Circular Economy Conversations:

Construction & Demolition

Hosted by: The Rediscovery Centre & the Environmental Protection Agency

11 July 2019, 10am
Rediscovery Centre – The National Centre for the Circular Economy
Dublin, Ireland

Tom Woolley
Visiting Professor
Anglia Ruskin University

Rachel Bevan Architects
County Down
Northern Ireland
In my view there are four kinds of building materials

Materials that are contributing to the climate crisis. “85%”

Materials that may be re-usable in the future. “5%”

Materials that may be recyclable in the future. “5%”

Materials that do no harm TODAY! “5%”
However no mention of pollution, toxic chemicals or health
We raised the issue of embodied energy 20 or more years ago in GBH and were ignored. Greenwash has been the order of the day ever since. An absence of ethics in the discourse.
Construction materials account for:

• 420 million tonnes of material consumption (7 tonnes per person)
• 20% of the UK’s total ecological footprint
• 19% of the UK’s total greenhouse gas emissions
• 30% of all UK road freight

1.2.1 Embodied Energy

As important principles, the above four principles are of Embodied Energy. This is a topic of concern to many academics and researchers but as yet there is no internationally agreed method for calculating embodied energy. The term has already been mentioned in this chapter but it is worth examining it more closely as it is central to the understanding of green building thinking. Essentially, calculating embodied energy enables one to evaluate the global rather than the local impact of particular materials and products. For instance, an energy conscious householder may wish to install UPVC double glazing under the impression that this will be an environmentally friendly thing to do. However, as embodied energy calculation might show that the energy used in manufacturing and transporting such windows was substantially more over the life of the product than the energy saved in the house where it is installed over the same period. If one also takes into account the costs of disposal or recycling (if this is technically possible) and the environmental costs of disposing of toxic products and so on, then other solutions to the windows, such as using timber might be more environmentally acceptable.

"Calculation of embodied energy is complex, for they include the energy from the extraction of raw materials through its production and recycling. Taking transportation (as well as infrastructure) into account, one cannot measure a portion of the energy used to make existing, processing, transportation and construction equipment, one has a challenging task to arrive at a comprehensive figure for the embodied energy of any green material. Considering the variety of materials which go into any building, a simple figure for a building is even more daunting."  

Examples of reclaimed and recycled materials

<table>
<thead>
<tr>
<th>Reclaimed</th>
<th>Recycled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re-used timber sections or floorboards</td>
<td>Panel products with chipped recycled timber</td>
</tr>
<tr>
<td>Bricks cleaned up and re-used</td>
<td>Crushed concrete or bricks for hardcore</td>
</tr>
<tr>
<td>Steel sections shot-blasted and refabricated</td>
<td>Steel with a proportion of recycled content</td>
</tr>
<tr>
<td>Re-used glass panels or windows</td>
<td>Crushed glass recycled as sand or cement replacement</td>
</tr>
</tbody>
</table>

Green Building Design

Why ‘Green’?

Building Materials: Impacts Compared

Timber Materials & Design

Green Products > Building Design > PASS Endorsement

1.3 Why Green Building?

In order to understand the thinking behind green building principles, it is necessary to remember why we should be so concerned with such issues in the construction industry. Perhaps producing more energy from renewable sources and protecting wildlife and habitats is much more important? Indeed, there are many who do not give green building a high priority. It is easy how many environmental groups, for instance, appeal to tackling the problem of abortion as a higher priority to their built environment. Groups concerned with the natural environment, wildlife, habitats and so on, sometimes inhibit or build endangered buildings using toxic materials and high embodied energy materials.

Many others see the issue purely in terms of energy efficiency or more specifically fuel efficiency and are largely unconcerned about the environmental impacts of the materials which they chose to achieve efficiency in gas, oil and electricity bills. Government and corporate research and development programmes such as Foresight, Sains and Access or the UK Clean Technology programme seem largely designed to encourage high technology development, leading to new and more products and systems which will expand industry and create new markets.

When the four main principles set out above are taken into account, it is clear that the building materials industry, the transport of materials and products, their construction on site and then the pollution and energy ranges coming from buildings collectively has a surprisingly wide impact on the environment than most other human activities. The figures have suggested that 60% of total UK energy consumption is accounted for by buildings and building construction and services. 7 Thus the importance of buildings and the construction industry has been made one of the most, if not the most important user of energy and resources in advanced society.

Mayer suggests that the building and building services industry has been one of the most critical in the energy consumption, with the increase in the use of energy from the manufacturing of materials, the production of materials and the transport of materials and products. Thus, the importance of buildings and the construction industry has been made one of the most, if not the most important user of energy and resources in advanced society.

