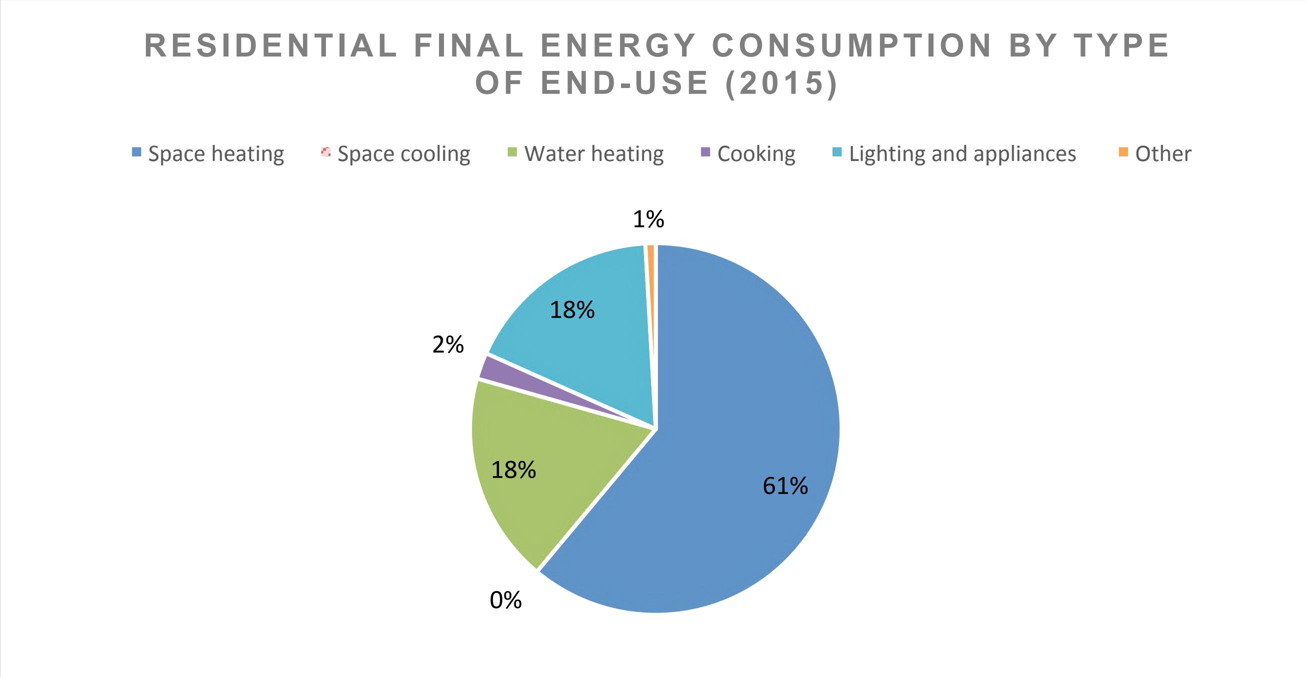


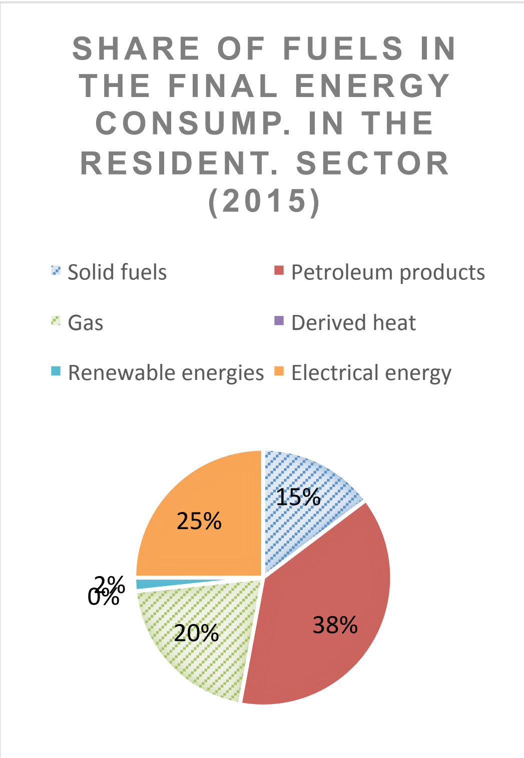
CLIMATE: Ireland's location on the northwestern periphery of Europe lends itself to a temperate oceanic climate, modified by the North Atlantic Current. The country experiences relatively mild winters and cool moist summers, with abundant rainfall year round. Average temperature is 10°C.

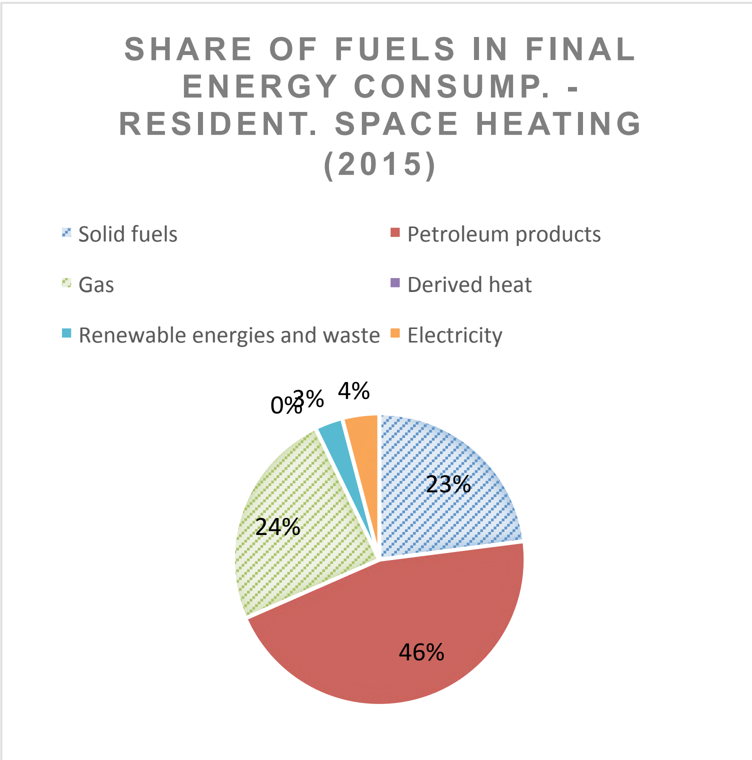












FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

6.788 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

Ireland's energy system is heavily reliant on fossil fuels, which accounted for 91% of all energy used in Ireland in 2015. Ireland's energy system is also largely dependent on imports, accounting for 88% of total primary energy requirement (TPER) in 2015, at a cost of €4.6 billion. Imported oil and gas are particularly dominant sources of energy, together accounting for 77% of TPER in 2015 (SEAI, 2016). The contribution of renewables at 9% share of energy is significantly behind Ireland's target under EU Directive 2009/28/EC of 16% renewable energy by 2020. According to a report by the Sustainable Energy Authority of Ireland, Ireland is projected to miss this target under several scenarios modelled (SEAI, 2017). Moreover, a recent EPA report has found that Ireland will also fail to meet its binding 2020 target to achieve a 20% reduction of non-Emission Trading Scheme sector emissions (i.e. emissions associated with energy use in buildings and in transport, and emissions from agriculture) on 2005 levels. In this case, recent projections estimate that emissions reduction will be in the region of 4-6%, a figure that is significantly short of the 20% target (EPA, 2017).

Particular socio-material aspects that influence energy consumption

Transport accounts for the largest proportion of energy use in Ireland at 42%, followed by the residential sector at 25% (SEAI, 2016). The residential sector is also responsible for a quarter of Ireland's energy-related CO_2 emissions. In 2015, the average household in Ireland used 7% more energy than the EU average, and emitted 5.5 tonnes of CO_2, almost 60% more than the average EU home (SEAI, 2018). Continuing dependency on high-carbon fuels (e.g. oil, coal, peat), falling oil prices and higher incomes are some of the factors that contribute to recent increases in CO_2 emissions across the residential sector. In addition, Ireland has experienced a growth in population of 25% over the period 2000-2016. To accommodate an expanding population, the number of dwellings has also increased to currently stand at 1.7 million households. Current trends also show that households are getting bigger, with an average 15% increase in floor area across all homes between 2000-2016 (SEAI, 2018). Despite the number of new homes built to ever increasing energy performance standards, the Irish housing stock is among the poorest in Europe in terms of energy efficiency (Goggins et al., 2016). Over 40% of occupied houses in Ireland were built before 1980, and hence before the introduction of thermal performance standards in national building regulations (SEAI, 2018). By the end of 2013, only 0.6% of dwellings achieved the top energy rating of A1 status, calculated using the Building Energy Rating (BER) system introduced in response to the requirements set out in the Energy Performance Building Directive (EPBD) 2002/91/EC. In contrast, 12% of houses were rated F/G, with a G rating up to 18 times less efficient than the highest standard (Goggins et al., 2016). Home ownership rates in Ireland are almost 70%, or close to the European average (Eurostat, 2015). 42% of all dwellings in Ireland are detached houses, with just 7% of people living in apartments. Household size is the second highest in Europe at 2.7 persons per dwelling (SEAI, 2018).

Current Trends in Energy Policy

The most recent government long-term energy policy paper is a White Paper called "Ireland's Transition to a Low Carbon Energy Future 2015–2030" (DCENR, 2015). The paper outlines the country's ambition to transition towards a low carbon energy system, while maintaining the three core objectives of sustainability, security of supply, and competitiveness. The focus of the paper is on achieving the optimal benefits at least cost to consumers through new frameworks and pathways, consumer interaction and by promoting innovation and enterprise opportunities. Ireland's energy policy is largely techno-centric, with a strong emphasis on technological change and innovation. However, the government perceive that, in time, Ireland's energy system will become more decentralised, altering many traditional assumptions about demand and supply, and requiring deep change in the mindsets of individual consumers, businesses, agencies, and utility companies (DCENR, 2015). For example, the White Paper proposes that citizens move from being "Passive Consumers" to "Active Citizens", and that every citizen has a role to play in the energy transition. In this regard, consumer choice – in the home, in the community, at work and when travelling – is an important aspect of the energy citizen's role and responsibilities. The White Paper also proposes that landowners, neighbours and communities will be able to engage with infrastructure providers and local government to ensure acceptable outcomes for all energy users and become more engaged in the energy landscape in Ireland, although it is not explicitly clear how this may happen.

Improving energy efficiency in the residential sector is considered a critical element of energy policy and of a sustainable energy transition, with the SEAI estimating a capital investment of the order of €35 billion over 35 years would be required to make the existing housing stock low carbon by 2050 (SEAI, 2017). At present, grant aid for households to engage in energy efficiency improvements (e.g. cavity insulation; solar photovoltaic systems) is offered through one of several schemes run by the Sustainable Energy Authority of Ireland (SEAI). Applications can be made by individual households or as part of a community scheme, with various funding rates available depending on a number of predefined socio-economic and other criteria. Most recently, the government are supporting 'deep' retrofit programmes, where projects generally comprise a whole house solution, which includes a fabric first approach, and deployment of renewable solutions supporting a transition from fossil fuels. In total, over 375,000 homes received government grants for energy efficiency improvements between 2000-2016.

Trends in national campaigns

National campaigns are reflective of Ireland's energy policy and focus on two main areas, encouraging retrofitting of homes and increasing energy awareness. Recent energy awareness campaigns are focused on the main areas of residential energy use including space heating (61% of energy use), hot water (18%), lighting and appliances (17%) and cooking (Eurostat, 2016). For example, the SEAI are currently running a "Tips and Advice Campaign" and the "Be your own energy manager" campaign focused on providing householders with a series of steps on how to reduce their energy consumption. Recommendations include using timers with hot water and heating systems and ensuring heating and hot water systems are only switched on as required. Further examples include turning off lights when not in use and aiming for a common cooking time for everyone's main meal. Retrofitting is also encouraged and information campaigns are on going aimed at encouraging householders to avail of the significant grants for energy efficiency and renewable energy upgrades.

OVERVIEW OF NATIONAL SECIS

Below please find a list of Irish SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). *The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country*.

SEAI's "Better Energy Communities" (BEC) Scheme	Changes in Technology
SEAI's "Power of One Street"	Changes in Everyday Life Situations
Drombane/ Upperchurch Community Retrofitting Project – Tipperary	Changes in Technology
Cloughjordan Eco-Village - Tipperary	Changes in Complex Interactions
Think Energy Hub (CODEMA & Dublin City Council)	Changes in Individuals' Behaviour
The Home Energy Saving Kit (CODEMA & Dublin City Council)	Changes in Individuals' Behaviour
Home Energy Saving Tips (CODEMA & Dublin City Council)	Changes in Individuals' Behaviour
Dublin City Council Better Energy Communities Project - Pearse House (CODEMA)	Changes in Technology
Dublin City Council Better Energy Communities Project - Cromcastle Court (CODEMA)	Changes in Technology
Dublin City Council Better Energy Communities Project - Greendale Court (CODEMA)	Changes in Technology
Dublin City Council Better Energy Communities Project - Ballymun North-East (CODEMA & Dublin City Council)	Changes in Technology
3D Sustainable House (CODEMA & Dublin City Council)	Changes in Technology

Imagine Energy Competition (CODEMA & Dublin City Council)	Changes in Complex Interactions
Renewable Energy Dublin (CODEMA & Dublin City Council)	Changes in Technology
Emerge – Sustainable Energy Community Dublin (CODEMA & Dublin City Council)	Changes in Everyday Life Situations
Green eMotion - Electromobility (CODEMA, ESB, TCD. Cork City Council)	Changes in Complex Interactions
EPLACE - ICT solutions for personalised energy use data (CODEMA)	Changes in Individuals' Behaviour
Templederry Wind Farm, Co. Tipperary	Changes in Technology
Power of One House	Changes in Individuals' Behaviour
Be Your Own Energy Manager (under HOLISTIC)	Changes in Individuals' Behaviour
Power of One Community	Changes in Everyday Life Situations
An Taisce's Green-schools Programs	Changes in Individuals' Behaviour
Engineer's Week	Changes in Individuals' Behaviour
Meath Energy Awareness Program	Changes in Individuals' Behaviour
Aran Islands Energy Co-operative	Changes in Technology
Atlantic Coast Energy Co-operative	Changes in Technology
Bagenalstown Community Better Energy Project	Changes in Technology

Ballyleague Community Energy Project	Changes in Individuals' Behaviour
Camphill Ballytobin Energy Project	Changes in Technology
Energyhub – Carlow Kilkenny Energy Agency	Changes in Technology
Clonakilty Community Cycle Scheme	Changes in Everyday Life Situations
Sustainable Clonakilty Group - Clonergy 2020	Changes in Complex Interactions
Cultivate Cellbridge	Changes in Complex Interactions
Donate As You Save Energy (DaysE)	Changes in Individuals' Behaviour
Donegal County Council Buncrana Retrofit Scheme	Changes in Technology
Dunleer Retrofit Scheme	Changes in Technology
Eco-Unesco	Changes in Individuals' Behaviour
Energy Co-operatives of Ireland	Changes in Complex Interactions
Energy in Education	Changes in Individuals' Behaviour
SEAI Energy Award	Changes in Technology
Green Awards	Changes in Technology
Kerry Sustainable Energy Co-operative	Changes in Technology

Kilkenny Retrofit Scheme	Changes in Technology
LEAF (Laois Environmental Action Forum) Laois	Changes in Everyday Life Situations
Mohill Community	Changes in Technology
RESPOND Housing Scheme	Changes in Technology
Tidy Towns	Changes in Individuals' Behaviour
Transition Towns	Changes in Complex Interactions
RESTART (Renewable Energy Strategies and Technology Applications for Regenerating Towns)	Changes in Technology
SEAI Better Energy Homes	Changes in Technology
SEAI House of Tomorrow	Changes in Everyday Life Situations
SEAI Schools	Changes in Individuals' Behaviour
SERVE Region	Changes in Complex Interactions
Social Housing Action to Reduce Energy Consumption (SHARE)	Changes in Complex Interactions
National Association of Building Co-operatives	Changes in Technology

‘GOOD PRACTICE’ EXAMPLE OF IRISH SECI

SHARE (Social Housing Action to Reduce Energy consumption)

Brief Description

The SHARE project is a partnership between sustainable energy organisations working with social housing providers and residents in eight European regions in the UK, Bulgaria, Estonia, France, Germany, Ireland, Slovenia and Sweden. Within an overall context of reducing carbon emissions and reducing the risk of fuel poverty, the project focused on existing housing and aims to increase awareness of the opportunities and practical options for sustainable energy retrofit and behavioural change. The project targeted low-income groups and ran from January 2006 to June 2008. It was coordinated by the Severn Wye energy agency in the UK, and included the Irish-based Tipperary Energy Agency (TEA) as a partner organisation. The role of the TEA was to apply the methodologies developed by the project consortium in the Irish context, with a focus on social housing. The TEA examined social and voluntary housing in Ireland, and explored approaches that would provide people with tailored information on energy efficiency and actions to reduce energy bills.

Contextualization

At the time of the project, a behavioural change and energy awareness campaign called ‘The Power of One’ was running in Ireland. The Power of One was a national mass advertising campaign that aimed to encourage people to reduce their energy use. The SHARE project aligned itself with the information and message of the Power of One campaign, but was administered at a local level. The project involved house-to-house visits and individualized and tailored information provision and supports, rather than the universal approach to information provision as had been the norm at the time. The TEA engaged with both the public and the voluntary sector, including local authorities that are responsible for management of social housing in Ireland. In total, there were 10 different communities of different scales and sizes included in the project. The householders involved the project were living in social housing provided by government or by other private sector providers, and were in receipt of a welfare allowance towards the cost of their energy bills.

Aims and objectives

This project aimed to increase the sustainability of energy use, minimize carbon emissions, limit uncomfortable temperatures and reduce fuel bills in social housing. To achieve these goals, it attempted to raise awareness of economic benefits of energy efficiency, develop retrofitting methods that address energy concerns, examine possible changes in behaviour, maximize financial and technical resources, promote good practices and encourage the sharing of experiences. From an Irish perspective, the project also aimed to influence designers and implementers of social housing on how they can improve their technical design, and to encourage them to provide energy efficiency information to the residents in the future.

Methods for intervention

SHARE Forums were set up for each of the eight countries involved. Forums include social housing providers, residents, local authorities, energy providers, building and services contractors, and a variety of specialists working within the sector. Training sessions were undertaken with both the householders and those that are responsible for managing, designing and building social housing. Awareness and advice plans on existing materials and good practices for each participating country were produced. A series of case studies covering the forums training and awareness campaigns were made available on the project website. The TEA were responsible for the training sessions in Ireland and concentrated on providing information related to insulation, more energy efficient central heating systems, suitable and easier to use heating controls, more intelligent metering or monitoring equipment and renewable technologies where appropriate.

Steps of implementation

The initiative began with the scoping out of the scale and levels of social housing within the partner countries and identifying the key stakeholders. The next step was the setting up of the social housing forums and getting the public sector, voluntary sector and other relevant bodies involved in a think tank around implementation of the project. Forums ran throughout the duration of the project and met 4 times over the life of the project to facilitate knowledge exchange between stakeholders. The intervention phase involved delivering tailored training sessions with the householders and other target groups on a range of sustainable energy topics. The training sessions were delivered as a shared workshop experience and were inspired by both Irish and European best practice.

The SHARE training in Ireland identified some key areas that tenants typically have problems with including understanding energy bills, efficient use of heating and hot water controls, and awareness and management of energy related to electrical appliances and lighting. Other key areas particularly relevant to Ireland included ventilation and condensation, draught proofing, insulation, fuel poverty, options for home heating, renewable energy options, and grants and assistance. Other than the training sessions, information was distributed through the project website, telephone interactions, information stands in Local Authorities and site visits.

The role of the households

Householders were required to attend the training workshops and then attempt to implement some of the recommendations and reduce their energy consumption. The initiative tailored information to align with the needs and barriers faced by the householders. The householders, in general, were not required to financially invest in the project, although at times small investments were recommended, for example to purchase a draft proofing strip for a door. Some participants felt that it was the job of the local authority to be responsible for any upgrades that needed to be done, therefore raising tensions about financial investment and responsibility. The householders were not involved in the design of the initiative, which remained the same from the beginning until its completion.

Results/outcomes

There were no studies conducted of the environmental or monetary impact of the project. Energy consumption was not measured before or after implementing the initiative. The measure of the success of the project was the householders and forum members' evaluation of the project. In this regard, 85% of participants reported the training to be 'very useful', 15% found it to be 'fairly useful', with no participant indicating that the training was 'of no use'. The average feedback rating given by 89 participants was 4.5 (out of 5). As there was no consumption data recorded, it is difficult to determine whether there were significant, or any, changes in energy consumption in the long term. However, the positive feedback from the householders revealed the perception that the information provided was of consequence to their daily lives.

Textual and communicative aspects of initiative

The TEA primarily focused on framing energy in financial terms, for example "save on your energy bills", and also talked about the broader environmental implications of saving energy. Topics of comfort or health were not addressed, however they were subsequently recognised as omissions and identified as targets for future projects. For participants, energy was framed in terms of expensive energy bills. For example, the implementers found that if they spoke about trying to reduce energy consumption that the discussion might morph into a debate about the perceived failure of government to increase welfare fuel allowances or provide other financial supports.

The physical/technological aspects of the initiative

In general, technologies were not provided to householders as part of the initiative. Some recommendations were made to social housing providers in relation to retrofitting, however, technologies were not offered to individual households. Householders were, however, educated on how to use specific existing technologies more efficiently.

Shared understandings related to initiative

The implementers reported a lack of shared understandings between the project initiators and the householders. One of the challenges was that householders would tend to voice other issues affecting them in the community or housing estate, as they had no other platform in which to voice their concerns. Participants felt that energy was a small part of these issues. Similarly, discussion about the lack of support from government would arise from time to time in the forums. The implementers reported that trying to focus specifically on energy in social housing presents a challenge, as people have lots of other issues in their lives that they need to deal with, and energy is not often a priority.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

Ireland has a long way to go in order to meet its binding carbon emissions targets for 2020 and beyond. Responsibility for reducing carbon emissions must be shared across different sectors in society, including the residential sector, which currently accounts for a quarter of all emissions. While CO_2 emissions in the residential sector reduced significantly from 2006 to 2014, recent years have seen a reverse in trends with emissions increasing by 6.7% from 2014 to 2016. Irish homes on average also use more energy and emit substantially more CO_2 than their European counterparts. If Ireland is to meet its longer-term carbon emissions targets, household energy use and related carbon emissions will need to reduce dramatically.

This document provides examples of recent Sustainable Energy Consumption Initiatives undertaken in Ireland. As evidenced in section 2, the majority of these initiatives target changes in individual behaviour or technological changes. These approaches mirror general government policy, where technological and innovation approaches are pursued to provide ‘solutions’ for problems such as excessive energy use. However, recent trends suggest that technological approaches alone are insufficient to deliver the necessary reductions in residential carbon emissions.

The good practice example described in section 3 illustrates some of the complexities in achieving more sustainable energy use. The SHARE initiative brought together a range of actors from across society, including local authorities, householders and practitioners, to help people in social housing to reduce their energy use and alleviate energy poverty. The tailored approach aimed to overcome some of the contextual difficulties experienced by householders and other actors. However, it also demonstrated the myriad other difficulties facing low-income households, and showed that people are somewhat detached from their energy use. The project also identified some shortcomings in existing SECIs, such as linking energy use with related issues such as comfort, health and well-being, as well as environmental and economic concerns. This more holistic approach to energy use should be considered in designing future initiatives.

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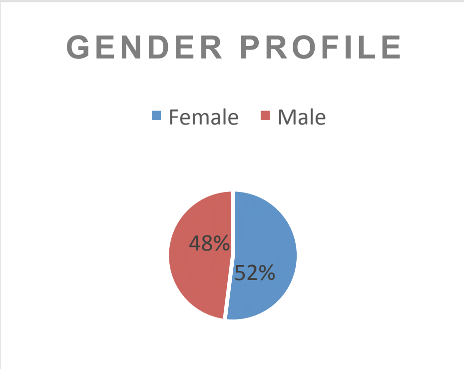
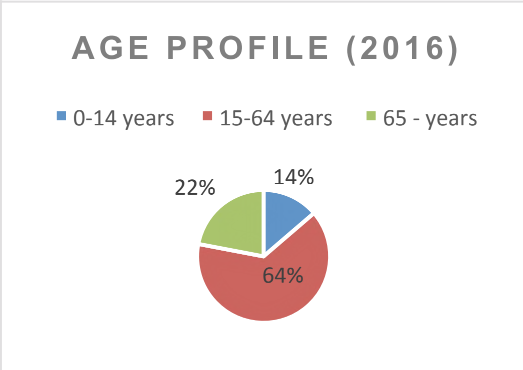
ITALY

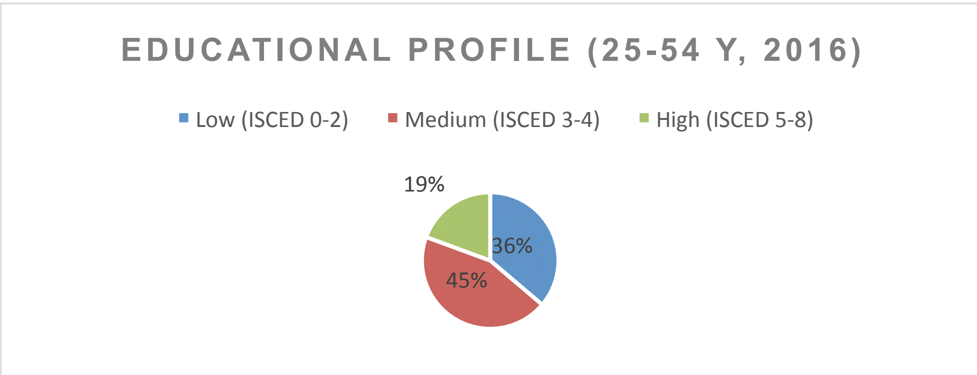
Authors: Renda Bellmallem, Tomislav Tkalec, Lidija Živčič

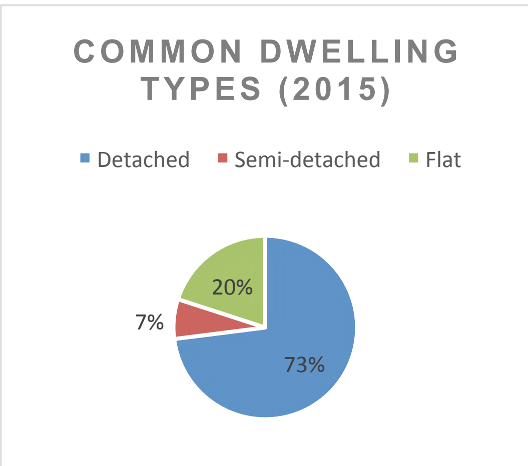
DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY

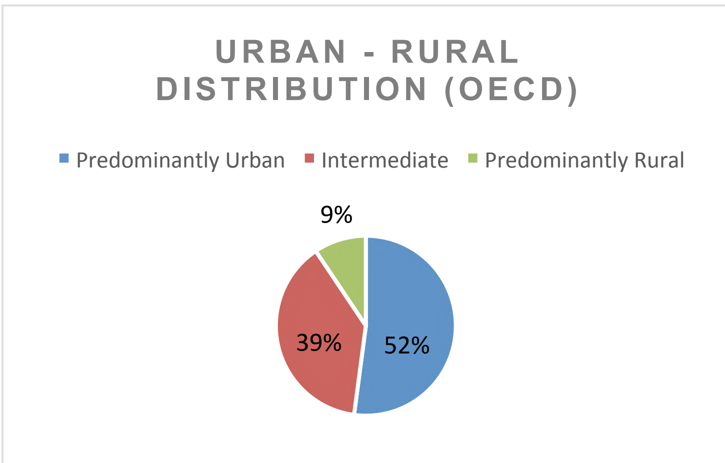




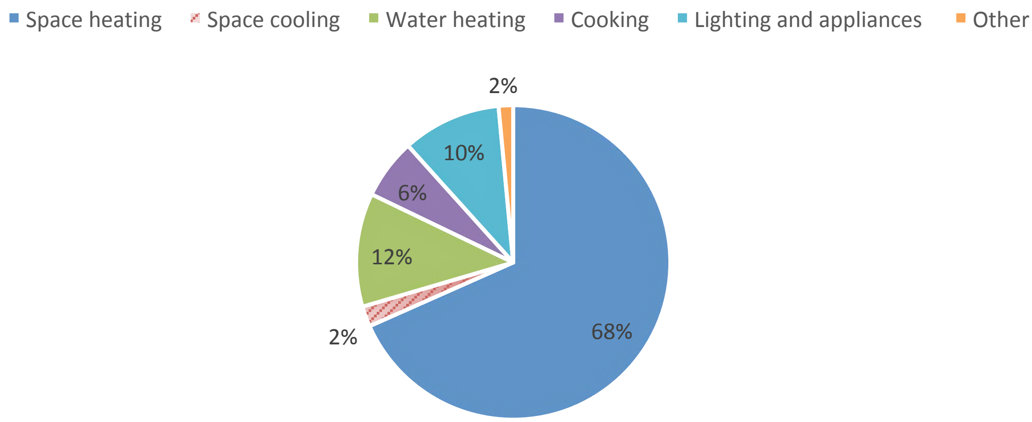
CLIMATE: predominantly Mediterranean; Alpine in far north; hot, dry in south



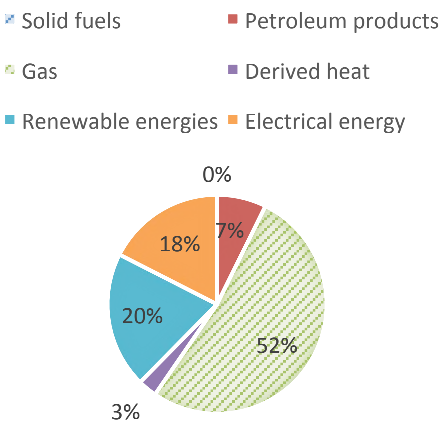




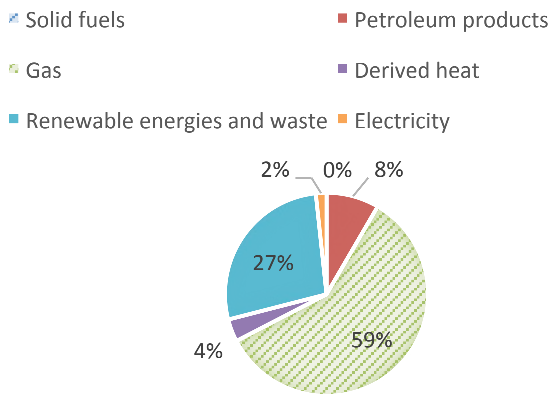
RESIDENTIAL FINAL ENERGY CONSUMPTION BY TYPE OF END-USE (2015)



SHARE OF FUELS IN THE FINAL ENERGY CONSUMPTION IN THE RESIDENTIAL SECTOR (2015)



SHARE OF FUELS IN FINAL ENERGY CONSUMPTION - RESIDENTIAL SPACE HEATING (2015)



FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

6.223 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

Italy is a highly import-dependent country for its energy supply, which exposes it to energy security risks. In 2016, 76% of the energy consumed in the country came from abroad, mostly net electricity, oil and gas. Italy's fossil fuel reserves are limited. Oil is the main energy imported. However, the balance of trade in petroleum products means that Italy is an exporter (due to the production of Italian refineries). At the rate of current production (5.3 Mt in 2011), the Italian oil reserves would be exhausted in 2025. The same is true for gas, which is the second most imported energy in Italy. Regarding coal, the country has very low reserves, so it's also mainly importing it.

Renewable energies were quickly developed in Italy (solar, geothermal, wind, biomass). In total, renewable energies produced 40.1% of Italian electricity in 2015, compared with 16.1% in 2005. Energy renewable energy is a priority of the Italian government, which sees a possibility to reduce its imports and energy dependence. In a few years, Italian solar energy has risen to second place on the European podium and fifth place in world production. Italy has significant hydroelectric potential, particularly in the Alps, but it is already almost fully exploited. Italy has been a pioneer in the development of hydroelectricity, which supplies 15.3% of its electricity in 2016, and geothermal energy.

The transmission of high voltage electricity is provided by Terna, a company listed on the Italian Stock Exchange, which emerged in 1999 from the splitting of Enel's transmission business. Enel (Ente Nazionale per Energia Elettrica) was, until its privatization in 1999 (privatization driven by the European Commission), the Italian national electricity company. It remains the main producer of electricity in the country. It has also become a multi-service Italian group (electricity, water, gas), while being one of the heavyweights of electricity production worldwide. With Enel, ENI is the most important Italian energy player. ENI (Ente Nazionale Idrocarburi) is a hydrocarbon company, privatized in 1998 (previously public). It is active in the petroleum, natural gas, petrochemical, power generation and engineering. ENI is the first Italian company by market capitalization and the fifth largest oil group in the world.

Particular socio-material aspects that influence energy consumption

Italian energy production is experiencing regional contrasts between north and south, especially with regard to solar energy issues. A law that requires owners of new homes to be equipped with solar panels is one of the elements that make Italy one of the worlds most endowed with solar energy.

A substantial part of the housing stock is low energy efficient. For that reason there are several programs for energy refurbishment of buildings. Because of the warm climate, a lot of energy is used for cooling in the summer.

Current Trends in Energy Policy

The government energy plan announced in November 2017 calls for the closure of existing coal plants by 2025. Fossil fuels are used mainly in transportation, heating and industry. Italy has a tendency to become a southern European gas hub with proposals for new gas pipeline and LNG terminals projects.

Regarding nuclear power, Italy renounced the use of civilian nuclear energy in 1987 (following the Chernobyl disaster) after a referendum approved by 62% of the population. The nuclear power plants then in operation were gradually stopped. In May 2008, the government of Silvio Berlusconi announces a return to nuclear energy in order to solve the country's energy dependence. An agreement was signed in February 2009 to create a company half owned by Électricité de France (EDF) and ENEL. Rome's goal was to produce 25% of its electricity needs by 2030 through nuclear power. But the emotion raised by the Fukushima disaster of March 2011 forced the government to abandon this project, which met very strong oppositions. On the other hand, if it does not produce it, Italy imports nuclear energy.

The publication of the National Energy Strategy in 2013 sent a strong signal to stakeholders as to the government’s medium- and long-term objectives for the energy sector. It established clear goals: reduce energy costs, meet environmental targets, strengthen security of energy supply and foster sustainable economic growth.

Italy has experienced impressive growth in the renewable energy sector and has been successful in integrating large volumes of variable renewable generation. Containing costs is a priority, and policies need to focus on bringing deployment costs towards international benchmarks.

Trends in national campaigns

The government has introduced tax benefits for the implementation of energy change by individuals. These tax advantages are complex and have been reformed five times since 2005. The encouragement to use renewable energy sources is essentially based on the Verdi Certificate (green certificates), the energy account, the thermal account, the contributions of municipalities, regions and the state.

For any owner, it is possible to benefit in addition to a tax deduction of up to 65%, relief for the purchase of home appliances and furniture for the home, a bonus for those wishing to do work of restructuring by putting in place systems that use "green" energy (replacing doors and windows, water heater installations, solar panels, soil insulation, etc.). There is also a 50% tax deduction for the renovation of premises.

Enel is a pioneer in the field of "smart meters". Enel first installed communicating meters at 27 million subscribers between 2000 and 2005. The installation of 16 million new meters, which can be managed remotely, began in 2017, with the aim of becoming a leader in the Internet of Things and better managing the intermittent flows provided by solar and wind energy. Enel is the largest geothermal energy producer in the world. Furthermore, ENEL has allocated 300 million Euros to deploy 12,000 charging stations for electric cars.

Campaigns from non-governmental stakeholders are focusing on smart meters, renewable energy, energy efficiency, energy poverty and more.

OVERVIEW OF NATIONAL SECIS

Below please find a list of Italian SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). *The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country*.

European Citizens Climate Cup (ECCC)	Changes in Individuals' Behaviour
POWERHOUSE NEARLY ZERO CHALLENGE (POWER HOUSE NZC)	Changes in Technology
USMARTCONSUMER	Changes in Individuals' Behaviour
ELIH MED - A EURO-MEDITERRANEAN PROGRAM TO FIGHT ENERGY POVERTY	Changes in Technology
FINANCIAL AND SUPPORT INSTRUMENTS FOR FUEL POVERTY IN SOCIAL HOUSING IN EUROPE (FINSH) FRANCE, UNITED KINGDOM, GERMANY, ITALY, POLAND	Changes in Individuals' Behaviour
CLEAR Consumers to Learn about, Engage with and Adopt Renewable energy technologies	Changes in Individuals' Behaviour
About EnergizAIR The renewable energy weather forecast - Europe	Changes in Technology
EnerSHIFT : Energy Social Housing Innovative Financing Tender	Changes in Technology
SMARTER TOGETHER	Changes in Complex Interactions
STEP_BY_STEP	Changes in Individuals' Behaviour
2gether4vulnerability	Changes in Complex Interactions
4RinEU : Robust and Reliable technology concepts and business models for triggering deep Renovation of Residential buildings in EU	Changes in Complex Interactions
MOBISTYLE : MOtivating end-users Behavioral change by combined ICT based tools and modular Information services on	Changes in Complex Interactions

energy use, indoor environment, health and lifestyle	
IN-BEE : Assessing the intangibles: the socioeconomic benefits of improving energy efficiency	Changes in Individuals' Behaviour
Energy, Education, Governance and Schools. A European school panel for involving local communities in energy efficiency programs (EGS)	Changes in Complex Interactions
TOPTEN ACT : Enabling consumer action towards top energy-efficient products	Changes in Individuals' Behaviour
Rescoop	Changes in Technology
enCOMPASS : Collaborative Recommendations and Adaptive Control for Personalised Energy Saving	Changes in Individuals' Behaviour
Smart-up project	Changes in Individuals' Behaviour
DOMINO - Connecting Europe, Saving Energy	Changes in Individuals' Behaviour
Energy-Conscious HOuseholds in ACTION (ECHO ACTION)	Changes in Complex Interactions
Sustainable Energy Communities in Historic URBan Areas (SECHURBA)	Changes in Individuals' Behaviour
FIESTA	Changes in Technology
Promoting best practices to support energy efficient consumer behaviour on European islands (PROMISE)	Changes in Technology
European Young Energy Manager Championship (EYEMAN CHAMPIONSHIP)	Changes in Individuals' Behaviour
Instigating Simple Energy Efficient Behavioural Practices in Schools (FLICK THE SWITCH)	Changes in Individuals' Behaviour
Persuasive force of children through education (FEEDU)	Changes in Individuals' Behaviour
Common appliance policy – All for one, One for all – Energy Labels (COMEON LABELS)	Changes in Individuals' Behaviour

Eco n' Home or how to reduce energy consumption in Household (ECO N' HOME)	Changes in Individuals' Behaviour
European Network of Information Centres promoting Energy Sustainability and CO2 reduction among local COMmunities (ENESCOM)	Changes in Individuals' Behaviour
European Solar Days II (ESD II)	Changes in Technology
FRESH	Changes in Technology
TRENDY TRAVEL; Emotions for sustainable transport (TRENDY TRAVEL)	Changes in Everyday Life Situations
Promotion of energy efficient appliances (PROMOTION 3E)	Changes in Individuals' Behaviour
SPIRIT - Energising Faith Communities (SPIRIT)	Changes in Individuals' Behaviour
Pattern of Energy Efficiency in the Schools (P.E.E.S.)	Changes in Everyday Life Situations
Integration of Active Learning and Energy Monitoring with School Curriculum (ACTIVE LEARNING)	Changes in Individuals' Behaviour
Residential Monitoring to Decrease Energy Use and Carbon Emissions in Europe (REMODECE)	Changes in Individuals' Behaviour
The Energy Path: an e-learning platform for education of the new generations in the sustainable energy field (ENERGY PATH)	Changes in Individuals' Behaviour
European fuel Poverty and Energy Efficiency (EPEE)	Changes in Technology
EPORE - Energy Poverty Reduction in Eastern Europe	Changes in Individuals' Behaviour
Initiative State General of Energy Efficiency	Changes in Individuals' Behaviour
Energia positiva	Changes in Technology

‘GOOD PRACTICE’ EXAMPLE OF ITALIAN SECI

MOBISTYLE: MOtivating end-users Behavioral change by combined ICT based tools and modular Information services on energy use, indoor environment, health and lifestyle

Brief Description

The overall aim of MOBISTYLE is to raise consumer awareness and awareness of ownership, thus empowering consumers and providing confidence of choosing the right thing, by providing attractive tailor-made combined knowledge services on energy use, indoor environment, health and lifestyle, by ICT-based solutions. This awareness will support and motivate end-users to well informed pro-active behaviour towards energy use, energy efficiency and health.

Brief Contextualization

Most of today's buildings are equipped with sophisticated building automation systems and sensors measuring large amounts of different building performance data types (mostly related to building's energy performance or thermal comfort). This data is commonly used for energy management of large buildings. In addition, the number of wearables monitoring personal activities are arising. The data from these sensors can be used for the purpose of this project. However, this data (from buildings and wearables) is often not available or understandable to the building users, especially residents. Experience shows that promoting the importance of a building's energy efficiency as such is not an attractive driving factor for changing everyday habits and lifestyle of the building users. However, changing the user's behaviour towards more energy efficient building usage could contribute towards achieving one of the main targets of European Union: reducing energy consumption and eliminating energy wastage. Combining information on energy use with other relevant information such as the indoor environmental quality, personal health and eventually combined with other attractive life style information can be used to catch the interest of consumers and even more importantly change their behaviour and maintain their new habits and interest in the long term.

Aims and objectives

The overall aim of MOBISTYLE is to raise consumer awareness and motivate behavioural change by providing attractive personalized combined knowledge services on energy use, indoor environment, health and lifestyle, by ICT-based solutions. Providing more understandable information on energy, health and lifestyle will motivate end-users to change their behaviour towards optimized energy use and provide confidence in choosing the right thing. It will offer consumers more and lasting incentives than only information on energy use. The objectives are:

- To present **understandable information** on: energy, indoor environment, health
- To motivate behavioural **change** of consumers/energy end-users by combined and personalized modular information on energy use, health and lifestyle.

- To develop **easy to use, desirable ICT-based tools** which will make energy monitoring a well-accepted and attractive ‘daily activity’.
- To motivate **a prolonged change of consumers habits**’ by modular personalised information on energy, health and lifestyle.
- To **foster new business models** and applications for future development

Methods for Intervention

MOBISTYLE methodology will elaborate an approach leading to an efficient and long-lasting change of user behaviour and consequently towards more energy efficient building usage. This will be reached by combining information services on energy, indoor environment, health and lifestyle, which can catch the interest of consumers and even more importantly maintain their new habits and interest lasting in the long term. Tailor made tools and information services will be developed for the different energy end-users types where the end-user will have self-control on which information he/she wants to obtain, how long and during what time and which type of data will be offered. By providing attractive combined information, the end-users will be encouraged to become curious about their energy usage, indoor environment and health and become confident in making the right choices leading to energy savings. The business and exploitation models are a key output of MOBISTYLE to continue the activities after the project duration. In order to ensure the continuation of MOBISTYLE after the project duration and to maximize the impact an open on-line accessible MOBISTYLE Open Users Platform will be created, supported by a business plan for the further exploitation. This platform will have the following functionalities: Share and store all relevant methodologies, tools and online services; Creation of a database on monitoring data, as a bases for the information services.

Steps of implementation

1: Mapping of data supply and communication needs for different types of end-users

2: Development of methodologies

3: Development of practical ICT-based tools

4: Development of modular information services and business applications

5: Demonstration and validation

5 selected demonstration cases will be used to present real life situation in five different climatic regions (geo-clusters) covering different building types, different types of end-users and different scales (building, district).

Results/outcomes

MOBISTYLE methodology will elaborate an approach leading to an efficient and long-lasting change of user behaviour and consequently towards more energy efficient building usage. This will be reached by combining information services on energy, indoor environment, health and lifestyle, which can catch the interest of consumers and even more importantly maintain their new habits and interest lasting in the long term. Tailor made tools and information services will be developed for the different energy end-users types where the end-user will have self-control on which information he/she wants to obtain, how long and during what time and which type of data will be offered. By providing attractive combined information, the end-users will be encouraged to become curious about their energy usage, indoor environment and health and become confident in making the right choices leading to energy savings. Gamification will be introduced as a solution that will encourage occupants to be better in comparison to the other users (mutual-control) and in relation to past achievements (self-control).

The role of the households

PL and DK cases are residential (city and neighbourhood)

https://www.mobistyle-project.eu/en/mobistyle/demonstration

Location

Partner countries: Netherlands, Slovenia, Denmark, Italy, United Kingdom, Poland.

Textual and communicative aspects of initiative

Energy or environment as such are not attractive driving factors for changing user behaviour. Promoting the importance of a building's energy efficiency as such is not an attractive driving factor for changing everyday habits and lifestyle of the building users. Combining information on energy use with other relevant information such as the indoor environmental quality, personal health and eventually combined with other attractive life style information can be used to catch the interest of consumers and even more importantly change their behaviour and maintain their new habits and interest in the long term.

The physical/technological aspects of the initiative

Using ICT tailor made tools where the user can compare him or herself to the past and to other users, and can choose which information one wants. Adapted to physical circumstances, based on pilot projects.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

Italy is a highly import-dependent country, with over three quarters of the energy consumed in the country came from abroad, mostly net electricity, oil and gas. Due to this, renewables are a priority of the Italian government as they can help to reduce energy costs, meet environmental targets and strengthen security of energy supply, which are the key goals of Italian energy policy. Italy has experienced impressive growth in the renewable energy sector and has been successful in integrating large volumes of variable renewable generation. In total, renewables produced 40.1% of Italian electricity in 2015.

The government has introduced tax benefits for the implementation of energy change by individuals. The encouragement to use renewable energy sources is essentially based on the green certificates. In the renewables aspect, SECIs are not as abundant as the generally favourable policy towards renewables would suggest. The renewables oriented SECIs are not very common, but there is a cluster of them, mainly focused on awareness raising. Some of them promote community renewables and some foster investments in production from renewable energy sources.

Although energy efficiency is not specifically exposed in the energy policy, the largest part of identified SECIs addresses energy efficiency awareness raising, be it on personal or household level. There are enough community oriented SECIs, organising competition of households for energy savings, engaging local actors and families in energy planning, working with communities in historic areas. Several are focused on energy labelling for appliances. E-learning and ICT tools are used by some SECIs. Some SECIs focus on targeted audiences: young managers, island communities, faith communities. The next visible cluster of activities is focused on energy poverty, from audits and advising to financial support. Another visible cluster is working with schools and children to mobilise local communities, families and wider audiences. The building retrofit SECIs are not very common, but there are a few on nearly-zero energy homes promotion and developing models to trigger deep renovation. This is, however, answering one of the aspects of energy use that is specific for Italy, namely that substantial part of the housing stock is poor in energy efficiency aspect. The transport SECIs are rare; in fact, there is only one identified.

The majority of identified SECIs focus on changes in individuals' behaviour (24), then some on changes in technology (11), while focus on changes in complex interactions and changes in everyday life situations is scarce (5 and 2 respectively). Majority of SECIs (41) are run at a cross-national level, only 3 are focused on national level. The described SECI, Mobistyle, is informing about and motivating change by providing attractive personalized combined knowledge services on energy use, indoor environment, health and lifestyle, by ICT-based solutions. The interesting aspect of this SECI is that it combines information on energy, indoor environment, health and lifestyle, which promises to maintain their new habits and interest on the long run. Building of comprehensive / holistic understanding of how energy use is related to other aspects of our lives is an added value of this SECI, as well as an interesting lesson to inform policy.

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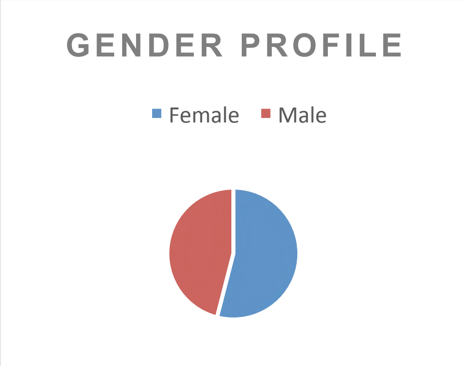
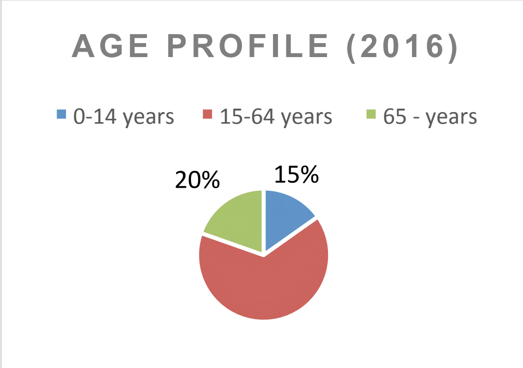
LATVIA

Authors: Marko Hajdinjak, Desislava Asenova

DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY





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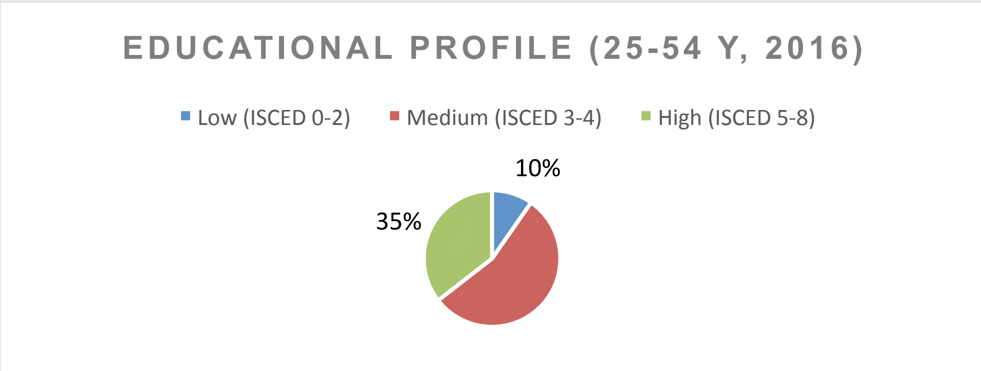

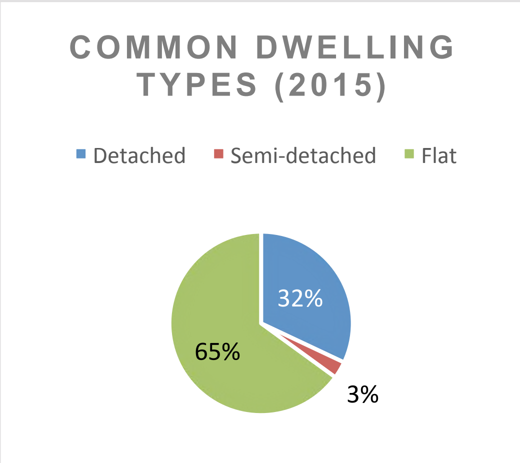

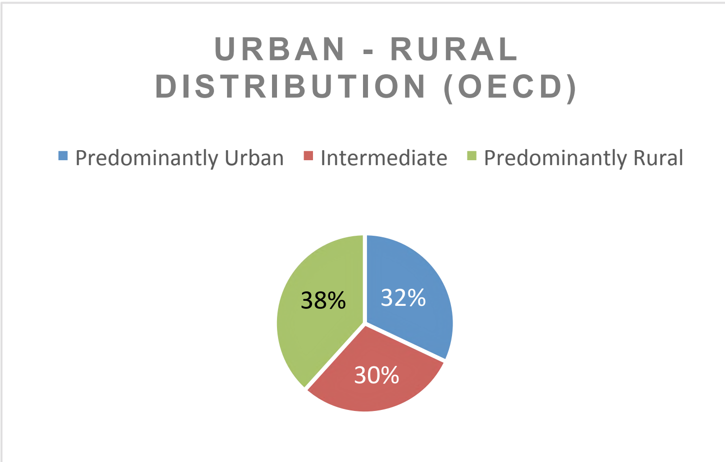

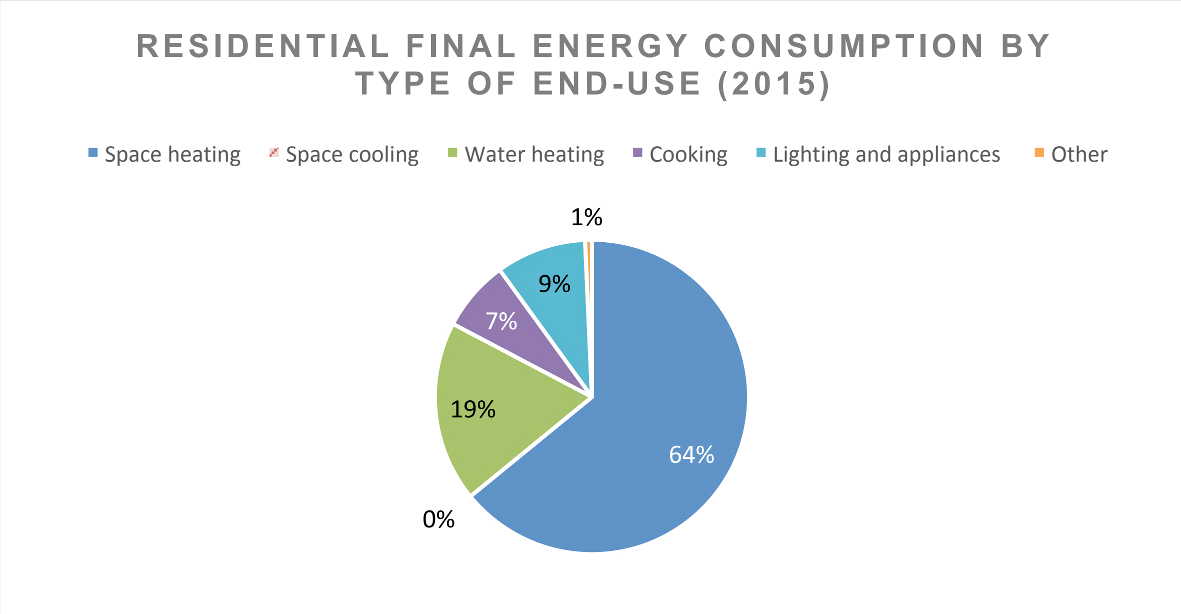

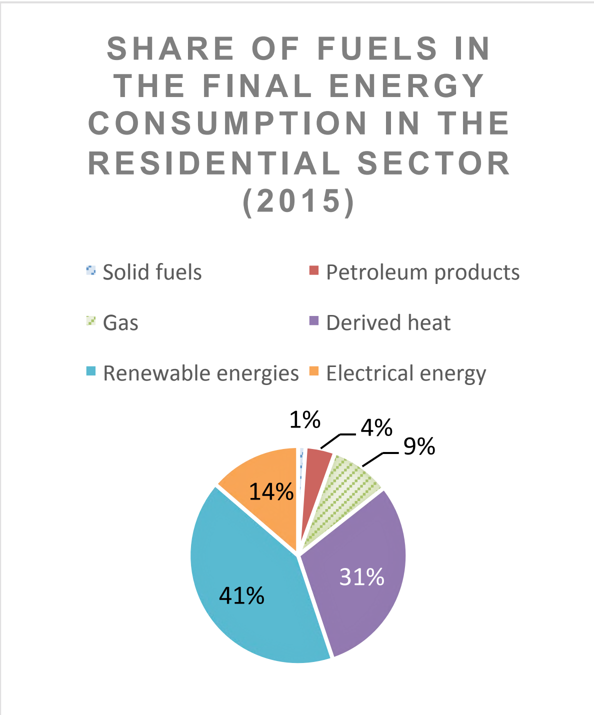

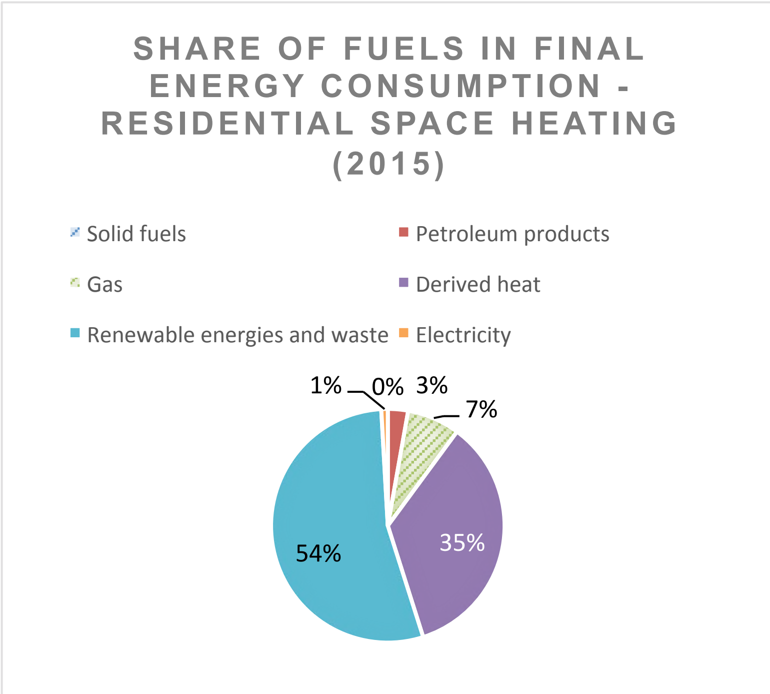

FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

6.505 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

Liberalisation of the Latvian electricity market began on 1 July 2007, when new legal provisions gave all electricity final consumers (that are connected to the power grid) the right to change their electricity supplier without any restrictions. In the period 2010-2012, six traders operated on the electricity market in Latvia: the JSC Latvenergo, Enefit Ltd, "Enerģijas avots" Ltd, BCG Riga Ltd, Inter RAO Latvia Ltd and Baltic Energy Pool Ltd. By far the biggest market share was held by JSC Latvenergo (around 80%). The second largest trader is Enefit Ltd which managed to attract 15% of legal entities as clients (data from the end of 2015). By 2015 new players emerged on the market – four traders that supply electricity to household clients and 11 traders that serve legal entities. In 2016 there were already 36 registered traders – six of them supplying electricity to household clients. The growing competition in the electricity market in Latvia makes it more difficult for the traditionally dominant players to retain their market share.[74]

The majority of energy demands in Latvia are met by domestic generation (80.3%), while the other 19.7% are imported (data for 2013).[75]

There are approximately 850,000 household consumers in the country. They account for about 25% of the total electricity consumption.[76]

Due to lack of own natural gas resources, all gas consumed in Latvia is imported from Russia. The country's gas market is isolated from the rest of the EU and is only connected to the Lithuanian and Estonian markets. Latvijas Gāze JSC holds 100% of the market share on the wholesale gas market. The same company is also the sole player in the gas retail market, which makes switching suppliers impossible.

