

Designing for Reuse & Disassembly of Timber

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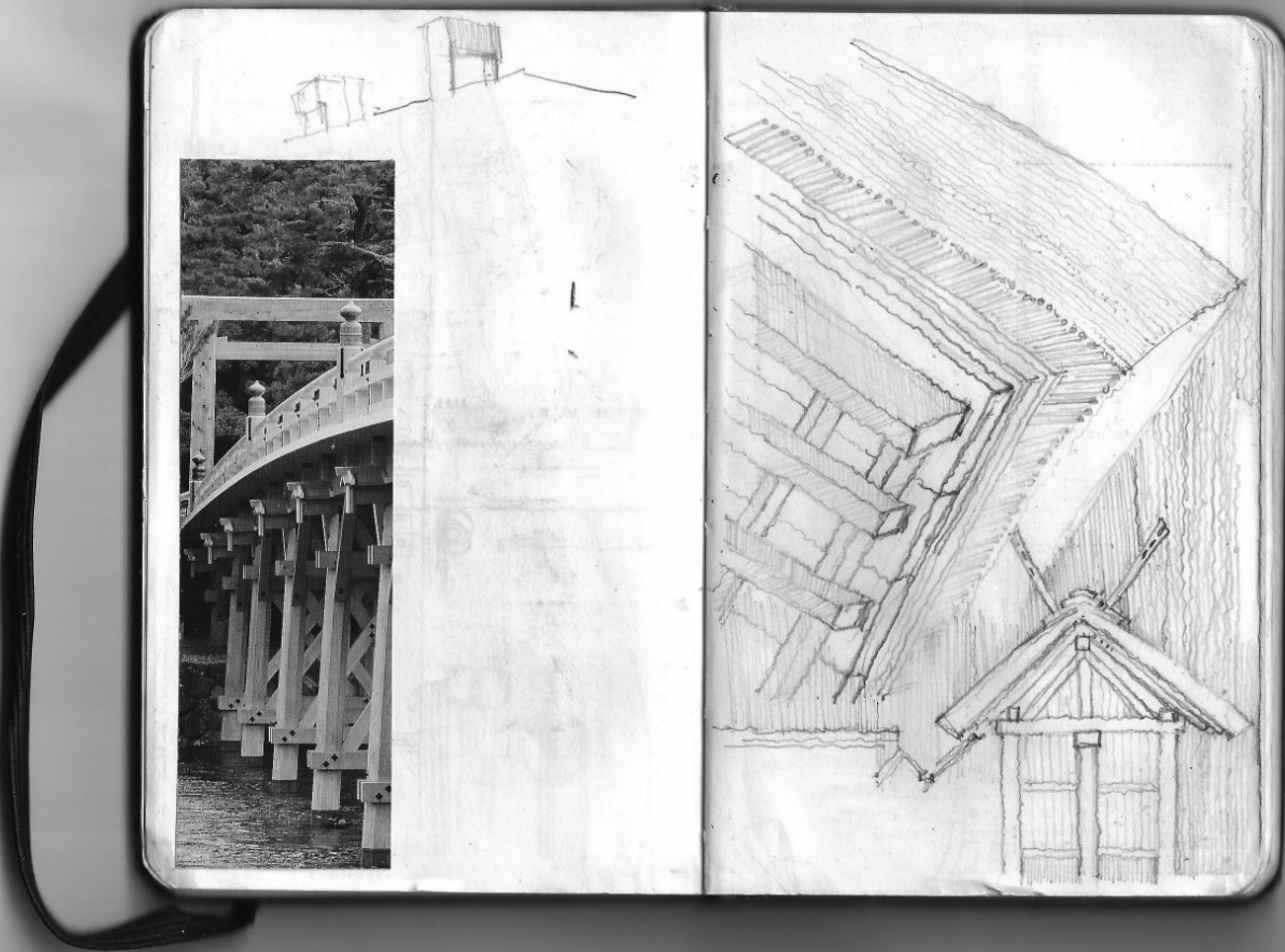


Figure 1 : Traditional Timber Reuse at Ise, Japan - Site Visit

Encapsulated Structural Timber in the Irish 'Material Bank'

A study of the current Irish housing stock was undertaken to establish the volume, dimensions and quality of the timber used in residential structures as well as the manner of its encapsulation. Housing in Ireland is largely made up of low density single family dwellings with a masonry outer leaf construction. This typology has resulted in large footprints, with significant amounts of quality timber components which have been protected from the elements and therefore remain in a good condition.

