

# COURTYARD HOUSING AS A SUBTROPICAL URBAN DESIGN MODEL

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**Exegesis**

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# Keywords

architecture  
Bowen Hills  
*bricolage*  
*bricoleur*  
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collage plan  
Colin Rowe  
communal courtyard housing  
Cornell Urban Design Studio  
courtyard  
courtyard house  
courtyard housing  
*danwey*  
*dazayuan*  
figure-ground  
green structure  
housing diversity  
*hutong*  
*insula*  
net residential density  
Parque das Nações  
perimeter block  
practice-based research  
*Shichahai*  
*siheyuan*  
subtropical climate  
subtropical design  
thermal comfort  
TOD - transit oriented development  
urban density  
urban design  
urban design model  
urban design prototype  
urban diversity  
urban fabric  
urban green structure  
urban growth



# Abstract

The planning of compact and sustainable contemporary communities worldwide challenges all involved to provide housing that enhances social and cultural inclusion and participation, and that is conscious of the need for environmental protection. In Australia, the predicament of urban sprawl has challenged architects and urban designers to mitigate the effects of this low density sprawl through compact housing solutions that promote efficiency in public transportation, and provide safe public green spaces that contribute to ecological sustainability.

This practice-based research developed and tested the idea that courtyard housing can deliver sustainable compactness in proposing a contemporary urban design model for rapidly growing cities with subtropical climates. Although the relationship between sustainability, residential density, and housing typologies has been investigated in several previous studies, this research focuses on the utilisation of European and Asian courtyard housing typologies, and examines their viability under the specific lenses of subtropical design, urban green structures, and Transit Oriented Design (TOD).

The research combines quantitative and qualitative methods to provide a pragmatic approach to solving the research problem in a reflective yet practical way. The process intersects theory and practice, combining the lenses of inquiry with courtyard housing typologies to plan and design a sustainable neighbourhood in the specific context of subtropical Brisbane (Australia). The theoretical component integrated the exploration of design precedents, urban design theories and best practice guides, along with specialised feedback from industry experts.

The practical analysis validated the selected housing typologies by employing a reflexive procedure that included hand drawings, image collages, and CAD software to build urban design prototypes. The outcome of this intersection of theory and practice – a set of drawings of a comprehensive urban design scenario – tested the feasibility of the courtyard housing typology as a response to the specific

need for spatial, liveable, and sustainable residential densification in a subtropical climate. The completed urban design scenario is assembled in an urban design model laid out as an indicative Collage Plan to exemplify the prototypes application.

The research findings provide a valid alternative to current urban design models that either perpetuate urban sprawl or promote excessive densification. By capitalizing on passive design, complementing the urban green structure, and maximizing urban infill sites (brown-field) around railway corridors, the study shows how courtyard housing can enhance the qualities of a subtropical lifestyle. In addition, the inquiry shows that courtyard housing responds to the present demand for both small and large plan layouts and proposes private and semi-private gardens as microclimate moderators.

This inquiry and its outcomes are a clear contribution to the consideration and provision of spatial efficacy, social diversity, and equity in the design of compact neighbourhoods. It proposes, for the first time in Australia, an entire development incorporating both Communal Courtyard Housing and courtyard houses, in line with the requirements of Transit Oriented Development. Finally, it offers urban design prototypes that can be further developed by architects and urban designers in similar climatic conditions worldwide.

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## List of abbreviations/acronyms/symbols

≈	Approximately equal
2D	Two-dimensional
3D	Three-dimensional
Ap_[No]	Appendix number
ABS	Australian Bureau of Statistics
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
AUS	Australia
BR	Bedroom
BBQ	Barbeque
BCA	Building Code of Australia
BCC	Brisbane City Council
BHC	Brisbane Housing Company
BNE	Brisbane
BIM	Building information modelling
BRA	Brazil
C_[No]	Chapter number
°C	Degrees Celsius
CAD	Computer-aided design
CBD	Central Business District
CCH	Communal courtyard housing
CH	Courtyard houses
chain	Gunter's chain (measure unit) = 20.108m
CHN	China
CIM	City Information Modelling
COST	Co-operation in the field of Scientific and Technical Research
CPTED	Crime prevention through environmental design
CSD	Centre for Subtropical Design
DS_[No]	Drawing page number in the Drawing Set
DP#	Detail Plan No #
dph	Number of dwellings per hectare
dw	Dwellings
Fig.	Figure
FSR	Floor space ratio
GDP	Gross domestic product
GF	Ground floor
GFC	Global financial crisis
ha	Hectare = 10,000 square metres (m <sup>2</sup> )
/ha	per hectare
HRA	Historical Records of Australia

<b>IPCC</b>	International Panel on Climate Change
<b>ITA</b>	Institute of Tropical Architecture
<b>JIA</b>	Jolimont Industrial Area
<b>km</b>	Kilometre
<b>km<sup>2</sup></b>	Square kilometre
<b>KMT</b>	Kuomintang of China - Chinese Nationalist Party
<b>C[No]</b>	Chapter number
<b>LAF</b>	Landscape Architecture Foundation
<b>m</b>	Metre
<b>m<sup>2</sup></b>	Square metre
<b>m/s</b>	Metres per second
<b>MAX</b>	Maximum
<b>min</b>	Minutes
<b>MIN</b>	Minimum
<b>NRAS</b>	National Rental Affordability Scheme
<b>NSW</b>	New South Wales
<b>OECD</b>	Organisation for Economic Co-operation and Development
<b>p</b>	perch (measure unit) = 25.3m <sup>2</sup>
<b>ppha</b>	People per hectare
<b>PLEA</b>	Passive and Low Energy Architecture
<b>PMV</b>	Predicted mean vote (thermal comfort)
<b>POS</b>	Private open space
<b>PRC</b>	People's Republic of China
<b>PRT</b>	Portugal
<b>QUT</b>	Queensland University of Technology
<b>RA</b>	Redevelopment Area
<b>RIBA</b>	Royal Institute of British Architects
<b>ROSS</b>	Regional Open Space System
<b>S_[No]</b>	Section number
<b>SEQ</b>	South East Queensland
<b>SEQRP</b>	South East Queensland Regional Plan
<b>SGP</b>	Singapore
<b>SOM</b>	Skidmore, Owings & Merrill LLP
<b>SRA</b>	Subiaco Redevelopment Authority
<b>SSAA</b>	Shichahai Scenic Area Administration
<b>UDA</b>	Urban development area
<b>UK</b>	United Kingdom
<b>ULDA</b>	Urban Land Development Authority
<b>USA</b>	United States of America
<b>WA</b>	Western Australia
<b>y/o</b>	Years old