The Latvian energy consumption mix has the highest renewables share among all three Baltic States – 35.8%, with hydropower and biomass being the main renewable sources. The country has set a renewables target of 40% to be achieved by 2020 and so far it is on the right track to achieve it.[77]

Particular socio-material aspects that influence energy consumption

Energy consumption in Latvian households varies widely and mainly depends on the income and on the age and type of dwelling. The average household energy consumption is 220-250 kWh/m2/year. The National Energy Guidelines claim that this figure should decrease to 150 kWh/m2/year by 2020.

According to data from 2015, the distribution of energy use in the residential sector was as follows: 67% of energy was used for space heating, 18% for water heating, about 7% for both cooking, domestic appliances and lightning, and 1% for air cooling.

Most of the multi-apartment buildings in Latvia were constructed during the Soviet times. The condition of these buildings continues to deteriorate because of the harsh weather conditions and

[74] Bride, D. and Zvaigzne, A. (2016). 'Electricity market development in Latvia'. *Journal of Social Sciences,* No 1(8).
[75] European Commission (2014) *Latvia Country Report.* Available at: https://ec.europa.eu/energy/sites/ener/files/documents/2014_countryreports_latvia.pdf
[76] Bride, D. and Zvaigzne, A. (2016). 'Electricity market development in Latvia.'
[77] European Commission (2014) *Latvia Country Report.*

lack of proper maintenance. Renovation and insulation of the buildings could significantly improve the situation. However, various barriers exist in this regard such as: i) difficulties of residents to take a collective decision for renovation; ii) lack of awareness and technical knowledge; iii) limited availability of funding.[78]

After a sharp price increase from 13.01 euro cents per kWh in 2014 to 16.35 euro cents per kWh in 2015, the electricity prices for households stayed relatively stable in the period 2015-2017. The price in 2017 was 15.86 euro cents for kWh – almost 22% lower than the average in the EU.[79]

In the period 2002–2012 Latvia had one of the fastest growing rates in household energy consumption. The main reason for the increased consumption is assumed to be the growing number of appliances owned by households (TVs, computers, mobile phones and kitchen appliances). The rapid technological progress and the desire to live better also contribute to replacing appliances more frequently, which in turn boosts electric energy consumption of households.[80]

Current Trends in Energy Policy

Energy efficiency is prioritised in the Latvian Energy Policy. The Energy Development Guidelines for 2007-2016 promoted energy efficiency as one of the key priorities for the energy sector development in Latvia and intended to support energy efficiency measures in energy end-use sectors. Energy Development Guidelines for 2014-2020 have also been developed by the Ministry of Economics, linking Latvia's energy policy to the EU 2030 energy package, providing overview of the current state in the energy sector in the country and proposing future steps, including energy efficiency measures.[81]

Since 2016, smart grid elements started to be gradually introduced into the existing grid. These elements include damage location indicators, remote-controlled circuit breakers and smart electricity metering. The Sadales tīkls AS, which is the maintainer and developer of the electricity network in Latvia, plans to complete the introduction of smart electricity meters by 2023 by installing more than 100,000 smart electricity meters every year.

It can be said that most new measures related to energy efficiency in Latvia are focused on the building sector. They include: i) renovation of residential, central government and municipal buildings, and also of buildings of small and medium enterprises; ii) upgrades in heat insulation of multi-apartment residential buildings; iii) improvement of energy and electricity installation, modernisation of the lighting infrastructure, and reduction of greenhouse gas emissions in municipal buildings.

Complying with the EU legislation in the field of energy, some of the key energy efficiency targets that Latvia has set out and that must be achieved by 2020 include: i) primary energy savings should

[78] Brizga, J., Trotta, G. and Lorek, S. (2015). *Consumers and Energy Efficiency – Country Report Latvia. An inventory of policies, business and civil society initiatives, focusing on heating, hot water and the use of electricity*. EUFORIE – European Futures for Energy Efficiency. Available at: http://www.utu.fi/en/units/euforie/Research/deliverables/country-reports/PublishingImages/Pages/home/EUFORIE%20D%205%201%20%20Country%20Report%20Latvia.pdf
[79] Bride, D. and Zvaigzne, A. (2016). 'Electricity market development in Latvia.'
[80] Jakušenoks, A., Laizāns, A. (2015). 'Impact of household electric energy usage trends on electrical power supply net power factor.' *Research for Rural Development*, Vol. 1. Available at: http://llufb.llu.lv/conference/Research-for-Rural-Development/2015/LatviaResearchRuralDevel21st_volume1-253-257.pdf
[81] Brizga, J., Trotta, G. and Lorek, S. (2015). *Consumers and Energy Efficiency – Country Report Latvia*.

reach 7.8 TWh, including 6.2 TWh in end-use sectors; ii) 40% share of renewables in final energy consumption; iii) reducing GHG emissions by 25-30% compared to 1990 level.[82]

Trends in national campaigns

Various types of activities targeting households' behaviour have been organised in Latvia. Most of them are NGO campaigns or research projects with household/consumer participation. The activities aim to attract public attention, promoting and introducing new environmentally friendly technologies as well as behavioural change. Examples of NGO energy campaigns in Latvia are: i) Several projects and campaigns organised within the scope of the Dutch-Latvian co-operation programme SCORE – Supporting the Cooperative Organisation of Rational Energy Use that aimed at creating interest in people about rational use of energy, providing information about energy saving possibilities, and motivating and involving residents in energy conservation activities; ii) The Efficient Lighting Initiative that focused on the promotion of compact fluorescent bulbs aiming to reduce the amount of GHG emissions and the impact on global climate; iii) "Active to Passive!" that promotes the use of sustainable and low energy buildings and constructions in Latvia and Estonia and is meant to help reducing the use of energy.

An example of a research project with household/consumer participation is the SUNShINE project, which was co-funded under the European Union programme "Horizon 2020". The project's objective was to improve the renovation of buildings in Latvia.[83]

OVERVIEW OF NATIONAL SECIS

Below please find a list of Latvian SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country.

ECCC: European Citizens Climate Cup	Changes in Individuals' Behaviour
PRO.MOTION: Creating liveable neighbourhoods while lowering transport energy consumption	Changes in Individuals' Behaviour
ESMA: European Smart Metering Alliance	Changes in Technology

[82] Bogdanova, O. (2016). *Smart Grid Related Specialization Areas in Latvia, Investment Programs and Instruments*. Available at: http://s3platform.jrc.ec.europa.eu/documents/20182/195230/4.+SMART+GRIDS_Bogdanova_14112016_in_Latv_Regio.pdf/fe6108a6-0837-442e-a207-2419ebb7047c

[83] Brizga, J., Trotta, G. and Lorek, S. (2015). *Consumers and Energy Efficiency – Country Report Latvia*.

COMEON LABELS: Common appliance policy – All for one, One for all – Energy Labels	Changes in Individuals' Behaviour
MOBILE2020: More biking in small and medium sized towns of Central and Eastern Europe by 2020	Changes in everyday Life Situations
EnergyNeighbourhoods 2	Changes in everyday Life Situations
ALTUM	Changes in Technology
Using Ecological Construction Materials in New, Energy Efficient Buildings in the Baltic States	Changes in Technology
ECOLISH: Energy Exploitation and Performance Contracting for Low Income and Social Housing	Changes in Technology
IDEAL EPBD: Improving Dwellings by Enhancing Actions on Labelling of the EPBD	Changes in Individuals' Behaviour
Increasing Energy Efficiency in Multi-Apartment Buildings: EU programming period of 2014-2020	Changes in Technology
Latvian Energy Efficiency Strategy for the years 2008 - 2010	Changes in Technology
ENERLIN: EuropeaN Efficient Residential Lighting INitiative	Changes in Technology
CARMA: Cycling Awareness Raising and MArketing	Changes in Individuals' Behaviour
PTP-CYCLE: Personalised Travel Planning for Cycling	Changes in Individuals' Behaviour
BIG>EAST: Promoting Biogas in Eastern Europe - Mobilization of decision makers and training for farmers	Changes in Technology
Renovation Impact on Climate Change and Energy Efficiency Habits of Residents	Changes in Individuals' Behaviour
The SUNShINE: Save your bUildiNg by SavINg Energy	Changes in Technology

Accelerate SUNShINE: Save your bUildiNg by SavINg Energy. Begin to move more quickly	Changes in Technology
The campaign "Let's live warmer!" ("Dzīvo siltāk!")	Changes in Technology
E-mobility in Latvia for Climate Change Mitigation	Changes in Individuals' Behaviour
CADDIES: Creating Attractive, Developed and Dynamic Societies together with Inhabitants	Changes in Complex Interactions
Building Energy Audits	Changes in Individuals' Behaviour
Energy management in residential buildings in Madona city	Changes in Individuals' Behaviour
Latvian Volunteers for Energy Efficiency	Changes in Technology
PREMIUMLIGHT: Top quality energy efficient lighting for the domestic sector	Changes in Individuals' Behaviour
EPORE: Energy Poverty Reduction in Eastern Europe	Changes in Individuals' Behaviour

'GOOD PRACTICE' EXAMPLE OF LATVIAN SECI

CADDIES: Creating Attractive, Developed and Dynamic Societies together with Inhabitants

Brief Description

The project CADDIES addressed the following challenge: how to motivate city residents to take a more active role in developing their neighbourhoods and empower them to take ownership of the process? Some of the main barriers include inadequately defined roles for voluntary work in local development and weak connections between residents and municipal authorities. The project deployed tools to motivate residents to volunteer and collaborate in improving their own houses, blocks or neighbourhoods in sustainable ways and piloted them in six neighbourhoods across cities in Finland, Sweden and Latvia. The overall aim of the project was to improve the quality of life, develop more inclusive communities, test new and innovative models for neighbourhood development processes, and motivate local residents to participate and take responsibility for sustainable development of their neighbourhood.

Brief Contextualization

Energy efficiency itself is not the central objective of the project. Rather, a responsible use of energy and resources is seen as inevitable and natural element in the complex process of sustainable development of a given neighbourhood, or even entire city. The project was implemented by Housing and Environment Department at the Riga City Council. The selected pilot neighbourhood was Latgale Suburb (Latvian: Latgales priekšpilsēta), one of six administrative districts of Riga, the capital of Latvia.

Latgale suburb is one of the shabbiest and poorest sections of town, but it also has plenty of character. Architecturally, the area represents a mixture of neglected early 20th century art nouveau mansions and traditional 19th century working-class wooden homes, some of which appear to be on the verge of collapse. Meandering cobblestone streets often flank large empty parks. The area also features the trendy warehouse district just behind the Central Market, which is home to cafés, shops and galleries as well as a recently completed promenade along the bank of the Daugava River. The area is considered unsafe in the dark hours of the day.

Aims and objectives

The central aim of the project was to revitalise the community spirit in a deprived city neighbourhood, providing the residents with tools and venues for engaging in discussions and development processes related to gentrification of the area. As a result of the project, living conditions in the neighbourhood have improved, and many people actively participated in transformation of their own house, block or neighbourhood in a sustainable way.

Methods for intervention

The first major challenge was to select the appropriate and effective way to motivate different residential groups to participate in community development processes in a sustainable way. The project found inspiration in the ‘profession’ of caddies. A caddie is a person who carries golf player’s bag and clubs, and gives the player insightful advice and moral support, because he/she is well acquainted with the challenges and obstacles of the golf course. Knowledgeable caddies were at the heart of this project as well – of course, not to provide tips to golf players, but to motivate neighbourhood residents to participate in different events and activities for improving the quality of life in the area.

The project developed and tested methods for empowerment of local communities, created models for local vision and strategy building, and strengthened local resources in the neighbourhood development processes. The main activities of the project were:

- to collect, develop and test various methods and tools in the project’s target area;
- to identify best practices via benchmarking;
- to support the sense of community in the target areas;
- to report the outcomes and produce three manuals based on the results.

Steps of implementation

During the course of the project, a wealth of information was acquired about the pilot areas and studies were conducted concerning various involvement methods. Local networks were mobilised to take part in the strategy building and visioning. By developing a model for a local communication platform, the project ensured access to important local information for all inhabitant groups and local actors.

Results/outcomes

Outcomes of the project are:

- Improved quality of life in the target area;
- Identification and testing of new and innovative models for sustainable neighbourhood development;
- Developed communication structures and increased co-operation and participation among residents.
- Mobilization of local networks to take part in the strategy building and visioning.

The role of the households

Local households actively participated in different activities. The most important role was played by so-called caddies, or community builders, who worked dedicatedly to put the local residents in the driving seat of social change, following three basic principles: Empowerment, Passion and Cooperation.

Location

Latgale Suburb (Latvian: Latgales priekšpilsēta), one of six administrative districts of Riga, the capital of Latvia.

Was/is the initiative successful?

The CADDIES project successfully piloted a collection of methods to empower citizens to develop their neighbourhoods in a sustainable and eco-friendly way. The examples are interesting for other municipalities working on community-based development. The experiences and good practices were compiled into a manual and a toolbox.

Textual and communicative aspects of initiative
A caddie is someone who supports, gives advice and helps to choose the right tools, but does not take action himself/herself. The caddie leaves both responsibility and freedom to the key player – in this case, a resident of the neighbourhood. Important communication channels that were used included local events, information boards, newspapers, direct communication, mobile phones and online tools (local websites, social media, and emails). Communication targeted people active in the local community, families and young parents, immigrants, local officials, NGOs, young people, senior citizens, local businesses.

The physical/technological aspects of the initiative
Physical and technological aspects were not at the forefront of the initiative, although issues like traffic, condition of public areas and construction works received substantial attention.

Shared understandings related to initiative
CADDIES is an example of initiative where a shared understanding is the crucial ‘make or break’ factor. The sustainable development of the neighbourhood can be ensured only by connecting inhabitants and local actors into an active and dedicated local network. Members of the network need to be aware of each other’s activities, exchange experiences and share and discuss joint local current issues. They need to contribute to the planning and take part in common activities, and trust and understand each other’s motivations and goals.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

Most residential neighbourhoods of Latvian cities were built in the Soviet period. Affected by harsh weather, insufficient maintenance and substandard construction quality, a majority of multi-apartment buildings in the country are highly wasteful energy consumers – especially when heating is concerned. The thermal insulation of buildings could reduce the high energy consumption, but a major obstacle is the absence of the community spirit. Latvian people usually prefer to seek individual solutions and rarely come together to contribute to shared endeavours for achieving common benefits.

National energy policies prioritise renovation of buildings and upgrading of their thermal insulation, but these efforts cannot overcome the major barrier mentioned above – individualisation and atomisation of the society. Yet, only a handful of SECIs in Latvia offer solutions for surmounting these obstacles and change the entrenched life situations or influence the complex social interactions. These few exceptions are ‘More biking in small and medium sized towns of Central and Eastern Europe by 2020 (MOBILE2020),’ ‘Energy Neighbourhoods 2’ and of course CADDIES.

MOBILE2020 introduced good practices for changing the mobility behaviour – a switch to biking as a mode of everyday transport. Energy Neighbourhoods 2 combined training, consumption monitoring and local information campaigns to engage households in energy saving competition.

Although improved energy efficiency is only a potential secondary goal of CADDIES initiative, its importance should not be underestimated. Out of 27 SECIs in Latvia, 12 facilitate different technological solutions and other 12 promote a range of changes in energy consumption behaviour of individuals. While all of these initiatives contribute their piece to the mosaic of energy efficiency, only CADDIES seems to be capturing the big picture: that connecting individual households into an active local network and an organic community is an essential precondition for a successful transition towards sustainable future.

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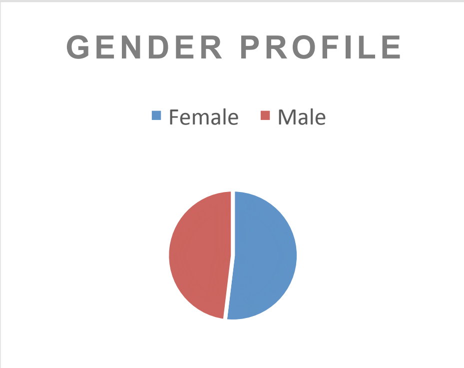
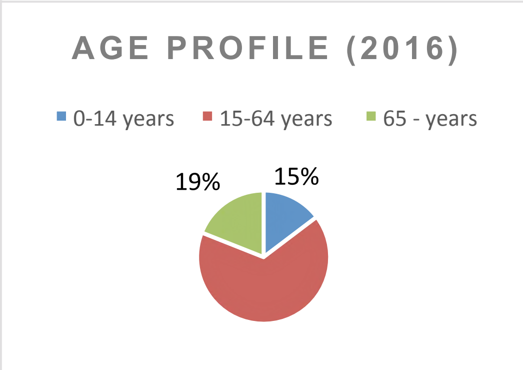
LITHUANIA

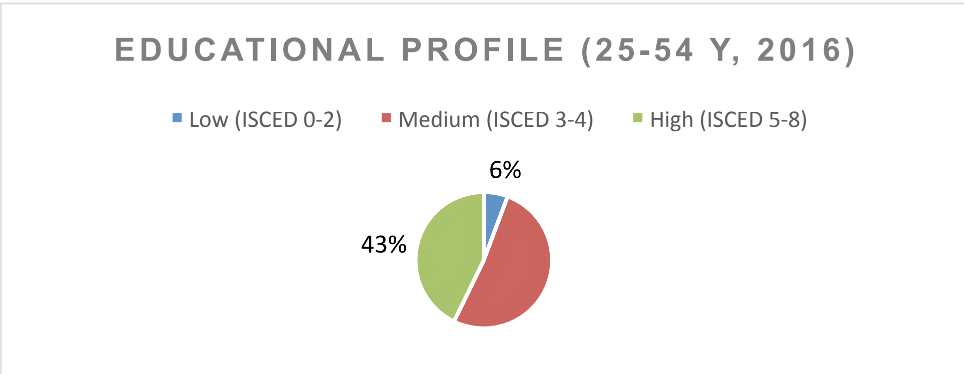
Authors: Marko Hajdinjak, Desislava Asenova

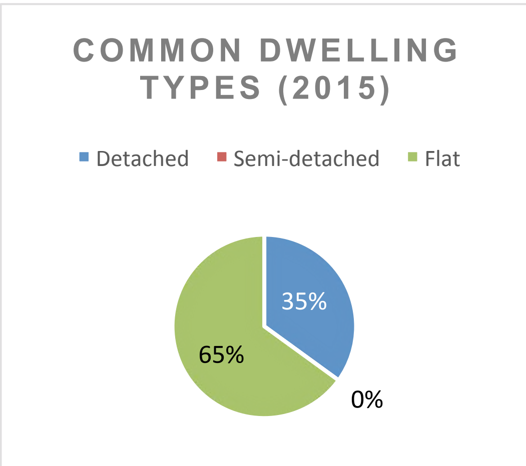
DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY

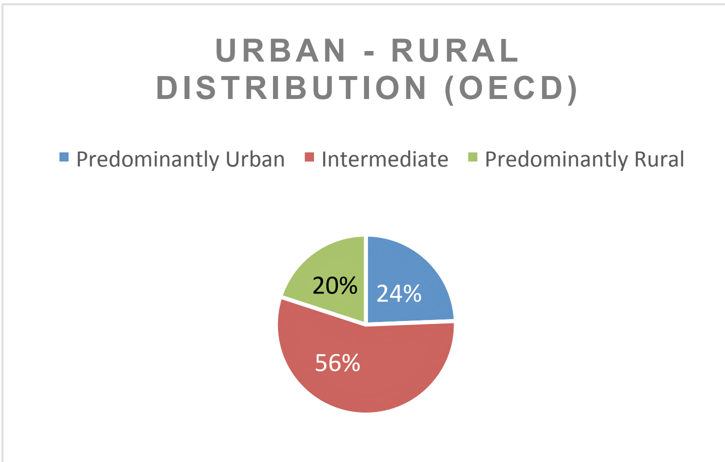


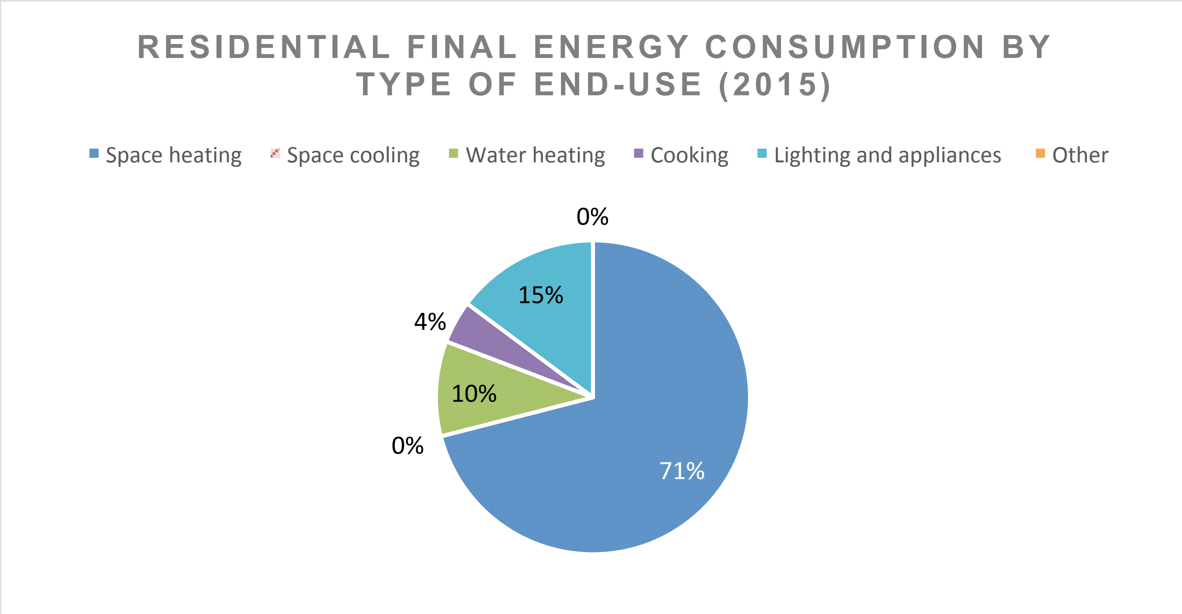


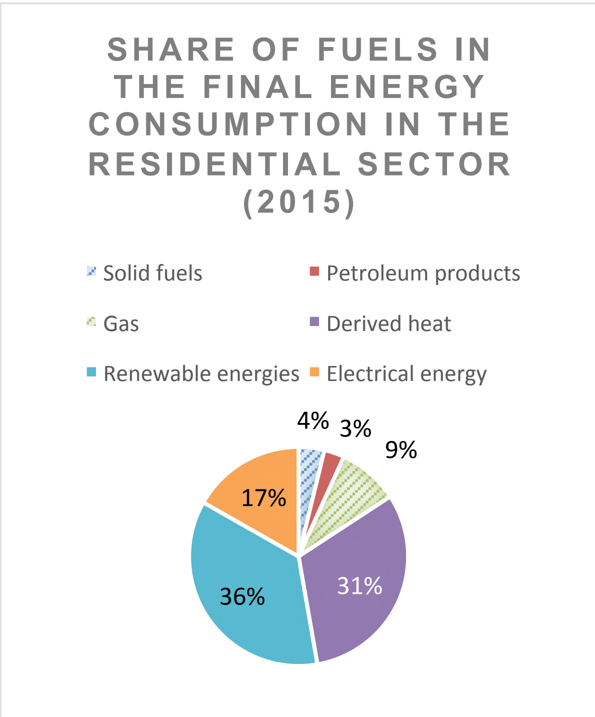
CLIMATE: transitional, between maritime and continental; wet, moderate winters and summers

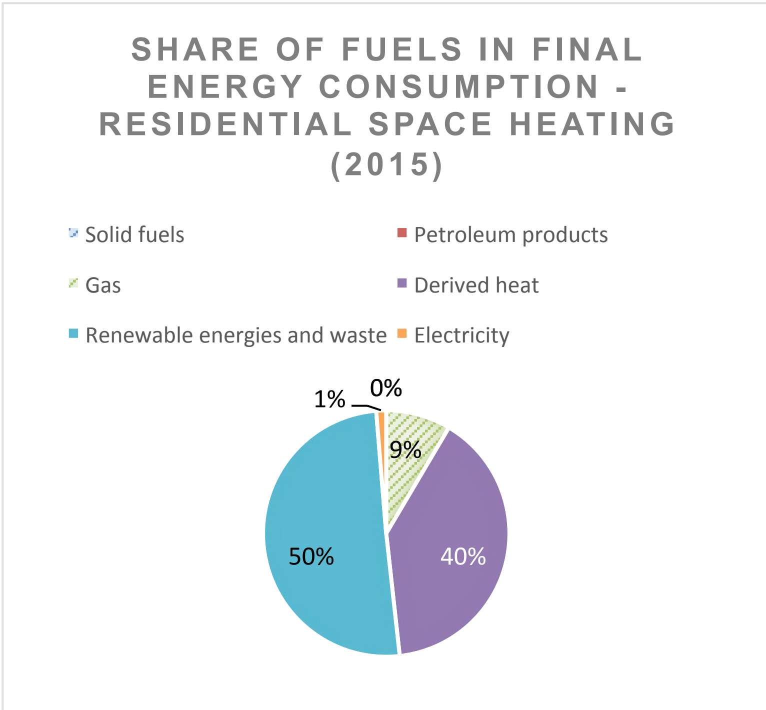












FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

5.465 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

Until 2009 Lithuania used to generate 77% of total net generated electric power from nuclear sources and was considered a net electricity exporter. However, since the shutdown of the Nuclear Power Plant Ignalina in 2009 the country has not been able to satisfy its internal electricity demand and electricity became its major import commodity. Lithuanian electricity network is not connected to the European electricity system and electricity can be imported from a very limited number of countries. Currently, electricity imports come mostly from Russia, and also from Estonia, Latvia and Belarus.[84]

The closure of Ignalina NPP in 2009 created opportunities for new suppliers on the market. The main electricity supplier companies in Lithuania in 2014 were AB LESTO (35.7% of sales), UAB Elektrum Lietuva (19.3%), UAB Enefit (7.9%), AB INTER RAO Lietuva (12%), UAB Energijos tiekimas (14.1%) and UAB Enerty (7.6%).[85] Although full liberalisation of the electricity market has been discussed since 2010, the electricity market for household consumers will not be liberalised before 2020, after which residents will be able to choose their electricity supplier.[86]

Lithuania fully relies on imports for ensuring natural gas supply for its citizens. All gas is imported from Russia via a single pipeline through Belarus with Gazprom being the single source of gas supply. The opening of the LNG terminal in Klaipeda in 2014 and the planned interconnector with Poland (GIPL) have contributed to the diversification of gas supply.

The retail gas supply in Lithuania is dominated by two suppliers: Lietuvos Dujos AB holds 69% and UAB Dujotekana 29% of natural gas supply market. The other gas supply companies hold a low share of only 2% of the retail market.[87]

Particular socio-material aspects that influence energy consumption

The majority of multi-apartments buildings in Lithuania are Soviet-type, being built before 1992. Domestic heating and hot-water systems in these buildings are in a poor condition. Furthermore, the heating system capacities in apartments do not meet the requirements of the technical design. As a result, some apartments are overheated, while others are too cold. It is estimated that heat savings of approximately 15-20% could be achieved after full automation of heat substations, balancing of all domestic heating and hot-water systems and installation of individual meters and regulation devices.[88]

[84] Aidukienė, L. and Skaistė, G. (2013). 'Sustainable development of Lithuanian electricity energy sector'. *Journal of Economics and Development Studies*, Vol. 1 No. 3.

[85] National Commission for Energy Control and Prices (2015). *Annual Report on Electricity and Natural Gas Markets of the Republic of Lithuania to the European Commission*. Available at: http://www.regula.lt/SiteAssets/naujienu-medziaga/2015-rugsejis/GALUTINIS%20METINE_ATASKAITA_EK_2015_EN.pdf

[86] LETA/TBT (2018). 'Liberalized power supplies to Lithuanian residents should not rise prices.' *The Baltic Times*. Available at: https://www.baltictimes.com/liberalized_power_supplies_to_lithuanian_residents_should_not_raise_prices_-_energmin/

[87] Aidukienė, L. and Skaistė, G. (2013). 'Sustainable development of Lithuanian electricity energy sector'.

[88] Lithuanian District Heating Association (2016). *Trends for Implementing the Energy Efficiency Directive in the Lithuanian District Heating Sector*. Available at: http://www.lsta.lt/files/events/161201%20Energetikos%20konferencija/Brosiura_ENG_spaudai.pdf

According to statistics from 2016, 52% of dwellings in Lithuania and 75% in cities were connected to district heating networks. The price of district heating has reached 72EUR/MWh in 2015. The increased price in combination with the rather low disposable income in Lithuania causes a risk of fuel poverty ("the inability of people to keep their home adequately warm, to pay their utility bills and to live in a dwelling without defects"). In 2012, around 30% of Lithuanian population were considered at risk of fuel poverty which was above the EU28 average of 25%. Data also shows that in 2014, 38.2% of people in Lithuania were unable to keep their dwellings adequately warm.

Space heating household expenses in Lithuania account for 13.3% of total household expenses, which in comparison to other EU countries is significantly high. In order to improve the situation, Lithuanian government has taken the initiative to promote heat savings within the building stock and to ensure a well-functioning and more sustainable heating supply system that is in line with the EU policy.[89] Regarding electricity prices for households in Lithuania, a decreasing trend is observed since the end of 2013. Compared to 13.91 euro cents per kWh in 2013, the price of electricity was 11.16 euro cents per kWh in 2017.[90]

Current Trends in Energy Policy

The policies for improving energy efficiency in Lithuania mainly focus on providing loans and subsidies for modernising multi-apartment and public buildings, as well as on the development of district heating systems. It is expected that by 2020, 70% of all multi-apartment buildings in Lithuania will be modernised. The government also plans to increase the use of Combined Heat and Power generation. The objectives for the transport sector are to promote green public transportation and to improve road and railway networks, all these by using EU structural funds.[91]

Lithuania has set the following renewable energy targets to be achieved by 2020: i) 23% share of energy from renewable sources in gross final consumption; ii) 10% share of energy from renewable sources in all modes of transport; iii) 60% share of energy from renewable sources in district heating; iv) 20% share of electricity generated from renewable sources. All these targets comply with the Directive 2009/28/EC and with the National Energy Independence Strategy of the Republic of Lithuania. In order to achieve these objectives, Lithuania has introduced support schemes for renewable electricity including: i) support via Public Support Obligation; ii) investment support (Special Climate Change Programme, EU Funds); iii) incentives under the Law on Energy from Renewable Sources (feed in tariff, discount for grid connection, capacity reservation, transmission priority, balancing responsibility exemption).[92]

The use of smart technologies for managing electricity distribution network and providing services to final consumers is still not widely spread in Lithuania in comparison to other EU countries. Smart

[89] Vaicaityte, A. (2015). *Lithuanian Least-Cost Heating Strategy*. Master's Thesis of Sustainable Energy Planning and Management. Available at: http://projekter.aau.dk/projekter/files/213498153/Lithuanian_Least_Cost_Heating_Strategy.pdf

[90] Statista (2018). *Electricity Prices for Households in Lithuania from 2010 to 2017*. Available at: https://www.statista.com/statistics/418098/electricity-prices-for-households-in-lithuania/

[91] OECD (2016). *Towards Reduction in Energy Intensity. Lithuania Policy Brief*. Available at: https://www.oecd.org/environment/lithuania-towards-a-reduction-in-energy-intensity_EN.pdf

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remote meter reading technology is used only by a few large business customers in the country. Smart grid management is applied only in isolated grid zones. Lithuania is planning to invest in smart electricity distribution network management technologies in the future that would allow offering new services to consumers and would enable their engagement in the electricity market and will as well provide a more efficient and smooth grid management.[93]

Trends in national campaigns

Corresponding with the energy policy trends described in section above, most national campaigns promote the need for renovation of old Soviet-era buildings to make them more energy efficient. The information provided by the government officials underlines the numerous benefits of the renovation programme – from creation of new jobs to reduction of energy losses and carbon emissions. The renovation programme does not concern only apartment buildings, but numerous public buildings as well – like hospitals, theatres, museums, schools, district courts, clinics, and police stations. Lithuanian government is funding this programme from its own budget, EU structural funds and loans.[94]

One of the state bodies, most actively involved in organisation of national campaigns for energy efficiency is the Energy Efficiency Centre, created in 1995 by the Ministry of Energy. The Centre provides information and advice on energy saving possibilities in Lithuania, promotes energy efficiency and undertakes energy audits in the residential sector and industry.[95] Among the more prominent and successful campaigns organised by the Energy Efficiency Centre was 'Taupukas' (in English – 'little saver') project. Its aim was to raise awareness about energy saving issues in the residential sector. An advertisement campaign promoted the benefits of energy and water saving and tried to influence the household residents to change their behaviour and use less energy and water. The campaign was fairly effective and succeeded to sensitise various groups of population, changing the common attitude towards reduction of energy consumption while retaining comfort. The response and attitude of the Lithuanian society to 'Taupukas' were positive. However, the evaluation of the campaign also showed that such initiatives can achieve durable results only if they are continuous and persistent, with regular updating and adjustment of their targets and implemented activities. If not reminded, people tend to quickly forget what they had learned.[96]

93 Klementavičius, A. (2016). *Smart Grid Development in Lithuania*. Available at: http://s3platform.jrc.ec.europa.eu/documents/20182/195230/10.+Arturas+Klementavicius_LEI.pdf/48ca7a1c-086e-4d41-a759-bf1dfdd07c8f

94 NIB (2010). 'Lithuania: Improving energy efficiency in buildings despite slowdown.' *Nordic Investment Bank Newsletter.* Available at: https://www.nib.int/news_publications/cases_and_feature_stories/197/lithuania_improving_energy_efficiency_in_buildings_despite_slowdown

95 Jarasunas, V. (2000). *The Contribution of the Energy Efficiency Centre to the Energy Efficiency Policy in Lithuania*. Lithuanian Energy Agency. Available at: https://www.eceee.org/static/media/uploads/site-2/library/conference_proceedings/eceee_Summer_Studies/2001/Panel_1/p1_4/paper.pdf

96 Valuntiené, I. (2009). *Taupukas Residential Awareness Campaign, Lithuania*. Changing Behaviour Project - Work package 2 Case Study. Available at: http://www.energychange.info/downloads/doc_download/332-cbcase13lithuaniataupukas

OVERVIEW OF NATIONAL SECIS

Below please find a list of Lithuanian SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country.

EEPLIANT: Energy Efficiency Compliant Products 2014	Changes in Technology
SAVES2: Students Achieving Valuable Energy Savings 2	Changes in Individuals' Behaviour
TOPTEN ACT: Enabling consumer action towards top energy-efficient products	Changes in Individuals' Behaviour
enCOMPASS: Collaborative Recommendations and Adaptive Control for Personalised Energy Saving	Changes in Individuals' Behaviour
ECHO ACTION: Energy-Conscious HOuseholds in ACTION	Changes in Complex Interactions
FLICK THE SWITCH: Instigating Simple Energy Efficient Behavioural Practices in Schools	Changes in Individuals' Behaviour
MOBILE2020: More biking in small and medium sized towns of Central and Eastern Europe by 2020	Changes in Everyday Life Situations
TRENDY TRAVEL: Emotions for sustainable transport	Changes in Everyday Life Situations
INTENSE: From Estonia till Croatia: Intelligent Energy Saving Measures for Municipal housing in Central and Eastern European Countries	Changes in Individuals' Behaviour
SAVES: Students Achieving Valuable Energy Savings	Changes in Individuals' Behaviour
"Modernization of multi-Apartment buildings" scheme	Changes in Technology
Taupukas residential awareness campaign	Changes in Individuals' Behaviour

Lithuania Energy Efficiency Housing Pilot Project		Changes in Individuals' Behaviour
Programs for the development of municipal problem areas for 2011-2013		Changes in Technology
Program for Ignalina "Energy efficiency improvement in buildings"		Changes in Technology
BUILD2LC: Boosting low carbon innovative building rehabilitation in European Regions		Changes in Technology
A Transnational Nordic Smart City Living Lab Pilot		Changes in Technology
ACTIVE LEARNING: Integration of Active Learning and Energy Monitoring with School Curriculum		Changes in Individuals' Behaviour
EPORE: Energy Poverty Reduction in Eastern Europe		Changes in Individuals' Behaviour

‘GOOD PRACTICE’ EXAMPLE OF LITHUANIAN SECI

TRENDY TRAVEL: Emotions for sustainable transport

Brief Description

The project used emotional approach to promote public transport, cycling and walking as alternatives to car travel. Sustainable travel was made more attractive by appealing to people's emotional needs, which led to energy savings, emissions reductions and cost savings. More than 50% of all human decisions are emotional and often go against rational awareness. This constitutes a formidable barrier for marketing and awareness campaigns for sustainable transport. Providing information about the positive consequences of the use of sustainable modes helps, but is not enough. Public transport, cycling and walking should be associated with positive emotions like excitement, fun, desire for life, pride and similar. TRENDY TRAVEL was designed to address current and potential users of clean urban transport, but also practitioners and decision-makers in public transport companies, energy agencies and educational institutions.

Brief Contextualization

Vilnius is the largest city and the capital of Lithuania, with a population of nearly 554,000. The metropolitan area has almost 850,700 inhabitants. The city is the major economic centre of Lithuania and one of the largest financial centres in the Baltic countries. There are numerous universities in the city. Being a cosmopolitan city with diverse architecture, Vilnius is also very popular among tourists. All these factors contribute to the continuously rising number of cars in the city, causing serious congestion and traffic jams. Since 2007, the municipal authorities have tried to tackle the problem by introducing an intelligent city-wide traffic management system, but other measures are still needed to reduce the volume of motorised traffic and improve the air quality.

Aims and objectives

The main objective of Trendy Travel was to achieve a modal shift from the car to healthier, more eco-friendly transport modes by making sustainable transport more emotionally appealing with various approaches. These approaches included ‘Storytelling,’ ‘Ritualization,’ ‘Raising the image of cycling,’ ‘Interesting designs’ and ‘Children that guide their parents.’ All these approaches were used to achieve a positive attitude towards sustainable mobility.

Methods for intervention

Five main methods were used to promote cycling as an alternative to cars:

- Storytelling: absorbing stories were created to capture the attention of listeners, viewers and readers.
- Rituals to provide structure: bicycle events throughout the year became an integral part of activities organised by the city administration.
- Raising the image of cycling: the idea that cycling is a means of transport only for poor people needed to be dispelled.
- Pleasing the eye: interesting art and design for sustainable transport.

- Parents are touched: children guided parents to become active cyclists and embrace the idea of sustainable transport.

Steps of implementation

- Removal of the main barriers – negative emotions, negative images and a general underestimation of the potential of soft policies and sustainable transport. These barriers necessitated a general change towards a more positive perception and attitude towards sustainable transport.
- Anchoring of sustainable transport in everyday municipal policy.
- Active dissemination and promotion of information materials.
- Creation of virtuous circles (upward spirals) for sustainable transport.
- Energy savings in the form of reduced consumption of fossil fuels.
- Spreading of these steps towards other cities.

Results/outcomes

The following outcomes of Trendy Travel activities were achieved in Lithuania:

1. Storytelling
    - Audio Book was produced, presenting in an entertaining way the best stories from the Storytelling competitions.
    - Video Clips that convey the advantages of sustainable mobility in an entertaining way.
    - Kindergarten Books to give children an understanding about sustainable mobility.
2. Rituals and annual events (various cycling activities repeated annually):
    - A safe traffic campaign “Child passenger – safe traffic participant.”
    - “To school on my bicycle!”
    - Children art contest “Clear air for all”
    - Competitions for safe behaviour on the streets
    - Bicycle carnival “Bicycle – the new fashion in Vilnius.”
3. Raising the image of cycling
    - Brochure “20 good reasons for cycling”
    - Fact Sheet about actions carried out to promote soft mobility
    - Bicycle Climate Test (320 questionnaires filled in)
4. Pleasing the eye
    - Emotional artwork
    - Emotional photographs
    - Comic strips and a poster
5. Parents are touched
    - Kindergarten programme including different activities bringing together children and their parents

All these activities have increased enjoyment of cycling among current cyclists and increased public awareness about the attractiveness of cycling among the general public.

The role of the households

Households participated actively in about 30 events organised in Vilnius, such as contest "My bicycle, me and my parents" held at schools and kindergartens, training of children in 10 kindergartens “Safe cycling on bicycles,” a fashion contest “I am the best dressed cyclist in Vilnius city," an exposition of children drawings "Clear air for all," "Ecological weekend tours with local doctors" and others.

Location
The initiative was implemented mainly in Vilnius, but some activities were repeated in other Lithuanian cities as well.

Was/is the initiative successful?
The initiative was very successful. The evaluation report states that overall 25,000 participants took part in different events, and that with the help of activities organised by the initiative, about 1,700 children learned to ride a bike. The survey among participants showed that 97% were satisfied with the events, and that 72% of them have started looking at bicycles as a viable transport option. The actual percentage of active cyclists has increased by 25% during the Trendy Travel duration, and the share of public transport users has gone up by 27%. Cycling was promoted in local press and other media (total of 87 articles / media appearances) and on 14 national workshops, where Trendy Travel know-how was disseminated.

Textual and communicative aspects of the initiative
The central message of the Trendy Travel initiative was that cycling is a highly efficient mode of transportation and is optimal for short to moderate distances. Compared to motor vehicles, bicycles have numerous benefits. They improve personal health and wellbeing, reduce traffic congestion, minimise air and noise pollution. To give an overview of the manifold advantages of cycling, a brochure providing 20 good reasons for cycling was produced.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

The Lithuanian energy policy for enhancing energy efficiency has five main priority areas:
- Increasing the share of renewables in the energy mix
- Use of smart technologies for managing electricity distribution network
- Construction of Combined Heat and Power plants
- Thermal insulation and renovation of multi-apartment and public buildings
- Promotion of sustainable transport

Only the last two areas directly concern the household energy consumers. Corresponding with these priority areas are the national campaigns, which also typically promote the possibilities for renovation of old energy-wasteful buildings, or raise awareness about the benefits of energy and water saving and try to change the energy-consuming behaviour of household residents.

Most of the SECIs listed in Section 2 have similar objectives – influence people to change their behaviour and consume less energy and resources. SAVES and SAVES2 promoted sustainable energy behaviour among university students living in university accommodation and in rented private housing. TOPTEN ACT directed the attention of consumers towards energy-efficient products. enCOMPASS developed innovative digital tools for self-monitoring of energy consumption at home. INTENSE focused on the transfer of successful energy saving measures from more energy-conscious “old” EU member states to Lithuania. Taupukas was an awareness-raising campaign promoting the benefits of energy and water saving.

Some SECIs targeted a specific socio-demographic group. FLICK THE SWITCH and ACTIVE LEARNING worked with primary and secondary school children, trying to influence them to be responsible and sustainable in the use of energy and achieve actual energy savings in school buildings. EPORE tackled fuel poverty by facilitating more sustainable energy behaviour and choices in vulnerable households.

The second largest group of SECIs had an underlined technological aspect. EEPLIANT, Modernization of Multi-Apartment Buildings, Development of Municipal Problem Areas, Program for Ignalina, BUILD2LC and Transnational Nordic Smart City facilitated the renovation of multi-apartment buildings or proposed innovative technical solutions for energy saving.

Finally, two initiatives correspond with the final priority area of the national energy policy – green transport. MOBILE2020 and TRENDY TRAVEL promoted the use of bicycles and public transport as alternatives to car travel. In Lithuania, as well as in many other former socialist countries, biking is far less popular than in Northern and Western Europe. While the underdeveloped bike infrastructure (insufficient bike lanes, no city bike rental systems, car drivers not used to paying attention to bikers) remains a considerable problem, other barriers are mostly cultural – perceptions that bicycles are only for people who cannot afford a car, that it is not appropriate to use a bike to go to work, that bikes are only for children and similar. The approach undertaken by TRENDY TRAVEL, discussed in more detail above, shows that these prejudices can be successfully challenged with an attractive campaign and innovative activities involving people from different segments of society.

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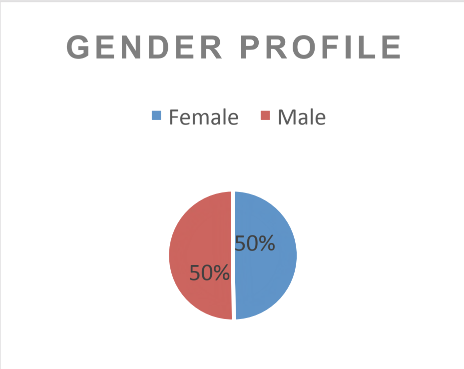
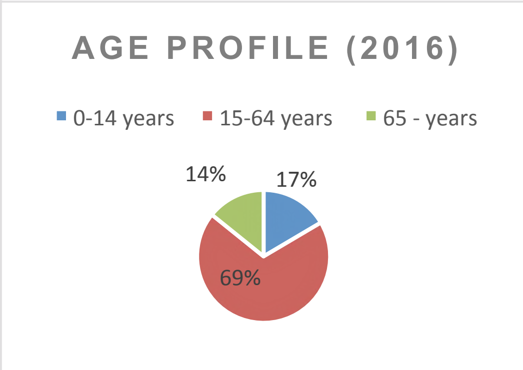
LUXEMBURG

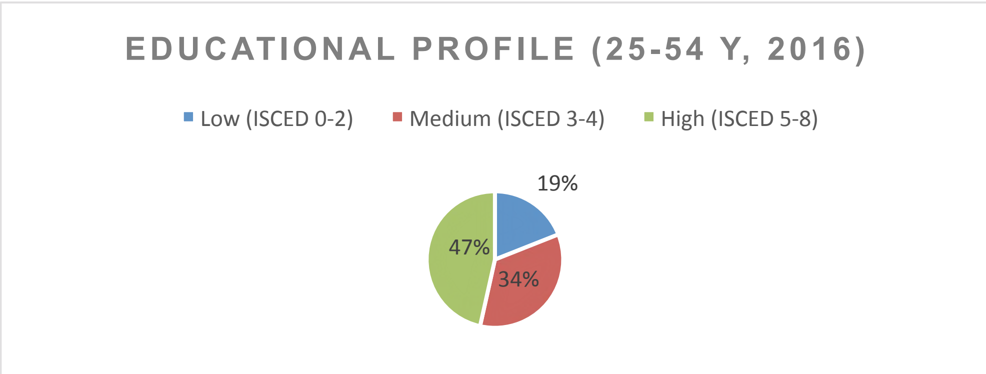
Authors: Kristjan Čoklc, Tomislav Tkalec, Lidija Živčič

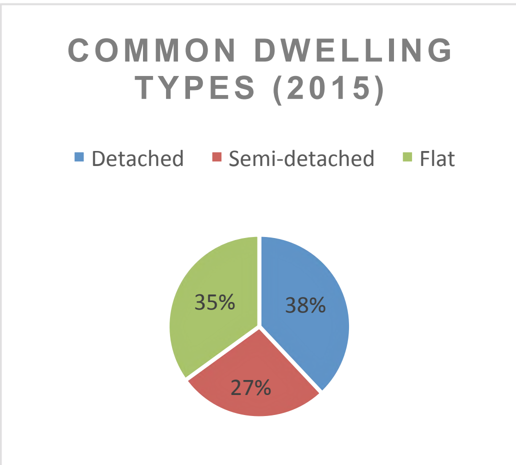
DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY

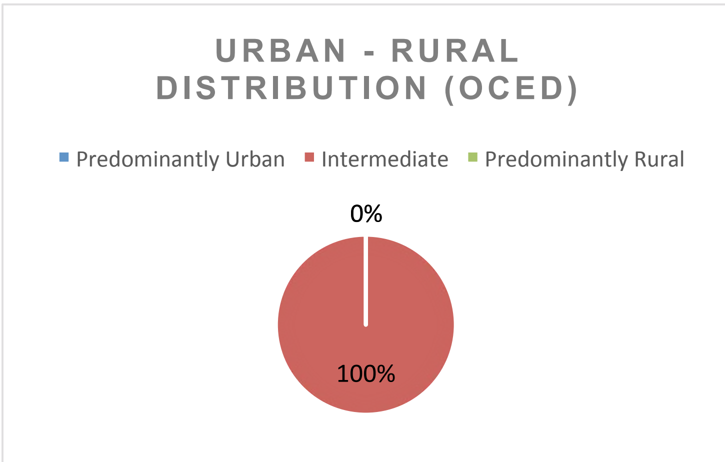


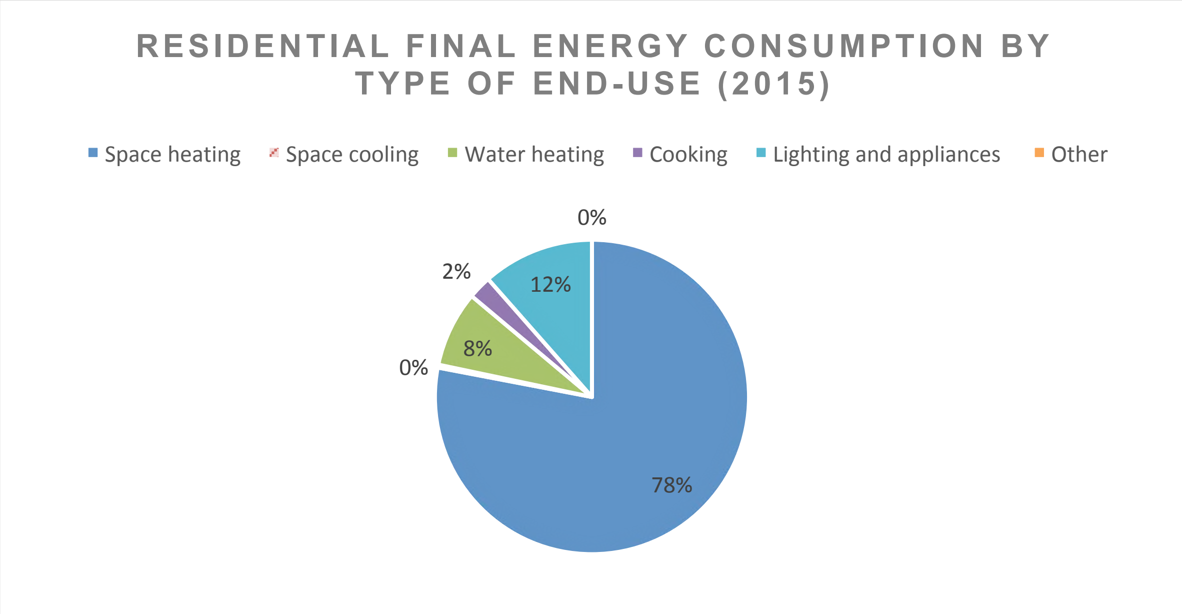


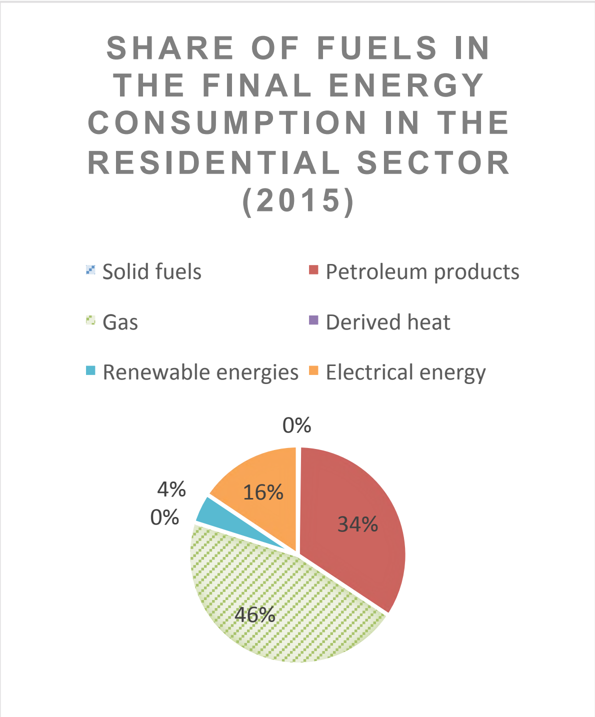
CLIMATE: modified continental with mild winters, cool summers

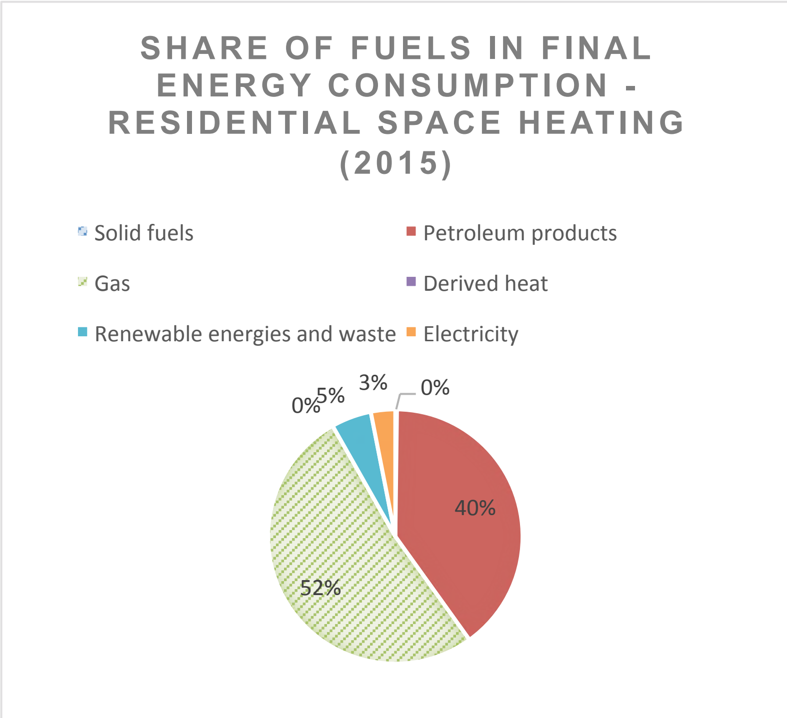












FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

10.106 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

The majority of the electricity in the Grand Duchy of Luxembourg comes from Germany via two double high-voltage lines. The interconnection with the Belgian electricity market has become operational with the commissioning of a phase shifting transformer (PST) at the Schifflange centre in October 2017, and around 15% of the energy fed into the network is produced locally (biogas, co-generation, wind, hydro, PV).

