

LAYMAN'S REPORT

LIFE ENV/IE/000763



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ar son na hAeráide & Comhshaoil
Department of Communications,
Climate Action & Environment



Comhairle Cathrach
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Department of Housing, Planning,
Community and Local Government



REDISCOVERY
CENTRE



WISER Fact Sheet

WISER LIFE+ is co-financed by the LIFE+ programme, the EU's funding instrument for the environment and climate action.

(LIFE13 ENV/IE/000763)

Duration: 2014-2018

Budget: 3.6 Million Euro

The aim of the project was to demonstrate the reuse of an industrial building (Boiler House) in Ballymun, Ireland, to create an immersive environmental learning experience (also known as an example of a “3D Textbook”) and new home to an Ecocluster of reuse social enterprises which demonstrates excellence in sustainability which stands as a practical, physical and social example of the “Circular Economy”.

The project was made possible through collaboration with Dublin City Council and financial support from LIFE+, Department of Housing, Planning and Local Government, and the Department of Communications, Climate Action & Environment.



Project Website:
<http://wiserlife.eu/>

Rediscovery Centre Website:
<http://www.rediscoverycentre.ie/>

The Environmental Problem

A key challenge to the modern world is sustainable development with regard to our built, cultural and natural environment. The European Commission (EC) [targets](#) for waste management and recycling are:

- A common EU target for recycling 65% of municipal waste by 2030
- A common EU target for recycling 75% of packaging waste by 2030
- A binding landfill target to reduce landfill to maximum of 10% of municipal waste by 2030
- A ban on landfilling of separately collected waste
- Promotion of economic instruments to discourage landfilling
- Simplified calculation methods for recycling rates throughout the EU
- Concrete measures to promote re-use and stimulate industrial symbiosis
- Economic incentives for producers to put greener products on the market

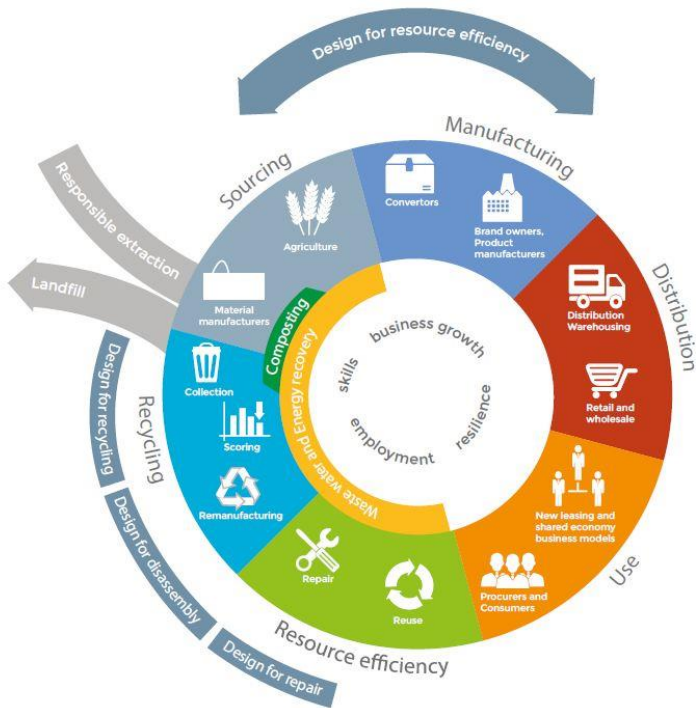
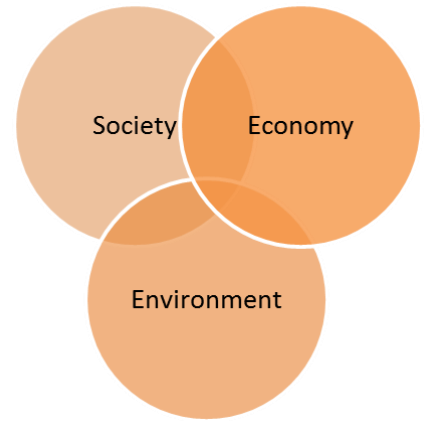
A set of targets which form part of EU's wider plan to transform Europe's economy into a more sustainable one, make up the [Circular Economy](#) package [1].

