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EPISCOPE

Community Energy Workshop
Energy Show 2016

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Michael Hanratty, IHER Energy Services Ltd
michael@iher.ie

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Intelligent Energy Europe EPISCOPE Project (2013-2016)



- Follow-on from TABULA (2009-2012) & DATAMINE (2006-2008)
- Partners in 16 Member States
- **Objectives:**
 - To produce **National Building Typologies**
 - To develop **Methods to Track the Refurbishment of Housing Stocks** (local and national), e.g. **what proportion** stock has been refurbished **to date?**, **what proportion** of dwellings are getting energy upgrade works done **each year?**



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Irish Building Typology



Building Typology Brochure Ireland

A detailed study on the energy performance of typical Irish dwellings
August 2014



- 31 existing dwelling types
- 3 new dwelling types
- standard and advanced upgrade analysis for all existing dwelling

www.episcope.eu

http://episcope.eu/fileadmin/tabula/public/docs/brochure/IE_TABULA_TypologyBrochure_EnergyAction.pdf



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www.building-typology.eu



Welcome

Building Typology

Building Stock Monitoring

Download & Contact

IEE Project

Home > Welcome

Welcome to the joint EPISCOPE and TABULA Website

++++ CURRENT PUBLICATIONS ++++++ CURRENT PUBLICATIONS ++++++ CURRENT PUBLICATIONS ++++++ CURRENT PUBLICATIONS +++++

- 2016-02 | Excel workbook "tabula-calculator.xlsx" published - includes current TABULA typology data | <LINK>
- 2015-11 | EPISCOPE Tool included in the BPIE Data Hub launched | <LINK>
- 2015-11 | TABULA WebTool: new version published | <LINK>
- 2015-03 | Mapping Tool showing Energy Efficiency of Housing on the Northside of Dublin City | <LINK>
- 2014-11 | Report: Inclusion of New Buildings / NZEBs in Residential Building Typologies | Download <PDF>

| Download the presentations from the EPISCOPE Experts' Workshop, 18 November 2015 in B

The European project EPISCOPE has been launched in April 2013 as a follow-up of the TABULA project. The typology concepts and contents developed during TABULA form an integral part of the new project and are therefore presented at this joint website together with the new EPISCOPE focus of building stock monitoring.

- 20 national typology brochures
 - TABULA webtool
 - 16 pilot action reports
- www.episcope.eu

IEE Project EPISCOPE



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Basic Idea

The overall strategic objective of the EPISCOPE project is to make the

For more information about building typologies consult the TABULA website section:



Building Stock Monitoring

Building Typology



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Existing Buildings: Revised Upgrade Measures (2014)

	Standard Level Measures	Advanced Level Measures
Roof U-Value	0.13W/m ² K	0.13 W/m ² K
Flat roofs	0.22 W/m ² K	0.22 W/m ² K
Wall U-Value	0.27 W/m ² K - 0.48 W/m ² K*	0.15 W/m ² K – 0.27W/m ² K
Wooden Floor (replace)	0.25 W/m ² K	0.25 W/m ² K
Windows U-Value	1.4 W/m ² K**	0.9 W/m ² K
Doors	2.0 W/m ² K	1.5 W/m ² K
Space heat generator efficiency	90% gas, 90% oil, 89.5% Condensing Wood Pellet Boiler	Air Source Heat pump: 380% min, Ground Source Heat Pump: 400% min, Air to Air Heat Pump 270% min
Water heat generator efficiency	90% gas, 90% oil, 89.5% Condensing Wood Pellet Boiler	Air Source Heat pump: 380% min, Ground Source Heat Pump: 400% min, Air to Air Heat Pump 270% min
Solar Thermal		40% contribution of total energy (10% electric immersion)
Heating controls	Full zone control	Full zone control
Cylinder Insulation	50mm, spray foam	Increased Capacity Cylinder* with 50mm spray foam
Mechanical Heat Recovery Ventilation		92% minimum efficiency, AP<5 m ³ /hr/m ² **
Demand Control Extract Ventilation		Specific Fan Power min 0.18W/l/s
Photovoltaic panels		4-8 panels***



No.	Age Band:	House type	Current State	Standard Measures	Advanced Measures
1	1800-1899	SFH.01.Gen	G	B3	B1
2	1800-1899	TH.01.Gen	G	B3	B2
3	1800-1899	TH.01.325SB	E2	B1	A3
4	1800-1899	SFH.01.325SB	F	B2	B1
5	1900-1929	SFH.02.Gen	G	C2	B1
6	1900-1929	TH.02.Gen	G	B2	B1
7	1900-1929	TH.02.325SB	G	C1	B1
8	1930-1949	SFH.03.Gen	G	C1	B2
9	1930-1949	TH.03.Gen	G	C1	B2
10	1950-1966	SFH.04.Gen	G	B3	B1
11	1950-1966	TH.04.Gen	G	B2	A3
12	1950-1966	TH.04.HBlockHBF	G	B2	A3
13	1967-1977	SFH.05.Gen	G	B3	A3
14	1967-1977	TH.05.Gen	G	B2	A3
15	1950-1966	AB.04.Gen	G	B1	B2
16	1978-1982	SFH.06.Gen	E2	B3	A3
17	1978-1982	TH.06.Gen	E1	B2	A3
18	1978-1982	SFH.06.HBlock	E1	B2	A3
19	1978-1982	TH.06.HBlock	E1	B2	A3
20	1983-2004	SFH.07.Gen	D2	B3	B1
21	1983-2004	TH.07.Gen	D2	B3	A3
22	1983-2004	SFH.07.Hblock	D1	B3	A3
23	1983-2004	TH.07.Hblock	D1	B3	A3
24	1983-2004	SFH.08.Gen	D2	C1	A3
25	1983-2004	TH.08.Gen	C2	B2	A2
26	1983-2004	SFH.08.Tframe	C3	C1	B1
27	1983-2004	TH.08.Gen	C3	B3	A3
28	2005-2010	SFH.09.Gen	C1	B2	A3
29	2005-2010	TH.09.Gen	B3	B2	A3
30	2005-2010	SFH.09.Tframe	C1	B1	A3
31	2005-2010	TH.09.Tframe	B2	B2	A3

Refurbishment Analysis Results

(based on DEAP BER calculation)

Terraced house, hollow block, 80's

End of terrace house, cavity walls, 70's.

