



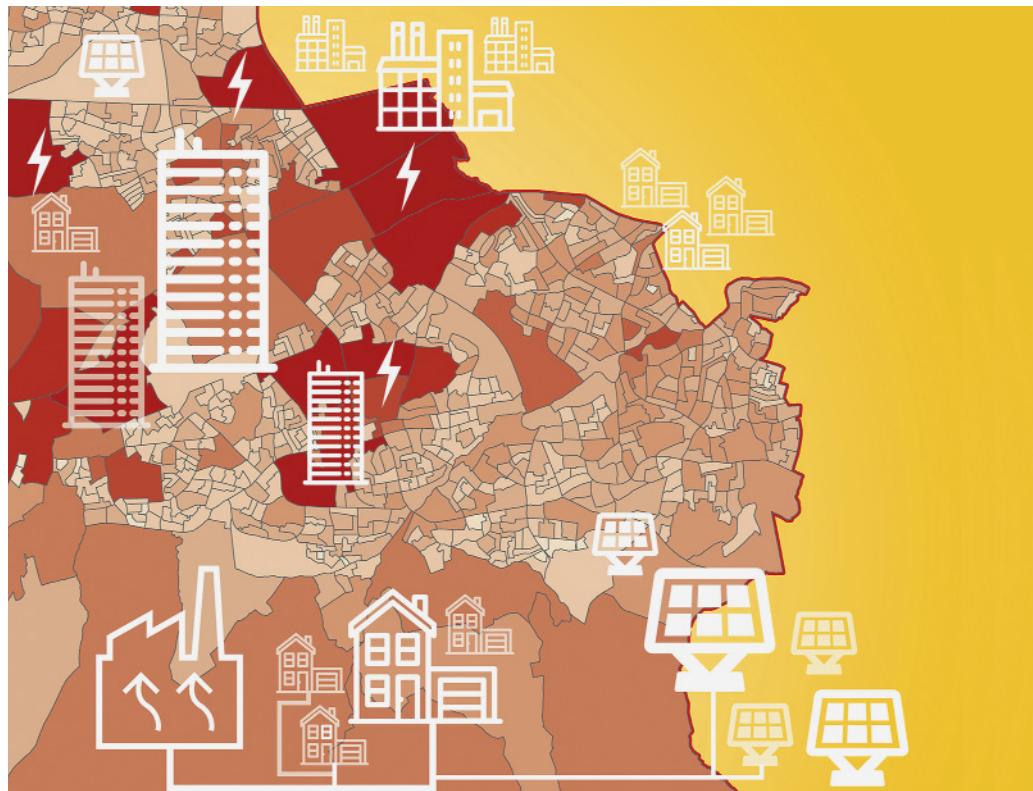
SPECIAL Expert Paper 2

SPATIAL PLANNING and ENERGY for
COMMUNITIES IN ALL LANDSCAPES



Co-funded by the Intelligent Energy Europe
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Advancing evidence-based energy policy in Ireland



A Spatial Energy Demand Analysis of South Dublin County
By Anthony McNamara



Co-funded by the Intelligent Energy Europe
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About SPECIAL

Spatial planning has a key part to play in creating urban environments that support less energy-intense lifestyles and communities, and spatial and urban planners have a pivotal role in developing energy strategies and action plans. The SPECIAL (Spatial Planning and Energy for Communities In All Landscapes) project has been set up to help bridge the gap between climate change/energy action planning and spatial and urban planning.

SPECIAL is funded by Intelligent Energy Europe and is an exciting partnership between eight Town Planning Associations (TPAs) and planning authorities from across Europe. It is a three-year programme with a focus on spatial planning for the deployment of local energy efficiency and renewable energy solutions. The Town and Country Planning Association (TCPA) is the lead partner, with partner TPAs and planning authorities in Austria, Germany, Greece, Hungary, Ireland, Italy, and Sweden.

The project has been set up to help the TPAs and planning authorities of the partner countries meet the EU's challenging energy and climate change targets for 2020. It has several objectives relating to exchanging best practice and experience; promoting integrated renewable energy strategies; and building the capacity of the partner planning associations and authorities in the planning and delivery of renewable energy solutions. Most importantly, the partners must then share that learning through their professional networks and maximise the dissemination of their training to others, in a multiplier effect.

The SPECIAL partnership:

-  Provincial Government of Styria, Department of Spatial Planning Law, Austria
-  German Institute of Urban Affairs, Germany
-  Organisation for the Master Plan and Environmental Protection of Thessaloniki, Greece
-  Hungarian Urban Knowledge Centre, Hungary
-  Irish Planning Institute, Ireland
-  National Centre for Town Planning Studies, Italy
-  Swedish Society for Town and Country Planning, Sweden
-  Town and Country Planning Association, UK

The SPECIAL project runs from March 2013 to March 2016, culminating in a final conference in London to disseminate the project outcomes, including a pan-European Guide on Spatial Planning and Sustainable Energy.

