



European Construction Sector Observatory

Policy fact sheet

Ireland

Home Performance Index

Thematic objectives 3, 4 & 5

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In a nutshell

Implementing body	Irish Green Building Council (IGBC)
Key features & objectives	The Home Performance Index (HPI) is Ireland’s first national voluntary certification system for quality and sustainable residential development.
Implementation date	2015 (system piloted) 2016 – ongoing (system live)
Targeted beneficiaries	Developers and buyers of residential homes and the entire built environment value chain.
Targeted sub-sectors	Residential, energy efficiency.
Budget (EUR)	Not published.
Good practice	★ ★ ★ ★ ★
Transferability	★ ★ ★ ★ ★

The Irish Green Building Council¹ (IGBC) is a unique network of organisations that represent the entire built environment value chain in Ireland. Founded in 2011 as a non-profit organisation, IGBC has 160 members. They include universities, professional institutes, NGOs, local authorities, contractors, architects, engineers, energy companies, and leading national and transnational companies.

The main role of IGBC is to educate, advocate, rate, communicate and most of all collaborate for a better, greener built environment. IGBC members are united in their pursuit of one common goal – to accelerate the transformation of the built environment value chain, including related industries and supply chains, to one that is sustainable through leadership, research, education, and providing policy input to national and local government².

To aid their leadership and work towards a sustainable environment and their input into policy on climate action, **IGBC has developed tools** to provide credible metrics to measure progress towards sustainability³:

- The **Environmental Product Declaration (EPD) Ireland programme** provides transparent information on the environmental impact of construction products and enable the mainstreaming of lifecycle assessments (LCAs) for buildings in Ireland;
- **An independent certification system – the Home Performance Index (HPI)** – to improve the environmental quality of new homes;
- **Comprehensive listing of green building certifications and accredited professionals** – Leadership in Energy and Environmental Design (LEED⁴), Building Research Establishment Environmental Assessment Method (BREEAM⁵), and HPI.

To develop HPI, IGBC studied existing sustainability assessment systems, including UK’s Code for Sustainable Homes, Sweden’s GBC MiloByggnad (Green Building), Germany’s DGNB system and the international LEED for Homes. Based on that analysis, the most useful criteria for Ireland were selected⁶.

HPI was designed to be easy to apply and fully integrated with Irish Building Regulations to avoid duplication. It was piloted in 2015 on a small number of developments and was brought to market in 2016, supported by funding from the Environmental Protection Agency⁷.

HPI is a successful scheme that has rapidly grown the number of homes registered on HPI certification system by nearly 3,000% in 2018 and again in 2019. According to the latest data published by IGBC, there were 2,350⁸ homes registered on HPI certification system in 2019.

1.

General description

The Home Performance Index is Ireland’s first national voluntary certification system for quality and sustainable residential development.

HPI is an independent third-party system that assesses the overall environmental and sustainability credentials of residential developments across a range of indicators. The system complements existing schemes used in the commercial sector such as LEED and BREEAM.

HPI provides home builders and home buyers with a trusted quality label that is based on verifiable indicators.

HPI was developed by IGBC in consultation with its members, major housing developers, housing associations, the main construction institutes and state agencies. It is informed by an extensive review of best international and European practices for the design of assessment and certification systems for sustainable housing.

HPI is one of the instruments being deployed by IGBC to address issues of housing quality and sustainability. The ultimate aim is to provide good quality housing and to future proof the Irish housing stock to meet the commitments set out at COP21 in Paris to tackle climate change. The HPI system recognises that carbon emissions result from the full lifecycle of housing construction and usage, as well as the decision of where to locate the housing⁹.



HPI provides a voluntary framework for designing, assessing and certifying new residential design and construction. By addressing performance criteria, HPI is

enabling all sectors of the housing chain to evaluate performance from their individual perspective.