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Dust levels at plasterboard firm 20 times the legal limit

A plasterboard recycling company has been fined for exposing workers to dust levels up to 20 times the legal limit. The criminal safety breaches were identified at Plasterboard Recycling Solutions Ltd during a routine Health and Safety Executive (HSE) inspection of their premises in Bedfordshire. Luton Magistrates’ Court heard the on 22 September 2015 inspection found health and safety standards at the site were generally poor. The company failed to adequately control exposure to plasterboard dust, which covered the floors, walls, machinery and ledges of the premises. Subsequent occupational hygiene surveys carried out after the inspection identified exposures to dust on the premises were up to twenty times the legal limit. Plasterboard Recycling Solutions Ltd pleaded guilty to three criminal safety offences and was fined £60,000 and ordered to pay costs of £2,327.60.

Why is embodied energy high? Use of petrochemical materials and cement which cannot be recycled.
Plastic Pollution

The increasing use of plastic, synthetic and chemical materials in buildings is an environmental problem and also increases fire risks.
The 72 deaths at Grenfell were the inevitable result of the unrestricted use of plastic foam and this has led to greater interests in risks. This is not just a problem in high rise.

Grenfell families file US lawsuit over cladding and insulation

Bereaved and survivors seeking damages potentially worth hundreds of millions

The families of 69 victims and 177 survivors of the Grenfell Tower disaster have launched legal action in the US against the manufacturers of the cladding and insulation used in the building’s refurbishment, which lawyers said could result in a payout worth hundreds of millions of dollars.
Emissions from plastic foams in fires present long term health risks

**Article**

**Occupational Exposure to Polycyclic Aromatic Hydrocarbons and Elevated Cancer Incidence in Firefighters**

Stec, Anna A, Dickens, Kathryn, Salden, Marielle Louise, Hewitt, Fiona, Watts, Damien Paul, Houldsworth, P and Martin, Francis L. Available at [http://clok.uclan.ac.uk/21659/](http://clok.uclan.ac.uk/21659/)

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**Study to evaluate the need to regulate within the Framework of Regulation (EU) 305/2011 on the toxicity of smoke produced by construction products in fires**

**Final Report**

Written by Tim Yates

October 2017
MMC? Buildings are very lightweight using timber and high embodied energy petrochemical based materials.
Report of the Review Panel on Building Standards Compliance and Enforcement

June 2018

FIRE WARNING Persimmon and Bellway new-build homes ‘are fire risk’, BBC Watchdog investigation finds

House builders are required to make sure the homes they sell meet fire safety standards

By Alice Graham, Digital Consumer Reporter

HUNDREDS of new homes constructed by Persimmon and Bellway Homes have been built with “potentially dangerous fire safety issues”, an investigation by BBC Watchdog Live has found.

The Persimmon properties were sold with missing or incorrectly installed fire barriers, designed to prevent the spread of fire, according to a new episode airing on BBC One tonight.

FIRE SAFETY

 Builders and councils “regularly failing” to identify fire safety defects

Builders and local authorities in Scotland are “regularly failing” to identify fire safety problems in new buildings, according to a new report.
The manufacture of plastic foam insulation has been causing massive pollution problems. Attempts to clean up and restrict production has led to serious shortages.

"The Flix Water Reservoir in Tarragona has received more than 700,000 cubic metres of toxic waste from ERCROS" (Covestro). (according to the Environmental Justice Atlas)
Recent production of foam insulation has led to a 25% increase in CFC emissions which damage the ozone layer (the increase has been tracked to Asia).
Passiv Haus is largely dependent on Plastic foam insulation materials.

Passivhaus Buildings: Case Studies

Current status: COMPLETED PROJECT

Country: Ireland

Building Owner:
Dun Laoghaire Rathdown (DLR) County Council
In the past five years alone, the Frankfurt Fire Department has documented more than 90 fires nationwide in which styropor in house walls have gone up in flames – causing 11 deaths and 124 injuries. Time and again, the fire spread via the building’s facade to other floors that had not initially been on fire, as it did at Grenfell Tower. But this can result in “many completely misunderstanding the safety situation,” says Dirk Aschenbrenner, chief of the Dortmund Fire Department and president of the German Fire Protection Association. He warns: “Just because the insulation panels don’t catch fire as quickly as things like gasoline, once on fire, they present fire fighters and residents with a barely manageable threat.”
Stone wool? increasingly being
Used to replace plastic foam

Nitrogen Oxides 239
to tonnes per year
Sulphur Dioxide 148
to tonnes per year
Volatile Organic Compounds (VOCs) 472
to tonnes per year
Particulates over 300
to tonnes per year
Methanol 104
to tonnes per year
Formaldehyde 67.6
to tonnes per year

(Based on an application to West Virginia Department of Environmental Protection estimating the potential emissions from the Roxul factory 22 November 2017)
We are facing a global environmental crisis
100 companies responsible for 70% of emissions
Many of them producing building materials and they not only cause CO2 emissions but pollution and adversely affect our health
Increased use of plastic, synthetic materials and flame retardants is leading to raised risks to bad indoor air quality and health problems.
President's Cancer Panel: Environmental Cancer Risk Underestimated

Roxanne Nelson
May 13, 2010

May 13, 2010 — Exposure to environmental contaminants has a stronger impact on cancer risk than previously believed, according to a new report from the President's Cancer Panel.

