

BUILT TO LAST

The Sustainable Reuse of Buildings

TÓGTHA LE MAIREACHTÁIL

Athúsáid Inbhuanaithe Foirgneamh

An Action of the Dublin City Heritage Plan
Gníomh de chuid Phlean Oidhreachta Chathair Bhaile Átha Cliath

2004



Contents

Clár Ábhar

1	INTRODUCTION / RÉAMHRÁ	2
2	EXECUTIVE SUMMARY / ACHOIMRE FEIDHMEACH	3
3	CONCLUSIONS AND RECOMMENDATIONS / TÁTAL AGUS MOLTAÍ	5
4	CASE STUDIES METHODOLOGY / MODHEOLAÍOCHT CÁS-STAIDÉAR	7
5	CASE STUDIES RESULTS / TORTHAÍ CÁS-STAIDÉAR	10
6	SUPPLEMENTARY INFORMATION / EOLAS CÚLRA	20
	DEFINITION OF TERMS / SAINMHÍNIÚ TÉARMAÍ	24



1. Introduction

Réamhrá

The retention, rehabilitation and reuse of older buildings can play a pivotal role in the sustainable development of the city. Dublin City contains many examples of buildings, which, though not protected, have artistic, architectural or historic merit. Many of these buildings are well designed, soundly constructed and fit for continuance of use. In many cases they make a positive contribution to both streetscape and sense of place. In some cases they also serve to protect underlying deposits of archaeology. Equally importantly, the retention and reuse of older buildings can benefit the environment through the reduction in waste generation.

Dublin City Council, commissioned this study in association with the Heritage Council, in order to achieve one of the objectives of the Dublin City Heritage Plan (2202-2006), which is to promote environmental, economic and cultural sustainability. This report about the sustainable reuse of buildings identifies the issues and suggests further actions and study.

This study also reflects the policies of the draft Dublin City Development Plan 2005-2011, in particular Policy H25 which states: “It is the policy of Dublin City Council to seek the retention, reuse and refurbishment of older buildings of architectural, cultural, historic and aesthetic merit which, though not protected structures, make a positive contribution to the character, appearance and quality of local streetscapes and the sustainable development of the city.”

It should, however, be noted that the results presented are based on an examination of just five buildings which comprises:

- desktop research;
- five case studies comparing reuse and new construction;
- consultation with relevant bodies.

This document details the results of the case studies.

This study looks at five existing buildings from an economic, environmental and cultural perspective. It compares the results of reusing each building with those estimated on the basis of replacing it with a new building on the same site. The figures used for the economic analysis are based on real-life refurbishment costs.

The **economic** review examines the case-study buildings and compares the cost of demolition and rebuilding with the cost of retaining and re-using the buildings.

The **environmental** review analyses the environmental impact and whole life cost of each case-study building. It details the differences and similarities between the existing buildings and their hypothetical replacements.

The **cultural** review establishes the aesthetic, amenity and heritage values of the existing buildings and compares these values with the replacement buildings.

Quite a number of issues outside the scope of this study were identified for further study (see pages 5-6) and include:

- A more comprehensive study using similar methodology on a larger number of buildings.
- A specific analysis of the sustainable reuse of buildings listed on the Record of Protected Structures
- An analysis of the effect of urban intensification on the environment, i.e. does the reduction in commuting and urban sprawl resulting from intensification have a positive effect on the environment by reducing ecopoints.
- The market end value of reused buildings versus new buildings.

There is no attempt in this report to deal in detail with these important issues, and in this regard this report cannot be considered conclusive. However the actions outlined will be implemented, where feasible, through the Dublin City Heritage Plan and other partnership initiatives.

Thanks are due to the Steering Group for their guidance and assistance in the compilation of this study. The Steering Group were:

*Mary Hanna, The Heritage Council
Dick Gleeson, Acting City Planner, DCC
Susan Roundtree, Senior Architect, DCC
Paraic Fallon, Senior Planner, DCC
Nicki Matthews, Conservation Officer, DCC
Breda Lane, Administrative Officer, DCC
Geraldine O'Mahony, Executive Planner, DCC
Donncha Ó Dúlaing, Heritage Officer, DCC
Brid Kelliher, Steering Group Secretary, DCC*

2. Executive Summary

Achoimre Feidhmeach

The facade of the Gilbert Library (now the Dublin City Archive and Library) before conservation (left) and after (right).

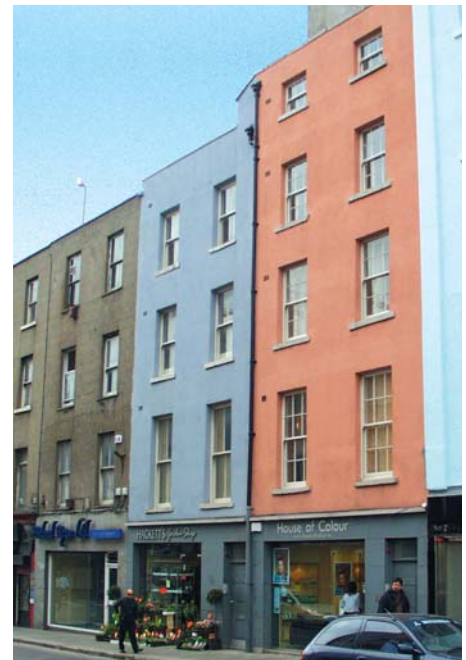


- The many organisations and interests which constitute the Irish construction industry should be made aware that re-using buildings is a viable alternative to demolition and new construction, with additional environmental and cultural benefits that translate to more profitable buildings in the long term.
- In the five case studies used to prepare this report, hypothetical new build scenarios were compared with actual refurbishment projects in relation to building costs, environmental analysis and whole life costs. In general, the conclusions illustrate the advantages, both economic and environmental, of re-using and extending the lifespan of the building stock.
- The case studies show that constructing new buildings on brown-field sites is more expensive than retaining and re-using existing buildings *except* in situations where the extent of building repair and refurbishment required is extremely high. As the repair costs decrease, the re-use option becomes progressively more economic to a point where reduced costs of as much as 50% can be achieved.
- This study has shown that the re-use of buildings has greater value for the environment and cost savings over the future life of the buildings. Existing buildings can also have greater aesthetic and heritage values.

