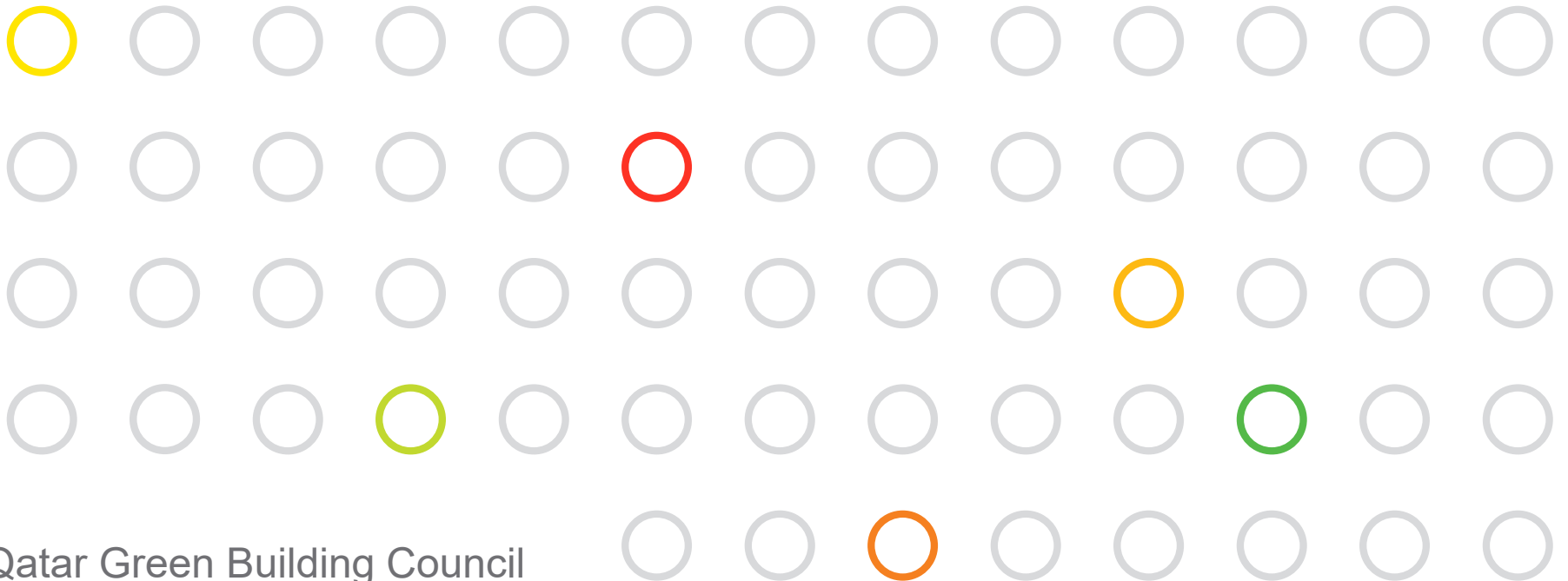


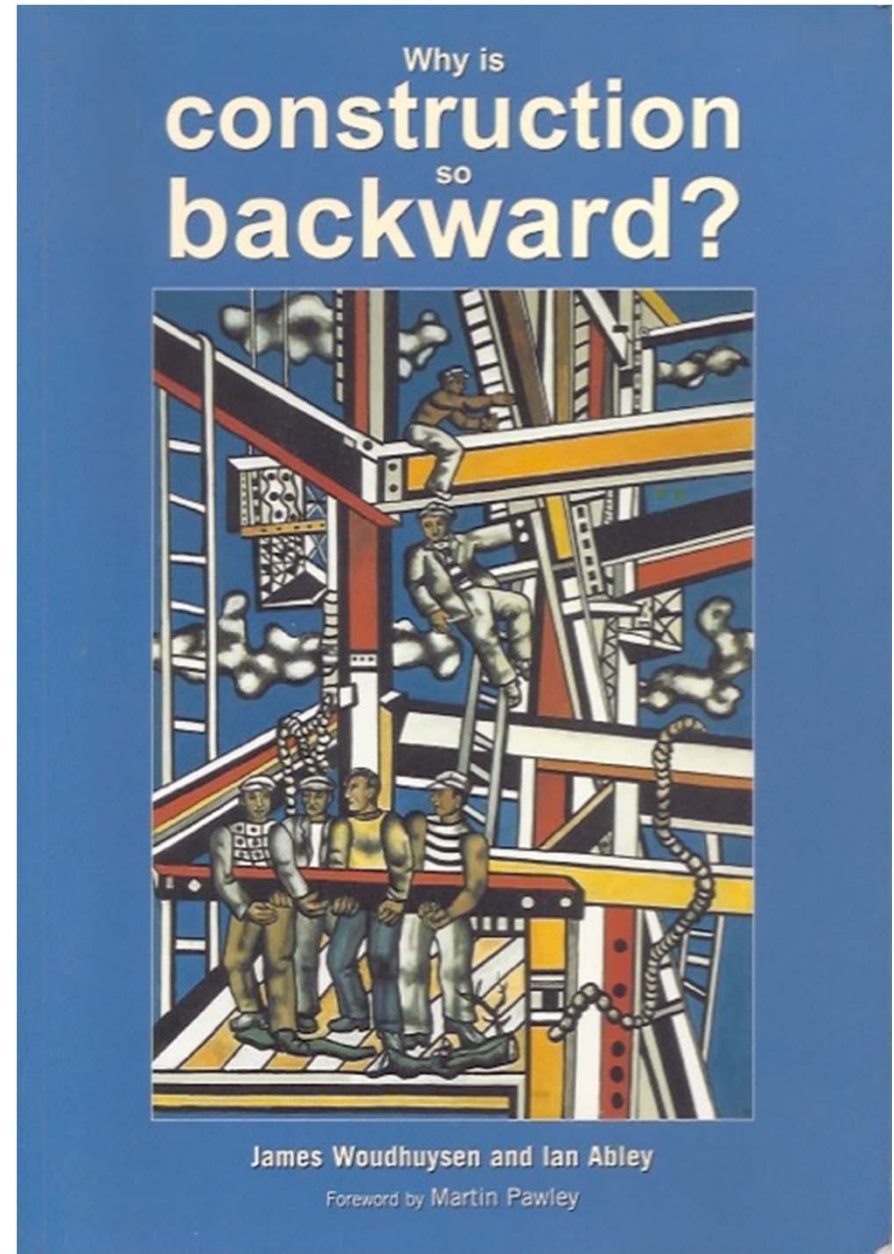
# Lean and Green: towards a sustainable industry

Dr. Alex Amato – Head of Research



## the problems with construction:-

- poor record of delivery to programme;
- poor record of delivered quality;
- low productivity;
- poor record of training and continued career development;
- very adversarial;
- low investment in research and development; and
- poor record of innovation and adapting to, and implementing new technology



## Latham Report: Constructing the Team 1994:-

*“identified industry inefficiencies, condemning existing industry practices as 'adversarial', 'ineffective', 'fragmented', 'incapable of delivering for its clients' and 'lacking respect for its employees'.”*

## Egan Report: Rethinking Construction 1998:-

*“the construction industry has consistently performed in a way that is thought to be **wasteful** compared to other industries. There is a general impression that it does not deliver good value for its customers.”*



I want to focus on just one word that links the world of Lean to the world of Green