Detached House, stone walls, 1900

Building elements : Insulation U-value

Detached house, solid brick walls, 1920

Terraced house, solid brick wall, 1900

Building elements : Insulation U-value

Terraced house, mass concrete, 1930

Building elements : Insulation U-value

Bungalow, hollow block, 1950's

Building elements : Insulation U-value

Semi detached, hollow block walls, 1970

Terraced house, cavity walls, 1978.

Detached bungalow, cavity walls, 1980

Detached bungalow, 1993

Detached bungalow, timber frame, 2001

Description
1980s detached but dry-lined internally and a plastered and a standard pic (between the attic joist)

Description
1970s end of terrace/ (300mm) cavity walls. This house type has an pitched roof insulated joists. Most likely for

Description:
1930s in run to 400mm thick the insulation is suited for

Description: Late house typically Normally brick and rear. Internu external wall ins

Description
Typical redbrick etc from late 1800 extension to rear. 2 wall insulation. So can be retrofitted

Description
Terraced house, ver 1940s. Originally be concrete walls and candidate for exten

Description
1950s detached bungalow hollow block walls, timber and a standard pitched roof between the attic joists. This lin and east coast areas in p

Description
Semi-detached with small cavity betw All walls would comform from th lin and along the

Description
Terraced house w found in Dublin be house in a perfect floors were stand options are limite

Description
This house was found in Dublin and had hollow block walls with internal dry-lining. If it was located outside Dublin, cavity wall construction would be more likely. The room in the roof at first floor level would have had modest insulation at the time of construction and could be much improved.

Roof
Walls
Floors
Windows
Doors
Primary
Secondary
Hot water
Controls



Building elements : Insulation U-value

Building elements :	Insulation	U-value
Walls	Timber frame	50-100 mm 0.55
Roofs	Pitched, insulation between joists	150 mm 0.26
Floors	Solid	20-30mm 0.41
Windows	Double glazed, wood/PVC frame, 12 mm gap	na 2.8
Doors	Solid wooden	none 3.0

Heating systems characteristics: Fuel Efficiency

Primary	Central heating boiler, primary pipework uninsulated	Gas	80%
Secondary	Electric heaters	Electricity	100%
Hot water	From primary heating system. Separated time controls.		
Cylinder	Insulated with 35mm spray foam, cylinder thermostat		
Controls	Separated timers for SH and DHW, room thermostat		

Description
Timber frame construction started to become increasingly popular in the late 1990s and has made up more than 10% of the market from 2000 onwards. Apart from adding additional roof insulation, the focus for retrofit would be on upgrading the space & water heating systems.

Refurbishment steps — standard

Building fabric upgrade steps:

Roof insulation and standard package*	Add	200 mm mineral wool over existing insulation.
Expected U-values		215 (actual state)
		43 (actual state)
		C3

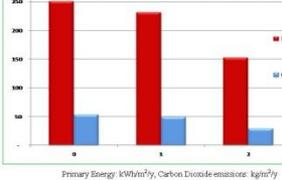
Walls are insulated, but the thickness of the insulation is below the stalling external wall insulation to achieve a U-value of 0.27 W/m²/K. In this case, around 80 years. Therefore it is not recommended on economic grounds is also possible, but due to long payback times, this step is not

Systems upgrade:

Space and water heating system and controls	Replace	Condensing boiler 90% efficient zones with time and thermostat water heating. Hot water cylinder insulated.
Expected U-values		150
		29
		B3

*Also includes draughtstripping, 80mm lagging jacket for DHW cylinder and low energy bulbs.

Refurbishment Steps—Standard Measures



Primary Energy: kWh/m²/yr, Carbon Dioxide emissions: kg/m²/yr

**Note: 1. Costs are indicative only, based on typical prices (2011). 2. Measures analyzed are one of many options, especially for the renewable heating systems.

Refurbishment steps — standard

Building fabric upgrade steps:

Roof insulation and standard package*	Add	150 mm of mineral wool over the existing insulation	Expected U-values	215 (actual state)	43 (actual state)	Energy Rating
			0.13	197	39	C2

Systems upgrade:

Space and water heating system and controls	Replace	Condensing gas boiler 90% efficient, additional space heating zone	Expected U-values	150	29	B3

Estimated costs and payback time**

Measure	Estimated costs	Payback (y)
Step 1	€ 950	8.6
Step 2	€ 2,060	7.6
Total:	€ 3,010	7.9

Standard upgrade summary

Consumption of primary energy reduced by:	65 kWh/m ² /yr
Emission of carbon dioxide reduced by:	14 kgCO ₂ /m ² /yr

**Note: 1. Costs are indicative only, based on typical prices (2011). 2. Measures analyzed are one of many options, especially for the renewable heating systems.



