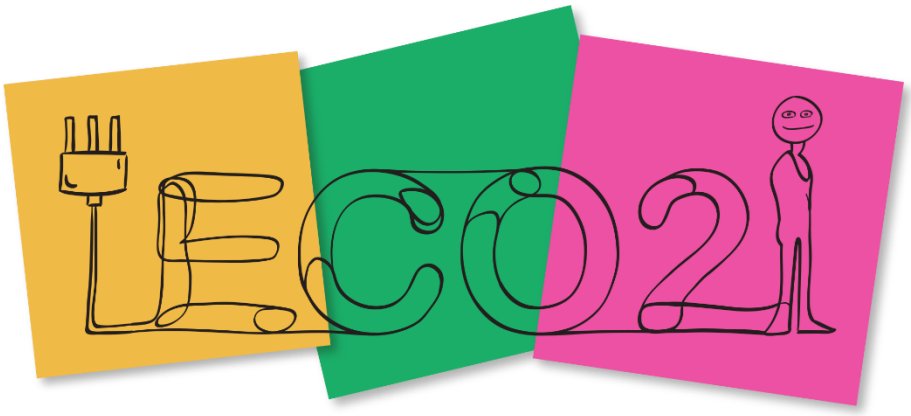

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ANNEXES 9

1. ECO2 project overview

Energy Conscious Consumers (ECO2) is a project which commenced in March 2018 and is funded under Horizon 2020. Nine EU partner organisations have implemented the project, representing Belgium, Bulgaria, Denmark, Finland, Greece, Ireland, Italy, Lithuania, and Portugal.

The main objective of ECO2 project is to facilitate a large number of consumers throughout Europe to become more conscious about their energy consumption and improve the energy efficiency of their homes. Since consumers play a key role in the transition processes towards sustainable energy, ECO2 both engaged and empowered them by providing knowledge on how to consume energy more responsibly in their everyday lives. To achieve this, ECO2 consortium developed a large-scale, multi-language and action-oriented online learning platform (Act4Eco.eu) that provides consumers with information and advice on how to reduce their energy consumption and CO_2 footprint by implementing various solutions in terms of home improvements and implementation of energy-saving good practices.

Act4Eco platform delivers "Actions" in five important thematic areas:

i. home improvements in terms of energy efficiency,
ii. energy smart equipment,
iii. managing energy consumption,
iv. sustaining efficient energy use (rebound effect),
v. and producing own energy at home.

To ensure the trustworthiness of the information presented on the platform, the ECO2 consortium validated its content with energy experts and tested it with external users before opening it to the wider public.

In addition to the Act4Eco platform, the ECO2 project worked on co-creation of policies, innovations and designs, the results of which were communicated to policymakers and innovators through policy briefs and policy seminars at national and EU-level.

The continuation of the ECO2 project and namely of its main outcome – the Act4Eco platform – beyond the lifetime of the project will be ensured by the ECO2 Community of National Nodes, who will be responsible for maintaining and updating the content of the platform as well as for uploading additional resources on the platform.

2. Introduction to the Policy Briefs

To communicate the policy challenges and advice gathered through the engaging activities within the ECO2 project (surveys, workshops and policy seminars) a set of seven policy briefs in English was produced. Five of the policy briefs have a clear connection to the thematic areas presented on the Act4Eco platform, that touch upon the most common aspects of improving energy efficiency of dwellings and reducing households' carbon footprint through saving energy. The sixth policy brief is a synthesisof the main results from the two EU-level policy outreach seminars held in mid-July and end of August 2021, while the last one presents the output of a two-day Design Jam creative workshop that gathered EU designers to generate ideas to address the challenges identified by the users of the Act4Eco platform and ECO2 consortium partners.

The ECO2 policy briefs target policymakers, networks and other stakeholders by delivering policy advice for increasing the energy efficiency opportunities for households. The policy briefs correspond to and support the ECO2 objective of contributing to policy developments which influence consumers' behaviour in terms of decreasing their energy consumption. The policy briefs are published on the ECO2 and Act4Eco websites and are disseminated through mailing lists with relevant stakeholders as well as on social media.

3. Policy Brief collection

Policy brief: Policy to help citizens improve the energy efficiency of their homes

Abstract: *Policies on energy and climate change should focus much more on how to support responsible behaviour among citizens, since behaviour must change if Europe is going to become climate-neutral by 2050. Areas for policy include: much higher levels of information and training for citizens'; revisiting the subsidy schemes for energy renovation of houses; creating local energy communities to help citizens change behaviour and to create collective action, and, to use not only carrots but also the whip to motivate the unwilling to take their part of the work of transition.*

Go to ***Annex I*** to read the full text of the policy brief.

Policy brief: Support and sustain efficient energy use

Abstract: *The policy brief promotes the following highlights: i) The need to promote greater articulation between all the stakeholders involved in the definition and implementation of energy efficiency initiatives is crucial to increase the impact of such measures among consumers. ii) The relevance of working in collaboration with local entities, considering the most vulnerable consumer segments as priority target-groups, ensuring a continuous assessment of the needs and results achieved among consumers and reflecting such results in the definition and implementation of the measures will enhance the success of energy efficiency initiatives. iii) The need to make available financial support schemes that enable the continuous implementation of these kind of initiatives by the different market actors, combined with the availability of affordable and simple financial support mechanisms for ordinary consumers to improve the energy efficiency of their households.*

Go to ***Annex II*** to read the full text of the policy brief.

Policy brief: Manage your energy consumption: Answering the challenge of communicating energy consumption measurements to the consumer

Abstract: *Teaching consumers about energy aware consumption routines has for decades been a central goal for national energy actors at the EU countries as well as a responsibility of the utility companies. Enrolment of smart meters across the EU has enabled apt and timely feedback for the consumers, but this has not proved effective. Instead, both the energy consumption level and the*

number of appliances in households has grown. In this policy brief based on a workshop with Belgian, Finnish, and Italian energy experts, we return to the basics of what kind of feedback the consumers benefit from and what are the most important thumb rules for national energy actors in promoting energy awareness.

Go to ***Annex III*** to read the full text of the policy brief.

Policy brief: Become a Smart Consumer

Abstract: *The policy brief highlights the following insights: i) Consumers are one of the key drivers of the energy system transformation – energy transition has to take account of the social and economic impacts on individuals and communities, and treat people as active participants. ii) A societal appropriation of energy should be taken into consideration, when addressing the fundamental changes in the energy supply of the future. iii) Consumer empowerment encapsulates both the process of information disclosure as well as the outcome of acting upon such information - regulators should primarily focus on improving the process of empowerment and safeguarde the rights of "active customers".*

Go to ***Annex IV*** to read the full text of policy brief.

Policy brief: Produce your own energy

Abstract: *Energy citizenship plays a crucial role in the transition to fossil fuel-free energy systems in Europe. To reap its potential, a number of policy measures are needed which empower households to be active participants on the energy markets and prepare the energy systems for this transition. In this policy brief we present the results of several national level policy seminars organised in five EU countries which discussed namely the current challenges and necessary policy interventions related to energy self-generation of European households.*

Go to ***Annex V*** to read the full text of the policy brief.

Policy brief: Policy interventions aiming to encourage change in consumer behaviour on energy efficiency – Insights from EU-wide expert discussions

Abstract: *This policy brief presents the results of expert seminars which aimed to identify challenges and policy options for encouraging change in consumer behaviour on energy efficiency. The recommended policy interventions include: providing access to specialised information and guidance, developing smarter subsidy schemes, communicating good practices and impact of savings and operationalising the energy community concept.*

Go to ***Annex VI*** to read the full text of policy brief.