# Statement of Original Authorship

The work contained in this thesis has not been previously submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

Signed:

[QUT Verified Signature](#)

Raul Dias de Carvalho

4 November 2015



# Acknowledgments

It has been a truly long crossing. It started 30 years ago as a seemingly straightforward and obvious track to take after gaining my Masters' Degree at Cornell University. Although enrolled in a PhD Program, it was logical for me to continue my theoretical learning through architectural and urban design practice. I wanted to gain my knowledge of architecture by doing it, experiencing it, and loving it.

The human support I had during this extensive journey was immense and invaluable. My acknowledgments here cover only a small number of the wonderful individuals who have helped me through my academic life; I have received more help from many more people than I could ever write down. Without all this support, this mission would have been unfeasible.

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# Reflections

He's a real nowhere man,  
Sitting in his Nowhere Land,  
Making all his nowhere plans for nobody.  
Doesn't have a point of view,  
Knows not where he's going to,  
Isn't he a bit like you and me?

John Lennon

Basic research is what I'm doing when I don't know what I'm doing.

Wernher von Braun

I am always doing that which I cannot do, in order that I may learn how to do it.

Pablo Picasso

Whenever a theory appears to you as the only possible one, take this as a sign that you have neither understood the theory nor the problem which (sic) it was intended to solve.

Karl R. Popper

The pursuit of an idea presumes its contradiction.

Colin Rowe

Nothing is original. Steal from anywhere that resonates with inspiration or fuels your imagination. Devour old films, new films, music, books, paintings, photographs, poems, dreams, random conversations, architecture, bridges, street signs, trees, clouds, bodies of water, light and shadows. Select only things to steal from that speak directly to your soul. If you do this, your work (and theft) will be authentic. Authenticity is invaluable; originality is non-existent. And don't bother concealing your thievery - celebrate it if you feel like it. In any case, always remember what Jean-Luc Godard said: "It's not where you take things from, it's where you take them to."

Jim Jarmusch

I don't believe that architecture is now making a better world. I believe it is part of culture, which (sic) makes life, individual life, more a broadening experience. Because that's what we have: we live, we die.

I've never seen any architecture that helps to make a better world. In that effect I think architecture creates problems rather than solves problems and I think that is really good. To me architecture is something that challenges people, challenges what they want, challenges their idea of what comfort is, challenges their perspective on how they did live. So, creating problems, I think, makes a better world.

Peter Eisenman

In architecture, form is a noun. In industry, form is a verb.

Richard Buckminster Fuller

Never tell a story because it is true: Tell it because it is a good story.

John Pentland Mahaffy

# Thesis structure

The structure of this thesis complies with the “Guidelines for Thesis by Creative Works”, Category 1.2: Practice as a Means of Reporting (Creative Industries Faculty, Queensland University of Technology), as presented in Appendix H.

As practice-based research, this study reports its knowledge claims in the technical language of the architecture/urban design practitioner. As such, it also stands as an examinable component to be judged for its control of the creation and innovation demonstrated within the specific context of the research project.

Thus, this study has two components, where the written component (Exegesis) serves to explain and clarify the practice component (Drawing Set: architecture and urban design drawings as the research outcome); both components are equally weighted (that is, 50% each). The Exegesis documents the best practice work related to the research topic, provides discussions of the understanding of the research questions, and demonstrates the original contribution of both components as an integrated part of the research outcomes.

# Chapter 1: Introduction

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## 1.1 BACKGROUND

The courtyard housing typology has been a recurring element in the structure of cities for over 8000 years. This fact has intrigued me since my first year of architectural studies. My first built project was an atrium house, and I used the communal courtyard housing typology in the *Urban Design Proposal for West Berlin* in 1984.<sup>1</sup> However, during my architectural practice its application has been most complicated. The main obstacles to its implementation have been issues related either to inappropriate land parcel layouts or to city council development codes. This practice-based research now creates the opportunity to investigate the feasibility of using this ancient housing typology to meet current urban needs.

## 1.2 CONTEXT

In the first half of the twentieth century, the establishment of an industrial society brought the independence associated with private car and home ownership, followed by the opportunity to live on the city outskirts and so enjoying extended contact with nature. These ambitions engendered a process of urban expansion while promoting the establishment of low-density housing with longer commuting distances between home and work. Thus, the compactness of the historical city cores – solids with voids – became replaced by the new urban *zeitgeist*:<sup>2</sup> the city of Modern architecture, voids with solid objects.<sup>3</sup>

Published in 2012, the Organisation for Economic Co-operation and Development (OECD) Report *Compact City Policies: a comparative assessment*

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**Note:** This inquiry adopts the Chicago referencing style. Thus, the documentary notes consist of last name of first author, year of publication, title and page number (when applicable). The full bibliographic entry is listed in the Works Cited section. (See The University of Chicago 2010, *The Chicago manual of style*.)

<sup>1</sup> Master of Architecture, Dpt. of Architecture, Art & City and Regional Planning, Cornell University.

