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# Energy Research

@ University of Exeter  
Business School

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# Professor Steffen Boehm

## Sustainable Futures (Penryn)

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# Renewable Energy Activism

How people bring about the sustainability transition across business and society

Forthcoming Book by Annika Skoglund (Uppsala) and Steffen Bohm (Exeter) – published by Cambridge University Press (2019)



# From activism on the streets...



...to activism in the workplace.



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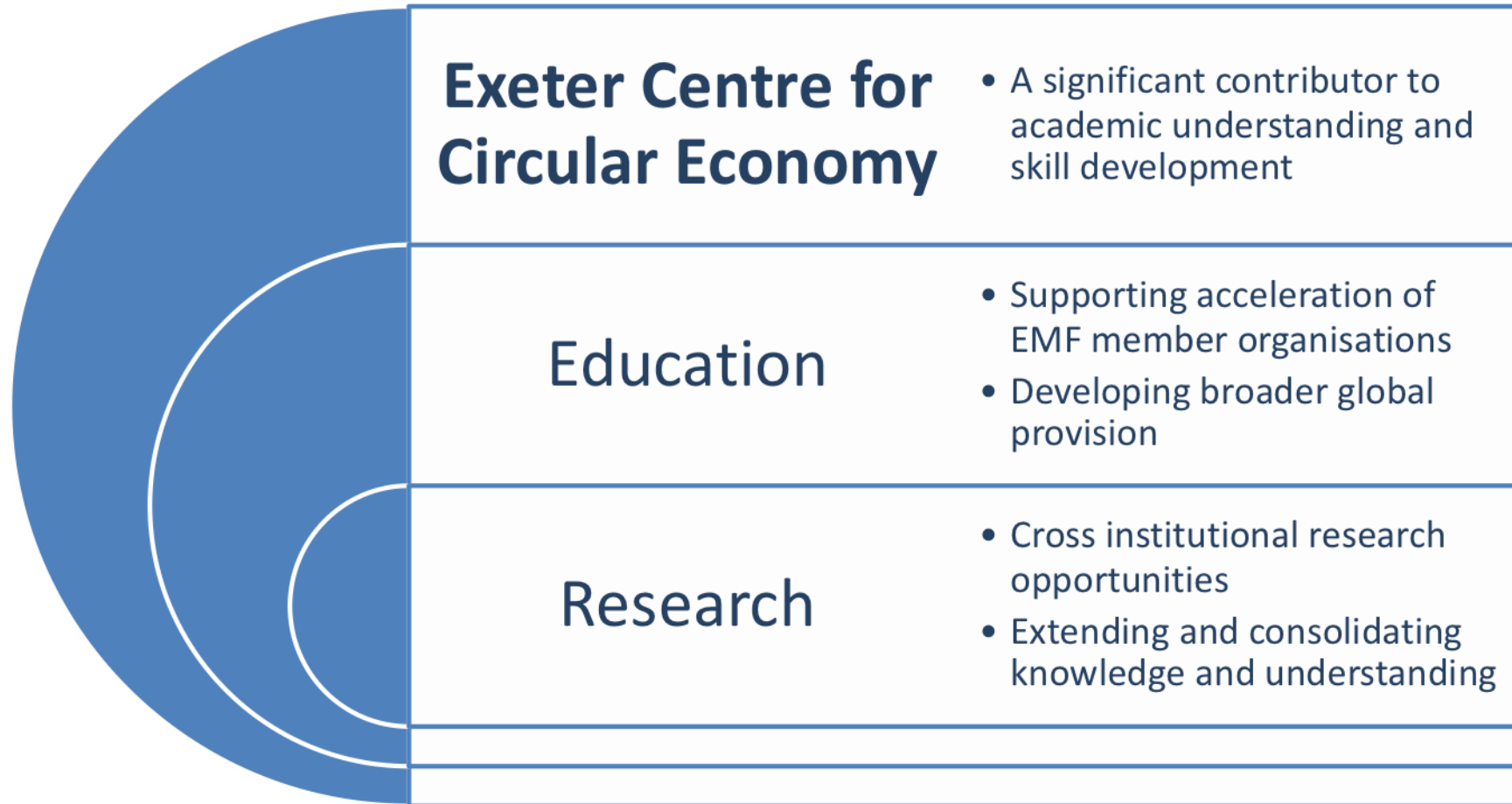
# Centre for Circular Economy