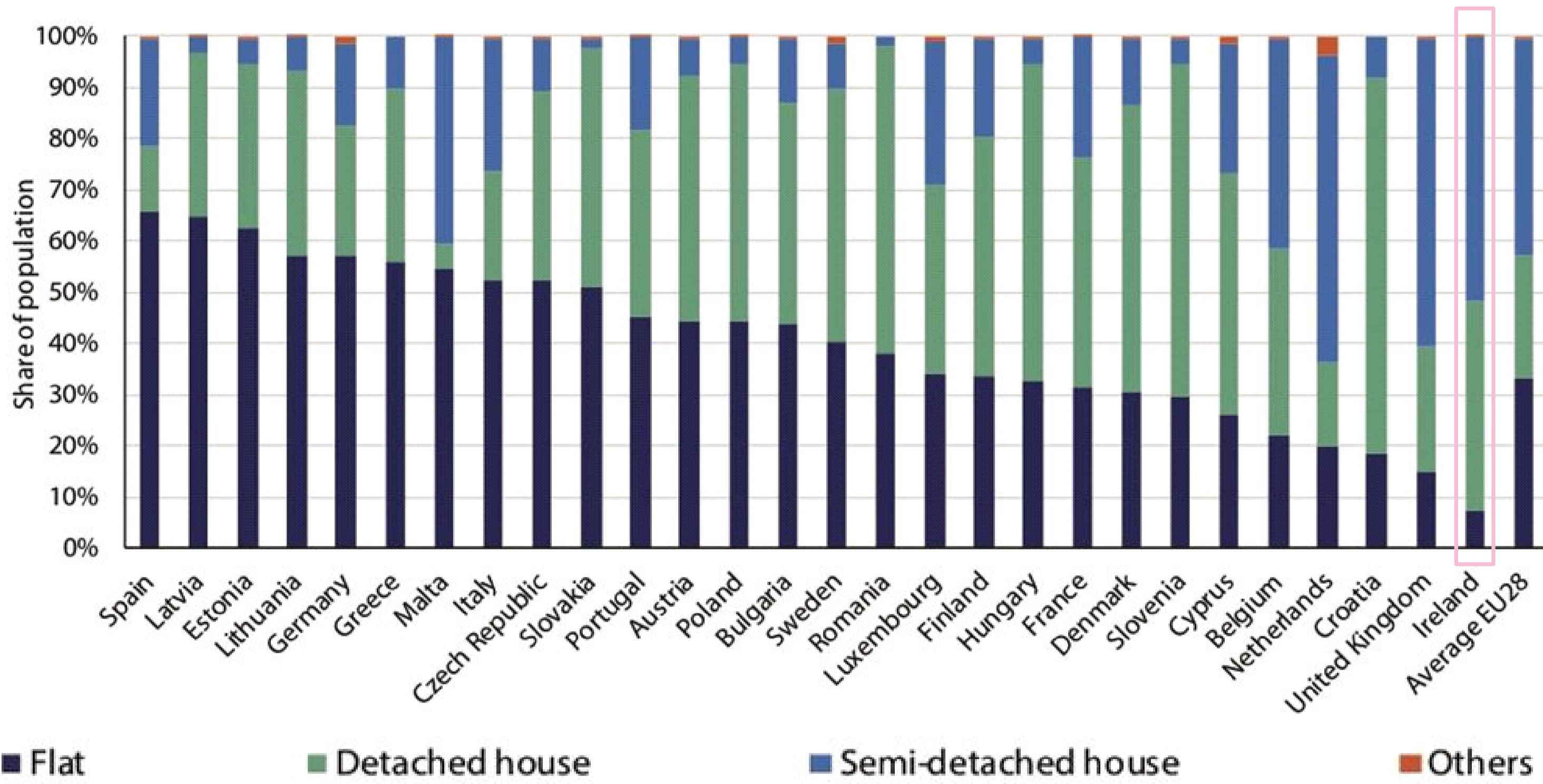


Figure 3: Distribution of population by dwelling type in EU member states 2015 (Source: CSO, Eurostat & SEAI / Table SEAI)

In traditional Irish construction, a high volume of structural timber per square metre (0.031 cubic meters) exists due to the low-density nature of our housing stock.