0

1 Roof insulat standard pack

2 Walls insulat

3 Windows and

4 Space and wa ing system and controls

*Also includes draught

0

1 Roof insulat standard pack

2 Walls insulat

3 Windows and

4 Space and wa ing system and controls

*Also includes draughtstripping,

0

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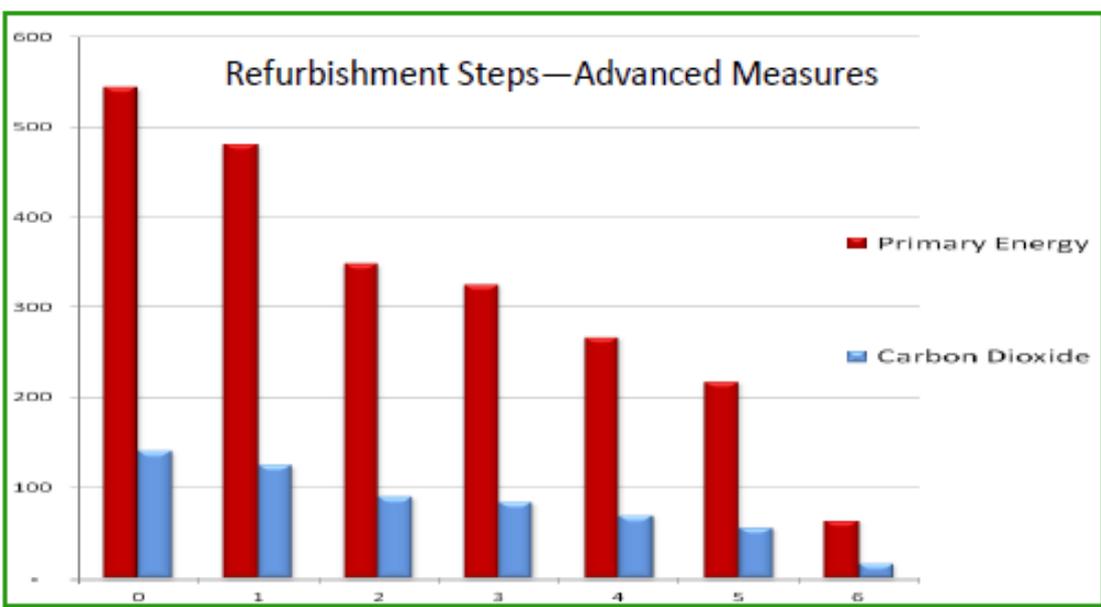
*Also includes draught



Typical roof upgrade (standard/advanced)		Heating system upgrade		
50mm of mineral wool between joists	Before: _____	Feature:	Standard	Advanced

Refurbishment steps — standard				Prim. energy kWh/m ² /y	Carbon Dioxide kgCO ₂ /m ² /y	Energy Rating	
Refurbishment steps — advanced				Prim. energy kWh/m ² /y	Carbon Dioxide kgCO ₂ /m ² /y	Energy Rating	
0	Building fabric upgrade steps:			Expected U-values	544 (actual state)	140 (actual state)	G
1	Roof insulation and standard package*	Add	250 mm mineral wool between and over the ceiling joists and installation of required roof vents .	0.13	481	125	G
2	Wall insulation	Add	150-200mm external insulation to both wall types	0.15	348	90	E2

* package also includes draught stripping, 80mm lagging jacket for HW cylinder and low energy bulbs.



Primary Energy: kWh/m²/y, Carbon Dioxide emissions: kg/m²/y

Estimated costs and payback time**		
Measure	Estimated costs	Payback (y)
Step 1	€ 2,354	3.1
Step 2	€ 23,693	16.3
Step 3	€ 754	2.9
Step 4	€ 12,887	20.1
Step 5	€ 3,847	7.1
Step 6	€ 20,101	12.6
Total	€ 63,636	12.15

Advanced upgrade summary	
Consumption of primary energy reduced by:	480 kWh/m ² /y
Carbon dioxide reduced by:	124 kgCO ₂ /m ² /y

**Note: 1. Costs are indicative only, based on typical prices (2014). 2. Measures analysed are one of many options, especially for the renewable heating systems.

Tips when planning Retrofits



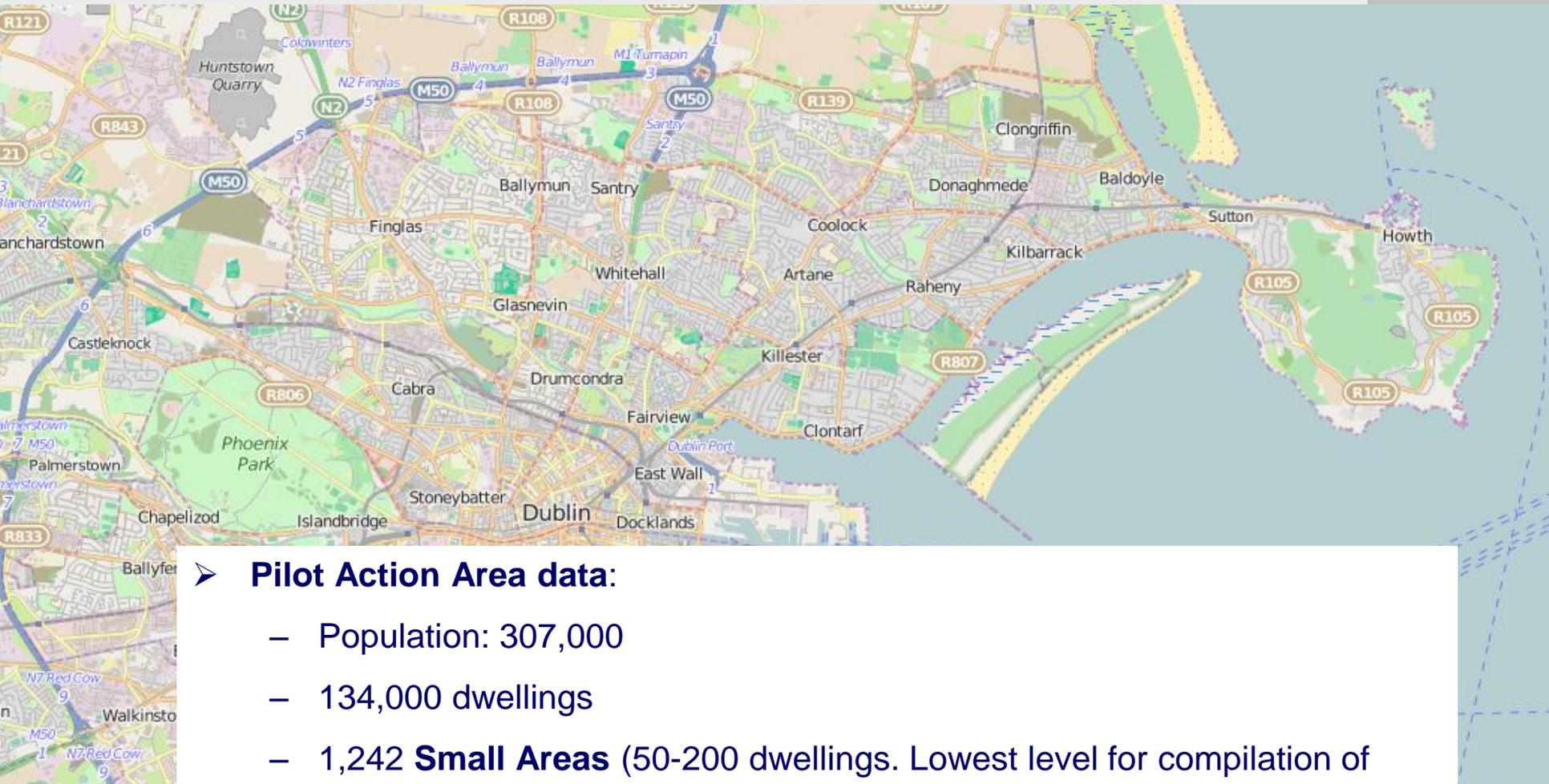
1. Address heat loss and ventilation losses before considering heating systems or renewables
2. Reduce heat losses via insulation upgrades to roofs, walls, floors (where possible), windows, doors with priority for shortest paybacks
3. Reduce ventilation losses via draught-proofing or replacement – ensure adequate ventilation is maintained and establish a ventilation strategy
4. Looking to the longer term, consider space and water heating options that will offer lowest running costs and/or best environmental impacts
5. For best final BER scores, be sure only to use materials or products with recognised Agreement / Test certificates
6. S.R. 54:2014 – Code of Practice for the energy efficient retrofit of buildings