[http://business-  
school.exeter.ac.uk/research/centres/circular/](http://business-school.exeter.ac.uk/research/centres/circular/)

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# The new Global Pioneer University





# Research

- 100+ academics across the University will be part of the Centre
- Thematic approach that aligns with EMF interests
- £40M bids for funding since Nov 2018
- Numerous opportunities going forward
- Research led teaching



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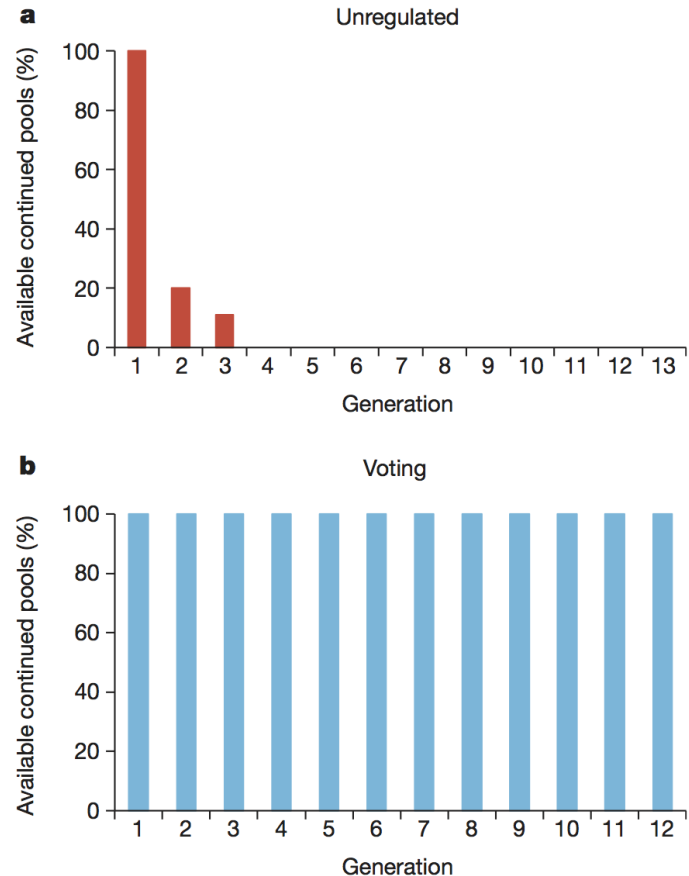
# Dr Oliver Hauser

(Economics)

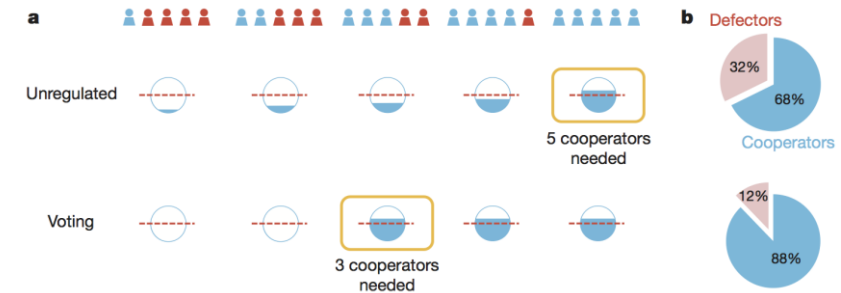
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# Can institutional design improve sustainable decision-making?