Building No	1	2	3	4	5
Level of conservation works	Very Low	Moderately Low	Moderate	High	Very High
Cost of reuse	€3,635,000	€555,000	€1,275,000	€705,000	€740,000
Cost of new build	€7,700,000	€925,000	€1,530,000	€710,000	€700,000
Cost benefit	€4,065,000	€370,000	€ 255,000	€ 5,000	-€40,000
Reuse percentage gain	53%	40%	17%	1%	-6%

- The study findings support the acknowledged international view that the re-use of buildings minimises the depletion of non-renewable resources and is therefore essential to sustainable development.
- The results show that a refurbished existing building performs better in environmental terms than a hypothetical newly constructed building on the same site. In the buildings assessed for this report, the environmental impact per m² is less in the refurbished building than in the hypothetical redeveloped building.
- Building practice in Ireland will in future need to respond to European legislation and policy on waste hierarchy, which will impact on costs and make the re-use of buildings more attractive.
- In most cases, the cost of servicing and running buildings during their lifetime far exceeds the initial costs of construction. There should, therefore, be a genuine interest in procuring built assets with low running and maintenance costs.
- In four of the case studies the re-use option generated lower whole life costs, making this a better environmental option.
- In four of the five buildings examined the re-use option had lower capital costs.
- From a cultural perspective the existing buildings were considered to have added value and thus outperformed the replacement buildings.
- It is considered that refurbished buildings have a particular benefit to offer in commercial terms. Figures outlining the commercial return for reused buildings are not currently available for Dublin. A study on the rental returns of listed historic buildings in the United Kingdom has found that they have consistently outperformed new build structures for the last five years.

Nos 3 and 4 Capel Street before conservation works (left) and after (right). (The reuse of these buildings was a demonstration project for the 'Living Over the Shop' scheme by Dublin City Council).



3. Conclusions and Recommendations

Tátaí agus Moltaí

Summary of Findings

- The capital cost study contained in this report concludes that only where intervention levels are extremely high does a new-build alternative cost less than a comparative conservation/reuse option. (See page 24 for definition). Thereafter, as intervention levels diminish, conservation becomes progressively cheaper to the point where significant reductions in cost can be achieved (up to 50%).
- In the case study buildings the conservation/reuse option had lower whole life costs, making it a better environmental option.
- From a cultural perspective, the reused buildings out-performed the hypothetical new buildings in all cases.

Further Study

Recommendations	Partners	Key Player	Timescale
The assessment methodology used in this document should be developed through a more comprehensive study of both Protected and non-Protected Structures. This would involve a more extensive statistical analysis of capital cost comparisons between both conservation/reuse and new build, change of use issues, market rental return and sales value.	DOEHLG, DCC, Heritage Council	DCC	Short Term
A pilot study of the assessment model in action should be carried out on a number of building projects nominated by selected Public Authorities.	DCC, Other Local Authorities	DCC	Short Term
Further study is needed about the market end value of reused buildings versus new buildings in Ireland, in order to investigate issues such as: • Is the market value of a conserved building higher or lower than that of a new building to the same location? • Is the market value of a historic building enhanced by conservation of its fabric? • Is the cost of conservation higher or lower than the increase in market value of the conserved building? • Does conservation act as a catalyst for increased market values in neighbouring properties? • Is a new building likely to appreciate at the same rate as a historic building over a ten year period?	DOEHLG, NCDWC, DCC & HC	DCC	Short Term

This research should include the examination of data and research carried out by English Heritage.

Other Issues for Further Study

• Spatial Location

The whole question of location has a huge bearing on the market value of a refurbished building. This question has not been addressed here. Any framework addressing this issue should explore how buildings in a marginalised location can be assisted i.e. through a regeneration / framework development plan.

• Density Gain

Potential density gain from a total rebuild is a normal part of developing options on a site. Again the conservation policies contained in the Framework Development Area Plan represent one effective way of counterbalancing the perception that total redevelopment will be acceptable.

• Framework Development Plans

Consideration should be given to how these type of plans can provide an integrated and articulated supportive context without having to assess the refurbishment in an isolated policy context.

• Buildings in a complex cluster

Consideration should be given to a case study involving a cluster of buildings where one or a number of buildings is being retained and the rest of the site is being redeveloped.

Education

Recommendations	Partners	Key Player	Timescale
A targeted conference on the sustainable reuse of buildings to key stakeholders, i.e. Local Authorities, developers, private owners, construction supply chain, professionals.	DOEHLG, Heritage Council	Heritage Council	Short Term
Existing education and training courses in related subjects should be reviewed.	Dept. of Education, FAS, NCDWC	FAS	Medium Term
A series of simple, practical leaflets on basic methods of conservation, i.e. window repair, roof repair and weathering of buildings should be promoted. The Department of the Environment, Heritage and Local Government leaflets (1996) should be revised and reissued and have regard to the environmental value as well as the cultural value of existing buildings.	DOEHLG	DOEHLG	Medium Term
Special training and accreditation of the professions, contractors and suppliers should be encouraged.	RIAI, IGS, FAS CIF	FAS	Short Term
Technical Guidance on the performance aspects of historic buildings should be prepared, demonstrating how Irish building typologies can be made conform with building regulations in terms of safety, structure and accessibility.	DOEHLG	DOEHLG	Long Term
Education about recycling of building components and materials is required for all those involved in the construction industry. This should be coordinated by a group consisting of the DOEHLG, Sustainable Energy Ireland, and the professional and academic institutes.	DOEHLG, Sustainable Energy Ireland, RIAI	Sustainable Energy Ireland	Long Term

Further Actions

Recommendations	Partners	Key Player	Timescale
Local Authority Development Plans should support the sustainable reuse of buildings.	All Local Authorities	All Local Authorities	Long Term
In making decisions on the demolition or reuse of buildings, local government and public authorities should adopt an integrated approach when making decisions about the viability of existing buildings.	DOEHLG, Sustainable Energy Ireland, Local Authorities.	Local Authorities	Medium Term
An integrated incentive-based approach should be applied to developing the historic environment, through tax incentives, grant aid, and development right trade-offs.	Dept. of Finance, DOEHLG	Dept. of Finance	Short Term
Review and evaluation of initiatives taken in the area of sustainable reuse of buildings should be monitored.	All	All	Ongoing

RIAI: Royal Institute of Architects in Ireland

DOEHLG: Department of Environment, Heritage and Local Government

IGS: Irish Georgian Society

NCDWC: National Construction and Demolition Waste Council

DCC: Dublin City Council

CIF: Construction Industry Federation

Note: All partners listed are proposed partners.

4. Case Studies Methodology

Modheolaíocht Cás-Staidéar

Introduction

This Section contains an overview of the observations and conclusions reached in this study. The economic, environmental and cultural results for Buildings 1-5 are given in Section 5, followed by supplementary information on the different requirements of conservation/reuse/redevelopment projects at design and procurement stage.

Economic Review

This study analyses the economic benefits, or otherwise, when comparing the reuse of buildings with new build alternatives. It was considered that meaningful comparison of capital costs could only be achieved by analysing a 'spread' of projects varying from VERY HIGH to VERY LOW refurbishment intervention.