The Irish Context

Waste Generation	Landfill and Resources	Sustainability Challenge
<p>Municipal waste managed in 2014 was c. 2,5Mt</p> <p>2010 2,580,435 t 2011 2,546,577 t</p> <p>Recent figures suggest a downturn in personal consumption. However occurring alongside increasing population.</p> <p>Waste generation per capita in Ireland c.367 kg, which is 16% less than the EU average 438kg.</p> <p>The forecast over the next decade is that this figure will rise by 830,000t [2],[3].</p>	<p>Five landfills accepted municipal waste for disposal in 2017 compared to twenty-five in 2010.</p> <p>EPA forecast that at current waste disposal rates, Irish landfill capacity will be reached by 2022.</p> <p>Ireland's 2nd Incinerator was opened in 2017 providing capacity for waste recovery.</p> <p>However, the resource value of waste is commonly overlooked, and with effective, innovative resource management these waste materials can be reused and recycled to reduce the environmental impact of raw materials extraction.</p>	<p>The Irish challenge is to adapt to the needs of sustainable development and move to a Circular Economy.</p> <p>Success can be achieved through applying EU environmental policy, Irish Government support, promoting environmental awareness, green jobs, retraining and investment in new and innovative social enterprises.</p> <p>WISER LIFE +has resulted in the creation of an exemplar centre for waste reduction, reuse & recycling. WISER LIFE+ provides environmental education across all levels of society in support supporting of the developing Circular Economy</p>

Introduction to the WISER LIFE+ Project

WISER LIFE+ developed a prototype '3D textbook', an innovative new concept in experiential learning. The development brings together the educational value from the built, natural and cultural environment to present a centre of excellence in resource efficiency and waste prevention in support of the development of the: "Circular Economy".



In demonstrating Circular Economy principles, the “3D textbook” highlights nature’s ability to reuse via closed loop systems: for example composting, biodiversity, biological restoration, willow coppicing, nutrient recycling.



Built environment elements demonstrate best practice with respect to natural building materials, construction reuse and highly efficient energy/water/waste processes such as solar panels, rainwater harvesting, biomass recovery, composting toilets, smart metering & sensors & the use of interactive Building Management Systems (BMS).

The Rediscovery Centre

An Eco Cluster



Rediscover Fashion



Rediscover Furniture

The demonstration of technical nutrient recycling is provided via the social enterprise activity. These activities divert waste from landfill and profits generated by creative activities are reinvested back into the social enterprises to ensure quality training and product development.



Rediscover Paint



Rediscover Cycling

The cultural aspects of WISER LIFE+ are also illustrated through the activities of the reuse Ecocluster alongside research bodies and businesses engaging with the centre.

The exhibition space at the Rediscovery Centre offers a unique setting for events that focus on sustainability and the protection of the environment.

The space is being widely used by mission- related organisations for exhibitions & meetings related to resource recovery, sustainable design, smart technology, waste prevention & Industrial heritage.



WISER LIFE+ has also resulted in the creation of a unique Ecostore. It provides an impressive platform for sustainable suppliers and reuse social enterprises to sell their products. AS a retail collective it sells and displays 'best in class' eco products and sustainable designers in Ireland and throughout the world.

Industrial Building Reuse and Retrofit

A key element of WISER LIFE+ was the reuse and retrofit of the old Boiler House in Ballymun, Dublin, to create an educational space and an innovative learning experience demonstrating excellence in building reuse, low carbon construction and sustainable development. The transformation resulted in the development of Ireland's first "3D textbook" a building which aims to promote positive behavioural change with regard to resource management and waste prevention through demonstrating best practice.

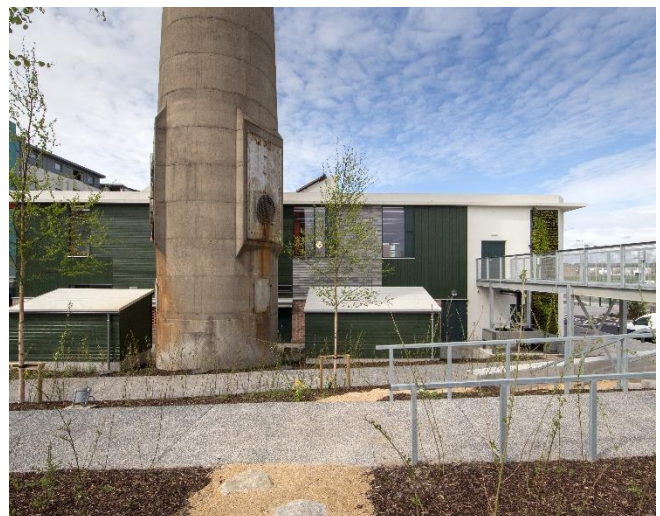
The retrofit of the building involved the extensive use of recycled materials from the original building combined with sustainable and experimental construction materials and techniques. Energy and water systems were designed to conserve precious resources and demonstrate the latest research with regard to environmental performance.