The **main objectives**¹⁰ of HPI are to:

- Provide home buyers with performance data about the home they are purchasing and encourage them to seek exemplary performance;
- Help financial institutions to assess the quality of assets on which they are lending, with a view to enabling the introduction of green mortgages;
- Allow those procuring new residential developments, such as local authorities and housing associations, to set clearly measurable performance requirements for new homes;
- Reward contractors and developers for their conscientious approach;
- Encourage design teams to set targets early at the design stage and work together as a team to achieve them.

HPI certification is based on over 30 verifiable indicators that are divided into five categories: Environment, Economic, Health and Wellbeing, Quality Assurance and Sustainable Location.

Table 1 summarises each category and its associated indicators. Most indicators allow for several levels of achievement based on good, better and best practice. Certification awards are based on overall attainment across all categories and indicators.

Table 1: HPI categories and indicators

Categories	Summary of indicators
Environment	Measures the full environmental footprint of the housing development, including land use, loss of biodiversity, density, water consumption, energy use, and the impact of materials used

	in construction.
Health and well-being	Deals with issues that impact the well-being of occupants, e.g. daylight; indoor air quality; acoustics; and walkability of the neighbourhood.
Economics	Addresses occupant running costs, from transport to energy, and the long-term value stability of the home, such as its capacity to adapt to changing family circumstances.
Quality assurance	Measures the quality of the design and construction team, air infiltration and other measures, ensuring a rigorous approach to the design and construction process. It also provides a testing regime to ensure that the design intention is achieved.
Sustainable location	Assesses the accessibility of schools, shops, parks, services, public transport and walking and cycling paths. It also assesses key risks on the site, such as flooding.

Source: Surveyors Journal, Home Performance Index & HPI Technical Manual¹¹

Mandatory/voluntary criteria and award levels

Mandatory requirements are set in the most important areas, such as water efficiency, ventilation, thermal bridging, and enhanced air tightness. For example, a maximum air infiltration level of 3m³hr/m²/50Pa was set (as opposed to 7m³hr/m²/50Pa in the current building regulations) in addition to a properly designed and commissioned ventilation system being installed. It also sets a maximum annual heat demand, encouraging builders to provide the most efficient building fabric first rather than achieving a higher rating through renewables. This is based on the view that the fabric cannot easily be improved afterwards whereas additional renewables can be retrofitted¹².

Award levels reflect good, better and best practice in Ireland. Not all criteria need to be assessed to achieve certification, as shown in Table 2.

There are **three levels of certification**:

- **CERTIFIED** signifies that a basic set of criteria that go beyond building regulations are met;
- **SILVER** demonstrates that additional voluntary criteria are met;
- **GOLD** shows real leadership, going well above the minimum criteria.

For each level, mandatory performance standards in certain indicators must be achieved, in addition to the required score.

Table 2: HPI award levels

Award levels	Performance against indicators
	≥ 35%
	≥ 50%
	≥ 70%

Source: Home Performance Index Technical Manual¹³

The design team is encouraged to work from a very early stage to achieve targets. They provide the evidence requested for each of the indicators. The evidence is then audited for compliance and, if successful, certification can be awarded for the level achieved.

To achieve certification, the dwelling is required to demonstrate that it is designed to meet minimum performance levels in certain indicators which may exceed standard building regulations.

Points are awarded for each indicator and the development must meet a target score. The minimum score is based on good performance across the core indicators. Where poor performance is unavoidable in certain indicators, it is offset by targeting enhanced performance in others.

Where development fails to achieve the required score from core indicators, it must assess further indicators. Where certification is already achieved within these core indicators, the developer can achieve an enhanced level certification by assessing and meeting criteria within non-core indicators.

In all cases, evidence must be provided in support of each indicator before points can be awarded.

Principal HPI beneficiaries and benefits

HPI provides developers and buyers with a range of important benefits, as shown in Table 3.

