AUTHOR(S): MCCLEAN, D., NOOR, R. and DEVECI, G.

TITLE: Explorations in urban resilience for a post-hydrocarbon economy.

YEAR: 2017

Publisher citation: MCCLEAN, D., NOOR, R. and DEVECI, G. 2017. Explorations in urban resilience for a post-hydrocarbon economy. Charrette [online], 3(1), pages 78-88. Available from: http://ingentaconnect.com/contentone/arched/char/2016/00000003/00000001/art00008

OpenAIR citation: MCCLEAN, D., NOOR, R. and DEVECI, G. 2017. Explorations in urban resilience for a post-hydrocarbon economy. Charrette, 3(1), pages 78-88. Held on OpenAIR [online]. Available from: https://openair.rgu.ac.uk

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Explorations in Urban Resilience for a Post-Hydrocarbon Economy.

David McClean, Raju Noor, Gokay Deveci.
Robert Gordon University.

ABSTRACT Aberdeen presents a unique context for its school of architecture, and a set of conditions that define much of its identity and enquiry. The city's economic base is dominated by the hydrocarbon industry, which generates particular issues of long-term socio-economic sustainability and urban development that are of local and wider relevance. The theme of urban resilience from an economic perspective is particularly pertinent, as highlighted by the volatility of the oil and gas industry in the last year. Applying processes of partnership and community engagement, the Masters students at RGU have consistently explored the theme of urban resilience, through its unique two-year single project structure. This paper introduces the processes involved in this work, and discusses two key areas of particular significance: the thesis structure and its attendant benefits; and the contribution that the school makes through its work to political and community debate about the city's post-hydrocarbon future.

KEYWORDS resilience, economy, post-hydrocarbon, masters, thesis

The relationship between a school of architecture and its immediate context is always of interest to architecture educators, as it is this that often helps define its identity through the nature of its thematic preoccupations, and the explorations and investigations undertaken. Arguably such relationships are more tangible for those schools that lie outside the metropolitan centres and which are situated in places defined by a more limited set of conditions. Indeed, as in the case of Aberdeen, the conditions can be quite particular, as well as being influential in shaping the identity of the school. As the most northerly school of its type in the Union, the Scott Sutherland School of Architecture & Built Environment has long been conscious of its geography and perceptions of peripherality. However, it is Aberdeen's status as the capital of Europe's oil and gas industry that presents a unique context in which to be located, and with which to work. It is a city of paradoxes: of great economic wealth yet under-investment in the

public realm; of spectacular technological innovation yet a dearth of civic vision; and of need, yet of complacency borne out of decades of sustained prosperity.

However, the commodity that has quite literally fuelled the prosperity of the city, is finite and, as we enter the period defined as post-'peak oil'[1], production has already entered decline. The medium to long-term consequences of this are profound and, in a world so heavily dependent on hydrocarbons, Aberdeen's circumstances will be played out in numerous locations around the world over the coming years and decades.

'Resilience' is a word that has come to be appropriated very widely, bringing a plethora of meanings depending on context. Within an urban context, it commonly refers to physical, socio-political, and economic strategies designed to mitigate the worst effects of events that may be categorised as 'disruptive'. In contemporary terms these are often climate or security based, but in the case of Aberdeen, one of the world's 'Energy Cities', the work of the school has focused primarily on economic resilience as its area of enquiry. Due to its dominance, the economic base of the oil and gas industry makes the city prone to an unusual form of volatility. With the sensitivity of viable oil production to global market trends, the city's economic conditions are subject to sudden movements that can impact severely on the community. Viability of production in the industry can change overnight, with the ripples travelling at speed down a lengthy and varied supply chain, only to recover later with similar speed. At a corporate level, many businesses are cushioned by their international coverage which allows such storms to be weathered by shifting the geographic focus. But many employers and communities are much more vulnerable.

The present economy of Aberdeen has a clear time horizon, regardless of whether its remaining life is determined by ethics, finance, or finitude. As a result, issues of urban resilience are typically interpreted principally from an economic perspective, with all the contingent issues that accompany decline. What is inevitable is that the short-term oscillations described above will progressively slow, with energy production in its current form eventually ceasing to exist. However, such is the scale of global carbon addiction, and considering the overall pace of the development of alternatives, this will not occur for another generation regardless of political imperatives and the outcomes of COP21[2]. However, this in itself can breed an inertia and complacency about the future, an attitude that has arguably been pervasive in Aberdeen in recent decades, and which represents significant risk to the community. After all, full implementation of effective urban and economic transformation will demand a similar timeframe. Moreover, such short-termism is arguably reflected in national politics where a unified strategy for a post-hydrocarbon Scotland remains elusive.

