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# Designing and Constructing for a Sustainable Future – Community Urban Housing in Timber. Projects by 4<sup>th</sup> Year Architecture Students at DIT.

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## **ABSTRACT:**

*There is some agreement and much debate among interested parties about what constitutes 'sustainable housing'. The term 'sustainable' is used somewhat liberally to mean different things to different listeners. Governments, institutions, interest groups and individual designers often address certain aspects while ignoring the bigger picture. But the bigger picture is such a multivalent issue that includes aspects outside the architect's immediate remit such as location, transport, security, procurement policy and post-occupancy analysis and management. Or are these outside the architect's remit?*

*Teaching sustainable housing within conventional architecture programmes means educators are restricted to identifying certain key issues that students should learn within a specific teaching timeframe, given the necessity for the students to demonstrate ability in the mainstay of architectural education – individual design approach, urban design, apartment planning, regulatory compliance and aesthetic aspiration.*

*Or should we be more radical in our pedagogical approach to such an urgent need?*

*This paper reflects on the teaching and learning of sustainable housing in challenging urban contexts by staff and students in 4th year at the Dublin School of Architecture, DIT in Semester 2, 2014 with reference to international examples and key texts on the issue.*

**KEYWORDS:** *sustainable housing, timber structure, flexibility, adaptability, energy, and threshold.*

## **1 INTRODUCTION - WHAT IS SUSTAINABLE HOUSING? - 1**

The considerations of sustainable housing span across a myriad of inconclusive, multivalent issues and disciplines from: **2**

- Location and public transport to higher densities.
- Stable family accommodation to third age flexibility.
- Building form and layout to universal access.
- Construction systems and embedded energy-to-energy usage over time with the related environmental assessment methods.
- Provision of communal amenities to management and maintenance and much more, with the word 'balance' featuring strongly in much of the declarations and literature.

Edwards (2000) gives a myriad list of issues but notes ultimately that “quite simply sustainable housing is a matter of both the design and the management of the housing stock” (p124) and that it must have “good, intergenerational asset value”(p.20).

EU ministerial meetings have issued many policy papers on sustainable development that include guidelines on housing. **3** The Bristol Accord (2005) for example defines eight characteristics of sustainable housing, included terms such as “sufficient range, diversity,” .....“appropriate size, scale, density, design and layout, ..... mixed-use, durable, flexible and adaptable buildings, using materials which minimise negative environmental impacts.”

An Irish Government publication **4** notes that: “Sustainability involves the construction of homes that are structurally sound, energy efficient, environmentally friendly and adaptable over time to changing household needs” and that housing provision must be integrated “with necessary transport and other physical infrastructure, social infrastructure and amenities. (DOEHLG, 2007).

Given these broad parameters what can teachers and students achieve in a 12-week sustainable housing studio project? I will address this question by reflecting on four issues of a student project in the 4<sup>th</sup> Year Architecture studio at DIT from January to May 2014.

## **2 THE STUDENTS’ CHALLENGE 5**

The challenge that staff set to 4th year architectural students at DSA/DIT was to design and part detail a new urban community housing scheme that would be SUSTAINABLE economically, socially and environmentally. The students’ design had to respond to a varied demographic profile hence have a range of apartment typologies. Universal design principles were mandatory while their response to the sustainability brief were to include strategies to minimise environmental impacts by selective material specification. Each design had to demonstrate how embedded carbon and energy were minimised in construction and during the lifetime of the project. They were also encouraged to include improved thermal performance, rainwater harvesting and on-site energy

All projects were to be designed with a timber structure with the ideal of achieving a carbon neutral proposal. The students were expected to demonstrate an ability to respond to the dual themes of environment and tectonics from concept through to a constructed detail.

This was quite an ambitious ask given that much of the time would be spent designing and planning dense housing projects on tight urban sites addressing the normal range of urban and architectural issues.

The four sites chosen, **6** all close to the historic Georgian core of Dublin’s north side, had some shared characteristics but also unique challenges. **7**



*Figure 1. The four sites in Dublin’s north inner city*

The teaching methodology was relatively conventional and included lectures by staff and visiting experts in all of the above topics, one-to-one studio tutorials and group reviews with visiting critics. Visits were organised to local residential and community centres where students could engage with

community activists, facilitators and residents. **8** The class of 55 students was divided into three tutorial groups with two or three staff responsible for each group.

I will examine the students' responses to four key topics of 'sustainable housing' that we covered on this project.