Table 3: Principal HPI beneficiaries and benefits

Beneficiaries	Benefits
Developers	<ul style="list-style-type: none"> • Build in value, not cost, for their business • Communicate the quality of housing to homebuyers; • Demonstrate the quality of the development to planning authorities, potentially saving time and cost; • Provide a third party verified sustainability indicator to investment funds and housing associations; • Enable design and construction teams to work more effectively together, setting and achieving quality and sustainability targets; • Add value to their development and investment portfolio.
Home Buyers	HPI provides home buyers with the assurance that their homes have been designed and

	constructed with care to ensure low running costs, enhance occupant well-being and minimise environmental impact.
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Source: Home Performance Index¹⁴

The HPI assessor training and certification programme

To support the sustained delivery of HPI certifications across Ireland, IGBC provides an HPI assessor training and accreditation programme. The aim is to build a pool of highly skilled and **certified HPI Assessors**.

There are **three stages** to the HPI training programme:

- **Trainees review the training materials, manuals and tools** one week in advance of the programme;
- **One day practical training** on the use of the Home Performance Index and associated tools. It includes three training sessions:
 - Understanding HPI environmental assessment, e.g. methodology, when to apply it, monitoring and quality assurance, mandatory and voluntary criteria, categories, indicators, scoring system and award levels;
 - Organising and delivering HPI assessments, e.g. information required, indicators, calculators, assessment results and organising assessment for certification;
 - Assessment method introduction, e.g. assessment and data spreadsheets, method conventions and assumptions, and exemplar home data;
- **Completion of the practical assessment** based on a set of provided evidence. Trainees are given an assignment to assess a home based on evidence provided for the different indicators. They must submit the assessment spreadsheet and report within four weeks. On successful completion, they are awarded accreditation.

2.

Achieved or expected results

The Home Performance Index scheme has achieved considerable success, with 2,350¹⁵ homes currently registered on the HPI certification system.

The number of HPI projects certified has risen sharply each year since the scheme's launch.

Following the award of three HPI certificates in 2017¹⁶, the number rose by 2,700% to 81 awards in 2018¹⁷, and by a further 2,900% to 2,350 awards in 2019¹⁸.

Examples of HPI certified developments



The first HPI gold certificate was awarded to a private house in Cork. Shown in Figure 1, the house was designed by Wain Morehead Architects. It was awarded the highest rating in recognition of its **very high-quality features and best practice performance** against cost, well-being and environmental indicators¹⁹.

The home was designed to have extremely low heating bills, meeting the Passive House standard, and is equipped with smart energy monitoring technology. It was also designed for possible mobility impairment.

To assure the well-being of occupants, the home provides good indoor air quality at all times, CO₂ monitoring, excellent natural daylight throughout, and very high-performance windows.

The environmental benefits include reduced water consumption (up to 80% compared to typical Irish homes) and added ecological value by increasing the number of plant species. The home also achieved an A1 Building Energy Rating (BER), meeting the Near Zero Energy Building (nZEB) Standard. In addition, the ecological footprint of the materials used to construct the home was assessed.

Figure 1: HPI Gold certified passive house at Wayside, Douglas Road, Cork



Source: Home Performance Index²⁰



Rapid delivery housing at George's Place²¹ in Dún Laoghaire (County Dublin) is a pathfinder project implemented by Dún Laoghaire Rathdown County Council. Its purpose was to explore how social housing could be delivered rapidly using factory-built components, while ensuring the maintenance of very high building and energy standards.

The project was the **first housing scheme to be awarded an HPI silver certificate** in recognition of their **better practice performance** against cost, well-being and environmental indicators²².

The homes were designed to have very low heating and energy bills due to its A1 BER rating. Well-being is addressed by providing good indoor air quality at all times, excellent natural daylight throughout, sound insulation that exceeds minimum regulations, and high-performance windows.

George's Place also received the highest ever score for walkability, reducing car dependency and boosting the health and financial well-being of residents.