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Advancing evidence-based energy policy in Ireland – A Spatial Energy Demand Analysis of South Dublin County

By Anthony McNamara

Contents

2 **Foreword**

3 **1 Introduction**

- 1.1 Who is this paper for?
- 1.2 The opportunity to integrate energy and spatial planning
- 1.3 Energy planning in South Dublin County

7 **2 Using the outputs of the South Dublin SEDA**

- 2.1 Low-carbon district heating networks
- 2.2 Energy demand and clusters of high-wattage energy users
- 2.3 Analysis of the South Dublin County dwelling stock

13 **3 Conclusions**

Cover illustration from the South Dublin Spatial Energy Demand Analysis

Foreword

Local authorities and spatial planning tools and strategies across Europe are recognised as playing key roles in countering the existing reliance on fossil fuels and in reducing the impacts of climate change. To combat the local effects of climate change, to move away from dependency on imported fossil fuels and to reduce energy costs across all sectors, South Dublin County Council, working in partnership with all stakeholders, aims to prioritise and unlock local low-carbon and renewable energy opportunities to 2022 and beyond.

Since its establishment in 1994, South Dublin County Council has a proven track record in pioneering activities in sustainable development and in promoting the growth of sustainable communities – in particular through spatial planning tools such as County Development Plans, Strategic Development Zones, and Local Area Plans. The Council acknowledges that strengthening climate change mitigation measures, reducing energy consumption and finding alternative, non-polluting and renewable sources for energy provision across sectors are priorities in responding to EU and national energy targets. It is clear that continued growth across South Dublin County will require a reliable, robust and efficient energy system to power homes, businesses and transport over the lifetime of the next County Development Plan and beyond. The Council aspires to becoming as carbon neutral as possible and to making every effort to increase energy efficiency and unlock renewable energy opportunities. As such, there is a recognised need to build on spatial planning tools and strategies, in particular County Development Plan energy policies, focusing on more evidence-based and spatially appropriate energy and climate change mitigation policies, objectives and implementation measures.

In 2015, South Dublin County Council prepared a county-wide Spatial Energy Demand Analysis (SEDA), in partnership with the City of Dublin Energy Management Agency (CODEMA). The energy profiles for the commercial, residential and municipal sectors, collated under the EU Covenant of Mayors and South Dublin Sustainable Energy Action Plan (SEAP) methodologies, have been refined to generate County-scale tabulations and maps representing a range of energy information, including energy demand, heat density and costs across sectors. The outputs and recommendations of the South Dublin SEDA have informed the review of the current County Development Plan and the preparation of South Dublin County Council Draft Development Plan 2016-2022.

In carrying out the SEDA the Council aimed to facilitate an enhanced spatial understanding of energy needs, energy efficiency profiles and renewable energy responses, which vary across sectors, settlement areas, land uses and the built environment.

1 Introduction

The Intelligent Energy Europe (IEE) supported SPECIAL (Spatial Planning and Energy for Communities In All Landscapes) project is a dynamic partnership of eight Town Planning Associations and planning authorities from across Europe. It focuses on spatial planning, local energy efficiency and the deployment of renewable energy solutions. The SPECIAL project aims to bridge the gap between energy action planning and spatial and urban planning by developing the capacity of Town Planning Associations and planning authorities in the planning and delivery of renewable energy solutions.

This Expert Paper highlights the role of Sustainable Energy Action Plan (SEAP) methodologies in advancing evidence-based energy policies at local authority/municipality level and in aiding the development of a local-authority-wide Spatial Energy Demand Analysis, with the ultimate aim of strengthening links between energy and spatial planning through County Development Plans, Strategic Development Zones and other local plans and strategies.

1.1 Who is this paper for?

This paper is designed to highlight the experiences of South Dublin County Council in developing evidence-based climate change mitigation policies for County Development Plans and other local plans and strategies, including identifying and taking advantage of energy efficiency and renewable energy opportunities.

The paper is aimed primarily at local authority planners and related professional staff, councillors, and private sector practitioners. It will also be useful for architects, energy engineers, renewable energy providers, developers, and all stakeholders interested in addressing the energy and climate change challenge at the local level.

1.2 The opportunity to integrate energy and spatial planning

In Ireland the energy targets set out in EU legislation have been translated into the National Renewable Energy Action Plan (NREAP) 2010 and the National Energy Efficiency Action Plan (NEEAP) 2013-2020 (updated in 2014). Ireland plans to meet the EU 2020 targets under the NREAP by delivering approximately 40% of energy consumption from renewable sources in the electricity sector, 12% in the heat sector, and 10% in the transport sector. The NEEAP sets out the Government commitment to deliver a 20% reduction in energy demand (over average 2001-2005 levels) across the whole economy through a range of energy efficiency measures. The Government believes that the public sector should lead by example, and has assigned an energy demand reduction target of 33% to the public sector.