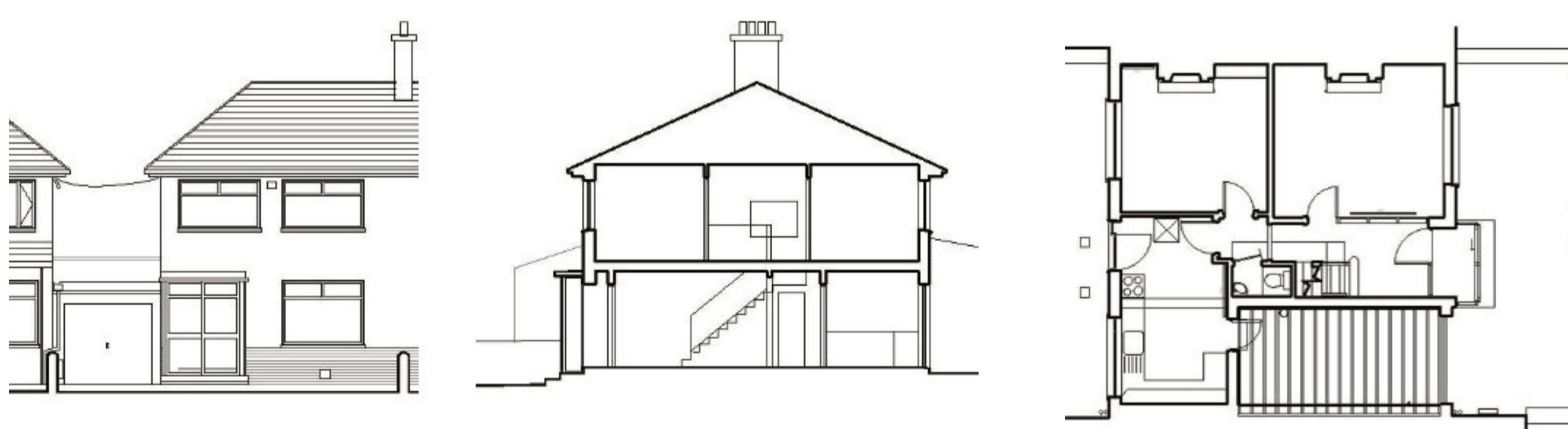


Figure 4: Case Study; Typical Suburban Semi-Detached House



Figure 5: Case Study; Typical Suburban Semi-Detached House - Survey / Demolition Photos

The most common section size used in Irish dwelling construction is 37.5 x 112.5mm (1.5" x 4.5"), making up approx. 60% of all linear meterage and with a high potential for reuse in Cross Laminated Panels and other timber products.

Linear Meters - National Estimate, Ireland (2020)