Environmental benefits include the re-use of a brownfield site to preserve greenfield land for other uses (e.g. wild life), an A1 BER rating that ensures the lowest carbon emissions compared to typical Irish homes, and careful monitoring of construction site waste ensuring 95% was diverted from landfills. The site location near multiple transport links and the density of homes built, also have the potential to improve local services and reduce carbon emissions from car transport.

Figure 2: HPI Silver certified rapid delivery housing at George’s Place, Dún Laoghaire (Dublin)



Source: Dún Laoghaire Rathdown County Council²³



The **Silken Park housing scheme**²⁴ in west side of Dublin, shown in Figure 3, is the **largest certified passive house development in Ireland** and was the **first HPI certified private development**. Silken Park homes were built by Durkin Residential using masonry construction techniques, utilising local materials and local skills, and supported by a smart, methodical and lean approach to design and construction.

The HPI certification was awarded to Silken Park²⁵ homes in recognition of their **good practice performance** against cost, well-being and environmental indicators. The homes have been designed to have extremely low heating bills, meeting the Passive House standard. Well-being is addressed by providing good indoor air quality at all times, excellent natural daylight throughout, sound insulation that exceeds minimum regulations, and high-performance windows. Environmental benefits include reduced water consumption (by 25-40%), responsible use of land, and Building Energy Ratings (BER) of A3 and A2,

ensuring much lower carbon emissions than typical Irish homes²⁶.

Figure 3: HPI certified Silken Park development (Dublin Citywest)



Source: Home Performance Index²⁷

HPI certification costs²⁸

To gain certification for residential developments, developers are required to pay an initial HPI registration fee, followed by a certification fee depending on the number and type of homes they wish to have assessed and certified. The registration fees are shown in Table 4.

Table 4: HPI registration fees

Number of homes	Fee (EUR)
1-5	120
5-20	150
20-100	175
100+	250

Source: Home Performance Index²⁹

The certification fees³⁰ are calculated per unit and unit type (excluding VAT):

$$(Number\ of\ unit\ types\ x\ EUR\ 100.00) + (total\ number\ of\ units\ x\ EUR\ 50.00)$$

Example A

The cost calculation for a development of 63 homes containing 5 different design layouts would be:

$$(100\ x\ 5) + (63\ x\ 50) = EUR\ 3,650$$

Example B

The cost calculation for a single home would be:

$$(100 \times 1) + (1 \times 50) = \text{EUR } 150$$

HPI assessor training

To support the implementation of the HPI scheme, IGBC has also succeeded in developing a pool of Certified HPI Assessors. To date, a total of 56 professionals have completed the HPI assessor training and accreditation programme. They are listed on the IGBC website³¹.

HPI v2.0 update

In 2019, the Irish Green Building Council launched version 2.0³² of the Home Performance Index. The new version includes a range of amendments to align HPI and its indicators with updated standards, as well as performance and certification criteria. Key examples include:

- Alignment of HPI v2.0 with the **International Living Future Institute (ILFI) Zero Carbon certification**³³, which aims to contribute to the achievement of zero carbon targets by 2050;
- Introduction of health and wellness performance criteria, enabling HPI to be **recognised as an approved Health and Wellness Rating system**, under Well

Communities³⁴, for use in Well Communities certification.

Green mortgages

IGBC is working with a wide range of national and international partners to help banks, investors, pension funds, developers and government to develop a robust definition of sustainable development. The purpose is to help facilitate the provision of tailored financial products, such as green mortgages, to support and encourage the demand for greener homes³⁵.

Following IGBC's recent collaboration with the World GBC and the European Mortgage Federation, energy efficient mortgages are now being piloted by 40 banks across Europe³⁶.

IGBC is also collaborating with an additional 16 international partners to further develop green mortgage programmes and expand them beyond the scope of energy efficiency. Here, verifiable data is key. Denmark Technical University is carrying out detailed research on the total monthly costs of homes. The aim is to provide real data to enable banks to offer better interest rates on mortgages for greener homes, based on their lower default risk³⁷.