<sup>2</sup> "The spirit or genius which marks the thought or feeling of a period or age." Dictionary, Oxford English. "*Zeitgeist*, n.": Oxford University Press. Accessed 2013-09-24

<http://www.oed.com/view/Entry/232756?redirectedFrom=zeitgeist&#>

<sup>3</sup> Rowe 1996, *Urbanistics*, 2

characterised a 'compact city' (that is, a city with a spatial form characterised by 'compactness') as having: “i) dense and proximate development patterns; ii) urban areas linked by public transport systems; and iii) accessibility to local services and jobs”.<sup>4</sup> The report emphasised the importance of creating policies to develop spatial forms characterised by 'compactness', “particularly in terms of how compact cities can contribute to green growth”.<sup>5</sup>

The relationship between sustainability, residential density and housing typologies has been conceptualised in several studies. However, until now, only a limited amount of research has examined the use of the courtyard housing typology in the context of the three critical lenses used to develop this process of inquiry – Urban Green Structures, Transit Oriented Development (TOD) and Subtropical Design – to produce urban design prototypes that contribute to sustainable and liveable urban communities. This constitutes a gap in the knowledge that is further intensified by the absence of courtyard housing in subtropical climates mainly in the Australian context.

### 1.3 DEFINITIONS

There are various interpretations of, and approaches to, the terms mentioned above and in the following chapters. In this inquiry, however, these terms are interpreted as follows:<sup>6</sup>

#### **Practice-based research**

This is a practice-based research that complies with the “Guidelines for Thesis by Creative Works”, Category 1.2: Practice as a Means of Reporting (Creative Industries Faculty, Queensland University of Technology), as presented in Appendix H. As such, it serves as a means of reporting the knowledge claims of the inquiry through the technical language of the architecture/urban design practitioner. As such, it also stands as an examinable component to be judged for its control of the creation and innovation demonstrated within the specific context of the research

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<sup>4</sup> OECD 2012, *Compact City Policies: a comparative assessment*, 26

<sup>5</sup> *Ibid.*, 26

<sup>6</sup> Subsidiary definitions are listed in Appendix A - Glossary

project. Thus, this study has two components, where the written component (Exegesis) serves to explain and clarify the practice component (Drawing Set: architecture and urban design drawings as the research outcome); both components are equally weighted (that is, 50% each). The Exegesis documents the best practice work related to the research topic, provides discussions of the understanding of the research questions, and demonstrates the original contribution of both components as an integrated part of the research outcomes.

**Urban design model:** “A ‘prioritised structure of design thinking’ ... that seeks to fulfil spatial criteria first, and then moves to fulfil spatially-related criteria of urban form and function, and then finally deals with other types of multi-objective criteria.”<sup>7</sup>

**Courtyard:** An uncovered three-dimensional space enclosed by building(s) and tall wall(s) (above eye level views at the ground level). This definition applies to the courtyard space in both courtyard houses and communal courtyard housing.

**Courtyard housing:** Both courtyard houses, and communal courtyard housing

**Courtyard houses (CH):** Dwelling house centred on one or more private courtyards

**Communal courtyard housing (CCH):** Communal (semi-private) courtyard surrounded by a multiple dwelling structure assembled in just one building or a group of buildings. The definition implies that all the external sides of the compound are separated from other buildings by public spaces, which can be all streets; it does not necessarily imply that the housing compound takes the entire city block

**Block:** “...a plot of land defined all around by a multitude of planned and unplanned paths, roads and streets. This is as true for the very large geographical blocks (including agricultural land, forests, mountains) as it is true for urban blocks.”<sup>8</sup>

**Building block:** “...the nineteenth-century institutional and residential block as

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<sup>7</sup> Al Sayed 2014, *Thinking systems in urban design: built form and design* 180

<sup>8</sup> Krier 1984, *Urban components*, 44

well as the twentieth century perimeter block.”<sup>9</sup> This definition does not imply that the central yard is communal. (Many central yards had/have specialised utilisations e.g. workshops and ground floor dwellings backyards or served only as ventilation wells).

**Perimeter-block:** “Apartment-block designed around an internal court or garden.”<sup>10</sup> “An autonomous organism with its own system of distribution, corridors, '*rues interieures*', access balconies, all competing with the streets.”<sup>11</sup>

**Reformed urban block:** “A perimeter block which introduced light, air and greenery into the block with a large courtyard, while still defining the public street space with continuous facades.”<sup>12</sup>

### **Sustainability:**

In the broad concept, sustainability is a condition to achieve or maintain a sustainable environment in “an area in which ecological integrity and basic human needs are concurrently maintained over generations”.<sup>13</sup> Therefore, “a sustainable community is one that is economically, environmentally, and socially healthy and resilient. It meets challenges through integrated solutions rather than through fragmented approaches that meet one of those goals at the expense of the others.”<sup>14</sup> Accordingly, “Positive Design™ or Positive Development™ is that which expands both the ecological base (life support system) and the public state (equitable access to means of survival)”.<sup>15</sup>

Specifically to the lenses of inquiry in this research, sustainability is related to:

- subtropical design in the developing of the aspects in the design

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<sup>9</sup> Ibid., 43

<sup>10</sup> Curl, James Stevens. "perimeter-block." In *A Dictionary of Architecture and Landscape Architecture*. : Oxford University Press, 2006.  
<http://www.oxfordreference.com/view/10.1093/acref/9780198606789.001.0001/acref-9780198606789-e-5863>.