The liberalization of the electricity market has led to the separation of activities: the production and supply functions are separate from the transmission and distribution functions and are performed by independent entities. On the one hand, network activities (transport and distribution of energy) remain a monopoly and their network usage tariffs are regulated and approved by the Luxembourgish Institute for Regulation (Institut Luxembourgeois de Régulation). On the other hand, production and supply activities are subject to competition. The end costumer has the right to choose its electricity suppliers.

In networks with fewer than 100.000 connected customers, activities may continue to be performed by the same entity provided certain organizational requirements are met. Therefore Creos Luxembourg, which manages most of the network in Luxembourg, is a separate legal entity with no production or supply activities, while the Esch / Alzette and Mersch networks continue to be operated by the same entity also active in production and / or supply. By transferring the production and / or supply activity to a commercial company set up for this purpose, the municipalities of Diekirch and Ettelbruck have voluntarily separated the commercial activity from the network manager activity.

Source: http://www.res-legal.eu/; https://en.wikipedia.org/wiki/; https://web.ilr.lu/FR/

Particular socio-material aspects that influence energy consumption

One of the most outstanding socio-material aspects that influence energy consumption in Luxembourg is the so called ‘fuel tourism’. Luxembourg’s policy of low road fuel prices lead to considerable increase in "road fuel sales to non-residents" since 1990. Although the "road fuel sales to non-residents", though price differences with neighbouring countries is reducing over time, it still forms a significant part of energy consumption. Another important aspect is that the economic development of Luxembourg these last 30 years has led to an important growth of both the resident population (40% increase over the last 20 years) and the cross-border commuters representing now almost 45% of the paid workers (a 250% increase over the last 20 years). This, in turn, has led to increasing built-up areas (housing, offices, services, infrastructures) and to ever growing transport flows, mainly by road. Population and cross-border commuters growth is also leading to rising energy demand, both for buildings and, as said, for transport. At the same time, industrial emissions have reduced a lot since 1990, both due to technological changes and to the de-industrialisation of the country.

Source: https://www.eea.europa.eu/soer-2015/countries/luxembourg

Current Trends in Energy Policy

Since 1 July 2007, the Luxembourg electricity and gas market has been liberalized and household customers are free to choose their energy supplier. Despite the largely harmonized energy structures between Luxembourg and Germany, the Institut Luxembourgeois de Régulation misses the market presence of supra-regional providers for the supply of electricity to end customers and thus ultimately also indications of a functioning competition.

In addition to the very low market potential and language barriers, there is a high level of concentration and strong links between the Luxembourg incumbent and potential supra-regional suppliers, who may be reluctant from a strategic point of view. In addition, there are clear harmonization deficits in the change of supplier and in network usage billing between Luxembourg and Germany. De jure, there are no market entry barriers. Rather, it requires supportive modification to further promote competition.

At a press conference on 1 March 2018, the Deputy Prime Minister, Minister of the Economy, Étienne Schneider, presented new measures promoting the development of Internet of energy, the self-consumption of electricity and the development of renewable energies, in line with the strategy of the Third Industrial Revolution.

The decentralization of electricity production on the basis of renewable energies as well as the digitization of the electricity markets are important energy issues. In line with these challenges, the Council of Government adopted on 21 February 2018 a draft law amending the legislation in the field of electricity. The planned adaptations introduce for the first time in Luxembourg legislation the concept of individual self-consumption, as well as that of collective self-consumption within an energy community.

In line with the principles of the "sharing economy", the adaptation of electricity legislation also provides for the sharing of electricity produced with other users in the context of collective self-consumption within a network energy community that can consist of the inhabitants of a street or a neighbourhood, but also of people living more distant from each other. Electricity produced with low power production facilities and self-consumed, individually or collectively, will also be exempt from the electricity tax.

Source: https://assets.ilr.lu/ ; https://gouvernement.lu/fr/

Trends in national campaigns

Campaigns in Luxembourg differ one from another and are focusing on energy efficiency, alleviation of energy poverty, promotion of renewables and other topics. Quite number of them are focusing on sustainable mobility. They are implemented by national authorities, municipalities, civil society organizations and energy agencies. In March 2018 the national government has introduced a regulation for self-consumption of electricity generated from RES, and has also presented new measures specifically encouraging the production of photovoltaic energy and contributing significantly to national energy objectives: these are calls for tenders for the installation of photovoltaic installations of size.

Source: https://gouvernement.lu/fr/

OVERVIEW OF NATIONAL SECIS

Below please find a list of Luxemburg SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country.

e-passport	Changes in Technology
TM EnerCoop	Changes in Technology
Assistance aux ménages en précarité énergétique (Assistance to households in energy precariousness)	Changes in Individuals' Behaviour
EcoPrêt (ecoloan)	Changes in Technology
TOPTEN ACT : Enabling consumer action towards top energy-efficient products	Changes in Individuals' Behaviour
« Energiesparen macht Schule »	Changes in Everyday Life Situations
Luxmobil	Changes in Individuals' Behaviour
mLive – synchronising mobility	Changes in Individuals' Behaviour
Den Trollmops ass mobi	Changes in Individuals' Behaviour
Vël'OK	Changes in Individuals' Behaviour
Energyhesper.lu	Changes in Individuals' Behaviour

'GOOD PRACTICE' EXAMPLE OF LUXEMBURG SECI

« Energiesparen macht Schule »

Brief Description

The initiative is focusing on schools and energy and water use in schools. Main target groups are teachers, school administration and caretakers, and through teachers also school children. Secondary target group are parents, who are targeted through their children. The initiative tries to develop knowledge about energy consumption through playful and experimental methods.

Brief Contextualization

The initiative started in Germany in 1997 by a German NGO and is focusing on schools and on changes in consumption patterns related to energy. From its beginning it has been introduced to more than 300 schools and kindergartens in which they have succeeded to save on energy and water costs.

Aims and objectives

This 5 year programme aims to reduce school water and energy consumption by promoting a change in habits. Various seminars and training sessions were organised to provide teachers with basic knowledge and practical examples and to present the various energy savings measures. This knowledge is imparted to the pupils through different playful and experimental methods. Establishments were also inspected, in collaboration with the consulting firms, to identify potential large consumers.

Methods for Intervention

Starting point is the user behaviour. Interventions include seminars and training sessions for teachers, who then present the knowledge to the children that they teach in the form of different playful and experimental methods. Apart from that energy audits are carried out in the facilities of the school.

Results/outcomes

Schools have reduced their energy use and energy related costs. In order to motivate schools to participate in the initiative, they can keep 40 % of the achieved cost savings and other 30 % of savings remain to the city. The financial savings achieved by the schools have meanwhile made it possible to fully pay for the remuneration of the consulting offices and even to purchase school supplies.

The role of the households

Households are not targeted directly, but are a secondary target group of the initiative. School children are taught about energy and water saving possibilities and measures, which they then transfer to their parents. In that way households' awareness raising is carried out by children that live there.

Location

The initiative is carried out in various places in Luxembourg and Germany. In Luxembourg it is implemented in the city of Dudelange.

Textual and communicative aspects of initiative
The initiative is focusing on didactic and pedagogical tools. It is easily replicable in other schools kindergartens and for that reason they have, apart from other communication and promotional materials, prepared a mascot of the initiative (a blue dragon).

The physical/technological aspects of the initiative:

The initiative is focusing more on behaviour aspect and on teaching / training, with inclusion of various physical teaching aids and experimental kits. But it also includes the use of measuring equipment, so they can measure energy and water use in the school. It also focuses on optimization of settings of various energy systems in the school (heating, etc.).

CONCLUDING REMARKS AND POLICY IMPLICATIONS

Luxembourg’s energy policy includes some progressive approaches, such as measures for promoting the development of Internet of energy, decentralisation of electricity production, the self-consumption of electricity, the development of renewable energies or digitisation of the electricity markets. The legislation also enables sharing of electricity produced with other users in the context of collective self-consumption within a network. The identified SECIs mainly do not follow the progressiveness of energy policy, as they are mainly oriented towards general energy efficiency awareness raising (energy certificates for buildings and appliances, energy saving advising or education, old-for-new appliances, CO2 calculator, etc.). One of the identified SECI follows the trends, set by the energy policy energy cooperative, which is the local producer of green energy.

One of the outstanding socio-material aspects that influence energy consumption in Luxembourg is an important growth of both the resident population and the cross-border commuters, which has led to ever growing transport flows, mainly by road. In response to this challenge, many of the identified SECIs focus on mobility, from surveying mobility needs to providing mobility information. The later SECIs focus on individual route planning, connections between mobility modes and promotion of multimodal approaches.

The SECIs are implemented by national authorities, municipalities, civil society organisations, and energy agencies. Mainly they are of national or even local coverage, only one of the identified SECIs was a part of an international campaign. The SECIs mainly work towards changes in individual behaviour (7 of the identified), there are several working towards a change in technology (3 of them) and one is stimulating changes in everyday life situations.

The highlighted SECI is an initiative focusing on energy and water use in schools. Main target groups are teachers, school administration and caretakers. Through teachers school children are targeted, who then target their parents as a secondary target group. This teaches us that working with children is beneficial because of their impact on parents and wider families. In order to motivate schools to participate in the initiative, they can keep 40 % of the achieved cost savings and other 30 % of savings remain to the city. The financial savings make it possible to fully pay for the remuneration of the consulting offices and even to purchase school supplies.

The financial sustainability of the action is the most important lesson learned from this example, which should inform policy. Putting forward measures that pay off well, as well as sharing the profits of such measures between the interested stakeholders, ensures financial sustainability of the measures, which is of key importance when talking about energy policies.

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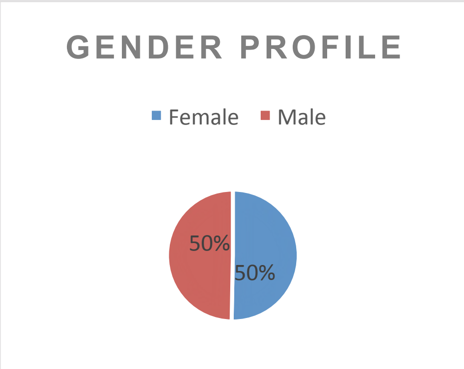
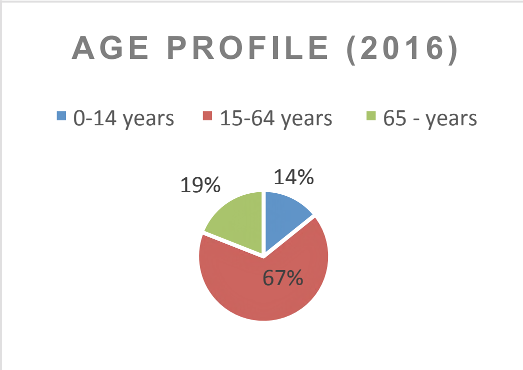
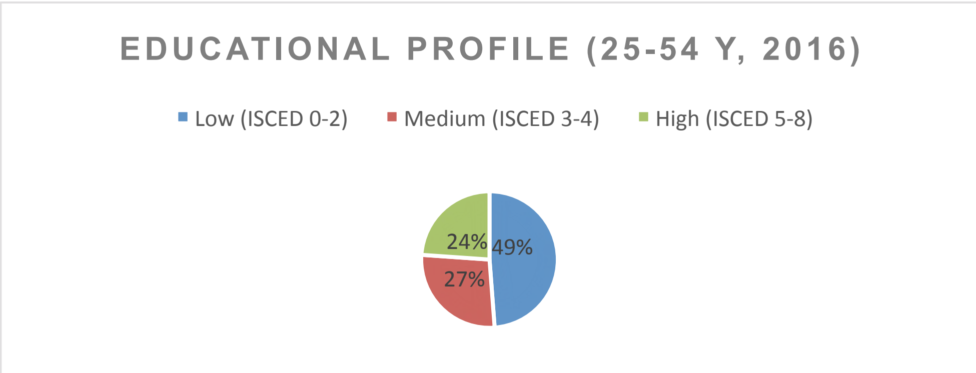
Authors: Renda Bellmallem, Tomislav Tkalec

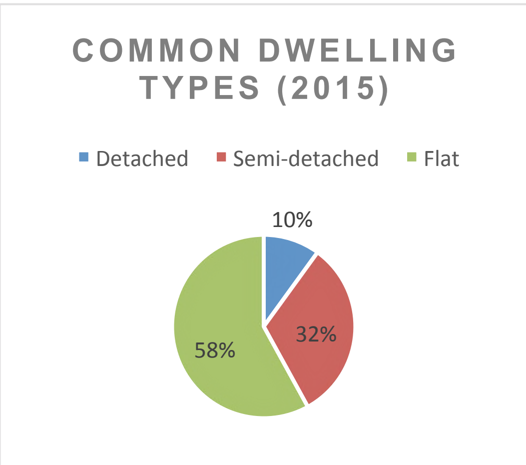
DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY

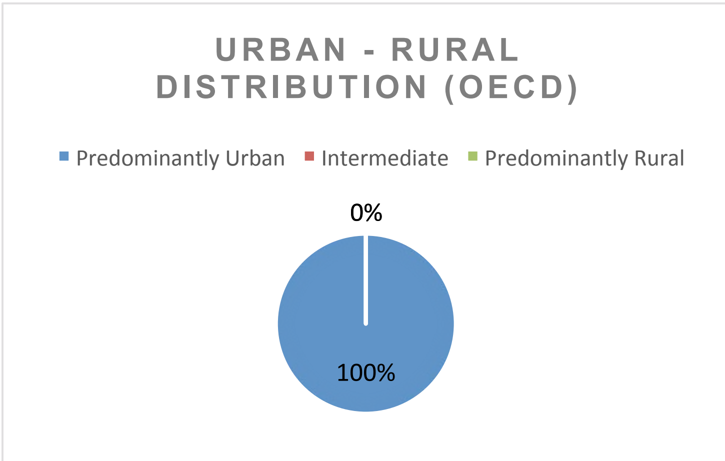


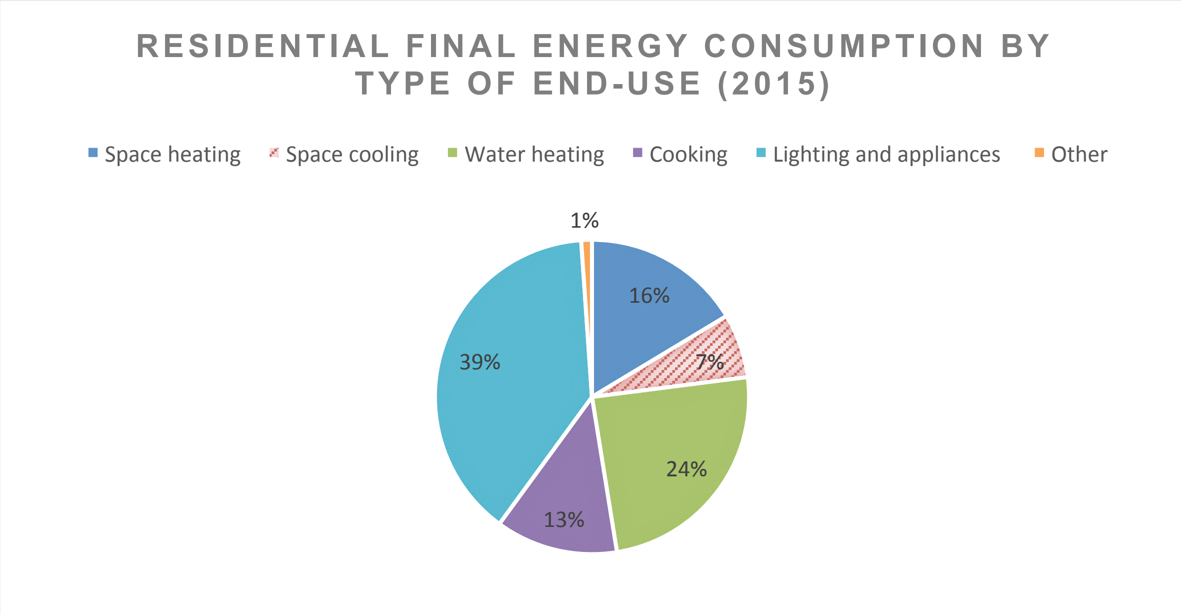


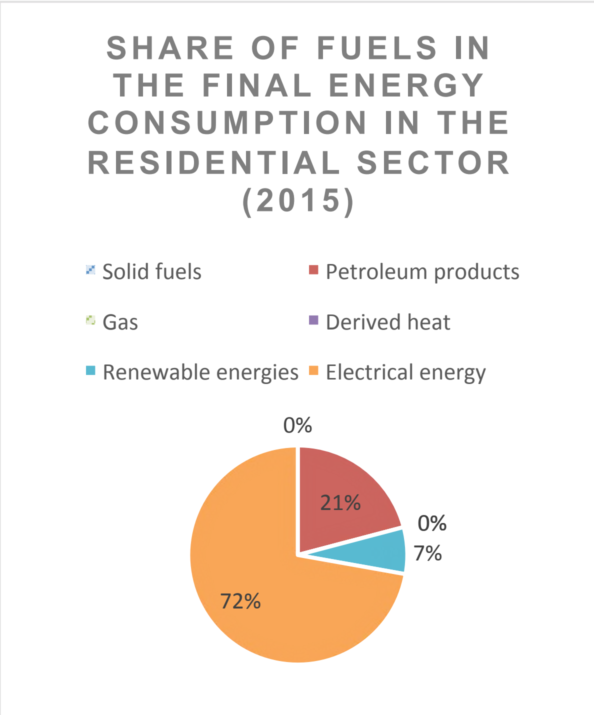
CLIMATE: Mediterranean, mild winters, warm to hot summers

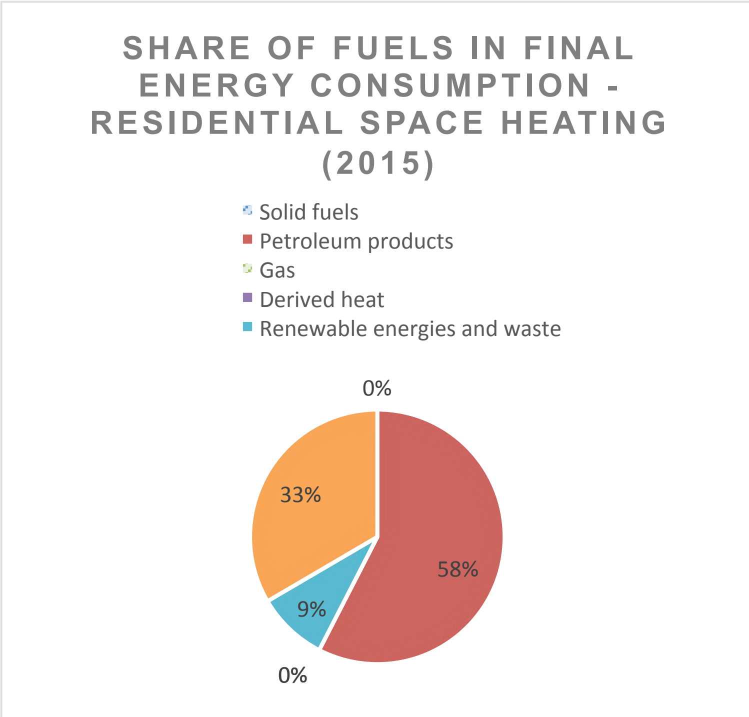












FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

2.093 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

The energy sector in Malta is almost 100% dependent on a single source of energy, oil, which is entirely imported. Malta has almost no resources and its island location limits its trade.

Malta has no production and no reserves of hydrocarbons. However, its waters are bordering areas with known reserves, both on the Tunisian side and near Sicily. For this reason, oil exploration efforts have been carried out in Maltese territorial waters. Eleven offshore wells and two wells on the island itself were drilled from 1959 to 2014, mostly dry, but some showing traces of oil or gas, but not commercially exploitable deposits.

Enemalta plc has the electric monopoly in the country. This company owns two power plants: the Delimara power station in Marsaxlokk, and the Marsa power station in Grand Harbor. Until April 2015, these two plants, which burned petroleum fuels (heavy fuel oil and distillate), supplied all of Malta's electricity. Since then, an electrical interconnection with Sicily has been put into operation, enabling 200 MW of electricity to be imported from Italy. An electric cable connects the island with the European continent, and ensures a long-term security of the Maltese network, which knew various prior difficulties.

Between 2005 and 2015, renewable energy production in Malta grew by an average of 40.3% per year, although the absolute level of production remained by far the lowest in the European Union. In 2015, the use of renewable energy in Malta is only 4.7% of primary energy demand. The use of RES is also not very diversified and is almost entirely limited to photovoltaics.

Particular socio-material aspects that influence energy consumption

The Maltese oil market is dominated by the consumption of heavy fuel oil (674 million tonnes of heavy fuel oil, or around 30,700 barrels/day in 2013). The insular specificity of the country means that many individuals own a ship or a boat. Two-thirds of heavy fuel oil consumption is used to refuel ships and one-third is used for electricity generation.

Before the connection with Italy in 2011, Malta set up around 250,000 smart meters among electricity and water consumers, to encourage a reduction in consumption. With tourism development, the Maltese energy networks were no longer able to provide all the island's users with electricity and drinking water. IBM-France has proposed and implemented smart meters whose stated objective is that each inhabitant can visualize its actual consumption and thus reduce it. In the same idea, owners of large plots are encouraged to set up rainwater harvesting systems.

Because of the warm climate and climate change there is higher need for energy for cooling in the summer months.

Malta has always been faced with a lack of water (the island does not have a lake or river), a problem that is likely to increase with climate change. The island is experiencing rainfall deficits, it has overexploited its groundwater. With rising demographics the demand for water is rising. To deal with this problem, three desalination plants have been set up. They have become the second largest source of drinking water in the country (after groundwater), but they are not a long-term solution as they operate thanks to (a lot) of fossil energy.

Current Trends in Energy Policy

In 2012 the Government of Malta has launched a new national energy policy following wide consultation with different stakeholders. The policy is based on a series of objectives aimed at diversifying the energy mix used in Malta while accelerating a shift in the energy culture. The policy is based on four main principles: diversification, security of supply, efficiency and affordability. As the EU member state that is most dependent on fossil fuels, Malta is placing some importance on the use of RES, especially the sun, to produce energy.

In August 2016, the European Commission approved the renewable energy production aid schemes in Malta. State aid is granted to the operators of photovoltaic installations and onshore wind turbines in the form of premiums in addition to the market price. Proponents of onshore wind power may also qualify for assistance if an eligible site receives development approval during the life of the plan. The total budget for the measure will be 140 million over the 2016-2020 period. This plan should enable Malta to reach a target of 10% renewable energy in its energy mix by 2020, an objective set by the European Union.

Trends in national campaigns

Government has in recent years run campaigns on RES, related to the national RES support scheme. Apart from that there were campaign focused on energy efficiency, and water conservation, as especially water is scarce on the island.

Other non-governmental stakeholders and actors run campaigns on RES projects, civil society has campaigns on community (RES) projects, energy efficiency, water conservation, energy poverty and sustainable mobility.

OVERVIEW OF NATIONAL SECIS

Below please find a list of Maltan (?) SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country.

European Citizens Climate Cup (ECCC)	Changes in Individuals' Behaviour
ELIH MED - A EURO-MEDITERRANEAN PROGRAM TO FIGHT ENERGY POVERTY	Changes in Technology
EEPLIANT : Energy Efficiency Complaint Products 2014	Changes in Technology

Smart-up project	Changes in Individuals' Behaviour
Instigating Simple Energy Efficient Behavioural Practices in Schools (FLICK THE SWITCH)	Changes in Individuals' Behaviour
Common appliance policy – All for one, One for all – Energy Labels (COMEON LABELS)	Changes in Individuals' Behaviour
European Network of Information Centres promoting Energy Sustainability and CO2 reduction among local COMmunities (ENESCOM)	Changes in Individuals' Behaviour
Eco Gozo	Changes in Complex Interactions
energycalculator from enemalta	Changes in Individuals' Behaviour
DAWL – Energy, Employment, Empowerment.	Changes in Individuals' Behaviour
EkoSkola	Changes in Everyday Life Situations
YAECI (Yearly Appliance Energy Cost Indication)	Changes in Individuals' Behaviour
energy efficiency program	Changes in Individuals' Behaviour
European Sustainable Energy Award for Prisons (e-seap)	Changes in Technology
Xrobb l-Għaġin	Changes in Technology

'GOOD PRACTICE' EXAMPLE OF MALTA SECI

Eco Gozo

Introduction

Gozo plans to become an eco-island and wants to reduce pressure on the environment and has set a range of other ecological and social objectives.

Brief Description

Eco Gozo is a concept which summarises the Government's vision for the future of the island. It is a vision, which aims at transforming Gozo and Gozitan society into a sustainable reality in its wider sense – not only environmentally, but also socially and economically. Gozo aims to become an eco-island by 2020, supported by an engaged and committed sustainable community.

Brief Contextualization

The eco-island of Gozo is an exercise in foresight on the future of this island, which generated a near-general consensus. The larger majority of stakeholders on the island see the ecoGozo project as a historic opportunity for the island and its enduring prosperity. Government launched action on ecoGozo in 2008, stating clearly that through this Sustainable Development strategy, it intended to trigger a community project with long-term vision and a commitment from the grassroots.

Aims and objectives

Aims and objectives of this strategy are referring to a broad field of topics and aspects and are not covering only energy or environment related ones:

- a better quality of life
- a society exerting less pressure on the environment
- a wholesome natural and cultural environment
- more sustainable jobs
- a caring society for all
- more quality investment
- an enhancement of the island's identity.

More specifically, objectives related to energy include:

- identifying optimal sites for small onshore wind farms and developing small onshore wind farms with a limited number of turbines,
- utilising rooftops of public buildings and other spaces such as public car parks for renewable energy projects involving solar energy,
- carrying out energy audits on all public buildings,
- converting all lighting systems in offices and public places to energy-saving lighting,
- providing free consultation to people on how to convert their houses to be energy efficient,
- awarding companies, households, villages and streets committed to energy-saving with a 'Green Award'.

Methods for Intervention

Preparation of the island's development strategy, and inclusion of various stakeholders and citizens in the process of its preparation through public consultation process.

Steps of implementation

The strategy/vision is being implemented in various different forms and in various different fields, from environment, society, economy, and culture and identity.

Results/outcomes

The main result of the process was preparation of the document: *A vision for an eco-island: ecoGozo* (available here: file:///home/tomi/Prejemi/A%20Vision%20for%20an%20Eco-Island_Ministry%20for%20Gozo_August%202013_low.pdf) and, after that, implementation of the written vision and strategy for the island development.

The role of the households

Throughout this whole process of developing the vision for Gozo, the crucial protagonists have been – and remain – the Gozitan population. In the few years that the Government has been working on this new venture, they have sought to involve Gozitan families and the island's stakeholders at large in the implementation of this strategy and many have taken up the invitation to participate actively in the implementation of the ecoGozo objectives. Households are also included in implementation part of the strategy, as they are targeted for energy refurbishment of their houses and implementation of RES projects.

Location

Island of Gozo (Malta).

Textual and communicative aspects of initiative

The main textual output of the initiative is the common written vision for an eco-island. The most important communication / dissemination tool is the webpage, where more publications and material can be found.

Shared understandings related to initiative

Government's view on the common or shared understanding goes in line, that the larger majority of stakeholders on the island – though not necessarily in agreement on the finer detail – see the ecoGozo project as a historic opportunity for the island and its enduring prosperity. In implementing a strategy to achieve higher levels of sustainability, policy setting and academic input are two central contributors. Yet, in addition to these, grass-roots endorsement and participation, is a fundamental requirement. There is simply no manner in which a community can become more sustainable if the persons forming it are not committed and involved in this ideal. EcoGozo is a People's vision and a People's project. In launching ecoGozo, the government has given a name, perhaps developed a brand, to a vision which the people of Gozo themselves have communicated to the Government over the years. EcoGozo is a vision of the people of Gozo for the transformation of their island into a sustainable reality. In this process, Government has taken up the role required to consolidate and formalise this vision, and at a second stage, organize and coordinate its implementation.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

The energy sector in Malta is almost 100% dependent on a single source of energy – oil, which in entirely imported. Therefore trends in Malta's energy policy are aimed at diversifying the energy mix and accelerating a shift in the energy culture. The policy is based on four main principles: diversification, security of supply, efficiency and affordability. Government has in recent years run campaigns on RES, but this aspect is not so well represented in the identified SECIs. The most visible link of policy and SECIs is in the field of energy efficiency. There are several SECIs oriented towards energy efficiency awareness raising and change of behaviour.

In terms of targeting particular socio-demographic profiles, or specific aspects of energy use, the identified SECIs do not go completely in line with major challenges, which are lack of water, high consumption of heavy fuel oil (for fuelling the ships and boats) and higher need for energy for cooling because of the warm climate. Majority of the SECIs are focusing on energy efficiency, there are several projects on energy poverty, but none of the identified was focusing solely on the specifics that were recognised as the national particularities.

The SECIs are implemented by national authorities, municipalities, civil society organisations and energy agencies. The majority of SECIs (8) are run at a cross-national level, several of them are run on the national level and few of them on local level. The SECIs mainly work towards changes in individual behaviour (9 of the identified), there are several working towards a change in technology (4 of them), while focus on changes in complex interactions and changes in everyday life situations is scarce (1 and 1 respectively).

The highlighted SECI shows us an example of a community – the whole island of Gozo – that has aspirations of becoming a sustainable society. Gozo plans to become an eco-island, wants to reduce pressure on the environment and has set a range of other ecological and social objectives. The initiative represents a concept – a governmental strategy – of future development of the island. The main lesson learned form this SECI is that if the decision-makers want to prepare a development strategy that will have real life effect and that people will follow it, they need to involve those citizens – in this case the whole island's community – in the process of preparation and adoption of the strategy. Only with inclusion can implementation of the concept be successful.

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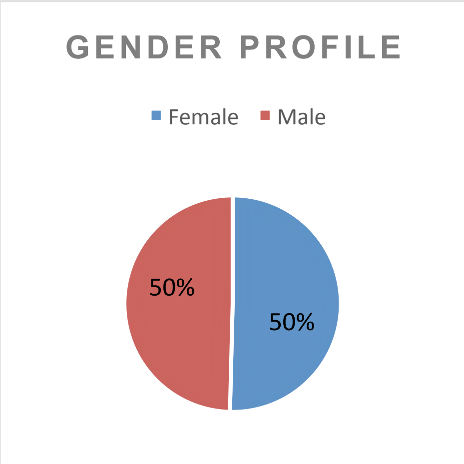
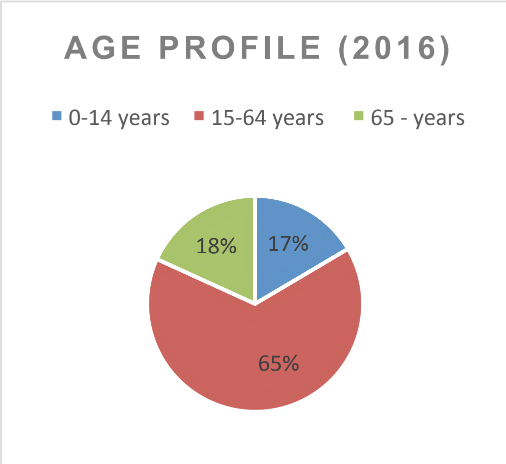
http://www.ecogozo.com/index.php?lang=en

NETHERLANDS

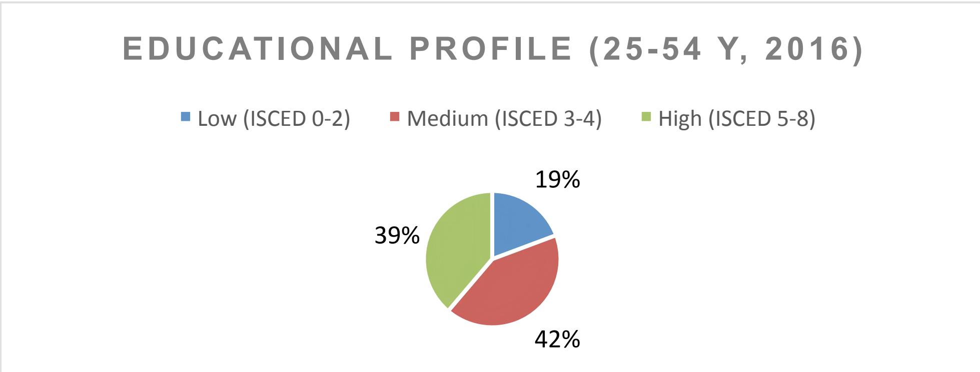
Authors: Julia Backhaus

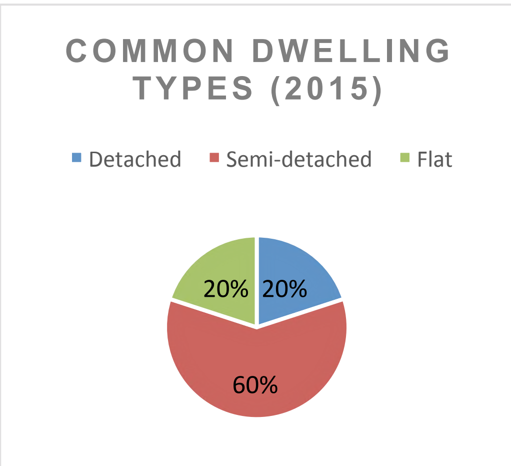
DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY

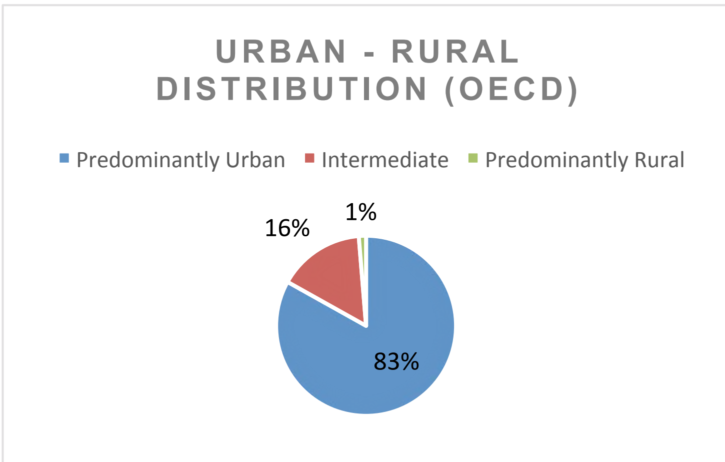


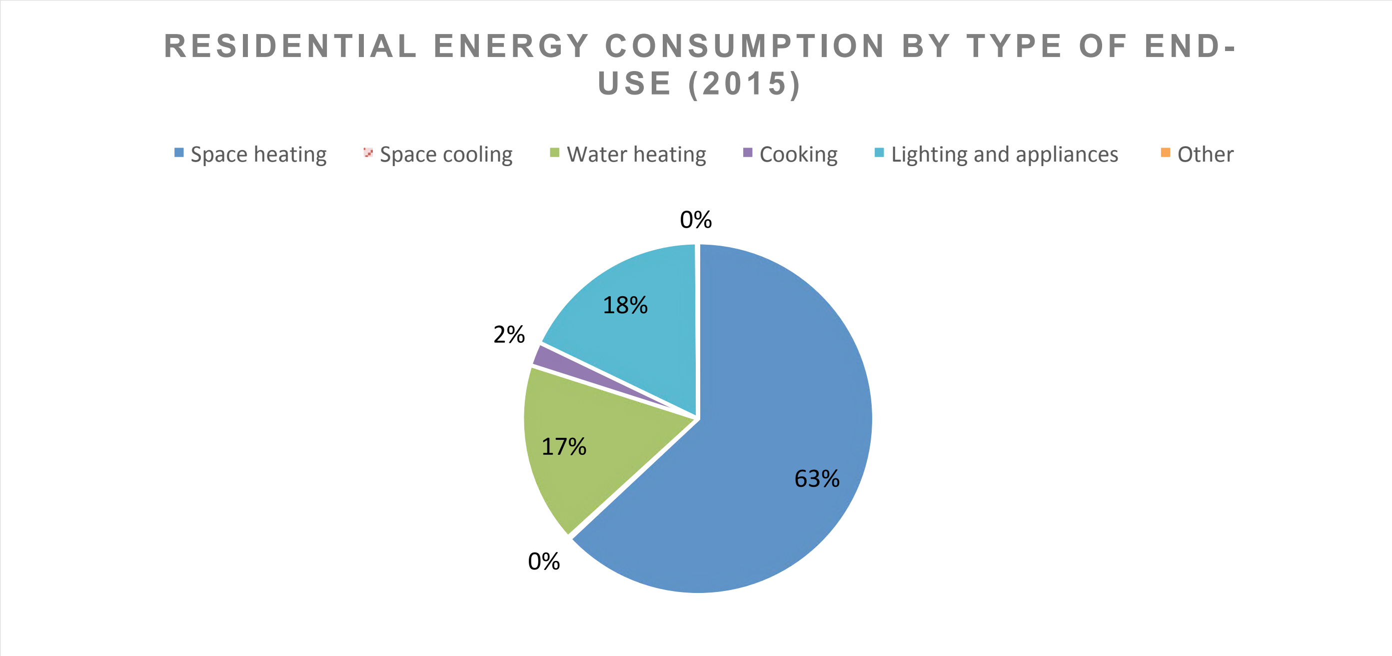


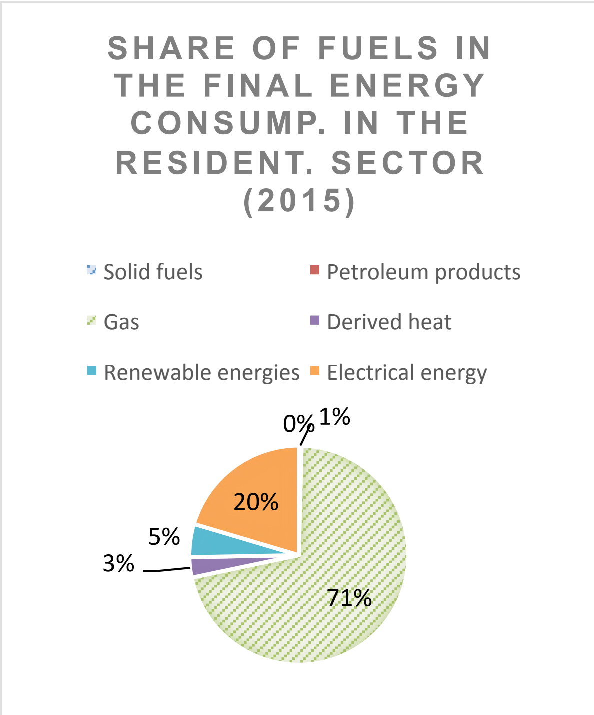
CLIMATE: temperate; marine; cool summers and mild winters

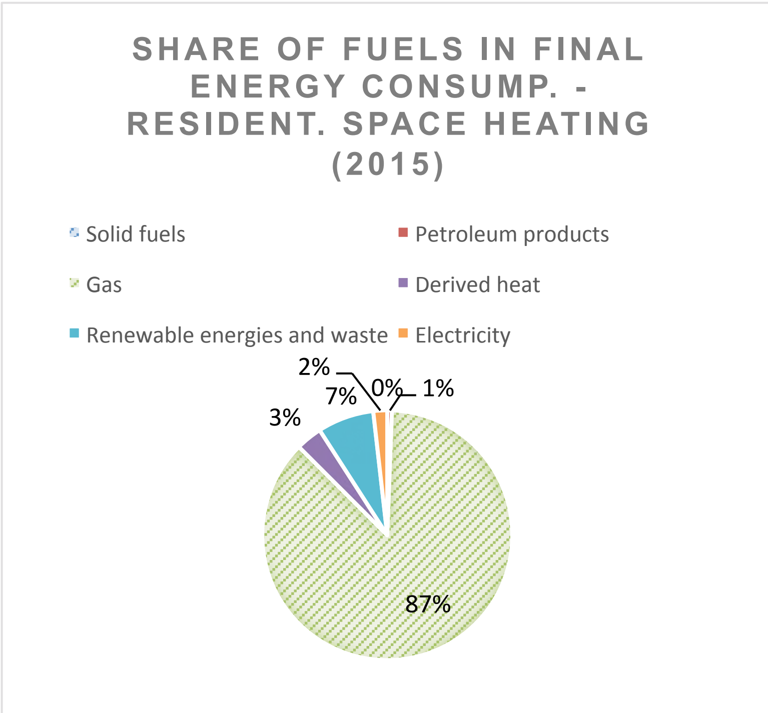












FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

6.562 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

Developments in the Dutch energy sector have been and will continue to be strongly dependent on policies and trends in other countries, especially neighbouring countries in Europe's North-West. While the Netherlands are currently a net importer of energy, this is said to change from 2023 onwards according to the most recent National Energy Outlook (Schoots, Hekkenberg & Hammingh 2017). The 2017 NEO indicates a 6% share of renewables in total domestic energy use which is projected to increase to 12.4% in 2020 and 16.7% in 2016. A steep downward trend of total energy consumption, especially in the built environment, could be observed between 2005 and 2016 and is expected to continue. However, actual energy reduction in the built environment is considered to be much lower than theoretical calculations may suggest (Majcen et al. 2013) and demographic as well as socio-economic trends draw into question positive future projections (Brounen et al. 2012).

The Dutch cooperative sector is undergoing remarkable developments, currently fuelling 85,000 (1%) of Dutch households. In 2017, 100 new solar cooperatives have been established, leading to an increase of 53% compared to 2016 and a total solar capacity of 37 MWp. 63 of the new cooperatives benefit from the *Postcoderoosregeling* ('Postcode rose regulation'), a national tax exemption scheme. This development will likely continue this year, with more than 200 projects planned for 2018. Although cooperative wind energy remained stable at 118 MW in 2017, a near doubling of capacity is expected for the period of 2018-2019 due to planned projects that emerged from close collaboration between several cooperatives, governments and commercial companies. Onshore wind energy is increasingly cooperative-based, partly due to municipal requirements (HIER local energy monitor).

Particular socio-material aspects that influence energy consumption

Personal mobility makes up for a great share of national energy use and more than 80% of Dutch households own at least one car. Partially due to public policy, cars on Dutch streets are comparatively smaller and more efficient than in other countries of Europe's North-West. A particularity of the Netherlands is the Dutch 'cycling culture' which is catered to and supported by an extensive network of cycling paths, in addition to a well-maintained road infrastructure and a rather efficient public transportation system.

Compared to households in other countries, Dutch households are not particularly interested in energy-related home renovations. The majority is concerned with investment costs (e.g. for home insulation) and consider their heating system to be working sufficiently well. Vis-à-vis households in other countries, Dutch people feel comfortable at comparatively lower indoor temperatures (below 20 °C) and actively regulate indoor temperature alongside other measures for indoor comfort, such as airing and ventilating. The latter is enabled by a central thermostat and a regulating valve on every radiator in Dutch homes.

Trends in national campaigns

The by far number one issue addressed is the energy efficiency of buildings and of appliances. National government as well as major, nationally known and operating environmental organisations are offering relevant information, guidance and support. Additionally, coaching and information campaigns seek to spread information on energy efficient behaviours.

Current Trends in Energy Policy

Dutch national policy for the built environment focuses on energy efficiency, offering subsidies for heat pumps, biomass, wood pellet or solar thermal heating systems; since 2017 also to municipalities, provinces and public bodies. The “energy efficiency you do now” (*energie besparen doe je nu*) programme provides cheap loans for energy efficiency renovations (e.g. insulation) to private home owners and associations of apartment owners. Further, national government supports industry efforts with respect to electric heat pumps, district heating (geothermal and residual/waste heat) and the electrification of transport, including personal mobility. Another field of action is the national roll-out of smart meters for all households by 2020.

Agreements have been made with municipalities and housing corporations that all rental apartments owned by housing corporations need to have an energy label of B or better and all privately-owned apartments need to have an energy label of C or better by 2020. There are subsidies for apartment owners who either offer social housing or who plan rather ambitious energy efficiency renovations. An agreement with the construction, installation and energy sector states that every year, 300,000 existing flats are to be made energy efficient. The block-for-block (*blok voor blok*) programme continues since 2012 and comprises 14 projects targeting at least 33,500 flats that are, ideally, renovated cost efficiently, i.e. on block-level.

In recent times, interest has risen in supporting communities that are keen to take collective action, for example by studying their business case (RVO) or by looking into the possibilities of an ESCO model for energy cooperatives (nmf Limburg). Although there are no longer subsides for solar PV, energy cooperatives can profit from tax exemption schemes.

Historical overview 2013-2017

Source: https://www.rijksoverheid.nl/onderwerpen/duurzame-energie/meer-duurzame-energie-in-de-toekomst

Interesting research on consumer behaviour has been commissioned and published by TNO in 2016. Moreover, there is research on Smart Energy Systems (smart grids) and 12 projects have experimented in practice. Six Dutch cities and an impressive list of partners are part of a transnational Smart Cities network and have urged national government to support their strategy – so far to no avail.

OVERVIEW OF NATIONAL SECIS

Below please find a list of Dutch SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). *The list should not be regarded as exhaustive or representative of all energy initiatives currently or previously carried out in the country*.

The Green Energy Train project in The Hague, Netherlands (2001-2003)	Changes in Individuals' Behaviour
The Green Energy Train in Leidsche Rijn, Netherlands (2001-2003)	Changes in Individuals' Behaviour
Warme Truien Dag (Warm Sweater Day)	Changes in Everyday Life Situations
HIER Klimaatstraatfeest (for neighborhoods and other groups)	Changes in Everyday Life Situations
Energy Advice in Student Housing by the Delft Energy Agency	Changes in Individuals' Behaviour
The GreenHouse project: evaluation of options for reduction of greenhouse gas emissions by changes in household consumption patterns	Changes in Individuals' Behaviour
Energie Boxen Nijmegen (energy boxes)	Changes in Individuals' Behaviour
Energieteam Zeewolde	Changes in Individuals' Behaviour
Warm and Comfortable Living - Amersfoort	Changes in Individuals' Behaviour
Besparen Loont! (Saving pays off!)	Changes in Individuals' Behaviour
Het Energiegezelschap Eindhoven (Energy Society Eindhoven)	Changes in Individuals' Behaviour
De slimme buurt Den Bosch (The smart neighborhood Den Bosch)	Changes in Individuals' Behaviour

Toon Smart Meter	Changes in Technology
Collectief Zonnepark de Gruyter Fabriek Den Bosch (solar park)	Changes in Everyday Life Situations
Energieteam Urk (Energy team Urk)	Changes in Individuals' Behaviour
Regional Energy Performance Assessment Counter	Changes in Technology
TuinWijk in het Zonnetje (TuinWijk in the sun)	Changes in Technology
Bomenbuurt-noord in Roden (Bomenbuurt North in the village of Roden)	Changes in Individuals' Behaviour
'all electric' wijk Hoog Dalem (all electric neighbourhood)	Changes in Complex Interactions
Perspectief op 0 (Perspective zero)	Changes in Individuals' Behaviour
Goed voorbeeld doet goed volgen (A good example tends to be followed)	Changes in Individuals' Behaviour
1000 slimme huishoudens (1000 smart households)	Changes in Individuals' Behaviour
Wooncoaches helpen bij energiebesparing in Voorst (energy coaches)	Changes in Individuals' Behaviour
Slim Net Lochem (smart grid)	Changes in Individuals' Behaviour
Jouw Energie Moment (Your Energy Moment pilot project)	Changes in Individuals' Behaviour
Cloud Power Texel	Changes in Individuals' Behaviour
Energiebox Utrecht (energy boxes)	Changes in Individuals' Behaviour

Energie Besparen Snel Verdiend (Saving energy as a quick gain)	Changes in Individuals' Behaviour
Perspectief project (Perspective project)	Changes in Everyday Life Situations
Student Energy Race	Changes in Individuals' Behaviour
De Achterhoek bespaart (De Achterhoek saves)	Changes in Technology
Energie Boks App (energy box online app)	Changes in Individuals' Behaviour
Buurttransformator: co-creeren met duurzame energie in buurten met sociale woningenverhuur (Neighborhood Transformer: co-creation project)	Changes in Everyday Life Situations
Mooie Wildeman (Beautiful Wildeman)	Changes in Complex Interactions
Huur de Zon (Rent the sun)	Changes in Technology
ThuisBaas	Changes in Technology
Local Energy Saving Support (LESS) Fatima	Changes in Everyday Life Situations
Drebbl (app)	Changes in Technology
energieteam Heerlen (energy team)	Changes in Individuals' Behaviour
Bestaande Wijk van Morgen	Changes in Technology
Samen Schakelen	Changes in Individuals' Behaviour
Energycoach	Changes in Individuals' Behaviour

Energieloket	Changes in Individuals' Behaviour
Servicepunt Energie Lokaal Limburg SELL (Service point energy local Limburg)	Changes in Everyday Life Situations
DUW Parkstad	Changes in Individuals' Behaviour
Repair Café	Changes in Everyday Life Situations
Goeie Peer (Good Pear)	Changes in Individuals' Behaviour

‘GOOD PRACTICE’ EXAMPLE OF DUTCH SECI

THE PERSPECTIVE (PERSPEKTIEF) PROJECT

Brief Description

This initiative is a research project that tested the possibility of living a low-energy lifestyle with a high level of well-being in a system of economic growth. The project Perspektief was carried out in the Netherlands from 1995 until 1998, financed by the then Ministry of Housing, Spatial Planning and the Environment (Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieu; VROM). Supported by a research institute and two universities, the consultancy practitioner CEA implemented the project, involving a dozen households over a period of two years. The 20 households were hand-picked and committed to aiming to reduce their energy use as much as possible over a period of two years. They were informed about the energy intensity of products and services, and coached and monitored throughout the entire run-time of the project towards achieving and maintaining a low-energy lifestyle.

Contextualization

In the Dutch context, the Perspective project is unique in terms of its focus, funding, run-time and ambitions. National government was confronted with a constant increase of energy use, also by households. Research gave reason to believe that demand would continuously grow unless addressed. Therefore, the idea emerged to test whether energy use can be reduced and kept low, even if income increases, whilst well-being remains stable or increases.

The Energy research Centre of the Netherlands (ECN) had already conducted studies on the energy intensity of products and services. Building on these figures, a project team was created with CEA, the University of Groningen and Utrecht University, that aimed to support households in reducing their energy consumption as much as possible. There had been research on energy demand reduction, none of which had focused on indirect energy and taken into account participants’ experience and well-being. A follow-up project conducted by the Netherlands National Institute for Public Health and the Environment (Rijksinstituut voor Volksgezondheid en Milieu; RIVM) incorporated the results of the Perspective project in scenarios on households’ future environmental impacts.

The Perspective project benefited from a general awareness of environmental and energy issues beyond the research and policy sphere. However, an exploration of what a reduction of indirect energy use means in practice was unprecedented. A variety of households were selected for participation and it appears that financial gains were as much a motivation to participate as possible environmental gains.

Aims and objectives

The main aim of the project was to test whether people could lead low energy-lifestyles in a framework of economic growth (which was simulated by providing people with additional household income) and to assess resulting advantages and disadvantages. While direct energy use was addressed by means of selecting participants living in energy efficient buildings and providing energy efficient appliances, the primary focus was on reducing indirect energy use. One objective, therefore, was to educate people about the energy intensity of products and services and to support them in changing levels and patterns of consumption. The project is regarded as rather successful for having achieved, on average, a reduction of household energy use of 43%.

Methods for intervention

The methods of intervention addressing direct energy use were the provision of energy efficient appliances, monitoring, information and coaching. Participating households were gathered at a kick-off event where the basic principles to reduce indirect energy use were explained (e.g. quality rather than quantity, services rather than products). Second, people were given information on energy consumption and monitoring in print form. Most importantly, households received monthly coaching advice. Advice focused on helping with the monitoring of home energy consumption, with thinking about saving strategies, with the planning of monetary spending and with additional information on the energy intensity of products and services. A second event bringing together all participating households was organized about half-way through the project to thank and motivate everyone, exchange tips and experiences and to commit people to the next period of keeping achieved consumption levels low. A final event was held to celebrate the successful finalization of the entire undertaking.

Another method of intervention was the provision of 20% additional household income to simulate economic growth. Households were obliged to follow a number of rules with respect to spending their income to ensure that their spending patterns would be following similar principles as before: no unusual donations or ‘silly’ expenditures; no more savings than prior to the project; and no big loans and investments. Any purchase costing more than 500 Dutch guilders had to be discussed with the coach who then gave advice based on potential energy impact.

Steps of implementation

The Perspective project was preceded by extensive research on ‘embodied energy’, i.e. energy that has gone into the production and provision of products and services, carried out by ECN, Utrecht University and the University of Groningen. During the initial phase 0, households were selected of different composition that lived in energy efficient housing. This was followed by a phase of baseline measurements, equipping households with a computer and teaching people how to register the products and services they consumed using a supermarket scanner and manual insertion of data (phase 1). Over the course of the following year, households were informed and encouraged to reduce their energy consumption as much as possible (phase 2). During the final year, people were motivated and encouraged to maintain the lowest consumption level achieved (phase 3).