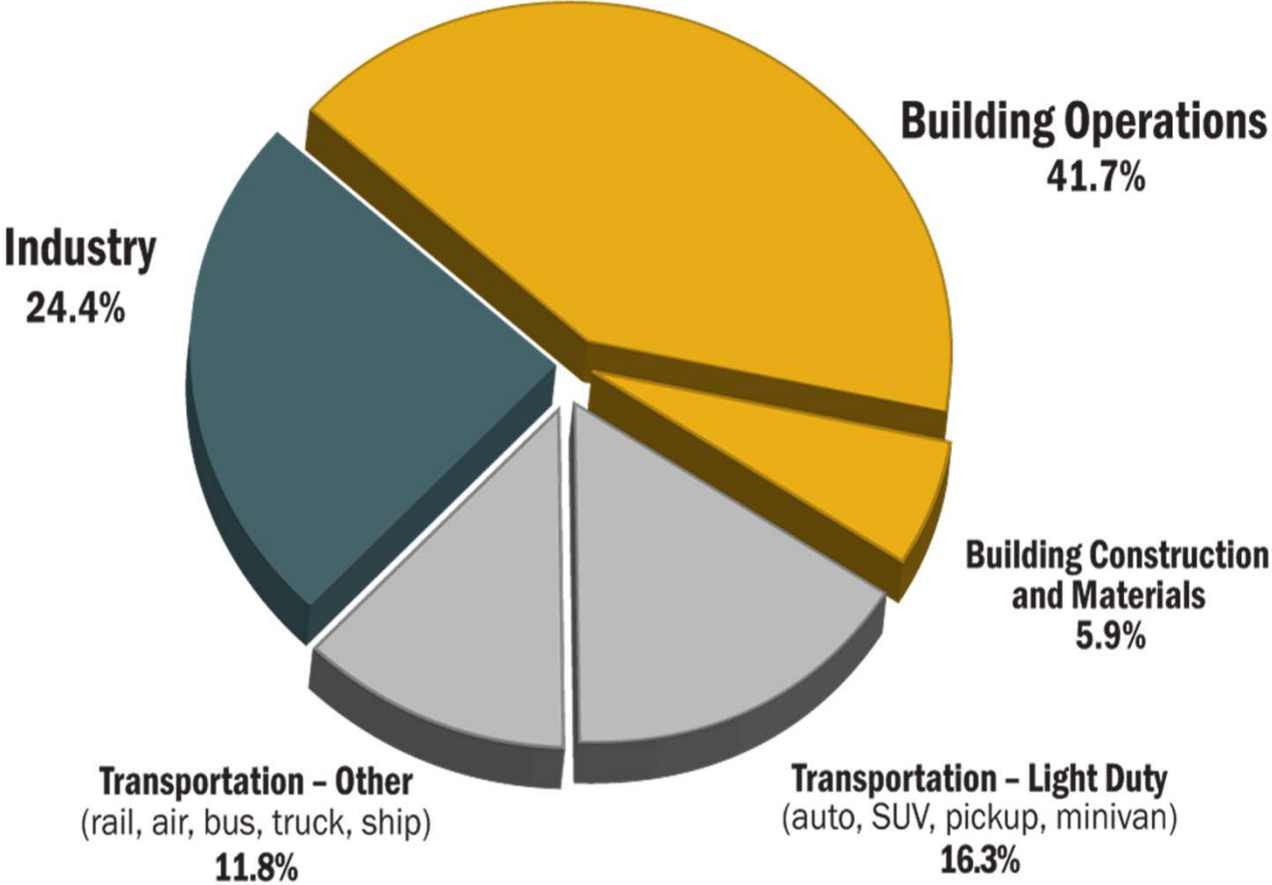
**wasteful**

# 3 lean and green thoughts

- energy
- materials
- prefabrication