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EPISCOPE Pilot Action: Tracking Energy Refurbishment on Northside of Dublin City



➤ Pilot Action Area data:

- Population: 307,000
- 134,000 dwellings
- 1,242 **Small Areas** (50-200 dwellings. Lowest level for compilation of statistics in line with data protection. Must nest within Electoral Divisions)
- 93 **Electoral Divisions** (smallest legally defined administrative areas in the State for which Small Area Population Statistics are published from the Census)

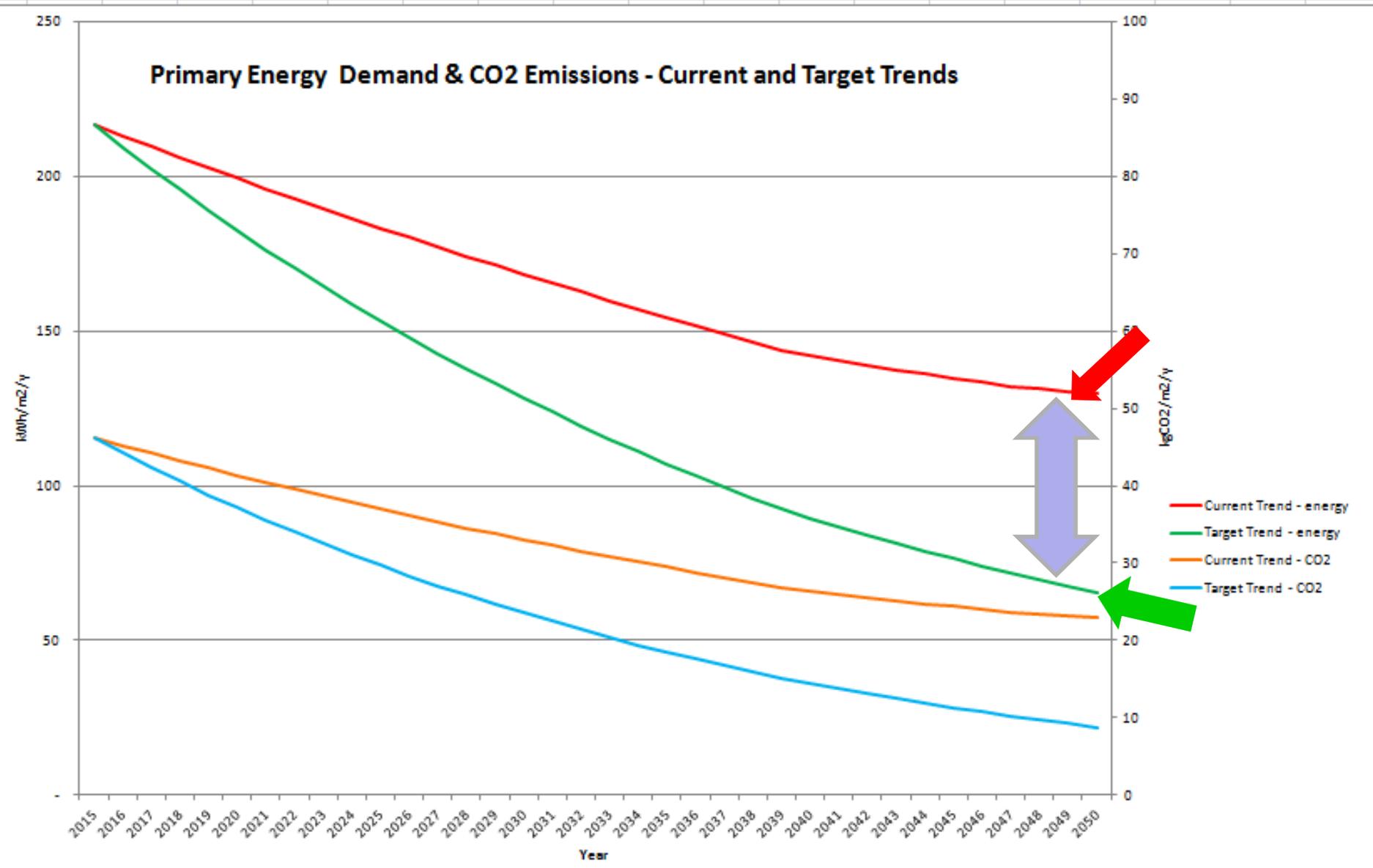
Aggregate Annual Refurbishment Rate/Trend – Northside of Dublin City

Aggregate Trend (annual):				
Element	3 * National Progr'mes	Field survey	BER Research Tool	Aggregate trend
Walls	1.06%	2.20%	2.50%	2.40%
Roofs	0.76%	4.50%	2.60%	3.60%
Windows	N.A.	3.20%	2.20%	2.70%
Boilers	0.51%	4.20%	2.00%	3.10%
Controls	0.04%	0.80%	N.A.	0.80%