Overview of the project period from December 1995 until December 1998

Phase	**Period**
0 – preparation, recruitment, consent	Until December 1995
1 – baseline and learning procedures for monitoring	December 1995 until June 1996
2 – trying to reduce energy consumption	June 1996 until June 1997
3 – maintaining low energy consumption	June 1997 until June 1998
Analysis	Until December 1998

Results/outcomes

The goal of the Perspective project was a 40% reduction in energy use compared to similar households. An average of 43% of reduction was accomplished, about half resulting from reductions in direct, and half from reductions in indirect energy use. Miniscule monitoring was done through meter readings as well as the careful registering of all products bought and services used. The registering of product purchases was made somewhat easier by means of a self-learning system, which required the manual entering of data only the first time an item from the supermarket was scanned. All subsequent scans were then automatically registered. Some products had to be weighed in the monitoring process. In addition, interviews were conducted to gain insights into people's emotions and experiences for example with respect to comfort and well-being and the value they attach to different consumption categories. Personal coaches took note of dilemmas people faced, such as the desire of wanting to go to a faraway place for vacation and, due to their commitment to the project, the requirement to take a low-energy holiday instead.

Overall, households reached the target by reducing their direct and indirect energy use and increasing their level of spending and wellbeing. They achieved a reduction in energy use in all categories measured: transport, food, living, hygiene, clothing and leisure. Monetary spending increased in the categories of food and living and decreased in the categories of direct energy use and leisure. Households were free to decide which changes to make. Three main strategies were identified: reducing or improving within consumption categories and shifting between consumption categories.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

Heating, cooking and showering in Dutch households is largely fuelled by gas – not least due to the country's natural gas reserves. Nevertheless, the Dutch "energy transition" has been brought on the way more than a decade ago and in the time since, Dutch government has committed to an energy system entirely based on renewables by 2050, no longer requires newly built homes to be connected to the gas net and ordered gas sourcing companies to cap and within four years completely stop extraction from a major gas field in the country's north after a series of increasingly severe earthquakes. While the country set out to become "gasless", the share of renewable energy is still very low and implementation is slow.

Sustainable Energy Consumption Initiatives (SECIs) in the Netherlands reflect Dutch energy policy in various ways. The slow roll-out and uptake of energy efficiency measures as well as renewable energy has been recognised and governmental actors at different levels have become better aligned by offering complementary support and services. While national energy policy for the built environment mainly addresses building envelopes, energy sources, (smart) systems, and appliances, Dutch municipalities and hence many SECIs seek to facilitate and support uptake by collaborating with commercial actors, neighbourhood initiatives, cooperatives, etc. In addition, municipalities and environmental organisations try reaching individual households with more direct, tailored and accessible information about energy efficiency, available subsidies and other support schemes. For example, several SECIs consist of central information points or energy coaches who provide tailored advice. Another frequently found SECI provides energy efficiency equipment to households for free – in the ideal case, like the energieteam Heerlen, coupled with a hassle-free installation service.

The 'good practice' example described in this national brief, the Perspective Project, was a long-term research project that combined various measures to explore options of maximally reducing direct and indirect household energy use despite a high and even increasing standard of living. Interestingly, levels of comfort and convenience could be maintained and even increased despite a 43% reduction of household energy use on average. By necessity, this ambitious project had to take a small-scale approach, which was partially compensated by means of detailed quantitative and qualitative evaluation.

Households' strategies to meet and maintain lowest possible energy use that were found in collaboration with personal coaches could serve as inspiration for future policies and projects. For example, care was taken to provide inspiration for how money saved or provided by the project as supplementary income could be spent in energy-efficient ways to increase happiness and well-being.

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https://www.rvo.nl/subsidies-regelingen/fonds-energiebesparing-huursector
https://www.rvo.nl/subsidies-regelingen/stimuleringsregeling-energieprestatie-huursector-step
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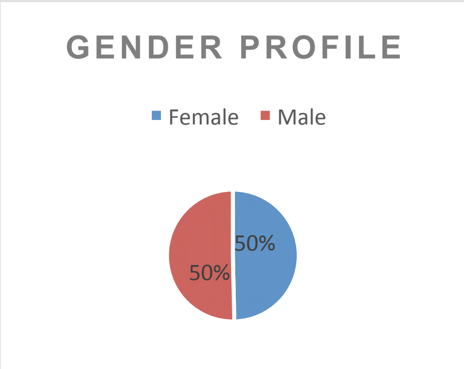
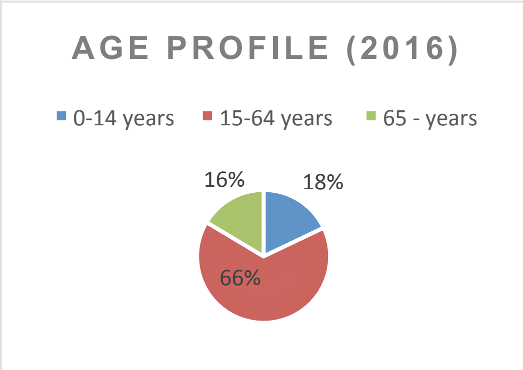
https://gsc3.city/our-cities/
https://www.energiebespaarlening.nl

NORWAY

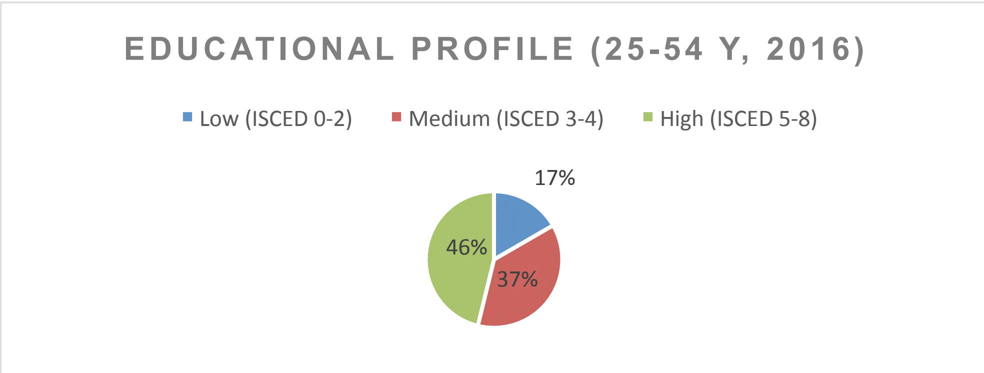
Authors: Renda Bellmallem, Tomislav Tkalec

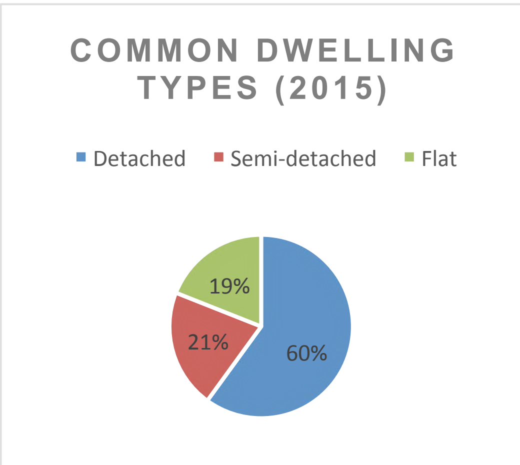
DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY

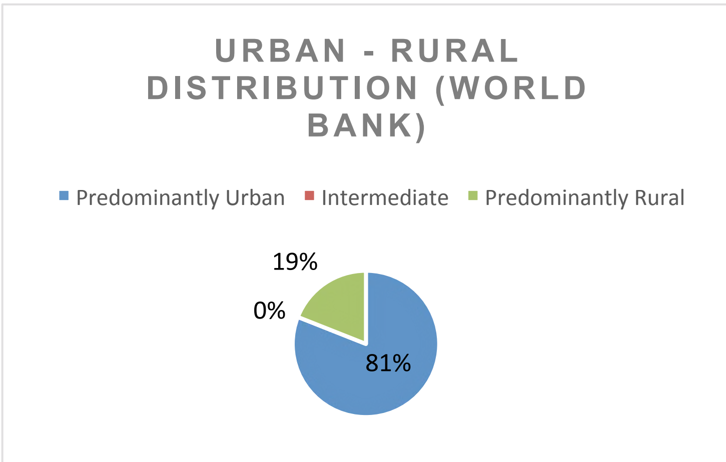


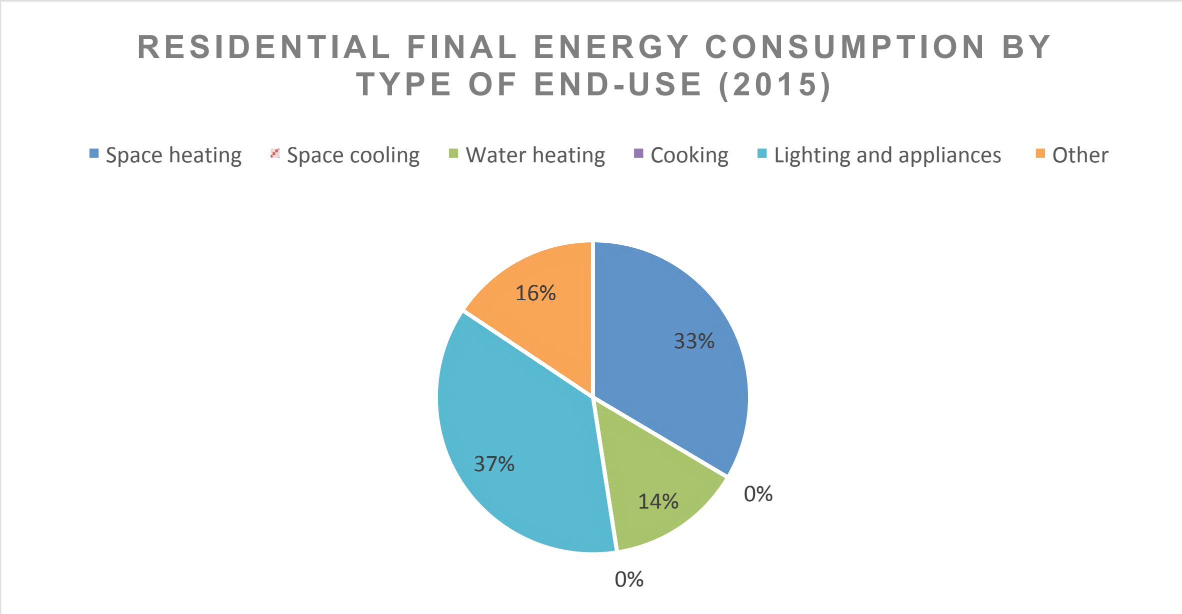


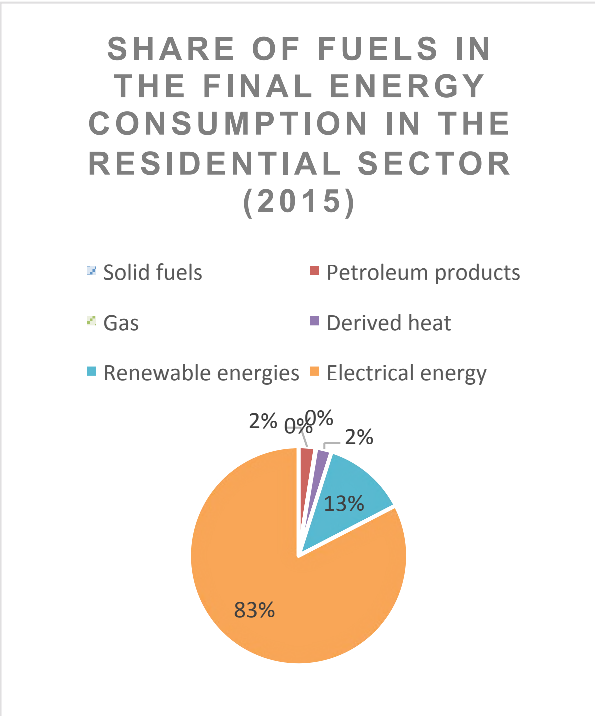
CLIMATE: temperate along coast, modified by North Atlantic Current; colder interior with increased precipitation and colder summers; rainy year-round on west coast

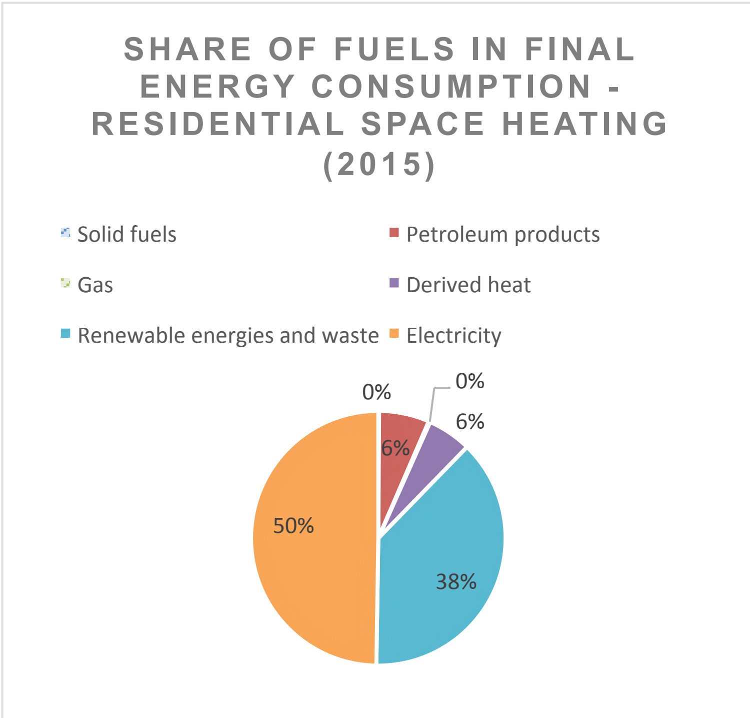







RESIDENTIAL FINAL ENERGY CONSUMPTION BY TYPE OF END-USE (2015)
Space heating
Space cooling
Water heating
Cooking
Lighting and appliances
Other
16%
33%
37%
14%
0%
0%


SHARE OF FUELS IN THE FINAL ENERGY CONSUMPTION IN THE RESIDENTIAL SECTOR (2015)
Solid fuels
Petroleum products
Gas
Derived heat
Renewable energies
Electrical energy
2%
0%
0%
2%
13%
83%


SHARE OF FUELS IN FINAL ENERGY CONSUMPTION - RESIDENTIAL SPACE HEATING (2015)
Solid fuels
Petroleum products
Gas
Derived heat
Renewable energies and waste
Electricity
0%
0%
6%
6%
50%
38%

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy System

The energy sector is a major sector of the Norwegian economy. The country has vast oil deposits that were discovered in the late 1960s. Norway's proven oil reserves were estimated at 1 billion tonnes at the end of 2015 (8 billion barrels), or 11.3 years of production at the rate of 2015. These reserves ranked Norway at 19th worldwide with 0.5% of the global total. Statoil is the national oil company. Norsk Hydro and Saga Petroleum have drilling and production rights

In 2015, Norway is the seventh largest producer and third largest exporter of natural gas. Natural gas reserves were estimated at 1 900 billion m3 at the end of 2015 (65.6 trillion US cubic feet), or 15.9 years of production at the rate of 2015. These reserves ranked Norway 16th in the world.

Norway is a net exporter of coal. In 2008, it produced about three times more than it consumed. Norwegian coal production comes from two mines on Spitsbergen, the main island of Svalbard. The country has reserves on the Norwegian continental shelf (estimated at 3 trillion tons). But, its reserves are difficult to reach and are currently not economically exploitable.

Fossil fuel explorations have been launched in the Barents Sea and in the Arctic by Norway. These surveys are debated because of their disastrous climate consequences. However, environmental concerns were placed secondarily due to the peak of Norwegian production in 2000 and the need to find more resources to pursue economic growth.

Regarding renewables, Norwegian electricity is almost exclusively produced by its hydroelectric dams. The country was the 6th largest hydro-power producer in the world in 2014. Depending on the annual rainfall, it can represent up to 99% of the country's electricity. Thermal generation ranked second with 4.7 TWh. The Norwegian electricity grid is operated by the state-owned company Statnett. Since 2008, the Norwegian and Dutch power grids have been connected by NorNed, a 580 km submarine DC cable, making it the world's longest submarine power cable.

Solar energy is also used (companies Scatec Solar and Rec Solar who also work abroad). Regarding wind power, the country is third with 1 TWh. The potential is strong, especially off-shore. The state-owned energy utility Statkraft built Europe's largest onshore wind farm in the vicinity of the city of Trondheim in central Norway. This renewable project represents an investment of 1.1 billion euros.

Between 1990 and 2012, marine chemical releases from oil exploitation are estimated at between 100,000 and 200,000 tonnes per year, depending on the year. Of this total, the vast majority (70% in 2012) is related to drilling actions. Extraction activities are also responsible for oil spills. In the first 40 years of Norwegian oil production, a total of 16.3 m3 of oil was reported to be spilt.

Particular socio-material aspects that influence energy consumption

Primary energy consumption in Norway is three times higher than the world average and electricity consumption is 7.6 times higher than the global average. This is due to the presence of electrointensive industries such as aluminium plants, attracted by the availability of low-cost electricity.

In 2014, registrations of electric vehicles in Europe reached 65,199 units, of which one-third were in Norway. In Norway, electric cars accounted for 12.5% of total registrations, thanks to particularly strong incentives: tax exemption registration tax (around € 11,500) and VAT, toll free driving, parking, ferry, free charging in public car parks.

In addition, municipal buildings must be built according to the passive building standard since 2014. Public lighting is serviced by LEDs and district heating is serviced by heat pumps.

Current Trends in Energy Policy

Norway is one of the five Arctic border states (along with Canada, Denmark, the United States and Russia), strengthening its military and strategic presence in order to advance its interests. The significant presence of fossil energy resources in the Arctic combined with a rapid melting of the pack ice makes it a geopolitical priority of importance for Norway. The Arctic would contain about 13% of world oil reserves and 30% of gas reserves. An important investment program for the "Far North" has been in place since the mid-2000s, and millions of euros have been spent on this program by the Norwegian government. Norway operates the remaining third of its natural gas reserves, most of which are located in the Arctic regions.

Norway voted in 2016 a resolution that advances from 2050 (date set by the Paris Climate Conference in 2015) to 2030, the goal of reducing to zero the net volume of greenhouse gas emissions. Electricity predominantly from hydropower is a point that goes in the direction of this objective. Intensive fossil fuel farms are the main source of greenhouse gas emissions in Norway. To achieve the target, it would be appropriate to stop, or at least reduce, the extraction of hydrocarbons.

However, Norway does not pollute less for achieving this objective, it buys offset credits abroad ("quotas") within the framework of the carbon neutrality and the carbon credits market of the Kyoto protocol. Norway, although the largest producer of oil in Western Europe, wants to be at the forefront of the fight against climate change because of these kind of policies. It is one of the first countries to have established the carbon tax. Part of the oil fund is invested in companies that are dedicated to renewable energy. It should be noted, however, that Norwegian greenhouse gas emissions are gradually increasing, due in part, to the entry into operation of a new oil field in 2015.

Trends in national campaigns

Since 2012, Norway, together with Sweden, has been issuing green energy certificates to encourage the use of renewable energy (wind, wave, solar, geothermal, biomass, hydroelectricity) by consumers and electricity producers.

National programs and campaigns focus mainly on energy efficiency measures, renewables and e-mobility for various target groups. Non-state actors are running campaigns for energy transition and there is a strong grass-roots movement of community energy initiatives and energy cooperatives.

Campaigns and initiatives are run by different stakeholders: national institutions, research institutions, NGOs and other actors, and can be divided in national/regional programs, European projects and local initiatives. Initiatives that were identified by the ENERGISE team are partly reflecting the trends from energy policies. On the other hand there are campaigns from civil society that are trying to persuade the Norwegian government and companies to go out from the fossil fuels business.

OVERVIEW OF NATIONAL SECIS

Below please find a list of Norwegian SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country.

4RinEU : Robust and Reliable technology concepts and business models for triggering deep Renovation of Residential buildings in EU	Changes in Complex Interactions
TOPTEN ACT : Enabling consumer action towards top energy-efficient products	Changes in Individuals' Behaviour
Instigating Simple Energy Efficient Behavioural Practices in Schools (FLICK THE SWITCH)	Changes in Individuals' Behaviour
European Smart Metering Alliance (ESMA)	Changes in Technology
European Solar Days II (ESD II)	Changes in Technology
Creating Actions among Energy Conscious Children (KIDS4FUTURE)	Changes in Individuals' Behaviour
Evaluation of Energy Behavioural Change Programmes (BEHAVE)	Changes in Individuals' Behaviour
Integration of Active Learning and Energy Monitoring with School Curriculum (ACTIVE LEARNING)	Changes in Individuals' Behaviour
Residential Monitoring to Decrease Energy Use and Carbon Emissions in Europe (REMODECE)	Changes in Individuals' Behaviour
The Energy Path: an e-learning platform for education of the new generations in the sustainable energy field (ENERGY PATH)	Changes in Individuals' Behaviour

TOGETHER on the move - Energy Efficient Transport training for immigrants (TOGETHER)	Changes in Everyday Life Situations
Oljefri (oilfree)	Changes in Technology
ZEB Pilot House	Changes in Technology
A Transnational Nordic Smart City Living Lab Pilot	Changes in Technology
Klimaløftet – Norway's public support to act on CO2	Changes in Individuals' Behaviour
Terra Libera Økogrend project	Changes in Complex Interactions
HURDALSJØEN ecovillage	Changes in Complex Interactions
Energismart	Changes in Individuals' Behaviour
SUSTAINCO (Sustainable energy for rural communities)	Changes in Individuals' Behaviour

'GOOD PRACTICE' EXAMPLE OF NORWEGIAN SECI

HURDALSJØEN ecovillage

Brief Description

Hurdalsjøen is a first eco-village in Norway. It consists of three parts: a housing cooperative consisting of energy efficient building made from natural materials. The second part is a living farm, which provides the community with fresh and local produce. The third part of the complex is organic nutrition centre. There are in between 400 and 500 people already living in the village or are moving there shortly. The focus is on sustainability and quality of life. 130 new housing units will come on sale in the next few years.

The legal form chosen is that of the cooperative. After the acquisition of the farm, the ecological village cooperative was responsible for covering the running costs, while the village was being designed. Once the first houses were built, a housing cooperative was created. Its members must also be members of the ecological village cooperative. The reason for this choice was the principle of "one person / one vote".

Brief Contextualization

The ecological village of Hurdalsjøen was born from a larger movement that sought a suitable place to create an ecological village in the late 1990s and early 2000s. People who settled in the ecological village of Hurdalsjøen are from this movement. It brought together a few families who saw in Hurdalsjøen an ideal place to settle. The concept of eco-villages is been implemented in various places across the Europe and the world, so it is not unique in any sense. There is a local awareness about the importance of adapting your lifestyle in order to achieve a more sustainable outcome.

Aims and objectives

The overall objective or vision is an ecological village that is respectful of the environment, which privileges local activity and a democratic mode of operation, where people of all lifestyles can cohabit. The project aims to create on-site businesses by encouraging local jobs, by developing activities such as a farm, a small grocery store, and a kindergarten. It also aims to minimize the ecological footprint of the village population (housing, food consumption, etc.), and to target social inclusion and social democracy in the organisation of activities in the village (cooperative decisions, democracy, consensus, inclusion). Finally, the project aims to be an example and inspire other similar initiatives.

Methods for intervention

Method of intervention in Hurdalsjøen is co-creation. Interested people come to live in the community and co-create the realities of it via a democratic decision-making process. Beforehand people are being educated about the sustainable living in an ecovillage, where they are provided with the information in order to facilitate the common understanding of the life in Hurdalsjøen.

Steps of implementation

Hurdalsjøen was established in 2002 and the first temporary houses were built in 2003. The group worked with experts in the fields of architecture, sanitation, agriculture, energy, and with local authorities. This was not only for housing planning but also for a national training centre, a crèche, and a research and presentation centre for renewable energies. In 2010 they built the first 28 units of housing and nursery, as planned. The houses were partially designed by the village group. The dwellings have developed new standards and use only non-polluting materials and modules, which allows different uses. Some of these units are rented but most are owner occupied.

Results/outcomes

There hasn't been any measured reduction in energy consumption or emissions reduction as there are no norms of reporting. What has changed in the lives of people that moved to the village is that the whole infrastructure of the village supports their sustainable lifestyle. In particular it lowered their energy consumption, since they live in more efficient buildings.

The role of the households

Households have been heavily involved in the initiative. The households have been part of designing the initiative and are involved in its activities on a daily basis. The initiative has definitely developed based on the feedback from people/households, since decisions are being made in a very democratic way (one person one vote). Households contributed financially in that they bought the house in the eco-village. They are also members of a food co-operative.

Location

It is situated 100 km North of Oslo. People who were searching for a new location find it suitable for housing and farming. Families or individuals (households) that want to move to Hurdalsjøen need to first go through the education process, which can be a sign of selection. We can say that there are spillover effects into the local society, since the municipality where they are situated decided that Hurdal will seek become a sustainable valley and try to become carbon neutral by 2025. There is also a sustainable festival organised in cooperation between eco-village and municipality. The initiative focuses on sustainable lifestyles form a very comprehensive approach. The main focus is on sustainable buildings although they never mention energy efficiency, but rather natural materials from which the buildings are made. The other focus is sustainable food production and consumption. They also seek to develop a sense of community with communal meals, community managed childcare, and community spaces that are shared.

Was/is the initiative successful?

The initiator does not explicitly state whether the initiative is successful or not. However it does give an evaluation of how successful the initiative was in creating local jobs. It is stated that it is still too early to assess the impact on job creation or employee retention. However, the current construction of housing and nursery, the future development of a grocery store and a small café create a favourable environment for job opportunities. The initiative offers people an opportunity to live a more sustainable life, without compromising their quality of life. It offers an alternative to living in a consumer driven environment. A part of the success is also due to the fact that it managed to gathered together like minded people. The biggest sign of the success of the initiative is its cooperation with the wider community. Often times such ecovillages are isolated which prevents them to make a bigger impact.

Textual and communicative aspects of initiative

Energy consumption is never specifically mentioned, but the information on the initiatives gives signs that energy consumption is framed as a natural by-product of living an unsustainable live. The initiators also never mention which problem they try to solve, but only offer an alternative and lead by example. I believe this mentality also corresponds with the way households think about their impact on society. The initiative is more focused on changing the individual behaviour, but on the other hand offer solutions that could also work outside the eco-village. Households are framed as people living everyday lives within sustainable community, which supports their sustainable lifestyle.

The physical/technological aspects of the initiative

Various activities are being developed on the premises of the ecovillage, in particular agriculture. Vegetables and agricultural products are mostly for local consumption. There are also small food outlets for the people of the village, which are without personnel, and run directly by the people of the village. There is also a bakery and a café. The introductory courses are intended for people who want to settle in Hurdalsjøen. To become a member of the cooperative, newcomers are required to take a four-step course. This is an introduction to the principles and ways of working in the village, and ensuring that the new villagers are well prepared. Finally, political work aims to examine the meaning and values of ecological villages. Technologies introduced to households enable them cook, heat, clean, etc., differently. There are physical layouts that enable residents to share and repair products, such as workshops for repairing stuff and communal spaces, where they can spend free time.

Shared understandings related to initiative

There is definitely a shared understanding that material consumption should have less priority than spending time together, spirituality, eating together, etc. There is a shared understanding of how to live sustainable in the eco-village. The understanding is ensured via educational programme. Shared understandings are reached via communal workshops, events, and communal meals.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

Norway has vast oil and gas deposits, which brought wealth to the country. On the other hand, Norwegian electricity is almost exclusively produced from renewables – hydropower. Trends in Norwegian energy policy go in the direction of reducing GHG emissions, firstly with switching the energy source (from oil to electricity in transport), with energy efficiency measures and with RES. This orientation is represented also in national programs and campaigns, and to a visible extent in the identified SECIs.

There is some attention paid in SECIs to the socio-demographic specifics of energy use. As the primary energy consumption in Norway is three times higher than the world average, quite some number of SECIs address specifically energy consumption and energy efficiency, also use of smart metering. Some of the identified SECIs actually have a rather strong community element and quite a few of them focus on cities, neighbourhoods, and local communities. On the other hand, among the identified SECIs there is only one that is focusing solely on sustainable mobility.

The majority of the identified SECIs focus on changes in individual behaviour (10 of them), while changes in technology (5 SECIs) and changes in complex interactions (3 SECIs) are less represented. Only one SECI is characterised as changes in individuals' behaviour. The majority of SECIs work at a cross-national level, the national and local level actions are rather rare (3 SECIs each).

The selected good practice example shows us an eco-village Hurdalsjøen that is run in the form of a cooperative. The whole infrastructure in the village supports the sustainable lifestyle of the villagers, who were also included in designing the initiative, are involved in it's activities on a daily basis, and are in that way co-crating decisions and development framework for the whole community (democratic processes – one person one vote). The main success of the initiative, and in that way also the main lesson learned, is that it offered people an opportunity to live a more sustainable life without compromising their quality of life – they have in self-organising principle created an alternative to living in a consumer driven environment. That can be important for policy-makers, as it also shows that in this way it is possible to create local jobs, which are at the same time minimising the ecological footprint of the community, and still have social inclusion, democratic mode of operation and respect for the environment on the top of the agenda.

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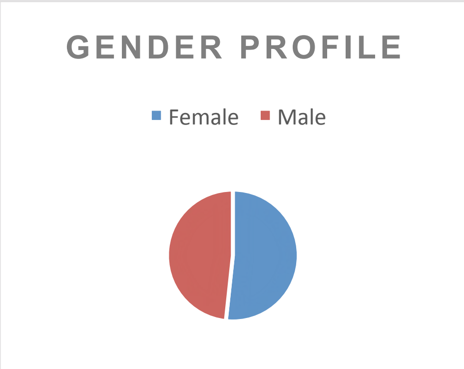
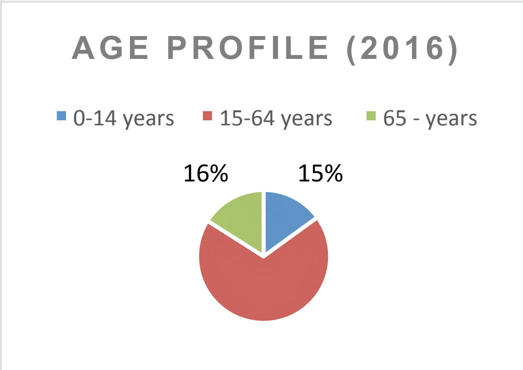
https://www.hurdalecovillage.no/livet-i-landsbyen/

POLAND

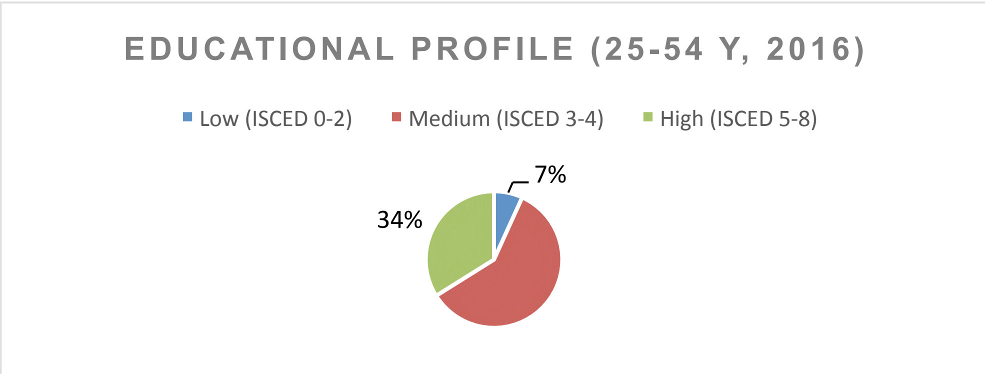
Authors: Marko Hajdinjak, Desislava Asenova,

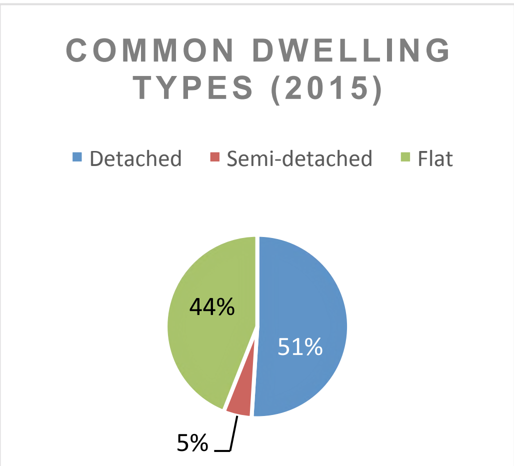
DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY

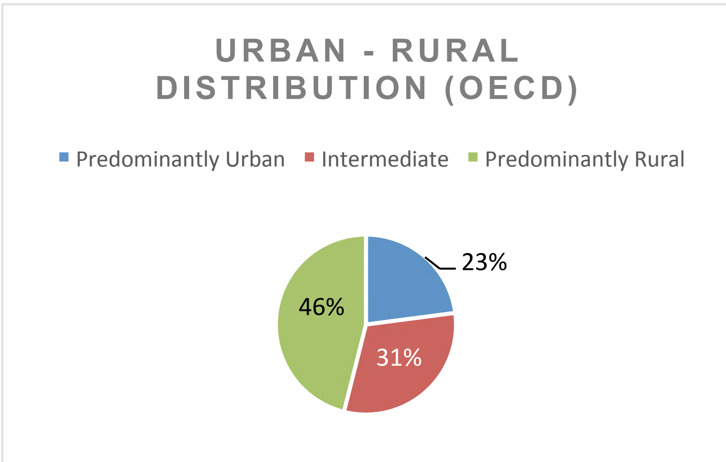


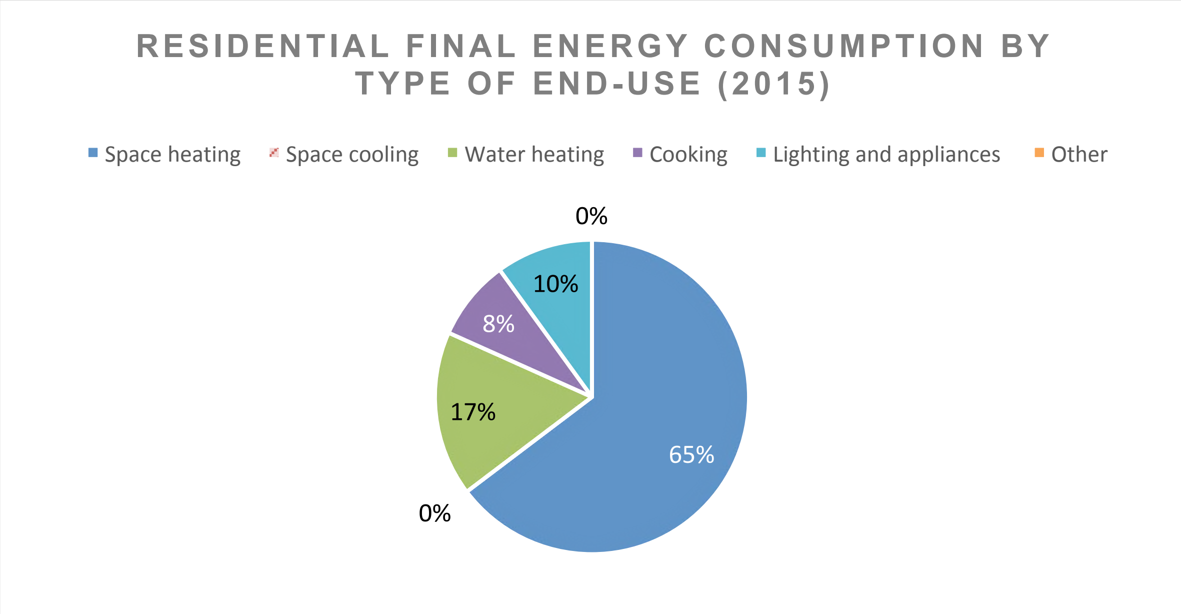


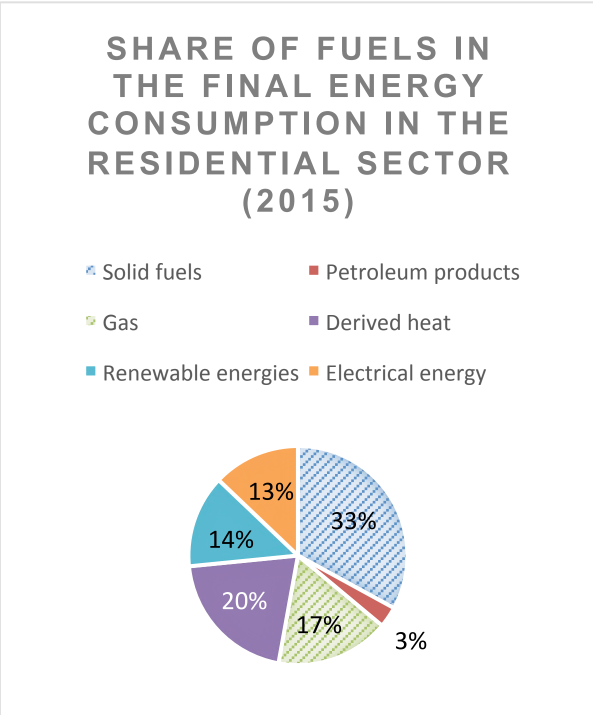
CLIMATE: temperate with cold, cloudy, moderately severe winters with frequent precipitation; mild summers with frequent showers and thundershowers

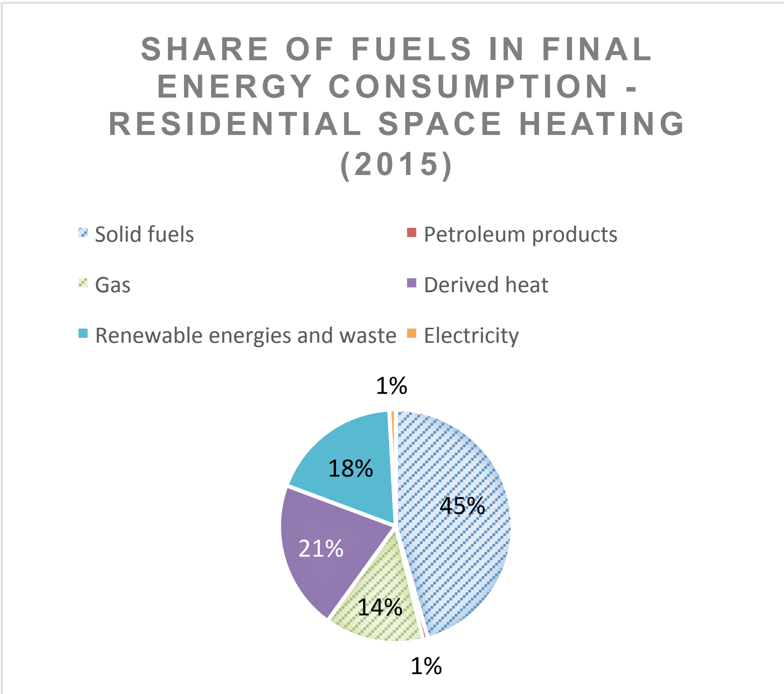












FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

5.768 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

What characterises the Polish energy sector is that Poland is the largest producer and consumer of coal in the EU, it has the largest central heating subsector in the EU and is the country of oil and gas transit between Russian Federation and Germany. Poland has neither nuclear power, nor substantial resources of hydro energy.[97]

Coal accounts for 83.7% of gross electricity generation. In 2015, coal-based plants share in electricity generation reached 50.6% and lignite's share amounted to 22.1%. Onshore wind and other renewable energy sources (other than hydropower plants) produced only 6.3%. When biomass co-firing is added, RES share in generated electricity reaches 12% in total. Another 2.6% of electricity generation comes from gas-fired power plants.[98]

According to data of the Energy Regulatory Office, six largest companies in the energy sector in Poland are: i) Grupa Kapitałowa (GK) PGE (in 2011 produced 40% of the domestic electricity); ii) GK Tauron (in 2011 produced 14% of the domestic electricity); iii) GK Enea (in 2011 produced 8% of domestic electricity); iv) EDF; v) ZE PAK; vi) GK Energa.

Gas supply in Poland is covered by domestic deposits as well as by imports. Gas is mainly imported from Germany and the Czech Republic, and also from Russia. Poland is among the EU countries that are least dependent on imported gas. The biggest producer and importer of gas is the Grupa Kapitałowa Polskie Górnictwo Naftowe i Gazownictwo (PGNiG). The main gas production deposits in Poland are located mainly in southern and western Poland (the Podkarpacie region and the western Wielkopolska region).[99]

Particular socio-material aspects that influence energy consumption

In 2015 the share of household energy consumption in total energy consumption in Poland accounted for 31%. The major energy source for energy consumption in households are coal and other solid fuels (33%), derived heat (21%), natural gas (17%), renewables (14%), electricity (13%) and liquid fuels (3%).

In terms of end-use, by far the largest share of energy consumed by households is used for heating, although this share has been falling – from 73.1% in 1993 to 65.5% in 2015. The main reason behind this decrease is claimed to be the installation of more efficient gas and electric heating appliances, as well as the thermal modernization of buildings and stricter building standards. Next in the list are water heating (16.2% of households' energy consumption) and cooking (8.5%). Lighting and electrical equipment are united in one category and account for 9.8% of energy consumption (almost two times higher than the percentage in 1993). The higher penetration of electrical equipment and changes in the intensity of use of equipment (washing

[97] World Energy Council (2014). *Energy Sector of the World and Poland. Beginning, Development, Present State*. Available at: https://www.worldenergy.org/wp-content/uploads/2014/12/Energy_Sector_of_the_world_and_Poland_EN.pdf
[98] Schnell, Ch. and Olszewski, A. (2017). *The German Energy Transition and the Polish Energy System. Part II: The Polish Energy System*. Available at: https://www.ecofys.com/files/files/ecofys-2017-the-german-energy-transition-and-the-polish-energy-system.pdf
[99] Polish Information and Foreign Investment Agency (2011). *Energy Sector in Poland*. Available at: https://www.paih.gov.pl/files/?id_plik=19610

machines, dishwashers, TV, computers) are assumed to be the cause for almost double increase.[100]

Poland is among the biggest users of district heating systems in Europe and is the second producer of district heat in the EU after Germany. Polish district heating systems are mainly coal-fired. It is claimed that Polish district heating systems could contribute to improving energy efficiency and decrease air pollution from power and heat sources. More than 60% of heat producers are small companies that generate heat in (coal) boiler houses, without cogeneration. The fuel mix for heat generation in the country is as follows: 75% coal; 8% gas; almost 8% RES; and 4% oil.[101]

In the first half of 2017, the electricity prices for households in Poland were among the lowest in the EU – 14.57 euro cents per kWh. In comparison, the average price for the EU-28 for the same period was 20.41 euro cents per kWh.[102]

Current Trends in Energy Policy

Energy efficiency policy in Poland is defined by two main documents: i) Poland's Energy Policy until 2030; ii) and National Energy Efficiency Action Plans (drawn in 2007, 2012, 2014, and 2017 and required by Directive 2006/32/WE and 2012/27/EU). The energy efficiency targets for 2020 pursuant to Directive 2012/27/EU are reduction of primary energy consumption and final energy consumption by 9% compared to the 2001-2005 period baseline. About one quarter of these savings are to be achieved in the household sector.[103]

In order to ensure energy efficiency in residential buildings, the government introduced measures that provide support for thermal modernisation and renovation of buildings. An example is the Thermal Modernisation and Renovation Fund (financed from the state budget) that is a support programme implemented since 2009. The aim of the programme is to provide financial assistance in order to improve the technical condition of the existing housing stock and to reduce its heat demand.[104]

After joining the EU in 2004, Poland experienced a rapid growth of RES. The share of RES in final energy consumption reached 12.4% in 2015. The fastest growing technology with a significant increase in the last decade was the onshore wind energy, but currently onshore wind and co-firing still account for almost 90% of RES in Poland.[105]

In the last few years, smart grid has also been developed. In 2016, four leading Polish distribution system operators (Tauron Dystrybucja, RWE Stoen Operator, Enea Operator and PGE Dystrybucja) joined forces to modernise their power grid. In 2016, a supply of 36,000 S650 Smart Grid Terminals for the medium- and low-voltage network was supplied through a major contract between Landis+Gyr (an industry leader in energy management solutions) and the four DSOs

[100] Peryt, S. and Gilewski, P. (2017). *Energy Efficiency in Poland in Years 2005-2015*. Available at: https://stat.gov.pl/files/gfx/portalinformacyjny/en/defaultaktualnosci/3304/5/13/1/energy_efficiency_in_poland_in_years_2005-2015.pdf
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[104] Peryt, S. and Gilewski, P. (2017). *Energy Efficiency in Poland in Years 2005-2015*.
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mentioned above. The Polish DSOs will need to upgrade 250,000 transformer stations with smart grid equipment.[106]

The roll-out of smart meters in Poland is expected to bring a range of positive effects including demand reduction, peak load moderation and cost savings from metering. The introduction of smart meters would result in the emergence of a new market that provides specific value added services and the ability to further use the functions of smart metering.[107]

Trends in national campaigns

Informational and educational campaigns as well as programmes related to energy saving behaviour, introduction of renewable energy sources and increasing energy efficiency of building stock have been implemented in Poland. An example is the Priority Programme of the National Fund for Environmental Protection and Water Management (NFOŚiGW) which finances educational and promotional actions, implementation of intelligent measurement and information networks and of distributed renewable energy sources, energy storage, etc.

With regard to national energy educational and informational campaigns, such have been organised by the Ministry of Economy in Poland since 2012. The aim of the campaigns is to promote public behaviour contributing to energy savings among end users and domestic households and to increase social awareness on energy efficiency issues and other issues concerning energy use. Educational handbooks and guidebooks related to the topic of energy savings have been published as part of the campaign and disseminated to the public through the Ministry website.[108]

OVERVIEW OF NATIONAL SECIS

Below please find a list of Polish SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country.

USmartConsumer: Joining Utilities & Consumers		Changes in Individuals' Behaviour
FINSH: Financial and Support Instruments for Fuel Poverty in Social Housing in Europe		Changes in Individuals' Behaviour
EEPLIANT: Energy Efficiency Compliant Products 2014		Changes in Technology

[106] Landis+Gyr (2016). *Smart Grid Development in Poland*. Available at: http://eu.landisgyr.com/blog/smart-grid-development-in-poland
[107] RWE Polska (n.d.). *Technology Scenarios for the Polish Energy Market through 2050*. Available at: https://www.rwe.com/web/cms/mediablob/de/2560854/data/184336/4/rwe/innovation/Technology-scenarios-for-the-polish-energy-market-through-2050.pdf
[108] Central Statistical Office and The Polish National Energy Conservation Agency (2015). *Energy Efficiency Trends and Policies in Poland*. ODYSSEE – MURE 2015. Available at: http://www.odyssee-mure.eu/publications/national-reports/energy-efficiency-poland.pdf

STEP_BY_STEP: Step by Step Commitments for Energy Saving	Changes in Individuals' Behaviour
iBROAD: Individual Building (Renovation) Roadmaps	Changes in Technology
2gether4vulnerability	Changes in Complex Interactions
MOBISTYLE: MOtivating end-users Behavioral change by combined ICT based tools and modular Information services on energy use, indoor environment, health and lifestyle	Changes in Complex Interactions
Assessing the intangibles: The socioeconomic benefits of improving energy efficiency (IN-BEE)	Changes in Individuals' Behaviour
START2ACT	Changes in Everyday Life Situations
TOPTEN ACT: Enabling consumer action towards top energy-efficient products	Changes in Individuals' Behaviour
EL-EFF REGION: Boosting efficiency in electricity use in 8 European regions	Changes in Individuals' Behaviour
EYEMAN CHAMPIONSHIP: European Young Energy Manager Championship	Changes in Individuals' Behaviour
ESMA: European Smart Metering Alliance	Changes in Technology
COMEON LABELS: Common appliance policy – All for one, One for all – Energy Labels	Changes in Individuals' Behaviour
ENESCOM: European Network of Information Centres promoting Energy Sustainability and CO2 reduction among local COMmunities	Changes in Individuals' Behaviour
ESD II: European Solar Days II	Changes in Technology
MOBILE2020: More biking in small and medium sized towns of Central and Eastern Europe by 2020	Changes in Everyday Life Situations

ICOSAW Promotion of the Intelligent Combination of Sun and Wood for Producing Warm Water and Heating for Private Houses	Changes in Technology
PROMOTION 3E: Promotion of energy efficient appliances	Changes in Individuals' Behaviour
SAVE@Work4Homes: Supporting European Housing Tenants in Optimising Resource Consumption	Changes in Individuals' Behaviour
Local energy production in Kisielice	Changes in Complex Interactions
EPORE: Energy Poverty Reduction in Eastern Europe	Changes in Individuals' Behaviour
Support for thermal refurbishment and renovations	Changes in Technology
Energy Saving in Schools - EURONET 50/50	Changes in Individuals' Behaviour
Installation of renewable energy systems in the public and residential buildings	Changes in Technology
Removal of the low-stack emission in Miechow – the KAWKA project	Changes in Technology
Promotional packs on energy efficiency in the Lesser Poland Voivodship	Changes in Individuals' Behaviour
Implementation of air quality plan for Małopolska Region - Małopolska in a healthy atmosphere	Changes in Individuals' Behaviour
KIDS4FUTURE: Creating Actions among Energy Conscious Children	Changes in Individuals' Behaviour
ACTIVE LEARNING: Integration of Active Learning and Energy Monitoring with School Curriculum	Changes in Individuals' Behaviour
BIOENERGY FARM: Implementation plan for BioEnergy Farm - an experimental agricultural biogas plant in Studzionka	Changes in Technology

'GOOD PRACTICE' EXAMPLE OF POLISH SECI

Local energy production in Kisielice

Brief Description

Kisielice is an example of electricity self-sufficient town. Since September 2014, 100% of the electricity used in the town has been produced from renewable sources such as wind energy installations and biomass boiler that is fed with straw provided by local farmers. In addition, 85% of winter heating comes from the local biomass combined heat and power (CHP) plant. In recognition of its achievement, the town has been awarded a European Commission ManagEnergy Award 2014 in the self-sufficiency category.

Brief Contextualization

The case of Kisielice is quite a remarkable one. In Poland, 90% of electricity is produced by coal-fired thermal power stations. In sharp contrast to the rest of the country, the little town of Kisielice in northern Poland is an extraordinary example of local energy transformation, proving that alternative ways are possible. In September 2014, the town and its 2200 citizens became energy self-sufficient, producing all electricity and most of the heating energy locally and from renewable sources. The idea to be self-sufficient for electricity with local renewable sources was implemented after a two year period of intensive and productive community debates and planning.

Aims and objectives

The aim of the project was to demonstrate to the citizens the positive effects of greener energy sources and to encourage foreign investors to fund the construction of wind farms in sparsely populated rural areas. The energy self-sufficiency project of Kisielice town had the following objectives: to increase the town's energy independence, abandon coal-based energy production, utilise the local biomass and biofuel capacity, and reduce CO_2 emissions. The overarching aim was to make Kisielice the leader in the use of renewable energy sources in Poland.

Methods for intervention

This project was initiated by the town's mayor, who wanted to copy in Kisielice some of the best energy efficiency and RES practices from different western European countries. Due to initial resistance of the town's population, the municipal authorities organised numerous awareness-raising events and open-door discussions to convince the people about the benefits of the project. The campaign was very successful and the majority of residents embraced the idea. Most opposition came from farmers, who had to provide land on which to raise the wind turbines, but after realising that they would directly benefit from the project, farmers also gave the initiative a green light.

Steps of implementation

- Involvement of and discussions with the town residents

- Construction of two wind farms which together consist of 50 wind turbines with a total capacity of 94.5MW.
- Construction of a 6MW biomass CHP plant generating electricity and heat energy by burning cereal straws which are purchased from the local farmers.
- Construction of a third 24MW wind farm.
- Planning of further RES projects: heat pumps, solar panels, small wind turbines.

Results/outcomes

The town became energy independent. At the same time, as the town no longer relies on coal to provide for its energy, GHG emissions were reduced and air quality improved. Local farmers benefit also financially, as those who have wind farms on their land are paid around 5,000 EUR per year for each turbine. Their agricultural surplus like straw that would otherwise go to waste is also purchased and used as biofuel in the combined power-heat plant.

The role of the households

Over the course of two years, citizens/households participated in numerous meetings and discussions organised by the municipal authorities. Citizens were initially rather sceptical and did not support the idea, but in time, the opinion of town’s residents turned around and they embraced the project, after they were informed about the economic and environmental benefits, including cheap thermal energy, reduced air pollution and the use of agricultural surpluses as fuel for the CHP plant. Local farmers get an extra income of about 5,000 EUR per year for the lease of each wind turbine within their land. They also provide cereal straw to be used as biofuel, which represents an additional source of income for them. Households interested in micro renewable energy sources projects such as heat pumps, solar panels, small wind turbines and similar can join local associations and apply for municipal micro-grants and loans.

Location

Town of Kisielice is located in northern Poland. It has 2200-2300 inhabitants and covers 17,280 hectares. Most of the land is farmland and the majority of population lives of farming and agriculture.

Was/is the initiative successful?

Kisielice is one of the first places in Poland where wind farms, biomass boiler plants and biogas plants were built, making the small town completely energy independent. 100% of the electricity and 85% of winter heating energy is produced from renewable sources. The European Commission recognised the town’s remarkable renewable energy project in 2014, when Kisielice received the ManagEnergy Award, as an outstanding example of sustainable energy action at the local level.

Textual and communicative aspects of initiative

Due to the fact that most energy / electricity in Poland comes from burning coal, energy consumption was above all framed as a problem of pollution and poor air quality.

Producing electricity and heating energy from local renewable sources was framed also in terms of monetary benefits for the town's population, especially the farmers. This was very important, since most people in the rural areas tend to be very conservative and do not easily accept changes and novelties in their lives.

The entire project had a very strong community aspect, and town's residents were explained that the initiative would not be successful unless it is actively supported by the majority of people (contributing land for wind turbines, providing biofuel for the power plant). A switch to RES and energy self-sufficiency was therefore possible only as a result of social organisation and not as a sum of individual actions.

The physical/technological aspects of the initiative

The town is surrounded by large and flat agricultural areas, which are very suitable for wind energy installations. With the help of foreign investors, two wind farms were built in 2014, which together consist of more than 50 turbines of a total capacity 94.5 MW. The local combined heat and power (CHP) plant with a 6 megawatt biomass boiler contributes 85% of the needed heat energy into the town's district heating network. The plant generates electricity by burning cereal straws, which are purchased from local farmers. The district-heating network provides heating to 250 buildings – in other words, it serves more than 90% of the households in Kisielice. In summer, waste heat from the plant supplies hot water to the town.

Another smaller biogas power plant started operating in 2014, producing additional 1 MW of heat and 1 MW of electricity. The plant is fuelled by silage corn, which is also bought from the local farmers.

An additional 24 MW wind farm is under construction. Kisielice intends to purchase and install the first solar photovoltaic plant in northern Poland. The municipality is also planning to finance local micro solutions such as small wind turbines, roof solar panels and heat pumps for local households.