In addressing energy targets to 2020 and beyond, planners and local authorities are best positioned to aid the transition to a low-carbon society, by integrating climate change mitigation and energy considerations into spatial planning tools and strategies. Energy and climate change mitigation issues should be recognised and included as an additional thematic layer in the plan-making process. There is therefore a need for planners, local authority staff and local decision-makers to develop robust evidence-based policy relating to energy and climate change mitigation, including energy efficiency in the existing and new building stock, and renewable energy opportunities at the local level.

The key objectives of advancing evidence-based energy policy at the local level are:

- To develop a closer link between European and national energy policy and spatial planning for energy and climate change mitigation.
- To base energy planning policies and objectives on a robust spatial understanding of the existing and future energy profiles across sectors at a local authority scale.
- To promote the generation and supply of low-carbon and renewable energy alternatives, having regard to the opportunities offered by the settlement hierarchy of a local authority/municipality area, the variety of land uses present, and the built environment.
- To educate local authorities, public and private sector organisations and energy stakeholders on energy responses that are most relevant at the local level.
- To stimulate the development of a regional methodology for spatial energy demand analysis, energy mapping, and energy planning policy development.
- To encourage greater local authority involvement and leadership in the roll-out of energy efficiency and low-carbon and renewable energy projects in partnership with other stakeholders.
- To inform and support the Covenant of Mayors initiative and advance Sustainable Energy Action Plan methodologies in Europe.

In Ireland, there is significant experience to date in planning for renewable energy alternatives, and a broad range of experience exists across the planning profession. A number of local authorities have prepared Local Authority Renewable Energy Strategies, Wind Energy Strategies, and Sustainable Energy Action Plans, informed by methodologies set out in the *Methodology for Local Authority Renewable Energy Strategies*,¹ *Wind Energy Development Guidelines for Planning Authorities*,² and *How to Develop a Sustainable Energy Action Plan (SEAP) – Guidebook*.³

Within this context of enhancing the skills-set of planners, other local authority staff and decision-makers, it is increasingly recognised that urban and peri-urban local authorities require an evidence-based response which captures a spatial understanding of the existing energy profile across sectors and land uses that can be used as a baseline to understand and consider future energy scenarios to 2020 and beyond. This has been the case for South Dublin County, and the South Dublin SEAP has been used as the starting point to further the integration of spatial planning and energy, thereby informing the policies and objectives of the South Dublin County Council Draft Development Plan 2016-2022.⁴

In Ireland, the Planning and Development Act 2000 (as amended) sets out the legislative requirements for the making of a County Development Plan. Each plan has a statutory lifetime of six years only. The function of a County Development Plan is to set out an overall strategy for the proper planning and sustainable development of a local authority area, and it consists of a written statement and maps. The plans and maps provide a geographic representation of the policies and objectives

1 *Methodology for Local Authority Renewable Energy Strategies*. Sustainable Energy Authority of Ireland, 2013. http://www.seai.ie/Publications/Renewables_Publications_/Wind_Power/Methodology-for-Local-Authority-Renewable-Energy-Strategies.pdf

2 *Wind Energy Development Guidelines for Planning Authorities*. Department of the Environment, Heritage and Local Government, 2006. <http://www.environ.ie/en/Publications/DevelopmentandHousing/Planning/FileDownload,1633,en.pdf>

3 *How to Develop a Sustainable Energy Action Plan (SEAP) – Guidebook*. Covenant of Mayors. Publications Office of the European Union, 2010. <http://www.eumayors.eu/Covenant-technical-materials.html> See also <http://www.eumayors.eu/Library,84.html>

4 *South Dublin County Council Development Plan 2016-2022*. Draft. South Dublin County Council, 2015. http://www.southdublindevplan.ie/sites/default/files/documents/SSDC_Full_Development_Plan%20Draft_2_%28low%20res%29.pdf

contained in the written statement. The Planning and Development Act 2000 (as amended) sets out the mandatory objectives that must be included in a County Development Plan. These include objectives for, inter alia, the zoning of land, the provision of infrastructure, the conservation and protection of the built and natural environment, and the integration of planning and sustainable development with the social, community and cultural requirements of the local authority area and its population.