<sup>11</sup> Krier 1984, *Urban components*, 45

<sup>12</sup> Sonne 2009, *Dwelling in the metropolis: Reformed urban blocks 1890–1940 as a model for the sustainable compact city*,

<sup>13</sup> Forman 1995, *Land mosaics : the ecology of landscapes and regions* 484

<sup>14</sup> Institute for Sustainable Communities 2013, *What is a Sustainable Community?*

<sup>15</sup> Birkeland 2008, *Challenging 'best practice' subtropical design* 1

solutions that both maximise human comfort in a microclimate and minimise the use of natural resources

- urban green structures considering that “the idea of sustainability has its origins in the science of ecology, which demonstrated the conditions essential for the ecosystems to survive in the long term”<sup>16</sup>
- the hallmarks of TOD when design provides balanced density along with diversity in housing options and mixed-uses and delivers accessible public transportation combined with walkable structures of public spaces that stimulate liveable communities

**Liveable Communities:** “...provide and promote civic engagement and a sense of place through safe, sustainable choices for a variety of elements that include housing, transportation, education, cultural diversity and enrichment, and recreation”<sup>17</sup>

**Lenses of inquiry:** Critical/analytical ‘filters’ used in this study to facilitate and influence perception, comprehension and evaluation when identifying criteria to develop the process of inquiry; in other words, the design framework. These lenses are:

1. **Subtropical Design:** “The subtropical climate allows people to enjoy being outdoors all year round. Subtropical design is a way of embracing this condition in the urban environment, to achieve sustainable urbanism and maintain a sense of place. Openness and permeability and a strong engagement with the natural environment are the main characteristics of well-designed subtropical places.”<sup>18</sup>
2. **Urban Green Structures:**<sup>19</sup> “Urban green structure today can be defined as all land of the urban landscape that is neither covered nor sealed, including parks, playgrounds, sport fields, allotments, private gardens,

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<sup>16</sup> Thorén 2000, “*The green poster*” *A method to evaluate the sustainability of the urban green structure*, 361

<sup>17</sup> Washington State Department of Transportation (WSDOT) 2013

<sup>18</sup> Centre for subtropical design 2013, *What is subtropical design?*

<sup>19</sup> It is relevant to note a difference from the concept of green infrastructure that generally does not imply the permeability (unsealed condition) of the soil

green space of housing districts, industrial properties as well as along streets and rail-roads etc.”<sup>20</sup> The urban green structure provides the ecological connectivity within the urban environment.

- 3. Transit Oriented Development (TOD):** A Transit oriented development should implement a “compact mixed-use community, centered around a transit station that, by design, invites residents and workers and shoppers to drive their cars less and ride mass transit more.”<sup>21</sup>

**Hallmarks of TOD:** The key hallmarks of TOD took into account in this study: accessibility, sense of community, mixed-uses and density

**Type:** “When applied to architecture, refers both to the images and to the organizational devices embodying the salient characteristics of a certain set of forms. The ending ‘-logy’ refers to systematizing information inherent in building types into a doctrine and theory.”<sup>22</sup>

**Building type:** “group of buildings with some characteristics, or a series of characteristics, in common”<sup>23</sup>

**Urban design prototype:** ...a conceptual design schema for representing a generalized grouping of buildings and their access; it is derived from similar design cases, and provides the basis for the initiation and implementation of an urban design”.<sup>24</sup>

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<sup>20</sup> Wlodarczyk 2007, *Introduction*, 9;

<sup>21</sup> Bernick and Cervero 1997, *Transit villages in the 21st century*, 5

<sup>22</sup> Polyzoides, et al. 1982, *Courtyard housing in Los Angeles: A typological analysis*, 1

<sup>23</sup> Caniggia and Maffei 2001, *Architectural composition and building typology : interpreting basic building*, 50

<sup>24</sup> This inquiry adopts adaptations of Gero’s definitions, as follows:

"**Archetypes** are the first and often singular examples of their type...

**Stereotypes** are copies without change. Mass production of goods is a means of stereotyping. In designing, stereotyping, i.e. the process of reproduction, belies the design endeavour.

**Prototypes** are the first on which others are modelled. This is the basis of the notion of design prototypes being elaborated here within the context of knowledge-based design...

**Design prototype** ... is a conceptual schema for representing a class of a generalized grouping of elements, derived from like design cases, which provides the basis for the commencement and continuation of a design. Design prototypes do this by bringing together in one schema all the requisite knowledge appropriate to that design situation." Gero 1990, *Design Prototypes: A Knowledge Representation Schema for Design*, 30



## 1.4 OUTCOME

The outcome of this inquiry illustrates how the intersection of theory (explored in the exegesis) and practice (presented as a set of architecture and urban design drawings) tests the feasibility of residential developments employing courtyard housing typologies within the parameters established by the three lenses of inquiry.

## 1.5 SCOPE AND LIMITATIONS

### 1.5.1 Scope

**My hypothesis is** that courtyard housing can deliver a sustainable and compact urban design model for rapidly growing cities with subtropical climates like Brisbane (Australia). Furthermore, this model could be applied to future housing developments in subtropical climates worldwide.

**The aim of this study is** to develop an urban design model that combines courtyard housing with sustainable subtropical design, green structures and TOD criteria.

**The main research question is:** How does the deployment of courtyard housing typologies contribute to sustainable compactness in cities with a subtropical climate?

### *Ancillary questions and design concerns*

#### Subtropical design

- How can courtyard housing be designed to provide an adequate microclimate within a subtropical urban context?

Design criteria concerns: Solar exposure, solar orientation, ventilation, transition spaces (in/out connectors) and open spaces

#### Urban green structure

- How can courtyard housing provide an effective private and semi-private

green space configuration, while at the same time contributing to a wider sustainable urban green structure?

Design criteria concerns: Green space characteristics and ecological connectivity

#### Hallmarks of Transit Oriented Development (TOD)

- Can courtyard housing typologies enhance the characteristics of TOD?