### **3 SITE, FORM and ORIENTATION – economic, social and environmental sustainability **9****

Siting, orientation and building form are crucial to sustainability and in particular energy usage. In the Irish climate, we strive to use the form and section of buildings to get good sunlight in to private and communal spaces while striving also to increase densities. **10** Students were given many examples of this.

The densities and contexts generally required between 3-6 storey perimeter blocks. Thus the south facing street edges on two of the sites **11** presented difficulties as students strove to accommodate this need with the desire that their schemes have a strong urban presence.



*Figure 2. Getting the light in*

Students also juggled the balance between these concerns and developing appropriate urban and architectural forms. **12** Schemes varied between a subtle response to the contextual urban grain and using their proposal as a strong urban marker.



*Figure 3. Strong urban markers*

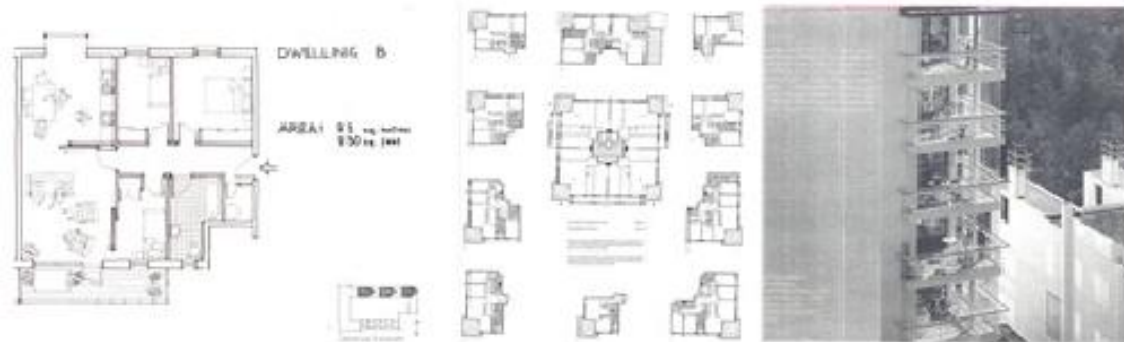
### **4 FLEXIBILITY and ADAPTABILITY – social and economic sustainability **13****

Though having varied interpretations these two terms are an essential aspect of sustainable housing. Broadly interpreted they require that new housing should be able to be adapted to suit changing needs to prolong its life in order to avoid obsolescence (Schneider & Till, 2007, 35). Schneider & Till have categorised flexibility into 'hard', which determines how the design may be used, but provides options for use of spaces such as sliding walls and fold-down beds, and 'soft' which refers to "tactics which allow



a certain indeterminacy” (p.7). Quoting historian Adrian Forty they note that hard flexibility provides “the means of allowing architects ‘the illusion of projecting their control over the building into the future’” (p.7) while soft flexibility relinquishes that illusion and allows occupants to change the design according to their needs (p.7).

A case study seminar illustrated hard and soft flexible strategies to the student group:



*Figure 4. Hard flexibility*

An example of the hard type **14** may be York Street Housing (Fig. 4, left image) by Seán Harrington Architects in Dublin that allows options for the use of the third bedroom. In theory all the non-structural walls can also be removed within the apartment, pending fire regulation compliance and service positions, allowing the occupier to completely re-design the interior. The scheme by architects Gullichsen Vormala Kairamo **15** in Finland (Fig. 4, right images) where, through clever positioning of structure and services, a basic shell and core affords multiple options for apartments sizes and types. While offering more than most hard flexible schemes the multiple results are still limited by the architects. **15a**



*Figure 5. Soft flexibility*

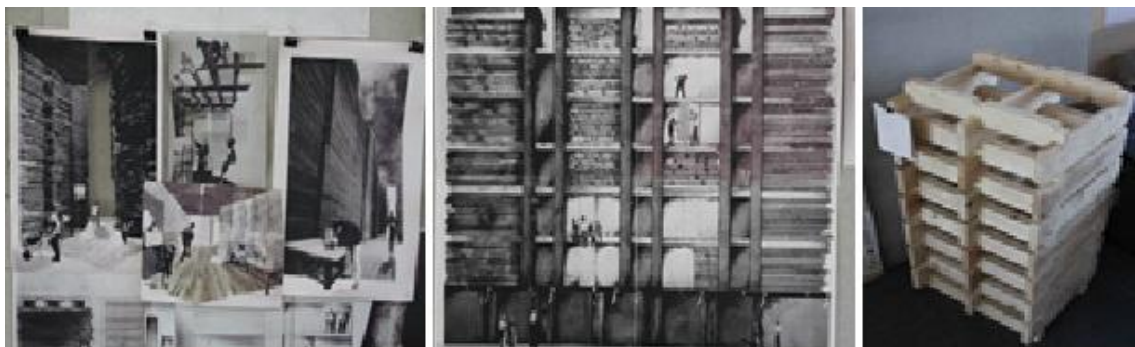
The soft flexible scheme of Quinta Monroy Housing, **16** Chile by architects Elemental offers users the ability to adapt the space to their needs over time, an idea that led to intense debate among the students about the role of the architect, particularly when examples of the tenants’ interventions were shown (Fig. 5). **17** The students’ own schemes generally opted for the ‘hard’ interpretation of flexibility often allowing for manipulation of rooms around a central core or removal of floors to create double height living spaces. **18 / 19**