The international call for a low carbon transition is gaining acceptance and momentum[3] (Bulkley, Broto, Hodson, & Marvin, 2011), and the city has the opportunity to plan strategically and diversify its economic base in parallel with the transition process. Indeed it has the prospect of off-setting the decline that has bedevilled many cities through erosion of primary key economic drivers.

It has been demonstrated that cities that possess a more specialised economic base are less resilient from a socio-economic perspective, than those with a broader base (Davies & Tonts, 2010). As different industries respond variably to disruption due to their innate characteristics and competitive dynamics[4] (Martin & Sunley, 2014), it is equally argued that cities with diverse economies have greater capacity and opportunity for recovery from economic 'shock'. The ebb and flow of economic prosperity is evident in a multitude of urban centres, but is most visible in those with heavier reliance on a single, dominant industry (Rogers and Power, 2000[5]). This suggests that the key to a sustainable future lies in diversity, founded on the combined building blocks of an attractive, connected city, and creative governance (Florida, 2002[6]).

The Context of Aberdeen

Historically, Aberdeen has been unusually fortunate in its continuing ability to capitalise economically on an abundance of valuable natural resources, whether fish, granite or, latterly, oil. This has generated a city of considerable wealth, articulated in granite in the 19th century in the form of the great institutional buildings of the city, and the leafy

avenues and terraces of the West End. Aberdeen is already identified as the oil capital of Europe, cementing links with Houston and the global oil and gas industry. Today, six out of ten of Scotland's largest companies have a major presence in the city[7]. Yet, in terms of tourism this strapline can work against the city, with the image conjured up by many who have not visited as one of an industrial, dirty and unattractive place (inter alia 'Urban Realm' nomination of city for annual carbuncle Awards', 2015). This is not the case, but the city urgently needs to reflect the importance of oil and energy in more exciting and engaging ways. As a hub of innovation and technological prowess, the city has much to celebrate yet at present opportunities fail to correspond with the notion of the city as 'powerhouse'. However, while acknowledging the importance of its existing reputation, the city, in developing its identity, must think beyond the economic dimension; certainly it must not rely on it. Paintings in the Art Gallery of the harbour crowded with herring boats remind us of economic transience. Importantly, the issue of identity and sense of place is inherently multi-dimensional, economics representing but a single strand.

The city is challenged with developing alternative economies, through attracting investment from beyond and cultivating an attractive entrepreneurial environment to stimulate diverse activity within. It would of course be inaccurate to suggest that Aberdeen is wholly dependent on a single industry, but oil and gas unquestionably dominates the city's economic landscape. However, it is also home to a major teaching hospital, two universities of repute, and one of Scotland's leading further education colleges. Thus the educational component, so critical to developing the future skills base, is therefore in place but, just as attracting expertise presents a challenge in a city underpinned by an economy in its twilight years, so too does retention of talent, and essentially for the same reasons. Without strategic action now, there is a clear threat of serious decline in North-East Scotland. These challenges frame much of the work of the School and University and establishes a key thematic interest at Masters level for Architecture students, namely the ways in which architecture and urban design can contribute to sustainable economic scenarios.

The Particular and the Generic

The role of the design of cities in achieving economic and social sustainability is fundamental. Indeed, as noted by the Urban Task Force (2005)[8], cities dismiss this at their peril as they vie to attract businesses whose ability to locate geographically is increasingly flexible, and who therefore place ever greater value on broader factors such as the design and management of the public realm, environmental quality, access to the arts, and identity. And there are few sectors so globally transient and rootless than that of oil and gas. Equally, personal choice about lifestyle is influenced less and less by employment, and increasingly by qualitative values. So it follows that there exists a crucial need to attract inward investment now as a means of securing the economic life-blood of the cities like Aberdeen in years to come. Equally, the quality of civic environment, amenity and infrastructure has become a powerful determinant in the ability of urban centres to attract and sustain such investment and talent. Indeed there is a strong relationship between these two factors, one that powerfully suggests that the time for visionary investment in the city's future is now, when Aberdeen has a relatively prosperous economy and when it can harness the resource represented by its international population.