Design criteria concerns primarily the hallmarks: Accessibility, sense of community, mixed-uses and density

### **1.5.2 Significance**

The relationship between sustainability, residential density, and housing typologies has been previously investigated in several documented studies: however, this study more specifically focuses on the utilisation of courtyard housing typologies under the lenses of subtropical design, urban green structures and transit oriented development. The value of establishing the relationship in the light of these three components of new urban development was noted by Bajracharya et al. in the book *A climate for growth: planning South-East Queensland*.<sup>25</sup> But, the application of their theory has never been tested by design in Australia as an urban design model utilising courtyard housing, or by a process like the one that is verified in this inquiry.

This process has intersected theory and practice in combining the lenses of inquiry with housing typologies to plan and design a subtropical neighborhood, using quantitative and qualitative urban design methods. The outcome of this intersection – a set of drawings of a comprehensive urban design scenario – tested the feasibility of the courtyard housing typology; specifically, in response to the need for spatial, liveable and sustainable conditions for residential densification in a subtropical climate.

Therefore, this study is significant as it offers an alternative to the current

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<sup>25</sup> Bajracharya, et al. 2010, *Greening transit oriented development and subtropical design*

development patterns that either perpetuate urban sprawl or promote extreme densifications in the city centres. By maximising the urban infill sites (brown-field) around railway corridors, the design research study shows that courtyard housing can attend to sustainability, liveability and social diversity in subtropical climates. The framework for the study draws on historical theory and critical practice.

The apartment and house plans proposed in this study were developed after extensive research of precedents across time, using a collage procedure to test and adapt best practice solutions to the urban design prototypes. The prototypes are innovative in that they are planned and dimensioned to create the appropriate attributes within the scope of the three lenses of inquiry. They also incorporate the principles of Live-Work and SoHo (Small\_office/Home\_office) spaces, and the guidelines for Livable Housing Design (Livable Housing Australia) to ensure the greatest usage for the most people (universal design principles).<sup>26</sup>

### 1.5.3 Limitations

#### *Urban design prototypes*

The architectural plans are indicative; their main role is to indicate the sample areas to be used in the urban density calculations for the proposed urban design prototypes. The apartment floor plans may vary in size according to the local market at the time of the development.

Airflow studies are limited by both the rough indication of buildings as a volume, and by the limited simulation tools of the software. They serve to show the recommended utilisation of airflow in the prototypes within specific wind conditions, to achieve a microclimate strategy inside the courtyards.

It is recognised that the use of computational fluid dynamics (CFD) modelling software applied on more elaborated volumes – with windows and balconies arranged within a street layout and adjacent buildings – might be more appropriate in providing more detailed results that are conducive to construction. However, this level of detail is out of the scope of this inquiry. Therefore, the airflow studies are

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<sup>26</sup> Livable Housing Australia 2012, *Livable Housing Design Guidelines*

applied to each communal courtyard housing prototype largely as a schematic approach albeit including the adjacent buildings at the urban layout scale (Collage Plan).

In the study of the urban design prototypes, the topography is assumed to have a minimum inclination. Higher inclination values could be the object of future studies that re-consider factors such as the use of ground floors, underground parking and courtyard terrain permeability.

### ***Collage Plan***

The urban design prototypes use a specific subtropical site to explore the feasibility of the implementation of courtyard housing typologies. These selected typologies are then positioned together as a collage on the preferred site as one of the feasible ways to lay out the prototypes. Therefore, it is considered appropriate to term the resulting plan the 'Collage Plan'; that is, a group of buildings of different or similar types indicatively put together in close association through a coherent sequence of public spaces.

The Collage Plan does not claim to be a Master Plan. This is because it does not indicate how the chosen area could be developed and redeveloped in the future; nor does it define "what is important about a place and how its character and quality can be conserved, improved and enhanced".<sup>27</sup> A more realistic implementation of the prototypes at the preferred site (Mayne Rail Yards, Bowen Hills) would require much more specific information than the restricted information currently available about the present and future functioning of Brisbane's train network.

## **1.6 OVERVIEW OF THE STUDY**

This study is organised into seven chapters. **Chapter 2 (C\_2)**<sup>28</sup> details the research outline, which is divided into six sections. **Section 2.1 (S\_2.1)**<sup>29</sup> is divided

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<sup>27</sup> Conditions for a master plan obtained from: Planning and Land Authority 2013, *What is a master plan?*

<sup>28</sup> The referencing of research chapters will use this type of abbreviation

<sup>29</sup> The referencing of research sections will use this type of abbreviation

into three parts, which describe the research plan. It introduces the challenges and opportunities in choosing, modelling and justifying the methods adopted in this research (2.1.1), explains the methodology used (2.1.2), and describes the adopted strategy (2.1.3). Section 2.2 identifies the participants involved in the study; Section 2.3 lists the instruments utilised and justifies their use; Section 2.4 establishes the sequence of the adopted procedures; Section 2.5 summarises how the design framework was analysed; and, finally, Section 2.6 outlines the study's ethical concerns and limitations.

**Chapter 3** reviews significant precedents with the objective of finding relevant design references to be applied to the research proposal. The chapter is presented in four sections. Section 3.1 identifies the design precedents that influenced the architectural/urban design vision for this inquiry. Section 3.2 outlines the history of the courtyard housing from its most ancient utilisation to the present focusing on twentieth century best practice examples and synthesises typological concepts. Section 3.3 provides an examination of strategic plans in two different urban contexts – Beijing, China (3.3.1), and Lisbon, Portugal (3.3.2).

**Chapter 4** describes the three lenses of inquiry as the analytical context through which courtyard housing is to be tested. Sections 4.1, 4.2 and 4.3 expose these critical lenses (Urban Green Structure, TOD, and Subtropical Design), and Section 4.4 then assembles the filtered elements that make up the criteria for build the design framework.

**Chapter 5** explains the design framework, including cross-references to the exhibition drawings (presented in the attached CD). Section 5.1 gives a summarised view of Brisbane context in relation to building blocks and housing typologies; Section 5.2 draws on the summaries from the previous chapters to explain the criteria employed in the design of the urban prototypes; and Section 5.3 discusses the collage of the prototypes throughout the Collage.