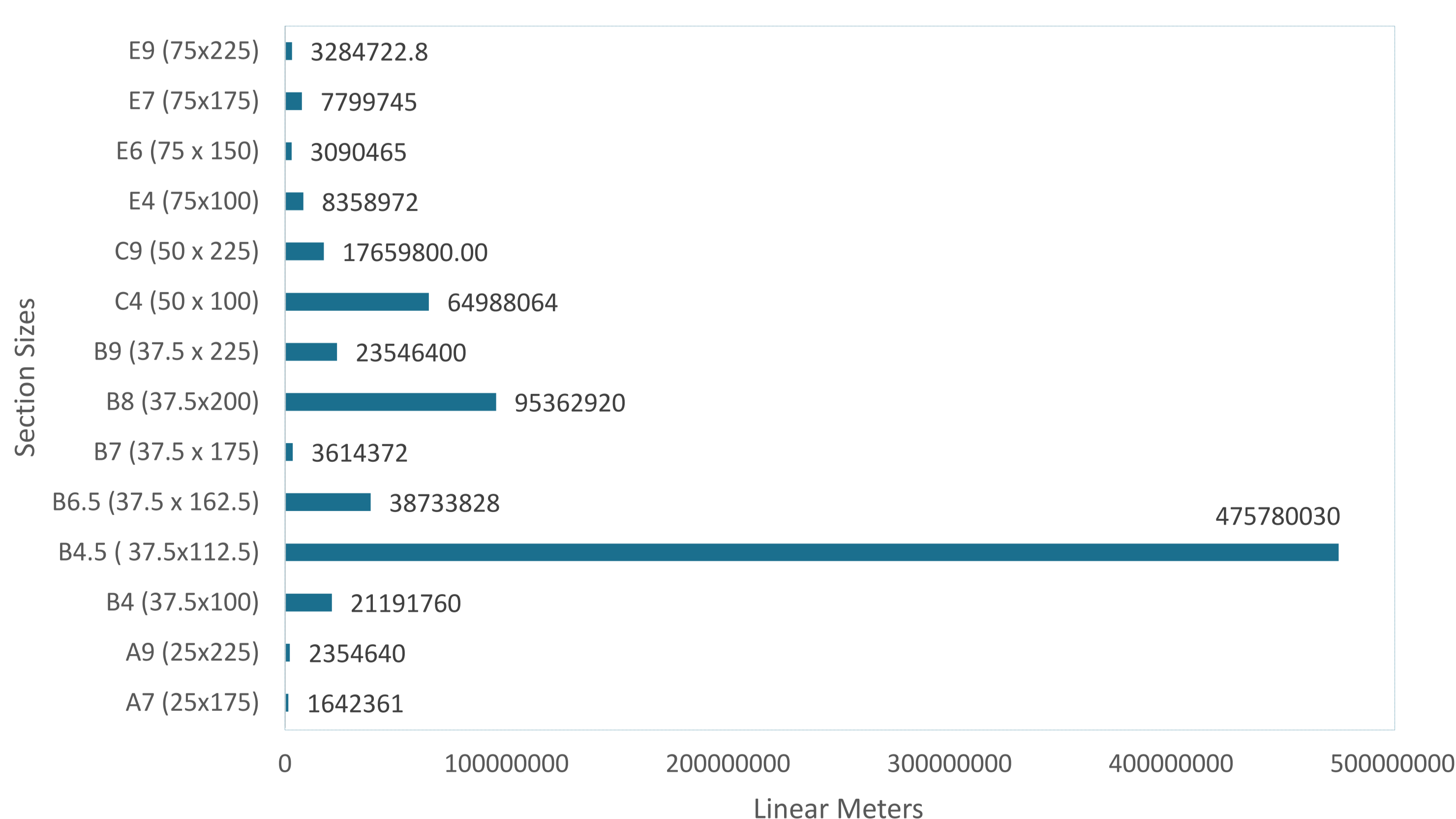


Figure 7: Based on 1) average cubic metres per m2 (Infuturewood, 2020), 2) average m2 per house (National Estimate, 2013)

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Buildings as timber 'Material Banks'

Within the context of growing environmental awareness and reduced resources, life cycle assessment (LCA) of construction materials now forms part of the European Commission's 'Level(s)' framework for Green Public Procurement [1]. Yet in Ireland, timber is largely considered a single use product, with almost all material incinerated following demolition and thus increasing the production of carbon

As life cycle assessment of materials becomes mainstream, producers, manufacturers and designers of buildings are required to change their approach to the use of materials including timber, by considering carefully how components, designs and assemblies forming 'Material Banks' will allow for disassembly and reuse of these products in the future, much like the shrines of Ise, Japan.

Demolition practices driven by labour and waste treatment costs

Current demolition practices, rarely considered in the design and construction of buildings, have been studied as they will play a key role in the recovery of quality reusable timber components. Utilising onsite observation of comparative examples and case studies from industry partners, the practical aspects of demolition, the flows of waste from the demolition site, and the commercial factors driving this industry were documented. Almost all waste timber produced in Ireland from demolition is either incinerated or downcycled (Figure.2) .