- energy

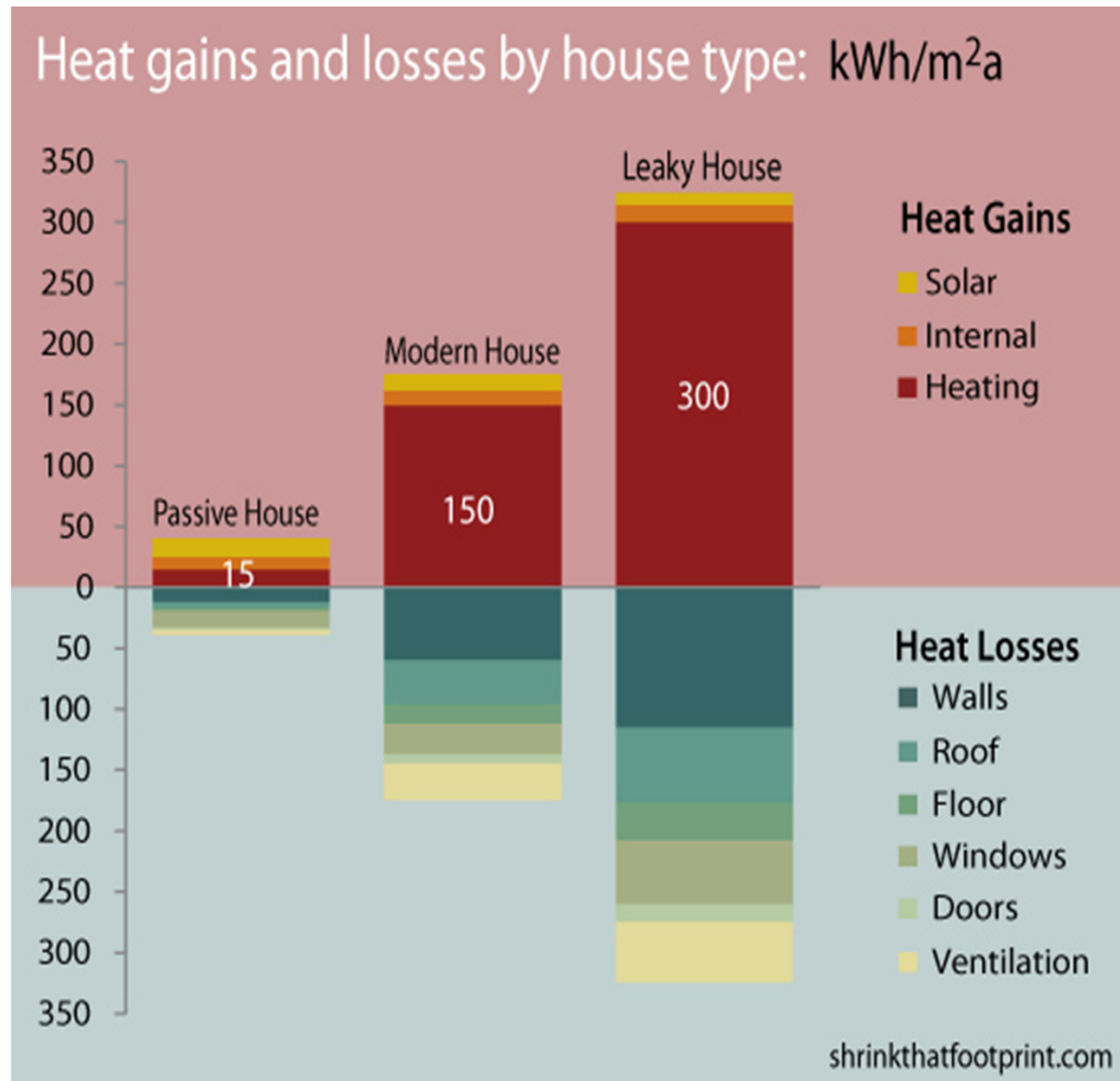
why the built environment is important to global warming