**Chapter 6** synthesises and discusses the results of the findings and their application in the Drawing set (See attached CD). The findings are discussed according to the research objectives, as previously detailed in the Introduction

chapter.

**Chapter 7** presents the conclusions drawn from Chapter 6 and reflects on the significance of the inquiry's contributions. The (few) practical limitations of the study and recommendations for future research are also outlined.

## Chapter 2: Research outline

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In Architectural Design and Urban Design, 'design' is taken to mean the creation and development of figural concepts. These ideas are drawn by hand or by digitised means through a process of systematic representation and evaluation, eventually becoming built forms that respond to a pre-established program. Accordingly, I think it appropriate to entitle this chapter 'Research Outline' *en lieu* of 'Research Design'; this is because it outlines the procedures established to review and select previous studies in order to choose and assemble adequate methods to answer the research question.<sup>30</sup>

### 2.1 RESEARCH PLAN

#### *Initial challenges*

Formerly pictures used to move towards completion in progressive stages. Each day would bring something new. A picture was a sum of additions. With me, picture is a sum of destructions. I do a picture, then I destroy it. But in the long run nothing is lost; the red that I took away from one place turns up somewhere else.<sup>31</sup>

Pablo Picasso

Although not an architect, Picasso's quote serves to illustrate the iterative procedures of analysis that are also embedded in the architectural research process. In a minimal sense, this research is an activity that starts with the individual aim of knowing.<sup>32</sup> In fact, some architects think it is more appropriate to use the word 'inquiry' rather than 'research' to define what is performed inside

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<sup>30</sup> Evans and Gruba suggest the name of Research Design for this chapter because it is where the researcher "start with a drawing together of reviews of previous work and preliminary studies to formulate research hypothesis or research questions." As an architect, I do not see how it is possible to 'draw' reviews and studies, even if in a metaphor. Evans and Gruba 2002, *How to write a better thesis*

<sup>31</sup> Picasso *The most impacting Picasso's quotations*

<sup>32</sup> Ranulph Glanville uses *knowledge* instead of *knowing* but makes a note mentioning that knowing would be more appropriate "because *knowing* requires an agent whereas *knowledge* appears to be knower-free." Glanville 1999, *Re-searching Design and Designing Research*, 2

architectural practices.<sup>33</sup>

Architectural inquiry within a small practice can be generally described as a process of reading relevant literature (bought for the purpose and/or already accessible); consulting specialists for technical feedback; using sketches and drawings to produce the best solution to satisfy the client's brief; and working with the contractor to achieve what has been envisioned in the detailed drawings. This is commonly done in the hope of having a final product published in a renowned magazine. If the latter occurs, it is likely that the final product makes a significant contribution to knowledge and practice, represents some level of innovation or, perhaps, simply illustrates well-manufactured presentational techniques created to communicate personal architectural views.<sup>34</sup>

From the 1980s, the recognition of design research developed by experienced practitioners increased. In 1982, for example, Colin Rowe remarked that:

... in spite of the academic belief, newness continually occurs within the world; and, without any sense of this permanent effervescence (too often like the corks of cheap champagne popping), without this continuous – and erratic – regrowth, serious existence would be even less than faintly tolerable.<sup>35</sup>

Nevertheless, the acceptance of the appropriate parameters for an academic equivalence was not easy because research and practice have different purposes. Academic work aims to investigate questions and produce (publish) research findings, whereas practical methods applied through architectural practice products architecture. Moreover, the term 'practice-led research' has different meanings for different people, and is the subject of continuous debate.<sup>36</sup> In 1996, Carole Grey suggested that, within the context of higher research (M.Phil., PhD.), this type of research should attend to two conditions: first, it should raise issues from practice, and be modelled according to the needs of practice and practitioners; and, second, the methods applied should mirror the procedures utilised in the professional

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<sup>33</sup> "We have found that when we use the word research, too much of can be expected in terms of methodology, and too little in terms of the usefulness of the result." McLaughlin 1979, *Notes on Research in Practice*, 15

<sup>34</sup> Tschumi 1996, *Architecture and disjunction*, 12

<sup>35</sup> Rowe 1982, *Program vs. Paradigm: otherwise casual notes on the pragmatic, the typical and the possible*, 9

<sup>36</sup> Till, et al. 2005, *Adapting research activity AHRC review of practice-led research*, 103



field.<sup>37</sup>

These benefits established the conditions for this research to be conducted as a practice based study. The fact that courtyard housing typologies are not a feature of the Australian subtropical climate is an issue that has been raised in architecture/urban design practice. Thus, the study responds to the needs of practice and practitioners; accordingly, its methods were chosen to match the project procedures utilised by practitioners.

In the framing of this type of inquiry, it was also considered pertinent to include the recommendations that Haseman and Mafe assert: the need for critical contexts to be defined and claimed before the 'practical' is applied, which required the understanding of relevant best practice precedents; and the need for the (re)presentations of the findings of a practice to be (re)defined in each step of the reflection process.<sup>38</sup>

Accordingly, this study used methods that developed the pragmatic stance of solving the problem stated by the hypothesis in a reflective yet direct way.<sup>39</sup> Based on my previous experience, I manage the urban components by balancing intuition and reason in building an urban design model using a rationalist *parti*<sup>40</sup> – a “choice of practice that is pragmatic, strategic and self-reflexive”.<sup>41</sup>

Yet, as Descartes explains:

... it is not my intention here to teach the method that each should follow to conduct his reason well, but only to show in what fashion I have tried to conduct

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<sup>37</sup> Grey 1996, *Inquiry through practice: developing appropriate research strategies*, 3

<sup>38</sup> Haseman and Mafe 2009, *Acquiring know-how: research training for practice-led researchers*, 214