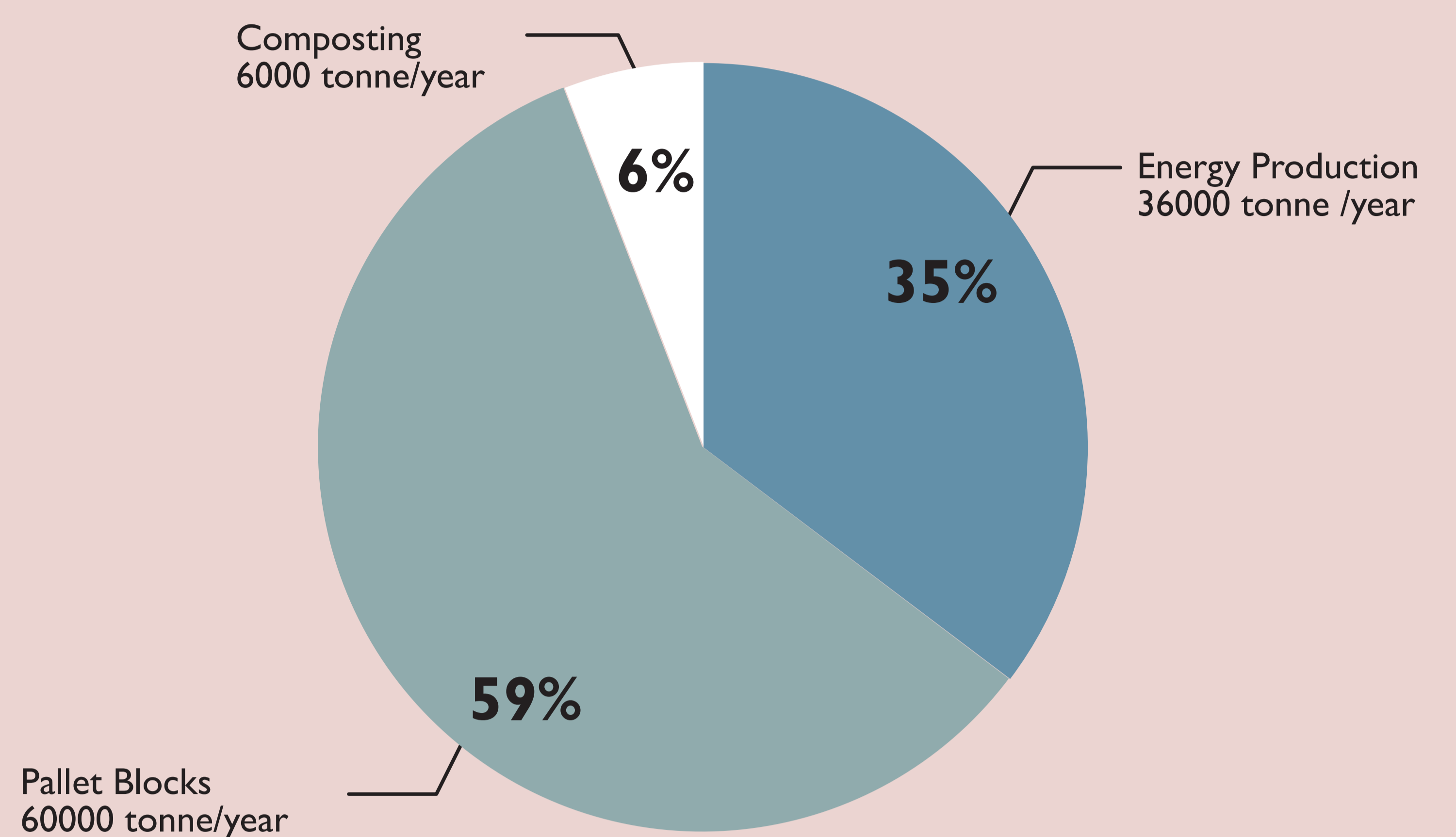


Figure 2 : Amount of wood waste in Ireland per annum and end-use (6)