In 2002, the 2nd UK Government Conference on Urban Renaissance identified a number 'weak market cities', most of which have enjoyed a renaissance based on clear regeneration strategies. Each possessed a number of common characteristics that were also shared with European cities such as Bremen, Bilbao and Belfast. These characteristics were: 'a major industrial history; loss of these industries and jobs; population outflow; a crisis of leadership, economic viability and inward investment', and have all been identifiable in Aberdeen.

The University and Its City

Robert Gordon University (RGU) views itself as having a clear role in debates of importance within its city and region, and in recent years has lent its voice to matters of strategic importance and public concern. There are delicate lines to be observed in such activity, especially in ensuring that an appropriate degree of political neutrality is preserved, but

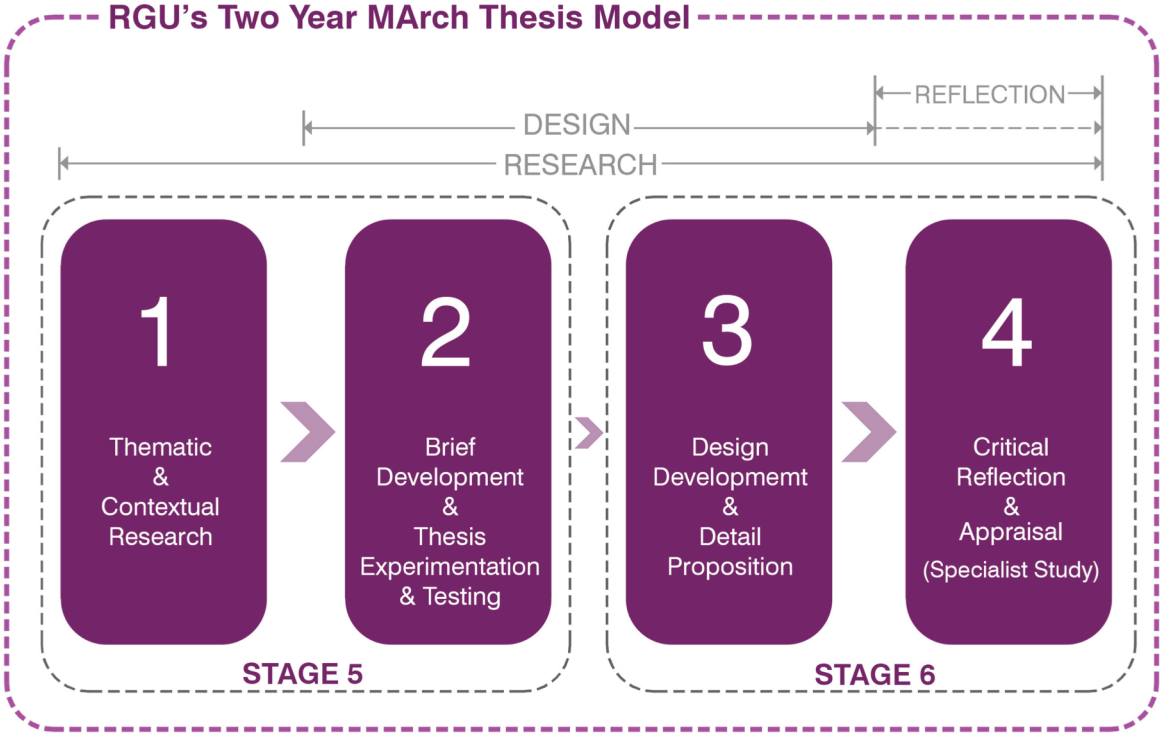

Figure 1: The two-year thesis model. (David McClean)

it is precisely this independence that allows the institution to position itself as a constructive and effective agent in fostering, and sometimes leading, debate.

For the Scott Sutherland School the history of engagement in community issues is long, extending back to the middle of last century. However, this activity has moved progressively from research and the development of propositions as a purely exclusive academic exercise, to a process that overtly engages with community and interest groups and governmental agencies, and offers the work of the students to the public as a vehicle for developing stimulus and aspiration.