Aggregate trend gives base assumption for 'business as usual' Trend Scenario



Current Trends & Target Trends (primary energy calibrated for actual use)



EPISCOPE Pilot Action Target Scenario



To bridge the gap to achieve 80% by 2050 will require, in addition to the current trend, we need to achieve

- a DEEP retrofit of 75% of the residential stock (i.e. to primary energy value of circa 43 kWh/m²/year)
- A 65% decarbonisation of the electricity grid

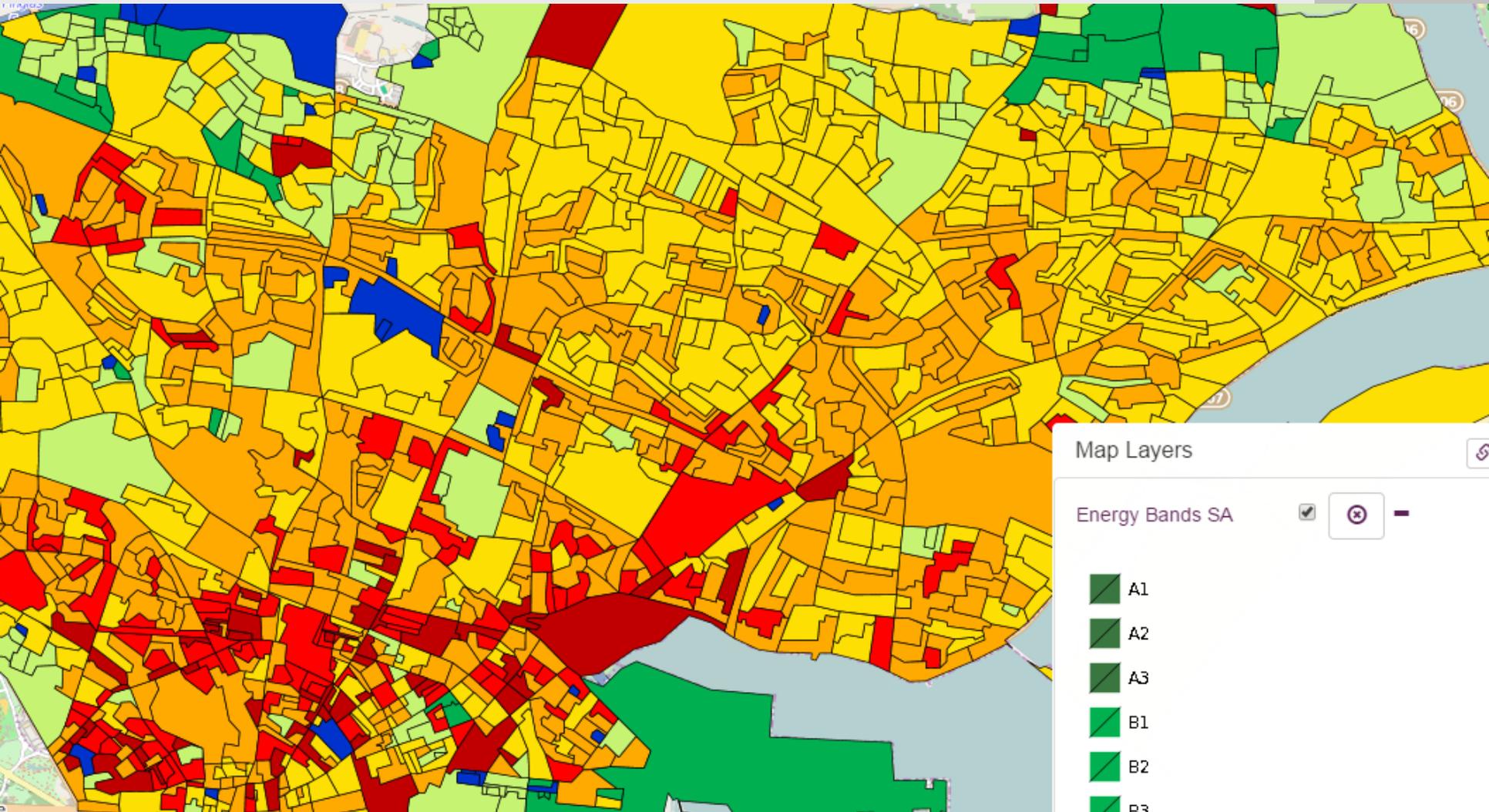
Here's a mapped view



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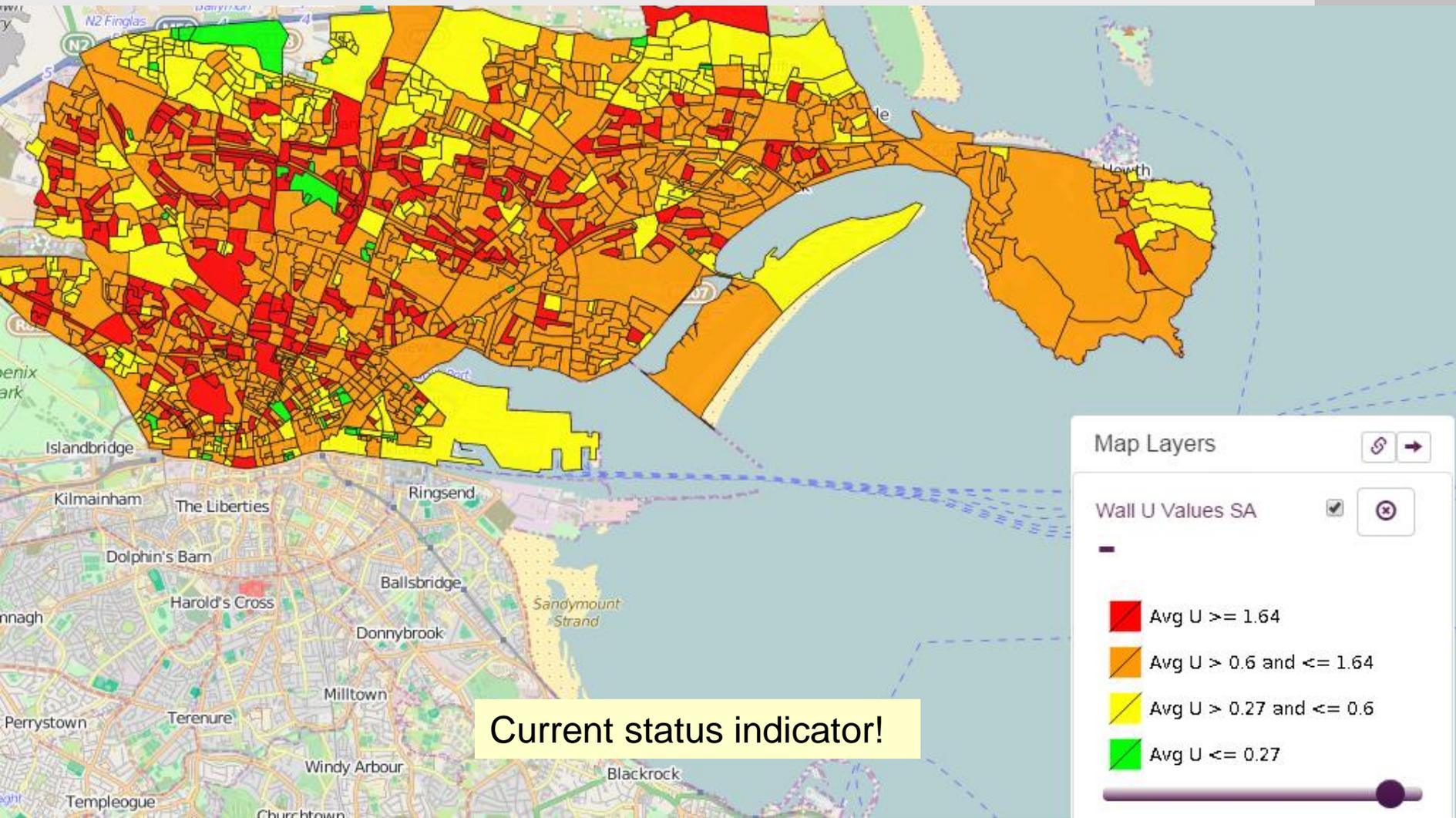