1. An unregulated intergenerational public goods quickly leads to depletion of the resource, but a voting institution sustains cooperation for a long time.



2. Voting works because it restrains defectors who lead the collapse of the resource. Furthermore, democracy further bolsters the willingness to cooperate in the population (“conditional cooperators”).



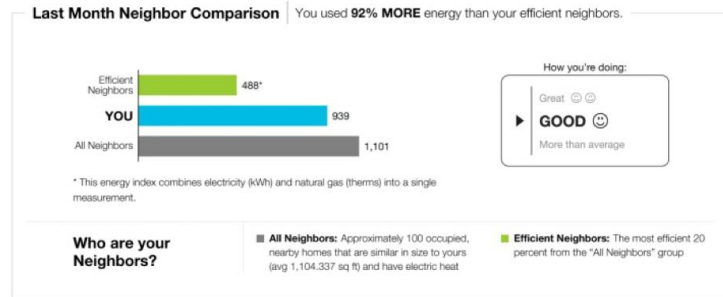
Take a look at this video for an illustration:



<https://youtu.be/xrXyRJV96mk>

# What predicts social norm success to reduce energy consumption?

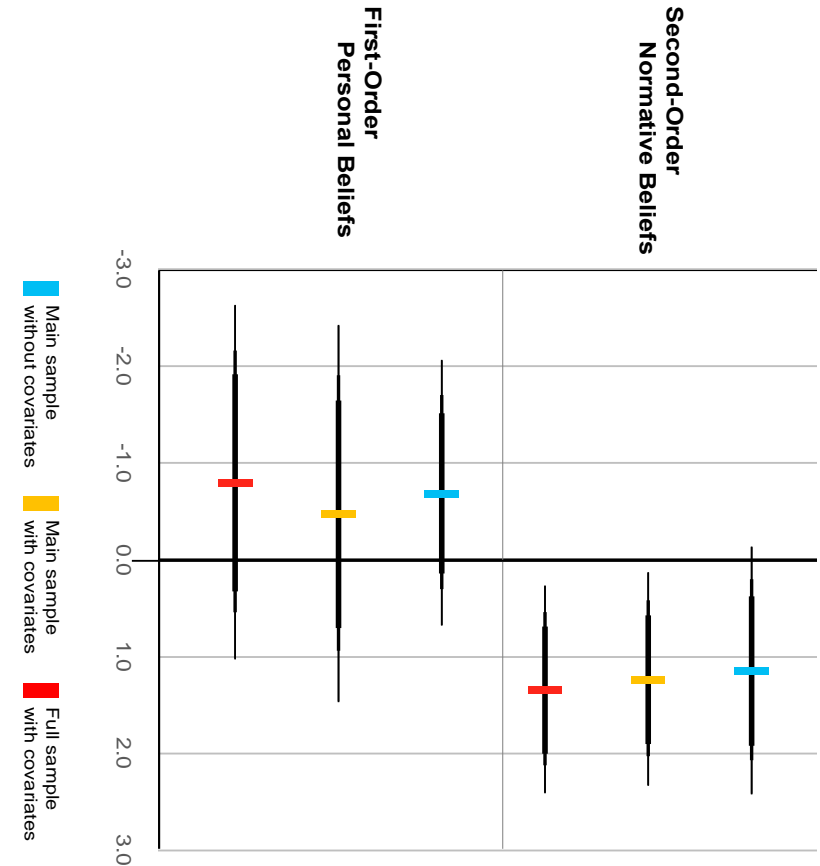
1. Showing households their own energy use (vs. their neighbours') reduces energy consumption (evidence from 211 RCTs)



2. First-order beliefs across U.S. states (x-axis) of how useful energy conservation really is vary (red). Similarly, people vary in their second-order beliefs (i.e. how much they think their neighbours care about energy conservation – blue bars).



3. What predicts energy consumption across U.S. states? Second-order beliefs (top panel) predicts energy savings, but first-order beliefs (bottom panel) do not.