In making County Development Plans, local authorities are required to include a Core Strategy, demonstrating that the plan is consistent with the National Spatial Strategy and Regional Planning Guidelines. The Core Strategy must also include a settlement hierarchy, evidence-based population data, and housing targets across settlements. Core Strategies can also demonstrate an analysis of zoned land availability and requirements to ensure that there are sufficient amounts of zoned land to cater for growth in the local authority area. In this regard there is an opportunity to take account of and spatially represent the existing energy profile of a local authority area and also forecast future energy requirements across settlement and growth areas. A spatial understanding of existing and future energy demand across sectors allows the necessary policy decisions regarding the integration of energy efficiency and renewable energy technologies into the built environment and the landscape to be made in a robust, informed and evidence-based manner. Once a spatial characterisation of energy issues has been articulated at County Development Plan level, local area plans and other locally based plans and strategies provide a further opportunity to provide more detail on measures and mechanisms to support climate change mitigation at the local level.

An integrated approach to spatial planning and energy allows planners, local authority staff and other stakeholders to make more informed policy decisions relating to energy efficiency and renewable energy alternatives, while generating an increased evidence base to inform further project feasibility and implementation, and also helps them to foster greater public acceptance of energy infrastructure projects.

1.3 Energy planning in South Dublin County

To advance a ‘bottom-up’ evidence-based policy response to address national and 2020 EU energy targets, South Dublin County Council signed up to the Covenant of Mayors⁵ in 2012. The Covenant of Mayors is a co-operative European movement that involves local and regional authorities voluntarily committing to increasing energy efficiency and the use of renewable energy sources within their jurisdiction areas. Covenant signatories commit to aiming to meet and exceed the EU 20% carbon dioxide (CO₂) reduction objective by 2020 and agree to approving a local-authority-wide SEAP within one year of signing up to the Covenant.

The South Dublin SEAP of 2013⁶ analyses the County’s energy consumption and CO₂ emissions at a sectoral level. Using 2006 as a baseline year, the South Dublin SEAP sets out how South Dublin County could reduce consumption and CO₂ emissions in line with 2020 energy targets, through a range of energy actions across sectors. The SEAP was approved by the elected members of South Dublin County Council in May 2013 and was verified by the EU Covenant of Mayors – Joint Research Centre in April 2014.

⁵ Further information on the Covenant of Mayors is available at <http://www.covenantofmayors.eu>

⁶ *South Dublin Sustainable Energy Action Plan*. South Dublin County Council, 2013.
http://www.codema.ie/images/uploads/docs/SDCC_SEAP_May_2013.pdf

To inform and help develop and frame robust policies in the South Dublin County Council Draft Development Plan 2016-2022, the Council sought to advance the South Dublin SEAP data and methodologies in a spatially geographic manner. This approach to energy policy development and integration with SEAPs is supported by the Regional Planning Guidelines for the Greater Dublin Area 2010-2022. The EU Covenant of Mayors also calls for local authorities to progress SEAP methodologies and to provide greater integration with spatial planning and related actions at local level.

The energy data for the commercial, residential and municipal sectors collated under the EU Covenant of Mayors and the SEAP methodologies have been further progressed and refined to generate County-scale tabulations and maps representing a range of energy information, including energy demand, heat density, and costs across sectors. A variety of data sources have been used to undertake this study, including Central Statistics Office, Valuation Office, Sustainable Energy Authority of Ireland publications and Building Energy Rating (BER) data, and energy data relating to South Dublin County Council owned buildings, facilities and operations. A summary of the estimated annual South Dublin County energy profile, using 2014 as the baseline year, is shown in Table 1.

Based on these datasets the South Dublin Spatial Energy Demand Analysis (SEDA)⁷ has used the County Development Plan Core Strategy projections to generate strategic assumptions on the future energy profile of South Dublin County. The SEDA has calculated that even though new homes in the County will be built to higher BER standards, reflecting changes in national Building Regulations, this sector still has the potential to generate an additional 0.4 TWh (terrawatt-hours) of energy demand by 2022, under the lifetime of the next County Development Plan. By reviewing past job/population ratio splits for the County and using Core Strategy population projections to 2022, it is estimated that the commercial sector could generate an additional 0.5 TWh of energy demand by 2022.

Table 1
2014 South Dublin County energy profile and estimated costs

Sector	2014 energy demand, TWh	Estimated costs, € million
Residential	1.94	161
Commercial	1.73	174
Municipal	0.01	2
Total	3.68	337

Source: *South Dublin Spatial Energy Demand Analysis*⁸

⁷ *South Dublin Spatial Energy Demand Analysis*. Codema, in association with South Dublin County Council. South Dublin County Council, 2015.

http://www.southdublindevplan.ie/sites/default/files/documents/9_South%20Dublin%20Spatial%20Energy%20Demand%20Analysis.pdf

⁸ *Ibid.*

2 Using the outputs of the South Dublin SEDA



Fig. 1 Example of CSO Small Area Breakdown in South Dublin County

Map © Ordnance Survey Ireland. Licence number 01/05/001

The Central Statistics Office (CSO) Small Areas have been used as the geographical boundaries to spatially represent the County's energy profile across the commercial, residential and municipal sectors. This has resulted in a detailed level of analysis which can be refined for further studies and planning strategies stemming from the County Development Plan and other local initiatives. Fig. 1 shows a sample of CSO Small Area breakdown in South Dublin County.