The following assumptions have been made when calculating the cost of hypothetical new build project alternatives:

1. Same location as conservation/reuse building.
2. Same building use as conservation/reuse building e.g. office, residential, etc.
3. Same size, footprint, floor area, external wall area, etc as conservation/reuse building.
4. Same construction timeframe – i.e. cost data is inflation updated to 2004.
5. New build option cost assumes current methods of construction using modern materials.

Based on the above, we have used current €/sq.m (assuming edge of town, green field site) to calculate a base cost, and then we have included for 'Abnormal Costs' such as demolition and site clearance of historic buildings, basement construction, party wall treatment and inner city site premiums, to arrive at a comparative cost.

Note on Unit Costs

Whilst it is generally perceived that economies of scale improve with increases in building size, the cost benefit is dependent on the design and extent of the comparatively larger building. Certain building features accrue cost benefits with an increase in size. For example, if the number of stories increases, the unit costs for foundations and roof decrease, while if the building footprint size increases, stairs and lifts become more cost-effective. The cost of other

building elements such as internal finishes and fit-out works are directly proportional to building area increases, regardless of whether a building is extended vertically or horizontally.

In summary, unless building area increases are significant, unit construction costs will remain reasonably constant.

Definition of Capital Costs

Capital cost is defined as the expenditure incurred in the construction of new buildings and the conservation/reuse of existing buildings. It includes the cost of construction works but excludes site purchase and fees.

The economic study concludes that only where intervention levels are extremely high does a new-build alternative cost less than the conservation/reuse option. Thereafter, as intervention levels diminish, conservation becomes progressively cheaper to the point where significant capital cost reductions can be achieved.

The Value of this Study

It may be considered that conclusions based on a data sample of just five buildings does not represent conclusive results. However, desktop research has found that similar, but more comprehensive studies, carried out elsewhere concurred with the findings of this study.

Commercial Value

Following detailed research carried out for this study it is considered that a refurbished structure has particular benefits to offer in commercial terms. A study on the rental returns of listed historic buildings in the United Kingdom has found that they have consistently outperformed unlisted structures for the last five years.

Environmental Review

This section of the study reports on the overall environmental impact and whole life costs of the five case-study buildings.

The environmental impacts of building construction are wide ranging and include climate change, mineral extraction, ozone depletion and waste generation. To



The interior of the Dublin City Archive and Library (below).

assist in making an assessment of these impacts, the Building Research Establishment (BRE) in conjunction with the UK Department of Trade and Industry have developed the Officescorer Tool computer programme. This allows for comparative analysis of the environmental and whole life cost impacts of conservation/reuse as compared to the redevelopment of office buildings. This is the system used in this study to assess environmental impacts.

Summary of Environmental Findings

The environmental results for each building are shown in the bar charts in Section 5, in ecopoints per m or ft² to show environmental impact and in € per m² for whole life costs. In the five buildings assessed in this study, the results show that a refurbished building performs better in environmental terms than a hypothetical newly constructed building on the same site.

Ecopoints

BRE measures several environmental impacts when assessing the embodied impacts of construction materials, components or buildings. Using BRE's Ecopoint methodology, these can then be weighted to provide a single score known as a UK Ecopoint. In all five buildings assessed for this report, the ecopoints per m² and per person are less in the refurbished building than in the hypothetical redeveloped building. (The lower the ecopoint score, the lower the environmental impact and the better for the environment.)

Capital Costs/Environmental

Capital cost is defined as the expenditure incurred in the construction of new buildings and the conservation/reuse of buildings. It includes the cost of construction works and associated professional fees, but excludes site purchase, conservation works and letting costs. In four of the five buildings the conservation/reuse option had lower capital costs. (Building 5 did not generate environmental capital cost information).

Whole Life Costs

All the costs associated with a project are added together to represent a total cost, discounted to a present day value. Costs taken into account include initial capital or procurement costs, opportunity costs and future costs. Those with lower costs over the period under consideration will be preferred.

- Initial costs will include design, construction and installation, purchase or leasing, fees and legal charges.
- Future costs will include all operating costs, such as rent, rates, cleaning, inspection, maintenance, repair, replacements or renewals, energy and utilities, dismantling, disposal, security and management all over the life of the built asset. Loss of revenue may also need to be taken into account, for example during maintenance work.

In most cases, the costs involved in servicing and running built facilities during their lifetime far exceed the initial costs of construction. For most building

owners therefore, there should be a genuine interest in procuring buildings with low running and maintenance costs.

Cultural Review

This section of the analysis explores the cultural value of the buildings selected for study.

Architectural Heritage Rating

The methodology used for assessing the architectural heritage value of the case-study buildings has followed the guidance set out by the National Inventory of Architectural Heritage (NIAH). This rating system categorises buildings in the following way: International, National, Regional, Local or Record Only. Where a building is given a rating of Regional, National or International importance by the NIAH, it is likely to be recommended by the Minister for Environment, Heritage and Local Government for protection. The Minister has the right, however, to make recommendations concerning individual structures at any time.

The case-study buildings, Buildings 2, 4 and 5 would be considered to be of Regional rating. Building 1 would be of at least Local rating, and Building 3 would be Record Only.

Adaptability and Use

Historic structures can be limited in the type of commercial use that they can accommodate. High amenity values for the refurbished buildings studied have been assigned where the historic interior is already open plan, as is the case with Building 1, or where the original residential usage is continued to the new structure, as is the case with Building 4.

It is assumed that a modern building will be highly amenable in layout terms to the wishes of the developer.

Heritage/Historic Value

Historic structures are at the core of establishing a visual sense of heritage and cultural value in an area. To create a new building that will be considered part of an area's architectural heritage in the future usually demands a high level of design and quality of materials.

The value of the built heritage generally centres on:

- Bequest Value** – the value of the structure as an inheritance for future generations.
- Existence Value** – the benefit people get from knowing that a structure or group of structures exists, regardless if they ever use it or not.
- Option Value** – the public's desire to retain the option of gaining some benefit from the structure at some point in the future.

While a historic structure may have all three values, only the bequest value is immediately possible for a new structure in the same location. Over the long term, it may prove possible for a new building to gain both option value and existence value; but those benefits would be lost to the community in the interim period of between 40-100 years, while it gains a position in the public consciousness.



Left and above: details of the interiors of nos. 3 and 4 Capel Street, before and after conservation.