BER Ratings – average D2

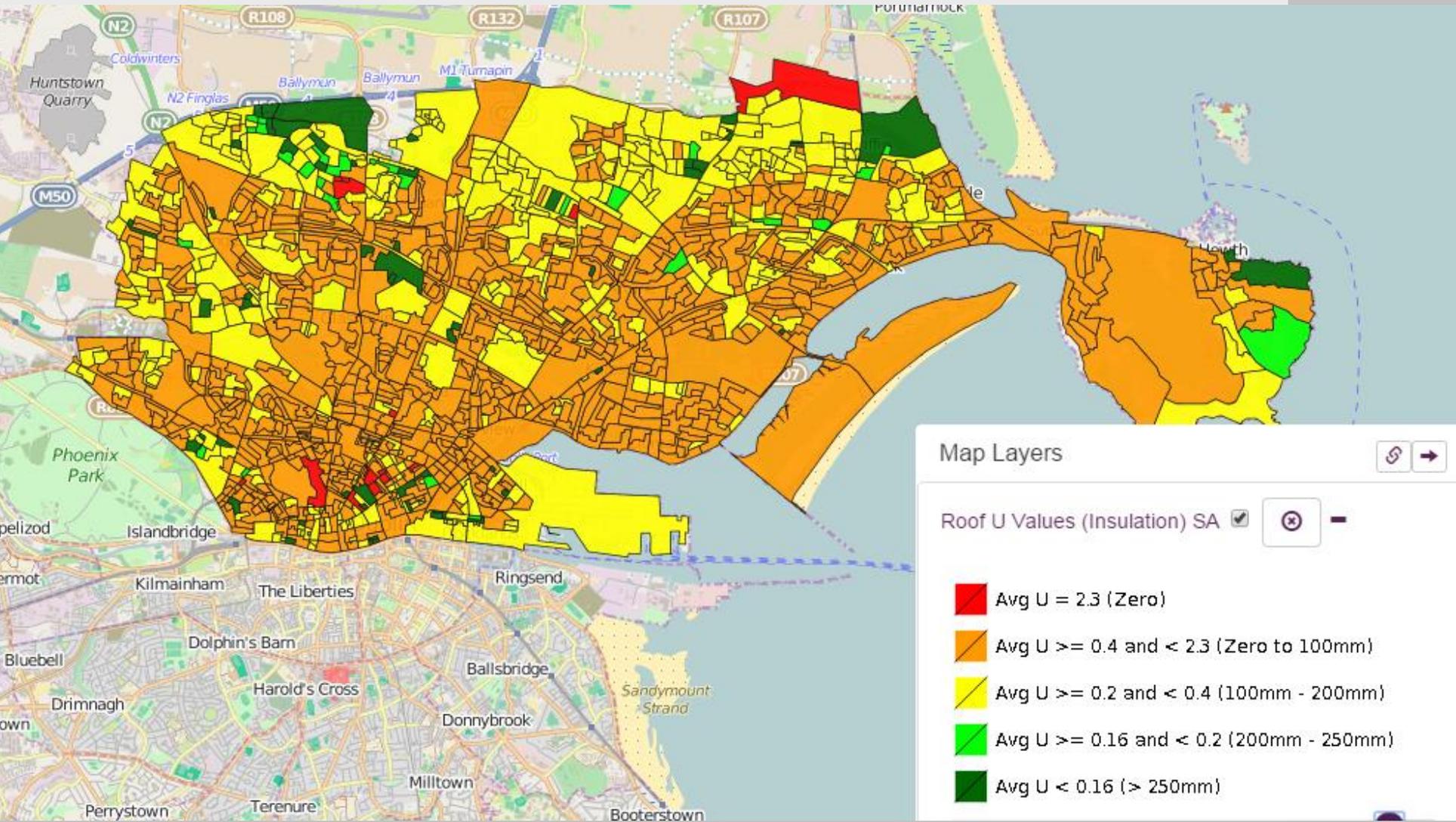


<http://energyaction-static.s3-website-eu-west-1.amazonaws.com/index.html>

Wall U Values