Policy brief: Innovation and Design Needs

Abstract: *To guide households in reducing their energy consumption, we recommend these seven paths to explore:*

- ***Making decisions:*** *Provide guidance or the right resources to the consumer so that they can easily make the appropriate and informed decision.*
- ***Changing habits:*** *Encourage positive reinforcement rather than culpability when motivating consumers to change their habits.*
- ***Easy control:*** *Identify ways in which energy consumers can become more active and have the possibility to better manage their energy consumption.*
- ***Acting responsibly:*** *Ensure that consumers behave responsibly on an individual and collective level when it comes to energy consumption.*
- ***No-care solutions:*** *Develop solutions that do not require any effort on the part of the consumer to reduce energy consumption on a daily basis.*
- ***Picturing energy:*** *Give a more meaningful representation of energy consumption to households.*
- ***Considering every use:*** *Remind users that all energy consumption, however small, should be considered and used responsibly.*

Go to ***Annex VII*** to read the full text of the policy brief.

4. Conclusion

The seven policy briefs produced within the ECO2 project and collected in the present document serve as advocacy instruments for the uptake of ECO2 advice by policy makers and stakeholders. The presented policy insights are expected to contribute to informing future policy on energy efficiency and consumer behaviour as well as to inspire future deliberations on the topic.

ANNEXES

Engaging consumers towards more sustainable energy consumption behaviour

Consumers are expected to play an important role in the transition towards sustainable energy and have therefore been induced to reduce their energy consumption. However, despite the abundance of information available on the Internet, they are often confused about what they could do to make their energy consumption behaviour more conscious and sustainable. ECO2, a Horizon 2020 project involving partners from nine European countries, aims to provide consumers with a structured information about how they can act to reduce their energy consumption.

Introduction

Energy consumption in Europe remains high, which calls for urgent measures and actions. At the same time, consumers are becoming more aware of the impact their daily lifestyles have on the surrounding environment. To motivate consumers to take action, the European Commission actively supports projects that involve European citizens in adopting more conscious behaviour towards their energy consumption.

ECO2 and ACT4ECO – inspiring energy conscious behaviour

Energy Conscious Consumers (ECO2) is a Horizon 2020 project aiming to guide the European energy consumers to become more conscious about their role in the transition to a low-carbon future. The project engages and empowers consumers by enhancing their knowledge on how to consume energy in a responsible way in their everyday lives, improve energy efficiency and increase utilisation of renewable energy sources.

The main outcome of the project is ACT4ECO – a large-scale and multi-language online learning platform. The e-learning platform advises consumers how to reduce their energy consumption and puts them in a position to act. The platform users have the opportunity to go through transformative learning processes, which are expected to change their behaviour and motivate them to implement concrete actions to save energy, make their homes more energy efficient and reduce their CO_2 footprint.

ACT4ECO thematic actions

ACT4ECO platform includes five thematic actions for motivating energy conscious consumer behaviour:

1) *Become a smart consumer*
2) *Improve your home*
3) *Avoid the rebound effect*
4) *Manage your energy consumption*
5) *Produce your own energy*

Each user of the platform can decide which thematic actions to complete, based on personal needs and interests.

The platform includes an additional action on policy support for the energy conscious consumer behaviour. The so-called *Policy Development Action* is implemented in a

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bottom-up manner, by asking the users of the platform to identify important issues/challenges related to conscious energy consumption that should be communicated to relevant policy-makers.

Expected outcomes

The ECO2 project expects 1,000 consumers from each consortium country and from two additional partnering countries to enrol in the e-learning platform, with each platform user completing at least three thematic actions. As a final outcome, this is expected to reduce the energy consumption of the users, increase their awareness and knowledge on energy efficiency and make them more responsible and environmentally conscious citizens.

Contribution to policy

Lessons and feedback from the ACT4ECO users will be collected, transformed into messages for policy and innovation and communicated to stakeholder networks and policy-makers nationally and at EU level.

The policy recommendations and advice will be communicated through policy briefs and policy outreach seminars.

A total of six thematic policy briefs (one per each thematic action) will be produced within the project along with nine national policy briefs focusing on specific national policy challenges identified by the platform's users in each consortium country. The policy briefs will target policy makers, stakeholder networks and the press and will address policy issues and advice regarding sustainable energy consumption and energy conscious behaviour.

The project will further contribute to policy development by organising nine national level policy outreach seminars and two EU level seminars. The seminars will provide opportunity to get in direct dialogue with stakeholders and policy-makers and to debate the policy issues and challenges that the users of the platform have identified.

Project partners

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University College Cork, National University of Ireland, Cork (UCC), Ireland

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Supporting citizens' desire for climate-friendly behaviour

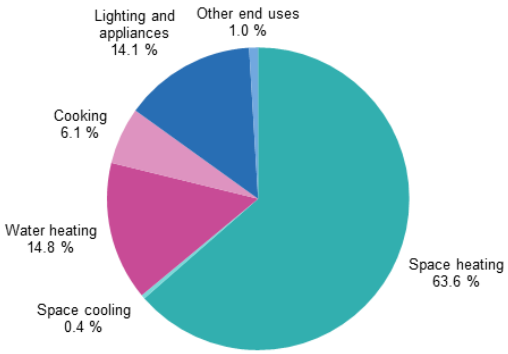
- *Citizens need independent, thorough, validated, and well-explained information so that they understand what they can do, why it is useful and so that they can act.*
- *There is a great lack of policy development that supports citizens in changing behaviour.*
- *Due to lack of policy measures supporting consumers in improving their behaviour, it is important to foster dialogue with citizens. Policies can be advantageously co-created through dialogue between citizens, officials, and experts, each of whom can bring important forms of knowledge to the table.*
- *ACT4ECO.eu is an example of how it is possible to give citizens access to knowledge about even the most complicated and technical changes they must make to live climate friendly.*
- *There is great potential in providing access to the same knowledge to all citizens in and beyond Europe on multilingual platforms such as ACT4ECO.eu, not least to citizens in economically weak countries.*

This Policy Brief describes the most important experiences from the EU project ECO2 (Energy Conscious Consumers), which from March 2018 to August 2021 has developed the e-learning platform ACT4ECO.eu that provides knowledge on how citizens can save energy, especially within households. ECO2 also conducted a series of workshops and seminars on how politics and design can help citizens change their behaviour.

According to Eurostat[i] Europe's households accounted for 26.3% of the EU's total final energy consumption in 2019, i.e. consumption at the final consumer.

The commitment of every citizen in reducing his/her own energy consumption will contribute to quickly achieve the ambitious goal of climate neutrality by 2050 all over the EU. This is because the less the energy consumption is, the more renewable energy proportionally contributes to the total energy production. Therefore, energy savings will result in reduced energy production based on fossil fuels. This raises the question of how to support citizens in changing the use of energy of the house and of the occupants' energy-related behaviours. Not only reducing their use of fossil fuels, but generally reducing their use of energy.

Final energy consumption in the residential sector by use, EU, 2019



Source: Eurostat (online data code: nrg_bal_c) eurostat

In 2019, heating of homes and water accounted for 78.4% of household consumption. Both are consumption areas for which there are effective solutions to reduce consumption and/or have it supplied with renewable energy.

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Methods in the ECO2 project

The ECO2 project has carried out the following activities, which have contributed to the conclusions:

1) Developed the platform ACT4ECO.eu, which in 12 languages gives citizens insight into 23 different themes for changing behaviour and action.

2) Attracted a total of 13,000+ users of the platform between its launch in April 2020 and the issuing of this brief in August 2021. In August 2021, the number of users increased by approx. 1000 / month.

3) Conducted online seminars on policy development on behavioural change in 9 countries and at the EU level, with the participation of more than 80 experts.

4) Published 6 other Policy Briefs within 5 thematic areas and one concerning EU policy, all providing concrete suggestions for policy initiatives.

5) Conducted several pilot trials, surveys, and debates with citizens to learn about their needs and experience of a platform like ACT4ECO.eu.

Taken together, these activities have provided insight into the need to create the right opportunities for citizens to change their behaviour.