<sup>39</sup> Pragmatism is seen here as Andrew Metcalf describes it in the 'Glossary' of *Thinking architecture : theory in the work of Australian architects*: "A theory ... concerned with action and consequences, i.e. get things done as opposed to speculating and theorising. A pragmatist would probably favour intuition over reason, and accept the concept of accountability, i.e. the individual making a choice through free will. In an ethical approach the pragmatist would choose the course of action which would benefit the majority of people." Metcalf 1995, *Thinking architecture : theory in the work of Australian architects*, 102

<sup>40</sup> "Choice, means, or method. *Parti pris* means a bias or a mind made up, so in architectural criticism the *parti* is the assumption made that informs a design as well as the choice of approach when realizing the scheme. *Prendre le parti* is to take a decision, or a certain course, as in architectural design." Curl, James Stevens. "parti." In *A Dictionary of Architecture and Landscape Architecture*, Oxford University Press. (n.d.). Accessed 2012-11-29

<http://www.oxfordreference.com/view/10.1093/acref/9780198606789.001.0001/acref-9780198606789-e-3374>

<sup>41</sup> Grossberg, et al. 1992, *Cultural studies: an introduction*, 2

my own.<sup>42</sup>

### **Methodology**

... what to say about Edgar Allan Poe except that he was the progenitor of Sherlock Holmes, Arsène Lupin, Hercule Poirot, Nero Wolfe, Peter Wimsey, and all the rest? That, before Karl Popper was born, Poe was Popperian *avant la lettre*. That quite privately and still scarcely noticed, he invented the hypothetico-deductive method, the proposition that in all problem-solving operations hypothesis, the paradigm, which, of necessity precedes all empirical investigation. For, with Poe as with Popper, it is the initial conjecture that awaits either refutation or confirmation. In other words, related to a particular situation or crime, the investigator should have knowledge of the great criminal paradigms because without it he will not be able to place 'facts' in their proper place.<sup>43</sup>

Colin Rowe

Taking into consideration Rowe's belief that an investigator should have knowledge of previous practice-related paradigms to "be able to place 'facts' in their proper place" and to thus adopt a hypothetic-deductive stance, I appropriated the conditions cited by Grey, Haseman and Mafe (and given above) to mould an appropriate methodology to this inquiry. Accordingly, my hypothesis was established after identifying an architecture/urban design practice gap – the absence of courtyard housing in the Australian subtropical climate – during my previous architectural practice in Brisbane. From this hypothesis, I developed a course of action that I considered appropriate for this inquiry on **Drawing Set (DS\_)**<sup>44</sup> **2 – Course of action**).

Thus, this inquiry utilises mixed approaches, and the methodological choice commonly associated with a pragmatic approach.<sup>45</sup> The use of the methods follows an order that is determined by an overall strategy. Each method requires a particular set of actions (hereafter referred to as 'tactics') associated with the specific context of this inquiry. Thus, the strategy provides the framework for action

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<sup>42</sup> Descartes, et al. 2012, *Discourse on Method*, 17

<sup>43</sup> Rowe 1982, *Program vs. Paradigm: otherwise casual notes on the pragmatic, the typical and the possible*, 18

<sup>44</sup> The referencing of pages on the Drawing Set will use this type of abbreviation

<sup>45</sup> John Creswell and Vicki Plano Clark in *Designing and conducting mixed methods research* explained that this choice happens because "the focus is on the consequences of research, on the primary importance of the question asked, and on the use of multiple methods of data collection to inform the problems under study. Thus, it is pluralistic and oriented toward 'what works' in practice." Creswell and Plano Clark 2011, *Designing and conducting mixed methods research*, 41

(the long-term plan) and the tactics define specific actions (the short-term plans).<sup>46</sup>

This mixed methods approach is an explanatory sequential model. It begins with the implementation of a quantitative strand (quantitative research questions, quantitative data collection, etc.); proceeds by using strategies determined by the quantitative outcomes (drawing classification, qualitative questions improvement, selection of consultants, etc.); continues with the design and implementation of the qualitative strands (qualitative questions, interview permissions, etc.); and finishes by interpreting the connected results (summary, interpretation and discussion of both quantitative and qualitative strands). It is a participant-selection variant because the outcomes from the initial quantitative phase serve to categorise criteria and to identify the consultants in the following qualitative phase.<sup>47</sup>

The core method employed in this study is the design process, using the concept of 'action research'.<sup>48</sup> This method requires the creation of a recursive procedure (action routine),<sup>49</sup> such as the ones used in problem-solving and purposive design processes related to research and development. It is a recursive sequence of actions (formulation, synthesis, analysis and evaluation) graphically represented by a spiral, which shows the cyclic characteristic of a DO-loop in an iterative process moving along the third dimension created by time.<sup>50</sup> It is an appropriate method for the process of decision-making in problem solving because it involves the continuum of reflection-in-action systematically employed by the

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<sup>46</sup> The most appropriate descriptions for strategy and tactics to be used in this inquiry were given by Joel Falconer, co-founder of Methodic Studios Falconer 2012, *Tactics & Strategy: Do you know the difference?*

<sup>47</sup> Creswell and Plano Clark 2011, *Designing and conducting mixed methods research*, 82-86

<sup>48</sup> "... studies that examine a concrete situation, particularly the logic of how factors within that situation relate to each other as the process moves toward a specific empirical goal. The emphasis is upon knowledge emerging from localized settings, as opposed to abstract knowledge applicable to many settings." Wang 2002, *Design in relation to research*, 111

<sup>49</sup> **Routine:** "A section of a program that performs a particular task. Programs consist of modules, each of which contains one or more routines. The term routine is synonymous with procedure, function, and subroutine." <http://www.webopedia.com/TERM/R/routine.html>

<sup>50</sup> Jonas 2007, *Research through DESIGN through research: A cybernetic model of designing design foundations*, 1366; Susman 1983, *Action research*, 95; Eckert, et al. 2003, *The spiral of applied research: A methodological view on integrated design research*, 10; Burghardt and Hacker 2002, *Informed Design: A Contemporary Approach to Design Pedagogy; Research and Evaluation on Education in Science and Engineering (REESE)* 2010, *Research and Evaluation on Education in Science and Engineering (REESE)*, 4

architect/urban designer.<sup>51</sup> Details of the means of execution of this process are illustrated in **S\_2.3** ('Means') and the tactics utilised are explained in **S\_2.4** ('Procedure').