5. Case Studies Results

Torthaí Cás-Staidéar

BUILDING 1



This is a multi-bay two-storey over basement brick faced building in the city centre dating to the early 1950s, originally designed as a printing works with offices. The building has recently been refurbished for a new use as a digital media enterprise centre. The building is not a Protected Structure. The building was in reasonably good condition and therefore required a Very Low Level of intervention in basic adaptation to its new use. Works required included:

- Extensive asbestos removal
- Replacement of existing northlight glazing with double glazing
- Replacement of existing roof asphalt over original structure
- Removal of some internal partitions
- Localised crack repair
- Steam cleaning of front elevation
- Repair of existing steel windows
- Replacement of existing water tanks
- Installation of ESB substation and passenger lift
- Widening of internal opes
- Installation of new internal stud partitions
- Installation of air conditioning system and standard mechanical and electrical fitout.
- Creation of new reception area, café, meeting and presentation rooms with full audiovisual fitout

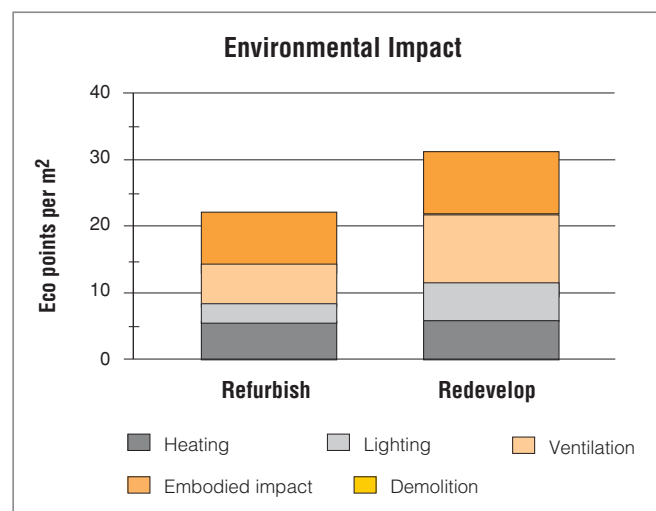
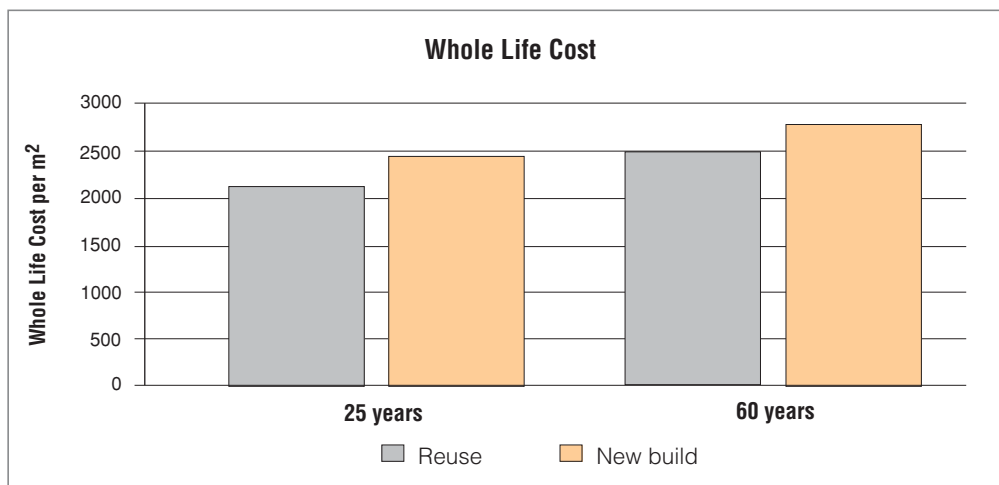
Building 1: Economic Results

Item	Level of conservation works	Cost of reuse	Cost of new build	Reuse cost benefit	Reuse percentage gain	Project description
1	VERY LOW LEVEL	€3,635,000 €1,281/sq.m	€7,700,000 €2,710/sq.m	€4,065,000 €1,429/sq.m	52.7%	Conservation and repair works were carried out on a multi-bay two-storey over basement 1950s brick-faced building for use as a digital media enterprise centre with a gross internal floor area of 2,838 sq.m.

Note: All costs exclude V.A.T., site purchase, professional fees, external works and inflation from report date

Building 1: Environmental Results

Parameters <i>Explanation of parameters in Section 4</i>	Building 1 Reuse	Building 1 New Build
Gross internal area of building	1,684.00	2,807.00
Total ecopoints for building	37,774.44	87,556.13
Ecopoints per sq.m.	22.43	31.19
Ecopoints per person	291.61	405.50
Whole life cost per sq.m. over 25yr period	£2,159.00	£2,458.00
Whole life cost per sq.m. over 60yr period	£2,499.00	£2,798.00



Building 1: Cultural Results

Value	Reused	New Build
Architectural Heritage Rating	Local	N/A
Adaptability and Use	High	High
Heritage/Historic Value	Medium	Low
Commercial Value	High	High

BUILDING 2



This is a two-bay, four-storey over basement terraced eighteenth century building in a city centre location in use as offices. It is a Protected Structure. This building continues to function as office accommodation. The building had been previously modified so the scope of works for modernisation was Low Level. Works were required which included:

- construction of new extended basement accommodation
- structural restraints to external walls
- new steel and hardwood staircase to replace non-original staircase
- repair of existing walls and ceilings with lime plaster
- repair of existing timber floors
- repair of existing doors and windows
- new metal stud partitions to revised layout
- new cast iron rainwater goods
- new sanitary ware/renewal of services
- replacement of existing roof coverings
- new services to current office standards including pressurised ventilation system to protect the staircase stairwell.