The South Dublin SEDA reveals that there is potential for the development of both decentralised, local district heating networks and a range of on-site/in-house low-carbon and renewable energy alternatives to address the energy needs of the various sectors operating in South Dublin County, particularly commercial and industrial uses. The SEDA analysis of the residential sector reveals a diverse energy profile spanning homes built over the past 100 years, in both urban and rural environments.

2.1 Low-carbon district heating networks

In order to identify areas that are suited to local district heating schemes, energy information can be analysed in terms of heat density – which is the amount of thermal energy used within a defined area and is an indicator for the economic viability of district heating schemes. This is an accepted methodology used in other European countries, including Denmark and Sweden. The viability of district heating schemes is increased when buildings are closer together (due to shorter pipelines and reduced heat losses) and where anchor loads with high levels of energy use are present (such as 24-hour loads).

District heating schemes can be based on a variety of technologies and renewable energy sources, such as combined heat and power (CHP), biomass energy, geothermal energy, or energy from waste. The diverse mix of land uses and the built environment in South Dublin County offers potential for the development of local low-carbon district heating networks. The South Dublin SEDA has analysed the energy profiles of the commercial, residential and municipal sectors and has identified 'Areas of Potential'.

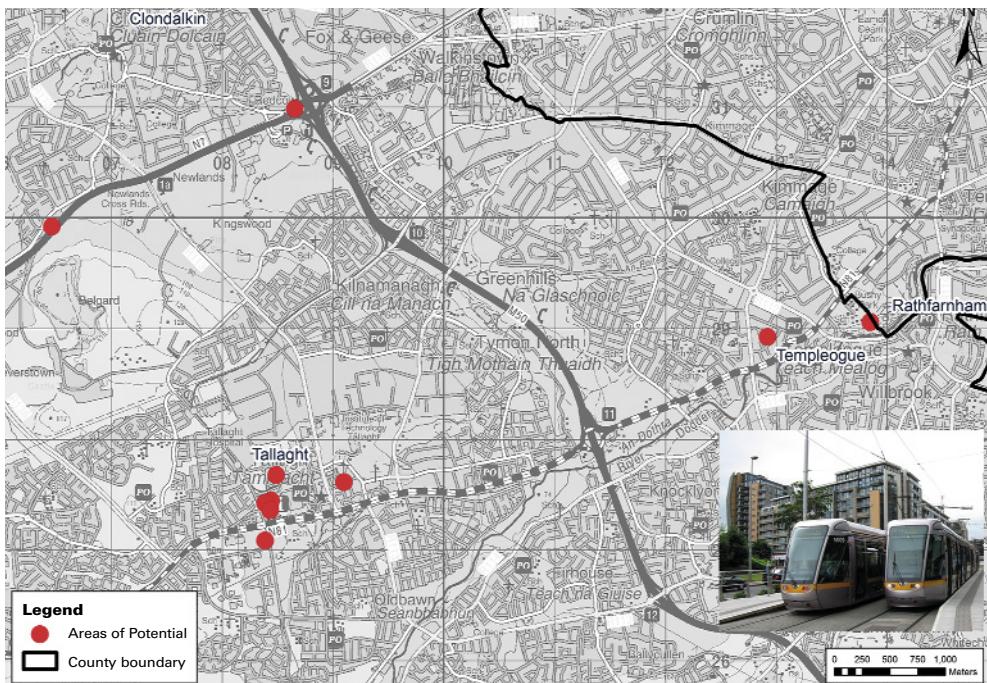


Fig. 2 Areas of Potential for low-carbon district heating in South Dublin County

In South Dublin County areas with a heat density above $250 \text{ TJ}/\text{km}^2$ (terajoules per square kilometre) have been identified as those of best potential for initial development. As shown in Fig. 2, six of these areas are located in Tallaght (the county town of South Dublin County). Many of the top ten Areas of Potential in South Dublin County are located within the same electoral division and as such could be grouped with other adjoining/nearby sites of high heat density.

Once such Areas of Potential have been identified using the heat density methodology, County Development Plan policy and development management standards facilitating the development of district heating projects should ensure that all new developments above a certain threshold, within or directly adjoining such Areas of Potential, should undertake an Energy Analysis.