Main impressions in the ECO2 project

The main impressions from the project:

• Citizens who do not already know much about energy and climate get a lot out of using a platform like ACT4ECO.eu because it is easy to understand and provides high quality and thorough information.

• A relatively large proportion of citizens (60%) thus visit ACT4ECO several times.

• As sources of knowledge, a large proportion of citizens mention "Public websites", "Platforms such as ACT4ECO" and "Experts among friends and colleagues", which reflects that trust in the information provider is of crucial importance.

• In the 9 seminars, many new policy proposals, which could support behavioural change, were developed in a very short time. This shows that there is a wealth of knowledge among experts, stakeholders and policymakers that could be used for co-creating a varied policy toolbox for behaviour change.

• There was agreement at the seminars that there is a great need to open the debates and establish co-creation about policy development, especially within the policy area of energy related behaviour change.

Recommendations

For specific recommendations within the 5 themes and EU policy, please refer to the “Documents” area of ACT4ECO.eu: https://act4eco.eu/about-us/

At a more general level, the ECO2 project can provide the following recommendations:

1) Shift the political focus away from convincing and moralizing about the need for behaviour change, and towards concrete policies and actions that can easily be implemented on many fronts that help citizens change behaviour.

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2) Take advantage of the fact that the largest energy consumption in households is within areas where there are good solutions. Make it easier for citizens to reduce energy consumption for heat and hot water.

3) Initiate broad information to the population about concrete actions and changes in behaviour. Provide easy access to free, validated, independent, well-communicated know-how.

4) Provide free access to energy and climate advice.

5) Support the development of citizen groups and local communities that can help each other make changes in behaviour and in changing their households.

6) Initiate thorough studies of where citizens face problems and barriers for changing their behaviour. Invest in changing the conditions and technologies so that thresholds are lowered.

7) Focus the public subsidy and loan schemes on the households/houses that use the most energy and have the most financial difficulty in financing the changes.

The ECO2 project in short

ECO2 (Energy Conscious Consumers) was a Horizon2020 funded project which main aim has been to help EU consumers increase awareness of their energy consumption and improve the energy efficiency of their households. Since consumers play a key role in the transition processes towards sustainable energy, the project both engages and empowers them by enhancing knowledge on how to consume energy more consciously in their everyday lives.

The main outcome of the ECO2 project is **ACT4ECO,** an interactive online platform available at www.act4eco.eu, which is aimed at motivating energy consumers to explore various solutions in terms of household improvements and implementation of energy-saving best practices.

ECO2 created dialogue with policymakers and innovators at national and EU level through policy seminars, to discuss energy efficiency measures available to households and their impact on consumer behaviour.

Project partners

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[i] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_consumption_in_households

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Policy to help citizens improve the energy efficiency of their homes

Policies on energy and climate change should focus much more on how to support responsible behaviour among citizens, since behaviour has to change if Europe is going to become climate-neutral by 2050. Areas for policy include: much higher levels of information and training for citizens'; revisiting the subsidy schemes for energy renovation of houses; creating local energy communities to help citizens change behaviour and to create collective action, and, to use not only carrots but also the whip to motivate the unwilling to take their part of the work of transition.

Introduction to the topic

Reducing the consumption of energy is crucial for the pace of creating net zero emission societies, since the lower the energy demand the earlier the sustainable energy production will be able to cope with it.

Energy renovation of private, collective, and rented housing is key to lowering the total energy demand and to shift away from fossil-based fuels. Eurostat (2021[i]) estimated that in 2019 26% of the final energy consumption in Europe stems from energy use of households, of which only 20% were covered by sustainable energy.

Thus, there is a potential for increased energy efficiency in households, and a very large proportion of this relates to the energy standard of especially older houses.

This potential will not materialise without effective policies. Energy poverty, low level of knowledge and know-how among citizens, and confusing signals, missing feeling of urgency and willingness to implement energy and climate related policies from the side of politicians stand in the way.

This Policy Brief focuses on the policy aspect of energy renovation of houses in Europe. It provides ideas for policy-makers about what they can do to increase the pace and impact of energy renovation of houses in Europe.

Identified challenges

The ECO2 policy seminars in Bulgaria, Denmark, Italy and Greece that were held in May – June 2021 had a special focus on the topic "Improve the home". The following challenges were identified as being urgent.

Citizens may whole-heartedly want to act and to live in a more energy- and climate-compliant fashion. They are, however, hindered **by lack of concrete knowledge** about what to do and what not to do. This seems to especially apply to renovation of houses, since taking the wrong decisions – and even the right decision – may be very costly. This even seems to be a problem for administrators of large apartment buildings.

The **economic ability to renovate is low** among those citizens living in the least energy efficient houses. Energy poverty is already a serious challenge in Europe and this becomes even more challenging when house renovations are called for. This understanding is supported by a mini-survey among 27 users of the ACT4ECO.eu platform, in which only 4 users stated that they could pay for the renovations if they were economically efficient over time. The rest would need economic support.

Citizens seem to feel alone or isolated with their individual challenges. There are many strong indications that creation of local

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collaboration, for example "energy communities", increases the action level of single citizens considerably. The widespread political tendency to announce the market as the main driver for change unfortunately worsens this challenge, since it ignores the effect of good social connections and local collaboration.

Subsidy systems are seldom designed to embrace the diversity of houses, households, and geographic differences. Furthermore, they are **seldomly targeted to help where the help is mostly needed** and where it provides the largest effect. To this comes the fact that applications often are **complicated** to understand.

The incentives used are most often positive, which leaves it **open for the least willing to not act at all**. The lack of 'the whip' leaves a risk that even the willing ones are discouraged because they seem to have to carry the whole burden.

Policy insights

Across the four countries it was emphasised that there is a **massive need for information, training, professional support, and of awareness creation** for house owners and administrators.

- **Public Service** channels could be forced to provide "less cake-backing competitions and more solid climate know-how to citizens" as it was stated at one seminar.
- **Massive awareness campaigns** should be set up, which focus on providing concrete advice, tools and know-how to the populations.
- **Specialised web-platforms** like ACT4ECO.eu should be invested in, so that all European citizens have easy access to validated, unbiased, non-commercial know-how.
- **Training for building managers** in apartment buildings should be set up. The potential of energy renovation and good management is very big in this sector.
- **Energy action plans of family houses could be delivered for free**. This would result in private renovation investments that pay back, both for the family and for society.
- Provide **direct communication to owners of low-efficiency houses** with information about advisory and economic subsidy options.

Economic subsidies for climate and energy renovation of buildings should be much more targeted to where the need is highest.

- **Abandon first-come-first-served subsidy schemes**. These schemes tend to favour the most resourceful citizens. They do not invest where the gain of the renovation is biggest.
- **Provide specialised subsidy systems for the most inefficient buildings**. This could be done in the form of cheap loans that are paid back when the building is sold. And based upon the energy class of the house and an updated action plan.
- **Design subsidies for apartment buildings**, which relate to the energy standard of the buildings and consider the often-complicated decision processes in e.g. coops.

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- **Base subsidies on a solidarity principle** of giving priority to families suffering from energy poverty or in other ways not being able to finance their house renovation.

Establish programmes that support the **creation of local energy communities**. The effect is well documented, although it may be difficult to measure the performance of the single community. Therefore, programmes should focus on cheap but effective community building and help.

- Provide **local 'green agents'** to support local groups and citizens, and which should also have a community building role.
- Give **mini-funding for local energy communities**, relieving the costs for the most active citizens who take responsibility, invite local citizens etc. Provide them with templates, workflows and professional support to develop local action plans.
- Establish **support secretaries at municipalities** that have the role to help local energy communities to be established and ease the work burden for them – not to steer them.
- Make use of **local citizen participation in decision-making** processes, for example vision workshops, citizen assemblies and participatory budgeting. Understand citizens as political and local collaborators.
- Use **regional development funds** to back up initiatives from local energy communities.