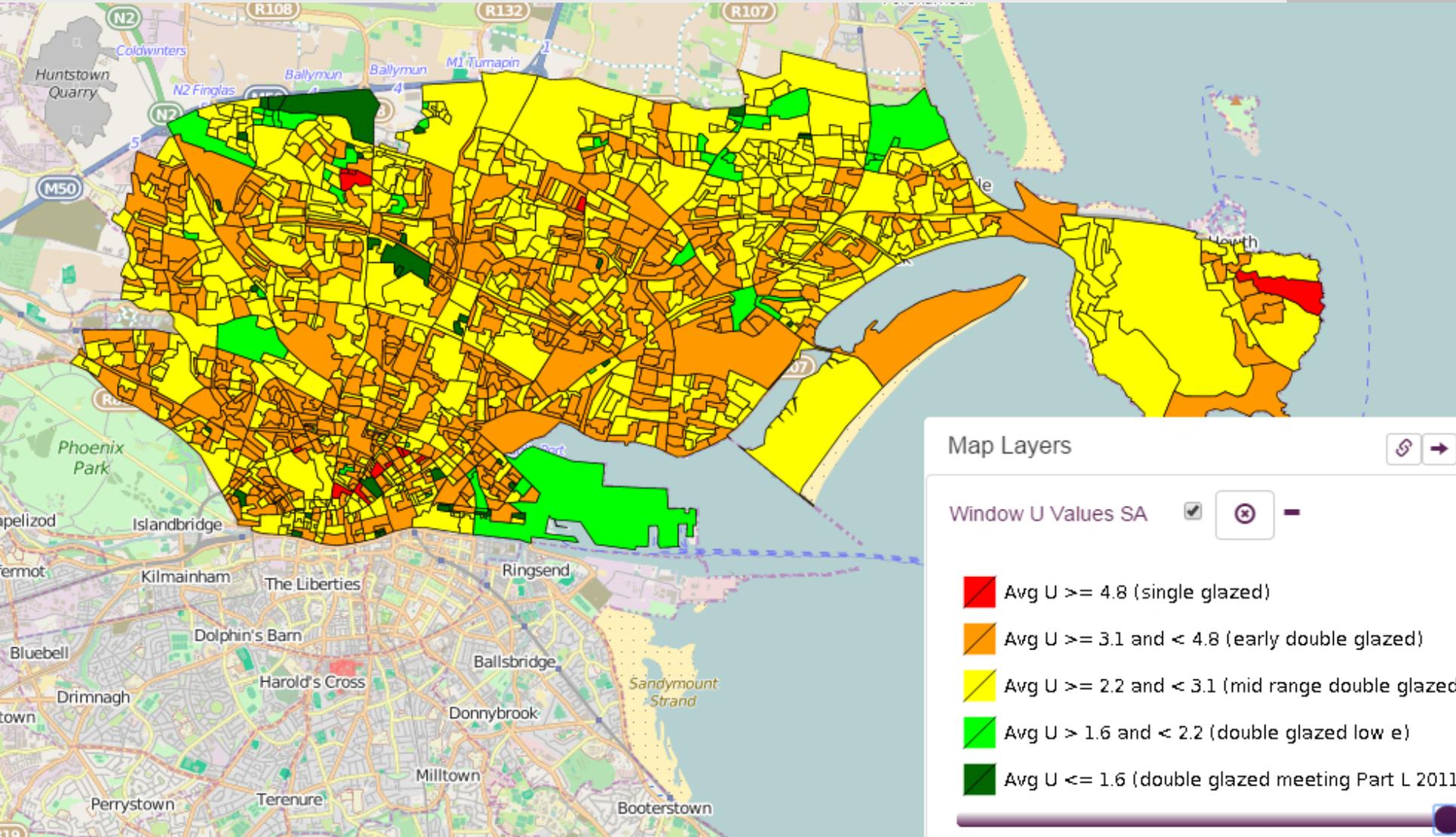
Roof U Values



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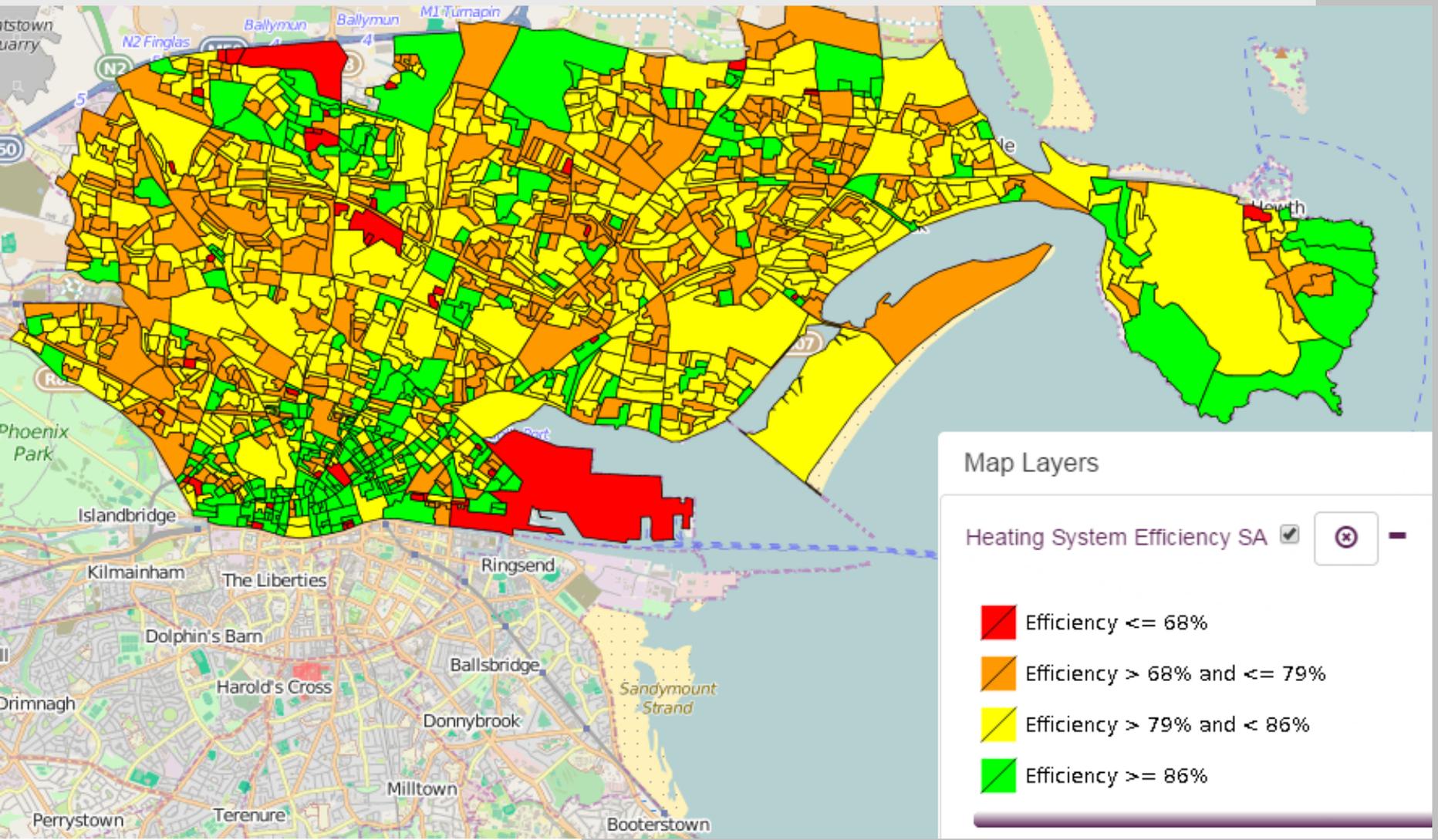
Window U Values