The Energy Analysis should be submitted with the planning application to the planning authority and should be related to the uses and quantum of floorspace associated with a proposal for development. It is considered that an appropriate threshold for such proposals could include 100+ dwellings at a density of 50 dwellings per hectare for large-scale residential development and 10,000 square metres for non-residential development. The Energy Analysis should also include proposals for the delivery of a low-carbon district heating system on site, including technology details and a timescale for delivery linked to the energy demand, energy load mix, layout, and phasing of the proposed development.

It is considered that in cases where the Energy Analysis concludes that the delivery of a district heating scheme has been fully explored and is not feasible on a particular site, details of future-proofing of the building fabric and the safeguarding of pipe network routes up to the boundaries of adjoining sites should be submitted with the planning application. This will facilitate future connection to local district heating systems on neighbouring sites and in the area.

2.2 Energy demand and clusters of high-wattage energy users

Fig. 3 shows total energy demand (for both heating and electricity) in each CSO Small Area across South Dublin County – areas coloured in darkest red have the highest energy demand in the County. Fig. 4 shows clusters of high-wattage energy users across the County. From a comparison of Figs 3 and 4 it is clear that areas with high

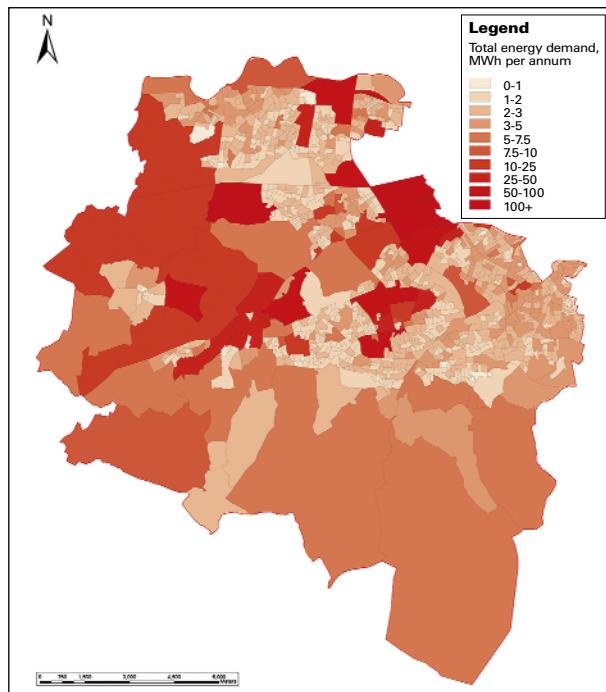


Fig. 3 Total energy demand map, by Small Area

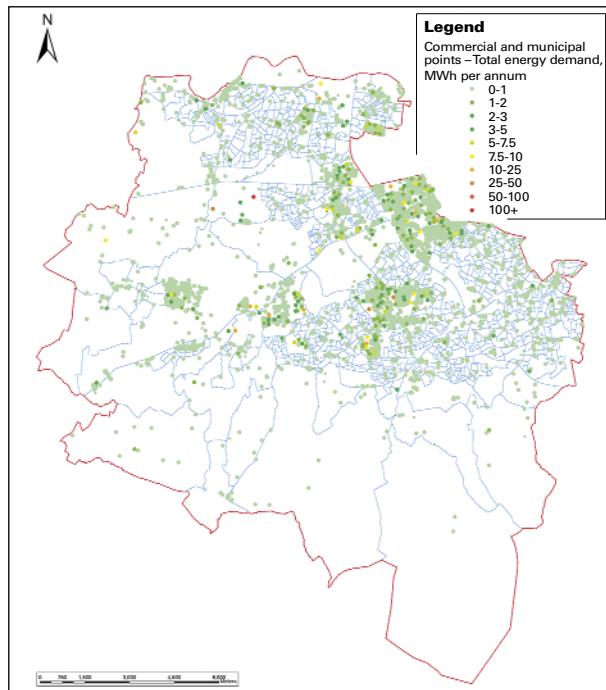


Fig. 4 Energy use and location for each commercial and municipal building - with Small Area divisions

total energy demand have a large number of commercial/municipal energy users and some users with very high energy demand per building. These areas include premises in Tallaght town centre, Ballymount Industrial Estate, and Grange Castle Business Park. In areas demonstrating clusters of high-wattage energy users, but not demonstrating heat densities sufficient for a low-carbon district heating project, the South Dublin SEDA identified a number of alternatives for on-site/building-level alternatives. A range of County Development Plan policies and development management standards can be considered in this regard, including waste heat utilisation, solar energy, biomass energy, or a mix of these and other technologies, all which offer potential for commercial and municipal premises demonstrating high energy demands. Shallow geothermal also offers potential in these areas.

With regard to electricity, for buildings with daytime electrical demand and a high cost of electricity per kilowatt-hour, solar energy, including seasonal storage technologies, can be a cost-effective way to reduce electricity demand and costs. For larger applications, combined heat and power (CHP) units can meet both electricity and heating requirements.