Despite a growing body of evidence linking environmental exposures to cancer in recent years, the panel noted that it was “particularly concerned to find that the true burden of environmentally induced cancer has been grossly underestimated.”

Cancer Alley

April 17, 2010

Context

This is a resource page to help people support the call by the Women of Cancer Alley for a moratorium on new petrochemical industry facilities and closure of existing facilities that refuse to reduce toxic emissions to safe levels and continue to endanger their communities.

Video series for the Women of Cancer Alley

Link: https://bit.ly/2D4AwW

https://www.youtube.com/watch?v=fButa8WgAnk
Major study of VOC emissions shows that indoor air pollution is nearly 7 times worse than diesel exhaust

**RESEARCH ARTICLE**

**ATMOSPHERIC CHEMISTRY**

**Volatile chemical products emerging as largest petrochemical source of urban organic emissions**

Brian C. McDonald, Z. Scott A. Goosens, Jessica R. Gillmor, Shantaram H. Jathar, Ali Akbarzadeh, Christopher D. Currie, Jesse L. Finney, and Julia K. Kuei

A major study of VOC emissions shows that indoor air pollution is nearly 7 times worse than diesel exhaust. The study, conducted by researchers from the University of California, Berkeley, found that volatile organic compounds (VOCs) from household products, such as cleaning agents and personal care products, are a significant source of indoor air pollution. The study is one of the first to quantify the relative contributions of indoor and outdoor sources of VOCs, providing new insights into the sources and sinks of VOCs in urban environments.
We now test for Indoor Air Quality

High levels of volatile organic compounds (VOCs) will be found in modern houses. Simple tests can be done to identify them. Here are the results from a test done on a house in Northern Ireland with elevated levels of VOCs and formaldehyde.

Total Mould Volatile Organic Compound (TMVOC) Summary

Your TMVOC Level is (μg/m³): 15  
Active Mould Level: Active-Moderate

Active growing molds are present, individuals sensitive to molds will likely be affected.

Approximately 6,000 Samples
Median TMVOC (μg/m³): 7
3rd quartile value where half the points are above this value and half are below
Mean or Average TMVOC (μg/m³): 10
Sum of all values divided by the number of values

All IAQ Home Survey TMVOC 
Active Mould Growth Indicator
My book looks at the evidence for links between health issues and building materials

Chapter 1: Introduction
Chapter 2: Volatile Organic Compound Emissions
Chapter 3: Emissions from materials – Why do we need to use hazardous chemicals?
Chapter 4: Cancer, Carcinogens and Building Materials
Chapter 5: Other Hazards and Radiation
Chapter 6: Hazardous Materials to be avoided and why
Chapter 7: Mould, Damp, Fuel Poverty and Breathability
Chapter 8: Ventilation and a critique of Passiv Haus
Chapter 9: Dealing with problems in existing buildings
Chapter 10: Healthy Building Theories
Chapter 11: How to building Healthier Buildings
Chapter 12: Policy Issues for Healthy Buildings – A Critical Analysis
Appendix A: Carcinogenic Chemicals used in buildings and building materials
Appendix B: Useful Organisations
NICE have just published documents for consultation

National Institute for Health and Care Excellence

Indoor air quality at home

[3.1] Evidence review for material and structural interventions

NICE guideline <number>
Evidence review
June 2019

Draft for Consultation
These evidence reviews were developed by the Public Health Internal Guideline Development team

National Institute for Health and Care Excellence

Indoor air quality at home

[1] Evidence review for associations between individual or building characteristics and exposure levels

NICE guideline <number>
Evidence review
June 2019

Draft for Consultation
These evidence reviews were developed by the Public Health Internal Guideline Development team

National Institute for Health and Care Excellence

Indoor air quality at home

[2] Evidence review for exposure to pollutants and health outcomes

NICE guideline <number>
Evidence review
[June 2019]

Draft for Consultation
These evidence reviews were developed by the Public Health Internal Guideline Development team
Thermal Insulation Materials for Building Applications: The complete guide

AUTHOR(S): Latif Eshrar, Rachel Bevan and Tom Woolley
STATUS: Forthcoming (This product will be delivered once in stock)

£45.00

FORMAT: Paperback
PAGE SIZE: 234 x 156
PUBLICATION STATUS: Forthcoming
NUMBER OF PAGES: 208

PUBLISHER: ICE Publishing
What is the solution? The Precautionary Principle
Bio-based materials could transform the future of sustainable building

Recent winners of the Cradle to Cradle Product Innovation Challenge include a brick made from bacterial byproducts and insulation created from agricultural waste products.