Original Boiler House in Ballymun, Dublin.



Winning "The Green Construction Award" in 2017 and securing an A2 BER energy rating.



Transformation to the Rediscovery Centre.

Boiler House Reuse and Retrofit

Design considerations:

- Passive design: optimising orientation for solar gain
- Heating and electricity from alternative, renewable and sustainable sources
- Rain water harvesting and grey water recycling
- The incorporation of green roofs and a green living wall
- Building construction and landscaping to encourage biodiversity
- Best practice waste and energy management
- Materials selection having regard to their reuse, recycled, natural and sustainable properties

The outdoor space was designed and landscaped to create an outdoor classroom and support habitats for the conservation and protection of biodiversity. The gardens demonstrate nature's ability to recycle via closed loop systems and highlight natural biological systems at play. Sensory gardens, green walls, bug hotels and a fresh water pond provide an exploratory space for adults and children alike, whilst the kitchen garden provides produce for the centre's café.

Solar panels (Photovoltaics (PV) & thermal) heat pumps, a combined heat and power plant and a willow-fuelled stove provide heat and hot water for the centre. Rainwater is harvested for reuse. The combination of composting toilets, a living wall and a reed bed system provide waste water treatment. Whilst smart metering, air quality monitoring & an interactive BMS ensure building management optimisation at all times.



The Sensory Garden, The Rediscovery Centre

Recycling and Waste Minimisation

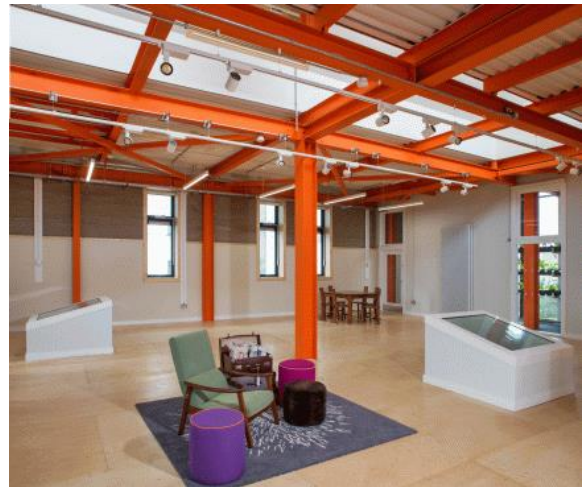
WISER LIFE+ was designed to have the highest regard to waste prevention, reuse and minimisation. The project reduced the quantity of materials being sent to landfill during the construction process by 'designing out waste' and effective site waste management.

Designing for the reuse of material components and/or entire buildings has considerable potential to reduce the environmental burdens from construction. Critical to this project's success, was the identification of original building fabric and contents suitable for direct reuse. Throughout the project, opportunities to minimise waste production through direct reuse were considered. Wherever possible building structures and materials from the original building were left in-situ. Wastes produced in the deconstruction process were reviewed and assessed based on their potential to be reused within the reconstruction phase. The process involved a detailed consideration of the entire deconstruction and building process involving Architects, Construction Contractors and Engineers.

Incorporating the retention of the main steel structure of the building into the redesign was a significant waste saving. The reuse of the original concrete flooring and north facing brick wall were also key to waste minimisation. A waste management plan for the reconstruction works was devised by the contractor and approved by the project team this plan was designed to ensure that the maximum possible level of waste was recovered, all waste was management appropriately and in accordance with legislation and that full records of waste consignments were maintained.



Before



After

Opportunities to Reduce, Reuse, Recycle (& Recover)

Throughout WISER LIFE+, opportunities for reuse were identified and given preference. Reused brick, louvers, windows, sheep's wool insulation and timber from both the original building and alternative demolition sites were incorporated into the reconstruction.

Furniture and fittings destined for landfill were upcycled through the Ecocluster's social enterprises (Rediscover Fashion, Rediscover Furniture, Rediscover Paint and Rediscover Cycling) and reused for the building completion. Overall wherever possible, materials were chosen based on their ability to demonstrate best practice reuse, innovation, recycling or recovery.

