

PARENT: Summary for policymakers



Limiting the effects of climate change may be the greatest challenge of our generation and will completely change the way energy is used and generated. Rather than demand-driven, energy will become supply-driven. This systemic change requires change at all levels in society, from policymakers, industry to citizens. Instead of just paying the bills, citizens will have to become energy-aware, thus contributing to sustainable, healthy and smart city environments.

In the project PARticipatory platform for sustainable ENergy management (PARENT) it was investigated how citizen communities can work towards more sustainable lifestyles by providing communities with technology and support to help reduce energy consumption in their homes. Within the three-years project, started in 2017, three living lab pilots have been carried out in Amsterdam, Bergen (Norway), and Brussels.

In the Amsterdam pilot, Resourcefully and the Copernicus Institute of Sustainable Development at Utrecht University primarily focused on households with solar energy production facilities (producers and consumers of energy, also called prosumers) in the East Harbour area of Amsterdam. In this East Harbour Prosumers Community (EHPC), energy monitors in 27 households of different types (houses, apartments and houseboats) were installed to gain insights on their electricity consumption and Photovoltaics (PV) production and help them in increasing their energy autonomy. To help residential customers reduce their electricity consumption and increase their PV self-sufficiency and self-consumption, an ICT-based platform was developed that was enhanced by gamification elements (www.prosumers.nl). This platform analyzes and visualizes collected data to help prosumers become more aware and engaged with their energy use. During the course of the pilot, using intensive meetings with participants, information on the developed technical solutions was shared and feedback was received. Also, a large number of data was collected. Several challenges were faced at different levels (e.g., management, logistic and technical, etc). We involved different stakeholders such as, community centres, electricity providers, municipalities, system operators, consumers associations and citizens.



Screenshot of EHPC dashboard, taken 9 February 2021

The numerical results show that the energy monitoring system and ICT-based platforms, enhanced by game design elements and engagement strategies and combined with the community building activities, contributed to reducing electricity consumption in households and led to a better utilization of locally produced solar energy in the target area in Amsterdam. Use and satisfaction led to self-adjustments during the project.

The main findings and conclusions of the Amsterdam pilot can be summarized as follows:

- The concept of Living Labs was seen as important. In the Amsterdam pilot, participants were proactive and helped in enriching the pilot implementation through discussions and direct feedback. Some participants also asked to be informed about the progress of the project and other similar activities.
- The increasing penetration rates of residential rooftop Photovoltaics panels as well as Electric Vehicles, Battery Energy Storage Systems, and Heat Pumps, has largely enhanced end-user's flexibility and opened up new market opportunities and innovative solutions for different stakeholders in the energy system.
- The concept of building an energy community, to share experience with each other regarding sustainable energy consumption, was positively evaluated by the participants in Amsterdam and the researchers consider this concept as essential for the uptake of the innovative solutions developed in the PARENT project.

- Regulated end-users centered solutions, such as Local Electricity Markets, that involves the coordination of prosumers at a community-level are needed, where prosumers can have a more proactive role in the power system.
- Implementing game design elements in energy apps can change end-user's energy consumption behaviour. Nevertheless, recent evaluations of energy apps in the Netherlands disclose a limitation in their incorporation of game design elements (i.e., gamification). This can be seen as a missed opportunity because gamification could be considered as a low hanging fruit solution for sustainability, which does not require high investments and can be adopted at a large scale, even by low-income households.
- Pilot participants liked the comparison of their electricity consumption and solar energy generation with the average in the community or with their own performance in a different period, less the household with another household approach. On the other hand, some participants reported that comparison is only interesting if you know how others have built up their energy management and their own household.
- Some prosumers were able to adapt their electricity consumption to the time when enough PV production occurs (e.g., washing machine, dishwasher, EV charging), using simple data-driven interaction solutions via mobile apps (i.e., game design elements, such as visualisation, dashboards and engaging graphics).
- Participants positively evaluated the overview and insights visualized in the mobile app on the consumption of different individual electric devices within the household.
- The investment cost of the extra device used in the project is considered high and might not scale-up without support by third parties or subsidies. Installation of such devices was sometimes difficult to be done by participants themselves and required extra support.
- Monitoring and passive solutions only are not enough. Additional actionable solutions such as Demand Response and Local Energy Markets will make such initiative more sustainable and create a higher impact. Some participants mentioned that after a couple of months they took their energy-related measures and lost interest in further monitoring and/or wondered what more actions are possible with their electricity consumption and solar energy production.
- After a year of monitoring and engagement, some participants wanted to do other things with their excess of PV production during the day (e.g., charging the EV of a neighbour or trading their surplus energy with another household).
- Sometimes the level of knowledge of end-users is limited, and this combined with conservative attitudes may result in a complete lack of activity. However, the prosumer community in Amsterdam can be considered as a front runner in innovative energy solutions.
- In order for a feedback, a tip or an intervention strategy to make an effect on an energy-related behaviour of participants in this kind of projects, it should be personal, meaningful and actionable.
- It was reported by some participants that the pilot inspired them to install a heat pump instead of using gas, to calibrate an already

installed heat pump better and save energy, or to detect that the heat pump was not running properly and hence save money and greenhouse gases.

- The pilot motivated another participant to start using an electric kettle instead of gas and to seriously consider having a better insulation of the households and replacing glass with HR +++ glass.
- Privacy of end-user's data is a critical issue that requires serious consideration in any future scenario or scaling-up. Recruiting people in the pilot and accessing their detailed energy information was a very time-consuming process that required a lot of efforts and trust. For instance, in the initial phase of the pilot, the willingness for pilot participation was to a large extent built on trust of neighbours who knew the responsible pilot manager in Amsterdam. After that, people started to inform each other about their experience. It can be concluded that building a trustful energy community, where data is only shared within the community and managed by a trustworthy entity, is seen as a valid solution. This shows the importance of nudging.

Based on this, some policy recommendations can be made:

- Energy communities including novel ICT solutions and data analytics lead to raising energy awareness and sustainable behaviour; however, local energy markets should be made possible to exchange excess energy with the community. This requires changes in current legislation.
- Gamification will increase energy awareness by influencing citizens' behaviour. Campaigns to increase sustainable behaviour should include gamification elements.
- Providing subsidies for home energy management devices would be necessary when more advanced solutions like Demand Response or Local Energy Markets will be made possible.
- Development of energy communities should be supported as that will decrease energy consumption and increase sustainable behaviour.