3.

Perspectives and lessons learned

The Home Performance Index provides home buyers with an assurance of a better-quality home.

HPI assessment and certification framework assures home buyers that they are purchasing a home that has been designed and built to a high standard. It provides an assurance that their new home will ensure low running costs, enhance occupant well-being and minimal environmental impact. Buyers can also be confident that HPI certification will add value to their property.

HPI enables developers to communicate the quality of a home to a buyer.

HPI assesses a home across a wide range of quality indicators, from energy efficiency to indoor air quality, natural lighting, the impact of the construction materials used, the ecological impact of the overall development, as well as the proximity to local amenities (shops, schools, transport, etc.). Risk factors, such as potential flooding, are also covered.

The efficiency and sustainability of a home is not just a desirable outcome, it is guided by a comprehensive standards-based certification system and is in demand. This provides a strong business case for developers and it also makes it easier for developers to communicate the quality features of a building to potential buyers and planners.

The Executive Director of the Irish Green Building Council stated that in recent years, *“we have seen a big uptake by commercial developers using sustainability certification schemes such as BREEAM and LEED for their new office development. There is now an appetite from the quality builders to implement the same best practice on their residential development”*³⁸.

HPI provides a benchmark for high quality and sustainable new homes in Ireland.

The HPI certification system has adapted more than 30 indicators used in other assessment and certification systems around the world to create a quality benchmark for new homes in Ireland. Developers and buyers now have a transparent framework against which to measure the quality and sustainability of new homes and make informed decisions.

According to the Managing Director of Wain Morehead Architects³⁹, *“With HPI, we feel there is finally a comprehensive standard to benchmark quality home delivery in Ireland. It ticks all the sustainability boxes”*. Wain Morehead designed a passive house at Wayside (Douglas Road) in Cork which received the first HPI gold certificate in Ireland.

HPI certification helps to de-risk lending to developers and buyers.

According to the Executive Director of IGBC, *“A certified home is a pretty good indicator of the quality of the development. It adds to the home’s asset value and generally means reduced energy, water and transport costs for the homebuyer and therefore reduced risk of mortgage defaults”*⁴⁰.

HPI scheme provides the opportunity to promote greener homes through smarter finance.

IGBC is currently working with banks and developers **to link the Home Performance Index certification with discounted Green mortgages**. The main goal is to allow banks to have a robust and credible definition of a ‘Green Mortgage product’. The collaboration also aims to educate home buyers on what to look for in high-quality, healthy homes and enable them to access more affordable monthly payments⁴¹.

4.

Conclusion and recommendations

The Home Performance Index has achieved considerable success since its launch in 2016. A total of 56 professionals have completed the HPI training course to become Certified HPI Assessors. With their support, the scheme has managed to expand the number of new homes registered on the HPI certification system by almost 3,000% annually in both 2018 and 2019. The total number of HPI certified homes increased from just three in 2017 to 81 in 2018 and to 2,350 in 2019.

The scheme is successful and is growing exponentially because it delivers tangible benefits for all concerned. Home buyers benefit from a better-quality home that affords a better quality of life, a lower carbon footprint and lower running costs. Developers benefit from greater brand recognition by delivering added value services, increased customer demand, better customer communication, a lower carbon footprint, and time and cost savings. Localities and society benefit from higher quality housing with a minimal impact on the environment.

Looking forward, one recommendation is suggested to help improve the reach and impact of HPI:

- The growing success of the HPI scheme suggests that the scope of the HPI assessment and certification system could and should be extended to cover all homes in Ireland, existing homes as well as new builds.

Overall, the Home Performance Index is rated a '5-star good practice measure' on a scale of 1 (low) to 5 (high).

This score is based on the HPI development approach adopted by IGBC, which is founded on

international standards and best practices. Assessment and certification systems in other countries around the world were studied and relevant indicators were incorporated into the HPI assessment and certification system.