### U.S. Energy Consumption by Sector

Source: ©2013 2030, Inc. / Architecture 2030. All Rights Reserved.  
Data Source: U.S. Energy Information Administration (2012).

# energy conservation – demand side management







is there an elephant in the room right now ?

so what is the elephant  
in the room as far as the  
sustainable built  
environment is  
concerned.....?

**YES** – I'm sure you all  
answered correctly  
it's the **existing**  
**building stock!**

- **materials**



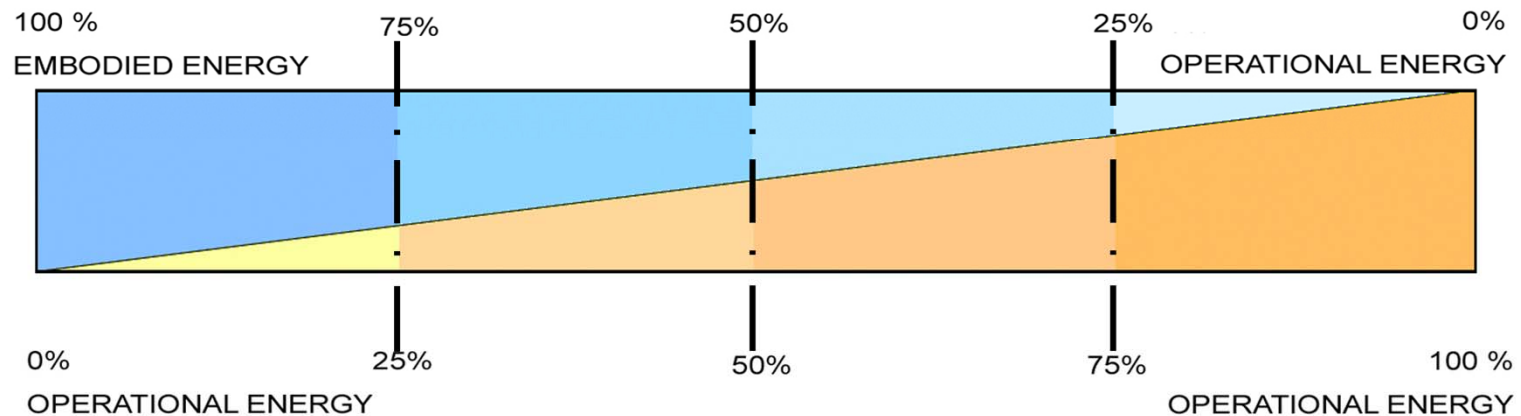
roads bridges docks and piers  
that's the stuff for engineers

EMBODIED ENERGY  
PREDOMINATES

OPERATIONAL ENERGY  
PREDOMINATES

*civil engineering structures tend to have a relatively high proportion of embodied energy to operational energy*