Of note, recycled paint from the Rediscover Paint social enterprise was used throughout the building. Rediscover Paint salvages disposed waste paint from civic amenity sites and recycling centres and reprocesses it to create paint for redistribution. The use of the paint in the new eco-building was positive from both an enterprise and a demonstration perspective as the scale was far in excess of any previous order the enterprise had received.

In preparing furniture & fittings the WISER LIFE + Ecocluster coordinated make days to facilitate co-design projects between enterprise staff and volunteers.



Reuse building materials



Upcycled furniture and fittings

Sourcing “Green” Suppliers or Sustainable Materials

Material used for the construction of the Rediscovery Centre was chosen based on the following prioritisation process ;

1. Reused materials resulting from the partial demolition of the old boiler house
2. Building materials and construction waste available locally from other demolition or construction projects
3. Sustainable, natural, renewable materials or those manufactured from recycled waste
4. Materials with excellent thermal performance, low embodied carbon and environmental impact

Material finishes were selected having regard to low levels of volatile organic carbons (VOCs), petrochemical compounds and environmental toxins. Low carbon GGBS (Ground-granulated blast-furnace slag) concrete was specified and used throughout the building.

Timber products for cladding, doors, joinery elements were Irish where possible and certified FSC (Forest Stewardship Council). Internal plaster finishes were vapour permeable and primarily lime based.

External finishes include recycled brick, reused and upcycled louvres from the original building, reused aluminium roof deck and timber. Paint finishes throughout are low VOC & recycled paint. External walls received mineral/clay based breathable paint finish on internal surfaces. The original concrete floor was polished and sealed. The staircase balustrade was made from Irish fir. The structure of the first floor was designed as timber easi-joist and the floor is finished with treated birch FSC plywood. Overall, the material selection process resulted in the use and demonstration of ecological superior materials.



Staircase made from Irish Fir



Art piece made from old
pipes from the Boiler House

Material Showcase: Hempcrete Wall

Hempcrete is a composite material of hemp and lime, which, when used in a timber frame, is not only strong, but also acts as an excellent vapour permeable insulator for the building. Hempcrete is one of the best performing, non-toxic, ecological and renewable materials available.

It has a negative CO₂ footprint, improves air quality, reduces energy requirements for heating and cooling and provides a comfortable and healthy living environment. Hempcrete walls were used in the south and east facing walls in the Rediscovery Centre. The material avoided the use of high embodied energy alternatives such as cement and concrete block. It also avoided the use of petrochemical based insulant products.

Although hempcrete has been used previously in structures around Europe for over a decade, the Rediscovery Centre is the first public building in Ireland to adopt this innovative technology. For demonstration purposes, an internal section of the hempcrete has been left partially exposed as a textbook bookmark so that it is visible for visitors to observe.



Material Showcase: Sheep's Wool



Sheep's wool, is a natural and sustainable material. It acts as an insulator which retains heat in winter and keeps the building cool in the summer. It is also inherently flame retardant and self-extinguishing.

The sheep's wool for the building was salvaged from the demolition of a local housing project and was used in the west façade of the building. This insulation would have been sent to landfill had it not been repurposed in the Rediscovery Centre.

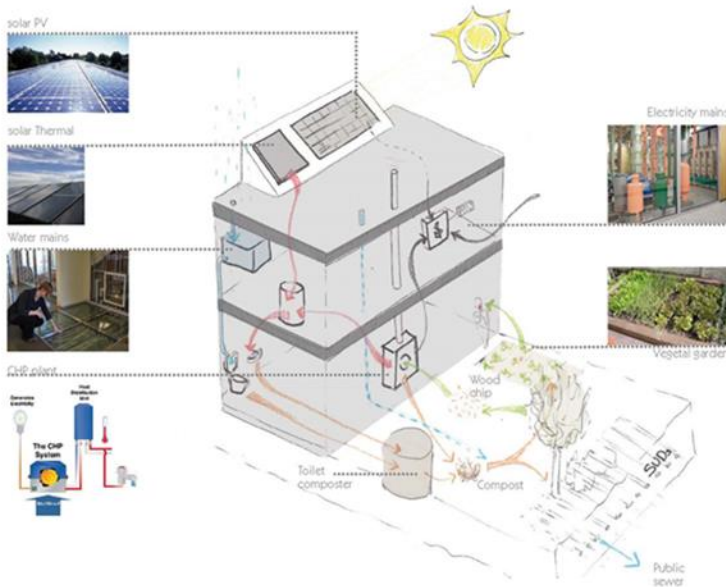


Unlike many other insulation products, no special equipment or safety clothing is required to install sheep's wool insulation. This results in a faster, hazard-free installation process which can have positive impacts on the construction cost.