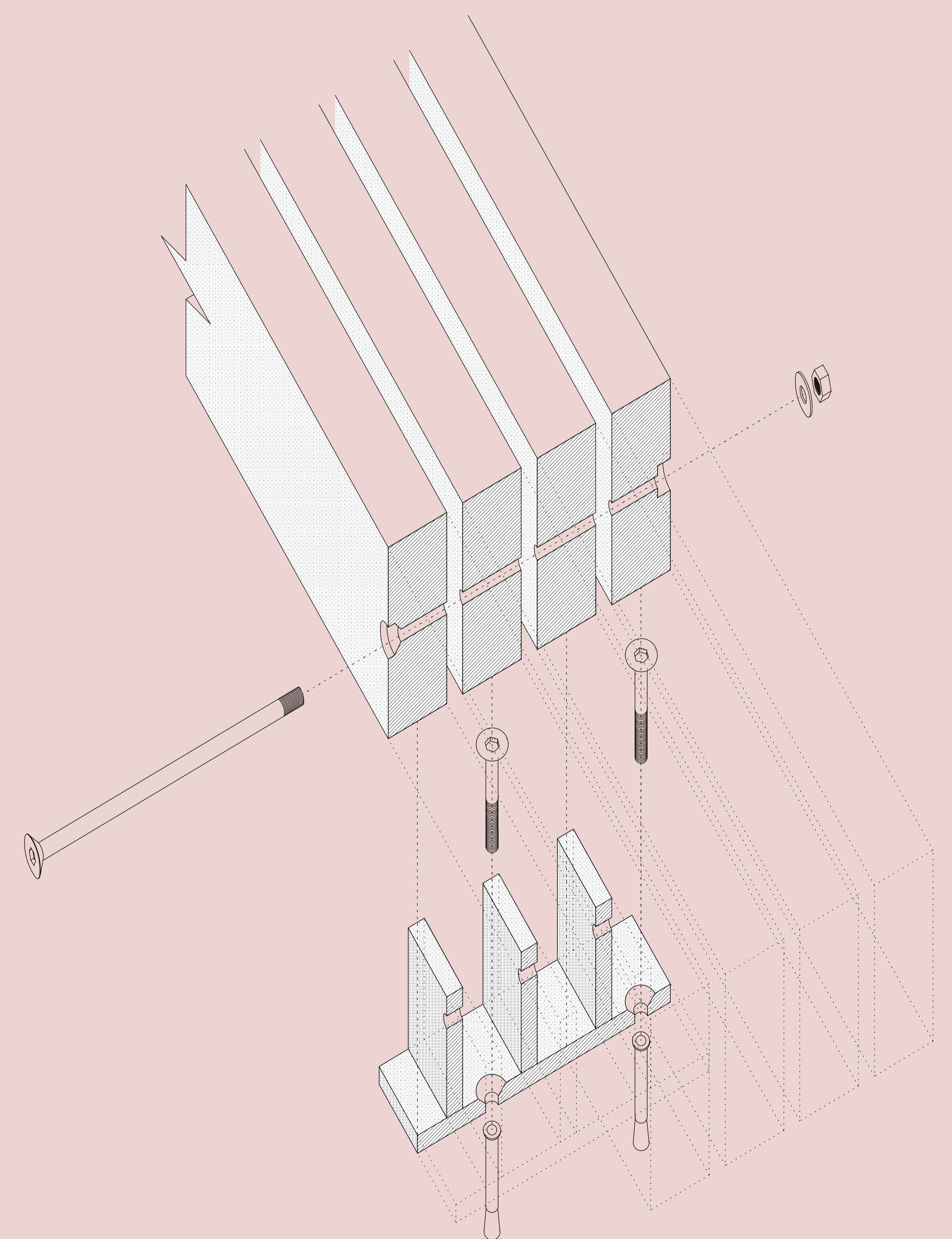


Figure 6: Exploded Axonometric Detail, Reversible Timber Construction, St. John Walsh / AY Architects

Reversibility of Timber Connections

In conjunction with craftsmen and those who demolish buildings, current principles and strategies of design for disassembly have been assessed from the perspective of timber construction to establish what methods might easily enable disassembly and future reuse of timber. This assessment has highlighted that simple traditional techniques, such as pre forming holes, might ensure fixings can be removed easily following use with limited damage to the material, while not increasing the cost of construction prohibitively.

The Future of Irish Timber Construction

The analysis highlights that a huge amount of waste timber which is potentially suitable for reuse or remanufacture is disposed of every year in Ireland. This fact, along with the significant quantities of potentially reusable structural timber in the Irish housing stock, highlights an opportunity for the development of accessible principles and strategies for design for disassembly & reuse that could be easily implementable on site.