Go beyond the positive incentives and **make use of negative incentives as well**.

- Establish options for **public utilities organisations to manage energy and climate systems in apartment buildings** over a certain size. Such buildings need very high-level management that most often is not possible for building administrators to acquire.
- **Prohibit renting out inefficient houses and apartments** if the house has an energy tag below a certain threshold.
- Make use of policies that **put pressure on the unwilling ones** and spread out the responsibility of action to all.

Methodology for collecting results

The challenges and policy insights presented in this policy brief were collected during national-level policy seminars that were held by each ECO2 partner in May-June 2021. The seminars gathered policy-makers, academia, NGOs (incl. consumer organisations) and businesses and looked into EU level, as well as national and local level policy interventions for improving the impact of policy on consumers' behavior towards increased energy efficiency.

The ECO2 project in a nutshell

ECO2 (Energy Conscious Consumers) is a Horizon2020 funded project. Its main objective is to increase the awareness of EU consumers regarding their energy consumption and ways to improve the energy efficiency of their homes. Since consumers play a key role in the transition towards more sustainable energy use, the project both engages and empowers them by enhancing their knowledge on how to

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consume energy more consciously in their everyday lives.

The main outcome of the ECO2 project is **ACT4ECO,** an interactive online platform available at www.act4eco.eu. It is aimed at motivating energy consumers to explore various solutions in terms of home improvements and implementation of energy-saving best practices.

ECO2 also aims at establishing a dialogue with policy-makers and innovators at national and EU level through policy seminars, to discuss energy efficiency measures available to households and their impact on consumer behaviour.

Project partners

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[i] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_consumption_in_households

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Support and sustain efficient energy use

- The need to promote greater articulation between all the stakeholders involved in the definition and implementation of energy efficiency initiatives is crucial to increase the impact of such measures among consumers.

- The relevance of i) working in collaboration with local entities, ii) considering the most vulnerable consumer segments as priority target-groups, iii) ensuring a continuous assessment of the needs and results achieved among consumers and iv) reflecting such results in the definition and implementation of the measures will enhance the success of energy efficiency initiatives.

- The need to make available financial support schemes that enable the continuous implementation of these kind of initiatives by the different market actors, combined with the availability of affordable and simple financial support mechanisms for ordinary consumers to improve the energy efficiency of their households.

Introduction to the topic

According to the European Commission, buildings in the EU are responsible for 40% of our energy consumption and 36% of greenhouse emissions. Households' energy consumption is, therefore, one of the strategic axes in energy efficiency policies and programs to tackle climate change and foster a transition to a circular economy where citizens can have an active and decisive participation.

The empowerment of citizens for a more efficient and sustainable energy consumption has been at the centre of initiatives that seek to provide information and knowledge, but also to motivate for an effective and lasting change of behaviour of consumers and their households in terms of energy consumption.

Important efforts have also been made to mitigate the possible behavioural responses from consumers that can "take back" the potential energy savings that come from the improvements made in energy efficiency in a first effort of behaviour change.

This phenomenon, known as rebound-effect, is defined as an unexpected increase in energy consumption which may occur as an unintended side-effect of the introduction of policy, market or technology improvements in energy efficiency.

The effectiveness and positive impact of information, awareness raising and capacity building initiatives aimed at consumers can only be achieved through an effective integration of the rebound effect dimension in the definition and implementation of such activities, that translates into greater support and information for consumers regarding their energy consumption management and behaviours.

Integrating rebound effect in current policies and programmes is therefore crucial to assure that consumers continue to have the right and strong motivation and "reward" to keep in the path of energy efficiency, but also not to end up making energy efficiency a way of saving on one side to spend on the other, using more energy or buying more appliances.

Identified challenges

The challenges presented below have been identified during three national level policy

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seminars that took place in May-June 2021 in Portugal, Denmark and Finland, discussing the topic of sustaining efficient energy use (rebound effect).

Overlapping initiatives and lack of articulation in intervention

There is a general consensus that the multitude of market and non-profit actors involved in the array of strategies and initiatives for promoting energy efficiency, ends up hindering an articulated implementation of the initiatives and highlights the importance of a greater involvement and collaboration between all entities with responsibilities in the definition and implementation of such measures.

This is particularly important when stakeholders end up targeting the same publics, for instance, with an awareness and information campaign. Sharing this kind of initiative would raise quality in terms of the message, of the reach and of the credibility.

Project or time framed approach

It is also noted that the current initiatives aimed at the consumer, arise, in most cases, as a result of national or European funding schemes, having an implementation and monitoring that is limited to the life time of the project, lacking many times continuity over the years to make the needed improvements and consolidate results.

A single approach for all

These initiatives also end up not being able to cover all the vastness of target audiences and consumer needs, not reaching the most vulnerable populations such as the elderly and children. This is even more relevant when we are dealing with measures that use digital channels, which ends up not including consumers without access to information and communication technologies.

Professionals and salesperson are out of the equation

These gaps in the suitability to different target audiences and the needs of different consumers are also reflected in the fact that key market players such as housing and construction professionals are not involved, which is a missed opportunity since their participation could help create conditions for a reduction in the energy needs of households.

Lack of clear, easy and attractive sources of updated information

All issues related with energy efficiency are in a constant change and consumers need to be clarified and updated every step of the way, no matter if they are beginners or already at ease with the topic.

Consumers need to be aware where they can get reliable information at any step of the way, be it to change a lamp or to buy a heating system. Can they trust salespersons? Are they certified? How to navigate in long information sites and portal and find quickly the information you need?

Policy insights

Greater stakeholder cooperation for greater synergia and impact

The cornerstone for an effective promotion of energy efficiency initiatives among consumers should lie in greater collaboration between stakeholders. This would allow sharing

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resources and creating synergies for a greater impact and reach. However, the greatest potential could be of working more closely with a wider range of target audiences targeting them separately with specific messages, activities and approaches. This would be particularly relevant for vulnerable consumers, such as elderly or with less economic capacity. At the same time, it would allow to better tap the potential of using younger audiences as a dissemination channel and the role that schools may have in promoting these issues among young consumers.

Tailored approaches (message and activities) for each audience

As introduced above, it is also important to take into consideration the profile and needs of consumers when defining and implementing initiatives. In this sense, efforts should also be made to guarantee greater support and follow-up among consumers in the long term and to foster partnerships with local bodies and actors that are already recognised by consumers and that support them daily, being in the best circumstances to know what their needs and how they should be overcome. Local actors can act as mediators and be the key to overcome lack of access to technologies or to the proper understanding the complexity of energy efficiency.

Energy efficiency needs to fit consumers' possibilities and responsibility

Investments in regular and up to date consumer information and education has necessarily to be accompanied by a legal framework that creates the conditions for an increase in energy efficiency in the market, for instance availability and prices of equipment, as well as in the areas of construction and housing. Consumers cannot see their efforts blocked because building is not suitable, because choosing appliances is too complex or because they need to spend too much time studying, preparing, comparing, moving around, buying things. Changes in legal framework should consider easiness for consumers to change and adapt.

In this respect, more funding schemes should be made available to enable the implementation of information and consumer empowerment measures, being that these funding schemes, should be defined in a way to facilitate the participation of consumers and thus making it possible for consumers to seize these support schemes. This is particularly relevant for vulnerable consumers who cannot deal with the bureaucracy to reach for funds or to advance money or coordinate house interventions.

Methodology for collecting results

The challenges and policy insights presented in this policy brief were collected during national-level policy seminars that were held by each ECO2 partner in May-June 2021. The seminars gathered policy-makers, academia, NGOs (incl. consumer organisations) and businesses and looked into EU level, as well as national and local level policy interventions for improving the impact of policy on consumers' behavior towards increased energy efficiency.