*approx. range for offices assessed in study*

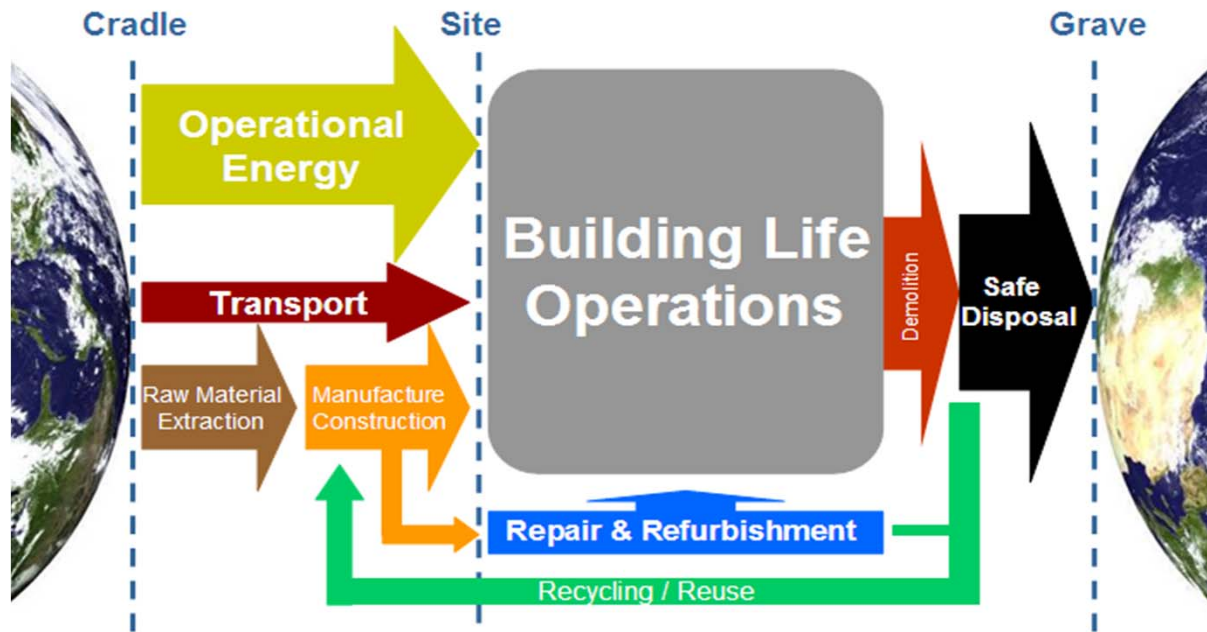


*hospitals tend to have a high relatively proportion of operational energy to embodied energy*

*Proportional relationship between embodied and operational energy for building types*