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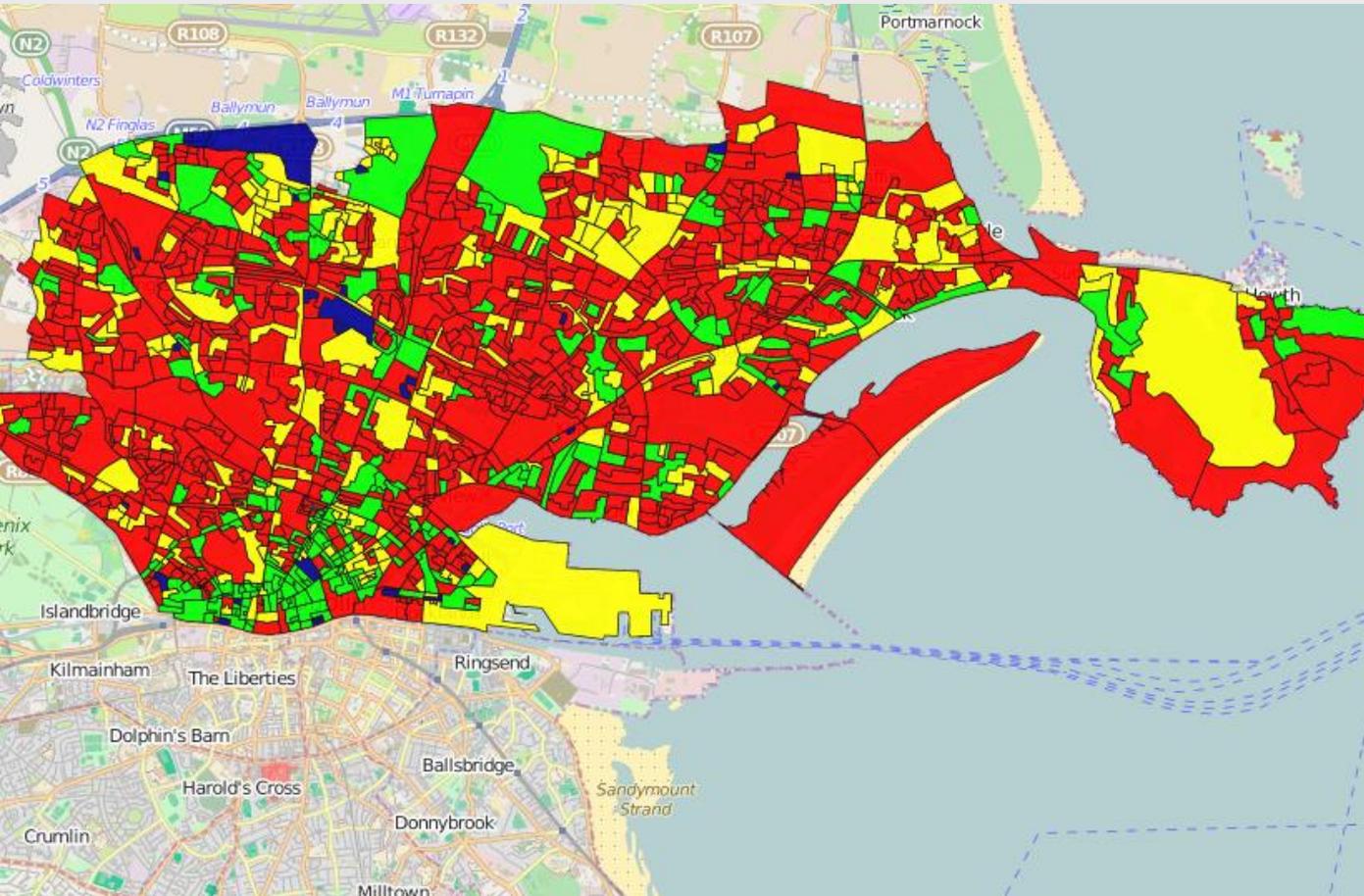
Primary Heating Efficiency



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Heating Controls



Map Layers

Heat Controls Category SA *

- A: No Thermostatic Control
- B: Room Thermostatic Control
- C: Full Zone Control
- Not Defined

Heat Controls Category SA Pie

- A: No Thermostatic Control
- B: Room Thermostatic Control
- C: Full Zone Control

1



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Conclusion

- Huge amount of energy retrofit to be done
- The involvement of local community groups is critical – one-off retrofits won't suffice
- Lots of excellent resources available
- Finally, watch out for NZEB Open Door events weekend of 11th – 13th November 2016

www.nzeb-opendoors.ie