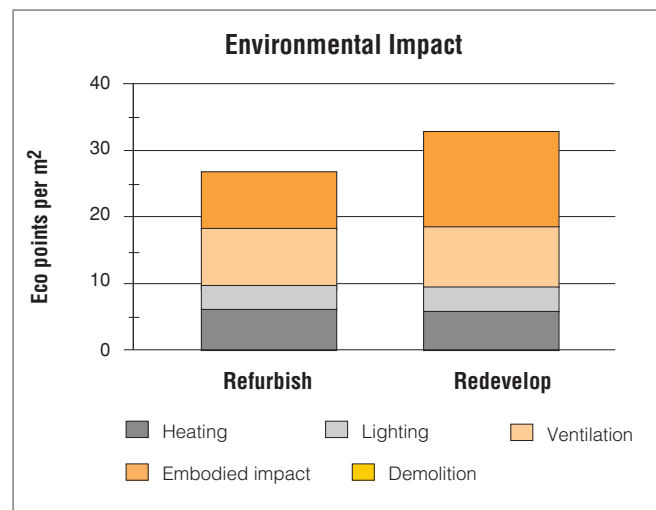
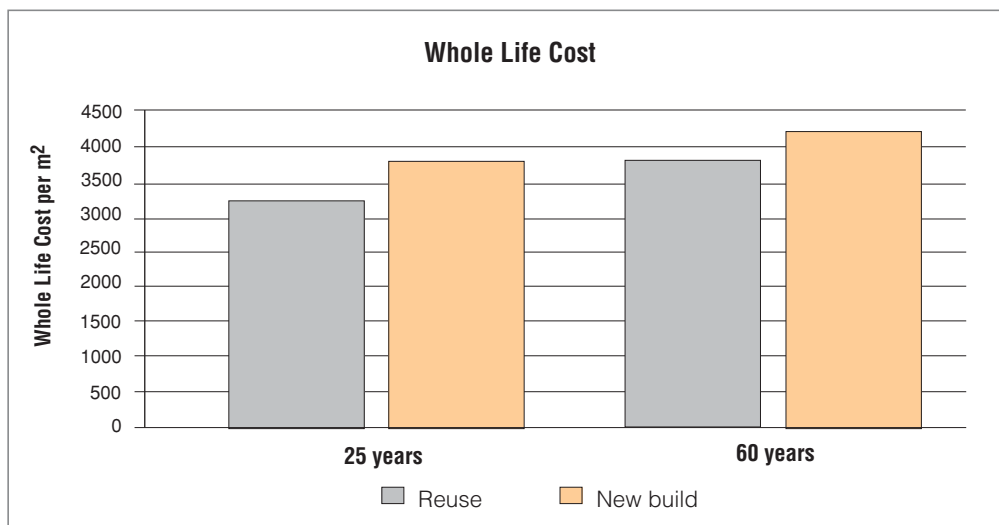
Building 2: Economic Results

Item	Level of conservation works	Cost of reuse	Cost of new build	Reuse cost benefit	Reuse percentage gain	Project description
2	LOW LEVEL	€ 555,000 €1,445/sq.m	€ 925,000 €2,403/sq.m	€ 370,000 €958/sq.m	40%	Renovation of a four storey Georgian town house (over basement) to provide upgraded accommodation, gross internal floor area 384sq.m, in the centre of city.

Note: All costs exclude V.A.T., site purchase, professional fees, external works and inflation from report date

Building 2: Environmental Results

Parameters <i>Explanation of parameters in Section 4</i>	Building 2 Reuse	Building 2 New Build
Gross internal area of building	226.00	226.00
Total ecopoints for building	6,139.31	7,472.
Ecopoints per sq.m.	27.17	33.07
Ecopoints per person	217.32	264.52
Whole life cost per sq.m. over 25yr period	€3,281.00	€3,740.00
Whole life cost per sq.m. over 60yr period	€3,780.00	€4,239.00



Building 2: Cultural Results

Value	Reuse	New Build
Architectural Heritage Rating	Regional	N/A
Adaptability and Use	Medium	High
Heritage/Historic Value	High	Low
Commercial Value	High	High

BUILDING 3



This is a three-storey mid-twentieth century apartment block on the city edge, in use as social housing. It is not a Protected Structure. The refurbishment works for this development included the retention of existing foundations, structural frame, suspended floors, flat roof structure, internal load-bearing walls and concrete stairs but involved major material refurbishment. The intervention level is considered Moderate and included:

- Part renewal of existing front and rear external walls
- external cladding of gable walls and new roof construction
- internal refurbishment of apartment units
- minor alterations to existing structure for new layout
- replacement of existing concrete ground floor slab
- removal of internal partitions and finishes
- new facing brick and render to external walls
- new Rational timber windows and doors, new internal doors and stairs
- acoustic floor insulation
- new steel roof structure
- new partitions and ceilings
- new zinc roof finishes
- new extruded aluminium rainwater goods
- new services and mechanical and electrical installations
- new kitchen fittings

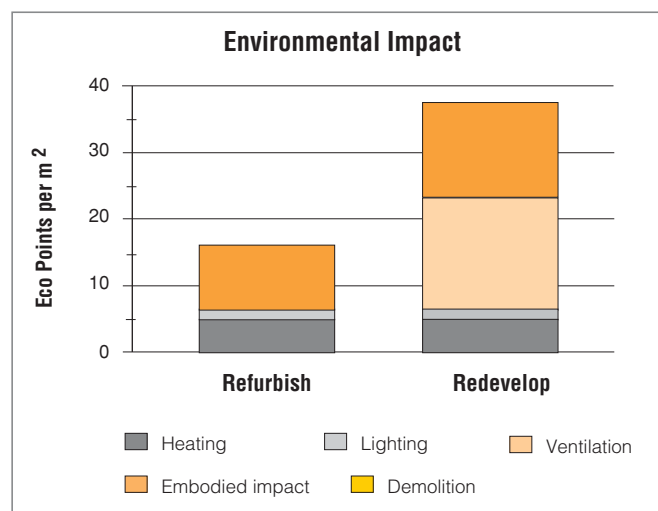
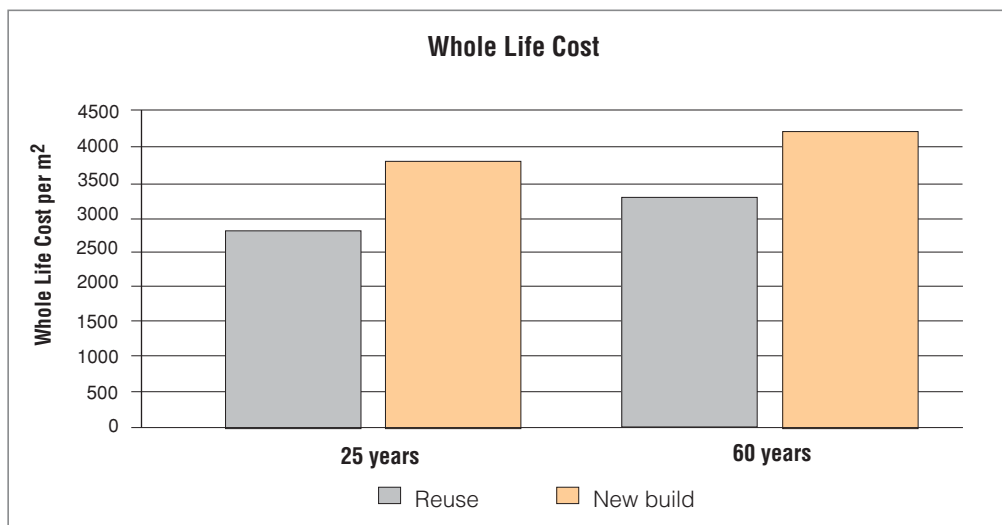
Building 3: Economic Results

Item	Level of conservation works	Cost of reuse	Cost of new build	Reuse cost benefit	Reuse percentage gain	Project description
3	MODERATE LEVEL	€ 1,275,000 €1,100/sq.m	€ 1,530,000 €1,320/sq.m	€ 255,000 €220/sq.m	17%	Refurbishment of mid-20th century housing/flat accommodation on the outskirts of a major city to provide upgraded residential accommodation with a gross internal floor area of 1,159sq.m