# why a life cycle approach?

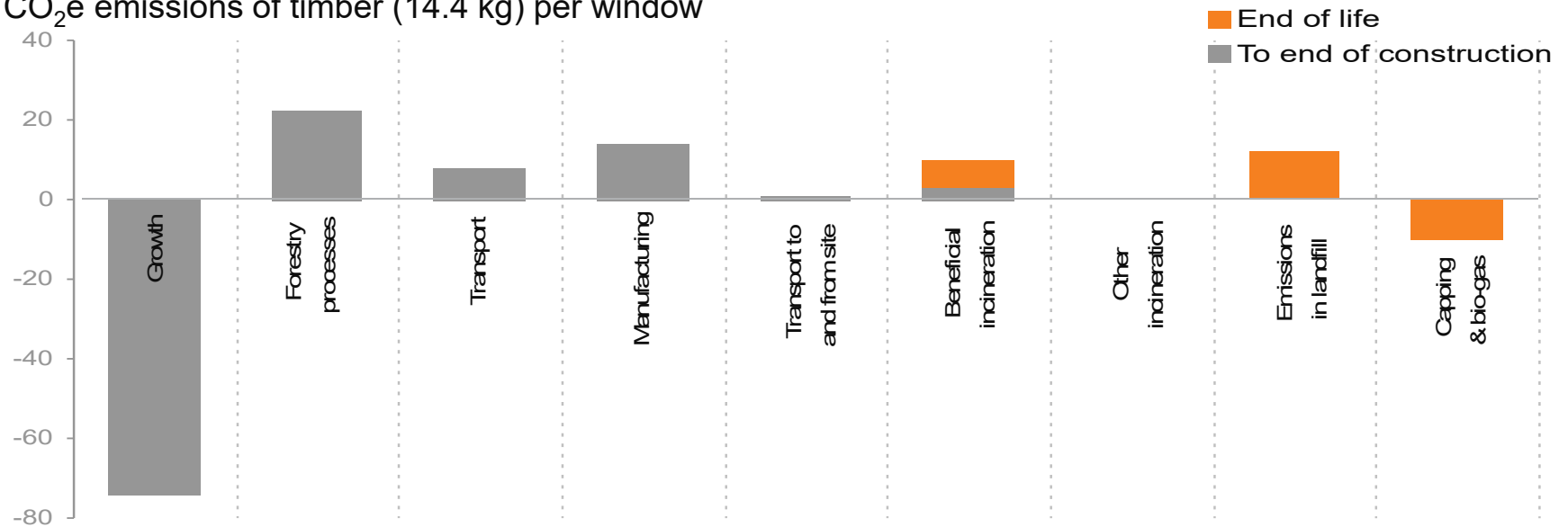


- because impacts and mitigation occurs throughout the **life cycle** of most construction materials;
- because any assessment must take into account the **repair and maintenance regimes and end-of-life scenarios** of any material or product.

# Comparison of Life Cycle Assessment of CO<sub>2</sub>e for windows

CO<sub>2</sub>e emissions for the timber part of a wood window

CO<sub>2</sub>e emissions of timber (14.4 kg) per window







T E C H N I K E R

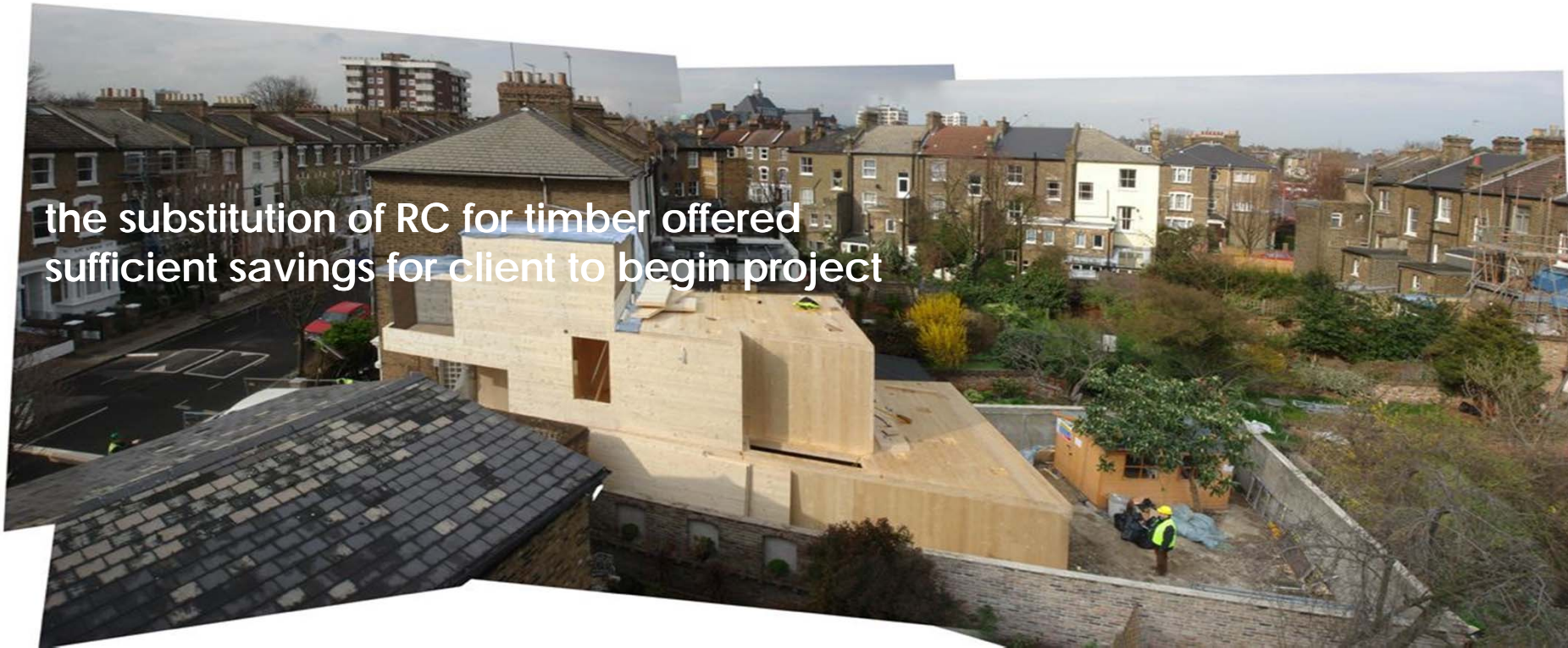
# Cross-Laminated Timber Structures

## Matthew Wells



KLH factory in Austria





the substitution of RC for timber offered sufficient savings for client to begin project