In 2013 these institutional and departmental roles came together when the school led the development of a university-wide position paper on Aberdeen's urban regeneration and resilience aimed at stimulating positive action in the aftermath of a series of publicly divisive proposals[9]. Subsequent work with the local authority and political leaders led to the establishment of a competition for a strategic master plan for the city centre, and the definition of an outline briefing document. This work drew heavily on that of the school's Masters level architecture students, who operate within a research-led structure extending over a two year period.

RGU's Two-Year Thesis Model

Compared to many Part 2[10] courses, the experience at RGU assumes the unusual form of a single two-year extended thesis project comprising distinct research, design, and reflective stages.

Consisting of three parallel studio units of divergent character, the Master of Architecture is nevertheless united by underlying, enduring thematic interests, which are explicit or implicit in their specific territories of exploration from year to year. These themes relate to the fundamental issue of urban development within a low energy, low carbon context, and transformative urban regeneration that secures social, economic, and cultural sustainability within a changing, post-hydrocarbon paradigm. These issues are of both local and international relevance, and an illustration of the course's academic agenda and identity being borne out of the specifics of context.

The Master of Architecture (Part 2) studios are set up as experimental research design units fostering an approach to design through purpose-made research-led methodologies where students are given the freedom to select their own research themes, design projects and site(s). Research remains a core component

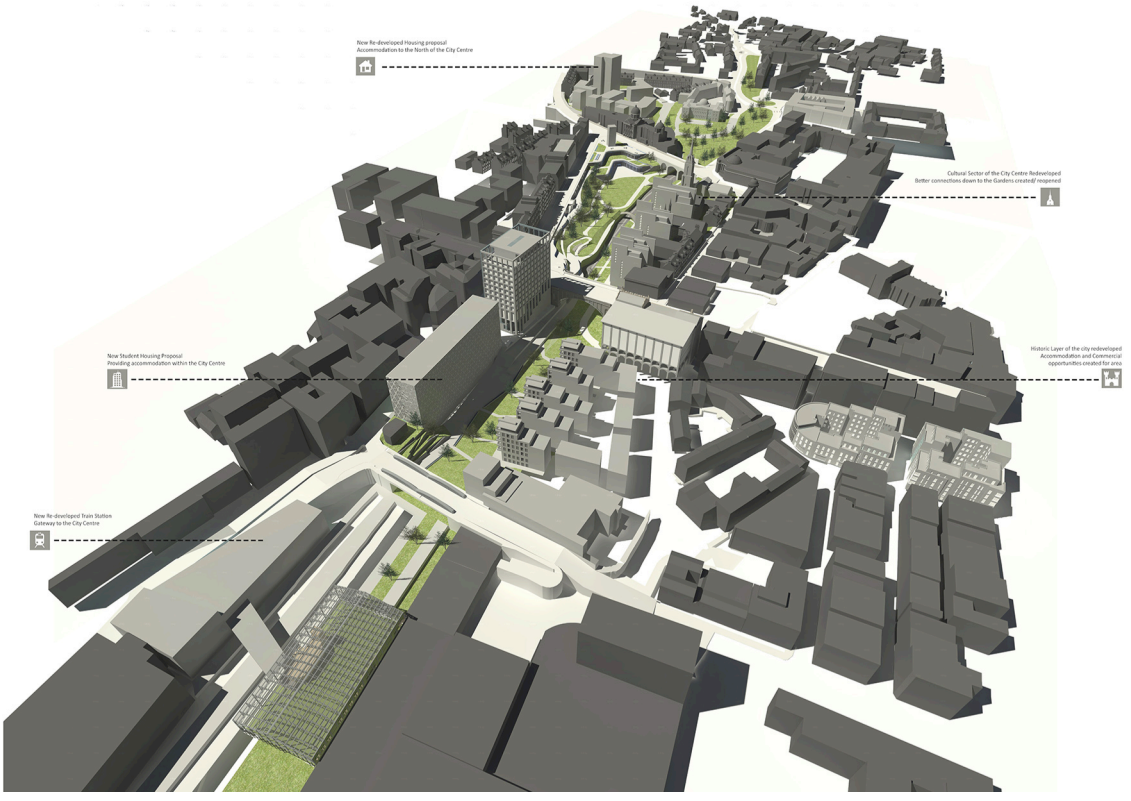

Figure 2: Resilient Cities, Aberdeen-Denburn Masterplan

throughout the two year thesis project with key research activities and outputs aimed at delivering rigorous, convincing and meaningful design propositions towards the end of the process. More importantly, the structure also allows the alignment of the research interests of the school and local context with the design studio objectives. This places the school within current debates and allows students to develop a critical understanding of the social, economic, environmental, aesthetic, and spatial implications of the design methods employed, in addressing the 'live' scenarios identified by each unit.