Salvaged Sheep's Wool
insulation at the
Rediscovery Centre

ENERGY MANAGEMENT



Energy services for the building were designed to support Europe 20-20-20 objectives of increasing energy efficiency & renewable energy by 20% and decreasing greenhouse gas emissions by 20% base 1990 levels by 2020.

In line with the demonstration and educational objectives of the project, the energy requirements have been addressed through a combination of alternative and renewable technologies.

The building is predominantly naturally ventilated with passive background ventilation to all spaces. A double height corridor on the west elevation encourages stack ventilation through automatically opened ventilators. The first floor has a metal grille walkway that allows the passage of air, while providing access to a planted irrigation system.

The centre's heating system is provided primarily by the combination of an air source heat pump and the CHP (Combined Heat and Power), with solar thermal and a biomass stove with back boiler providing backup. Heat is stored in a large water buffer vessel when not required. The distribution of heat is controlled by zones with local control via thermostatic radiator valves.

Dynamic simulation modelling was carried out to determine the optimum control strategy for heating supply and delivery and the BMS has been programmed accordingly.

The heating control ensures that heat is delivered only to areas requiring heating at times when the spaces are occupied and that the heat is supplied by the most efficient combination. The supply of heat is prioritised according to availability and responsiveness; thus solar thermal and the biomass stove act as lead heat sources with the CHP and heat pump providing heat as required.

ENERGY MANAGEMENT

The centre acts as a stand alone microgrid encompassing solar PV and output from the CHP. The CHP is designed to allow scheduling to maximise output at times of peak network demand and pricing to integrate with smart grids and time of use pricing. A buffer tank on the CHP provides flexibility in operation allowing the CHP to act as a demand response unit. This combination of solar PV and CHP in the centre provides a pilot test site for the optimisation and integration of microgeneration and demand response within a smart grid network.

Lighting is provided exclusively by LED lights throughout the building. The lighting control strategy includes extensive occupancy and daylight detection to ensure that lights are only on in occupied areas when the levels of natural daylight are too low to provide the necessary level of lighting.

The Centre was awarded an A2 Building Energy Rating (BER), an impressive energy performance given the retrofit nature of the building and its former occupation and use as a district heating centre designed to dissipate heat.



A look into the Plant room and the CHP system located in every room.



LED lighting around the RDC

Water Management

The Rediscovery Centre's water management and drainage system were designed and installed to minimize waste water discharge, mains water use & sewage sludge generation and to maximize water recycling and nutrient recovery.

The Centre uses a rain water harvester to collect water on the roof and it is then used to flush the toilets through out the building. Water conservation and the minimisation of usage was at the forefront of the water system design.

This is achieved through a range of water management processes and technologies and includes;

- Rainwater harvesting from the building roof
- Composting toilets
- Grey water recycling of sink and basin waste water
- Onsite reed bed system
- Permeable paving and swale area water runoff attenuation
- Intensive and semi-intensive green roofs
- A vertical living wall
- Urinal waste water collection and use for plant nutrition within the internal comfrey wall.
- Monitoring of water use, harvesting and treatment.



The living wall that also contributes to the insulation of the RDC



Natural filtration system from the inside reed bed

Biodiversity and natural habitats



The gardens at the Rediscovery Centre were created with biodiversity and functionality at the forefront of the design.

Protecting the environment, encouraging urban biodiversity and demonstrating circularity in nature is a key educational message of the “3D textbook” and an integral part of outdoor education programmes.

The Rediscovery Centre garden and environs were designed to support this work. The landscaping and planting within the garden were selected to provide a wide variety of native species, broadleaf and evergreen plants and trees which will provide biodiversity and support for wildlife as they mature.

A view of the RDC from the composting area



Biodiversity Pond and garden

Biodiversity and natural habitats.

The gardens at the Rediscovery Centre demonstrate nature's contribution to conserving vital ecosystem services on which we all rely on such as food, water and fuel and supporting soil formation, primary production, photosynthesis, and nutrient cycling. Nature's ability to reuse nutrients is highlighted through onsite open and in-vessel composting systems. Willow has been planted extensively to allow for short rotation coppice for use in the biomass boiler as demonstration.