Focus House

Qatar Green Building Council

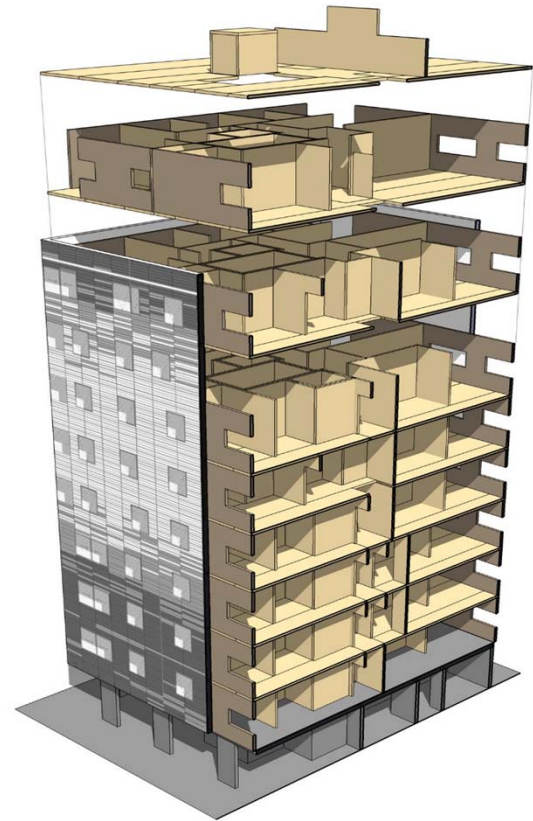
## Outline

**Eight storeys of cross laminated timber onto RC podium slab at first floor.**

**Mixture of private and social housing with separate access.**

**Cellular construction.**

**A carbon positive footprint over a twenty year period.**



**Stadthaus**





Stadthaus

Qatar Green Building Council

- prefabrication



# prefabricated housing current practice Murray Grove London UK

- volumetric construction in comparison with panelised systems enables all the fit-out and finishing trades to be carried out in the factory with an established flexible workforce in a controlled environment, protected from inclement weather
- this leads to efficiencies in both labour and material and ensures a high quality product compared with on-site working practices as trades can rapidly follow on from each other
- it also leads to speed of construction as the process is well planned allowing for essential site based operations to commence while factory production continues, optimising the programme





## Light Steel Frame in Module

Qatar Green Building Council



# prefabricated housing current practice Murray Grove London UK

- rapid programme



Murray Grove Apartments - 25 March 1999 - 10:00



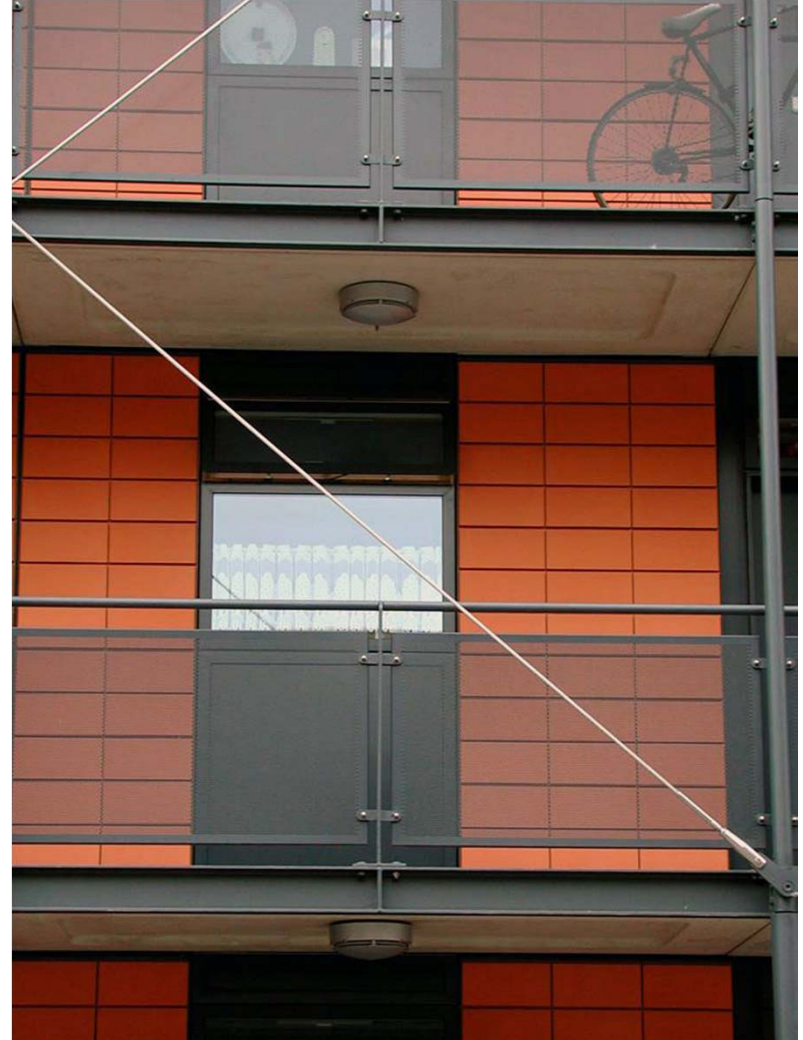
Murray Grove Apartments - 13 April 1999 - 12:00