The two-year thesis project begins with the unit leader setting out the theoretical and intellectual framework for the incoming students, and establishing the context which students build upon. Students collectively undertake thematic and contextual research exploring the brief set out by the unit leaders whereby students engage with the existing body of literature on the wider aspects of the themes being explored, such as urban resilience. Based on the initial findings, students are required to research, select and define their individual thesis project by presenting a research proposal which underpins the two-year thesis project. The next phase of the project involves the process of brief development and experimentation where students are encouraged to engage with current literature and policy to establish the background context for their chosen topics, and to channel this work into the definition of specific design research questions. Students undertake a series of small primer project(s) as a method of testing their thesis proposition's and brief to set out to explore initial ideas. This concludes with students developing, proposing and presenting a design project of conceptual clarity. A key outcome of the central stage of the project (Design development & Detail Proposition), students are required develop their conceptual design research projects to produce a comprehensive proposition of significant complexity by way of a rigorous architectural design process, developed to a high level of resolution and representation. Finally, through self-selected study of an aspect of their work, students deepen their investigation, this often involving reflection and critique of their design work or its intellectual position.

In recent years the settings have been rooted within urban and rural contexts and have grown out of issues of contemporary debate.

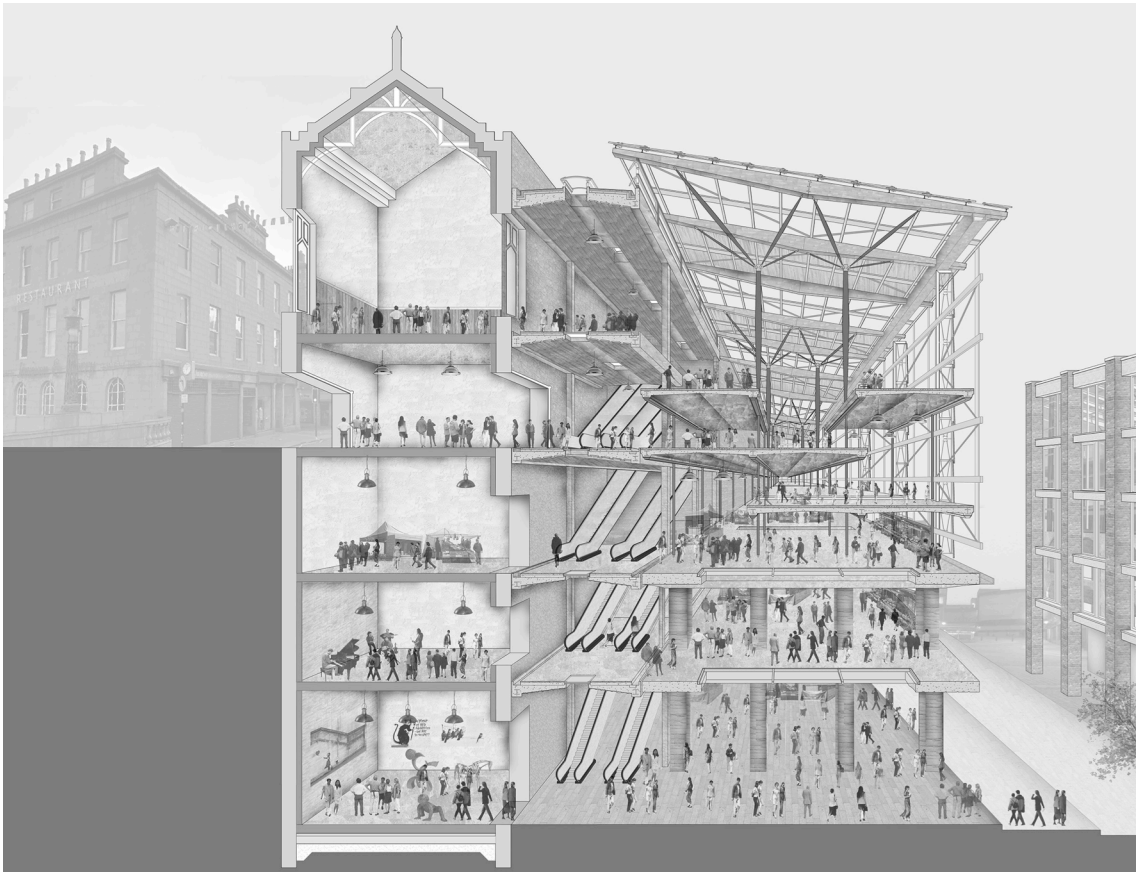

Figure 3: Legible Connections, Aberdeen (Rachael Murry)

During the initial stages students collectively undertake extensive research into identified themes through practical and desk-top based investigations. Students engage with a broad range of stakeholders including local government, public interest groups, and commercial interests and other private sector organisations, as a means of formulating the scope and nature of the overall brief. Concurrently, students are independently required to research, select and define their individual thesis project by presenting a research proposal. Together with their supervisor and visiting tutors, students each undergo a process of investigation and discussion to develop their own individual research projects stemming from the collective work of the unit. This builds and frames the contextual research that underpins the two-year thesis project.

This methodology pursued by each unit positions research as the backbone of the design process that is used to continuously inform design decisions. Regular reviews are held throughout the year with internal and visiting critics to monitor brief development, conceptual generation, design development, detailed technological studies, and the process of critical reflection. Additionally, students typically present their work to community groups, politicians, local government officers, and other bodies, exposing them to the complex stakeholder dynamics that accompany urban regeneration projects.