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Eleanya Nduka  
&  
Professor Brit Grosskopf  
(Economics)

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# Energy Poverty Among Rural Households in Nigeria: What Can Be Done?

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- ✓ About 73 million out of 186.6 million Nigerians lack access to electricity.
- ✓ While some 128 million don't have access to improved cookstoves (ICS).
- ✓ Households rely on kerosene lanterns, candles, kerosene stoves, biomass-based (such as wood, crops, garbage) three-stone and clay fires for cooking.
- ✓ Aside from the cost and time incurred in buying and gathering these items, the CO2 emissions from them are detrimental to the environment.
- ✓ Additionally, school children struggle with their home work in darkness.
- ✓ Meanwhile, Nigeria has one of the highest potential for renewable energy generation in the world and is a leading country in the production of liquified petroleum gas (LPG).
- ✓ Thus, we want to evaluate households' perception about **“Pico Photovoltaic Systems (PPS)”** and **“Improved Cookstoves (ICS)”**.

# ENERGY STATUS QUO IN NIGERIA



# IMPROVED STATE





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# Dr. Marcus Gomes

(Sustainable Futures, Streatham)

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# Community energy in turbulent times: challenges and opportunities within the UK context

- ESRC Impact Acceleration Account (IAA) funded research (July – December 2018).
  - Dr. Alette Lambert (UoE); Dr. George Ferns (Cardiff) and Dr. Marcus Gomes (UoE).
- The research seeks to examine how community energy groups either succeed or fail within a context of austerity.
- This project aims to strengthen strategic relationships with local groups and key stakeholders in the community energy field in South West England and Wales, such as:
  - Community Energy Wales;
  - Bristol Green Capital Partnership;
  - Bedminster Energy Group;
  - Low Carbon Gordano;
  - Cardiff Community Energy coop.

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# Professor Tim Coles

(Sustainable Futures, Streatham)

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‘We have a long term interest in the nexus, in particular in how environmental resources and their management feature in the operations, business models and mitigation practices among SMEs, with most of our work located in the South West and with tourism enterprises (funded by ESRC and ERDF). The adoption of renewables has been a key interest.’ Professor Tim Coles

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- Energy consumption, generation and the Jevons Paradox in tourism.
- Energy literacy, the fuel mix and energy mapping among small accommodation businesses.
- Environmental resource (energy/water) management to improve SME competitiveness, as cost control.
- Design, messaging and response to social marketing messages to visitors on water-saving (PhD studentship with SW Water, Borden)

- **Borden DS, Shaw G, Coles TE** (2017). Consensus building in social marketing campaigns through the Delphi method. *Social Marketing Quarterly*, 1-14. [Abstract](#). [Full text](#). [DOI](#).
- **Borden DS, Coles TE, Shaw G** (2017). Social marketing, sustainable tourism, and small/medium size tourism enterprises: challenges and opportunities for changing guest behaviour. *Journal of Sustainable Tourism* [Full text](#). [DOI](#).
- **Coles T, Warren N, Borden DS, Dinan C** (2016). Business models among SMTEs: identifying attitudes to environmental costs and their implications for sustainable tourism. *Journal of Sustainable Tourism*, 25(4), 471-488. [Full text](#). [DOI](#).
- **Coles TE, Dinan C, Warren N** (2016). Carbon Villains? Climate Change Responses among Accommodation Providers in Historic Premises. *Journal of Heritage Tourism*, 11(1), 25-42. [Abstract](#). [Full text](#). [DOI](#).
- **Coles TE, Dinan C, Warren N** (2016). Energy Practices among Small- and Medium-sized Tourism Enterprises: a Case of Misdirected Effort?. *Journal of Cleaner Production*, 111(B), 399-408. [Abstract](#). [Full text](#). [DOI](#).
- **Coles TE, Dinan CR, Warren N** (2015). Climate change mitigation and the age of tourism accommodation buildings: a UK perspective. *Journal of Sustainable Tourism*, 23(6), 900-921. [Abstract](#). [Full text](#). [DOI](#).