Note: All costs exclude V.A.T., site purchase, professional fees, external works and inflation from report date

Building 3: Environmental Results

Parameters <i>Explanation of parameters in Section 4</i>	Building 3 Reuse	Building 3 New Build
Gross internal area of building	907.00	907.00
Total ecopoints for building	14,929.32	34,003.24
Ecopoints per sq.m.	16.46	37.49
Ecopoints per person	131.68	299.92
Whole life cost per sq.m. over 25yr period	€2,849.00	€3,742.00
Whole life cost per sq.m. over 60yr period	€3,323.00	€4,242.00



Building 3: Cultural Results

Value	Reuse	New Build
Architectural Heritage Rating	Record Only	N/A
Adaptability and Use	High	High
Heritage/Historic Value	Low	Low
Commercial Value	Medium	Medium

BUILDING 4



This is a three-bay, two storey over garden level detached mid-nineteenth century residence in a suburban square. It is a Protected Structure. The building remains a private residence and was subject to High Level intervention/repair and extending of accommodation. Specialist repair works to existing fabric were required. The works included:

- re-pointing of external brick facades
- window replacement with historically appropriate timber sash windows
- stripping out and re-roofing works
- new internal decoration including decorative plaster repairs
- new three storey extension to the rear
- new kitchen fittings
- mechanical and electrical upgrading
- renewal of services – plumbed and wired services

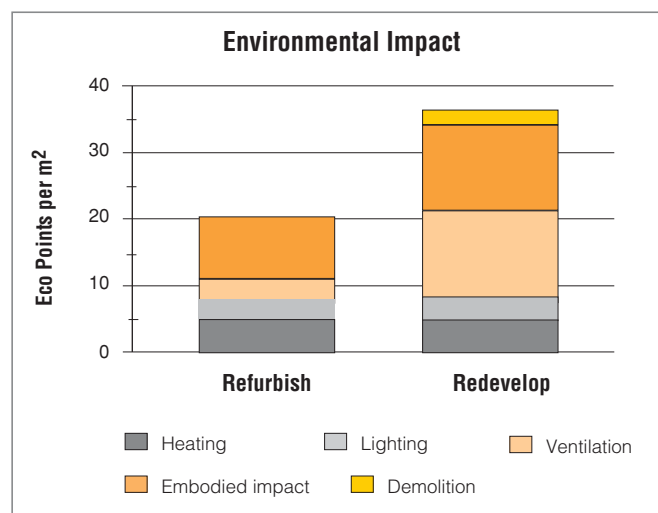
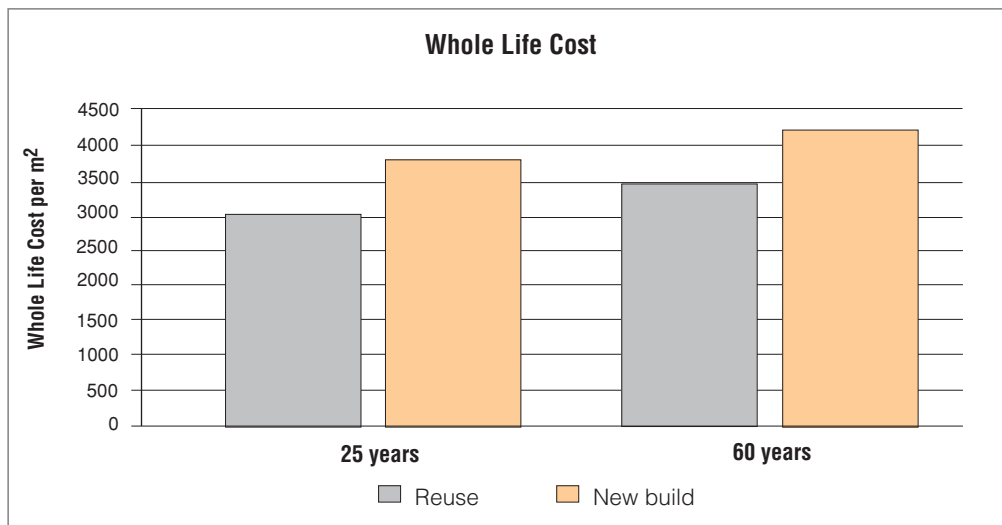
Building 4: Economic Results

Item	Level of conservation works	Cost of reuse	Cost of new build	Reuse cost benefit	Reuse percentage gain	Project description
4	HIGH LEVEL	€ 705,000 €1,567/sq.m	€ 710,000 €1,581/sq.m	€ 5,000 €14/sq.m	1%	Redevelopment of large detached private residence with a gross internal floor area of 450sq.m in the centre of a major city

Note: All costs exclude V.A.T., site purchase, professional fees, external works and inflation from report date

Building 4: Environmental Results

Parameters <i>Explanation of parameters in Section 4</i>	Building 4 Reuse	Building 4 New Build
Gross internal area of building	384.00	720.00
Total ecopoints for building	7,848.35	26,156.51
Ecopoints per sq.m.	20.44	36.33
Ecopoints per person	265.70	472.27
Whole life cost per sq.m. over 25yr period	€3,023.00	€3,742.00
Whole life cost per sq.m. over 60yr period	€3,507.00	€4,242.00



Building 4: Cultural Results

Value	Reuse	New Build
Architectural Heritage Rating	Regional	N/A
Adaptability and Use	High	High
Heritage/Historic Value	High	Low
Commercial Value	Very High	High

Building 5



This is a three-bay, three-storey terraced eighteenth century building in a town centre location. It is a Protected Structure. The building is used as offices. Only minor elements of the existing building were considered safe to retain and these included rear and party terrace walls and timber upper floor joists where considered structurally sound. All other elements of the building were replaced on a like for like basis using specialist techniques. Conservation/repair works level were therefore Very High and included the following:

Intervention

- 50% removal of existing façade and set aside for re-use
- 'Poultice' system paint removal
- removal and repair of existing timber sash windows and doors
- asbestos removal
- provision of temporary structural supports and monitoring
- new floor slab on mini piles and injection grouting below existing foundations
- new timbers to bearing ends of existing joists
- repair of existing decorative timber stairs
- new roof structure and slate finish
- lime render and lath and plaster to internal walls
- wooden floors and skirtings
- new cast iron fireplaces and rainwater goods
- new office standard mechanical and electrical installations to current office standards
- renewal of services

