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## Collective intelligence for community energy initiatives.

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# Collective Intelligence for Community Energy Initiatives

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## ABSTRACT

In this paper we present an approach aimed at overcoming barriers to the success of community energy initiatives in urban areas. The proposed methods will support communities in identifying and adopting community energy solutions by connecting citizens with a collection of relevant datasets including satellite, energy and socio-economic data. Citizens will be provided with the ability to explore the data and with advanced urban data analytics methods to identify key aspects and potential areas where initiatives could be successful. Communities will be supported with advice and expertise and in identifying dedicated and enthusiastic participants. To meet all these requirements is a difficult task, but the benefits include: reduction of carbon emissions, generation of savings for communities, reduction of fuel poverty and creation of local jobs.

The concept of urban area is a key one in this approach, because energy efficient cities will only be possible through a broad-based consensus between science, politics, industry and citizens. Traditionally citizens have played a passive role in the energy market, but now they have the opportunity of being involved in generation, reduction of consumption and management and purchasing of energy, becoming new actors in the market and using collective intelligence for the common good.

## Keywords

Community energy, energy, data, citizens, bottom-up initiatives.

## 1. INTRODUCTION

With a rapid increase in urbanisation over the last decade, with around 54% of world's population living in cities and urban areas in 2014 [5], sustainable city development has become a focal point of energy concerns. Facing the challenges to become an energy efficient city and to reduce carbon emissions to achieve the European targets can only be tackled through a broad-based consensus between science, politics, industry and citizens. At the heart of such a consensus lies the ability to understand and converse about complex energy phenomena and the likely impact of technology initiatives.

Citizens have a major role to play in this process, specifically through community energy initiatives. Community energy is an umbrella term for many different types of communities involved in different ways in energy issues. In the context of the UK, communities have been recognised to be involved in 4 different energy activities: generating energy, reducing energy use, managing and purchasing energy [2]. Traditionally, citizens have played a passive role in the energy market, but the need to reduce carbon emissions and secure supply without oversizing the energy system has provided an opportunity to new actors [3]. Community

energy initiatives will empower citizens to collectively take charge of the way they want to consume energy. The benefits they achieve will be shared through a wide range of stakeholders, contributing to create a more equitable society and to protect the environment: using collective intelligence for the common good.

## 2. URBAN ENERGY AS COMMON GOOD

In times gone by villages and village life were often organized around the village green, a common open area of grassland used by villagers for grazing livestock such as cattle. Some village greens also had a pond, used for watering stock. Today, village greens have mostly lost their original purpose and are often used for recreation.

Increasingly modern villages and cities realize that they possess a different kind of commons, a commons capable of generating energy for the local community. This commons consists of the sunlight hitting roofs and the ground, the wind blowing overhead and the ground underneath, all of which can be used to generate energy by means of solar panels, wind turbines, and ground heat pumps.

The potential for energy generation of this kind is substantial. In the UK there are currently at least 600 community groups with a strong interest in renewable, with 66MW of community renewable electricity capacity installed, over 200MW in development and a realistic near-term potential of 3GW [1]. The community projects installed will offer between 12-13 times as much community value re-invested back into local areas as would be achieved through 100% commercial models [1]. The estimate is based purely on an assessment of economic value, when full social and wider environmental returns are factored in the benefits will be substantially higher.

## 3. BARIERS TO COMMUNITY ENERGY

To become successful, there are a number of barriers that community energy initiatives must overcome. Community energy projects must have enthusiastic participants and require access to actionable information and impartial advice and expertise [2]. However, the conditions for communities to come together to initiative and implement community energy are often not met: The range of expertise required to develop a successful energy project is vast, including but not restricted to skills in community organization, knowledge about financial, accounting and legal matters, expertise in planning and designing energy projects, and skills in project management. Insights into the potential of community energy projects is scarce and highly distributed among a large range of stakeholders including residents, city councils, urban planners, energy professionals, installers and retrofitters.