The ECO2 project in a nutshell

ECO2 (Energy Conscious Consumers) is a Horizon2020 funded project. Its main objective is to increase the awareness of EU consumers regarding their energy consumption and ways

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to improve the energy efficiency of their homes. Since consumers play a key role in the transition towards more sustainable energy use, the project both engages and empowers them by enhancing their knowledge on how to consume energy more consciously in their everyday lives.

The main outcome of the ECO2 project is **ACT4ECO,** an interactive online platform available at www.act4eco.eu. It is aimed at motivating energy consumers to explore various solutions in terms of home improvements and implementation of energy-saving best practices.

ECO2 also aims at establishing a dialogue with policy-makers and innovators at national and EU level through policy seminars, to discuss energy efficiency measures available to households and their impact on consumer behaviour.

Project partners

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Manage your energy consumption: Answering the challenge of communicating energy consumption measurements to the consumer

Teaching consumers about energy aware consumption routines has for decades been a central goal for national energy actors at the EU countries as well as a responsibility of the utility companies. Enrolment of smart meters across the EU has enabled apt and timely feedback for the consumers, but this has not proved effective. Instead, both the energy consumption level and the number of appliances in households has grown. In this policy brief based on a workshop with Belgian, Finnish, and Italian energy experts, we return to the basics of what kind of feedback the consumers benefit from and what are the most important thumb rules for national energy actors in promoting energy awareness.

Introduction to the topic

Energy consumption of households has increased markedly within last decades as the number of electric appliances has grown. Even if the appliances have become more energy efficient, current social norms about energy consumption leads to excessive use of it: for example, long hot showers daily, having more than one television, maintaining a house temperature at 21 °, are in many countries things that are considered normal.

As electricity is – in many countries at least for most households - cheap, consumers do not often reflect on their energy use. Energy bill is the only visible link between energy consumption and the consumer, but very few consumers look at their bills, very few use the monitoring services offered by the utility companies and even fewer consumers act based on the information that is available.

Daily choices and energy consumption routines can be effectively readjusted through consumption feedback. Energy actors' role is helping the consumers navigate consumption data and make informed decisions based on their feedback. However, the practices in providing this feedback to consumers contain many problems.

Identified challenges

In a series of workshops organised with Belgian, Finnish and Italian energy experts focused on the issue of energy awareness in May-June 2021, some issues were raised in terms of communicating energy costs to the consumer.

The following viewpoints related to the feedback offered for consumers emerged:

1. ***Use of difficult jargon:*** Consumption metrics in kilowatts have limited information value for the average consumer.
2. ***Lack of proper training:*** Learning can be enhanced by investing in effective training activities and awareness building campaigns for citizens teaching them how to monitor energy consumption and implementing retrofitting projects in households.

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3. ***Targeting for "normal use":*** Feedback can help in detecting anomalies in energy consumption and fixing specific problems (related to appliances and their use as well as house technology), but feedback can also fortify existing routines and burden households. Communicating the need to reduce energy consumption together with offering tools for monitoring relative savings can be more effective than establishing criteria for normal use.
4. ***Hiding consumption feedback:*** All feedback on consumption will not reach the consumers and therefore will not reduce energy consumption. This concerns especially information hidden in e-bills and utility company apps.
5. ***Providing knowledge in a difficult format:*** Basic knowledge about energy consumption should be established already at school. Gamification may enable learning the basics about energy in the youngest groups. For grown-ups, campaigns should be carefully targeted according to consumer segment and type of housing. Simulation tools and appliances to monitor energy consumption can make citizens better aware of how much energy they consume at home.

Policy insights

The project makes the following recommendations to EU energy policymakers and energy awareness promoters in relation to advancing energy awareness across the EU countries:

- **Communicate better what is needed**. Promote using less energy rather than establish an average level of consumption. Turn the focus away from individual appliances and energy labels to consumer action and best practices in energy consumption.
- **Make the messages focused.** Promote specific energy saving measures for specific target groups instead of making broad and generic recommendations.
- **Contextualize communication.** Appreciate the knowledge and the resources the consumers have and adapt communications accordingly.
- **Contextualize effects.** Create personal messages that work in the realities that individual consumers live in. For example, the issue of Demand-Side Flexibility (DSF) should be reframed in order to make it relatable to the consumers.
- **Create a social buzz.** Energy use and energy saving should not be seen as just individual or household issues. Energy saving efforts should be made visible within neighbourhoods and communities to reach their full potential.

Methodology for collecting results

The challenges and policy insights presented in this policy brief were collected during national-level policy seminars that were held by each ECO2 partner in May-June 2021. The seminars gathered policy-makers, academia, NGOs (incl. consumer organisations) and businesses and looked into EU level, as well as national and local level policy interventions for improving the impact of policy on consumers' behavior towards increased energy efficiency.

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Become a Smart Consumer

Highlight of the policy insights:
1.Consumers are one of the key drivers of the energy system transformation – energy transtion has to take account of the social and economic impacts on individuals and communities, and treat people as active participants.
2. A societal appropriation of energy should be taken into consideration, when addressing the fundamental changes in the energy supply of the future.
3. Consumer empowerment encapsulates both the process of information disclosure as well as the outcome of acting upon such information - regulators should primarily focus on improving the process of empowerment and safeguarde the rights of "active customers".

Introduction to the topic

As the total energy demand is expected to significantly increase in the coming years, addressing energy generation and consumption is a number one priority of the EU's sustainable energy transition strategy. On the other hand, the way we produce and use energy accounts for more than 80% of the total greenhouse gas emissions. Hence, the radical transformation of the energy sector is key to both secure energy supply and bring a sustainable energy future within reach.

On the way towards this energy transition, a decarbonized power sector, dominated by renewable sources, form the cornerstone of a viable climate solution. In short, renewables and the rapid decline of the renewable energy cost, along with rapidly improving energy efficiency as well as the widespread electrification, increasingly "smart" technologies, continual technological breakthroughs

More substantially, Europe's strength in the energy transition lies in the drive of millions of citizens, who make this transformation or "Green Deal" a reality. As the expected changes will affect multiple aspects of individuals' life, both as citizens and consumers, the wholescale transformation of energy sector cannot be achieved without their active involvement and engagement. After all, it is ultimate people who drive demand for energy related goods and services, thus societal norms and personal choices will play a pivotal role in steering the energy system onto a sustainable path.

In this context, the transition from the liable status of energy consumers to that of "smart" or active consumers, who self-generate energy to accommodate their own needs (prosumers) or store/ share/exchange/even sell it via Energy Communities or other carriers, will play a decisive role in achieving the desirable energy transition and in safeguarding consumers against the dire effects of energy poverty. Active participation in the energy system will allow consumers to monitor energy consumption closely and to respond promptly and adequately to the pricing variations. In this way, energy consumers can reinvent their energy behavior and timely intervene in the process of transitioning to cleaner energy.

Identified challenges

In the future scenarios for the sustainable energy transition, it is important to embrace as the key drivers of the energy system

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transformation. Towards this, the reorientation of policy and industry efforts often have a focus on digital transformation processes. However, there is not only a technological dimension, but also, and most critical, a societal and behavioral dimension, which has to be explored and addressed. In this regard, a societal appropriation of energy is suggested to be taken into consideration.

According to this process, the empowerment of energy consumers to contribute to the EU's energy transition involves four level of actions, namely the awareness, the understanding, the involvement and finally the steering of the transformation of the wholescale energy system by the end-user. While the first two levels are consistent with the general interest and might be promoted by public authorities, the next two levels ("involvement" and "steering") require solutions from the private sector as well as an appropriate policy framework.

Existing challenges to end-user empowerment can be categorized into the following types:

1. Informational barriers that consumers face when attempting to find, sift, understand and use the information they need to make better decisions. Some issues underlying here have to do with **information access,** referring to the availability of information and consumer education (the ability to understand and use this information – which is linked to 'imperfect knowledge'), **information asymmetries and trust,** which can fuel a generalized sense of distrust and undermine consumers' confidence that they can tackle an issue effectively, and **cognitive overload,** which can sometimes have the opposite effect of inducing consumers to disengage even further. Due to information barriers and consumers' awareness of the difficulties of obtaining accurate, trustworthy information discourage them from even trying. Likewise, their fear that they may not fully understand the information they are presented with, thereby creating the risk of a "bad" decision, may undermine their confidence in their ability to act effectively.