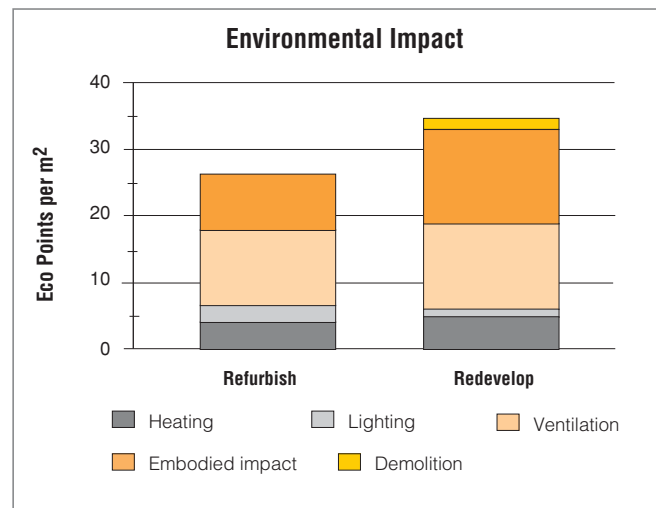
Building 5: Economic Results

Item	Level of conservation works	Cost of reuse	Cost of new build	New build cost benefit	New build percentage gain	Project description
5	VERY HIGH LEVEL	€ 740,000 €3,177/sq.m	€ 700,000 €3,008/sq.m	€ 40,000 €169/sq.m	6%	Conservation and repair of an 18th Century, 3 storey terraced building in use as offices in the centre of major city, floor area of 233sq.m.

Note: All costs exclude V.A.T., site purchase, professional fees, external works and inflation from report date

Building 5: Environmental Results

Parameters <i>Explanation of parameters in Section 4</i>	Building 5 Reuse	Building 5 New Build
Gross internal area of Building	186.00	372.00
Total ecopoints for building	4,882.80	12,849.48
Ecopoints per sq.m.	26.25	34.54
Ecopoints per person	341.27	449.04



* Whole life costs were not generated for this building.

Building 5: Cultural Results

Value	Reuse	New Build
Architectural Heritage Rating	Regional	N/A
Adaptability and Use	Medium Low	High
Heritage/Historic Value	Very High	Low
Commercial Value	High	Medium

6. Supplementary Information

Eolas Cúlra

Design/Procurement

The following sequence of issues should be reviewed as part of an overall methodology when assessing conservation/new works to an existing building.

When considering the sustainability of re-using an existing building (either protected or non protected), the overall implications of cost, programme etc. in addition to environmental and whole life costs should be carefully considered.

In the five case studies used in this report, hypothetical new build scenarios were compared to actual conservation projects in relation to building costs (only), environmental analysis and whole life costs. In general, the overall conclusions illustrate the advantages, cost and environmental, of re-using and extending the lifespan of existing building stock where possible.

Background

When reviewing the value of restoration/conservation projects as opposed to new build works, the International Charters and conventions that have set the standards to be achieved should be recognised.

Of particular importance are the Venice Charter, which sets out the basic principles of conservation philosophy, and the Burra Charter, which deals with the significance of historic places. The principles of the Charters include issues such as:

- Intervention in historic buildings must be based on respect for the physical, historical and aesthetic character of the property, its authenticity and integrity.
- Intervention should be minimal with respect to the means adopted and should not falsify, remove or destroy evidence of the building's history.
- The valid contribution of additions over time should be respected.
- Intervention in historic buildings must be based on knowledge of the works of the past.
- Repair rather than replacement of materials should be the first option.
- Where new work or materials are required, they should be compatible with and distinguishable from the old; work carried out should not damage the building; work should be reversible if possible.

a) Incentives

Conservation/reuse grant funding for private conservation projects is limited. The Local Authority Conservation Grant Scheme for Protected Structures is the main source of funding at present, which has been the subject of cutbacks in recent years. Funding is also available through the Heritage Council, the Irish Georgian Society and Bord Fáilte¹.

Tax incentives in the form of the Urban and Village Renewal schemes have had limited success. Grants are available to a range of buildings including those of architectural significance. These are due to finish after July 2006.

b) Statutory Obligations

Planning Legislation

Since the Local Government (Planning and Development) Act 1999 and the subsequent Planning and Development Act 2000, the statutory obligations regarding Protected Structures (and Proposed Protected Structures) and buildings within Architectural Conservation Areas, have imposed an additional duty on owners.

A concern exists where buildings are not currently protected, but may become so in the future. The National Inventory of Architectural Heritage, set up following Ireland's ratification of the Granada Convention, is working towards completing inventories of every county in Ireland. These inventories may identify buildings with previously unforeseen values, defined in the 2000 Act as having 'special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest.

Prior to the latest Planning Act, a listed historic building requiring upgrading would be subject to planning implications depending on its gradation of listing; e.g. List 1, List 2, List 3. With the current system, 'grades' of protection are not described, with the result that proposed minor works in some cases must go through the process of seeking a Declaration and/or proceeding through the planning process. This can impose expense and time constraints for the owner.

In addition, it appears that these additional duties on owners have not been reflected with adequate administrative back-up at local authority level which could expedite the decision-making process.

Building Control/Building Regulations

The Building Regulations are not intended to be strictly applied to historic structures. There is a general perception however that they should be upgraded to similar standards, which has increased cost implications as these costs are often seen as an isolated and extra cost in conservation works. The cost of making a new building comply with the Building Regulations is built-in to the overall package, and therefore not rated as an additional factor.

A general review of Building Regulations in relation to historic buildings should occur in the light of the Planning and Development Act 2000 revision, along with publication of a Technical Guidance document relating to this issue.

Sustainability and Waste Legislation

All construction projects, whether they are conservation/reuse or new build, must comply with environmental legislation. The recent plethora of European and Irish environmental legislation focuses on reuse of materials and the management of waste. In addition, there are substantial savings to be made by reusing construction materials as the developer does not have to pay the increasingly expensive landfill charges. Information regarding current and future legislation on construction and demolition waste management and sustainability issues should be reviewed and considered when assessing reuse/conservation projects.

Design Issues

a) Feasibility Study

When assessing an existing building for upgrade, the proposed future use and appropriateness needs to be carefully considered by the Design Team. It is necessary to assess how the new use can be accommodated without affecting the essential character of the original fabric.

Adequate time should be allocated at feasibility stage to ensure the requirements of the brief can be appropriately accommodated within an existing set of circumstances.

b) Input of Consultants / Specialist Consultants

In considering a Design Team for works to a Protected Structure, it is important to employ the services of suitably qualified consultants at the initial stages, to properly assess the character and fabric of the historic building before embarking on a discussion for its new use.



No. 9 Merchant's Quay before (left) and after conservation (right) which included the reinstatement of its third floor.