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# Land, Environment, Economics and Policy Institute (Streatham)

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# Addressing the Valuation of Energy and Nature Together (ADVENT)

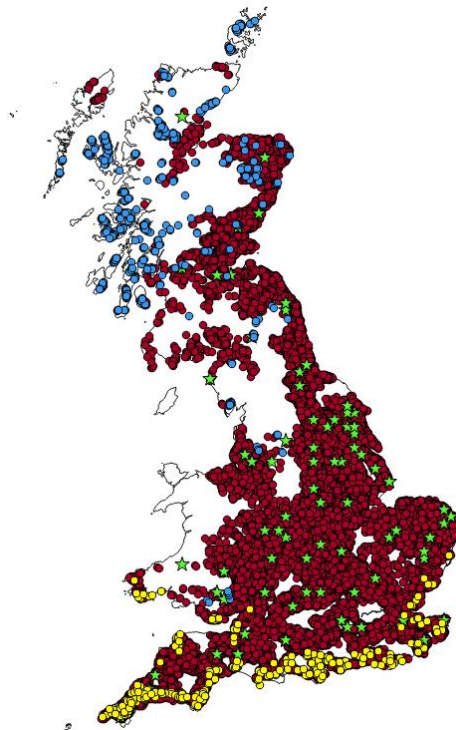
- Aim: to explore future UK low carbon energy pathways and quantify their implications for natural capital and ecosystem services
- Prof Brett Day, Prof Ian Bateman, Dr Greg Smith & Gemma Delafield





# Spatial optimization model

Optimize the locations of energy infrastructure considering both **market and non-market costs**



- Solar farm ●
- Wind farm ●
- Bioenergy power plant ★
- Bioenergy crop ●

Preliminary model output



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# Mike Yearworth

(Centre for Simulation, Analytics  
and Modelling, Streatham)

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# REPLICATE

- Professor Mike Yearworth (CSAM) leading the Strategic Planning and Business Models work package of this €29.3M H2020 Smart Cities and Communities Lighthouse Project
- Developing smart city strategies for replicable interventions/business models suitable for investment (via e.g. green bonds)
- See <https://replicate-project.eu> email: [m.yearworth@exeter.ac.uk](mailto:m.yearworth@exeter.ac.uk)

# MAIN ACTIONS

## Summary of implementations in lighthouse cities



### ENERGY EFFICIENCY ACTIONS



- Building Retrofitting in 696 dwellings and 34 commercial premises.
- District Heating System.
- Smart Grid and Demand Side Platform.



### SUSTAINABLE MOBILITY ACTIONS



- Acquisition/Monitoring of 27 EV Cars, 26 e-motos, 4 e-buses, 112 e-taxis, 32 e-bikes.
- Advanced Charging Infrastructure, 256 charging points.
- Transport Management services for Citizens.



### ICT AND INFRASTRUCTURES ACTIONS



- Smart City Platform integrating current Local IT System.
- Open data and Citizen Participation services.
- Deployment of services and sensors.
- High Speed Wireless Mobile Network deployment based on postWIMAX technology.
- Public Smart Lighting deployment.



**REPLICATE**  
RENAISSANCE OF PLACES  
WITH INNOVATIVE CITIZENSHIP  
AND TECHNOLOGY

[www.replicate-project.eu](http://www.replicate-project.eu)  
[info@replicate-project.eu](mailto:info@replicate-project.eu)  
[@ReplicateEU](https://twitter.com/ReplicateEU)

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement N° 691735

Partners:



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Donostia/San Sebastián



Florence



Bristol

## DONOSTIA / SAN SEBASTIÁN



Donostia/San Sebastián:  
186.377 inhabitants  
Metropolitan area:  
324.511 inhabitants

### URUMEA RIVERSIDE DISTRICT

Nearly zero district: District branding in sustainability. An integrated strategy aiming for a smart district

- Residential area + Industrial Park + Green Park.
- 200 hectares of surface.
- Industrial Park: 350 companies and 4.500 people.
- Largest Green Park of the city - Ametzagaina: carbon sink.