Although HPI is a voluntary certification system, it has achieved a high level of success in a relatively short period of time by incentivising both home buyers and developers. With a growing demand for sustainable homes, HPI enables buyers to have confidence in the quality of the home they are purchasing. On the supply side, HPI provides residential developers with a strong business case. They benefit from a quality and standards-based framework that enables them to meet the growing customer demand and improve their brand.

The highest good practice score is also awarded for the continued work of IGBC to expand and improve the HPI certification system. Alignment with updated and additional standards, and performance and certification criteria, is needed to assure the long-term sustainability of the scheme and the homes it aims to support.

The Home Performance Index is rated a '5-star transferable measure' on a scale of 1 (low) to 5 (high).

This score is based on the fact that there are similar assessment and certification systems in place in other countries. HPI was developed following a review of other systems in operation around the world, e.g. Germany; Sweden; and the UK. HPI has also adapted more than 30 indicators that are used in other systems. The HPI research and development process itself is evidence that the HPI scheme is highly transferable.

Endnotes

- 1 Irish Green Building Council (IGBC):
<https://www.igbc.ie>
- 2 Irish Green Building Council (IGBC), About:
<https://www.igbc.ie/about/>
- 3 Copenhagen Centre on Energy Efficiency, Irish Green Building Council (IGBC):
https://c2e2.unepdtu.org/kms_object/irish-green-building-council-igbc/
- 4 LEED (Leadership in Energy and Environmental Design) is an internationally recognized green building certification system developed by the US Green Building Council (USGBC):
<https://www.usgbc.org/leed>
<https://www.igbc.ie/certification/leed/>
- 5 BREEAM, How BREEAM certification works:
<https://www.breeam.com/discover/how-breeam-certification-works/>
- 6 Surveyors Journal, The Home Performance Index, 2018:
<http://www.surveyorsjournal.ie/index.php/home-performance-index/>
- 7 Ibid
- 8 Copenhagen Centre on Energy Efficiency, Irish Green Building Council (IGBC):
https://c2e2.unepdtu.org/kms_object/irish-green-building-council-igbc/
Irish Green Building Council (IGBC), Activity Report 2019:
<https://www.igbc.ie/wp-content/uploads/2019/12/IGBC-Activity-Report-Web-13.12.19.pdf>
- 9 Home Performance Index, Technical Manual, Nov 2019:
http://homeperformanceindex.ie/wp-content/uploads/2020/09/HPI-technical-Manual-v2.0_with_corrections_since_publication.pdf
- 10 Ibid
- 11 Surveyors Journal, The Home Performance Index, 2018:
<http://www.surveyorsjournal.ie/index.php/home-performance-index/>
Irish Green Building Council (IGBC), Home Performance Index, Technical Manual, Version 1.1:
https://www.igbc.ie/wp-content/uploads/2018/01/HPI_technical_Version_1.1_Jan_2018.pdf
- 12 Engineers Ireland, The Home Performance Index measuring the sustainability of our new homes:
<https://www.engineersireland.ie/Brexit/the-home-performance-index-measuring-the-sustainability-of-our-new-homes>
- 13 Irish Green Building Council (IGBC), Home Performance Index, Technical Manual, Version 1.1:
https://www.igbc.ie/wp-content/uploads/2018/01/HPI_technical_Version_1.1_Jan_2018.pdf
- 14 Home Performance Index (Irish Green Building Council, IGBC):
<http://homeperformanceindex.ie>
- 15 Copenhagen Centre on Energy Efficiency, Irish Green Building Council (IGBC):
https://c2e2.unepdtu.org/kms_object/irish-green-building-council-igbc/
- 16 Irish Green Building Council (IGBC), Activity Report 2017:
<https://www.igbc.ie/wp-content/uploads/2017/12/IGBC-Activity-Report-Web-Final-14.12.17.pdf>
- 17 Irish Green Building Council (IGBC), Activity Report 2018:
<https://www.igbc.ie/wp-content/uploads/2018/11/IGBC-Activity-Report-Web-19.11.18.pdf>
- 18 Copenhagen Centre on Energy Efficiency, Irish Green Building Council (IGBC):
https://c2e2.unepdtu.org/kms_object/irish-green-building-council-igbc/
Irish Green Building Council (IGBC), Activity Report 2019:
<https://www.igbc.ie/wp-content/uploads/2019/12/IGBC-Activity-Report-Web-13.12.19.pdf>
- 19 Home Performance Index, Certified Homes, Passive House at Wayside, Douglas Road, Cork:
<http://homeperformanceindex.ie/find-a-home/douglas-rd/>
- 20 Ibid
- 21 Housing Europe, Delphis, IUT, European Responsible Housing Awards, Handbook 2019:
<https://www.iut.nu/wp-content/uploads/2019/06/European-Responsible-Housing-Awards-2019-HANDBOOK.pdf>