Construction Materials from the Bio-Economy

11th September 2017
Ashtown Conference Centre, Teagasc, Dublin 15

Performance of Bio-based Building Materials

Bio-based Building Skin

Premier Irish Industrial Hemp Conference

20 June 2019
Teagasc Food Research Centre
Ashtown
Dublin 15
My work over the past 20 years has been to promote low carbon building solutions
We use wood fibre boards and insulation
Hempcrete is well established in England but less common in Ireland.
HEMPCRETE WORKSHOP

Join our two-day hemp building course in the beautiful tranquil surroundings of Beal Organic Farm in County Kerry

SATURDAY & SUNDAY 10th & 11th AUG 2019

The renowned architect TOM WOOLLEV, pioneer of the use of 100% natural materials in buildings will give instruction on:

- THE NATURE OF HEMPCRETE
- USING THE RIGHT MATERIALS
- THE NATURE OF BIO-BASED MATERIALS FOR INSULATION
- ABOUT HYGROSCOPIC PROPERTIES
- PRACTICAL METHODS FOR RETROFITTING

Starting at 11am Saturday and finishing 4pm Sunday, this workshop is suitable for self-builders, enthusiasts and professionals and run by green building legend Tom Woolley.

This workshop features both a classroom and a hands-on practical element and will cover materials and sourcing, cost and thermal performance and the different techniques for applying the material to a section of a wall, you will get hands-on experience with the mixing and applying of hemp lime for insulating. This workshop will demonstrate the use of hemp lime, materials with their fantastic eco-credentials, and will demonstrate how they are used in both renovations and new builds.

- Hands on experience with mixing and applying hempcrete
- Using the right materials
- The nature of bio-based materials for insulation
- About hygroscopic properties for good indoor air quality
- Practical methods for retrofitting onto stone or brick walls.

THE COST PER PERSON IS €170

Enquiries: info@hempcooperativeireland.com
Bank Transfer: IBAN: IE31 ZAIB 10030997550001
B ogólna: 15779948737
YOU WILL NEED TO BRING:
Safety goggles, long sleeves, practical clothing, long sleeved top, long trousers and a pair of sturdy boots.
Accommodation recommendations available through: Ballybunion Tourist Office Facebook page.

*Tom Woolley is an architect who has been a pioneer of the use of natural materials, particularly hemp and lime in buildings. He works for Rachel Bevan Architects and has published several books on green building and healthy indoor environment. Tom has taught at several universities and educational institutions including the Centre for Alternative Technology, and is a Visiting Professor of Anglo Irish University. He currently runs workshops around the world on hemp and lime.

August 10-11. Kerry
Hempcrete in Chile, South America

Around the world
Chile
South Africa etc
The lime binder we use is manufactured by Kilwaughter Lime in Northern Ireland following a careful series of tests and trials using hydraulic and hydrated lime.

The hemp comes from Harrison Spinks in Yorkshire.
28th September 2018

EBUKI Conference

This year’s annual conference, held this time every two years in Ireland. This year’s theme is:

The Secret Life of Earth

Our Crash and Matriarchal speakers and presenters from 12 countries and our incredible keynote speakers will guide us through contemporary cob houses in Ireland and beyond. From 27th to 29th.

Friday 28th September 2018
Tickets: £110

Dinner and Ceili

After a week of building, workshops and learning, join us to celebrate with a traditional Irish evening on Friday 28th at the National Heritage Park, Clonmel.

Tuesday 4th September
Tickets: £35

FREE EVENTS

Cob Maltha

Zennar, a New Handover event to build a cob house with Zennie and Ulla Reeder and their friends. Cob! 2018 is a 3-day event.

Opening 24th September
In association with Cork City Council.

Monday 24th
Tuesday 25th
Wednesday 26th
Thursday 27th

Open House Tours

29th September 2018

The secret life of house tours in the amazing cob houses of contemporary Earthships. A group of building and cob houses, and green homes, so you can see what is possible and how it is built. They will be taking place on Friday 28th from the Irish National Heritage Park.

Earthen Building UK and Ireland
Tel: +353 (0)74 930 0488
Email: info@ebuki.co
Website: www.ebuki.co
In partnership with the Irish National Heritage Park

Check www.ebuki.co for additional partners and sponsors

Book Now
Tickets for all events available on www.ebuki.co

Clayfest! 2018
International Festival of Earth Architecture
24 - 29 September
Irish National Heritage Park
Fenians, Co. Westmeath, Ireland
Rediscovery Project: Detailed Environmental Performance Guidance

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Emerald: recycled sheep's wool
The Award winning Rediscovery Building Ballymun biggest hempcrete building in Ireland
Thank you

tom.woolley@btconnect.com