The input of specialist consultants should be sought as a matter of course when working on conservation projects. An assessment of the qualifications/appropriate experience of specialists should be reviewed. The recently introduced RIAI Conservation Accreditation system for Architects should be a model for other professional institutions and associations.

c) Detailed Survey / Record of Historic Building

Where works are proposed to a Protected Structure (or Proposed Protected Structure), a detailed survey / record of the structure and fabric is sought by the planning authority as part of the planning process. This survey is one of the most important tools when dealing with a historic building, as it provides the base line information for generating all other documents, as well as recording the building and its historical development prior to the next phase of intervention.

A review should occur of the level/quality of record information necessary, as there is much variation in quality of recording historic fabric.

It is necessary to review the situation regarding historic structures which are not Protected but are of merit, as there is no obligation to create a detailed inventory of such a building for record purposes.

d) Detailed Design

Preparation of Planning Documents

When working with a Protected Structure, it is a statutory requirement to submit a fully detailed set of



Buildings converted to residential use Beggar's Bush

drawings at planning stage, indicating how any proposed works will affect the character of the structure. This may require the carrying out and submission of detailed survey/record work at this early stage, rather than in the post-planning stage of the project. The same level of detailed survey work would not be required for new build.

Appropriate pre-planning consultations should reduce the risk of difficulties in the planning process.

Preparation of Tender / Construction Documents

If a detailed set of drawings are prepared at planning stage in accordance with the Department of the Environment, Heritage and Local Government Guidelines, then a full set of tender documents should merely be a supplement to this information.

This information can save valuable time in the post-planning period when issuing the works to tender. However, it should be borne in mind that alterations to the plans necessitated by objections or planning stipulations may be required for re-design.

Unforeseen Issues

When working on a building or collection of buildings that have been subject to a number of periods of development, it is not uncommon to discover previously hidden fabric elements of merit as stripping out works proceed.

Such potential discoveries necessitate taking a flexible approach to redesigning as the project progresses so that they may be incorporated into the refurbished structure, if appropriate. It may be possible to allow other site works to continue while the impact of the new discovery is recorded and incorporated into the conservation design, so that any additional cost is limited as far as possible.

To avoid any potential delays, it is imperative that



The Fruit and Vegetable Market and the Iveagh Trust Public Baths.



thorough and appropriate site investigation and research is carried out at the early stages of a project so as to anticipate as far as possible any items of concern, which were not initially apparent.

Equally, where part of a historic building is to be partly/completely demolished for new build works, adequate site surveying should occur at an early stage to assess possible archaeological implications of a development on the site, under the National Monuments Acts. Recycling of materials should also be considered at all stages.

Procurement

a) Demolition / Deconstruction

- If a historic building is to be replaced, consideration from an architectural, environmental and cost perspective should be reviewed as to whether demolition or deconstruction is an appropriate route.
- If a building is Protected, complete demolition will not be permitted, save in exceptional circumstances.
- If a building is not Protected but is of some value within its streetscape, appropriate professional advice should be sought before replacement is considered.

b) Materials

The National Construction and Demolition Waste Council (NCDWC) now provides incentives for the use of recycled materials and disincentives for the landfill of readily recyclable construction and demolition (C&D) waste materials. The details of these schemes are due to be published shortly and will include the construction and demolition industry.

The NCDWC is also advising the Government on providing State support for research and development into markets for recycled C&D waste products and also the optimisation of recycling of C&D Waste within public contracts.

These schemes, once finalised, will aim to incentivise the reuse of construction materials over the employment of new materials.

The NCDWC should complete a sample review of the costs, both financial and environmental, of sourcing suitable replacement materials instead of re-using salvaged materials. At all times the historic fabric, where sound, should remain. In some cases, items of historic value can be reused in other locations within

the development, giving additional historic, cultural and added environmental value.

Education regarding environmental legislation and incentives will also be an initiative of the NCDWC.

c) Input of Specialist Contractors:

Initial assessment by trained professionals, in line with Best Conservation Practice, should be followed through by appropriately trained/specialist workers being employed to carry out the work.

DEFINITION OF TERMS / SAINMHÍNIÚ TÉARMAÍ

For the purposes of this study the following definition of terms is understood:

Protected Structure: A building or site protected from inappropriate intervention, as defined by the Planning and Development Act, 2000.

Historic Building: A building, either protected or not protected, that is of historic significance.

Conservation: The management and process of change necessary to secure the survival or preservation of a building in such a way as to retain its significance. This may include interventions of various kinds and also improved social, utilitarian or environmental contexts.

Redevelopment: The construction of new buildings to an existing site, which may involve the demolition of existing buildings.

Whole Life Costs: A tool to assist in assessing the cost performance of construction work, aimed at facilitating choices where there are alternative means of achieving the client's objectives and where those alternatives differ, not only in their costs but also in their subsequent operational costs.

Ecopoints: An Ecopoint score is a measure of the overall environmental impact of a particular product or process covering the following environmental impacts:

- Climate change
- Fossil fuel depletion
- Ozone depletion
- Freight transport
- Human toxicity to air
- Human toxicity to water
- Waste disposal
- Water extraction

- Acid deposition
- Ecotoxicity
- Eutrophication
- Summer smog
- Minerals extraction

Ecopoints are derived by adding together the score for each issue, calculated by multiplying the normalised impact with its percentage weighting.

Embodied Impact: Embodied impacts are measured using life cycle assessment (LCA) principles, collating information on the total impacts in extraction, manufacture, transport, maintenance and disposal associated with a process.

Life-Cycle Analysis (LCA): Life-Cycle-Analysis or Assessment (or LCA) is the study of the environmental impacts of a product or service over its entire life cycle, from the extraction of raw materials, through to the consumption and final disposal of the product. It is a concept and a method to evaluate the environmental effects of a product or activity holistically, by analysing the entire life cycle of a particular product, process, or activity. Life-cycle assessment is typically described in three complementary phases: inventory analysis, impact assessment, and improvement assessment.

The Environmental impacts included within an embodied impact score in Ecopoints are outlined below in Table 1.

BRE's Ecopoints are a single score which measure environmental impact. The average Irish citizen would have an impact equivalent to 100 ecopoints. The lower the ecopoints score, the lower the environmental impact, and the better it is for the environment.

Table 1: Environmental impacts included within an embodied impact score in Ecopoints

Climate Change Fossil Fuel Depletion Ozone depletion Human toxicity Waste disposal Water extraction Acid deposition Ecotoxicity Eutrophication Summer smog Mineral extraction	Global warming or greenhouse gases Coal, oil or gas consumption Gases that destroy the ozone layer Pollutants that are toxic to humans Material sent to landfill or incineration Mains, surface and groundwater consumption Gases that cause acid rain etc Pollutants that are toxic to the ecosystem Water pollutants that promote algal blooms etc. Air pollutants that cause respiratory problems Metal ores, minerals and aggregates.
--	---