Community energy initiatives heavily rely on civic participation and engagement and a network of relationships among people and between people and organisations[4]. Yet participants of community energy initiatives are usually involved on a voluntary basis making it very difficult to develop and maintain a strong sense of community, a shared sense of purpose and trust relationships.

To meet all these requirements and integrate these disparate pieces is a real challenge but the benefits for the community are substantial: reduction of carbon emissions, generation of savings for communities, reduction of fuel poverty and creation of local jobs.

#### **4. COLLECTIVE INTELLIGENCE FOR COMMUNITY ENERGY**

Community energy is a prime example of where collective intelligence approaches can make a substantial impact. Over the past 18 months we have engaged in a research project aimed at understanding how data-driven approaches can be used to support community energy groups. Our aim is to bring together three disparate strands:

- Urban big data,
- Collective intelligence and
- Social action.

There is an increasing amount of urban data being collected by cities around the globe. For example, the Milton Keynes based smart city project MK:Smart ([www.mksmart.org](http://www.mksmart.org)) is planning to bring together up to 5000 datasets pertaining to the city of Milton Keynes, covering transport, water, energy, social, economic, education, political and other domains. Similar initiatives are under way in the UK and elsewhere, for example in Glasgow, Bristol, Birmingham, London, to name just a few.

In Milton Keynes we are collecting a large range of data sets directly related to community energy. These include: open energy datasets (for example identifying building type and energy efficiency measures in buildings), real-time energy meter data, satellite data and data from aerial surveys indicating the current use of solar panels, the site and generating potential of future solar and ground heat installations, and the heat loss of buildings. In addition to that we have identified a range of social and economic datasets, indicating for example the socio-economic profiles of the population in city districts but also the level of community cohesion and level of voluntarism. These datasets, if combined and analyzed together, have a great potential for community energy projects.

Until now the datasets we have identified have only been of interest to experts, and to a large extent have not been accessible to the public. However, we see these datasets as a potential source for community-driven local innovation instigated and driven by communities in collaboration with commercial and city council stakeholders. Collective intelligence approaches will play a key role in making these datasets meaningful and usable. In particular we see three concrete opportunities for collective intelligence:

- Collective collection of evidence
- Collective interpretation of data
- Inspiring and guiding collective action

We are now developing a Community Action Platform for Energy (CAPE) that will connect local people with existing datasets, to provide comprehensive information about how energy is consumed and generated in their area, and what the opportunities are to reduce energy demand and greenhouse gas emissions. This platform is aimed to support active participation by citizens in the collective identification and analysis of relevant datasets by enabling users to identify people with interest and/or expertise, identify relevant datasets, annotate datasets, and to use analytical services to interrogate datasets and create shared meaning and shared understanding.

#### **5. BENEFITS**

As a result of the development of this platform there are a number of expected benefits:

- Citizens and community energy initiatives will make better decisions by being provided with exploratory and analytic tools.
- Community energy initiatives will be able to provide energy services that can reduce environmental impact.
- Community energy initiatives will be able to reduce energy bills and fuel poverty while promoting new business opportunities to local companies and supply chain.
- Bottom-up social action and citizens' involvement will be encouraged.
- Community engagement will be fostered through the use of the tool as a platform to disseminate successful projects.

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Jose Cavero is a Research Assistant at the Computing and Communications department of the Open University (Milton Keynes, United Kingdom). His interests focus on spatial analysis and visualisation and as part of the MK:Smart project he is researching how the use of data can help citizens to develop community energy initiatives in urban areas

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Gerd Kortuem is Professor of Computing at the Computing and Communications department of the Open University (Milton Keynes, United Kingdom) and deputy-director of MK:Smart with responsibility for the citizen, energy and education strands of this project. His interests focus on the design of computing systems for addressing sustainability challenges, ubiquitous computing and the Internet of Things.

##### **Annika Wolff**

Annika Wolff is a Research Associate at the Computing and Communications department of the Open University (Milton Keynes, United Kingdom). Her research interests include Smart City technologies, learning technologies, narrative, games, hypermedia, mobile-learning and learning analytics. She is currently working within the MK:Smart project to bring big data skills and smart city topics into schools to create a future generation of urban innovators.

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