2.3 Analysis of the South Dublin County dwelling stock

The energy performance of existing buildings is one of the foremost considerations in responding to the energy challenge at local authority level. Increased efforts in this area, in particular the upgrading and refurbishment of existing buildings, can make a significant contribution to reducing energy demands and costs. In order to ascertain priorities in addressing the energy performance of the existing residential stock, there is a need to compile and map the energy profile of the residential sector, with particular regard to identifying areas of older housing stock and buildings with a low BER.

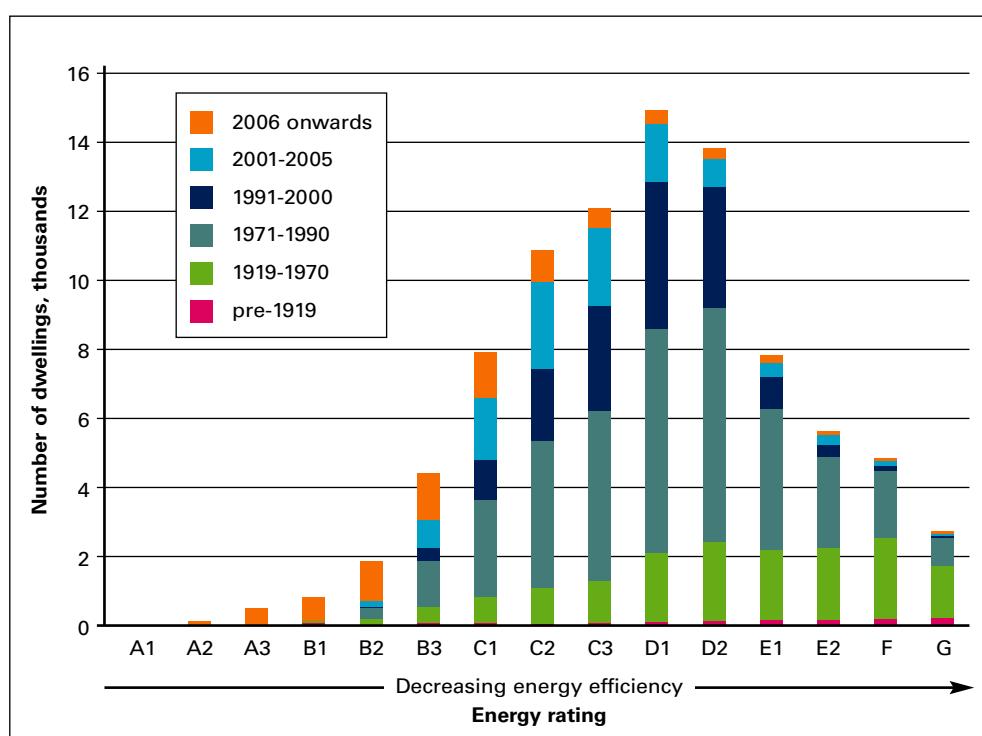


Fig. 5 South Dublin housing stock BER distribution by year built

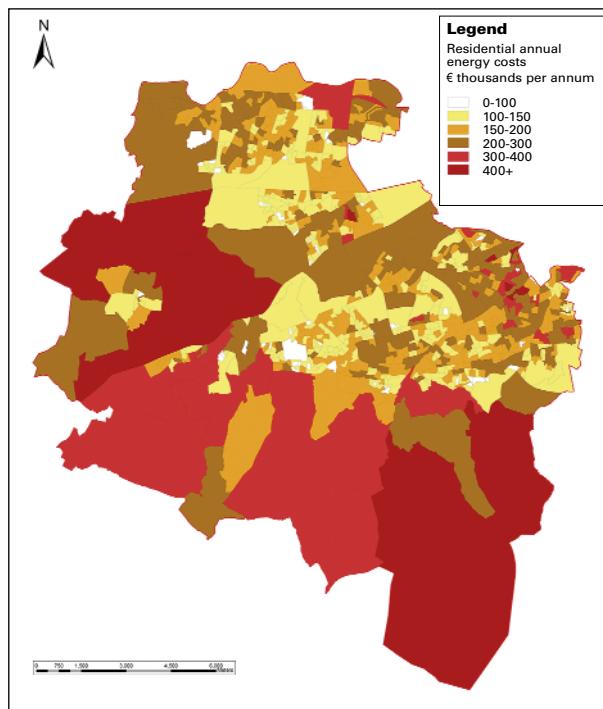


Fig. 6 Estimated annual energy costs for residential energy use, by Small Area

The South Dublin SEDA has profiled the residential sector in detail; this has been facilitated by the detailed data sources available, in particular Census 2011 and Sustainable Energy Authority of Ireland BER data. Fig. 5 shows the distribution of BER scores for dwellings in South Dublin County, by period of construction. Analysis of the residential sector indicates that approximately 56% of BER scores are D1 or lower. Furthermore, 66% of all semi-detached housing, 46% of terraced dwellings and 60% of detached dwellings are rated D1 or lower. Terraced housing and apartments make up the majority of A and B BERs, with the majority of A and B rated homes built from 2006 onwards. The lower F and G rated dwellings are dominated by buildings constructed in the period 1919-70. This analysis assists in the identification of homes that could be at risk of fuel poverty.