3. Technical and Structural Barriers are related to the end-user technologies and the availability of "'smart" technological solutions that could simplify consumer involvement in the new retail market. Smart integrated solution for the grids and the households could facilitate consumer action by connecting smart metering systems with smart home energy management systems, and smart appliances which make it simple to manage consumption, participate in demand response, or match consumption with their micro-generation as closely as possible according to energy price information. However, it is not just the acquisition of these technologies, but mainly their "domestication" that should be considered as the most important constrain factor.

On the other hand, investment in profitable energy efficiency technologies depends on the ownership status of a house, with renters being less likely to invest in renovation or efficient appliances. This owner-tenant dilemma, in which only tenants benefit from an energy efficiency measure (e.g., lower energy costs) whereas the owner has to bear the investment costs, is the most common example of a structural barrier here**.**

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4. Economic barriers consist of missing monetary incentives both on the profit side (e.g., premium for load shift) and the cost side (e.g., subsidies.). Liquidity constraints are an example of economic barriers, as some individuals do not have access to capital to invest in energy efficiency technologies. When owners need to rely on capital markets to finance costly investment and if those markets do not function efficiently, then credit constraints may limit the adoption of more efficient and active behavior. This happens even if expected future savings are higher than the costs.

Policy insights

1. Provision of Information. Active consumers are empowered through the provision of information and the exercise of choice, which in turn disciplines market players. In this regard, informational instruments are intended to influence consumers' behavior by disclosing crucial information and raise awareness on two levels:

- The need of improving general knowledge or "energy literacy" and technical know how;

- Motivate people to change and actively contribute to energy transition when they are in their comfort zone.

Within this group of instruments are also included low-cost motivational and persuasion strategies also called "nudges" that end up guiding the consumers in the decision process, and consequently they lower the cognitive costs of energy decision-making. It could be argued though that its most essential outcome is the empowerment of the energy consumers' role resulting from their transition from mere consumers to prosumers. On the other hand, simple energy saving and bill reduction tips along with adopted practices applied in daily routine can also be an essential constituent of the awareness campaigns for all target-groups.

In either way, the awareness and information campaigns in question should constitute horizontal interventions. Starting first locally, targeted dissemination of information and prioritizing can play a vital role in ameliorating vulnerable households' living conditions. Municipal authorities in collaboration with local entrepreneurs, associations and organizations will be able to provide information on current energy trends, including prices and available new technologies, as well as demonstrate the current conditions in the energy sector.

2. **Economic and financial instruments**, such as grant and loan facilities, subsidies, tax deduction, tax credits, rebates, guarantees, and energy taxes. Additionally, economic incentives address capital market failures. Moreover, some individuals choose to make energy efficiency investments because their awareness has already been raised by the existence of the incentive schemes. Economic incentives are also particularly relevant for persons who are risk averse because they lower the upfront costs of an investment. Finally, subsidies and taxes can address the same type of barriers as standards, in particular rational inattention, bounded rationality, and present bias. This is because, in case of these behavioral barriers, product subsidies and taxes can divert purchases towards the most efficient appliances.

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3. Regulatory instruments. Planning and operating the energy system in a holistic way, considering the interlinkages between energy vectors, energy uses as well as supply and demand, will allow optimizing the resources and costs faced by all. Crucially, it promotes efficient choices, at least cost to consumers and to the environment. For Europe's energy systems to be effectively integrated, they must be assessed and adapted at several stages, from the planning of system needs and investments, to the design of the market to their resulting operation in practice. Given the responsibilities of regulatory authorities in these various aspects, regulation has an important role in identifying and overcoming barriers as well as highlighting the need for new areas of regulation (for example RES or prosumers) and improvement of existing processes. In this respect, particular attention should be placed on regulatory oversight and governance (including the proper separation between market & regulated areas), consistency of rules and increasing the efficiency of the procedures that apply across the energy sector.

3.1 **Consumer-centric design.** For consumers, green transition policies should help reduce their carbon footprint, improve energy efficiency, especially in buildings, and speed up the transformation of energy markets by enabling the take-up of new technologies, sustainable energy carriers and new business models. At the same time, consumers stand to benefit from greater flexibility and digitalisation. This will contribute to a decarbonisation at least cost and help the energy system to cope with a much higher degree of electrification and increased production of electricity from renewable sources. In addition, during the energy transition, it is important to protect all consumer types, in particular vulnerable and disadvantaged groups. Ensuring that consumer rights are promoted and protected, whilst delivering on the EU's sustainability and climate neutrality objectives, is a key priority for the future vision for Energy Consumers.

3.2 **From consumers to prosumers.** The residential prosumer has a significant role in the development of a future energy system in line with a green transition in the EU region. A mainstay of EU policies is therefore to empower consumers to act, meaning providing consumers information, protection and alternatives that enable them to achieve more sustainable energy consumption, lower costs and opportunities for becoming suppliers and managers of their energy needs. As, motivations for becoming prosumers are quite varied, including financial benefits, environmental aspects, technological interest, security etc, this also urges the importance of a varied promotion of this empowerment both underlining economic and environmental issues as well as creating interest among people. Finally, simplification of the bureaucracy, support in the assessment of the suitability of solar to the household's circumstances and selection of the products and installers, as well as minimization of the burden linked to registration and monitoring of the systems on the part of prosumers are some key aspects to enable and foster prosuming.

3.3 **Promoting Synergies and cooperation.** Combining various stakeholders in a collective scheme may prove essential in developing energy upgrade projects for consumers' active participation. To guarantee success, Public-

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Private Partnerships (PPP) could be formed by local government agencies, citizens' associations, construction – or pertaining to construction companies, energy service companies, energy providers operating in the obligation schemes, banks, non-governmental organizations etc. The new legal framework for Energy Communities drives and facilitates development of such schemes.

Methodology for collecting results

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Produce your own energy

Energy citizenship plays a crucial role in the transition to fossil fuel-free energy systems in Europe. To reap its potential, a number of policy measures are needed which empower households to be active participants on the energy markets and prepare the energy systems for this transition. In this policy brief we present the results of several national level policy seminars organised in five EU countries which discussed namely the current challenges and necessary policy interventions related to energy self-generation of European households.

The climate crisis that we face today calls for an urgent transition to fossil fuel-free energy systems. The European Green Deal introduces measures aimed at turning Europe into a climate-neutral continent by 2050. Within its framework, EU stimulates a more active role of energy consumers in the European energy systems as producers of own energy at home[1][2].

Energy citizens, also referred to as prosumers, are individuals that are not only energy consumers but also produce energy that they either consume or sell to the grid. Enabling households to produce their own energy at home could serve as a stepping-stone in the process of decarbonisation.[3] Researchers recognise the significant potential of European households to become energy citizens and to actively contribute to the future energy systems. According to a recent study[4], around 83% (187 million) of EU's households could potentially become active participants in the energy market (by producing renewable electricity, adapting electricity demand to renewable energy production or storing energy at times of oversupply). To realise this potential, however, significant policy efforts and investments will be needed.