Through original investigation this research-led methodology provides a platform for students, as emerging architects, to acquire in-depth knowledge and experience in a subject of specific personal interest. It also develops an awareness of research-informed processes and their importance within architectural design and practice, this aligning with current professional debate about the role research and the construction of design knowledge. All three units share similar fundamental concerns but explore them via different contexts and approaches. This includes work on directly equivalent economic challenges faced by urban communities that share the same economic base in Norway. The following section describes the work of one unit as an exemplar of the pedagogic approach and over-arching thematic agenda.

Figure 4: Resilient Cities, Aberdeen- Visions for Union Street (Thomas Armistead)

Unit 1: Urban Resilience

Over the past five years Unit 1 has explored the theme of 'resilience' with particular focus given to North East towns and cities, in particular Aberdeen and Peterhead. The dominance of the oil and gas industry in North-East Scotland presents a very specific context for many settlements, especially those that directly relate to the sea, and exerts considerable influence on the area. Although enormously lucrative and wealthy as an industry, oil and gas is also highly vulnerable to the fluctuations of financial markets, especially in locations where extraction is inherently expensive, such as the North Sea. Equally, as an industry its nature is peripatetic and it is seldom deeply rooted to place, or to investing in the long-term future of towns and cities when the life of the industry in its current guise is itself clearly finite.

In recent years, students have explored issues relating to the development and regeneration of Aberdeen city centre, as well as the regional port of Peterhead to the north of the city. Through careful and thorough strategic planning and investment, the opportunity still exists for the city and regional towns to develop future resilience before the inevitably final decline of oil. The role that architecture and urban design can play within this has consequently been a key facet of the student work. Projects have explored economic diversification, housing, the public realm, and transport infrastructure.

Peterhead, an historic coastal town in Aberdeenshire, is a strategically important deep water port serving both the fishing and oil industries, as well as serving as a commuter town to the city of Aberdeen. Recent development has been around its perimeter, and the historic town centre has become blighted, and the vibrant port rendered an ostensibly private domain that has become disengaged from the centre. As such, many of the issues that apply to Aberdeen have a resonance with Peterhead's situation, and the fundamental challenges of developing resilience are shared. Moreover, beyond the economic dimension, coastal towns such as Peterhead have a special social and cultural significance to the North East, and to Scotland.