- 22 Home Performance Index, Certified Homes, George's Place:
<http://homeperformanceindex.ie/find-a-home/silken-park-3/>
- 23 Dún Laoghaire Rathdown County Council, George's Place, Rapid Delivery Housing:
<https://www.dlrco.co/en/architecture/architecture-projects-case-studies/georges-place-rapid-delivery-housing>
- 24 Passive House Plus, Ireland's largest passive house scheme shows the way to nZEB, July 2017:
<https://passivehouseplus.ie/magazine/new-build/ireland-s-largest-passive-house-scheme-shows-way-to-nzeb>
- 25 Home Performance Index, Silken Park first to achieve HPI certification for private development, Feb 2017:
<http://homeperformanceindex.ie/silken-park-first-to-achieve-hpi-certification-for-private-development/>
- 26 Home Performance Index, Certified Homes, Silken Park:
<http://homeperformanceindex.ie/find-a-home/silken-park/>
- 27 Home Performance Index, Certified Homes, Silken Park:
<http://homeperformanceindex.ie/find-a-home/silken-park/>
- 28 Home Performance Index, Developer:
<http://homeperformanceindex.ie/developer/>
- 29 Ibid
- 30 Ibid
- 31 Irish Green Building Council (IGBC), Looking for an HPI, LEED, BREEAM or WELL Accredited Professional:
<https://www.igbc.ie/looking-for-a-leed-professional/>
- 32 Irish Green Building Council (IGBC), Activity Report 2019:
<https://www.igbc.ie/wp-content/uploads/2019/12/IGBC-Activity-Report-Web-13.12.19.pdf>
- 33 International Living Future Institute (ILFI), Zero Carbon Certification:
<https://living-future.org/zero-carbon-certification/>
- 34 Well Communities, Health and Wellness Certification:
<https://www.wellcertified.com/certification/community/>
- 35 Passive House Plus, Social Skills – The A1 rapid build council homes that are sustainability all-rounders, Green mortgages, 2019:
<https://passivehouseplus.ie/magazine/feature/social-skills-the-a1-rapid-build-council-homes-that-are-sustainability-all-rounders>
- 36 Ibid
- 37 Ibid
- 38 Construction Network Ireland, IGBC launch Ireland's first label for sustainable homes, 2016:
<https://www.constructionnetworkireland.com/igbc-launch-irelands-first-label-sustainable-homes/>
- 39 Irish Green Building Council (IGBC), First Home Performance Index Gold Certification Awarded, Nov 2017:
<https://www.igbc.ie/first-home-performance-index-gold-certification-awarded/>
- 40 The Irish Times, Home Performance Index ticks all the green boxes, Nov 2017:
<https://www.irishtimes.com/special-reports/property-construction-land-prospects/home-performance-index-ticks-all-the-green-boxes-1.3269935>
- 41 Irish Green Building Council (IGBC), Activity Report 2019:
<https://www.igbc.ie/wp-content/uploads/2019/12/IGBC-Activity-Report-Web-13.12.19.pdf>