Shared understandings related to initiative

Initiators and householders had a shared understanding of the initiative, seeing it as having diverse and numerous positive effects. These included financial benefits, cleaner air and less pollution, and a strong sense of pride and satisfaction for being a part of the project that is unique for Poland. Initially, the perceptions about the initiative were quite different, but a shared understanding was achieved through a long process of awareness events and public discussions.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

Polish energy policy is clearly set on achieving the planned reductions in primary and final energy consumption. About 25% of the envisaged reductions should occur in the household sector, mainly through technical measures such as thermal insulation and renovation of multi-apartment residential buildings, the majority of which date back to the socialist period. Several SECIs reviewed in the frame of the ENERGISE project resonate with this objective – for example ‘Support for thermal refurbishment and renovations’ which provides partial (20%) funding for thermal renovation of buildings.

As Poland is overwhelmingly dependent on coal to meet its energy needs, the air pollution is a major problem in the country. Not surprisingly, quite a few initiatives have the goal of improving the air quality by replacing the old and inefficient heating sources using coal with cleaner and more energy-efficient energy systems (‘Installation of renewable energy systems in the public and residential buildings,’ ‘Removal of the low-stack emission in Miechow,’ ‘Promotional packs on energy efficiency in the Lesser Poland Voivodship,’ ‘Implementation of air quality plan for Małopolska Region’). This would have a combined effect of increased energy efficiency, reduced greenhouse gas emissions and decreased use of hazardous combustion products.

The majority of analysed initiatives (17 out of 31) were classified as initiatives targeting a change in behaviour of individuals. They include information and awareness raising campaigns, promotion of best practices, tailored energy tips and similar. Quite a few of them are specifically addressing vulnerable consumers, as energy poverty is an important issue in Poland. In their case, the energy use aspect which most often receives particular attention is heating, since the low income households are most likely to use low-efficient and highly polluting fuel for heating their homes. Some awareness and educational campaigns promote introduction of renewable energy sources as means for increasing energy efficiency.

A very good example which tackled several aspects of Polish energy-related problems is the case of Kisielice – a town which manages to satisfy all its electricity needs through local energy production. The project included an effective awareness-raising campaign, which convinced sceptical citizens to embrace the idea of abandoning coal-based energy production in favour of electricity and heat produced by wind turbines, solar panels and biomass CHP plans. After the successful construction of the energy-producing capacities, Kisielice became 100% energy independent, the air quality improved, and some of the local residents, who provided land for wind turbines or who supply agricultural surplus used for fuel in the CHP plant receive regular income.

Kisielice case shows that by engaging a large number of relevant stakeholders and a bold vision that attracts new actors like local residents (households and farmers) to enter the energy market, tangible results can be achieved in relatively short period of time. Kisielice won the European Commission’s ManagEnergy Award in 2014. It was praised not just for its technological achievements, but especially for the wide support that the project received from the local community, making it an inspiring example for what local residents can achieve when they work across a community. Kisielice can be an excellent model not just for other towns in Poland, but across entire Europe as well, because the local authorities and communities are uniquely positioned to contribute to a clean energy future for all.

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PORTUGAL

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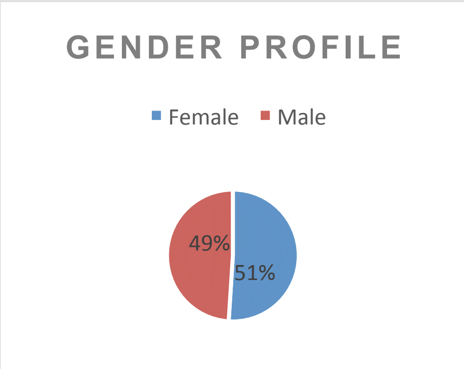
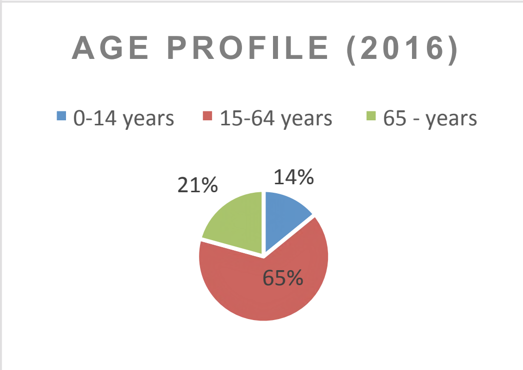
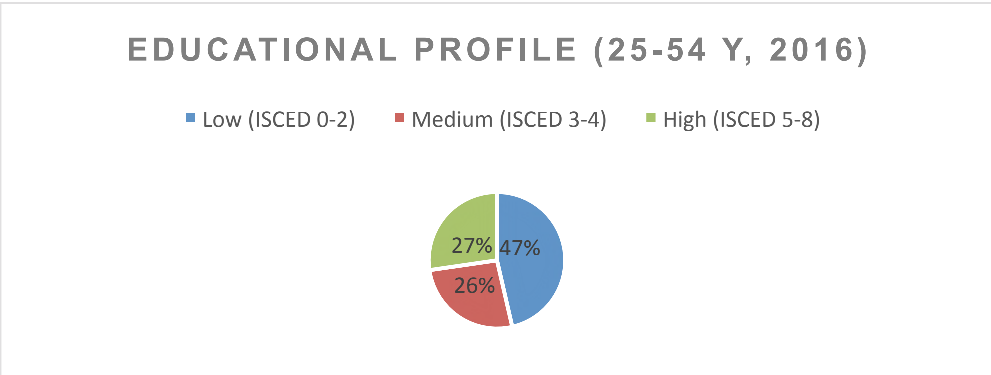
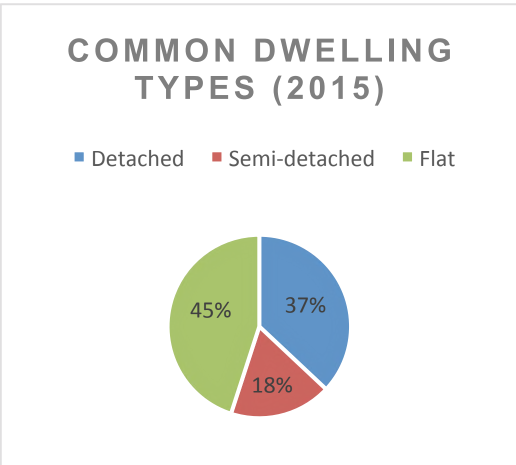
DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY

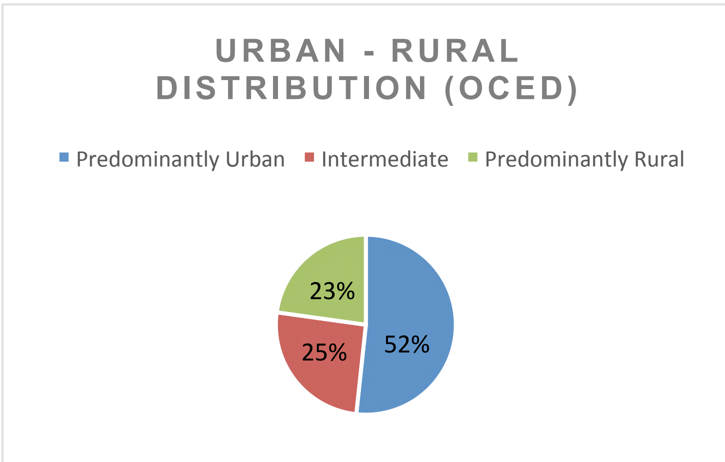


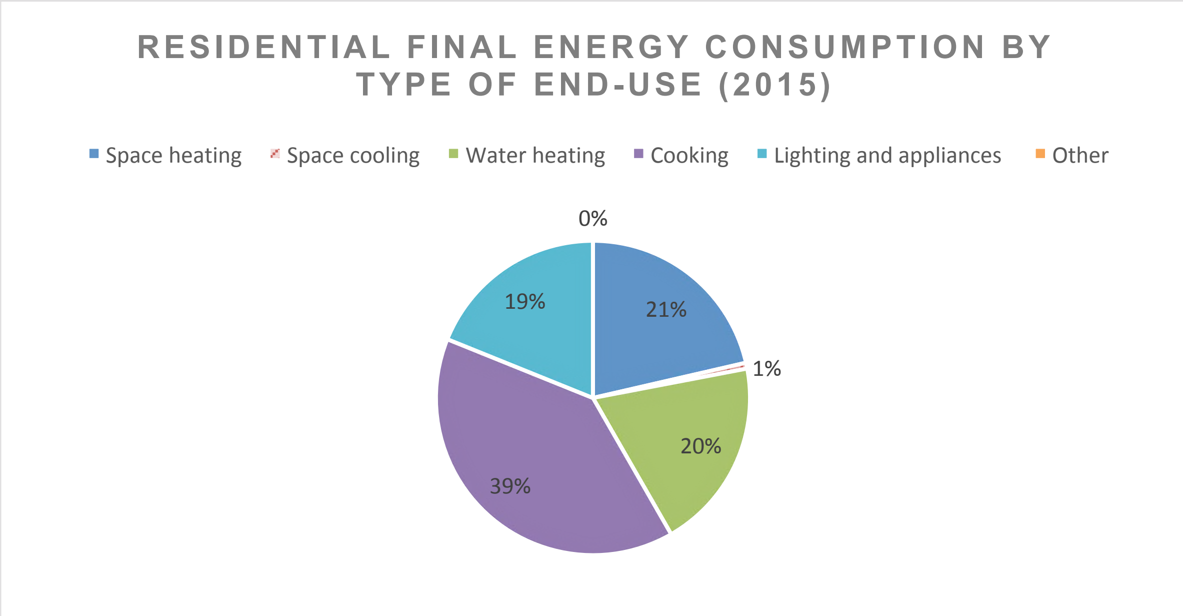


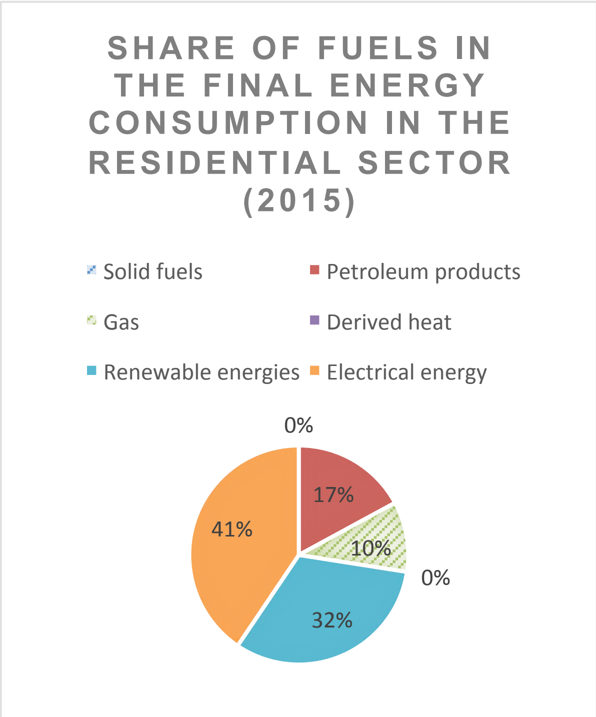
CLIMATE: maritime temperate; cool and rainy in north, warmer and drier in south

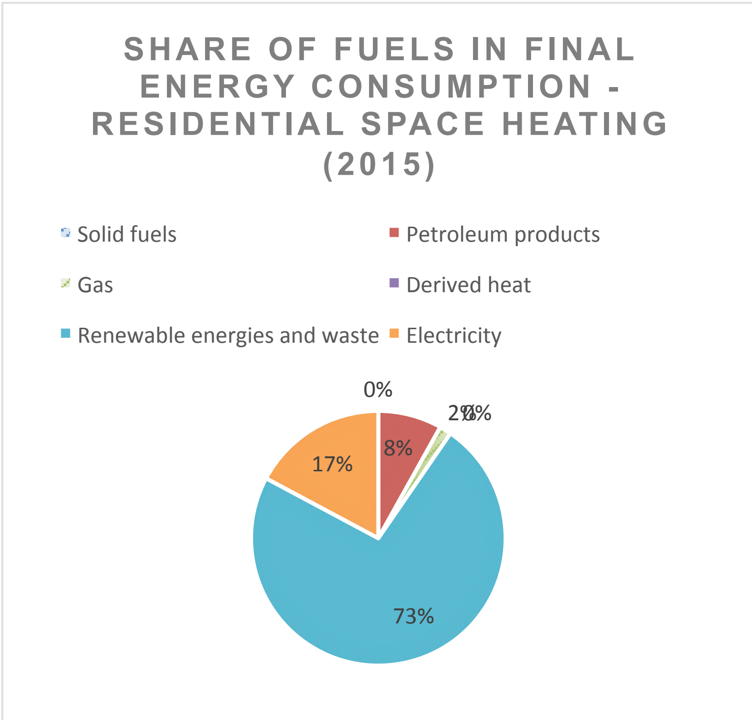












FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

2.851 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

Portugal imports 100% of the fossil fuels (oil, gas, coal) consumed in the country (77% of the country's primary energy needs in 2014). Oil is the main energy resource used in Portugal. Galp Energia is the main Portuguese company in the oil and gas sector, created on 22 April 1999 as part of the restructuring of the Portuguese energy sector. It conducts exploration activities in Brazil, Angola and Mozambique. It is the only refiner in Portugal.

Galp Energia imports natural gas (from Algeria and Nigeria) and sells it in Spain and Portugal. Portugal trades a lot of electricity with Spain, which is its privileged partner. Galp Energia has 175 MW of power plants (co-generation and wind turbines). Natural gas is the second largest source of primary energy used in Portugal. Two of the power plants operate from natural gas. The gas transmission and storage infrastructure is managed by REN (Redes Energéticas Nacionais), which also operates the electricity transmission network. REN manages the overall management of Portugal's public electricity supply system. The operator of electricity production and distribution is EDP (Energias de Portugal). Coal is the third source of primary energy used in Portugal. Coal production in Portugal ceased in 1995. Coal is almost exclusively used for electricity generation.

The national production is exclusively composed of renewable energies (biomass and waste account for more than half of the production, and followed by hydroelectricity, geothermal, solar, wind). The development of RES is done in order to reach the environmental objectives set by the European Union and in order to reduce the Portuguese energy expenditure and dependence on imports. Portugal's growth in renewable energy has been particularly important in recent years in terms of its electricity consumption, particularly since 2005 and the implementation of a governmental program promoting the development of RES. In 2014, RES accounted for 52.1% of the country's electricity mix.

Wind energy is a very important source of energy in Portugal: wind power covered 23.3% of the country's electricity consumption over the period from mid-2016 to mid-2017. This rate places the country in 3rd place in Europe, behind Denmark and Ireland.

The geographical situation of Portugal can be seen as a limit to its energy development. Indeed, it can export its surplus renewable energy or establish interconnections to another electricity network only with Spain.

Particular socio-material aspects that influence energy consumption

The Portuguese have an important use of air conditioning systems in summer. This is an issue that raises questions in the development of energy policy, especially on the wind issue. Indeed, due to the Portuguese climate, the wind turbine produces mainly in winter, during the night period. However, the use of air conditioners leads to high demand in the summer in the daytime.

Current Trends in Energy Policy

Portugal’s significant development in wind power finds its limits in the unpredictable intermittency of production. To compensate for this this limit, Portugal wants to develop the hydroelectric potential, particularly through the construction of several reservoirs and pumped-storage plants. Since 2007, Portugal has been developing the largest hydro-power project in Europe in the last 25 years. But the construction of new dams provokes a mobilization of opponents because of the environmental and patrimonial consequences.

For the first time in the world, one country – Portugal, operated only with electricity from renewables for 4 consecutive days, at the beginning of May 2016. For 107 hours between May 7 and 11, the electricity needs of Portuguese citizens have been covered only by RES: wind, solar and hydro-power. In March 2018, for 139 hours (almost 6 days) Portuguese electricity consumption was entirely provided by RES. During this period, the renewable production was greater than the consumption 60% of the time, but was therefore less than the same consumption 40% of the time. Over the whole month of March, the total production of electricity from renewable sources exceeded the needs of the country. But, in fact, with a highly variable wind and the difficulty of storing energy, a complement of fossil fuels was needed (coal and natural gas mainly) to meet the consumption punctually. By 2040, Portugal hopes to guarantee the country's annual electricity production through renewable energy while reducing greenhouse gas emissions. Nevertheless, they depend largely on weather conditions, and the constant increase in household demand complicates this ambition.

Trends in national campaigns

To encourage the establishment of wind turbines, a government measure has been implemented: the incentive of municipalities that receive 2.5% of the price of electricity paid to wind farms located in their territory. This has greatly contributed to promoting the acceptability of wind power and making municipalities active partners in wind projects. Although there are oppositions against the introduction of new wind turbines, the Portuguese population is largely in favour of wind development, contrary to other European countries. From 2001 to 2004, the Ministry of the Environment amended the Environmental Impact Assessment Regulations several times in order to facilitate and speed up procedures for granting permits to build wind farms.

Transport is Portugal's largest end-use energy sector, and its emissions are expected to continue to grow. Vehicle taxation based on CO2 emissions and scrappage schemes have created strong incentives to use more fuel-efficient vehicles. However, the increase in road traffic cancels the progress made in terms of fuel consumption, and does not take into account the energy needed to recycle cars "to scrap" and to create more fuel-efficient vehicles. Campaigns from various stakeholders are focusing mostly on renewables and energy efficiency. Portugal's specifics compared to some of the other countries is that high number of campaigns either for RES or EE are targeting whole families or even communities.

OVERVIEW OF NATIONAL SECIS

Below please find a list of Portuguese SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country.

CLEAR Consumers to Learn about, Engage with and Adopt Renewable energy technologies	Changes in Individuals' Behaviour

About EnergizAIR The renewable energy weather forecast - Europe	Changes in Technology
Euro-Topten Act (Topten.pt)	Changes in Individuals' Behaviour
iBROAD : Individual Building (Renovation) Roadmaps	Changes in Technology
EcoCasa	Changes in Individuals' Behaviour
EcoConsumo	Changes in Individuals' Behaviour
Conversas com Ambiente & EcoFamílias da Póvoa (conversations with the environment and EcoFamilies from Povoa)	Changes in Individuals' Behaviour
Ecosave	Changes in Individuals' Behaviour
Ecofamilias	Changes in Individuals' Behaviour
EcoFamílias - Água	Changes in Individuals' Behaviour
Ecological families from Oeiras	Changes in Individuals' Behaviour
Planet Me°	Changes in Individuals' Behaviour
EcoBrigadas	Changes in Individuals' Behaviour
Energy, Education, Governance and Schools. A European school panel for involving local communities in energy efficiency programs (EGS)	Changes in Complex Interactions
Coopernico	Changes in Complex Interactions
Energy-Conscious HOuseholds in ACTION (ECHO ACTION)	Changes in Complex Interactions

ENERGY SELF SUPPLY IN RURAL COMMUNITIES (ENSRC)	Changes in Technology
European Young Energy Manager Championship (EYEMAN CHAMPIONSHIP)	Changes in Individuals' Behaviour
Ecocomunidanes (eco communities)	Changes in Complex Interactions
Tamera, sustainable community	Changes in Complex Interactions
Persuasive force of children through education (FEEDU)	Changes in Individuals' Behaviour
European Smart Metering Alliance (ESMA)	Changes in Technology
Common appliance policy – All for one, One for all – Energy Labels (COMEON LABELS)	Changes in Individuals' Behaviour
Eco n' Home or how to reduce energy consumption in Household (ECO N' HOME)	Changes in Individuals' Behaviour
European Network of Information Centres promoting Energy Sustainability and CO2 reduction among local COMmunities (ENESCOM)	Changes in Individuals' Behaviour
European Solar Days II (ESD II)	Changes in Technology
TRENDY TRAVEL; Emotions for sustainable transport (TRENDY TRAVEL)	Changes in Everyday Life Situations
Promotion of energy efficient appliances (PROMOTION 3E)	Changes in Individuals' Behaviour
Pattern of Energy Efficiency in the Schools (P.E.E.S.)	Changes in Everyday Life Situations
Residential Monitoring to Decrease Energy Use and Carbon Emissions in Europe (REMODECE)	Changes in Individuals' Behaviour
Campanha ON-OFF	Changes in Individuals' Behaviour

'GOOD PRACTICE' EXAMPLE OF PORTUGESE SECI

Ecocomunidades, Iniciativas de Transição para Sociedades Sustentáveis.

Description

The project Ecocomunidades was developed by an organisation called Zero, Associação Sistema Terrestre Sustentável. Households are large contributors to GHG emissions, are large consumers, and at the same time are vulnerable to changes if different models of development towards transition to a low carbon human ecosystem will not be adopted, the project was initiated.

Contextualization

The Zero association was born because a big group of people felt they needed to do something to change the development path and that sustainability has to be achieved also by the communities themselves.

Aims and objectives

The central objective is to promote lifestyle compatible with the post-carbon society, by interventions in various areas. The goal is to reduce GHG emissions, to improve the efficiency of resource consumption in all sectors and to promote incentives to changes in everyday habits.

- Promotion of reductions of consumption and energy efficiency in households; promotion of investments (collective and individual) in renewable energies, stimulating micro generation and self-consumption
- Promotion of sustainable mobility, through daily public/collective transport use, non-motorized transport options and progressive substitution from vehicles running on fossil fuels to electrical vehicles
- Water use reduction and re-utilization of waste water.
- Stimulate transition from a linear model, based on assumptions of abundance of resources (extraction – production – consumption – discard) to a circular model, which favours reduction, re-utilization, repair, recycling of materials and existing products.
- Stimulating practices aiming to reduce waste and raise recycling rates (bio waste as a main category) through education for sustainable consumption
- Raise awareness for the need for reconciliation between human diet and a type of agriculture which copies and optimizes natural ecological processes (balanced diet, short supply chains, localization)

Methods for Intervention

The concept is set to test a hypo-carbonic strategy in small local communities – ecocomunidades, on the level of municipalities or inter-municipal communities, with the vision to replicate the practices on wider society. All this by promoting a set of practices and everyday behavioural patterns with important impacts; followed and monitored, focused on reduction and prevention of consumption and efficiency in resource use. The users/target groups are Portuguese municipalities, trans-municipal communities, companies, which want to raise awareness between their employees and customers, in the framework of social responsibility.

Steps of implementation

Along the period of 3 years the interaction with citizens/families, connected in ecocommunities, will be constant. Through the interaction with communities different integrated and connected initiatives will be developed, in order to promote and sensitise for adoption of low carbon lifestyles within the logic “think global, act local”. The result will be a local strategy, which will be adaptable to the national level.

The role of the households

Adoption of practices promoted by the project, cooperation in shaping the strategies.

Location

Portuguese municipalities and trans-municipal communities, eco-communities.

Textual and communicative aspects of initiative

The energy consumption is framed as a problem within the wider need for change (resource use, GHG emissions, and inequalities). The practices are being taken from actual communities connected already and aimed in wider application.

The problem is tackled on a community level/ municipal level and from bottom up practices taken to national / policy level. The institutions are being understood as potential facilitators of the transition towards low carbon society.

It is not focusing on individual actions but instead on community level actions.

The physical/technological aspects of the initiative

The initiative includes technological aspect, as it promotes use of RES technologies for energy production and electricity self-consumption, substitution of vehicles running on fossil fuels to electrical vehicles. In that way it introduces new technologies to the target group and in some aspects substitutes existing ones.

Shared understandings related to initiative

Shared understanding is related to initiatives’ central objective, which is to promote lifestyles compatible with the post-carbon society. Understanding of these lifestyles should be at least similar, if not same, by majority of the included actors and individuals.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

Trends in Portuguese energy policy go in the direction of developing the RES sector, especially in terms of electricity generation. Currently, Portugal imports all of its fossil fuel consumption. But on the other hand they generate big amounts of electricity from RES. Their policy goes in the direction that in 2040 Portugal hopes to guarantee the country's annual electricity generation with RES. SECIs are in a way following this path, although the initiatives are focusing more on energy efficiency aspect than on RES.

Identified SECIs are in a big majority at least partly refer to the particular socio-material aspect of energy use in Portugal, that is high energy use for air-conditioning systems in the summer. Energy efficiency is one of the better represented topics in the initiatives. What is also specific for Portugal and the identified SECIs, is that more than half of them include the term 'eco' in their name and are referring not only to the energy topic, but are trying to integrate a more holistic approach to sustainable development in their objectives and activities. Apart from that, there are some SECIs that are dealing also with renewables and with sustainable mobility.

Majority of the identified SECIs are focused on changes in individual's behaviour (19), 5 of the SECIs on changes in technology and the same number of initiatives on changes in complex interactions, while 2 of them are focused on changes in everyday life situations. Many SECIs work at a cross-national level (18), while the national (7) and local (6) level actions account for less than half of identified initiatives.

Governmental programs are rather scarce, an important part of the action comes from EU projects and initiatives by the local NGOs. Actions are mostly not targeted to specific socio-demographic groups or are targeting families and whole communities. Some rare initiatives are targeting students and schools.

The highlighted SECI is focusing on community and initiatives and wants to guide them in sustainable development pathway. While targeting whole communities, its objective is to change everyday habits, not only regarding individual's energy use, but also regarding sustainable mobility, water use reduction, circular economy, reducing waste and dietary habits. Most important lesson of the initiative is that it encompasses a long term engagement of individuals and communities, because it's goal is to have long-lasting impacts on change. Apart from that, and this can be regarded as a relevant input for policy-making, the SECI is framing energy use as a problem within the wider need for change (resource use, GHG emissions, inequalities) and is framing the solutions in the same way – not focusing only on energy, but having in mind the broader picture, it also includes other aspects. The selected good practice example shows how to tackle problems on community or municipal level and how to understand (and include) institutions as potential facilitators of the transition towards low carbon society.

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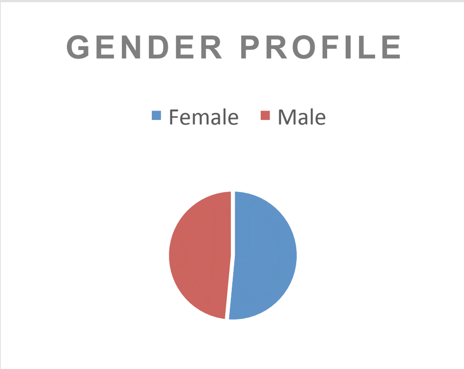
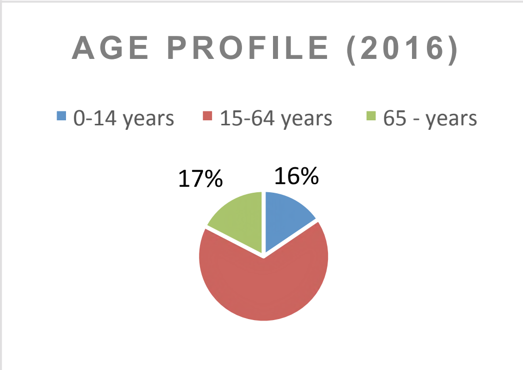
http://zero.ong/projetos/ecocomunidades/

ROMANIA

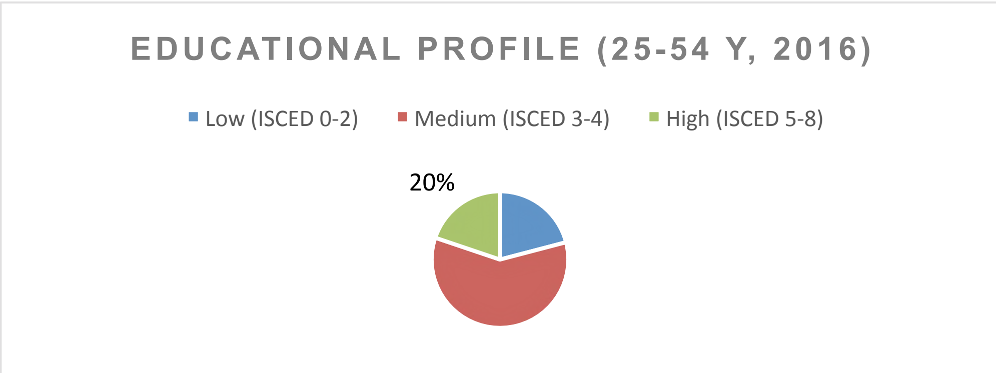
Authors: Marko Hajdinjak, Desislava Asenova

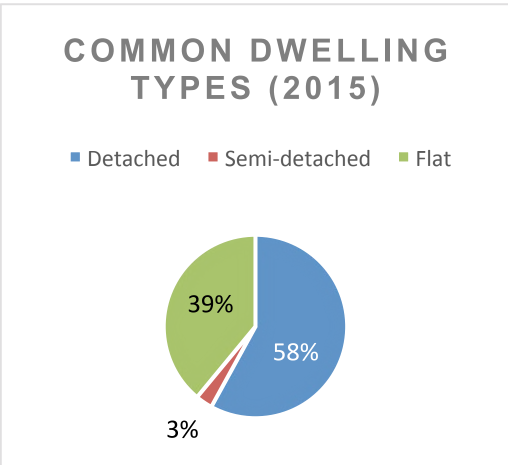
DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY

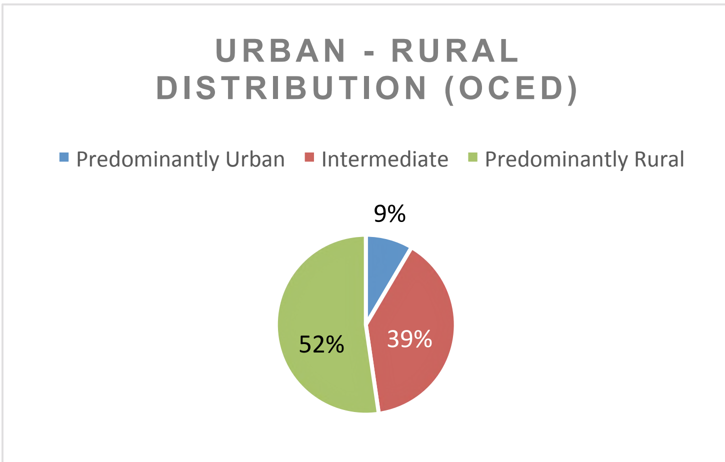


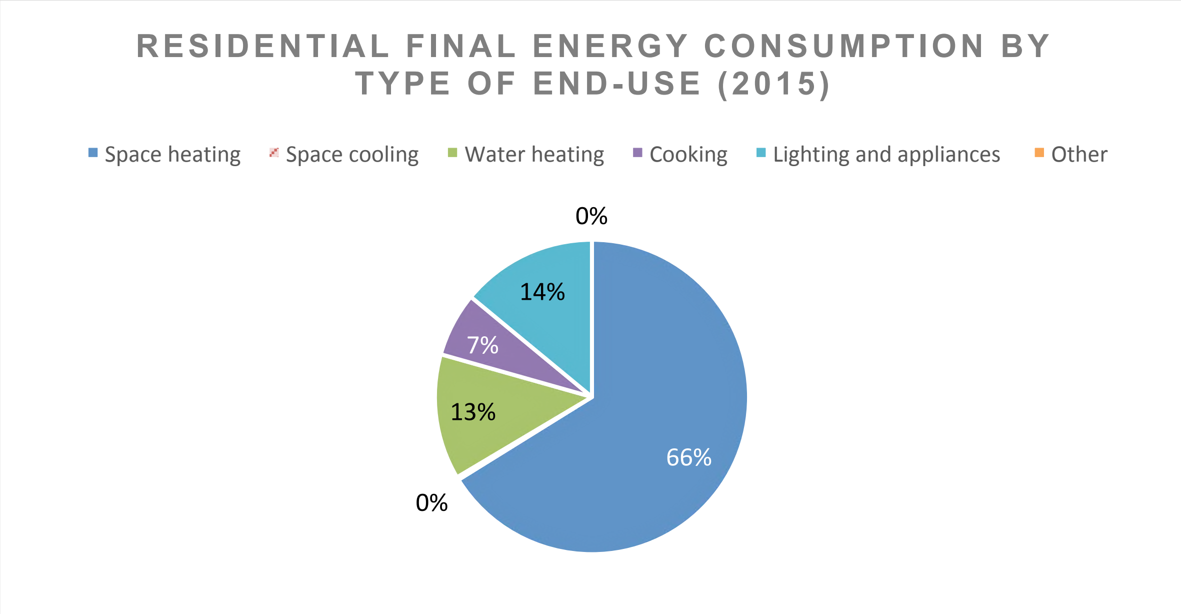


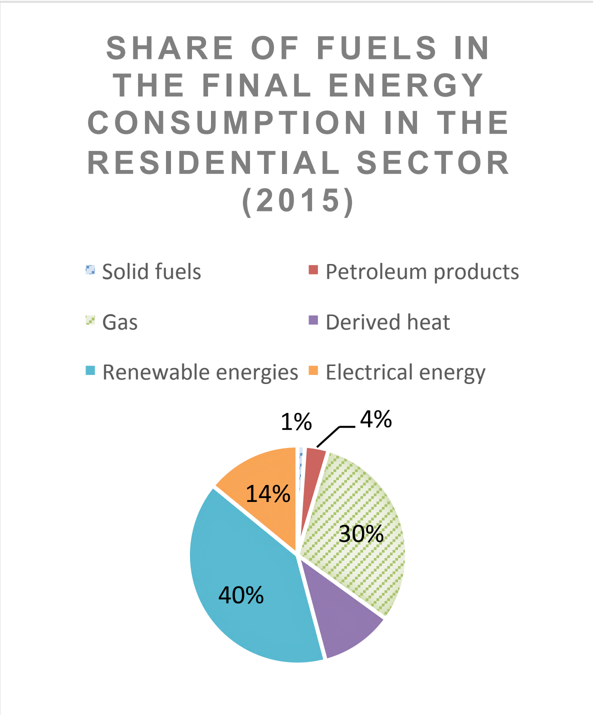
CLIMATE: temperate; cold, cloudy winters with frequent snow and fog; sunny summers with frequent showers and thunderstorms

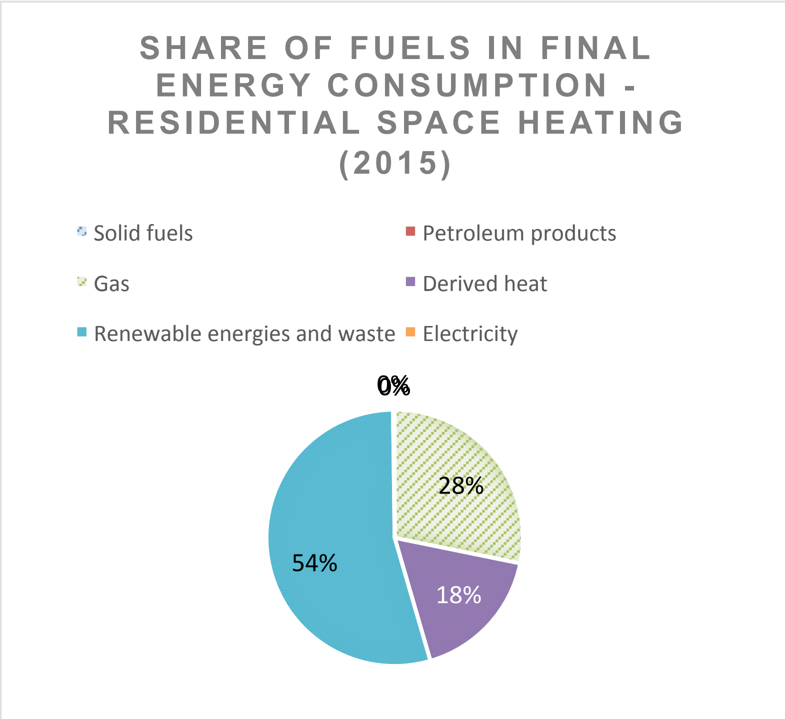












FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

4.329 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

Romania is one of the least dependent on energy imports European states. The country has domestic sources of natural gas, crude oil and coal. In 2013, 70% of the primary energy demand was covered by domestic production.[109]

In 2016, the energy production mix included nuclear power (17.1% of the total energy produced), coal power (23.4%), hydropower (29.8%), gas power (15.3%) and renewable energy (14.5%). The overall electricity generation in 2016 reached 60.7 TWh, which is approximately 1.7% lower than in 2015. Romania is a net electricity exporter.

The major three electricity generation companies in Romania are state-owned. These are Energy Complex Oltenia, Nuclearelectrica (that operates the nuclear power plant Cernavoda) and Hidroelectrica (that operated the hydropower plants). Electrical power in Romania is mainly generated from coal and hydrological resources that together contribute 58.72% to the generation of electrical power, followed by the nuclear production, which contributes 18.56%.

Two private companies are main players in the gas sector and in the field of wind energy. OMV Petrom owns the biggest gas power plant in Romania, while CEZ owns the biggest wind farms cluster.

In 2017, there were 173 licensed and registered companies for supplying electric power and 128 for natural gas; 43 out of these 258 companies are licensed for both services. Electricity supply is ensured by eight major independent Distribution System Operators (DSOs) that operate in specific regions of Romania. Five of these DSOs are private companies and members of the utility groups of companies ENEL, E.ON and CEZ, while the other three are state-owned.

Oil and gas discoveries in the Black Sea make Romania the largest producer of oil and gas in Central East Europe as well as an important player in the European oil and gas market. The main producers of natural gas in Romania are: Romgaz SA, OMV Petrom SA, Amromco Energy SRL, Raffles Energy SRL, Foraj Sonde SA, and Stratum Energy LLC. The first two companies (Romgaz SA and OMV Petrom SA) jointly cover 94.85% of aggregated consumption.

Nuclear power is also part of Romanian energy mix. The country has one nuclear power plant (NPP), Cernavoda, which has two units in operation and three more under construction. The two reactors currently in operation generate around 17% of Romania's total energy production.[110]

After a delay of about 10 years, electricity market in Romania was fully liberalised in the beginning of 2018, exempting household consumers from regulated tariffs that they had to pay until December 31, 2017. As of 2018, consumers will be allowed to choose between competitive regime and universal service market, with the option to return to the universal service market at any time. Romanian domestic gas market was liberalised in April 2017.[111]

Particular socio-material aspects that influence energy consumption

District heating systems in most of the Romanian larger towns are supplied by heat and power co-generation plants. However, due to the poor pipeline insulation, corrosion and lack of maintenance, high energy losses in these systems are often observed, which affects heating bills for households. Another issue is the inability of the centralised heating systems to meet the peak demand. As a

[109] Colesca, S. E. and Ciocoiu, C. N. (2013). 'An overview of the Romanian renewable energy sector.' *Renewable and Sustainable Energy Reviews* 24, 149-158.
[110] Dodoiu, M. (2017). *Romania – Energy*. Available at: https://www.export.gov/article?id=Romania-Energy
[111] Balkan Green Energy News (2018). 'Romania's electricity market is now fully liberalized.' Available at: https://balkangreenenergynews.com/romanias-electricity-market-is-now-fully-liberalised/

consequence, consumers at the end of the district-heating network often get low quality heat and hot water. Many consumers have therefore decided to disconnect from the district heating system, replacing it with domestic solutions such as gas heating systems and wood stoves.[112]

According to the European Commission data, only 12.3% of Romanians in 2014 were affected by energy poverty. However, some national and international institutions consider it as a major problem in the country. Around 90% of Romanian homes in the rural area and almost 20% in cities are heated only partially. The low incomes of families make it difficult to pay the bills and many families are unable to ensure the necessary level of thermal comfort.

Electricity costs have a significant share in the energy consumption basket of households. Another problem is the fact that about 100,000 households in Romania are not connected to the electricity grid. Keeping in mind that energy poverty is defined as a condition wherein a household could not access energy services at home up to a socially and materially necessitated level, it could be concluded that energy poverty in Romania is a significant problem and special measures should be taken to address it. In this regard, one of the main goals of the Romanian Energy Strategy 2016-2030 is to reduce energy poverty and protect vulnerable customers.[113]

Most of the residential buildings in Romania are old and have poor thermal performance. About 80% of them need to be renovated in order to prevent heat losses through building's envelopes and thus to decrease energy consumption. After joining the EU in 2007, Romania was obliged to comply with the objectives imposed by the Directive 2009/28/EC and with the requirements of the Energy Performance of Buildings Directive by year 2020. Thermal rehabilitation of the existing building stock is among the proposed measures in order to meet the requirements, as well as applying the latest thermal performance characteristics to new buildings and establishing certificate of energy performance. However, the high costs involved in implementing all these are a barrier towards renovating the buildings.[114]

The price of electricity for households in Romania in the first half of 2017 was 11.98 euro cents per kWh, among the lowest in the EU.[115]

Current Trends in Energy Policy

Romania is considered to be a pioneer in the field of promoting renewable energy. The availability of varied natural resources in the country has created a long tradition of using renewable energy sources for satisfying human needs – for example, since 1970s wind and water have been used in force mills, and wood and solar energy to heat water and houses.

Romania is exploiting renewable energy sources in three directions: electricity, heating/cooling and transportation. The share of energy from renewable sources in the country has increased from 16.3% in 2004 to 25% in 2016, already exceeding the target of 24% for 2020. The share in 2016 is above the EU average (17%). Despite the higher than the average levels, the energy is mainly obtained from conventional renewable sources (large hydro power plants and biomass) rather than through green renewable sources.

In order to promote the production of energy from renewable sources Romania implemented the National Renewable Energy Action Plan in 2010. The plan introduced various measures for promotion

[112] Colesca, S. E. and Ciocoiu, C. N. (2013). 'An overview of the Romanian renewable energy sector.'
[113] Clodnitchi, R. and Busu, C. (2017). *Energy Poverty in Romania – Drivers, Effects and Possible Measures to Reduce its Effects and Number of People Affected*. Available at: https://www.degruyter.com/downloadpdf/j/picbe.2017.11.issue-1/picbe-2017-0015/picbe-2017-0015.pdf
[114] Muresan, A. A. and Attia S. (2017). 'Energy efficiency in the Romanian residential building stock: A literature review.' *Renewable and Sustainable Energy Reviews*.
[115] Statista (2018). *Electricity Prices for Households in Romania from 2010 to 2017*. Available at: https://www.statista.com/statistics/418113/electricity-prices-for-households-in-romania/

of RES such as the creation of a legislative framework for renewable energy, the development of a functional system of incentives, the use of environmental funds and the development of a national strategy for renewable energy. The country also adopted a quota system with tradable green certificates that represent an additional income received by producers for the delivery of renewable energy in the grid.[116]

Besides the target of reaching 24% share of energy from renewables in gross final energy consumption by 2020, other energy efficiency targets of Romania are to decrease greenhouse gas emissions by 20% compared to the level in 1990, and to reduce the volume of primary energy consumption by 19% in order to ensure energy efficiency growth.[117]

According to EU requirements, 80% of electricity consumers in Romania should have smart meters installed by 2020. An investment of EUR 38.12m was allocated to the installation of smart meters in homes within the Large Infrastructure Operational Programme (LIOP) 2014-2020. Furthermore, CEZ Romania has already installed approximately 50,000 smart meters, targeting mainly households and small firms. The aim is to install at least 436,000 smart meters by 2020. Electrica, which is the main electricity supplier in Romania, has also invested in the installation of smart meters and their integration into the tele-management systems. The company plans to install 500,000 smart meters by the end of 2018. The Romanian National Regulatory Authority for Energy (ANRE) has given Enel (one of the energy suppliers in Romania) the permission to install 110,000 smart meters in 2016 as part of a pilot in Romania. The company plans to install similar meters for its 2.7 million clients and thus to pave the way for larger smart cities and infrastructure.[118]

Trends in national campaigns

Many national campaigns are aimed at promotion of RES. A few examples of energy campaigns in Romania are: i) An information campaign for final consumers in Romania organised by the Romanian National Regulatory Authority for Energy (ANRE) aimed at promoting energy efficiency measures and at educating consumers about the use of renewable energy and its benefits to daily living and to family budget; ii) The European campaign “Say YES to wind power” which aims to inform the Romanian society about the social, environmental and economic benefits of wind energy and of other type of energy provided by renewable energy sources. In Romania, the campaign is coordinated by PATRES (The Renewable Energy Producers Organization).[119]

[116] Colesca, S. E. and Ciocoiu, C. N. (2013). ‘An overview of the Romanian renewable energy sector.’;
EUROSTAT (2018). *SHARES (Renewables).* Available at: http://ec.europa.eu/eurostat/web/energy/data/shares

[117] Lazar, I. (2015). ‘Energy Efficiency trends and policies in Romania.’ *Romanian Energy Regulatory Authority Energy Efficiency Department*. Available at: http://www.odyssee-mure.eu/publications/national-reports/energy-efficiency-romania.pdf

[118] FRD Center (n.d.). *Romanian Smart Grid and Smart Metering. Developments and potential opportunities for international collaboration*. Available at: https://romania.trade.gov.pl/pl/f/download/fobject_id:414492

[119] European Times (2015) ‘Leading Energy Market Reform in Romania.’ *European Times*. Available at: www.anre.ro/download.php?f=ga6B&t=wOq0w9nTnMqmorLosA%3D%3D;
Nineoclock (10 May, 2016). ‘Romania enters the “Say YES to wind power” European campaign. The organizers prompt: “Be an energy hipster!”’ *Nineoclock News*. Available at: http://www.nineoclock.ro/romania-enters-the-say-yes-to-wind-power-european-campaign-the-organizers-prompt-be-an-energy-hipster/

OVERVIEW OF NATIONAL SECIS

Below please find a list of Romanian SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country.

iBROAD: Individual Building (Renovation) Roadmaps	Changes in Technology
SAVES2: Students Achieving Valuable Energy Savings 2	Changes in Individuals' Behaviour
START2ACT	Changes in Technology
ACCESS: Accelerated Penetration of Small-Scale Biomass and Solar Technologies	Changes in Technology
PRO.MOTION: Creating liveable neighbourhoods while lowering transport energy consumption	Changes in Individuals' Behaviour
EGS: Energy, Education, Governance and Schools. A European school panel for involving local communities in energy efficiency programs	Changes in Complex Interactions
TOPTEN ACT: Enabling consumer action towards top energy-efficient products	Changes in Individuals' Behaviour
enCOMPASS: Collaborative Recommendations and Adaptive Control for Personalised Energy Saving	Changes in Individuals' Behaviour
EYEMAN CHAMPIONSHIP: European Young Energy Manager Championship	Changes in Individuals' Behaviour
ENESCOM: European Network of Information Centres promoting Energy Sustainability and CO2 reduction among local COMmunities	Changes in Individuals' Behaviour
MOBILE2020: More biking in small and medium sized towns of Central and Eastern Europe by 2020	Changes in Everyday Life Situations
TRENDY TRAVEL: Emotions for Sustainable Transport	Changes in Everyday Life Situations

REMODECE: Residential Monitoring to Decrease Energy Use and Carbon Emissions in Europe	Changes in Individuals' Behaviour
Replacing incandescent light bulbs with energy-efficient ones	Changes in Technology
Suceava electro-mobility	Changes in Everyday Life Situations
Bistrita without car	Changes in Everyday Life Situations
ECOgroups: Involvement of school children	Changes in Everyday Life Situations
Casa Verde	Changes in Technology
Casa Verde Plus	Changes in Technology
Improving Energy Efficiency in Low-Income Households and Communities in Romania	Changes in Technology
Light for Romania	Changes in Complex Interactions
Thermal rehabilitation of blocks of flats	Changes in Technology
ANEGRO	Changes in Individuals' Behaviour
Marathon 2020 - start the long run for a green future	Changes in Individuals' Behaviour

'GOOD PRACTICE' EXAMPLE OF ROMANIAN SECI

Light for Romania

Description

According to the 2011 Population and Housing Census data, over 100,000 homes in Romania have no access to electricity. An NGO "Free Miorita" is running a project for bringing electricity to remote Romanian villages disadvantaged by location and lack of infrastructure. Since 2013, the project has brought light to the homes of 78 families and to two churches in villages across Romania, which previously had to make use of oil lamps, candles or flashlights. As these homes / villages are not connected to the grid, electricity is produced by solar panels.

Contextualization

In some corners of the EU, there are remote areas where life goes on without facilities that most Europeans consider a given fact: electricity, running water, gas, sewage, asphalted roads and the Internet. In mountainous and other hard-to-reach areas of Romania, numerous villages live in virtual isolation. According to the latest (2011) Census, over 100,000 homes are not connected to the national electricity grid.

The initiative Light for Romania is a campaign to bring light into the households without electric power. The reasons for this situation can be different. Sometimes households do not have access to the electricity grid because they are located in very remote places that are too far from the last electrical pillars, or people may be too poor to pay for the needed permits and connection fees. The project was designed and implemented by the NGO "Free Miorita," which tries to at least partially fill the gap left by the inactive and disinterested state. The basic idea, which triggered the entire initiative, was to make a direct impact in small communities, by challenging an embedded Romanian national mentality of "things are the way they are and nothing can be done about it."

Aims and objectives

The overall aim of the NGO "Free Miorita" is to improve the rural life through lively, pro-active and determined actions involving the local communities in the process. This is achieved by raising money through ambitious and innovative campaigns and using it to purchase and install solar panels for households in remote villages without access to the national electricity grid.

Methods for intervention

The initiative applied several methods of intervention. During the fund-raising campaign, providing information and raising public awareness was the most important element. These activities did not target the households the initiative was aiming at, but the wider public and above all corporate actors, who were expected to contribute financially and make the project possible in the first place. Citizens ready to contribute funds were invited to file a request to the Financial Administration in their place of residence, and ask that 2% of their income tax was redirected to "Free Miorita" for the Light for Romania campaign.

The amount was calculated and paid directly by National Agency for Fiscal Administration to Free Miorita's account some months after the submission of the forms.
Each year, the initiative is implemented in a different village. Typically, all households from the village (villages are small, consisting of 10-20 homes) are involved. The volunteers from “Free Miorita” install a solar panel at each home, and lay down all other necessary “infrastructure” to bring electricity into the home. Householders are explained how to take care of and maintain the solar panel and the battery. The initiative is a very original one and it is not easy to find a similar one in other EU countries.

Steps of implementation
Between 2013 (when the initiative started) and 2017, the project brought electricity to 78 households. Each year, a different village or hamlet was targeted. First, a fund-raising campaign was launched. Some money was collected by selling different items (like textile shopping bags, stickers, cups, T-shirts, etc.) branded with “Free Miorita” logo, but most came from corporate donors, who had embraced the initiative and supported it with donations. Fund-raising became much easier after the first successful campaign was implemented in the village of Ursici, as it attracted considerable attention of media, bloggers and institutions. The initiative even caught the attention of some international media outlets, such as Al Jazeera. The communication and fund-raising campaign lasted a few months, and consisted of numerous media appearances, public events, and strong online presence (blogs, social media, web articles…). The collected funds were used for the purchase and installation of solar panels (photovoltaic cells). The cost per household is about 500 euros, and includes the solar panel itself, the battery, LED bulbs, cables, and switches. The work on the installation of the panels in the village of Ursici in 2013 took about 10 days. After all of the 14 households in the village received electricity, Ursici became the first Romanian village to be illuminated solely with solar panels.

Results/outcomes
Between 2013 and 2017, “Free Miorita” brought light to 19 villages and hamlets – 78 households, 6 schools and 2 churches. The NGO does not forget about the villages once the solar panels have been installed, but regularly checks and maintains the photovoltaic systems they have installed, as many of the involved households are too poor to pay for the repairs, if something breaks down. In some cases, new equipment was installed to improve the technical performance of the photovoltaic systems and to provide more comfort to the household residents.

The role of the households
The households in the selected villages contributed physical work and helped with the installation of the solar panels. They also hosted (provided accommodation and catering) the team of volunteers from “Free Miorita,” who did most of the work on the electrification of the village.

Location
Villages in remote, often mountainous and difficult to access areas of Romania.

Was/is the initiative successful?
The initiative was very successful and has considerably exceeded its original goal of bringing light to Ursici village. Since this initial step, it was repeated in other villages as well and continues to grow in scope and popularity.

Textual and communicative aspects of the initiative
As already noted, this is quite a unique initiative and it is hard to compare it with other projects. Its aim is not to reduce energy consumption in households, but to bring to vulnerable and marginalised families something that most people take for granted – access to electricity. While the power produced by a solar panel placed on the roof of the house cannot feed the larger household appliances like stove or refrigerator, it is sufficient to noticeably improve the comfort of residents (hot water, light, power to charge batteries of different devices, etc.). Householders also obtained a viable alternative to producing electricity by diesel generators, which meant that their GHG emissions have (modestly) decreased.

The physical/technological aspects of the initiative
The most important technological aspect of the initiative was the installation of solar panels on the roofs of the houses, which enabled the households to use electric power instead of alternatives like candles, flash lights, batteries, and diesel generators. This made their daily lives much more pleasant and increased their comfort. For instance, prior to the installation of solar panels, children had to make sure to complete their homework before darkness, devices like radios or mobile phones had to be used very carefully and sporadically, as it was difficult to recharge the batteries.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

At 25% of energy generated from renewable sources, Romania is above the European average and seems on the right path towards more sustainable coverage of its energy needs. However, most of this energy comes from conventional renewable sources like hydropower and biofuel, and the country is still far from fully exploiting the potential of green renewables like solar and wind power. The national energy policy, as manifested by the National Renewable Energy Action Plan, is therefore dedicated to further promotion and uptake of renewable energy in the national energy mix. Several promotion campaigns organised by relevant state agencies aim to inform the population about the benefits of energy generated by renewable sources.

The country is also trying to improve its energy efficiency through modernisation of its energy network, including the introduction of smart grid. Like in many other European countries, poor thermal performance of residential buildings is an important problem and Romania is struggling to comply with the EU requirements about the energy characteristics of buildings. It is estimated that 80% of all residential buildings in the country will have to be renovated in order to decrease the thermal losses to the level accepted by EU standards.

24 SECIs reviewed in the frame of ENERGISE project reflect well these priorities of the Romanian energy policies. iBROAD, for example, explored and demonstrated the concept of renovation roadmaps as a tool outlining deep step-by-step renovation of buildings. ‘Thermal Rehabilitation of Blocks of Flats’ is a financing mechanism, covering 80% of the costs of thermal rehabilitation, while the remaining 20% are paid by the owners of the apartments. Initiative ‘Improving Energy Efficiency in Low-Income Households and Communities in Romania’ approached poorer households and communities, informing them how to implement energy efficiency measures by using locally-produced, energy efficient building materials.

Several initiatives foster the use of renewable energy sources. The ACCESS project addressed small-scale technologies that utilise biomass and solar energy for heating and hot-water supply in dwellings with individual and local heating systems, and projects Casa Verde and Casa Verde Plus provide grants to households to purchase solar thermal units and heat pumps.

Traffic contributes considerably to Romanian carbon footprint, as many cars are old and inefficient, and the quality of the fuel is not the best. Quite a few projects tackle car dependency and promote a change in mobility behaviour – PRO.MOTION, MOBILE2020, TRENDY TRAVEL, Suceava Electromobility and Bistrita without Cars.

One of the Romanian SECIs deserves a special mention and was presented in more detail in Section 3 – Light for Romania. As of 2018, there are still about 100,000 homes located mostly in underdeveloped and mountainous areas of the country, which are not connected to the electricity grid. Since 2013, the project has brought light to the homes of 78 family households, which had previously used oil lamps and candles. While this initiative probably cannot be a source of policy messages relevant in the wider European context, it does send a very important social, but also ecological message: that no matter how small, remote and disadvantaged, no European village or hamlet should be deprived of such a basic necessity as light – especially when it can be produced by solar power.