#### Actions

- Energy Efficiency in residential areas: Building Retrofitting (156 dwellings + 34 commercial premises). District Heating (service to more than 1.500 new properties + 156 existing dwellings) and Demand Side Platform.
- Sustainable Mobility: Connection of the area with the city centre, public and private e-mobility (bus, car, e-motos), charging infrastructure and advanced mobility services.
- ICT and Infrastructure deployment: Smart City Platform with integrated services, Open data and Citizen Participation services, IP services, high speed network deployment and Smart lighting deployment.

## FLORENCE



Florence:  
377.587 inhabitants  
Florence Metropolitan City:  
1.007.252 inhabitants

### NOVOLI / CASCINE / LE PIAGGE

An integrated strategy for a first smart district to be replicated and scaled up

- Novoli urban park: The new entrance to the very centre with a mix of uses with residential but also industrial settlements dismissed and important tertiary activities closed to the Cascine, the biggest park in Florence.
- Residential area: 5000 m<sup>2</sup> constructed /6000 buildings.

#### Actions

- Energy Efficiency & District Heating.
- Smart grid and energy demand management: 600 smart info for families.
- Capillar e-mobility infrastructures, very fast recharge and e-taxi fleet, advanced mobility services to citizen.
- Data management and smart city control room.
- Smart lighting and intelligent systems (IoT).



## BRISTOL



Bristol:  
442.500 inhabitants  
City Region:  
1.104.300 inhabitants

### ASHLEY, EASTON & LAWRENCE HILL SMART DISTRICT

Social, economic, environmental challenges:

50.600 people – Bristol's largest district with its highest rate of population growth. A culturally diverse area with many new UK citizens.

- 10% of households in fuel poverty.
- 1/3 of area in the top 10% of deprived areas in UK.
- Less personal transport choice than city average.

#### Actions

- Energy demand management, including smart grid.
- 240 homes retrofitted with energy efficient measures. Photo voltaic (PV) cells to public and community buildings.
- 150 connected homes with smart appliances.
- District heating system with biomass boiler.
- E-bike and e-vehicle charging points.
- On-demand EV public transport.
- New apps to help with parking and transport options.



## REPLICATE

RENAISSANCE OF PLACES  
WITH INNOVATIVE CITIZENSHIP  
AND TECHNOLOGY

**Coordinator:** Fomento de San Sebastián (38 partners).

3 cities: San Sebastián, Florence, Bristol.

3 followers: Essen, Lausanne, Nilüfer.

2 observers: Bogota, Guangzhou.

**Budget:** 29,3 millions €.

**5 years (60 months) project**

Starting date: 01/02/2016.

Y1-Y2-Y3 Implementation.

Y4-Y5 Monitorisation.

**Our vision:** To increase the quality of life for citizens across Europe by demonstrating the impact of innovative technologies used to co-create Smart City services with citizens, and prove the optimal process for replicating successes within cities and across cities.

### SCC1 SMART CITIES LIGHTHOUSE

**CALL:** SCC-01-2015 - Smart Cities and Communities solutions integrating energy, transport, ICT sectors through lighthouse projects.

[www.replicate-project.eu](http://www.replicate-project.eu)

[info@replicate-project.eu](mailto:info@replicate-project.eu)

[@ReplicateEU](https://twitter.com/ReplicateEU)

San Sebastián, Florence and Bristol have already collaborated in the **STEEP project** (Systems Thinking for Comprehensive City Efficient Energy Planning) called Energy 2012. 8.8.1 Strategic sustainable planning and screening of the city plans.

[www.smartsteep.eu](http://www.smartsteep.eu)