The South Dublin SEDA has also characterised and mapped energy costs for the residential sector. The range of residential energy costs across CSO Small Areas is shown in Fig. 6. Small Areas with high numbers of dwellings which use more expensive fuels such as home heating oil will have higher energy costs than others. Areas with high levels of electrical heating and older housing with low insulation levels will also have higher than normal energy costs.

The design, construction and operation of new buildings all have a significant role to play in reducing energy demand and increasing energy efficiency for the future. The integration of energy issues into the lifecycle of all new residential and non-residential buildings, at neighbourhood, street and individual building scale, can result in significant savings at local level. Energy efficiency and renewable energy requirements for the construction of new residential and non-residential buildings are primarily addressed in the current Building Regulations Part L.⁹ All new homes constructed

⁹ Conservation of Fuel and Energy – Buildings other than Dwellings. Building Regulations Technical Document. Department of the Environment, Heritage and Local Government. Government of Ireland, 2008; and Conservation of Fuel and Energy – Dwellings. Building Regulations Technical Document. Department of the Environment, Community and Local Government. Government of Ireland, 2011. <http://www.environ.ie/en/TGD/>

in South Dublin County currently must reach an energy performance equating to an A3 BER standard, and there are specific requirements with regard to thermal performance, overall energy use and CO₂ emissions. The regulations also prescribe that a reasonable proportion of the energy consumed by dwellings is provided by renewable energy sources.

There is a recognised need for planners to become more skilled in meeting the requirements of the Building Regulations Part L and to include policies and objectives in County Development Plans and other plans and strategies that confirm the requirements of the Building Regulations. Furthermore, County Development Plan policies and objectives should support incremental changes to the Building Regulations Part L and other national guidelines that may occur by 2020, without duplicating or introducing specific requirements on energy efficiency and renewable energy technologies that would conflict with or impede the implementation of the Building Regulations on site. In this regard, County Development Plan policies should continue to follow national guidance, including, for example, *Towards Nearly Zero Energy Buildings in Ireland*.¹⁰

10 *Towards Nearly Zero Energy Buildings in Ireland: Planning for 2020 and Beyond*. Department of the Environment, Community and Local Government, 2012. http://nzeb-opendoors.ie/sites/www.nzeb-opendoors.ie/files/page-files/Towards%20NZEBs%20in%20Ireland_Nov%202012.pdf

3 Conclusions

The South Dublin SEDA represents a visualisation of energy character areas across South Dublin County and acts as a robust starting point that informs the energy policies and objectives of the next County Development Plan, Strategic Development Zones, and other local plans and strategies. By collating and profiling assumed and actual energy data across sectors, a number of energy maps have been created – in particular maps of heat density, energy demand, and costs across sectors.

The spatial analysis provided by the SEDA highlights energy efficiency and renewable energy alternatives that should be further explored in County Development Plan policies, objectives and development management standards, in the context of the location of the County (within the Dublin region), the built environment, and the variety of sectors and land uses present. Basing the SEDA on the foundations of the SEAP methodologies strengthens capacity-building within and the commitment of local authority staff, and can increase local political support for the energy and climate change mitigation agenda (formalised by signing up to the Covenant of Mayors).

The South Dublin SEDA is the first of its kind to be prepared by a local authority in Ireland, and it marks a significant step in integrating spatial planning and planning for energy alternatives. The SEDA has also facilitated a ‘bottom-up’ approach to responding to challenging EU and national energy targets to 2020 and beyond. By utilising and advancing the Covenant of Mayors and SEAP methodologies, it also points towards the development of a regional methodology and spatial approach to energy profiling and a broadening of the local canvas for planning for renewable energy, across local authority boundaries.

By compiling a detailed local energy analysis the SEDA provides an opportunity for further local level analysis in South Dublin County, including renewable resource mapping (such as for solar roof space analysis) and mapping of waste heat sources. Detailed case studies could be carried out to ascertain the technical and economic feasibility of a range of measures in the light of EU and national policy and technology advances, while also fostering increased local and community ownership of energy projects in South Dublin County.

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- SPECIAL Expert Paper 2: *Advancing Evidence-Based Energy Policy in Ireland – A Spatial Energy Demand Analysis of South Dublin County*. By Anthony McNamara



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