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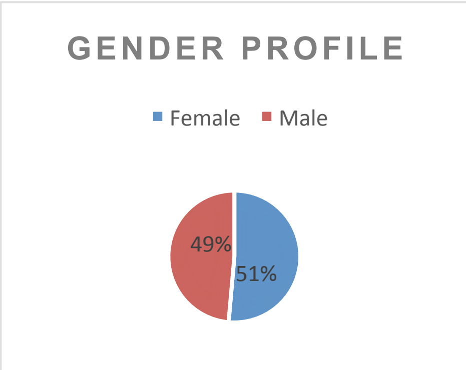
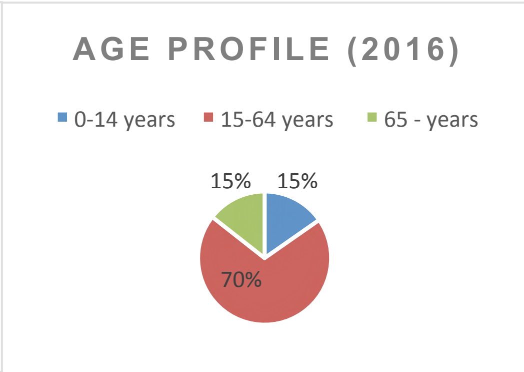
SLOVAKIA

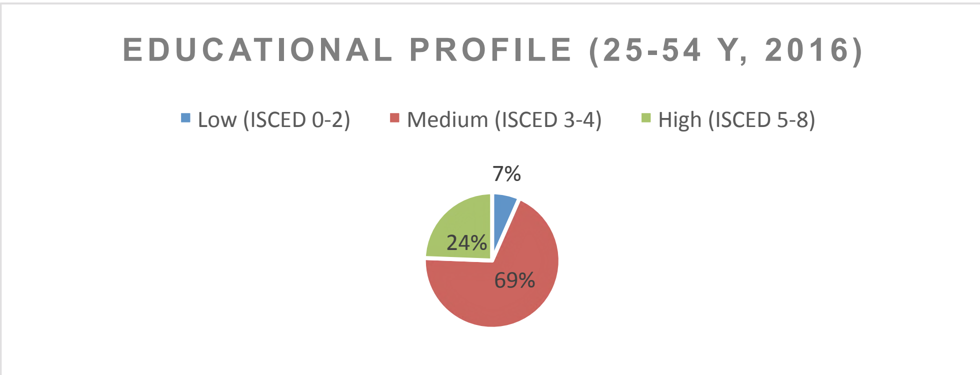
Author: Lidija Živčič

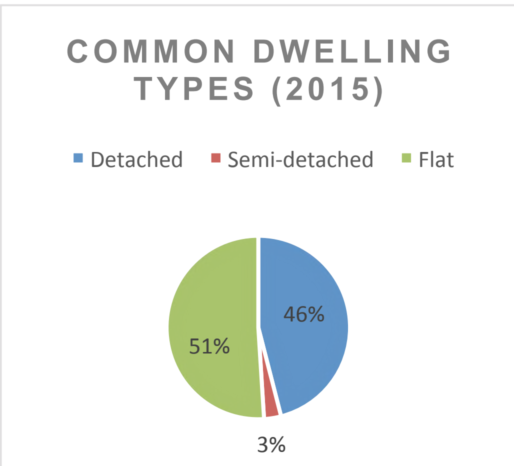
DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY

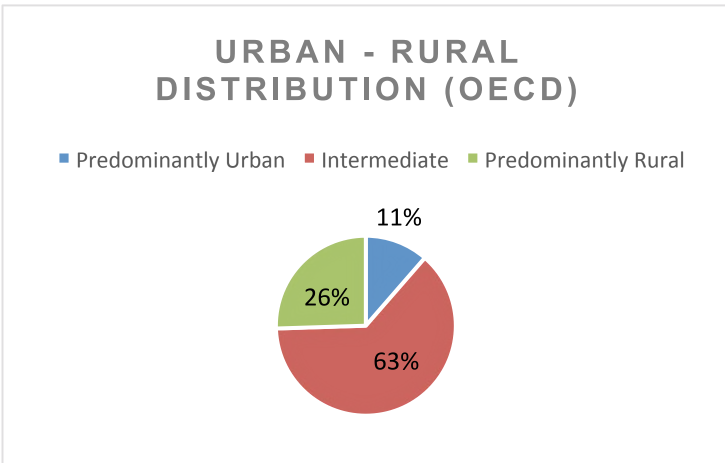


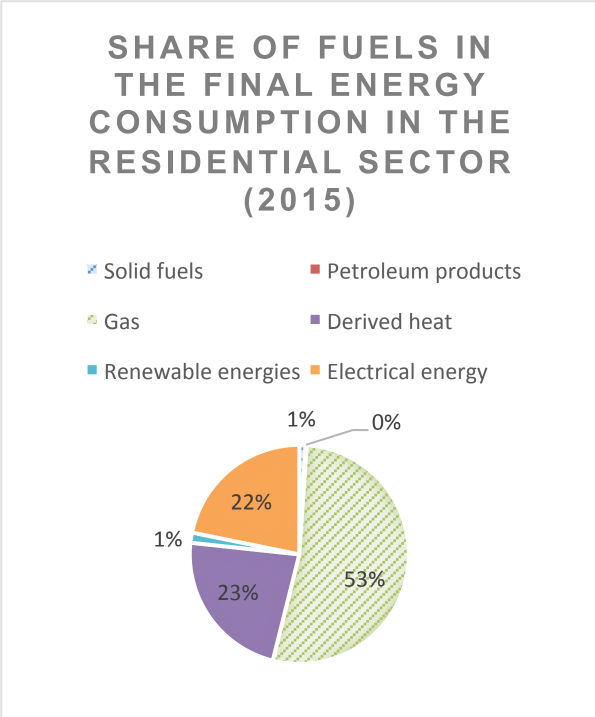


CLIMATE: temperate; cool summers; cold, cloudy, humid winters









FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

4.262 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

Slovakia has a balanced share of nuclear fuel and fossil fuels in terms of gross inland energy consumption. The shares of the individual energy sources in gross inland energy consumption in 2012 were as follows: natural gas 26%, nuclear fuel 24%, coal 21%, oil 20% and renewable energy sources, including hydropower, 9%.

The process of liberalising the gas and electricity markets led to the legal separation of generation/supply from transmission/distribution activities. Slovenské elektrárne a.s. was privatised in April 2006 with Enel, a.s. becoming the majority shareholder (66%). The question of covering the historical debts for the final phase of nuclear power plant operations - covering the costs of the decommissioning of nuclear power plants A1 and V1, processing and storing radioactive waste including decommissioning and storage of spent nuclear fuel and the final storage of spent nuclear fuel – remains open after privatisation.

Gas pipeline and distribution activities of Slovenský plynárenský priemysel, a.s. were legally separated with the creation of two subsidiaries: eustream, a.s. and SPP – distribúcia, a.s.

The legal separation of distribution from the supply or sales of electricity was accomplished in 2007 in distribution companies in the power industry with the creation of three regional distribution network operators (ZSE Distribúcia, a.s., SSE Distribúcia, a.s., Východoslovenská distribučná, a.s.) and three electricity providers. All consumers also became eligible consumers and gained the ability to select their own electricity and gas provider. The Slovak government decided within Resolution No. 656/2012 and on the basis of the new Energy Act that it would not apply a model of separate ownership for the transmission network operator within unbundling in the gas industry and as a result eustream, a.s. was not placed under separate ownership from SPP, a.s.; rather it remains a part of a vertically integrated company.

Source: http://www.economy.gov.sk/uploads/files/47NgRIPQ.pdf (accessed 11 April 2018)

https://www.iea.org/media/countries/Slovakia.pdf

Particular socio-material aspects that influence energy consumption

The structure of industry is one of the key aspects influencing energy consumption. Generally, the industry in Slovakia is not highly energy efficient, mainly due to highly energy intensive industries, such as aluminum production, iron and steel production and car industry. In spite of that, the energy consumption in Slovakia is below EU average. The per capita gross inland energy consumption in Slovakia in 2012 was 129 GJ per capita which is approximately 10% lower than the gross inland energy consumption in the EU 28 of 141 GJ per capita. The decrease in gross inland energy consumption is largely due to the restructuring of industry in the 1990s, the transition of investors over to sectors with higher added value and broader application of energy efficiency principles through the introduction of modern production technologies with lower energy intensity, insulating buildings, consumers transitioning to more energy saving appliances and savings resulting from the deregulation of prices. This development is the result of introducing less energy intensive technologies in industry and energy efficiency measures in households. Only the transport sector recorded an increase in final energy consumption over the past 10 years; decreases were recorded in all other sectors, including households. Final energy consumption of 69 GJ per capita in Slovakia is approximately 32% below the EU 27 average, which is 91 GJ per capita.

Final household energy consumption per capita in Slovakia, which was 17.2 GJ per capita in 2011 and 16 GJ per capita in 2012, is still below the European average of 23 GJ per capita. (2011). Future growth in electricity consumption must be considered given the expansion of air conditioning and electric vehicles. Energy efficiency measures, in particular insulating panel-construction apartment blocks and family homes, serve as a counterbalance to these increases. However, the improvements in insulation for buildings are usually concentrated to the better off parts of the population, while the less well-off parts of Slovak society are not able to invest into improving energy efficiency of their dwellings.

Sources:
http://www.economy.gov.sk/uploads/files/47NgRIPQ.pdf (accessed 11 April 2018)

Filcak, R. "National brief – Slovakia." Skype based communication, 10 April 2018.

Current Trends in Energy Policy

The latest trends in energy policy of Slovakia are captured in the 2014 ‘Energy Policy of the Slovak Republic’. In the field of energy efficiency, the following priorities are defined for increasing energy efficiency: achieve additional decreases in energy intensity at the level of the EU average; define a national target and securing financing for individual measures; fully transpose the Energy Efficiency Directive; establish a scheme for financing energy efficiency; secure high quality and thorough measurements, monitoring and evaluation in the area of energy efficiency; provide high quality energy efficiency information and education; introduce intelligent metering systems and creating intelligent networks to provide consumers with more information and the ability to make informed decisions; effective demand-side management. For increasing energy efficiency in the households, the following measures are highlighted: apartment building renovations and insulation, progressive shift in minimum requirements towards cost-optimum levels, replacement of high energy consuming appliances and products with new models, replacement of standard light bulbs with energy efficient fluorescent bulbs and LEDs, installation of individual temperature gauges and thermostatic valves, individual meters for all types of energy, voluntary energy audits.

Further contribution to decreased energy consumption in households is expected to come from the introduction of intelligent metering systems (IMS) and intelligent networks facilitating the remote calculation of energy consumption, regular meter reading for monitoring energy consumption over time and on higher IMS functionality also control over energy consumption. The constant overview of electricity, gas, heat and hot and cold water consumption, a greater quantity of information, simplified breakdowns and billing and new tariff products afforded by the introduction of IMS is expected to have a positive impact on the behaviour of consumers.

At the moment, one important debate is revolving around the access to grid. ENEL does not connect RES producers into the grid, which creates a barrier for faster penetration of RES. This obstacle is addressed by the association of RES businesses.

However, it is important to highlight that the major debates in Slovak energy policy still revolve around the mainstream energy sources; nuclear energy tends to be the center of debate.

Sources:

http://www.economy.gov.sk/uploads/files/47NgRIPQ.pdf (accessed 11 April 2018)

Filcak, R. "National brief – Slovakia." Skype based communication, 10 April 2018.

Trends in national campaigns

There are a couple of government organised campaigns, one on support for small renewable energy sources in households and the other on support of family houses insulation. Both programs offer subsidies to households. Apart from that, several renewables organisations and associations are implementing awareness raising and information activities on renewable sources of energy. The association of renewable energy businesses also advocate for enabling RES connection to grid. Several actors provide energy efficiency and energy saving tips for households, among which there are also various calculators available for households to calculate their energy use.

Slovak NGOs created a low-carbon platform, which is currently mainly focused on campaign against coal mining. Slovak Greenpeace runs an anti-nuclear campaign.

Sources: ENERGISE SECI Database
Filcak, R. "National brief – Slovakia." Skype based communication, 10 April 2018.

OVERVIEW OF NATIONAL SECIS

Below please find a list of Slovakian SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country.

Zelená domácnostiam (Green Households program)	Changes in Technology
Program for support of family houses insulation	Changes in Technology
Energy literacy	Changes in Individuals' Behaviour
Energy savings in high schools	Changes in Technology
Repowermap	Changes in Individuals' Behaviour
Energy saving tips 1	Changes in Individuals' Behaviour
Energy saving tips 2	Changes in Individuals' Behaviour

Energy saving tips 3	Changes in Individuals' Behaviour
Accelerated Penetration of Small-Scale Biomass and Solar Technologies (ACCESS)	Changes in Technology
Creating liveable neighbourhoods while lowering transport energy consumption (PRO.MOTION)	Changes in Individuals' Behaviour
Energy, Education, Governance and Schools. A European school panel for involving local communities in energy efficiency programs (EGS)	Changes in Complex Interactions
European Network of Information Centres promoting Energy Sustainability and CO2 reduction among local COMmunities (ENESCOM)	Changes in Individuals' Behaviour
European Solar Days II (ESD II)	Changes in Technology
More biking in small and medium sized towns of Central and Eastern Europe by 2020 (MOBILE2020)	Changes in Everyday Life Situations
Promotion of the Intelligent Combination of Sun and Wood for Producing Warm Water and Heating for Private Houses (ICOSAW)	Changes in Technology
TRENDY TRAVEL; Emotions for sustainable transport (TRENDY TRAVEL)	Changes in Everyday Life Situations
Heating calculator	Changes in Individuals' Behaviour
Lighting calculator	Changes in Individuals' Behaviour
CO2 calculator	Changes in Individuals' Behaviour
Urban ET Festival in Bratislava. Slovakia: reconfiguring public space through social interactions	Changes in Complex Interactions
Action days and mobility packages for students of the University of Zilina. Slovakia	Changes in Individuals' Behaviour
Awareness campaign about public transport at the University of _ilina. Slovakia	Changes in Individuals' Behaviour

Creative Competition and Mobile Exhibition on Public Transport by children in _ilina. Slovakia	Changes in Everyday Life Situations
DEHEMS	Changes in Individuals' Behaviour
Electricity map	Changes in Individuals' Behaviour
START2ACT	Changes in Everyday Life Situations
From Estonia till Croatia: Intelligent Energy Saving Measures for Municipal housing in Central and Eastern European Countries (INTENSE)	Changes in Individuals' Behaviour
Creating Actions among Energy Conscious Children (KIDS4FUTURE)	Changes in Individuals' Behaviour
EPORE - Energy Poverty Reduction in Eastern Europe	Changes in Individuals' Behaviour

‘GOOD PRACTICE’ EXAMPLE OF SLOVKIAN SECI

Creative Competition and Mobile Exhibition on Public Transport by children in Žilina.

Description

The municipality of Žilina held a creative competition for primary school children, dedicated to the theme “My dream public transport”. The children’s art works were displayed in municipal premises as well as on public transport vehicles.

Contextualization

This activity was implemented within the framework of the BENEFIT project, as part of the Intelligent Energy Europe programme. Many changes and trends in society have had a marked influence on the supply and use of public transport in Žilina in recent decades. The opportunity for individual mobility afforded by the passenger car has challenged public transport. Despite the implementation of regulatory measures, it is expected that there will be an increase in individual vehicle transport use in city in the coming decades.

Aims and objectives

The objective of this activity was to improve the image of public transport by introducing an interesting and unusual promotional activity. The city wanted to use children’s talent to convey the message that public transport is a safe and comfortable way of travelling in the city. Given children’s and young people’s reliance on public transport, it is essential to involve them in decisions concerning this important issue.

Methods for intervention

What is needed to discourage the use of cars and promote the use of public transport? Municipalities and public transport providers and operators should be committed to programmes that promote and develop public transport services. In bus or other public transport vehicle advertising, the vehicle is a medium commonly used by advertisers to reach the public with their message. This usually takes the form of promoting commercial brands, but it can also be used for public campaign messages, as was the case in this activity. The decorated trolleybus has certainly drawn a decent amount of attention from the public while travelling on the road. The purpose of the activity was also to increase public awareness, especially that of children, regarding environmental issues.
17 elementary schools participated in the competition and 289 artworks were entered. The activity was very successful. The relatively simple application and low costs mean there is huge potential for the replication of the activity in any city. Artworks were also used in the design of many promotional materials.

Steps of implementation

The activity started in September 2009 with the announcement of the competition at primary schools and its promotion via posters. The participants submitted their individual projects dedicated to the theme “My dream public transport”. Art works were collected until January 2010. The jury evaluated the children’s works in February. The best works were put on display in municipality premises as well as on public transport vehicles. All participants of the competition were awarded with small gifts, with winners receiving valuable prizes. Winners in three age categories had the extraordinary opportunity to cover a real trolleybus with their paintings in September 2010, during the open day in the public transport operator yard. The decorated vehicle has been operating around the city to support a more positive attitude towards public transport. Personal and implementation costs were about €2,200. About 180 person hours were spent on this action.

The role of the households

Households were not directly involved, but the children could speak to there parents and feel involved in the project. It is also part of a long-term project trying to change the mentalities and Collective imagination, already in the childhood to build the future of the society.

Location

Žilina is the third largest city in Slovakia, the third most important industrial centre and the seat of a university, the Žilinská univerzita (founded in 1953). Since 1990 the historical centre of the city has been largely restored and the city has built trolleybus lines. Žilina is the main industrial hub of the upper Váh river basin region, with a fast-growing economy as north-west Slovakia's business centre with large retail and construction sectors. By far the biggest and most important employer is Korean car maker Kia Motors. By 2009, the plant produced 300,000 cars a year and had up to 3,000 employees. Kia Motors' direct investment in the Žilina car plant amounts to over 1.5 billion USD. It means the city has a special relation with the car industry, making it harder to promote alternatives to the use of cars.

Was/is the initiative successful?

The project seems to be successful since a lot of school and pupils participated, and the trolleybus company approved to join. Sensitising young people on transport issues has to be run on long-term, a one-off event is interesting but it should be repeated every year to make it efficient.

Textual and communicative aspects of initiative

The transportation by individual cars is presented as a factor of traffic jam and pollution. The initiative is targeting the children, as they are going to school everyday, it means the way they go is also an issue for the municipality. Decorating the trolleybus will led them to feel involved in the system and in municipality citizen life, und bring them to get used to good practices.

The physical/technological aspects of the initiative

The initiative is promoting less car use, and encouraging children to go to school by bus. The municipality has improved the public transport system and have now to bring citizens to use it. So physically everything is ready, and the initiative is just promoting the use of public transport. The task is difficult, because of the attachment to car use due to car industry that is bring a lot of jobs in the region.

Shared understandings related to initiative

The project is about mobility so it is clear that, energy is meant as gas for the cars. They are not trying to aware householders about pollution, but try to promote the alternatives, and encourage changes in mobility patterns.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

The identified SECIs are a relatively good reflection of the current Slovak energy policy, especially when it comes to the field of energy efficiency. As the priorities of energy efficiency policy are focused on financing of energy efficiency, providing energy efficiency information and education or apartment building renovations and insulation, this is reflected in SECIs, mainly the ones that are promoted by the government.

The governmental programs Green Households and Program for support of family houses insulation are oriented towards energy efficiency and renewables and there are many SECIs focused on energy saving tips, energy literacy, CO2 or heating calculation. Apart from the general awareness raising through tips and calculators, there are several SECIs focused on raising awareness among children and students.

The struggle to get renewable sources of energy going in Slovakia is also reflected in SECIs as many focus on speeding up the penetration of various forms of renewables. Those are either government supported or motivated by RES businesses and initiatives.

The rising emissions from the transport sector are currently the least favorable trend in Slovak energy picture. Hence this sector is well covered by sustainable mobility SECIs, ranging from targeting individuals to involving towns and cities.

Majority of the identified SECIs are focused either on changes in individual’s behavior (17) or on changes in technology (6). The more complex approaches, such as SECIs focused on everyday life situations and changes in complex interactions, are not so common.

Governmental programs are rather scarce, an important part of the action comes from EU projects and initiatives by the local NGOs. Actions are mostly not targeted to specific socio-demographic groups, the only exception being students, which appear as a target group in several SECIs.

The selected good practice example shows Creative Competition and Mobile Exhibition on Public Transport by children in Žilina. Key lessons learned from this example are that schools are aware of the problems, related to car based transport, and eager to take action. Working with children is beneficial also due to their impact on parents and wider families. Using children’s creativity to show the benefits of public transport was a successful move of the SECI, as well as creating links between the public transport operator and schools. The later is important for policy-makers as it shows that creating links between two public actors that are very visible in the local community (school and public transport operator) can be a solid basis for forming promotion and awareness raising campaigns.

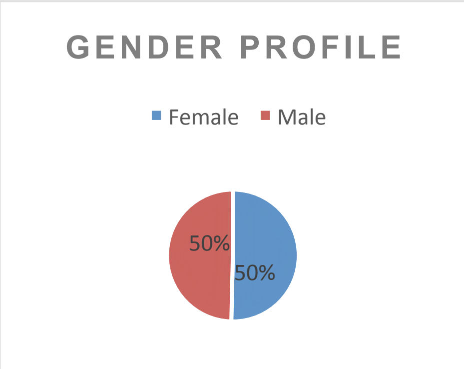
REFERENCES:

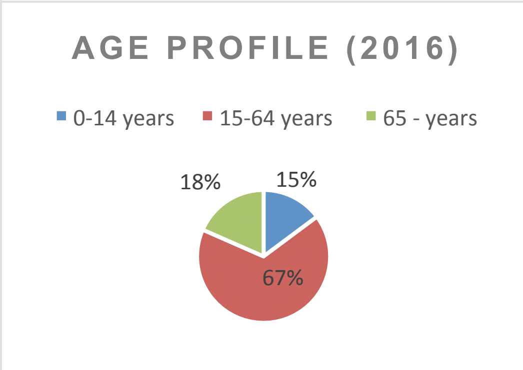
http://www.eltis.org/discover/case-studies/creative-competition-and-mobile-exhibition-public-transport-children-ilina#field_study_usr_contact_ref

SLOVENIA

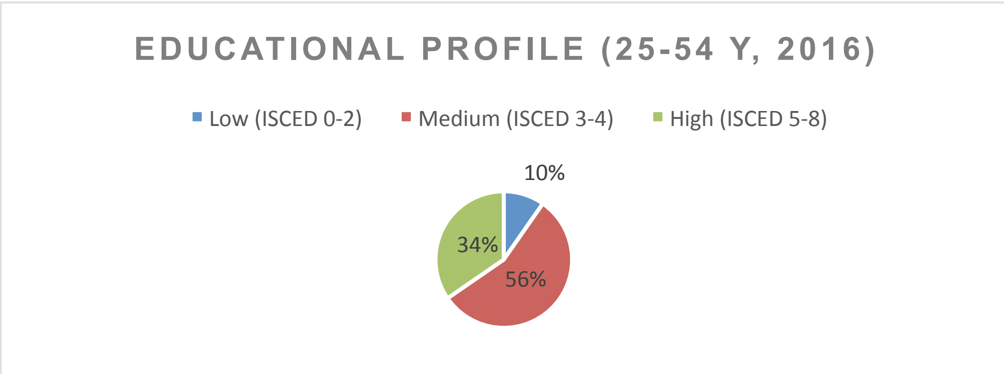
Authors: Tomislav Tkalec

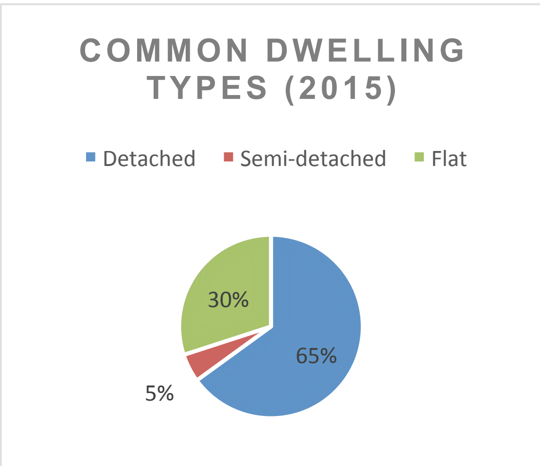
DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY

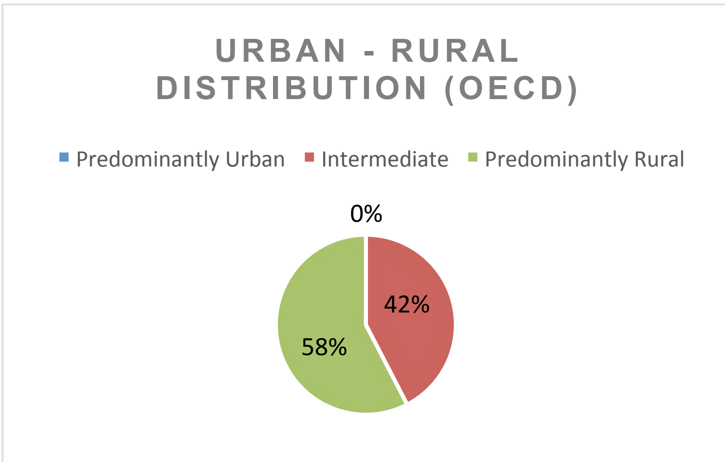


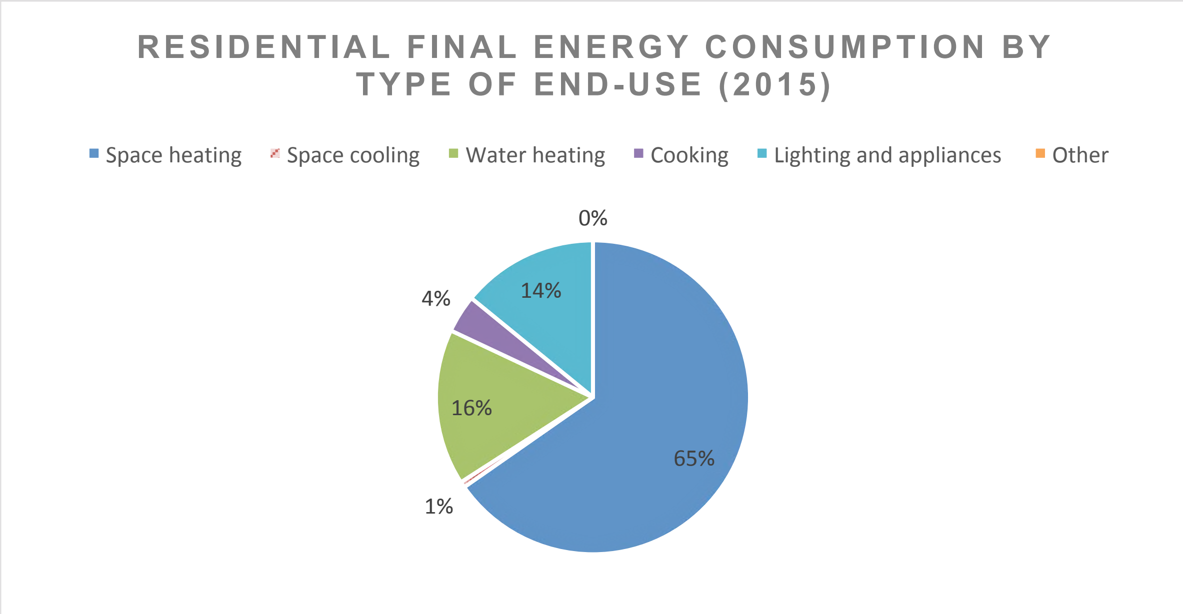


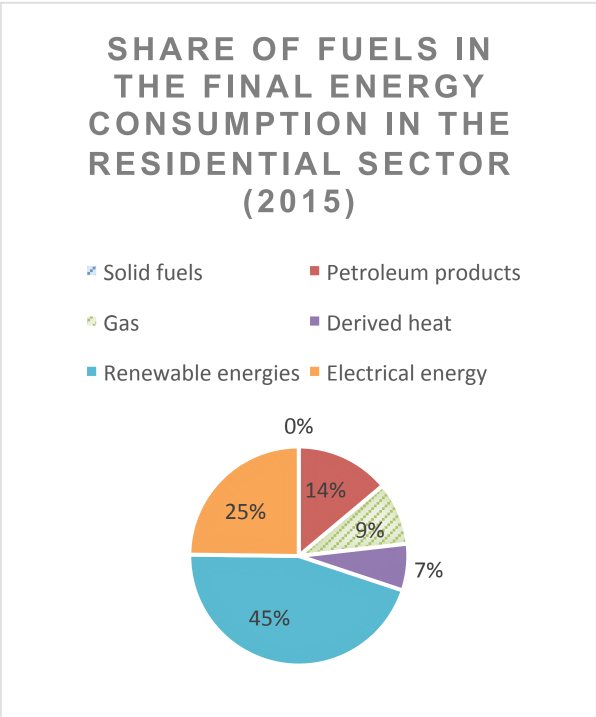
CLIMATE: Mediterranean climate on the coast, continental climate with mild to hot summers and cold winters in the plateaus and valleys to the east

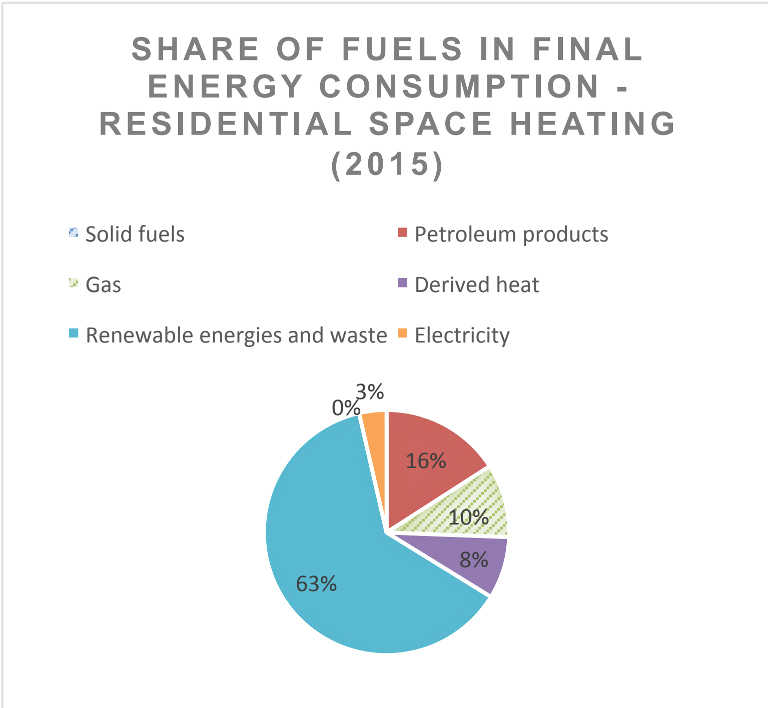












FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

6.262 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

Slovenia has a small energy sector, its final energy consumption in 2014 was 4,7 Mtoe (54.661 GWh). Its energy independence in 2014 was 56%. Oil (47,4%) is the main energy source, followed by electricity (23,1%), renewables (13,7%), natural gas (11,3%) and other (4,5%).

Electricity generation can be divided in three parts that wary slightly from year to year because of the weather conditions and amount of rain that influence generation in hydro-power plants: hydro power (37,5%), nuclear power (36%) and thermal power (25%). Biggest share of thermal power goes on coal (lignite). Solar accounts for 1,5% and 2 windmills account for 0,02% of electricity. This data is for the year 2014, when it was an excellent hydrology year. Annual electricity consumption in 2014 was 12.719 GWh.

While the gas and oil market is somewhat privatized, electricity production is still in state hands. The government of Slovenia owns a 100 percent stake in Holding Slovenske Elektrarne (HSE) and Gen Energija (GEN), the major electricity producers in Slovenia. In recent years the government has considered a merger of the two companies, as HSE did not have the necessary financing for the construction of a new coal burning generator at the Sostanj Thermal Power Plant (TES 6). Construction on the TES 6 project continued despite concerns about its cost, commercial feasibility, environmental impact and the perceived lack of transparency surrounding the project. The Government of Slovenia has provided the necessary loan guarantees to finish the project despite expressing serious reservations about its viability. TES 6 went on-line in 2015. GEN Energija own half of the Krško NPP and the other half is owned by Croatia (state company HEP).

Source:

http://www.cigre.org/var/cigre/storage/original/application/72b0f74d6a835404185b41fbf746efbf.pdf

https://www.export.gov/article?id=Slovenia-Electrical-Power-Systems

Particular socio-material aspects that influence energy consumption

Future growth in electricity consumption must be considered given the expansion of air conditioning and electric vehicles. Energy efficiency measures, in particular insulation of multi-apartment buildings and family houses, serve as a counterbalance to these increases. However, the improvement in insulation for buildings are usually concentrated to the better off parts of the population, while the less well-off parts of society are not able to invest into improving energy efficiency of their dwellings.

For the reason of low energy efficiency of buildings in combination with high percentage of ownership of housing stock (more than 95% people live in their own flat/house) and low incomes there is significant percentage of households living in energy poverty.

Because of rising prices of heating oil, in last 10 years there is a tendency to replace this fuel for heating with cheaper one, mostly households choose biomass, as wood is the cheapest option, but also heating pumps and gas. Higher percentage of heating with biomass lead to a higher problem of air pollution.

Current Trends in Energy Policy

The current government has worked on a new national energy concept since fall 2014; it released a draft in 2015, but the program has not yet been adopted. Current version focuses on keeping the status quo and preparing for changes in the long run. Slovenia's vision for the energy sector is gradually to transition to low-carbon energy sources by focusing on efficient energy consumption, use of renewable energy sources, and the development of active electricity-distribution networks. This strategy will likely envisage a strong reliance on nuclear energy and further development of hydroelectric power.

There is still no definite answer about the timing of closure of the coal power plant TEŠ, as its lifetime is expected not to be met because of economical and environmental reasons. RES are still not a priority and bigger investments (apart from hydro-power) are planned after the year 2030.

Increased hydroelectric power generation is one of the strategic objectives of the government's energy policy. Further upgrading of the upper stations on the Sava River is planned as well as construction of a chain of six new plants on the lower Sava. The government has invested in a series of plants since 2004 and recently announced construction of new hydro-power plants on the middle Sava River with expected investments of EUR 1.7 billion. There are also plans to upgrade three plants on the Drava River and feasibility studies are underway for additional small hydroelectric power projects. Together with the new plants, these renovations will create an additional 470 MW of hydroelectric capacity by 2020.

GEN Energija has prepared a plan for a second nuclear production facility; however, the government's decision on the timing of any possible nuclear expansion will depend on energy needs, available financing, and public sentiment about nuclear energy.

Energy efficiency and energy refurbishment of the building stock are perceived as priority measures, but this connotation is still not fully visible in the financial schemes and policies. Energy communities are only slowly entering the discourse.

Trends in national campaigns

National campaigns are run mainly through national Eco Fund and Energy Agency. Eco Fund has programs and financial aids for EE and RES measures (energy refurbishment of buildings, replacement of old inefficient heating systems, energy advising, energy poverty alleviation programs, co-financing investments in RES, subsidies for electric cars). Energy Agency is responsible for tenders for support scheme for RES projects.

The ministry for environment is also active in campaigns for cleaner air that is targeting air pollution from wood burning. Other non-governmental stakeholders and actors and also utility companies run campaigns on RES projects and self-consumption of RES electricity (net metering scheme), civil society has campaigns on community (RES) projects, energy efficiency, energy poverty and sustainable mobility.

Civil society is also active in campaigns against fossil fuels and nuclear power.

OVERVIEW OF NATIONAL SECIS

Below please find a list of Slovenian SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country.

Porabi manj (Use less)	Changes in Individuals' Behaviour
Gen I Sonce	Changes in Technology
Energetski center Petrol (Petrol Energy Center)	Changes in Individuals' Behaviour
Slovenija znižuje CO2 (Slovenia reduces CO2)	Changes in Complex Interactions
NEP Slovenija	Changes in Technology
ACHIEVE	Changes in Individuals' Behaviour
REACH	Changes in Complex Interactions
Energetska dieta (Energy diet)	Changes in Individuals' Behaviour
Bye, bye Stand-by!	Changes in Individuals' Behaviour
One tonne challenge	Changes in Individuals' Behaviour
Community based management of natural resources	Changes in Complex Interactions
Uresničujmo, z energijo varčujmo! (Let's make it real, let's save energy!)	Changes in Individuals' Behaviour
ECE – 100% renewable eletricity for households	Changes in Technology

Trainings »How to reduce energy consumption in households«	Changes in Individuals' Behaviour
District heating on biomass in Vransko	Changes in Technology
National energy advising network ENSVET	Changes in Individuals' Behaviour
Program for energy advising in energy poor households AERO of the ENSVET network	Changes in Individuals' Behaviour
OLEA Research unit	Changes in Individuals' Behaviour
Self-sufficient living cell Ljubljana	Changes in Everyday Life Situations
Sončna zadruga (Solar Energy Cooperative)	Changes in Technology
Energy refurbishment of multiapartment buildings in whole residential area Planina, Kranj	Changes in Technology
AFTER project	Changes in Technology
Energy Neighbourhoods2 - The Energy Challenge (EN2)	Changes in Everyday Life Situations
SHARE: reducing energy consumption in non-profit buildings	Changes in Individuals' Behaviour
SAVE project	Changes in Individuals' Behaviour
EI – Education	Changes in Individuals' Behaviour
Renewable energy sources in municipaliteis in Primorska region	Changes in Everyday Life Situations
Energy ViLLab	Changes in Everyday Life Situations

OPANK	Changes in Individuals' Behaviour
mOIDom	Changes in Individuals' Behaviour
ENERGO OPTIMUM	Changes in Individuals' Behaviour
MOVE for energy sustainability	Changes in Individuals' Behaviour
SEOP – Social Electricity Online Platform	Changes in Everyday Life Situations
Climate Literacy	Changes in Everyday Life Situations
ELIH MED - A EURO-MEDITERRANEAN PROGRAM TO FIGHT ENERGY POVERTY	Changes in Technology
EnergizAIR The renewable energy weather forecast - Europe	Changes in Technology
EEPLIANT: Energy Efficiency Complaint Products 2014	Changes in Individuals' Behaviour
MOBISTYLE : MOtivating end-users Behavioral change by combined ICT based tools and modular Information services on energy use, indoor environment, health and lifestyle	Changes in Complex Interactions
Creating liveable neighbourhoods while lowering transport energy consumption (PRO.MOTION)	Changes in Individuals' Behaviour
European Young Energy Manager Championship (EYEMAN CHAMPIONSHIP)	Changes in Individuals' Behaviour
Persuasive force of children through education (FEEDU)	Changes in Individuals' Behaviour
European Network of Information Centres promoting Energy Sustainability and CO2 reduction among local COMmunities (ENESCOM)	Changes in Individuals' Behaviour
European Solar Days II (ESD II)	Changes in Technology

More biking in small and medium sized towns of Central and Eastern Europe by 2020 (MOBILE2020)	Changes in Everyday Life Situations
Creating Actions among Energy Conscious Children (KIDS4FUTURE)	Changes in Individuals' Behaviour
Integration of Active Learning and Energy Monitoring with School Curriculum (ACTIVE LEARNING)	Changes in Individuals' Behaviour
The Energy Path: an e-learning platform for education of the new generations in the sustainable energy field (ENERGY PATH)	Changes in Individuals' Behaviour
Refurb	Changes in Technology
EUpeR - With energy efficiency against energy poverty	Changes in Individuals' Behaviour

‘GOOD PRACTICE’ EXAMPLE OF SLOVENIAN SECI

REACH

Brief Description

REACH (Reduce energy use and change habits) is an IEE project for reducing energy consumption in low-income (energy poor) households). It was implemented in Croatia, Macedonia, Bulgaria and Slovenia. In Slovenia it was implemented by FOCUS. In all countries, practical activities of the project – energy advising in households – were implemented on regional level. In Slovenia it was implemented in Pomurje and Zasavje regions. It started in 2014 and finished in 2017. REACH built on the success of the project ACHIEVE.

Brief Contextualization

Even though the EU is one of the most developed areas in the world, between 50 and 125 million of EU’s citizens are estimated to be energy poor. The situation is severe in the Eastern Europe Member States. In the majority of the new Member States up to 30 % or even more households are struggling with energy poverty. Energy poverty in Slovenia is becoming an increasing problem as rising energy prices surpass the rise of income of the population. Thus, the expenditure on energy for households in the first income quintile has risen sharply in the recent couple of years, representing 17.4% of all available resources of individual households in 2010 (in 2000, this share was 13.1%). In the context of EU policies, the issue of energy poverty is becoming more and more visible, but there is no single definition of who is energy poor. Despite the lack of definition, energy poverty is being tackled by some policies: governmental analysis of energy poverty from 2010 highlights energy poverty as a rising issue, National Energy Action Plan 2020 and the Operative program 2014–2020 list energy retrofit of energy-poor households as measures. Hence, some measures for addressing energy poverty already exist in Slovenia: national program for visiting energy poor households by advisers of the national energy efficiency advising network, support for energy retrofit of energy-poor households (100% subsidy), and support for the replacement of heating system in energy-poor households in areas which are particularly burdened with PM pollution. However, further steps are necessary to address the problem fully.

Aims and objectives

Project REACH had two overall objectives:

1. To empower energy poor households to take actions to save energy and change their habits.

- To establish energy poverty as an issue that demands tailor-made policies and measures at local, national and EU level.

Each of the objectives was supported with specific aims that project was trying to achieve:

- To compile data and analyse energy poverty situation in four countries in order to form definition(s) of energy poverty and policy recommendations.
- To engage and empower local actors to tackle energy poverty.
- To empower energy poor households to reduce their energy and water use and provide some of them with further support for tackling their problems.

- To engage decision-makers in tackling energy poverty as an issue that demands structural tailor-made solutions, provide them with recommendations for addressing the problem and create a platform for concerted formulation of structural solutions at the national and EU level.

Methods for intervention

Energy advising in households included free audit, analysis and advice. Visits were implemented in two steps:

- During the first visit, an energy audit was performed by the energy advisors. The advisors reviewed the energy and water bills of the households, conducted a set of measurements (energy use of appliances, water use, etc.) and discussed the household's habits with regard to energy and water use. Inserting data on energy and water use and costs (from bills), electricity using devices (lightning, cooking, washing, entertainment, cooling, heating, etc.), state of the building (heating system, insulation, windows, position of flat, etc.), and behaviour of the inhabitants enabled the energy advisors to run analysis and shape advice for each household.

- During the second visit, the advisors handed out devices, which helped the household reduce energy and water use, and advice for using those devices, changing energy use habits and further possible steps. The package of devices for the households was tailored to the needs of the households. The advice for the household was also tailor-made, taking into consideration the situation and habits of the members. Apart from tailor-made advice, the households also received a list of general tips for reducing their energy and water use and contacts to institutions that can support them in making further steps (e.g. insulation funds).

The approach (energy advising in households) was inspired by German approach (from Caritas Frankfurt) and is methodologically following it. The approach was set in the ACHIEVE project, where Caritas Frankfurt were one of the partners. The difference with ACHIEVE approach is that in the ACHIEVE project energy advising was carried out by unemployed persons (trained and paid for energy advising); and in REACH it was done by high school students.

Steps of implementation

The first step of the action was to map the local and national situation in the field of energy poverty. National analyses of the energy poverty situation were done in order to a) gain insight into the situation, b) provide a basis for fine-tuning the action and c) provide a basis for shaping policy recommendations. The other main activity was the transfer of know-how for energy advising to partners, teachers and students of vocational schools. The transfer was made through training for partners, who have transferred the know-how further to their local vocational schools through 10 training events for teachers and students. After equipping students – energy advisors – with the know-how for visiting households, the visits started. Households were approached in cooperation with Centres for Social Work (a flyer for them was prepared and the CSDs were collecting households applications for visits).

During the first visit, the advisors made energy audit of the household and studied its habits. Based on these inputs, tailored advice has been given to each household in order to empower them to reduce energy and water use. Apart from advice, the households also received free energy and water saving devices that helped them to save energy and water.

Results/outcomes

Results for overall project (for 4 countries combined): Over 200 students and volunteers from vocational schools and faculties were trained to perform energy audits in energy-poor households. They helped partners to implement 1,564 household visits, whereby basic energy efficiency measures were put in place and over 6,650 free energy and water saving devices were installed. The investment of about 30 EUR of free devices resulted in annual savings of over 65 EUR in the visited households, or over 560 EUR saved during the lifetime of devices. In total, 48,200 EUR was invested in energy saving devices that could save over 840,000 EUR over the lifetime of devices.

The role of the households

Energy advising was done in households – that means at least one person from the household (usually the one who takes care of the energy bills) had to be present. No financial contribution from households was included. In fact, they have received free energy saving devices. The communication part of the initiative was developed with help from the households – interviews with them were carried out to ask them which channels are best to communicate the initiative to them.

Problems encountered: Some households were reluctant to receive visits. This is mainly because the people are insecure and think that everything will eventually cost them money (that they will have to buy something or pay for the visits). Cooperation with the organizations that have established trust in the households, such as centres for social work, Red Cross or Caritas, was a must. Only through working with such organizations were the partners able to approach the households and establish sufficient trust to implement the visits and advising.

Location

Regions Zasavje and Pomurje were chosen because they are the least developed regions in Slovenia with the most acute social and economic problems. Target group was energy poor households.

Was/is the initiative successful?

Yes – the results are described above. Apart form the results on practical level – reducing energy consumption in households, it was successful also on structural level with working on policy issues. People found the visits very helpful, especially in terms of understanding their energy and water use better, but they also showed high appreciation of the delivered free energy and water saving devices.

Textual and communicative aspects of initiative

The main frame in which the initiative worked was focusing on energy poverty and trying to help households that are energy poor by giving them energy saving devices for free and giving them advices. Energy poverty was seen as energy and social problem. But when talking with households, the initiative did not use the term energy poor; also because the term is not widely known. That is why if was re-framed to “households that receive social help”.

The physical/technological aspects of the initiative
During the second visit, the advisors were handing out simple devices, which helped the household reduce energy and water use (energy efficient light bulbs, tap aerators, draft proofing for windows and doors, power strip with on/off button, reflective panels for radiators), and advice for using those devices, changing energy use habits and further possible steps. The package of devices for the households was tailored to the needs of the households.

Shared understandings related to initiative
Initiative was focused on reducing energy and water use in households – with energy saving devices; and also trying to influence their behaviour with giving them tips and advices about how to reduce their energy use. Main motivation for households (energy poor) was to save money.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

Slovenia has a small energy sector, where oil with its 47,4% share represents the main energy source (mainly for transport). Electricity generation can be divided in three similarly sized parts: hydropower, nuclear energy and coal. Trends in energy policy, as prepared in the new proposal for national energy concept go in the direction of keeping the status quo regarding the energy sources, while also trying to follow the EU directives and fulfilling the EU set targets for RES, EE and GHG emissions. SECIs are ahead of the trends in national energy policies. This is already evident in the field of energy efficiency and diversity of effective approaches that policy-makers still don’t perceive as relevant, and in particular in the cases of RES initiatives, community energy projects and the problem of energy poverty. Especially in the last two topics, SECIs show examples to the decision-makers on how to proceed in this area. This means that non-governmental actors take the initiative in these areas and, on the basis of their acquired knowledge and experience, influence the policy-makers who, due to these SECIs, are beginning to deal with the topics concerned (namely energy poverty and community energy).

There is some attention paid in SECIs to the socio-material specifics of energy use. Energy efficiency is highly on the agenda of several SECIs. Energy poverty is highlighted as one of the socio-material aspects and is reflected in 10 identified SECIs. One visible characteristic of energy poverty SECIs is that many of them work with such households in variety of manners, from working towards energy retrofits, to providing home audits, energy advising, awareness raising, understanding of energy and heating bills, participatory workshops on energy saving, providing financial support and other support measures.

The majority of identified SECIs focus on changes in individuals' behaviour (27), then some on changes in technology (11), while focus on changes in complex interactions are scarce (4). However, there are 7 SECIs focusing on changes in everyday life situations. Majority of SECIs (25) are run at a cross-national level, 14 of them are run on national level, 5 of them on regional and 5 of them on national level. Governmental programs are rather scarce, an important part of the action comes from EU projects, energy agencies and initiatives by the environmental NGOs. Actions are mostly not targeted to specific socio-demographic groups, although there is quite high number of initiatives targeting low income households (10), which shows that energy poverty is recognized as an important issue. Small number of SECIs target families, students or children.

The emphasised SECI provides an example of initiative that is focusing on energy poverty and includes activities on practical and structural level. Cross-national project's aim was to reduce energy consumption in low-income households and it achieved that part with energy advising in households. Results show over 65 EUR of savings per household per year on average. It also included a policy aspect, as advocacy activities were part of the project. Results from the practical part of the project were used for advocacy work and in that way decision-makers were presented with a 'ready-to-use' scheme. This would be the main lesson to learn from this initiate, especially as it was successful in engaging decision-makers on the national level and their activation on the topic of energy poverty and preparation of nation-wide program for energy poverty alleviation.

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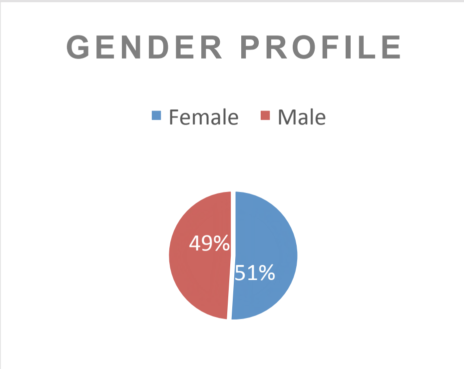
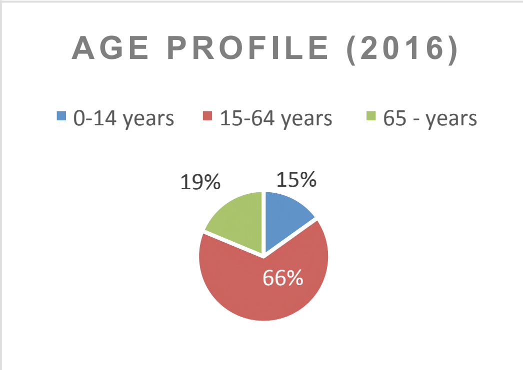
See also individual sections.

SPAIN

Authors: Marko Hajdinjak, Desislava Asenova

DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY





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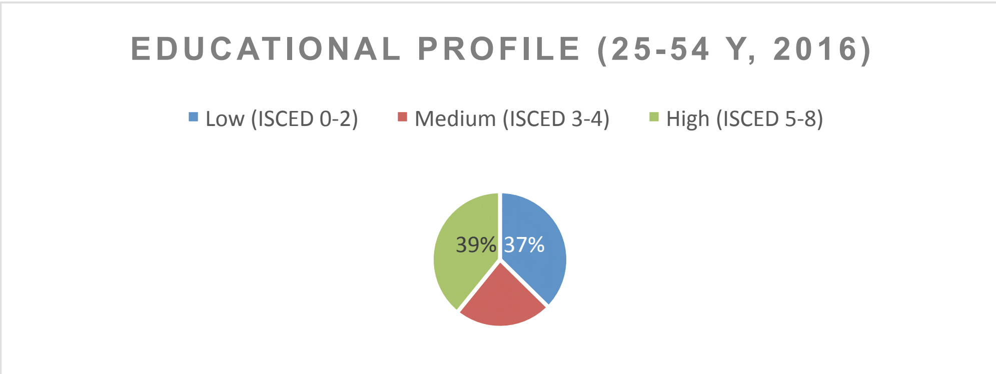

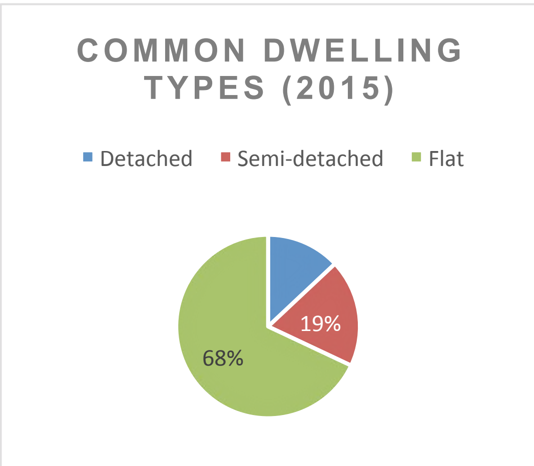

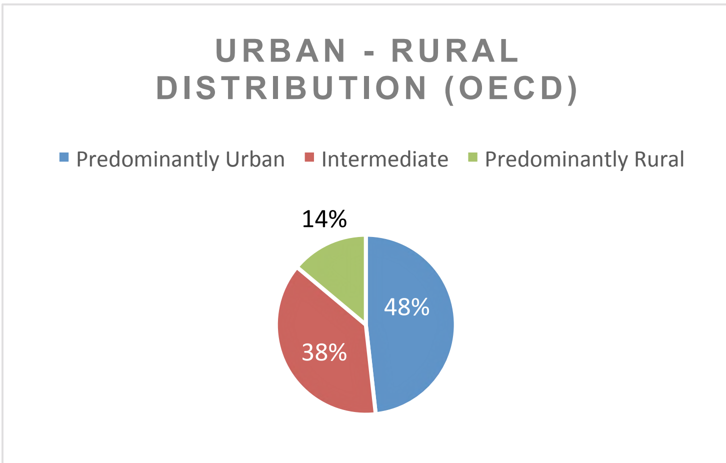

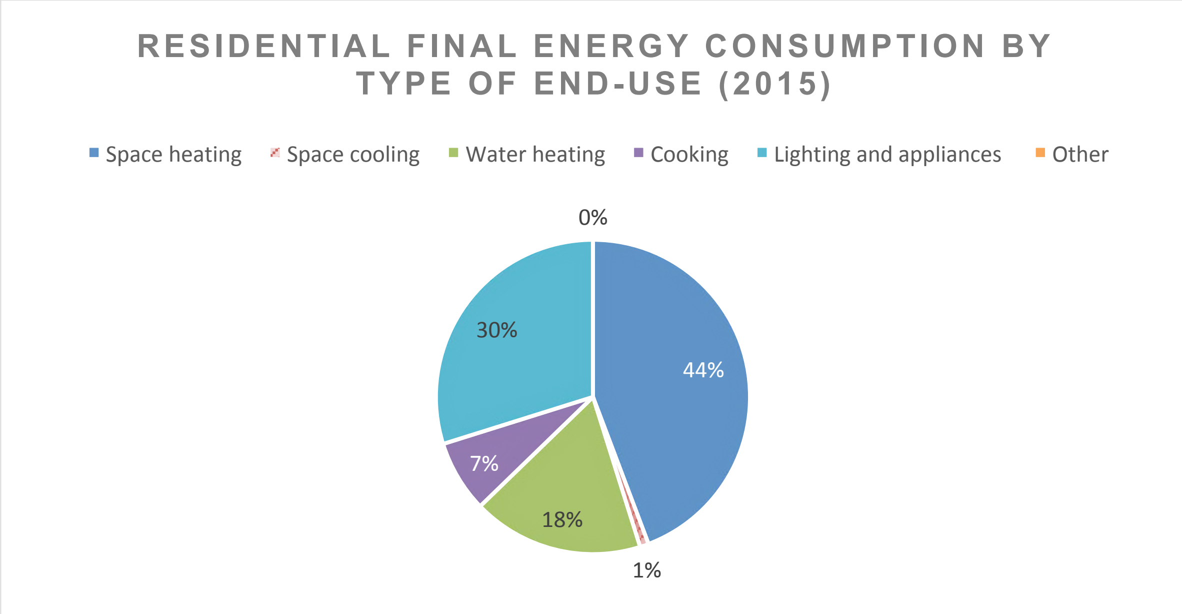

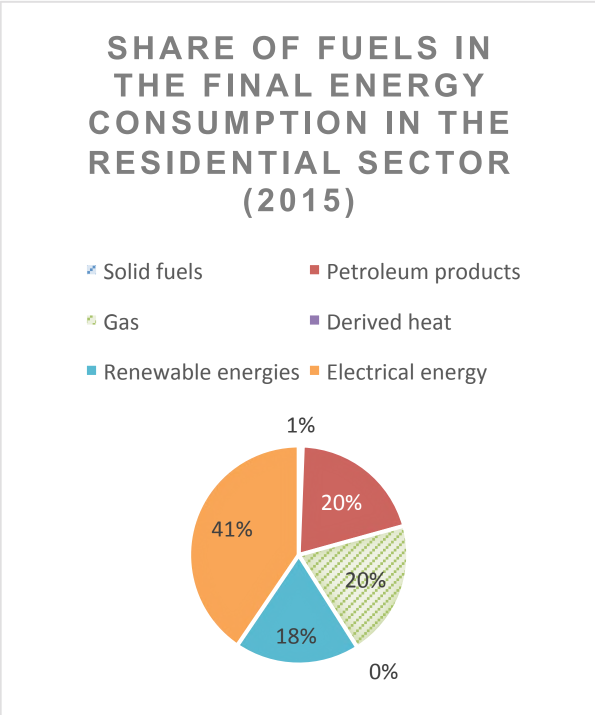

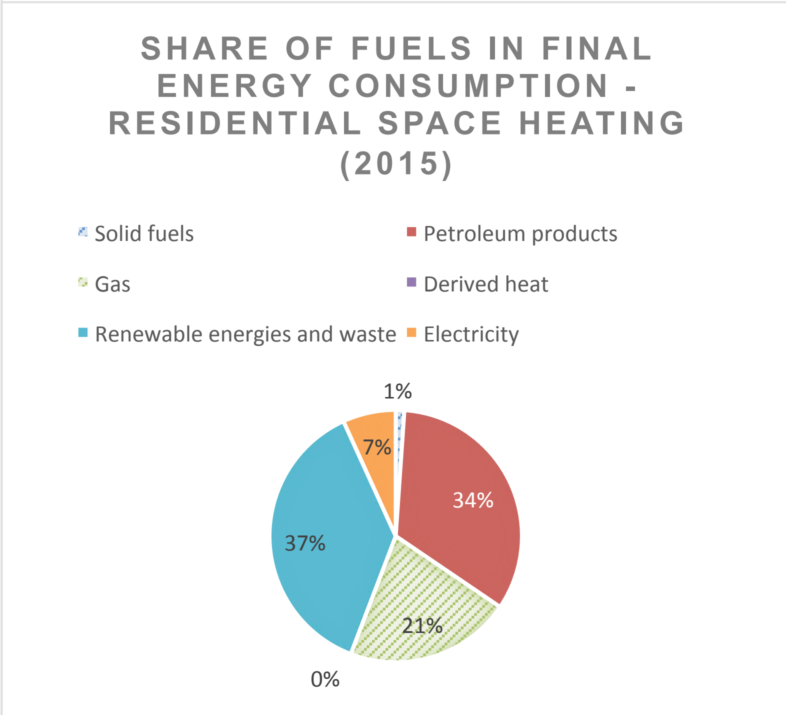

FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

3.725 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

The Spanish energy sector is highly dependent on fossil fuel imports – mainly oil, coal and gas. The highest peak in this regard was in 2006 (an energy dependence of 82%), but since 2008 the percentage has been steadily decreasing. By 2012 the energy dependence was estimated to be around 73% in comparison with the European average of 50%.