Identified challenges

Common challenges in terms of policy interventions related to energy self-generation of households in Europe were identified during several national level policy seminars that were organised within the ECO2 project. The topic has been discussed in Bulgaria, Belgium, Ireland, Italy and Lithuania where the following major challenges emerged:

- Low level of awareness of households on renewable energy solutions/technologies for energy self-generation and lack of individual consultation opportunities for citizens and households who are willing to start producing energy themselves.
- In some EU member states, it still needs to be clarified to what extent households are allowed to use the energy they produce for their own consumption, what happens to the surplus energy produced, whether it can be returned to the grid and under what conditions, whether it can only be used for own consumption or for sale. The net

[1] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Renewable_energy_statistics
[2] https://www.greenpeace.org/static/planet4-eu-unit-stateless/2018/08/2ef7fcdf-2ef7fcdf-160926-ce-delft-the-potential-of-energy-citizens-in-the-eu.pdf
[3] https://www.greenpeace.org/static/planet4-eu-unit-stateless/2018/08/2ef7fcdf-2ef7fcdf-160926-ce-delft-the-potential-of-energy-citizens-in-the-eu.pdf
[4] https://www.greenpeace.org/static/planet4-eu-unit-stateless/2018/08/2ef7fcdf-2ef7fcdf-160926-ce-delft-the-potential-of-energy-citizens-in-the-eu.pdf

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metering regulatory framework could be a solution but so far it has been introduced in only few of the EU member states (Denmark, Germany, the Netherlands, etc.).

- Energy storage is an issue – At times prosumers end up producing more energy than they need to cover their own needs. Therefore, it is crucial to find a solution to the problem of surplus energy, either by promoting energy storage technology (the prices of which are still quite high) or by improving the interconnections between regions with different energy production and consumption profiles in Europe.
- In the case of multi-family buildings, it is often impossible to fairly distribute the produced energy for self-consumption by the co-owners. It can either be used for the buildings' common areas (where consumption is rather low) or sold to the grid.
- Lack of funding schemes for energy self-production focused on households has been identified as a major challenge.

During the discussions, the case of Lithuania has been mentioned as a good practice, where support schemes for encouraging individuals to produce energy from renewable resources have been quite successful with a total of 4 190 applications for installing solar power plants by the beginning of 2021.

Policy insights

To correspond to the identified challenges, participants in the ECO2 national policy seminars proposed policy interventions that would be valid at both national and EU level. These include:

- Invest in effective training activities and awareness-building campaigns aimed at changing the perspective of energy consumers, so that they can take the leap from being just users to becoming prosumers.
- Create new business models - energy consumers are moving from passive actors receiving energy supply from the utility and paying for it, to acquiring a more and more active role by self-generating the energy they need from renewable sources (i.e. becoming prosumers), or by taking part in energy communities. This will also entail the need to transform energy players (e.g. utilities, energy agencies) in an ever-evolving market.
- Policy and financial schemes should take into consideration the different housing sectors e.g. rental, owner-occupied, social housing, and ensure that no one is left behind in the transition to household level renewable energy generation.
- The cost of household level renewable energy generation should be reduced by improving the financial investment schemes offered by governments.
- Wider engagement of stakeholders with relevant knowledge and expertise in the energy policy decision-making processes is also needed.
- Prosumers should be more actively involved in the management of energy consumption and even in the governance of the grid.
- Funding incentives that are clearly targeted at households, rather than companies, should be provided.
- Introduce mitigating measures to the construction of the installation and grid

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connection regime in cases where the produced energy is used for covering own needs, not for selling.

- Another measure that has been recommended is developing an easy-to-use guide, which presents steps and possible challenges and solutions to households willing to produce energy from RES for covering their own needs or for selling it to the grid.

Methodology for collecting results

The challenges and policy insights presented in this policy brief were collected during national-level policy seminars that were held by each ECO2 partner in May-June 2021. The seminars gathered policy-makers, NGOs, academia, consumer organisations and business and looked into EU-level and national and local-level policy interventions in the respective partners' countries, identifying ways of improving the impact of policy on consumers' behavior towards greater energy efficiency.

The seminars were organised online in two main sessions where participants were encouraged to share their views on the specific questions. In order to encourage a discussion the number of participants was limited to 25. To make the meetings more interactive, online tools and virtual whiteboards were used to collect participants' ideas.

The ECO2 project in short

ECO2 (Energy Conscious Consumers) is a Horizon2020 funded project which main aim is to help EU consumers increase awareness of their energy consumption and improve the energy efficiency of their homes. Since consumers play a key role in the transition processes towards sustainable energy, the project both engages and empowers them by enhancing knowledge on how to consume energy more consciously in their everyday lives.

The main outcome of the ECO2 project is **ACT4ECO,** an interractive online platform available at www.act4eco.eu, which is aimed at motivating energy consumers to explore various solutions in terms of home improvements and implementation of energy-saving best practices.

ECO2 also aims at establishing a dialogue with policy-makers and innovators at national and EU level through policy seminars, to discuss energy efficiency measures available to households and their impact on consumer behaviour.

Project partners

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University College Cork, National University of Ireland, Cork (UCC), Ireland

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Policy interventions aiming to encourage change in consumer behaviour on energy efficiency – Insights from EU-wide expert discussions

This policy brief presents the results of expert seminars which aimed to identify challenges and policy options for encouraging change in consumer behaviour on energy efficiency. The recommended policy interventions include: providing access to specialised information and guidance, developing smarter subsidy schemes, communicating good practices and impact of savings and operationalising the energy community concept.

Introduction to the topic

One of the key EU objectives, as set by the EU strategic framework instruments, is to provide "secure, sustainable, competitive and affordable energy"[1] to European households and businesses. To achieve this, citizens (and consumers) have long been recognised as not just a main beneficiary, but also a main actor in making the envisaged transition work. Furthermore, consumers seem to gain awareness of the need and value of sustainable energy practices, particularly at times of growing public concerns over increasing greenhouse gas emissions and the extending negative effects of climate change.

Making currently existing energy systems more efficient and carbon neutral requires not only technological innovations for curbing the use of fossil fuels but also a substantial reduction of the total energy consumption at household level. Thus, one of the major objectives related to citizens and consumers within the EU strategic framework is empowering consumers to make informed choices in regard to their energy consumption and facilitate their actions towards greater energy efficiency. Some locally applied instruments and measures seem to be effective in changing consumers' behaviour, but reducing overall energy consumption remains a challenge.[2]

In 2021 around 40 stakeholders from all over Europe gathered together to discuss challenges and policy options for encouraging change in consumer behaviour on energy efficiency. This policy brief highlights the most pertinent findings from these deliberations.

Identified challenges

During the seminars the following issues were identified as major challenges that European energy consumers face:

- Low level of awareness and knowledge among households on energy issues such as feedback on energy consumption (bills, costs), funding opportunities, real-time consumption monitoring, environmental impact of energy use, energy saving advice and impact of energy saving measures. Although information is widely available, mostly it is not communicated in an easy-to-understand way and is sometimes biased and too technical.
- Lack of accountability and public information on measuring the impact of energy efficiency. Consumers obviously can see the "beautiful packaging" of homes as a result of the implemented energy efficiency measures (insulation,

[1] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2015:80:FIN

2 https://www.frontiersin.org/articles/10.3389/fenrg.2015.00029/full

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change of windows) but are not sufficiently informed about the impact of these measures (saved emissions, benefit to the energy system, increased housing comfort). Such impacts need to be clearly communicated and promoted among consumers.

- Many households cannot afford large-scale home improvements in terms of energy efficiency due to financial constraints. Consumers are more prone to invest in small improvements, which are often insufficient.
- Households are still reluctant to invest in energy production from renewable energy sources. Among the reasons are lack of funding schemes, lack of information on available funding opportunities and technological solutions, as well as lack of supportive regulatory frameworks in some EU countries (e.g. net metering).
- Current policies to reduce energy consumption are aimed at individuals and households, whereas impactful behavioural change can more easily be achieved if through collective and participatory projects and energy communities.
- Energy poverty is an issue in all of Europe. There is insufficient support for vulnerable consumers, which results in limited access to information and services and limited participation in energy efficiency projects and initiatives by energy poor households.