Murray Grove Apartments - 30 March 1999 - 13:00

# prefabricated housing current practice Murray Grove London UK

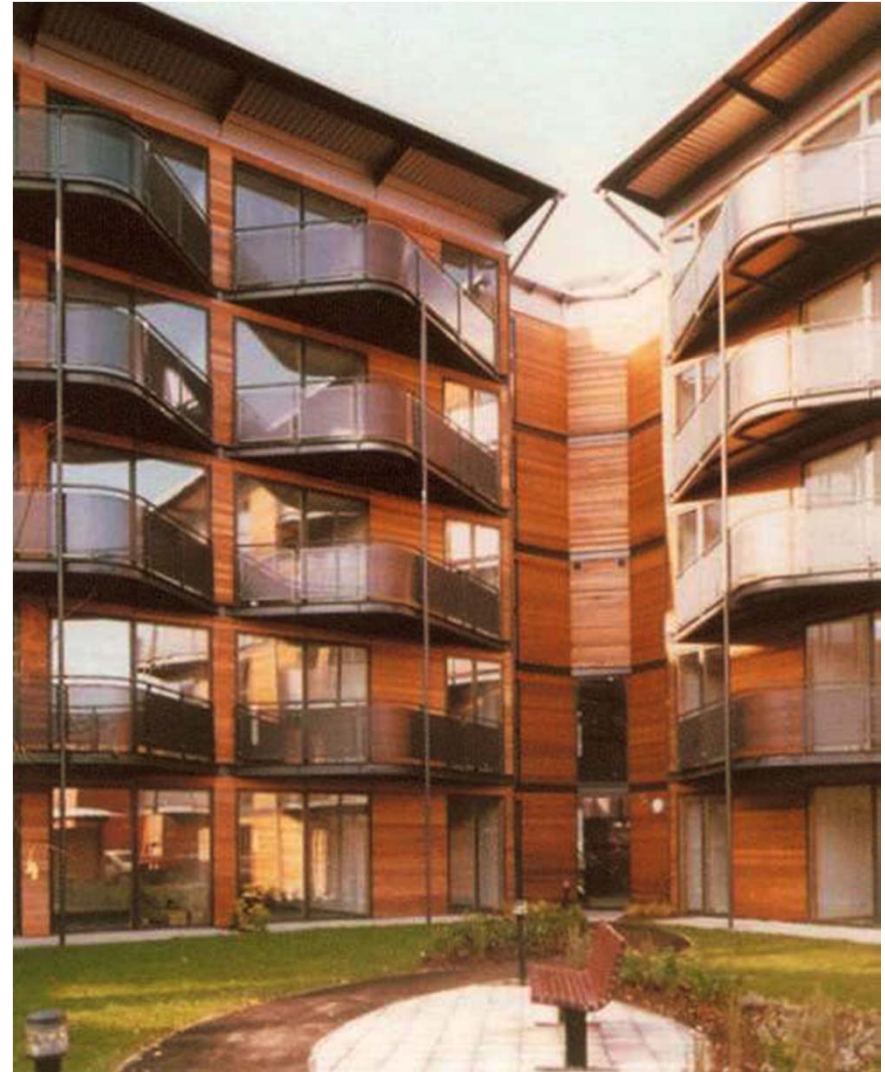
- external walkways, modular steel and precast concrete, fabricated off-site but erected on-site
- high quality detailing and finishes
- affordable housing for the Peabody Trust





# prefabricated housing current practice Murray Grove London UK

- housing for essential service workers e.g. nurses, police, tradesman
- internal court-yard, lift access etc.



Qatar Green Building Council

## a conclusion of sorts

so with all these advantages why don't we see a great deal more construction projects delivered using these methods?

there are numerous and complex reasons, some geographic some global but I raise 2 key points:

critical mass



fragmented construction industry



thank you for your attention