In 2016, power generation in Spain was distributed as follows: renewables (39%), nuclear (22%), gas (20%), coal (14%) and oil (6%). Electricity production of renewable energy sources grew rapidly in the last decade, reaching 51GW renewable power generation capacity (39% of electricity production). The highest share of RES is for wind (18%), hydropower (13%) and solar PV (5%).

The state-run energy sector was liberalised in 1997 with the establishment of five main utilities: Endesa, Gas Natural, Iberdrola, Union Fenosa and Hidroelectrica del Cantabrico. After the deregulation, the market was integrated with the Portuguese market in 1998. The following companies hold the largest share of the electricity market (2012 data): Endesa (23.8%), Iberdrola (20.1%), Gas Natural Fenosa (11.4%), EGL (8.1%), EDP Hidrocantabrico Energia (6.0%), Acciona (4.7%), E.ON (3.0%), EVM (2.7%) and Nexus (2.2%). There are also smaller players that sell around 18% of electricity. There is only one transmission operator – Red Electrica de Espana (REE) – which is involved neither in power generation nor in supply. There are 50 distribution system operators. The main ones are owned and operated by Endesa, Iberdrola, Union Fenosa, Hidrocantabrico and E.ON.[120]

In 2015, Spain had an installed gas generation capacity of 106 GW, making gas generation one of the major components of the Spain's energy mix, equal in share with hydropower and wind energy. However, by 2015 gas generation has been significantly reduced and amounted to about 50% of the 2010 levels. The reason for this is the increased support for national coal production and the increased percentage of coal power generation at the expense of gas generation.[121]

The primary energy consumption by source in 2015: petroleum products (43% of general consumption), gas (20%), renewables (14%), nuclear power (12%) and coal (11%). The breakdown of final energy consumption by sector for the same year was: transport (42%), industry (24%), residential (18%), services (12%), agriculture (3%) and other (1%).[122]

Six nuclear power plants operate in Spain with a total of eight reactors, generating 21% of electricity output in the country in 2016.[123]

Particular socio-material aspects that influence energy consumption

Over the past decades, social and economic transformations have caused an increase of the residential energy demand in Spain. Between 1990 and 2008, residential final energy demand has increased by 73%, with the annual growth rate being four times higher than the EU average. The increase was especially notable between 2000 and 2008 – 32%. This has been one of the highest

[120] Deloitte (2015). *European Energy Market Reform. Country Profile: Spain*. Available at: https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Energy-and-Resources/gx-er-market-reform-spain.pdf;
Wynn, G. and Julve, J. (2016). *Spain's Capacity Market: Energy Security or Subsidy?* Available at: http://ieefa.org/wp-content/uploads/2017/11/Spains-Capacity-Market-Energy-Security-or-Subsidy_December-2016.pdf ;
International Energy Agency (2016). *Spain – Energy System Overview*. Available at: https://www.iea.org/media/countries/Spain.pdf
[121] Wynn, G. and Julve, J. (2016). *Spain's Capacity Market: Energy Security or Subsidy?*
[122] Ministry of Energy, Tourism and Digital Agenda (2017). *2017-2020 National Energy Efficiency Action Plan*. Available at: https://ec.europa.eu/energy/sites/ener/files/documents/es_neeap_2017_en.pdf
[123] Deloitte (2015). *European Energy Market Reform. Country Profile: Spain*.

growth rates among European countries. The main reasons for this were:

i) population increase (from 40.5 million in 2000 to around 46 million in 2008) and increase in the number of houses and apartments by 20% in eight years);

ii) decreasing household size (more households with one or two members means a larger number of housing units consuming energy);

iii) increased use of air conditioning systems, moving peak demand from the coldest days in winter to the hottest days in summer;

(iv) climatic factors also influenced Spanish electricity demand in households.

Another aspect that influences energy consumption in Spain is that Spanish families consume primarily electricity, while gas is less prominent energy source compared to the rest of the EU. The high share of electricity consumption is a consequence of the poorly developed distant heating network in Spain and the high proportion of houses which still do not have any kind of heating system installed.[124]

In 2013, 43% of energy consumption in households in Spain were distributed to space heating, followed by household appliances (26.6%), water heating (17%), cooking (7.4%), lighting (5.1%) and air conditioning (1%).[125]

Electricity prices for households in Spain have raised from 17.28 euro cents per kWh in 2010 to 22.96 euro cents per kWh in the first half of 2017. This is above the EU average for the same period – 20.41 euro cents per kWh.[126]

Current Trends in Energy Policy

The energy and climate targets that Spain has set to achieve by 2020 include: i) a 26.4% reduction of its primary energy consumption; ii) a 20.8% share of renewables in final energy consumption; iii) and a 10% reduction of GHG emissions in the non-ETS sector and an 21% reduction of GHG emissions in the ETS sector.[127]

As set in the National Energy Efficiency Action Plan 2014-2020, 15.3% of the final energy savings target will be achieved through measures in the building and equipment sector. Savings are planned from the energy renovation of the thermal envelope of existing buildings, improvement in the energy efficiency of heating, cooling and domestic hot water systems, lighting, lifts and other transport systems and electrical installations. Restoration of existing buildings to a high rating, implementation of smart systems (home and building automation) and renovation of the stock of electrical appliances are also among the activities that are expected to contribute to generating energy savings.[128]

Recently, the most important efficiency actions in the building sector have been those implemented as part of the Action Plans of Energy Saving and Efficiency Strategy. These measures have mainly improved energy efficiency in buildings in general. Activity and development at legislative level is also observed. These are mainly regulatory provisions related to the transposition of Directive

[124] Blazquez, L., Boogen, N. and Filippini, M. (2012). *Residential Electricity Demand for Spain: New Empirical Evidence Using Aggregated Data*. Available at: https://www.ethz.ch/content/dam/ethz/special-interest/mtec/cepe/cepe-dam/documents/research/cepe-wp/CEPE_WP82.pdf

[125] IDAE (2015). *Energy Efficiency Trends and Policies in Spain*. National Report for the ODYSSEE-MURE Project. Available at: http://www.odyssee-mure.eu/publications/national-reports/energy-efficiency-spain.pdf

[126] Statista (2018). *Electricity Prices for Households in Spain from 2010 to 2017*. Available at: https://www.statista.com/statistics/418085/electricity-prices-for-households-in-spain/

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[128] Trotta, G. and Lorek, S. (2015). *Consumers and Energy Efficiency – Country Report Spain. An inventory of policies, business and civil society initiatives, focusing on heating, hot water and the use of electricity*. EUFORIE – European Futures for Energy Efficiency

2002/91/EC on energy efficiency in buildings that are meant to boost the energy service market in the building sector. More recent developments are the implemented actions that follow the EC guidelines to be applied in the sector, namely Directive 2012/27/EU on energy efficiency and Directive 2010/31/EU on the energy efficiency of buildings.[129]

In the field of renewable energy, positive developments are observed. A policy that fosters renewable and clean energies has been put in place. As a result, Spain became the second-placed country in Europe in terms of wind power generation and the forth worldwide in terms of installed power. Some support schemes for renewables are still necessary in order to make certain energy technologies competitive. In order to avoid the negative experience with the PV capacity installed in 2008 that implied a big budget for the feed in tariff premiums and the excessive capacity in crisis times that was too high for the demand, the government considered that support schemes for renewables should be time-limited and carefully designed. Since 2016, a new tendering system was put into force for new renewable energy capacity.[130]

Renewable energy and energy efficiency are further promoted in Spain through numerous and successful smart actions carried out in Spanish cities. Several Spanish cities are successfully carrying out pioneer smart city projects – Barcelona, Malaga, Bilbao, San Sebastian, etc. Projects are implemented in the field of energy, mobility, ICT, environment and transport. An example of a project is PRICE "Smart Grid Project in Henares Region" which involved about 500,000 inhabitants. Among its main objectives were monitoring and automatization of the power network, improving its operation and maintenance, contributing to a new power management system and improving the integration of already existing distributed generation.[131]

Trends in national campaigns

Various initiatives targeting household behaviour in the field of energy have been implemented. For example, the Energy Diversification and Saving (IDAE) promotes and facilitates an efficient use of energy by SMEs and households through communication campaigns and information and training programmes. The awareness-raising campaigns have contributed to tracking the evolution of the Spanish consumer profile in the last ten years and to better direct actions aimed at achieving quantifiable energy saving results.

Another example is the institutional communication and publicity campaign about the new electricity billing and energy saving system that have been carried out recently by the Ministry of Industry, Energy and Tourism and IDAE. The campaign aimed to provide the public with understandable information about the changes that have taken place in the electricity price calculation system and the rights of consumers with regard to power supplied to homes.

Additional examples from Spain are different websites, online newsletters, citizen information services, free e-learning courses and trainings, etc. that are all aimed at promoting energy efficiency and renewable energies, and providing tips how to save energy at home and at work.[132]

[129] IDAE (2015). *Energy Efficiency Trends and Policies in Spain*. National Report for the ODYSSEE-MURE Project.
[130] Olano, M. (2017). *Renewable Energies in Spain*. Available at: http://www.idae.es/articulos/renewable-energies-spain
[131] Mora, E. V. (2014). *Smart Cities in Spain.* Available at: http://ec.europa.eu/information_society/activities/sustainable_growth/docs/smart-cities/smart-cities-spain.pdf
[132] Trotta, G. and Lorek, S. (2015). *Consumers and Energy Efficiency – Country Report Spain.*

OVERVIEW OF NATIONAL SECIS

Below please find a list of Spanish SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country.

El Valle de Sensaciones	Changes in Complex Interactions
Amigos de la Tierra: Energía comunitaria	Changes in Individuals' Behaviour
Huerta Solar	Changes in Technology
Auditorías energéticas	Changes in Individuals' Behaviour
EOLPOP	Changes in Complex Interactions
No Más Cortes De Luz platform	Changes in Complex Interactions
Liberar al Sol	Changes in Individuals' Behaviour
Cocinar al sol	Changes in Everyday Life Situations
El Hierro wind farm	Changes in Technology
EURONET 50/50	Changes in Individuals' Behaviour
EndeF hybrid solar installation (St. Sara Maynar, Zaragoza)	Changes in Technology
Piscinas Solares	Changes in Technology

GoiEner	Changes in Complex Interactions
Luz en Casa Oaxaca	Changes in Technology
Madrid 100% Sostenible	Changes in Individuals' Behaviour
Enerzuul	Changes in Technology
Energía con conciencia	Changes in Individuals' Behaviour
Som Energia	Changes in Technology
8th Life EcoVillage Project	Changes in Complex Interactions
O Couso	Changes in Complex Interactions
La Borda cohousing	Changes in Complex Interactions
Finca Luz Serena	Changes in Complex Interactions
Hogares Verdes	Changes in Individuals' Behaviour
Actúa con energía	Changes in Individuals' Behaviour
Sol sin límites, energía sin límites	Changes in Technology
Granada en transición (GET)	Changes in Complex Interactions
La Flor de la Vida transition town	Changes in Complex Interactions

Noctisolar Ecolight: luz a la esperanza	Changes in Technology
Alcolea del Río solar plant	Changes in Technology
Ecoxarxa Montseny	Changes in Complex Interactions
Calafou	Changes in Complex Interactions
Pla d'Energia Participatiu	Changes in Complex Interactions
Banc d'energia	Changes in Complex Interactions
Valldaura Self-Sufficient Labs: Energy Lab	Changes in Technology
Azimut 360 SCCL	Changes in Technology
Ibiza Transition Island	Changes in Complex Interactions
Casita Verde	Changes in Complex Interactions
Cardedeu en Transició	Changes in Complex Interactions
CLEAR: Consumers to Learn about, Engage with and Adopt Renewable energy technologies	Changes in Individuals' Behaviour
TRIME: Trias Mores Energetica	Changes in Individuals' Behaviour
Smarter Together	Changes in Complex Interactions
4RinEU: Robust and Reliable technology concepts and business models for triggering deep Renovation of Residential buildings in EU	Changes in Complex Interactions

TRIBE: TRaIning Behaviours towards Energy efficiency: Play it!	Changes in Individuals' Behaviour
TOPTEN ACT: Enabling consumer action towards top energy-efficient products	Changes in Individuals' Behaviour
Smart-up project	Changes in Individuals' Behaviour
FIESTA	Changes in Technology
PROMISE: Promoting best practices to support energy efficient consumer behaviour on European islands	Changes in Technology
USMARTCONSUMER	Changes in Individuals' Behaviour
EYEMAN CHAMPIONSHIP; European Young Energy Manager Championship	Changes in Individuals' Behaviour
FLICK THE SWITCH; Instigating Simple Energy Efficient Behavioural Practices in Schools	Changes in Individuals' Behaviour
ESMA: European Smart Metering Alliance	Changes in Technology
European Solar Days II (ESD II)	Changes in Technology
PROMOTION 3E: Promotion of energy efficient appliances	Changes in Individuals' Behaviour
EPEE: European fuel Poverty and Energy Efficiency	Changes in Technology
P.E.E.S.: Pattern of Energy Efficiency in the Schools	Changes in Everyday Life Situations
KIDS4FUTURE: Creating Actions among Energy Conscious Children	Changes in Individuals' Behaviour
BEHAVE: Evaluation of Energy Behavioural Change programs	Changes in Individuals' Behaviour

The Energy Path: an e-learning platform for education of the new generations in the sustainable energy field	Changes in Individuals' Behaviour
Argelaguer en Transició (Argelaguer in Transition)	Changes in Complex Interactions
Santa Coloma en Transició (Santa Coloma in Transition)	Changes in Complex Interactions
Granollers en Transició (Granollers in Transition)	Changes in Complex Interactions

‘GOOD PRACTICE’ EXAMPLE OF SPANISH SECI

Granada en Transición – Granada in Transition

Description

Granada en Transición promotes the development of initiatives that address current challenges such as climate change, the economic and social crisis, the production and reproduction of inequalities in our society, and our dependence on fossil fuels and their derivatives. These initiatives are aimed at developing a greater capacity for self-sufficiency, resilience and creativity so that together, as a supportive and sustainable society, we can achieve a more equitable and healthy well-being.

Granada in Transition is part of the network of cities in transition – a grass-root movement of citizens committed to change their urban environment for the better (reducing dependence on oil and other fossil fuels, growing fruits and vegetables locally, repairing and reusing products and resources, and engaging in other activities protecting the environment).

Contextualization

The idea for this initiative emerged in 2012 as a common effort of a group of people from Granada. They were motivated by their realisation that the society needed to find a way towards a more sustainable physical and social environment. *Granada en Transición* is a part of a larger movement – “Red de Transición” [Transition Network] in Spain. The Spanish Transition Network uses the first transition town Totnes, located in the U.K. as a model for its development.

Granada en Transición initiators have learned from other successful transition towns, especially from representatives from Totnes and from Juan del Río (the co-founder and coordinator of the Spanish Red de Transición). They have visited Granada, giving lectures and workshops to support and encourage the growth of Granada in Transition.

Aims and objectives

Granada in Transition shares its objectives with the other cities from the Transition Network. They are trying to address in innovative and sustainable way four main challenges:
1. Climate change:
2. Oil dependency
3. Distorted economy dominated by multinational corporations
4. Myth of unlimited expansion

Instead of being overwhelmed by the gloomy forecasts for the future, people participating in the initiative try to spread the message that action is urgently needed and that every individual can in fact make a difference. They offer their help and advice to other people and their communities to develop healthy and resilient local responses to these issues, honestly admitting that they do not have all the answers and that Granada in Transition is an ongoing experiment in which all participants are learning as they move forward. But what they had already learned, they are more than willing to share.

Methods for Intervention

Simple but effective online platforms are used to attract people to participate in the projects and to address home energy consumption. Granada in Transition has a website and a Facebook page. Both are used to disperse information about meetings and to educate the audience about energy and climate awareness.

Many activities implemented by the initiative's members, such as Debates in Transition or Movies in Transition, require no funding. For those that require minimal sums of money, such as Cooking in Transition, each participant makes an individual contribution. Some activities require a substantial start-up fee (such as Happy Chicken Coop or the Repair Café) – in such cases, crowd funding is employed, although this rarely occurs more than twice a year. Projects include:

- Aquaponics system: locally produced fish and vegetables using less chemicals, fertilizers, and water.
- Happy Chicken Coop: locally produced, free-range eggs.
- Debates in Transition: exchange of ideas and mutual learning.
- Movies in Transition: events with projection of inspirational and educational movies
- Cooking in Transition: meals are prepared and enjoyed together in order to reduce the use of energy and resources
- Urban gardens: organically grown vegetables and fruits
- Repair Café: a workshop for efficient use of resources and increasing skills and competences.

Each project has its own committee that oversees it. There are no specific indicators or thresholds that must be met, but an overhead organisational group meets periodically to discuss the projects and plan future endeavours.

Steps of implementation

The seed of the initiative was planted by several like-minded people, which were soon joined by others who were equally committed to making a change and who valued the power of a community. The first meeting of the implementing team was in 2012, marking the official start of Granada in Transition. The initiative has been growing ever since. The first project, Happy Chicken Coop, was successfully launched in 2013, to be followed by other projects over the years. Members of the initiative are also actively disseminating information – distributing flyers and leaflets, and organising debates and documentary viewings on the theme of sustainability.

Results/outcomes

It is difficult to enumerate exactly how many households have been reached and to what extent this has changed their behaviour. However, as an example, vegetarian social dinners organised in the frame of Cooking in Transition, have been attended at least once by 57 different people. Overall, projects carried out by Granada in Transition involve hundreds of people from different areas of Granada and different generations. Many people have been active since the very beginning, giving sustainability and continuity to the project, while doors remain permanently open to new ideas and new people.

The role of the households
Households are involved through participation in social events. They are also recipients of information dispersed through Granada in Transition's online presence (Facebook page and website). As it is a grassroots, bottom-up initiative, all projects within Granada in Transition have been designed by members of the community. Households are therefore engaged in all the ongoing activities (they may select those that interest them the most), including: Cooking in Transition, Debates in Transition, Movies in Transition, the community garden, Happy Chicken Coop, and the aquaponics systems. Householders may have contributed financially to the initiative in a minimal way, e.g. buying supplies for Cooking in Transition, but did not make any major financial donations.

Location
The initiative is based in Granada – a city of 234,000 (2016) in southern Spain. It was designed and implemented by a group of motivated volunteers, united in their hopes of transitioning to a post-petroleum future.

Was/is the initiative successful?
People from Granada in Transition consider themselves to be a success in social terms, with a cohesive and supportive group leading the movement. They are also successful in the sense that the initiative has been widely recognised and is well known among environmentally conscious Granada residents.

Textual and communicative aspects of the initiative
Communication and dialogue are essential components of the initiative, and workshops and meetings are regularly organised to inform and educate people about the importance of energy savings and environmental consciousness. Communication and "governance" (as a loose term) has been quite successful. As alluded to previously, each project under the umbrella of Granada in Transition has its own organising body. In addition, there is a committee that oversees all projects from an organisational perspective and that meets to discuss their development and success. Communication between all parties is fluid and successful.

The physical/technological aspects of the initiative
The technological and physical aspects are rather marginal, as the most important factor contributing to way participants rethink and change their approach to environment and sustainability is the social one.

Shared understandings related to initiative
Participants share on their website that they do not set goals, but have their attention focused on the road towards transformation of our society – making it more cooperative, supportive, associative and sustainable. The only way to achieve this goal is to travel the road as a community. Establishing a community is therefore the central objective of the initiative – people who have never met before come together and join their efforts, forming a community through common projects. They share reflections, concerns and political positions while cooking, dancing, singing in a choir, fixing appliances, cultivating a garden, collecting eggs, watching a movie. An ever-growing number of people from the city learn about Granada in Transition and decide to join it.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

One of the main priorities of the Spanish energy policy is to reverse the trend of the growing energy consumption – the rate at which the energy consumption is Spain has been rising over the past decades has been much higher than in most other European countries. Along with the reduction of overall consumption, the country aims at increasing the share of renewables in the energy generation.

Like in many other countries, one of the most important measures is the energy renovation of the building stock. Many multi-apartment buildings in Spain are rather old and have a very poor thermal record. Another technological measure expected to contribute to energy savings is accelerated installation of smart systems in residential and public buildings. Another important priority are programmes supporting the development of renewable and clean energy generation. This has been quite successful, and today Spain is among the European leaders regarding solar and wind power generation. Finally, various national campaigns also try to bring about a change in the energy-consuming behaviour of Spaniards.

While it must be underlined that the mapping of Sustainable Energy Consumption Initiatives conducted by the ENERGISE project across 30 European countries cannot be considered as a comprehensive and thorough examination of all energy-saving initiatives with active participation of households, it nevertheless indicates in which countries citizens are more concerned with the protection of the environment and sustainable use of energy. Spain, with 61 identified and described SECIs, is at the very top of our list. Perhaps even more importantly, 36% (22 initiatives) have been classified as the ones trying to obtain 'Changes in Complex Interactions' – the highest-ranking category of ENERGISE typology. This percent is much higher than in most other countries – the average rate for all 30 countries is 13.5%. 3% of Spanish SECIs are pursuing 'Changes in Everyday Life Situations,' 33% are promoting 'Changes in Individuals' Behaviour, and the remaining 28% are proposing 'Changes in Technology' to achieve energy savings.

Granada en Transición is therefore quite typical for the way Spanish citizens try to contribute to the conservation of resources and protection of the environment. The initiative corresponds well with the main concern of the national energy policy – that Spain has been consuming far too much energy over the past years and needed to change the trend quickly and decisively. *Granada en Transición* is a very democratic initiative, open to all people sharing the idea and spirit of the community, and willing to contribute to the common goal.

The central lesson that can be drawn from the *Granada en Transición* is that no transition to sustainable future will be possible without the formation of an active and devoted community of people, willing to scarify some of their personal comfort for the greater goal. Implementation of solutions based on a positive vision of the future necessities:

- A drastic reduction, both individually and collectively, in the consumption of fossil fuels as well as of our carbon emissions.

- Consolidation of the resilience of our territories and of their capacity to absorb future shocks.
- Transition of the economy towards local food production and use of renewable energy.
- Solidarity and cooperation among all members of the community.
- Solutions that best correspond to the needs and challenges of each community, and to the available resources.

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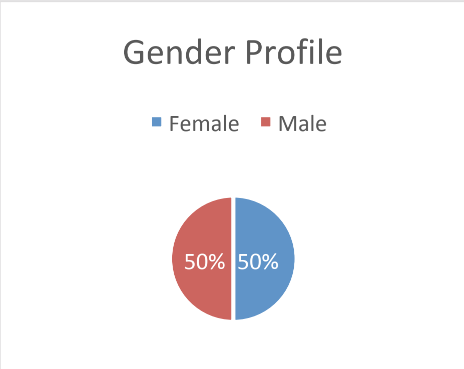
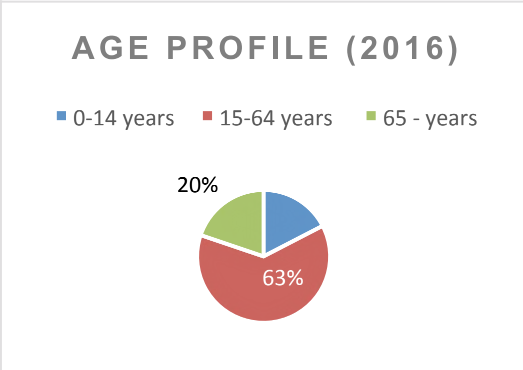
SWEDEN

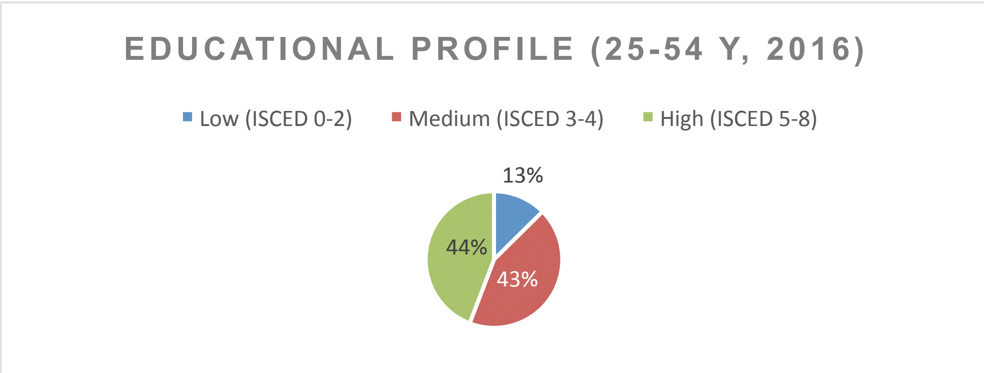
Authors: Marko Hajdinjak, Desislava Asenova

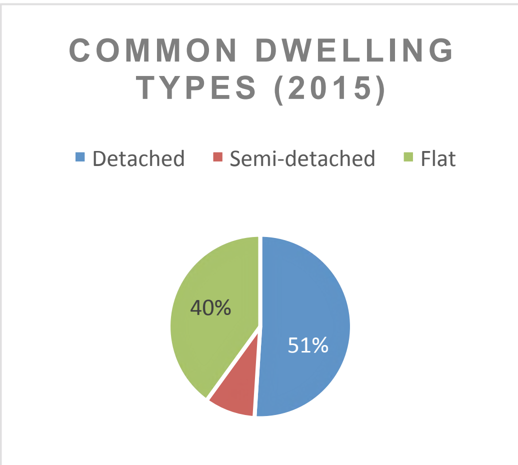
DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY

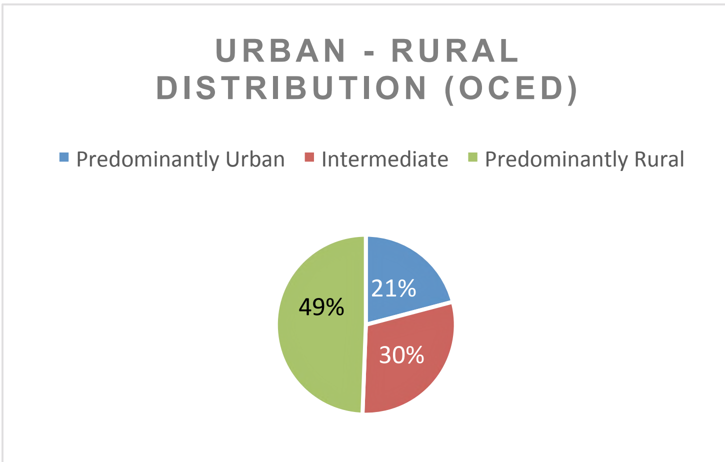


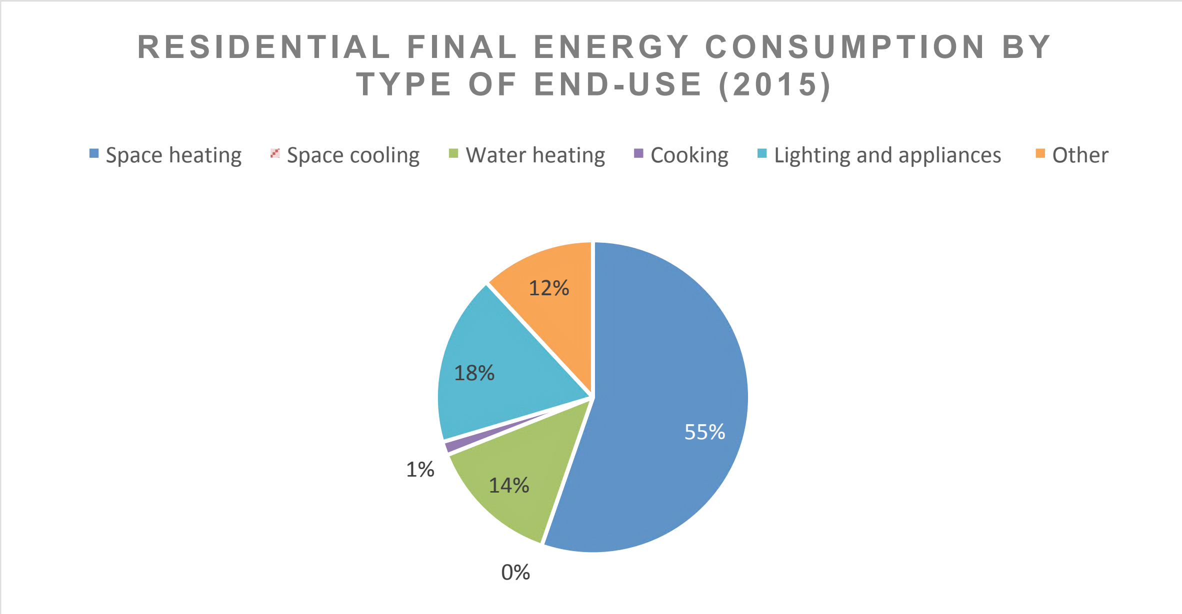


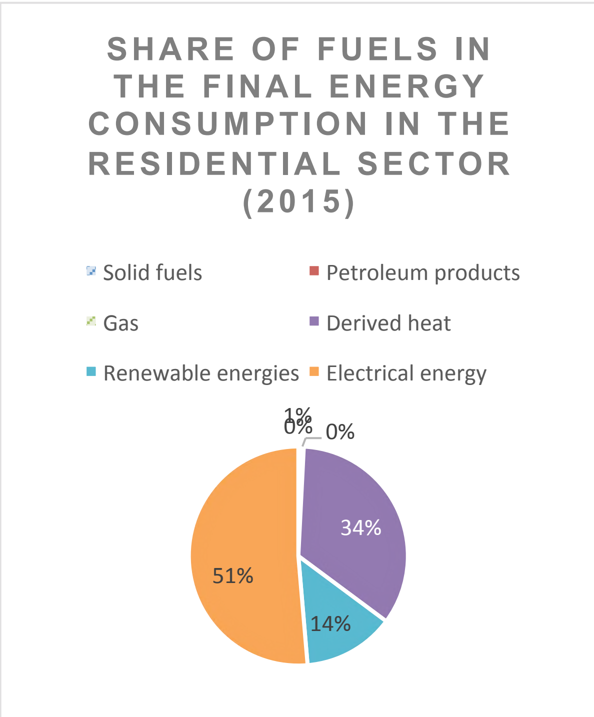
CLIMATE: temperate in south with cold, cloudy winters and cool, partly cloudy summers; subarctic in north

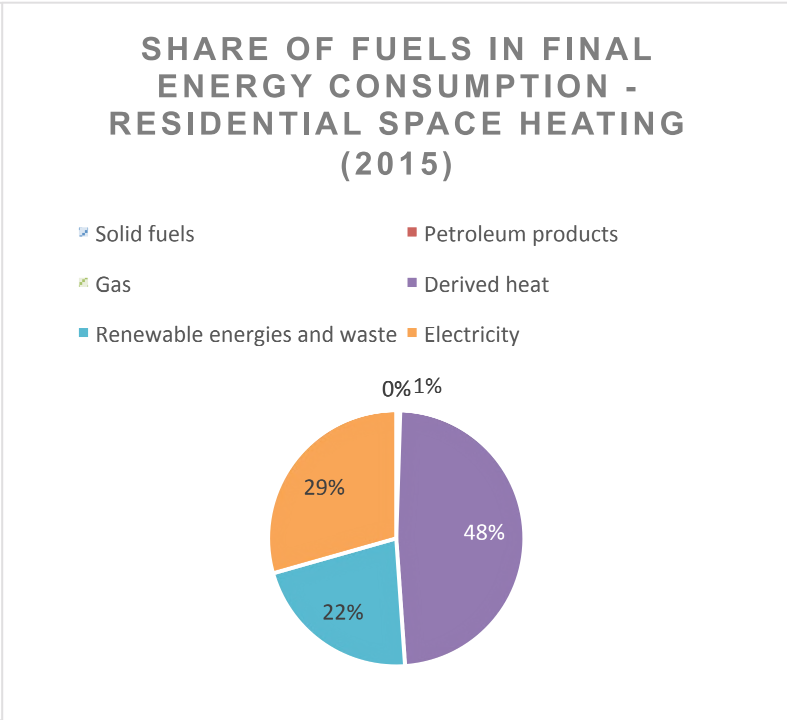












FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

8.541 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

The Swedish energy system is powered by domestic sources of renewable energy such as water, wind and biofuel, and imports such as nuclear fuel for electricity production in nuclear reactors and fossil fuels like oil and natural gas for the transport system. Electricity production is mainly based on hydropower and nuclear power, but currently the use of wind power and biofuel is increasing as well.[133] The overall energy generation in 2016 was 154.8 TWh with renewables accounting for 57% (hydropower – 40%; wind – 10%; biofuels and waste – 7%), nuclear power for 41%, gas and coal for 1% each, and oil representing 0.4% of the total energy generated.[134]

The single transmission system operator in Sweden is Svenska Kraftnät. It operates and manages the Swedish power grid and the electricity network. There were 121 electricity suppliers in the electricity market at the end of 2016. The three biggest suppliers are Vattenfall, Fortum and E.ON that in 2012 controlled 79% of the electricity generation.

Sweden has no natural gas sources. The country covers domestic gas demand by imports through the pipeline from Denmark. There are three gas operators active at wholesale level – E.ON, Dong Energy and Goteborg Energi. Since all gas is imported, there is no wholesale market hub. The TSO for gas in Sweden is Swedegas.[135]

In 2016, the Swedish national market for electricity, gas and district heating was deregulated, which allowed household customers in the country to freely choose their electricity supplier. The Swedish Energy Market Inspectorate became responsible for monitoring how the market functions. Another important change in the energy sector occurred in 2003 when monthly meter readings were introduced, ending a period of payments for estimated values of electricity consumption. These developments led to increase of energy prices and it was estimated that after the liberalization of the market, average household electricity prices have increased by around 50%, mainly due to higher taxes since year 2000. This, in turn, made households consider more energy efficient options that would lower their energy use.[136]

Around 270 out of the 290 municipalities in Sweden have a district heating system and more than 90% of apartment buildings are connected to this system. A large percentage (around 80%) of the heat supplied to the Swedish district heating systems is generated from renewable and recycled fuels. This makes Swedish heating sector pretty sustainable.[137]

Particular socio-material aspects that influence energy consumption

A study from 2012 made the following observations regarding the socio-economic parameters that influence households' energy related behaviour and consumption:

i) No direct influence of outdoor temperatures on domestic electricity or hot water consumption is observed. There are winter-summer consumption variations but they are mainly a result of holiday periods and excessive usage of electricity and hot water during winter periods when Swedish energy consumers tend to spend more time at their homes;

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[133] Swedish Energy Agency (2015). *Energy in Sweden 2015*. Available at: https://www.business-sweden.se/globalassets/invest-new/data-center/energy-in-sweden-till-webben.pdf

[134] International Energy Agency (2016). *Sweden – Energy System Overview*. Available at: https://www.iea.org/media/countries/Sweden.pdf

[135] European Commission (2014). *Sweden Country Report*. Available at: https://ec.europa.eu/energy/sites/ener/files/documents/2014_countryreports_sweden.pdf ; Lindblom, J. et al. (2017). *The Swedish Electricity and Natural Gas Market 2016*. Available at: https://www.ei.se/PageFiles/310277/Ei_R2017_06.pdf

[136] Vassileva, I. (2012). *Characterization of Household Energy Consumption in Sweden. Energy savings potential and feedback approaches*. Available at: https://www.diva-portal.org/smash/get/diva2:536634/FULLTEXT02.pdf

[137] Stockholm Data Parks (2017). *A Brief Introduction to District Heating and District Cooling*. Available at: https://stockholmdataparks.com/wp-content/uploads/a-brief-introduction-to-district-heating-and-district-cooling_jan-2017.pdf

ii) Income levels of households affect the electricity consumption. Observations show that low income consumers are more aware about their consumption and put efforts to reduce it, while moderate and high-income consumers lack the economic pressure and have almost no incentive to lower their energy usage;

iii) The number of occupants and the size of the house also influences energy consumption. The higher the number of occupants, the higher the energy consumption. The same is valid for the size of the house.[138]

In 2015, the household sector in Sweden accounted for 40% of the total energy used in the country. Space heating and water heating represented 60% of the total household consumption, and the remaining 40% were used for lighting and domestic appliances. According to statistics from the past four decades, electricity consumption in households in Sweden has more than doubled. Among the reasons for that are claimed to be the increasing share of single-person households and the raising number of electrical appliances. Significant changes in the household energy sector have occurred as well that could also affect the level of energy consumption. These are the replacement of oil heating systems with electricity, district heating and electricity-driven heat pumps. A positive development is that buildings in Sweden have become more energy-efficient.[139]

Electricity prices for households have increased from 18.51 euro cents per kWh for the first half of 2015 to 19.36 euro cents per kWh for the first half of 2017. In comparison, the average electricity price for households in the EU in the first half of 2017 was 20.41 euro cents per kWh, a bit higher than the price in Sweden.[140]

Current Trends in Energy Policy

Due to the migration of millions of people from the country-side into the cities in the 1960s and 1970s, around one million new dwellings were built in Sweden. Nowadays, these buildings are in urgent need of refurbishment and efficient heating systems. Tenants complain about draught and low indoor temperature as well as about the worn out sanitary equipment and façades in an urgent need of repair. In result of the refurbishment programmes that were implemented on national and local level, the following measures were implemented: i) thermal insulation on the ground floor and the outer walls; ii) acoustic insulation on inner walls; iii) new façade material; iv) new windows; v) energy efficient household appliances. A concrete example is the local refurbishment project in Alingsås (Sweden) that was started in 2008 by the municipality-owned housing company Alingsåshem and that contributed to the renovation of 16 buildings with 300 apartments to passive house standard.[141]

There are also long term policies that have contributed to energy efficiency in Sweden. The country has invested in improved information dissemination on energy efficiency since 2010. An average saving of 2 MWh for households and 20-30 MWh for SMEs was achieved as a result of this scheme. Another example of policies and developments in the field of energy is tax deduction for energy efficiency renovations and reconstructions that have been valid since 2010 and that allow households to receive a tax deduction of up to 50% of renovation expenses. Also, web tools for information on energy efficiency have been developed recently.

It is claimed that with the introduction of the automatic meter reading (AMR) that started in 2003 and that resulted in the deployment of advanced meter infrastructures (AMI), Sweden was the first EU country to indirectly adopt smart meters. The adopted system architecture includes meters, data

[138] Vassileva, I. (2012). *Characterization of Household Energy Consumption in Sweden.*
[139] Kjeang, A. E., Palm, J. and Venkatesh, G. (2017). 'Local energy advising in Sweden: Historical development and lessons for future policy-making.' *Sustainability* 2017, 9, 2275
[140] Statista (2018). *Electricity Prices for Households in the European Union (EU-28) from 2010 to 2017*. Available at: https://www.statista.com/statistics/418049/electricity-prices-for-households-in-eu-28/
[141] Zinko, H. (2011). *Building Refurbishment to Passive House Standards of the Quarter Bogarden in Alingsas, Sweden. Sustainable Cities and Regions*. Available at: http://www.ep.liu.se/ecp/057/vol12/043/ecp57vol12_043.pdf

collectors and the network company's data management system for billing. The reason behind adopting AMR and AMI was that the Swedish parliament decided that all electricity customers in the country should have monthly billing based on their actual consumption. After additional amendments to the legislation that were made in 2006, a full scale installation of AMR and AMI systems for nearly all Swedish consumers was achieved.[142]

Sweden's energy efficiency targets by 2020 are at least 50% of total energy use to come from renewable energy sources, at least 10% of energy in transport to come from renewable energy sources, to achieve 20% more efficient energy use and 40% reduction in greenhouse gas emissions.[143]

In 2012, with a share of 51.13% Sweden managed to already go beyond its goal of a 50% renewable energy share. This percentage continues to grow. In 2016, the share of renewable energy sources in Sweden was 53.82% which puts the country in top 3 in Europe after Iceland (72.60%) and Norway (69.44%). In comparison, the EU-average share of RES is 17.04%.[144]

The future of nuclear power remains vague. Although in 2010 the Swedish parliament decided to allow new nuclear power plants to be built in 2015, the owners of two of the three nuclear power plants in Sweden have announced their plans to shut down reactors corresponding to around 30% of the nuclear power capacity in the country in the years 2017-2020. Besides, nuclear energy tax was raised significantly in order to stimulate transfer of investments into renewable energy production.[145]

Trends in national campaigns

Sweden's government invests heavily in information and advice campaigns for households on how to save energy. An example is a long time initiative of municipalities employing local energy advisers who are responsible for interacting with and educating households on energy-related issues. This public-funded initiative started in Sweden in 1978 and since then is considered an important policy measure. Since 2004 all municipalities in Sweden have introduced energy saving advisors who offer energy counselling to citizens. All municipalities receive funding for this service as well as for coordination and professional development of the energy advisors. After change in regulations in 2008, local energy advisers became also climate advisors and advisors in the field of transport sector.[146]

The Swedish Energy Agency plays an important role in providing information through various channels and working with a large number of different actors ensuring the delivery of the information to the targeted groups. In 2006, it started the Energy, IT and Design national programme that was focused on consumers' every-day habits, values and behaviour. The aim of the programme was to make it easier for the households to control their consumption and to become more energy efficient.[147]

[142] Widegren, K. (2013). 'Development of Smart Grid and Smart Meters – the Swedish Experience.' *Government Gazette*. Available at: http://governmentgazette.eu/?p=5540

[143] Telenius, B. (2012). *Energy Policy in Sweden: A Pathway to a Carbon Neutral Society*. Available at: https://www.hhs.se/contentassets/7c92412606ee433e97207800662742a1/telenius.pdf

[144] Eurostat (2018). *Energy from Renewable Sources*. Available at: http://ec.europa.eu/eurostat/web/energy/data/shares

[145] Swedish Institute (2018). *Energy use in Sweden*. Available at: https://sweden.se/society/energy-use-in-sweden/

[146] Kjeang, A. E., Palm, J. and Venkatesh, G. (2017). 'Local energy advising in Sweden.'

[147] Vassileva, I. (2012). *Characterization of Household Energy Consumption in Sweden.*

OVERVIEW OF NATIONAL SECIS

Below please find a list of Swedish SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country.

POWER HOUSE NZC: Powerhouse Nearly Zero Challenge	Changes in Technology
EEPLIANT: Energy Efficiency Compliant Products 2014	Changes in Technology
iBROAD: Individual Building (Renovation) Roadmaps	Changes in Technology
TRIBE: TRaIning Behaviours towards Energy efficiency: Play it!	Changes in Individuals' Behaviour
TOPTEN ACT: Enabling consumer action towards top energy-efficient products	Changes in Individuals' Behaviour
ECHO ACTION: Energy-Conscious HOuseholds in ACTION	Changes in Complex Interactions
EYEMAN CHAMPIONSHIP: European Young Energy Manager Championship	Changes in Individuals' Behaviour
FEEDU: Persuasive force of children through education	Changes in Individuals' Behaviour
ICOSAW: Promotion of the Intelligent Combination of Sun and Wood for Producing Warm Water and Heating for Private Houses	Changes in Technology
SPIRIT: Energising Faith Communities	Changes in Individuals' Behaviour
"Swedish largest energy saving experiment"	Changes in Individuals' Behaviour
"End-use metering campaign in 400 households in Sweden, assessment of the potential electricity savings"	Changes in Individuals' Behaviour

Energy Neighbourhood: Climate Competition between Municipalities and Their Citizens		Changes in Everyday Life Situations
STATIC! - Energy as a Design Material		Changes in Everyday Life Situations
CEPHEUS project (Cost-Effective Passive Houses as European Standards)		Changes in Technology
M CUBE		Changes in Individuals' Behaviour
Värme i Villan (Heat in the House)		Changes in Individuals' Behaviour
"Energy advice in the Region of Stockholm"		Changes in Individuals' Behaviour
SAVES: Students Achieving Valuable Energy Savings		Changes in Individuals' Behaviour
A Transnational Nordic Smart City Living Lab Pilot		Changes in Technology
TOGETHER on the move - Energy Efficient Transport Training for Immigrants		Changes in Everyday Life Situations
ACTIVE LEARNING: Integration of Active Learning and Energy Monitoring with School Curriculum		Changes in Individuals' Behaviour
KIDS4FUTURE: Creating Actions among Energy Conscious Children		Changes in Individuals' Behaviour
BEHAVE: Evaluation of Energy Behavioural Change programs		Changes in Individuals' Behaviour

‘GOOD PRACTICE’ EXAMPLE OF SWEDISH SECI

STATIC! - Energy as a Design Material

Description

The Swedish Interactive Institute has been working on a project to redesign everyday items (lamps, tiles, window shades) in order to increase awareness of how energy is being used.

The ‘STATIC!’ project has two main goals:

1. Increase awareness of energy use
2. Stimulate changes in user’s consumption behaviour.

The project builds on the assumption that one of the largest barriers in encouraging energy conservation is simply the lack of awareness. ‘STATIC!’ products serve as effective and permanent reminders to be more energy conscious.

Contextualization

Energy is an increasingly valuable – but too often invisible – resource. The infrastructure for delivering electricity and the meters for measuring the amount of consumed electricity are often out of sight. Wires are hidden inside walls, electricity meters are located in basements or on outer walls. The project ‘STATIC!’ views energy as a design material, and proposes innovative design solutions for everyday items that use or transfer electricity in order to make energy more ‘visible’ and ‘tangible.’ The result of this effort is a series of products that are a standard feature of the average household, but have been redesigned in a unique and innovative way to make consumers more aware of the presence and use of energy, and consequently encourage more sustainable practices of energy consumption.

Aims and objectives

The main objective of ‘STATIC!’ is to stimulate changes in energy behaviour by changing the design of typical household items directly or indirectly involved in the household electricity consumption. A varied palette of prototypes and different scenarios are employed to help the consumers to ‘visualise’ electricity and become more aware of different ways in which they consume it.

‘STATIC!’ explores application of innovative solutions in design of everyday objects in order to:

- make energy visible and tangible to all senses
- express relations among different forms of energy used
- support reflection on the energy behaviour over time
- empower consumers by enabling them to understand and control energy use in their home environment

Methods for Intervention

‘STATIC!’ is an experimental project based on the premise that energy can be understood and viewed as a design material – not entirely different from other materials such as plastics, wood and textile, and can be therefore used to produce objects. By treating energy as an expressive material in its own right, we render it visible, enabling consumers to have an increased awareness of and control over the energy in the things they use. Moving beyond awareness promoted in information campaigns, this approach focuses on energy as a core aesthetic and functional issue in early stages of product design, thereby triggering substantial changes in the ways energy is perceived and used in everyday life.

Steps of implementation

- An extensive search for inspirational examples of related work (books, academic papers, articles, Internet, workshops).
- Selection of the design approach and methodology.
- Focusing the project's approach and intent: target young people between 15 and 25 years old and families with children; use interaction design as a means of increasing young people's awareness about energy and for stimulating changes in their energy behaviour.
- Research phase to gather inspiration and information about young people and their everyday life, focusing on their interaction with energy.
- Development of products: brainstorming of ideas; sketching and drawing; refinement of ideas; design of concepts.
- Testing the design proposals: proposals were presented to young people on a workshop and evaluated.
- Production of final version of products.
- Testing in pilot households.
- Collecting feedback through interviews with household residents.

Results/outcomes

The following innovative designs / products were developed:

- Appearing Pattern Wallpaper: wallpaper has a solid colour when purchased, but a pattern emerges over time as sunlight exposes textures printed with UV-sensitive ink.
- Disappearing Pattern Tiles: bathroom tiles are decorated with patterns in a thermo-chromic ink that reacts to heat, fading away to reflect hot-water use. The longer the shower, the less decoration on the wall.
- Element: radiator made out of glass, metal and light bulbs, which are glowing when radiator is on.
- Energy Curtain: a window shade woven from a combination of textile, solar-collection and light-emitting materials. During the day, the shade collects sunlight and in the evening, the collected energy is expressed as a glowing pattern on the inside.
- Erratic Radio: radio which "goes out of tune" when there are too many objects in the room consuming energy.
- Flower Lamp: lamp changes its shape depending on the energy consumption in a household. In order to make the lamp more beautiful, a change in behaviour is needed.
- Heat Sensitive Lamp: lampshade is made of heat sensitive paper – the heat generated from the bulb causes the lampshade to change form, as bubbles grow from the previous flat shade.
- Power Aware Cord: re-designed electrical cord which shines when electricity flows through it. Expressing the presence of energy through light can inspire people to explore and reflect upon the energy consumption of electrical devices in their home.

The role of the households

Households were first involved in evaluation of initial designs of products, which were presented to them during a workshop. Selected products were then tested in pilot households, which provided feedback through interviews. Two interviews were conducted in each household: one at the beginning of the test period when the prototype was brought into the domestic setting, another at the end of the test period.

Location
'STATIC!' was carried out between 2004 and 2006 in Swedish cities Eskilstuna and Göteborg.

Was/is the initiative successful?
The initiative was definitely successful. The feedback from pilot households was very positive and the energy-aware household products were presented in numerous events such as symposiums, seminars and exhibitions. The initiative resulted in numerous journal publications and a book[148] featuring original texts by research leaders and previously unpublished images of the conceptual designs. The School of Design and Crafts at Göteborg University conducted a series of workshops 'STATIC! Energy as design material' for its students. The Static! Power-Aware Cord and the Static! Flower Lamp has received major international awards. The research project stimulated a growing research area in energy, design, and IT in Sweden and abroad.

Textual and communicative aspects of the initiative
'STATIC!' explores how the design of everyday household objects can influence and change practices and patterns of (over)consumption of electricity at home by materialising it and making it more visible and tangible for people.

The physical/technological aspects of the initiative
Technological aspects are at the core of the initiative – the range of innovative and effective design solutions has been described in more detail above under 'Results/Outcomes.'

Shared understandings related to the initiative:
The initiative builds upon understanding that a considerable part of our contemporary lifestyles is powered by electricity. The economic and environmental costs of energy require us to rethink how we consume energy and how to change our behaviour. Participants in the initiative consider energy as an expressive material for design, in the sense that visibility and use of energy are brought to the forefront in products, enabling people to increase their awareness of and control over the energy in the products they use.

[148] Mazé, R. (ed.) (2010). *Static! Designing for Energy Awareness*. Stockholm: Arvinius Förlag.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

Although Sweden is among the European leaders regarding the use of renewable energy sources (mostly hydropower, but also wind and biofuel), further increase in the share of RES in the final energy consumption is among the priority goals of the national energy polices, along with the reduction in greenhouse gas emissions and improved energy efficiency. Efforts to consume energy in a more efficient way are concentrated, as in many other countries, on renovation and thermal insulation of old building stock and modernisation of the heating systems. Sweden was also a European pioneer in the adoption of smart metering, and the process of installation of automated meter reading has been practically completed. As the processes of applying technological solutions for increasing energy efficiency are quite advanced, most national campaigns focus on promoting behavioural changes and informing people how to consume less energy and diminish their carbon footprint. Often, the approach is quite innovative, as demonstrated by the 'STATIC!' project described in Section 3.

Numerous other initiatives focus on promotion and exchange of innovative ideas that help households to understand and control the ways in which they consume energy. ECHO ACTION addressed families as final users to shift the "demand side" towards more responsible energy use. "Swedish largest energy saving experiment" involved 10,000 households in an experiment to find out how much electricity could be saved if they have continuous feedback on their electricity consumption, load demand and costs in real time. "Transnational Nordic Smart City Living Lab Pilot" tested innovative technical energy solutions in real-life settings to produce energy saving solutions in homes and transportation.