*Figure 6. Student example of hard flexibility*

A challenging proposal of soft flexibility, **20** combined with user participation and community engagement, came from student Sophie Kelleher whose project, entitled 'The Stacks', envisages the urban site full of drying timber stacks **21** that can be developed in to homes over time. In her own words: "There is a creation of purpose, pride and community on the ground floor through a timber workshop **22** where unemployed people learn life skills and trades which in turn will be used to build their own homes. The edge is no longer protecting and barricading its inhabitants but is activated by the building programme as the drying timber is built up in to apartments – a tower of timber slowly inhabited."

A noble aspiration, evocatively represented and, while somewhat undeveloped in plan and detail, **23** it challenges the conventional mode of housing production and suggests another way of inclusively and collaboratively providing housing as well as an alternative approach to architectural practice along the lines of some of the methods espoused in the Spatial Agency project (Awan, Schneider and Till, (2011)).



*Figure 7. Student example of soft flexibility*

## **5 ENERGY, CONSTRUCTION and MATERIALS – environmental sustainability** **24**

The use of a timber structure was a determined requirement of the project. Wood is a carbon sink – it removes carbon from the atmosphere and stores it for its life - and the process to produce timber uses much less energy than for e.g. steel or concrete (SOM, 2013). **25** The regeneration of new forests continues the cycle of carbon sequestration. Prefabricated timber buildings can be erected quickly thus reducing site wastage and costs. This knowledge informed our insistence on a timber structure for the students' projects - despite some protestations. Students were asked to explore how energy conservation measures and environmental concerns can inform an architectural design in a holistic manner.



*Figure 8. Murray Grove timber residential building, Hackney, London.*

One case study highlighted to students, **26** Murray Grove is a recently completed 9-storey tall timber residential building in London. The 8-storey structure was erected in 27 days with 4 people. Gordon Miller, director of Sustain Worldwide notes that the sequestered carbon in this building is “equivalent to 29 years of operational energy; and with 20 per cent renewable energy, it would take 144 years to save the same amount of carbon” and that’s allowing for the transporting energy costs of the manufactured timber panels from Austria (Miller, 2012).

Students focused their research on the structural, environmental and aesthetic implications of the timber options available. Given the scale of the projects almost all students choose either an engineered **27** Cross Laminated Timber (CLT, spruce, larch or pine) system, the Brettstapel system (similar to CLT except that hard wood dowels are used thus reducing the harmful effects of glue) or a post and beam structure of glulam posts and beams in-filled with Structural Insulated Panels. Finishes were varied including timber cladding, tiles and render. **28**



*Figure 9. Examples of varied finishes to student's projects*

Students were also introduced to the CASAnova software (Fig. 10) **29** and were required to utilise this to calculate the energy demand of their buildings and then reduce this through design, or at least gain an understanding of the energy implications of their designs.



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Figure 10. Images from a lecture by my colleague Brian O'Brien

Several multi-disciplinary workshops **30** in both structure and detailing occurred between the architecture students and 3rd year engineering students and 3rd year architectural technology students to facilitate the students' learning. The final task of this aspect and the whole project was for each student to carry out a detailed investigation **31** at a scale of 1:20 and a full-scale model of a crucial junction, **32** the intention being to demonstrate an ability to carry design ideas through energy analysis to construction detail.