Policy insights

- *Provide access to specialised information and guidance* – provide access to services that deliver personalised guidance to home owners so that they can plan and implement energy efficiency renovations. Some funding for energy efficiency could support: i) services that facilitate intermediate actors (such as small Energy Service Companies (ESCOs)) to reach and support a large number of home owners themselves; or ii) innovations from ESCOs that target residential buildings and aim at achieving a real impact.
- *Smarter subsidy schemes* – Introduce accountability through linking funding to actual impact (including impact on energy poverty). Abandon first-come-first-served subsidy schemes and create different scheme versions for different levels of energy performance (for instance more compensation for deeper renovations), building type (such as schemes targeting rented buildings), or targeted to buildings that need renovations the most.
- *Communicate good practices and impact of savings* through national repositories of data on energy efficiency measures and their impact.
- *Operationalise the energy community concept* – Promote the idea that energy efficiency can also be part of the operations of an energy community and level the field for energy efficiency improvements to be financed in the same way that generation assets are financed in energy communities.

The ECO2 project in a nutshell

ECO2 (Energy Conscious Consumers) is a Horizon2020 funded project. Its main objective is to increase the awareness of EU consumers regarding their energy consumption and ways to improve the energy efficiency of their homes. Since consumers play a key role in the transition towards sustainable energy use, the project both engages and empowers them by enhancing their knowledge on how to

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consume energy more consciously in their everyday lives.

The main outcome of the ECO2 project is **ACT4ECO,** an interactive online platform available at www.act4eco.eu. It is aimed at motivating energy consumers to explore various solutions in terms of home improvements and implementation of energy-saving best practices.

ECO2 also aims at establishing a dialogue with policy-makers and innovators at national and EU level through policy seminars, to discuss energy efficiency measures available to households and their impact on consumer behaviour.

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Innovation and Design Needs

To guide households in reducing their energy consumption, we recommend these seven paths to explore :

- **Making decisions:** Provide guidance or the right resources to the consumer so that they can easily make the appropriate and informed decision.
- **Changing habits:** Encourage positive reinforcement rather than culpability when motivating consumers to change their habits.
- **Easy control:** Identify ways in which energy consumers can become more active and have the possibility to better manage their energy consumption.
- **Acting responsibly:** Ensure that consumers behave responsibly on an individual and collective level when it comes to energy consumption.
- **No-care solutions:** Develop solutions that do not require any effort on the part of the consumer to reduce energy consumption on a daily basis.
- **Picturing energy:** Give a more meaningful representation of energy consumption to households.
- **Considering every use:** Remind users that all energy consumption, however small, should be considered and used responsibly.

Introduction

Households rely heavily on the services provided by energy. They consume energy to keep their homes comfortable and to operate appliances and all sorts of electrical devices. Whether it is watching TV and surfing the web, cooking and washing, lighting and heating. Households consume a lot of energy. But as time goes by and households become more and more accustomed to comfort, the line between essential and luxurious services provided by energy has gradually blurred. The notion of sufficiency is no longer taken into account, and households consume energy excessively and this without worrying or even thinking about it. Yet energy is not infinite. Nor is it neutral for the planet. Therefore, transforming our production and consumption pattern is crucial.

But how? At the household level, this may mean changing some old, over-consuming appliances, insulating the home or changing the light bulbs, but it also means changing habits and behaviours. How can households be more reasonable consumers? How could they adapt their behaviours towards more responsible and sustainable uses of energy?

In the course of the project, the consortium discovered some of the needs, barriers (financial, time, knowledge, digital skills, technology, etc.) and gaps in the market that prevent citizen's from taking action in implementing the solutions proposed in the Act4eco.eu platform even if they're aware of the economic and environmental benefits

The feedback shared by users of the platform helped us identify 5 main problem areas to focus on:

- How can energy consumption be made **more apparent**?
- How can we create **better awareness** about energy use and its impact?
- How can we enable households **to be in control** of their energy consumption?
- How can we engage households to **adopt new responsible energy consumption habits**?

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- How to ensure that **reducing energy use requires as little effort** as possible and **excessive use requires more**?

In early June 2021, a Design Jam was held in Brussels, Belgium, with 15 designers coming from all over Europe to look for opportunities to tackle these challenges.

Hereafter, you will find the results that emerged from the Design Jam that are presented as our recommendations of seven paths that can be explored when designing solutions to support households in reducing their energy consumption.

The seven paths to explore

1/ Making decisions

Simplify, provide guidance and the right resources to the consumer so that they can easily make an appropriate and informed decision.

Whether it is a decision about home improvement or what type of appliance to buy, the easier it is for consumers to make an informed decision, quickly and with less effort, the better. These are critical moments and situations that should be used to guide consumers towards the appropriate decision.

The pressure to analyse many complex factors before making a decision can lead consumers to a form of decision fatigue, or even to focus only on factors that make sense to them, such as price.

2/ Changing habits

Encourage positive reinforcement rather than culpability when motivating consumers to change their habits.

Changing habits requires stepping out of the comfort zone. This means questioning everyday routines and adopting new ones. This may lead to feelings of anxiety or discomfort, which may result in a loss of desire to adopt a new habit. It is therefore important to introduce playful, fun and engaging ways and solutions that could encourage consumers to try new habits.

3/ Easy control

Identify ways in which energy consumers can become more active and have the possibility to better manage their energy consumption.

Alongside the suggestion that consumers should become prosumers in order to become active consumers, there should also be other solutions that give them the opportunity to move from being passive consumers to active consumers. This is crucial because, by being an active consumer, they are able to control their energy consumption and easily regulate their demand.

It is imperative to limit systems that tend to disempower energy consumers, such as flat-rate energy bills, the difficulty of easily regulating energy demand, etc.

4/ Acting responsibly

Ensure that consumers behave responsibly on an individual and collective level when it comes to energy consumption.

At a collective level, making consumers' efforts to reduce energy consumption visible is a way to give citizens a pathway to motivate them to adopt certain actions and in return benefit from concrete, tangible rewards or social recognition.

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At the individual level, advice and friendly reminder systems, with clear explanations of what to do, could contribute to helping people act responsibly.

5/ No-care solutions
Develop solutions that do not require any effort on the part of the consumer to reduce energy consumption on a daily basis.

The effort dimension can be used to limit excessive energy use, but it can also be a factor in making energy saving as easy as possible for the consumer.

In this context, reducing effort means that the consumer does not have to expend any physical, mental or time-related effort. Energy saving solutions are either built into appliances or they are modifications to existing devices that do not require changing or adopting new habits.

6/ Picturing energy
Give a more meaningful representation of energy consumption to households.

Energy is intangible and invisible. For consumers, the only way to make sense of their consumption is through the energy bill. But unfortunately, the energy bill is usually too complex and only shows the cost to be paid. Yet it is a real window of opportunity to communicate much more than just the price and kWh consumed. For instance, the energy used can be communicated in the form of the different activities that take place in the house like cooking, heating, entertainment and so on. This would allow households to better comprehend the cost and impact of their activities on energy consumption and have a clear idea of the priority areas they can make an effort on.

7/ Considering every use
Remind users that all energy consumption, however small, should be considered and used responsibly.

Over the years, we have found ways to add extra items whenever we need them for comfort and convenience purposes. We only have to look around to see that there is often more than one plug in every room we are in. Yet restricting access to certain items can help regulate our demand for energy supply.

Based on the energy suffiency approach, solutions that restrict abundant energy supply could be implemented to better regulate demand. Cutting off the power when energy consumption is high is not reasonable. On the other hand, requiring a little more effort on the part of the consumer when they need to use it for non-essential reasons is a path to explore.

Methodology for collecting results

Following the identification of needs and gaps expressed by platform users and ECO2 consortium partners, 15 designers were invited to participate in a Design Jam, a two-day creative workshop, to generate ideas to address the challenges. The insights, ideas and design concepts that emerged from this creative workshop were then used to extrapolate these seven paths to explore.

The ECO2 Project in a nutshell

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