Some initiatives focused on providing user-friendly information on energy performance of household appliances and other products (EEPLIANT; TOPTEN ACT), while others raised knowledge about sustainable heating alternatives (Heat in the House; Energy Advice in the Region of Stockholm; ICOSAW). The youngest energy consumers were not forgotten either. Education is at the core of several initiatives – for example FEEDU, which raised awareness about renewable energy sources and rational use of energy and mobility in schools, ACTIVE LEARNING that promoted energy education among children aged 6-12 years, and KIDS4FUTURE, striving to create understanding and enthusiasm for energy issues and raise interest towards the question of a sustainable future among children in 20 pilot schools. EYEMAN CHAMPIONSHIP and SAVES involved young people in energy saving competitions.

Two more projects deserve to be mentioned. SPIRIT engaged faith-based organisations in efforts to achieve measurable energy savings. Members of faith communities were trained as Energy Champions, who delivered energy saving advice to fellow members of their communities. 'TOGETHER on the move' developed and implemented energy efficient transport training for immigrants.

Compared to the initiatives implemented in most other countries, 'STATIC!' stands out as an example of SECI that goes beyond the usual approaches such as awareness campaigns and technical solutions, by using innovative solutions in design of products, like lamps, domestic appliances and electronic devices, to influence people's awareness and choices. Illustrating how we can work with energy not only from a technical but also from aesthetic point of view, 'STATIC!' reinterprets basic functionality of familiar objects and stimulates users to make active choices to save energy on a daily basis.

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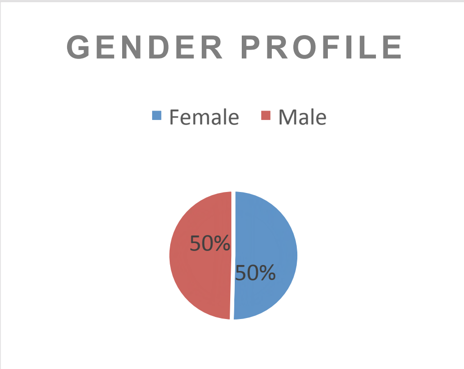
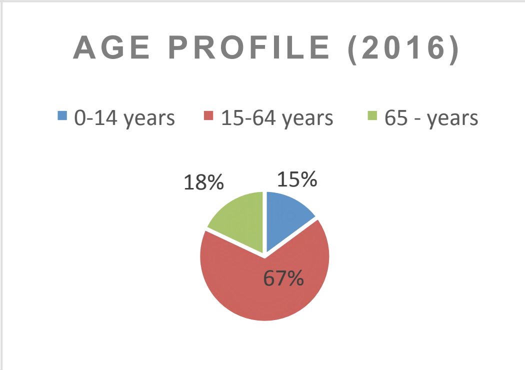
SWITZERLAND

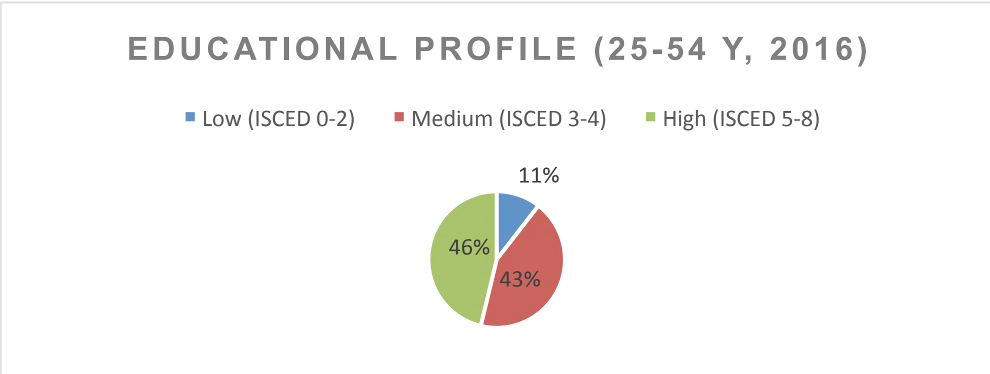
Authors: Laure Dobigny, Marlyne Sahakian

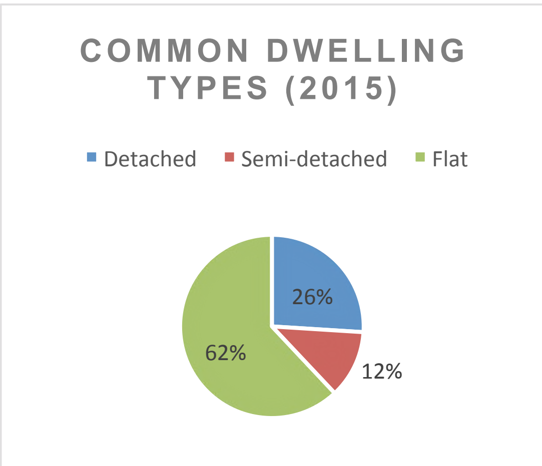
DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY[149]

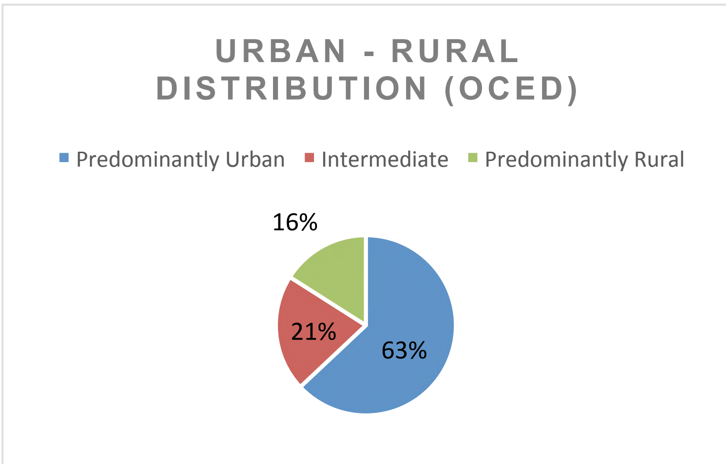




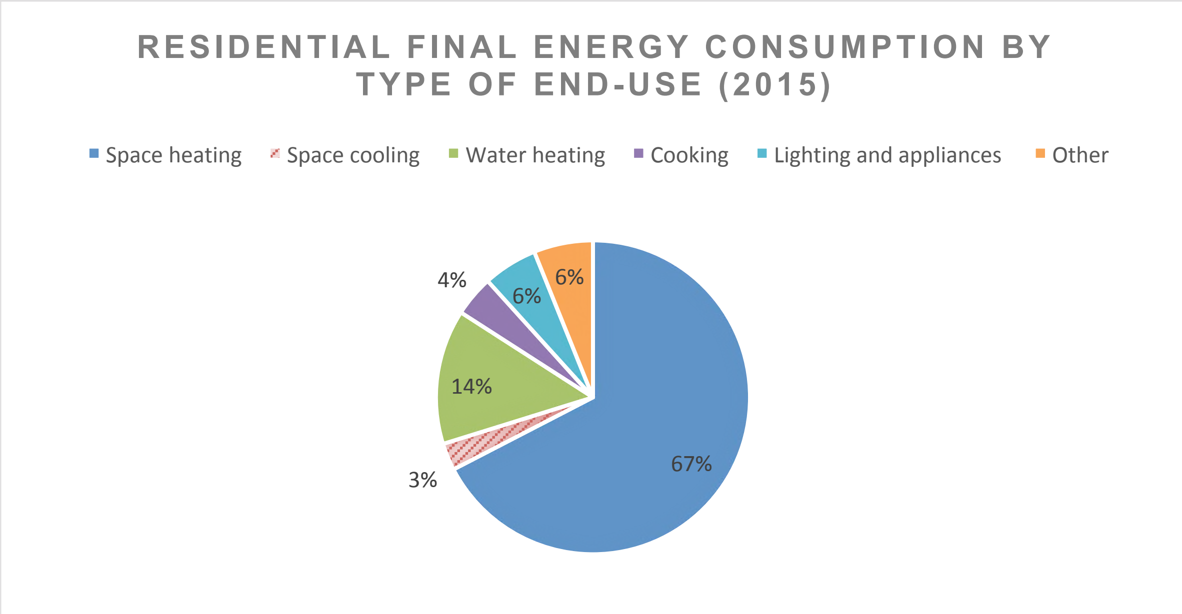
CLIMATE: temperate, but varies with altitude; cold, cloudy, rainy/snowy winters; cool to warm, cloudy, humid summers with occasional showers

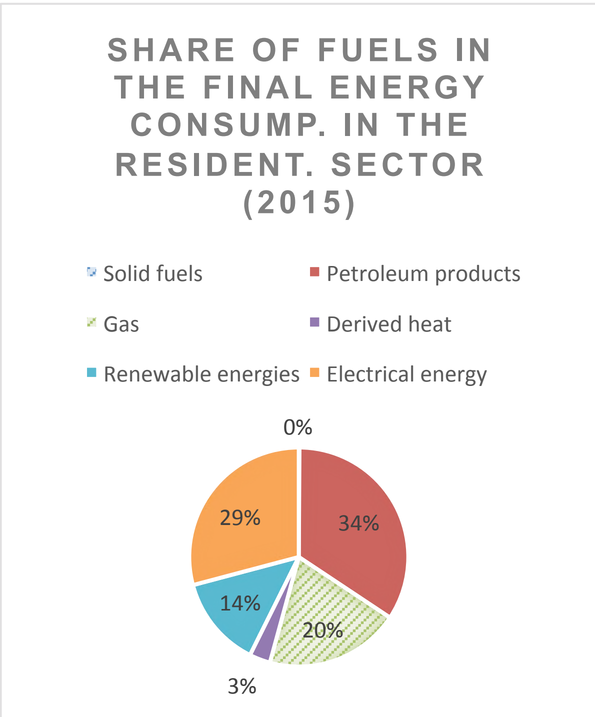


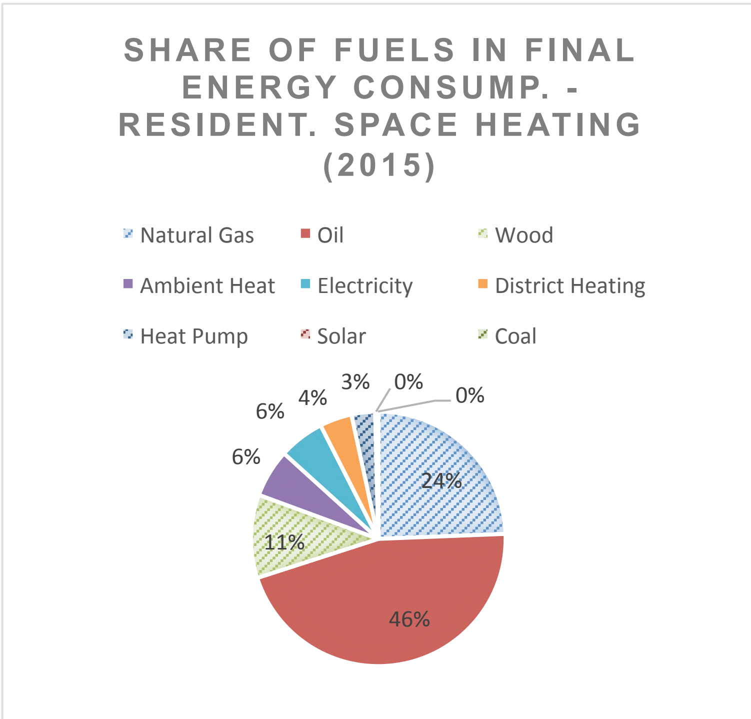




[149] Quantitative data for the energy consumption statistics presented in this section is not from eurostats, but from a compatible Swiss source Prognos (2016, data from 2015). The urban-rural ration statistics is from OFS (2017, data from 2012). Please note that some categories differentiate from piecharts in remaining briefs.


RESIDENTIAL FINAL ENERGY CONSUMPTION BY TYPE OF END-USE (2015)
Space heating
Space cooling
Water heating
Cooking
Lighting and appliances
Other
67%
3%
14%
4%
6%
6%


SHARE OF FUELS IN THE FINAL ENERGY CONSUMP. IN THE RESIDENT. SECTOR (2015)
Solid fuels
Petroleum products
Gas
Derived heat
Renewable energies
Electrical energy
0%
34%
20%
3%
14%
29%


SHARE OF FUELS IN FINAL ENERGY CONSUMP. - RESIDENT. SPACE HEATING (2015)
Natural Gas
Oil
Wood
Ambient Heat
Electricity
District Heating
Heat Pump
Solar
Coal
24%
46%
11%
6%
6%
4%
3%
0%
0%

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

The Swiss energy system is mainly composed of local energy companies (for electricity, gas and district heating), and mainly public (sometime public-private) in which case energy companies are accountable to the municipalities. Some energy production cooperatives (citizen-led and producing renewables, such as “Energiegenossenschaft” - Energy cooperative, or Optima Solar) and private companies exist, but they are marginal compared to the public local companies (providing energy production and distribution). In addition, new consortiums between citizens and local public companies are emerging, especially in renewable energy generation (implementation of RE plants with financial participation of citizens), e.g. in Delémont or Yverdon-les-Bains.

Heating is mainly provided by fossil energy (mainly by fuel, and by gas), with central heating in buildings and with estimated individualized heating bills for apartment units (and very little possibility to directly influence on heating, for apartment units). Electricity is mainly produced by hydroelectricity (59,9% - SFOE 2016) thus by nuclear energy (33,5%).

Particular socio-material aspects that influence energy consumption

Beyond private homes and metering, there is little opportunity to understand individual consumption for heating in apartments, as these are often calculated on an annual basis and bundled in with other utilities. Minergie is the energy efficiency label in Switzerland, which proposes floor heating and entails a fine tuning of hydraulic valves for adapting indoor temperatures. The “performance gap” between these highly-energy-efficient buildings and usage is well understood in Switzerland, by engineering companies and developers. Thermostats in apartments are very unusual. Owning secondary residences in the mountain areas, a popular destination for weekends and holidays, has implications for transport and heating.

The adage “clean and in order” is a strong social norm around cleanliness and tidiness, which has implications for laundry and cleaning. It is not unusual for apartment buildings to have a shared laundry facility, for washing and drying clothes (e.g., in a heated room in the basement), yet the trend is towards private ownership. Laundry machine purchases have grown exponentially in the past decades.

Preparing and sharing meals has a strong positive social connotation, which relates to energy used for storing and cooking foods. The emblematic shared meal is the Swiss fondue, cooked over burning fuel at the table! There is a strong “slow food” movement in Switzerland, involving community supported agriculture, the nose to tail movement, among others.

Private cars are the preferred means of transport for many, public transport is quite efficient and car/bike sharing is becoming more popular. There are also public events to “slow down”, involving biking and walking in city centres.

Smart technologies are in a pilot phase, but a recent report by the Swiss government signals such technologies as on the rise – put forward with the hope of engendering greater energy efficiencies.

Current Trends in Energy Policy

Partly due to a reaction to the Fukushima nuclear disaster, Switzerland has adopted a “2050

Energy Strategy". This strategy implies an energy law, which was adopted through a citizen referendum in May 2017. The first measures of the energy strategy are: lowering energy consumption, improving energy efficiency and promoting renewable energy. New nuclear power plant construction is forbidden. A progressive nuclear phase-out is planned. To set up these objectives, the government is promoting:

- Refurbishment of buildings (monetary incentives for owners to switch from oil heating systems by heat pump, or towards insulation works)
- Energy efficiency for appliances (monetary incentives) and cars (binding legislation)
- Promoting RE (monetary incentives by a system close to feed-in tariff in other European countries)
- Implementing smart metering in household
- Promoting RE self consumption among households and at the neighbourhood level
- Supporting research in energy transitions, focused mainly on technical innovations, but also a more modest sum dedicated to socio-economic aspects of energy production and consumption.

Trends in national campaigns

Individual actions and efficiency are mainly being promoted: e.g. tuning off lights and appliances, changing old energy-intensive appliances by more efficient appliances (e.g. fridge), technical changes in the household (e.g. buying LED bulbs, by offering a special discount), etc.

There are some efforts to promote solidarity between the so-called Global North and Global South: initiatives to save energy in Switzerland, with savings invested in RE energies elsewhere.

Given the recent funding of academic projects on energy consumption, there have been local campaigns that are based on community-level and participative actions towards sustainable mobility, for example. In general, the public transport system is quite efficient across the country (save for the more remote areas), bikes are popular though not nearly the "rulers of the road" as compared to private cars; car-sharing has a long history, through the Mobility cooperative and its partnership with the national rail system and a bike sharing platform.

OVERVIEW OF NATIONAL SECIS

Below please find a list of Swiss SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). *The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country*.

Eco-social actions	Changes in Individuals' Behaviour
Ecohousing (eco-logement)	Changes in Individuals' Behaviour
Doubléco - Activéco	Changes in Individuals' Behaviour
Equiwatt	Changes in Technology
Suisse energy	Changes in Individuals' Behaviour
OFF	Changes in Individuals' Behaviour
Declic / Eco-family	Changes in Everyday Life Situations
The sustainability of sustainable behaviours (La durabilité des comportements durables)	Changes in Everyday Life Situations
Eco energy Etoy (EEE)	Changes in Complex Interactions
Solar Plus	Changes in Technology
Soleysin	Changes in Complex Interactions
Photovolpotat	Changes in Complex Interactions

Optima Solar schweiz	Changes in Complex Interactions
Climat in our hands	Changes in Individuals' Behaviour
Equisol	Changes in Technology
Energy cooperative - Geranium campaign (Energiegenossenschaft)	Changes in Complex Interactions
Sun-Power	Changes in Complex Interactions
RE transition Delémont SID	Changes in Technology
Solar plant Yverdon-les-bains	Changes in Technology
Local Energy Independence (Cernier)	Changes in Complex Interactions
Carbon Conversations	Changes in Everyday Life Situations
SolarSupport / Sebasol	Changes in Everyday Life Situations
Sports club mobility intervention - national research project	Changes in Everyday Life Situations
Towards societal consensus – Futures Wheel approach, national research project	Changes in Complex Interactions
On débranche - national research project	Changes in Complex Interactions
Unplugged kids day/week	Changes in Everyday Life Situations
Road Lab	Changes in Individuals' Behaviour

Robin des Watts	Changes in Individuals' Behaviour
Social Power Project	Changes in Everyday Life Situations
Energy week	Changes in Individuals' Behaviour
Transition cities	Changes in Complex Interactions
Big Effects - Swiss Energy Tour	Changes in Everyday Life Situations
City of energy - Société 2000 watts	Changes in Complex Interactions
Bike4Car campaign	Changes in Everyday Life Situations
Noe21 Communications Campaign	Changes in Complex Interactions
Top Ten website	Changes in Technology
Energy observatory (Observatoire de l'énergie)	Changes in Everyday Life Situations
Monthoux Minergie (buildings)	Changes in Everyday Life Situations
Pumpipumpe	Changes in Everyday Life Situations
Publi Bike	Changes in Everyday Life Situations
La Bonne Combine (the good deal)	Changes in Everyday Life Situations
Makerspace	Changes in Everyday Life Situations

‘GOOD PRACTICE’ EXAMPLE OF SWISS SECI

PumpiPumpe

Description

Launched in Switzerland in 2012, PumpiPumpe is about sharing appliances and other household items between neighbours. According to Sahakian (2017), the founders, Lisa Ochsenbein (Zurich) and Ivan Mele (Bern), are product and process designers respectively, and were sharing a workspace in 2012 when they came up with the idea of creating a way for people to share everyday household items. Ochsenbein had moved around quite a bit and realized that she did not use many of her possessions, which were left unpacked in moving boxes. In developing a sharing platform, the duo decided to work at the level of neighborhoods, where they saw enormous potential. They came up with the idea of using the mailbox as a personal space and communication tool: the Pumpipumpe sticker system allows people to place directly on their mailbox specially designed labels illustrating different household items (e.g., drill, ladder, books, toys) that they are willing to share. More than 15,000 households in Switzerland, Germany, and Austria have ordered these stickers, but the association does not keep track of who is using them and what sharing activities are actually taking place. Recently, though, Pumpipumpe launched an online map that allows people to view approximately 9,450 addresses where objects are available for sharing (2018). In the future, Ochsenbein envisions a smart phone application for identifying different available items in a given area, but for this, additional funding would be necessary. Beyond virtual connections, she emphasizes the importance of the “real, live network” as she put it, or ‘the actual network around us [neighborhood and immediate community] is really underdeveloped.’”

Contextualization

In Switzerland, where this project originated, there tends to be an accumulation of household appliances, with a focus on ownership. But at the same time, there is a tradition of second hand stores and sharing among neighbours and friends. Pumpipumpe wanted to create opportunities for sharing at the scale of a neighbourhood, so as to reduce the purchase of household items but also prompt people to think about product and service design, inspired by the crade-to-cradle design philosophy. As quoted in Sahakian (2017), “’Sharing makes sense in the material world as we have it today and would make sense in a world where we have very intelligent products, which go back into recycling,” she explained. Ochsenbein feels that Pumpimpumpe could ultimately influence purchasing decisions: “How we buy, how we select. If you see that there are already two pasta machines in your neighbourhood, you know you don’t need to buy one,” leading to less material throughput in the economy and less waste.

Aims and objectives

The aim of the project Pumpipumpe is to reduce the purchase of household items, while promoting the sharing of consumer goods and community relations. A secondary objective is to prompt a change in how products are designed, with longevity-by-design in mind.

Objectives highlighted:

- Stand up for a conscious use of our consumer goods
- Promote the sharing of our rarely used personal belongings / sustainable way to use consumer goods in their own neighbourhood,
- Build a local network / improve social interaction in urban neighbourhoods / get to know their neighbours better

- Buy less / reduce purchase of household items
- Make sharing-friendly neighbours and their objects visible.
- It does not necessarily happen on the Internet, but where neighbours and local residents walk past every day.

Methods for intervention

- Online website, where people can order stickers
- Online interactive map, launched in 2012, where people can see what is available for sharing in their neighborhood
- Stickers can also be ordered in partner shops or by Pumpipumpe ambassadors, or individuals who purchase several sheets of stickers to share them with their contacts.
- Mailings are handled through social reinsertion programs, or the employment of people who are job searching or developing new skills
- Public relations, and primarily press articles and media coverage put forward on the Pumpipumpe website.

Steps of implementation

- October 2012: Project was founded by two people in Bern, Switzerland.
- Since September 2014: Pumpipumpe project is an association and non-profit organization.
- Since May 2015, a Pumpipumpe map is available online, featuring stickers and locations.

Results/outcomes

Worldwide, approximately 9,450 letterboxes have Pumpipumpe stickers. The majority are in Germany, Switzerland and France, but mailboxes with Pumpipumpe stickers can be found across Europe, and some letterboxes in Russia, America, Asia, etc.
One drawback is that the association has not been tracking the actual sharing taking place, there is no information currently on this aspect. This is a weakness of the project, as we only know what sticker have been sent out, and there is no information on what sharing is taking place.

Objective(s)	Outputs/intervention methods	Evaluation indicators	Outcomes
Sharing devices	Promote sharing by making visible on your mailbox available household items	Online order and registration by participants (if voluntary)	9,450 letterboxes worldwide

The role of the households

Households need to order stickers online and pay 5CHF/5€ per order, which pays for shipping and handling. Participants share devices and other household stuff, in their neighbourhood. Participants are free to share their tools, kitchen appliances or toys with their neighbours, however they see fit. Nevertheless Pumpipumpe promotes the free sharing (not renting for money) of personal belongings.

Location

The association is based in Bern and Zurich (Switzerland), but stickers are sent worldwide, mostly in urban cities.

Was/is the initiative successful?

In total, 9,450 letterboxes with Pumpipumpe stickers are available across the world, with a large concentration in some neighbourhood, mostly in urban cities and located in Germany and Switzerland. But how the stickers are used and the actual impact in terms of sharing and reducing new purchases has not been measured.

Textual and communicative aspects of initiative

The communications are not moralistic, Pumpipumpe simply proposes a means for sharing devices between neighbours. The initiative is most likely addressed to people already convinced by the idea of sharing devices and developing neighbourhood relations, or to people who have not yet considered sharing, but are open to sharing and engaging in the initiative. The stickers are composed solely of graphically-designed images (no text) to facilitate the exchange between neighbours, without difficulties of language or legibility.

The physical/technological aspects of the initiative

Putting stickers on mailboxes to see which device the neighbours share is more adapted to apartment building and not to individual house. Indeed, in case of individual homes, you would need to see each mailbox from each house to know which device is shared. In apartment buildings, mailboxes are closer together and shared devices (with stickers) are directly visible. There may be issues in buildings were stickers on mailboxes are not permitted. Since May 2015, to resolve this problem, a Pumpipumpe map is accessible online that displays the stickers geographically, with the agreement of the participants. The map is anonymous; it shows where what kind of object can be borrowed in the area.

Shared understandings related to initiative

- Sustainable consumption of goods
- Sharing devices, goods
- Buying less devices used once per year / producing less devices / throw away less
- Local networking / promote social relationships in neighbourhood.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

A specificity in Switzerland is the number of initiatives led by research teams. This is due to an ambitious national research policy that supported research programs on energy issues, in the past decade. As a result, numerous initiatives aimed at improving household energy usage (and systems more generally) are underway in Switzerland, engaging with innovative processes such living labs, action research, gaming, etc., with new collaborations underway between municipal actors, energy companies and researchers. There was a specific focus on socio-economic approaches to energy, in addition to technical developments, which further emphasized the important role in supporting social sciences and the humanities in relation to energy transitions. This lesson from Switzerland could inform European policy, towards further supporting research-action.

Another interesting development has emerged in relation to renewable energies (RE), and due to the specificity of the energy sector in Switzerland (e.g., mainly composed of local and public energy companies, responsible for energy production and distribution). To achieve the ‘turn’ toward renewable energy resources, collaborations are underway between utility providers and citizen groups. This is an original development in Switzerland, situated between large-scale RE implementation led by utility companies, and small-scale citizen cooperatives.

Swiss SECIs reflect the specificity of energy consumption in Switzerland, such as the significance of individual car usage. Several SECIs therefore propose initiatives aimed at changing mobility options, by promoting biking and e-biking, bike and car sharing, or public transport usage (for example, Bike4car and Publi Bike). On another hand, Swiss SECIs reflect tendencies observed elsewhere in Europe: low-income households tend to be more targeted than middle- or high-income households (for example, the eco-social actions led by energy providers in Geneva and Lausanne), although new initiatives are underway to target home owners and middle-class households (for example, an eco-housing action led by an energy provider in Geneva). Moreover, a majority of SECIs target individual behavior and energy efficiency (technical change, refurbishment, eco-actions, etc.), rather than sufficiency and social norms around energy consumption. Pumpipumpe offers a counter example, in this respect: without large costs, the initiative aims to have a high impact on practices and representations of ownership, consumption, sharing, etc., and promotes a sufficiency-based lifestyle. This type of initiative does have an impact at the national and international scales, as the problem of “over consumption” is common to other countries of the Global North, and citizens across Europe and elsewhere have already demonstrated their interest by ordering Pumpipumpe stickers. This international diffusion and success is no doubt due to the simplicity of its design and functioning. There is also coherence between the message (less consuming and more sharing) and the action type (simple to use, appropriable by all, exchange facilitating, etc.). The tendency of increasing technological complexity (smart grid, smart appliances, smart homes, etc.) could be counterproductive when it comes to promoting a more sustainable and sufficient lifestyle if we are to follow this example.

A second lesson learned from the Swiss SECIs to inform European policy, is to account for coherence: the design and functioning of an initiative should be aligned with the message – such as promoting sufficiency.

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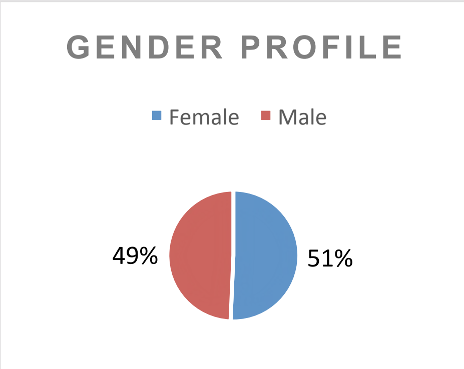
Interview with Lisa Ochsenbein, Co-Founder and President of Pumpipumpe, on December 15, 2017.

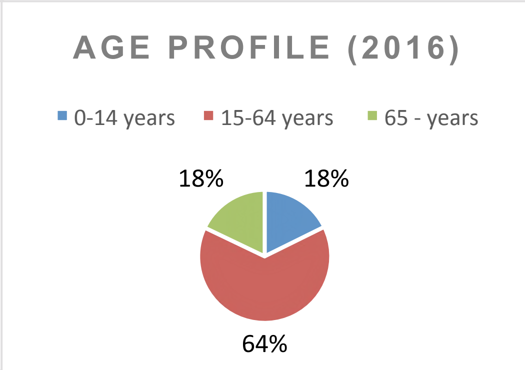
http://www.pumpipumpe.ch

UNITED KINGDOM

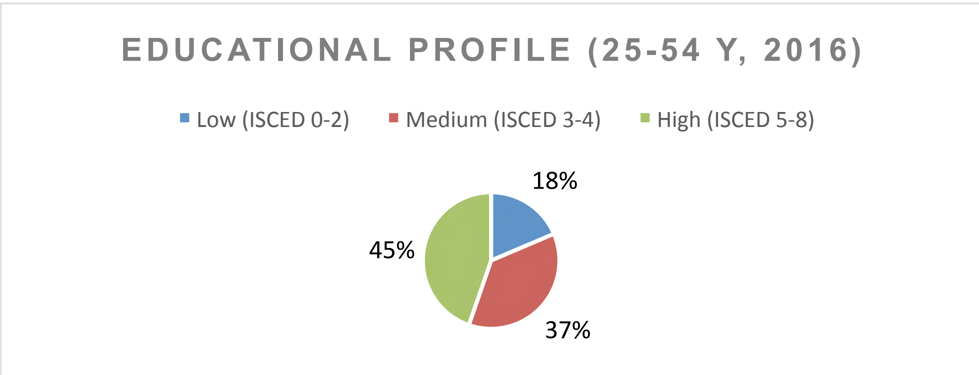
Authors: Marfuga Iskandarova, Audley Genus

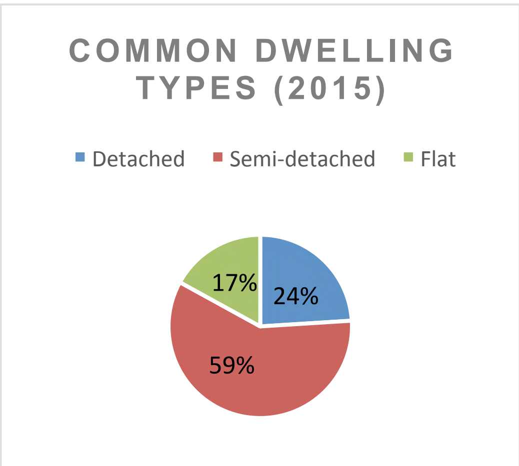
DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY

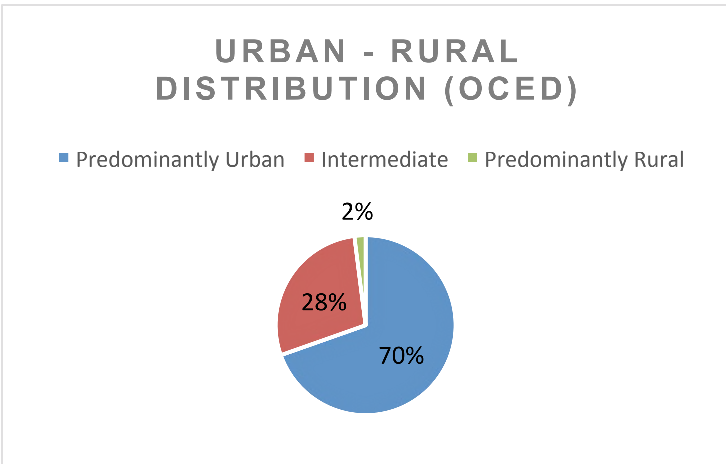


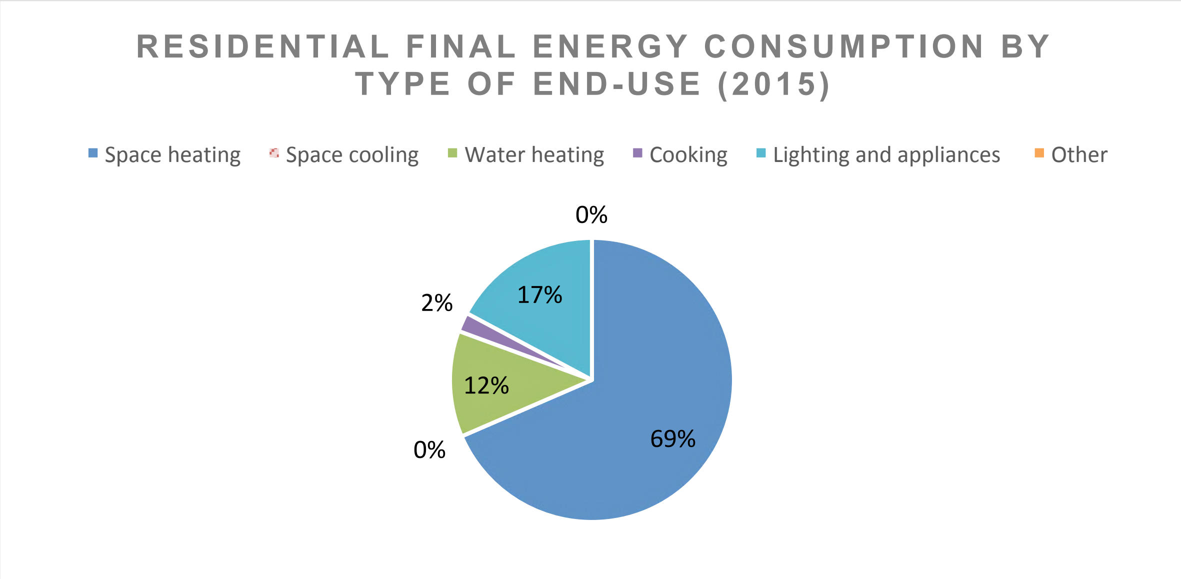


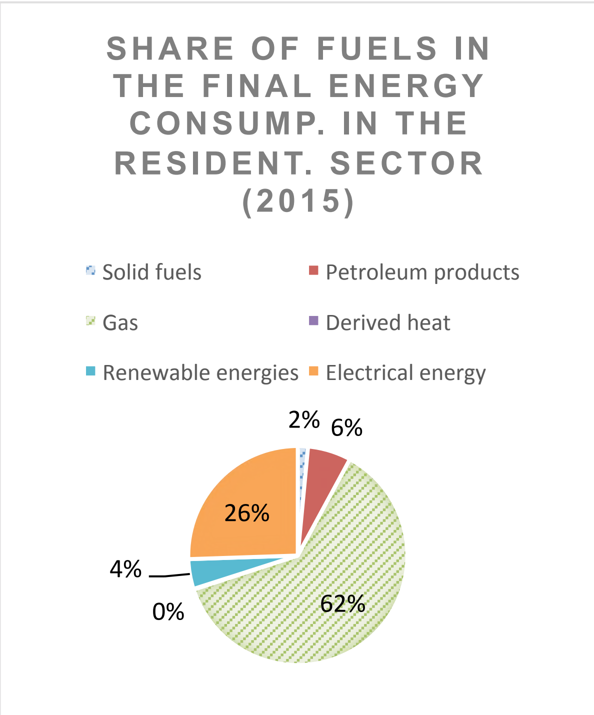
CLIMATE: temperate; moderated by prevailing southwest winds over the North Atlantic Current; more than one-half of the days are overcast

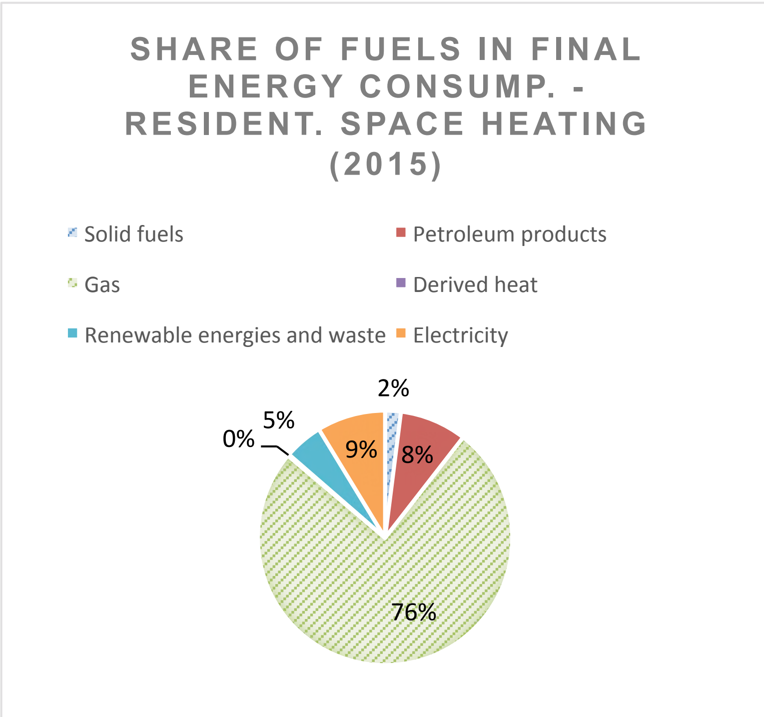












FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

6.514 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

The main fossil fuel sources in the UK are coal, gas and oil. The low carbon sources include nuclear and renewables such as wind, hydro, solar photovoltaics (PV) and biofuels. Fossil fuels remain the dominant source of energy supply and accounted for 81.5% in 2016, a record low level. (BEIS 2017a) The UK is a net importer of all main fuel types although it remains a net exporter of some products such as petrol and fuel oil. In 2016, 36% of energy used in the UK was imported (BEIS 2017b).

Under the EU Directive on Renewable Energy, the UK has a target to source 15% of energy demand from renewables by 2020. The UK is seen as the global market leader in offshore wind. The government has made a commitment to invest in offshore wind energy and is on track to deliver over 10GW by 2020 (DTI 2014). Solar PV, wave and tidal are not main contributors to the current energy mix in the UK. The UK is seen as a world leader and focal point for the development of wave and tidal stream technologies. With its excellent marine resource and its expertise in oil and gas exploration, the UK is in a unique position to benefit from this type of renewable energy – and to develop related wave and tidal stream services (BEIS 2013). The GB electricity system is divided into a national high-voltage transmission network and a number of regional, lower-voltage distribution networks. It is owned and maintained by regional transmission companies, while the system as a whole is operated by a single System Operator (National Grid plc). Ofgem has an important role in regulating the activities of these natural monopolies. National Grid plc also owns and operates the gas transmission system in Great Britain (four of the eight regional gas distribution networks). The electricity transmission network and the distribution network in Northern Ireland is owned and operated by Northern Ireland Electricity Networks. Northern Ireland only has five electricity providers to choose from. The gas transmission network consists of five pipelines, three are owned by Mutual Energy and two are owned by Gas Networks Ireland. Although the UK has pursued a centralised approach to energy for many decades, there is strong intention to develop decentralised energy and storage systems and replace significant volumes of large, transmission-connected fossil-fuel power stations by smaller, often distribution-network-connected, renewable generation technologies such as wind and solar. This fundamental shift will have implications for how the system is operated.

Particular socio-material aspects that influence energy consumption

Space and water heating account for 80% of final domestic energy consumption. In addition to weather factors, domestic fuel consumption is affected by household characteristics; efficiency measures and the age of the housing stock; the number and usage of appliances. An additional factor is the level of comfort required, i.e. a reasonable level of warmth, which varies over time. (BEIS 2017c) In the last 40 years, the average room temperature in the UK has risen considerably (from 12°C to 18°C in the winter months), largely due to the wide dispersion of central heating and improving insulation standards. Most households do not keep their heating on 24 hours a day; 70% of UK homes with central heating heat their homes twice per day with the peaks are around 7am and 7pm. On average, UK homes are heated for around eight hours per day in winter. (OVO energy). The UK housing stock is old relative to most European countries. As a result, many houses have poor insulation with properties resulting in additional consumption to maintain a given level of comfort. Older housing stock is gradually replaced with newer, more energy efficient homes. There have been some key changes to household characteristics, as well as energy efficiency measures, which have put downward pressure on consumption; e.g. a replacement of hot water tanks with more energy efficient boilers, installation of double glazing, cavity wall insulation. (BEIS 2017c). People in Britain prefer houses to flats. This is explained by the assumptions about the respect for privacy and independence, and the British pride in ownership. The UK is the only EU country not to have minimum-space standards for the homes; as a result, it has the smallest new homes in Europe, significantly smaller than 100 years ago (Henley 2012). Air conditioning is not a common feature in British houses; fireplaces as well as outdoor heaters and power shower are more popular.

Current Trends in Energy Policy

The evolution of energy policy in the UK in recent years starts with the liberalisation of the energy market linked to the privatisation of state controlled energy companies (1980s-1990s), and the establishment of Ofgem (the Office of Gas and Electricity Markets). In 2006 the UK Government undertook the Energy Review concluding that nuclear must remain part of the energy portfolio, the Renewable Obligations to be fine-tuned to encourage renewables other than wind, and the use of tradable targets by energy supply companies. A catalyst for the growth of renewables was the legal requirement that the UK provide at least 15% of its energy from renewable energy sources by 2020, with the Department of Energy and Climate Change (DECC) being established in 2008 to deliver this target. The Climate Change Act 2008 is part of the UK government's plan to reduce greenhouse gas emissions (by at least 80% of 1990 levels by 2050). The UK Low Carbon Transition Plan 2009 established a roadmap for the decarbonisation of the UK. The UK Renewable Energy strategy 2009 was the action plan for delivering UK's renewable energy objectives, and the Feed in Tariff scheme was launched in 2010 as a policy mechanism to accelerate investment in renewable energy. Through the microgeneration strategy 2011 together with the Renewable Heat Incentive the Government put in place a range of financial incentives to encourage the deployment of small scale, onsite, renewable energy. This was followed by the announcement of the Green Deal Scheme, a programme for building refurbishment (was closed in 2015). The energy efficiency agenda was underpinned by the Energy Efficiency Strategy 2012 which set the direction for energy efficiency policy and identified steps to stimulate the energy efficiency market. The UK government's first ever Community Energy Strategy launched in 2014 aims to encourage communities to play a greater role in achieving energy and climate change goals, e.g. community involvement in generating electricity. Recent years have seen a growth in small scale installations of renewable energy aided by the UK FiT, but since the UK General Election in 2015, there have been substantial, negative changes to support for key renewable energy technologies (e.g. cut of FiT). The Electricity Market Reform aims to attract investment needed to upgrade the UK's electricity infrastructure and be able to meet growing demand for electricity. One of the key mechanisms of the reform is Contracts for Difference designed to support investment in new low-carbon generation, with a technology-dependent fixed price. The reform was underpinned by the Energy Act 2013 that aimed to maintain a stable electricity supply as coal-fired power stations are retired. The construction of a new generation of nuclear power stations is facilitated by the establishment of Office for Nuclear Regulation. One of the strategic choices recently announced is a use of innovation and new technologies in designing the future electricity system based on smart metering with the supporting infrastructure. The Government is committed to ensuring that smart meters are offered to every home and small business by the end of 2020, enabling smart tariffs and other benefits for consumers.

There have been a number of schemes in recent years aimed at reducing fuel poverty: The Warm Front Scheme ran until January 2013, its replacement Affordable Warmth Scheme began in early 2013, The Central Heating Fund. The Fuel poverty strategy 2015 for England aims to improve the homes of the fuel poor by 2030 achieving where possible a minimum energy efficiency rating of Band C.

Trends in national campaigns

Fuel poverty and energy efficiency are at the heart of energy campaigns in the UK. They often target energy users by providing information and advice regarding their energy bills, choosing a supplier, and particularly providing advice to low-income households. E.g. the Campaign for Warm Homes & Lower Bills (2012-2015) aimed to raise public awareness about the UK's cold home crisis and to gain support for making energy efficiency an infrastructure investment priority that would also help end fuel poverty, reduce carbon emissions and create green jobs. Other campaigns: Clean British Energy campaign (Friends of the Earth) is about getting off fossil fuels and cutting the carbon out of the power system, which will also create jobs and give the UK the chance to become a world leader in renewable energy technologies. The campaigns on behalf of British Gas, EDF Energy, E.ON, npower, ScottishPower and SSE aim to cut the number of deaths and injuries caused by carbon monoxide poisoning.

OVERVIEW OF NATIONAL SECIS

Below please find a list of UK SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). *The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country*.

3e Houses (Bristol Living Lab)	Changes in Technology
City Lab Coventry	Changes in Technology
Building for the Future RENERGY LAB	Changes in Complex Interactions
Durham County Council RENERGY LAB	Changes in Complex Interactions
Kingston Smart Communties	Changes in Everyday Life Situations
Manchester is my Planet	Changes in Individuals' Behaviour
Edinburgh CRAG DEFUNCT	Changes in Individuals' Behaviour

Fownhope, Carbon Reduction Action Group ACTIVE	Changes in Individuals' Behaviour
Glasgow Carbon Rationing AG DEFUNCT	Changes in Individuals' Behaviour
Hackney & Islington Carbon Rationing AG DEFUNCT	Changes in Individuals' Behaviour
Hereford Carbon Rationing AG DEFUNCT	Changes in Individuals' Behaviour
Leeds Carbon Reduction AG DEFUNCT	Changes in Individuals' Behaviour
Oxford Carbon Rationing AG DEFUNCT	Changes in Individuals' Behaviour
Peckham Carbon Rationing AG 2007-09 DEFUNCT	Changes in Individuals' Behaviour
Sustainable Redland Carbon Rationing AG DEFUNCT	Changes in Individuals' Behaviour
York CRAG ('reduction') DEFUNCT	Changes in Individuals' Behaviour
ERIC project	Changes in Technology
Low Carbon Oxford North	Changes in Everyday Life Situations
GAP Big Energy race 2015	Changes in Individuals' Behaviour
British Gas Green Streets	Changes in Individuals' Behaviour
Halton Lune Hydro	Changes in Technology
West Solent Solar Co-operative Limited	Changes in Technology

The Othona community	Changes in Complex Interactions
Bristol Power Co-op (Lockleaze)	Changes in Technology
BedZed	Changes in Complex Interactions
NW Bicester Elmsbrook One Planet Living	Changes in Complex Interactions
One Brighton	Changes in Complex Interactions
Leamington CRAG	Changes in Individuals' Behaviour
Sevenoaks CRAG	Changes in Individuals' Behaviour
Blewbury Energy Initiative (Oxfordshire)	Changes in Technology
GoZero Chew Magna (near Bristol)	Changes in Everyday Life Situations
Carbon Neutral Biggar (Scotland)	Changes in Everyday Life Situations
Ashton Hayes Going Carbon Neutral (Cheshire)	Changes in Complex Interactions
Totnes Transition Town/TT Streets	Changes in Everyday Life Situations
Greening Wingrove	Changes in Individuals' Behaviour

‘GOOD PRACTICE’ EXAMPLE OF A UK SECI

BedZed

Description

Bed ZED is short for Beddington Zero Energy Development. There are several such eco-developments in the UK, developed by Bioregional, which was founded as a registered charity in 1994, by two environmental activists concerned about the effects of unsustainable consumption on the environment. The development featured here is in south London, in the borough of Sutton. The developer’s website describes it as the “UK’s first large-scale, mixed use sustainable community with 100 homes, office space, a college and community facilities. Completed in 2002, it has dwellings of various sizes and tenures.

Contextualization

As the developer suggests, BedZED is a ‘pioneering eco-village in south London suburbia [which is] … an inspiration for sustainable neighbourhoods and our One Planet Living Communities across the world’. At the time it could be considered to be an unusual, almost one-of-a-kind example, of a purpose built eco-village designed from scratch by an organisation founded on environmental activism. Surveys of the residents who have moved into the development show that they like the social and community aspects of the development and appreciate the sustainability of the buildings and facilities, which include on-site car club, office space a college and allotments.

Aims and objectives

To show what a ‘truly sustainable community looks like’.
To reduce ecological footprint of contemporary living and reduce carbon emissions related to consumption of energy, water, food, and transport and in relation to waste.
Criteria for measuring performance include: electricity and heat consumption; water consumption; car ownership and miles travelled, air miles travelled, bicycle ownership; number of households who grow their own food; organic vs non-organic food consumption; recycling rates; proportion of the foregoing in and the total carbon footprint of BedZED.
The initiative can be considered a success overall, in that BedZED residents have an average ecological footprint of about 2.5 planets’ worth and the initiative seems to have been influential in stimulating thinking about the potential for building zero carbon homes. Critics would point to the high cost of completing the development and problems with the originally envisaged on site energy plant and water treatment facilities.

Methods for intervention

Eco-village was purpose-built, featuring many material, intendedly lower carbon installations and facilities which could reduce e.g. transport needs of residents relating to use of offices for work, and education.

Results/outcomes

A survey in 2007 showed that BedZED’s total energy consumption was 82.4 kWh/m²/year, compared with a UK residential total of 275.3 kWh/m²/year. BedZED (2007)related carbon emissions were 19.9 CO2/m²/year, compared with the UK average of 63.3 CO2/m²/year (for based on dwellings built in 2002). Water consumption data for 2007 is given below.

Total Water Consumption

BedZED 2003 litres/ person/ day	BedZED 2007 litres/ person/ day	Local average for metered properties litres/ person/ day
91	87	143

Source: BedZED Seven Years On (2009)

The role of the households

Householders' role has been to buy, part-buy or rent BedZED properties and take advantage of the facilities provided. They contribute financially via the rent they pay or purchase price paid to own or part-own a dwelling, rather than through design activities. Yet part of what makes the initiative work on a human scale is to do with how residents interact with each other and their sense of community. Sustainability-minded people are to some extent attracted to living at BedZED by the environmental orientation underpinning the development.

Location

Hackbridge, Sutton, UK

Was/is the initiative successful?

The award winning development was designed to achieve big reductions in climate-changing greenhouse gas emissions and water use. It sought to make it easy for people living there to have a greener, lower impact lifestyle, relying less on private cars and producing less waste. It is claimed that BedZED has turned out to be a great place to live.

Textual and communicative aspects of initiative

Energy consumption is framed as a problem concerned with the whole way we live. Design of sustainable living is key to resolving over-consumption. Householders talk about BedZED in terms of the unique design of homes, the sense of community, the garden and sunspace, the green features of homes, and reduced energy bills. The initial treats energy consumption as a result of material and social organisation rather than as a result of individual actions and the way a community of people can live their everyday lives.

The physical/technological aspects of the initiative

Energy supplied via wood-fueled combined heat & power (CHP)

Homes fitted with energy efficient appliances:

- 20 watt compact fluorescent light bulb
- A-rated fridge/ freezer and washing machine

- Visible meters to make residents more aware of consumption
- Good daylight design reducing the need for electric lighting
- Passive ventilation removing the need for electric ventilation or fans
- Aerated showers, removing need for power showers
- Passive solar gain; dwellings face south with triple-storey conservatories (sun spaces)
- Super insulation; 300mm insulation jacket around each terrace
- 2 skins of double-glazing to south elevation and triple-glazing for all other elevations
- Homes fitted with water-saving appliances:
- Dual flush 2/4 litre flush toilet
- Reduced flow taps and shower head (basin taps: 3 litres/minute and shower 11 litres/minute)

Shared understandings related to initiative

Fundamental shared understanding of initiative as a more sustainable way to live though some residents refer to reduction in energy bills, for example, as a benefit of living at BedZED, undercutting the more inspirational and challenging narrative.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

UK energy policy today seeks to deliver solutions to the so-called energy ‘trilemma’ — the need for secure, affordable and clean energy supplies for the UK’s economic success. It is recognised by the government that for the digital energy economy the participation of a diverse range of consumers can help enable the development of a more efficient smart energy system. In a recent consultation BEIS announced the aim of the reform as maximising the ability of consumers to play an active role in managing their energy needs. However, the emphasis is on communicating effectively the benefits of smart meters and intelligent devices to manage energy use; this will not necessarily mean greater consumer engagement, and the focus is still on reducing energy demand rather than citizens becoming ‘prosumers’.

Although citizens in the UK are often portrayed as passive energy consumers for whom policy-makers attempt to deliver ‘affordable’ energy and competitive markets, the SECIs illustrate various ways to address/tackle issues of domestic energy consumption showing the potential for active citizens involvement. Energy efficiency, reduction of energy use and carbon emissions (carbon-neutral, low-carbon living) are declared as main objective pursued by SECIs in the UK.

It is estimated that fuel poverty affects over 4 million UK households – roughly 15% of all households. It is not surprising therefore that fuel poverty and energy efficiency are the focal points of policy discourse and energy campaigns in the UK. However, the issue of fuel poverty is still addressed directly only by a handful of the SECIs. This can be partly explained by the fact that sustainable energy consumption initiatives are usually carried out by communities with sufficient resources for investing in those initiatives. More nuanced policy support, and particularly specific tailored measures that would incentivise households affected by fuel poverty, are needed.

A community engagement element and an inclusive approach are extremely important for the UK energy initiatives, especially where collective actions are needed (e.g. investments in renewable energy projects). Community renewable energy projects often represent active involvement of citizens/households who participate in local electricity generation initiatives. These initiatives were usually a result of supportive policies for community energy, which stimulated the rise of community renewable energy initiatives around the country. However, the recent policy changes undermined the ability of communities to develop and implement such initiatives.

The vision underlying the UK energy system and current policy priorities includes moving towards a smarter energy system. (DECC 2015a) Smart metering and use of (ICT) technology for monitoring energy consumption and emissions are among priorities for the UK SECIs. Financial incentives such as bill reductions are important for many residents; this suggests that framing sustainable behaviour as financially beneficial would make it more attractive, increasing the acceptance and adoption of sustainable consumption practices.

The good practice example discussed, the BedZED development in a suburb of London, is among initiatives that aim to change ‘complex interactions’ in relation to energy. It demonstrates the value of the complex approach that targets energy use along with other aspects of sustainable living (water use, transport, waste). Professional design (not citizens) combined with financial contribution from households provided a winning combination of expertise and commitments/involvement of residents. In the BedZED example energy consumption is treated as an outcome of material and social organisation; an environment that is susceptible to more sustainable practices is created, and community building is seen as a crucial element of a sustainable living initiative. The BedZED example suggests that a more holistic approach to sustainable energy could be effective if adopted by policy-makers. Supporting sustainable/eco developments, where energy is addressed and understood in the context of related sustainable practices, could make sustainable living (including energy consumption) more attractive and easier to achieve.

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DISCLAIMER

The presented lists of SECIs in the national briefs are part of an attempt to systematically map European SECIs. As part of our work with developing such a dataset, we have had to make some decisions about what to include in the dataset and how to categorise and classify the SECIs that are various in scope, size and content. The methodology and scope of collecting data on European SECIs is presented in ENERGISE D2.2 (Jensen 2017) and the theoretical and methodological steps taken in analysing, classifying and categorizing the SECIs can be found in ENERGISE D2.4 (Jensen et al 2017b). Although the ENERGISE Team represents a number of European countries, and language skills related to and knowledge about researching European SECIs have been ensured, we acknowledge that some SECIs might also have been missed during our delimited search and some SECIs might be misrepresented by our classification and categorisation of the SECIs.

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