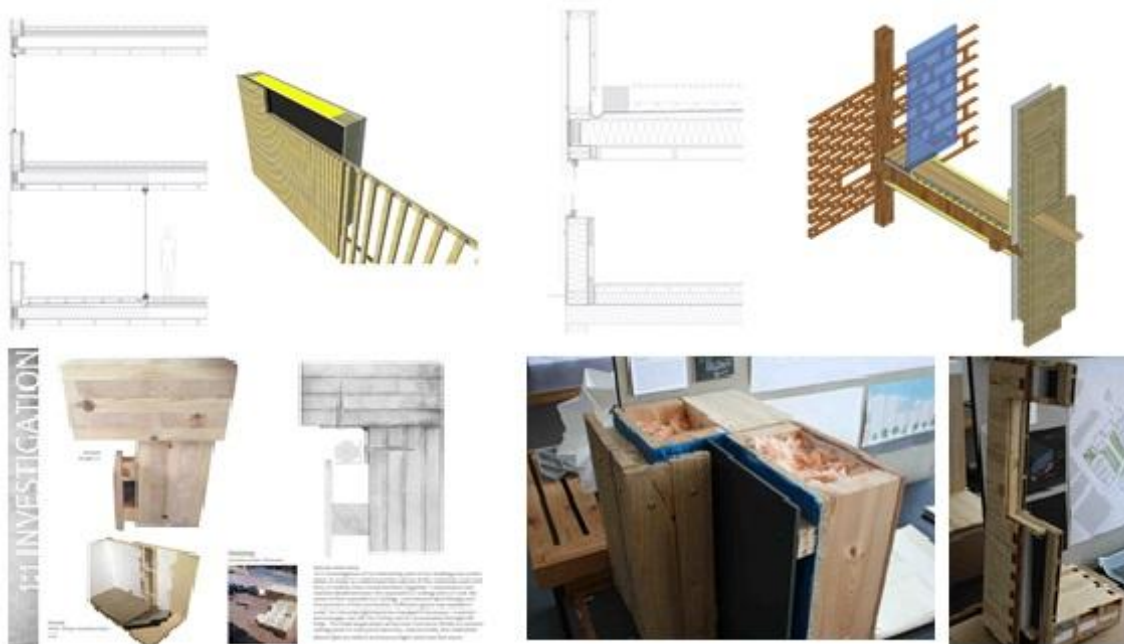


Figure 11. Detail sections and 1:1 models

## 6 THRESHOLD MATTERS **33** – social sustainability

This issue was introduced to the students as an OIKOnet workspace developed by colleagues Tomas Ooms and Sedef Ozcelik with input from Adam Jakimowicz and myself. **34** Different tasks were assigned to different groups of students in different institutes and they were asked to upload their results to the Oikodomus web portal and to comment on their fellow students' work.

Dutch architect Herman Hertzberger **35** has noted that "The threshold provides the key to the transition and connection between two areas with divergent territorial claims and, as a place in its own right, it constitutes essentially, the spatial condition for the meeting and dialogue between areas of different orders." (Hertzberger, Hermann, 1987)

Ambiguous yet affording opportunities, threshold thus affords options for socializing and amenity, a place to meet neighbours, survey shared territory and watch children at play while also serving as a



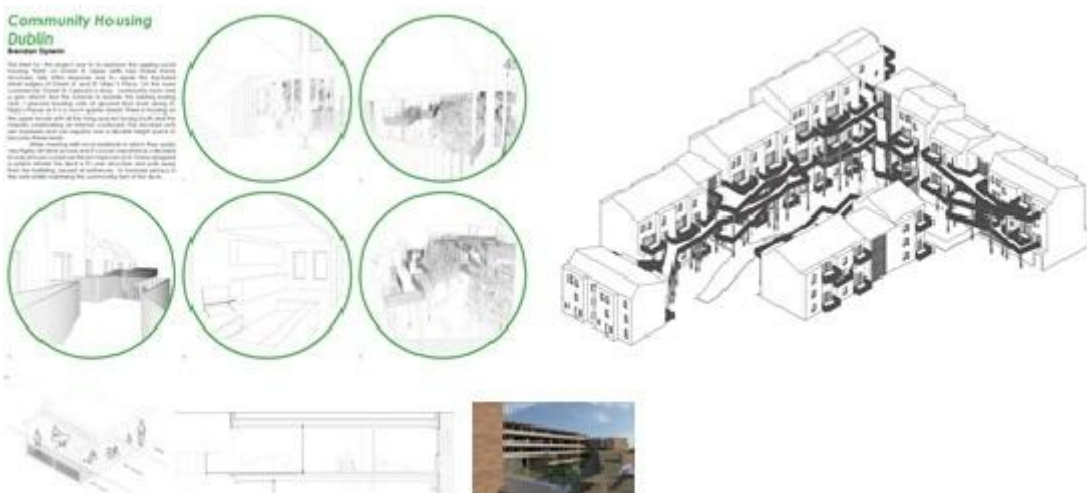
transitional space between the very public realm of the street and the very private world of the dwelling.