Figure 5: Living with industry, Peterhead (Andrew Stewart

Whereas resilience theory examines ecologies and ecosystems relating to complex and dynamic entities (Pisano, 2012[11]) the focus of this work has been on social and economic sustainability and the development of capabilities to withstand hardship and disturbance inflicted by shifts in the macro-environment. Indeed, a principal challenge has been to explore the meaning of 'resilience' which can interpret and respond to contemporary social, cultural, political and technological conditions in ways that acknowledge the specificities of context. In this respect work such as that by Simmie & Martin (2010) and Pickett, Cadenasso, & Grove (2004) has been particularly informative. Further key references have included the Scottish Sustainable Communities Initiative, work on developing resilience in town centres by the Centre for Local Economic Strategies (CLES), the Sullivan Report (2007) and literature that translates generic concepts of resilience to architecture and the city.

The lines of inquiry chosen by the students typically respond to the social, political,

Figure 6: Adapt(ation), Aberdeen- (Thomas Armistead)

Figure 7: Inhabit Denburn, Aberdeen- (James Nicol)

cultural and technological issues arising from the in-depth group investigations undertaken at the start of the process, and addressed through a strategic master plan or vision for the particular place being investigated. To frame their design briefs, students are encouraged to engage with current literature and policy to establish the background context for their chosen topics, and to channel this work into the definition of specific design research questions.

Students also undertake relevant typological studies to inform thinking and to help develop a series of design principals to inform their individual projects. Importantly, examples that explore notions of 'loose fit' and adaptability within a civic context, such as Tony Fretton Architects' Constantijn Huygensstraat, have been central to this investigation. Students are required to present and substantiate a Master's thesis proposal which outlines the project they wish to pursue through design and the ideas and design questions that have been developed through the initial research process.

Alongside processes of research and analysis of place, students actively engaged with community representatives as part of the initial research process, including local authorities, private sector interest groups, and community organisations. Council members and officers and independent community groups were invited into the school to participate in discussions with students and staff, and to develop an understanding of the perspectives and ambitions of various stakeholders, and the underpinning political tensions.

By researching and identifying the current pressures on these coastal towns and cities, the unit developed design strategies and methodologies to help create urban mixed-developments and new typologies to meet the future challenges. These future challenges are related to issues such as employment, ageing, density, mixed-development, population decline or expansion, transport, and renewable energy. Students undertook a period of collective research and strategic analysis leading to an intensive master planning design exercise. The resultant plan became the strategic framework within which individual ideas are developed.

The outcome for this unit's study has proved a catalyst for dialogue and debate, both in architectural circles and amongst the wider community[12]. The depth and relevance of the work, coupled with the integration of external engagement within the learning structure, has attracted public and political interest. The approach, which aligns closely with RGU's priority of leading and influencing regional debate on matters of strategic importance, has over time caused external parties to see the school as a politically neutral vehicle for exploring ideas laterally and for provoking thinking. Thus the work of the Masters students, in tandem with other initiatives, has fostered a clearer understanding not only of the role that a school of architecture can play in its constituency, but also of the value of its contributions.

Summary

Although many of the questions that this work asks relate to the presence of a single,

dominant industry and the consequences of its decline on urban, social, and economic structures, the particular context for Aberdeen is that of oil and gas. However, alongside issues of regeneration that secures social, economic, and cultural sustainability within a changing paradigm, the work engages with aspects of infrastructural design and the functioning of the city in a post-hydrocarbon society.

There are two principal aspects of the work that inform the wider discourse: the immersive model of the single two-year thesis project; and the contribution that it makes to political and community debate on a post-hydrocarbon future.

The opportunity for students to immerse themselves in a single research-led project that offers the scope for a very significant depth of study, is seen as a strength of the Masters model. Indeed, the facility for students to critically reflect and evaluate their process and outcomes during the final semester 4 as a postscript to the design stages, represents an unusual opportunity yet one which further promotes the maturity of students as nascent practitioners. The extended nature of the thesis also enables an elongated engagement with stakeholders more akin to a true dialogue than momentary communication.

Developing thinking in the realm of urban development within a low energy, zero carbon context is central to the process of transition from the present day condition to a more sustainable paradigm, whether at a local or macro level. In the aftermath of the Scottish Referendum of 2014, in which oil and gas formed the mainstay of much political rhetoric, issues of decline and transition assume different meaning and imply consequences of a significance well beyond architecture and urbanism. Indeed, through extrapolation of the learning from the project at a localised level, the work of the school serves to inform thinking and opinion relating to the much broader question of national resilience at economic and social levels.

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