Sensory Garden and Reed bed system

Planters made from demolition materials (pipework and steel beams) have been installed on the reservoir roof and are being used to produce in-season food & herbs for the centre's Eco café, a sensory garden and plants to attract biodiversity. Bug hotels, bat boxes and bird feeders have been made from reused and recycled materials. The green infrastructure provided by the living wall and the mixed-intensity green roofs is designed to attract and provide habitats for biological diversity. The reed bed system and fresh water pond is also being managed to create the right habitats to maximize biodiversity.



Bug Hotel located in the Biodiversity Garden

Educational Impact

The main aim of the Rediscovery Centre as a “3D textbook”, is to provide education for sustainable development and affect positive behavioural change

As is the intent of the “3D textbook”, every aspect of the Centre and environs are used to create an educational opportunity. Elements of educational interest stand out as physical ‘bookmarks’ throughout the: “3D textbook”.

Related ecological information has been incorporated into the centre’s education trails and tours. Over 30 specific bookmark exhibitions have also been developed and installed which encourage interaction and active learning.

Throughout the building reuse phase a photo diary was created. These photos have been collated to produce a short animation. The animation forms part of the cultural bookmark and is available for viewing at the centre.

The Centre hosts numerous STEAM workshops throughout the year. We encourage school tours, community groups and youth groups to come to the Centre to experience the hands on workshops that bring science and the environment to life.

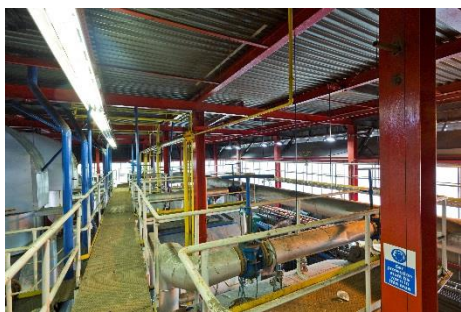
Focus groups were established and workshops held to assess the impact of these educational bookmarks and gain insight into further learning opportunities. The educational value continues to improve as result of this process.



Educational Impact



It is envisaged that the bookmarks will continue to evolve and emerge as the centre grows. Built environment bookmarks include services, construction materials and pipework which have been deliberately left exposed and are labelled to describe their purpose to the visitor. Viewing panels and/or portals also provide visibility to the plant room, workshops and the roof for educational purposes.



In attempting to create strong cultural bookmarks embedding the building within the community whilst maintaining significant links with the past, the retention of the iconic chimney and the use of materials such as aggregate from the demolition of the last remaining tower blocks was integrated.



Built in the 1960s as a solution to an inner city population crisis, the tower blocks provided a home for c.16,000 people. The demolition of the flats whilst seen as positive in regeneration terms impacted upon self-identity at a human level. The retention of elements of the towers and their incorporation within the textbook provides a reference point for residents of the old Ballymun town and a cultural link to times past.

Photographic and video exhibitions have been curated and are presented in the centre to link the building's cultural heritage to its re-visioning as an eco destination.

Images of the Old Boiler House
before the Rediscovery Centre refurbishment

The Rediscovery Centre - Eco Cluster

All of our products created onsite in the social enterprises are sold exclusively in the Eco Store.

Rediscover Furniture

Rediscover furniture boasts exceptional skills and courses in upcycling and restoration all while rescuing furniture destined for landfills. We either restore the furniture to its former glory or it is completely redesigned for resale.

Rediscover Fashion

Rediscover fashion was established in 2008 and produces 100% redesigned, repurposed, and recycled fashion, accessories, and homeware ranges.

Rediscover Paint

Rediscover paint collects paint from the public. The aim of the programme is to divert paint from disposal/incineration and provide affordable paint for reuse to local residents and community organizations.

Rediscover Cycling

Rediscover Cycling is a bicycle reuse social enterprise dedicated to building & reconditioning bicycles whilst providing training and employment opportunity since 2010.

References

- [1] "Closing the loop - An EU Action plan for the Circular Economy. 2015
- [2] Ireland's Environmental Waste, Environmental Protection Agency. 2012
- [3] Ireland's Sustainable Development Model (ISus), Environmental Protection Agency Ireland, and Economic and Social Research Institute. 2013

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