The DIT students were asked to consider **37** both the nature of threshold in housing, those multiple zones between the public and private realm that have many layers, meanings and often-varied treatments across different cultures and climates. In particular students were asked to consider threshold's detail treatment of an entrance from the street, a courtyard, an access gallery, a staircase or a hallway (or part of any of these) and other more private spaces and develop one or more drawings showing this treatment.



*Figure 13. Varied thresholds: plazas and portals, setbacks and underpasses, corner cafés and courtyards.*

Some students used devices **38** of public or semi-public activity or even expressive portals to ease **39** the transition from the public to the private realm, thus creating many layers of threshold along the way.



*Figure 14. Varied thresholds: the problem and opportunity of gallery access*

**40** Others reflected strongly on the issue of gallery access to apartments, often perceived as a difficult and contested space in the Irish context. In my own previous experience in practice Dublin City Council officials and many residents regarded gallery access in social housing projects as hugely problematic. **41** On a visit to the Dominic Street flats students were inspired by the desire of residents to maintain gallery access as a necessary social function, a clear example of the social power of threshold.

Many students explored this problematic in their schemes: how to achieve this useful social function yet offer privacy in the apartments.

**41** One student pulled the galleries away at key points making for an interesting sculptural array of flying timber galleries within the courtyard (Fig. 14) **42** another used the section and varied surface treatment to define thresholds from gallery access to apartment (Fig. 14).



*Figure 15. Varied thresholds: another approach to gallery access*

As an alternative to delineating threshold zones, **43** Ronan Keane's extensive but varied timber cladding treatment to the walls and soffits of the access galleries (Fig. 15) gives a feeling of containment yet breakout within what appears to be a sculpted timber block. Timber is literally everywhere and the spaces are no less enjoyable for that.



*Figure 16. Varied thresholds: windows, staircases and the street*

**44** Other students focused on windows, hallways and staircases or that difficult transition between the public and private realm at street level.

Many factors influence peoples' interactions with each other. One sociological study of a US suburban context, while acknowledging the role of physical space and planning, posits the stronger influence of homogeneous or heterogeneous communities as powerful catalysts for social contact (Gans, 1961). Hertzberger and others, **45** however, argue for the designing in of options for possible social encounters, thus affording choice to residents. Some of our students began to address how the design of the threshold spaces in their projects could possibly influence social relations and thus contribute to social sustainability.

## **7 CONCLUSIONS 46**

Writer and lecturer Peter Buchanan gives a cogent critique of the state of British architectural education (2012). **47** He observes: "detached from the ferment of epochal change, the groves of academe are failing to engage with current critical realities" (p.91) where "rather than relevance, what is sought is

startling originality, no matter how spurious” (p.93). He bemoans the lack of multidisciplinary projects noting: “ ..... architects collaborate with a widening array of consultants in multidisciplinary design teams in which even the architect component is made up of individuals of different expertise..... yet architectural education is still geared to producing the solitary genius, rather than today’s collaborator.” (p.92). He notes that: “sustainability is reduced to a much too narrow, peripheral subject added on to the curriculum rather than forming the core of a radically restructured education” (p.92). He outlines his vision of how sustainability should be taught to become the core of any architecture course beginning with a multidisciplinary foundation course for architects, urban designers and planners and landscape architects.

Considering Buchanan’s critique in relation to the DIT project described here it should be noted that teachers work within given structures that are often not ideal. While not all aspects of sustainable housing could be addressed in this one project, and some that were attempted were not always engaged in meaningfully by all students, in general the students did grapple with “current critical realities” 48 and designed convincing, universally accessible apartments, with timber structures, with many exploring hard and soft flexibility options, diverse threshold treatments, and all exploring a range of issues from the 49 urban scale down to 1:1 details of the construction system and texture treatments.

Though much was learned in this 12-week project, more community engagement, more meaningful multi-disciplinary collaboration and more rigorous scientific analysis of the energy performance of the students’ designs would be an aspiration for a future project.

## **8 ACKNOWLEDGMENTS**

The module coordinator and project leader was Paul Kelly. Patrick Flynn, Emma Geoghegan, Peter Crowley, Lenzie O Sullivan, Brian O Brien and myself also taught on the module.

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