This method "is most useful when the researcher wants to access trends and relationships with quantitative data but also be able to explain the mechanism or reasons behind the resultant trends".<sup>52</sup> Other considerations that contributed to the method's selection were: the nature of the problem and the quantitative orientation of my previous skills; the opportunity to re-access the consultants during the process; and the opportunity to develop new questions when the original questions could not be answered with quantitative data.

The challenges of using this explanatory sequence are minimal, because researchers can make quick and appropriate decisions based on their reflections on the drawings; this is essential to guarantee the best outcome within the timeframe of the inquiry.

Design Research usually begins with a research question starting with 'How'.<sup>53</sup> In a design context, this denotes an acceptance of the fact that "the acquisition of facts alone is of limited value without the development of some level of understanding. In simple terms, this would involve moving beyond the 'who', 'what', and 'when', to the 'how' and the 'why'."<sup>54</sup> As such, this Design Research presents and discusses all the material focusing on 'how' and 'why' the research questions have to be answered.

Taking all of the above into consideration, this Design Research is a "systematic inquiry directed toward the creation of knowledge" where the descriptor 'design' is attached to the word 'research' "to signal a substantive area of inquiry".<sup>55</sup> The inquiry is systematic because it establishes "a conscious

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<sup>51</sup> "A practitioner's reflection can serve as a corrective to over-learning. Through reflexion, he can surface and criticize the tacit understandings that have grown up around the repetitive experiences of a specialized practice, and can make new sense of the situations of uncertainty or uniqueness which he may allow himself to experience". Schön 2011, *The reflective practitioner : how professionals think in action*, 61

<sup>52</sup> Creswell and Plano Clark 2011, *Designing and conducting mixed methods research*, 82

<sup>53</sup> Glanville and van Schaik 2005, *Designing Reflections : Reflections on Design,,* 36

<sup>54</sup> Wallace 2012, *Knowledge*

<sup>55</sup> Snyder 1984, *Introduction to architectural research*, 2

demarcation of how particular information is culled from the rest of our experience, how it is categorized, analysed and presented".<sup>56</sup> Even though knowledge creation can imply a large contribution through grand theories, it might "also emerge in relatively small increments and be attained through a variety of means".<sup>57</sup> Here, new knowledge results from the summation of reflections and evaluations of testing courtyard housing types as urban building structures within the principles of Subtropical Design, Urban Green Structures and TOD; these elements have not been previously combined in this particular case study (Brisbane) context.

Thus, the particular information reviewed for this inquiry was selected from current best practice guides and theories. This information is categorized, analysed and presented on the basis of my previous experience, and mainly focuses on the three lenses of inquiry.

### **Strategy**

The inquiry utilised the 'design as a process' strategy. The overall strategy<sup>58</sup>, however, was to avoid methodolatry<sup>59</sup>, and to use a straightforward method of data collection within a practice-based approach. As the motivation for the study was my long-term interest in courtyard houses, courtyard housing acted as the central topic of inquiry and was surrounded by a triangle formed by the three lenses of inquiry: subtropical architectural and urban design, green urban structures and TOD.

The process evolved with the addition of a more descriptive and complex set of figural elements used to test and re-test the findings as part of the reflection process, the introduction and consequent evaluation of urban exemplars, and the contribution of consultants and colleagues. Hence, it could be argued that the

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<sup>56</sup> Groat and Wang 2002, *Architectural research methods*, 7

<sup>57</sup> Ibid. 7

<sup>58</sup> Strategy, in the context of this discussion "is the overall research plan or structure of the research study", utilised as a synonym of "research design". Ibid., 11. The use of the term is also "justified by the fact that practices give an adequate response to contingent situations". Certeau and Rendall 1984, *The practice of everyday life*, 55

<sup>59</sup> Valerie Janesick in 'The choreography of qualitative research design' uses "the term *methodolatry*, a combination of method and idolatry, to describe the preoccupation with selecting and defending methods to the exclusion of the actual substance of the story being told." Janesick 2000, *The choreography of qualitative research design*, 390

mixed-methods structure used the postmodern concept of Crystallisation<sup>60</sup>, for it became clear that there were more than three aspects from which to view the problem. Within this 'crystal' structure, the quantitative approach was influenced by the qualitative inputs from the complex development of the figural elements; this, in turn, formed the basis of the final results.

## 2.2 EXPERT CONSULTATIONS (INTERVIEWS)

This inquiry utilised expert consultations to elucidate professional issues and add specialised knowledge related to the research question. This feedback was obtained in three different ways from three types of professionals.

The first type of professional information was retrieved through a list of questions posed to urban design promoters/developers. The questions had the objective of clarifying issues inherent to promotion/development processes; however, their answers pertained to the public information domain. These questions were either sent and answered by email or posed during informal meetings.

The second type of professional feedback was achieved by inviting consultants to participate in interviews related to the best practice of their particular expertise.<sup>61</sup> As explained in S\_5.2.2, the questions were different for each interviewee, as they related to their specific expertise, knowledge, and practice. Their feedback and opinions served to corroborate or question my previous architectural/urban design practice.

Consultants were selected according to the relevance of their previous projects in architecture/urban design and the public recognition of the value of

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<sup>60</sup> Using Laurel Richardson metaphor, "crystals are prisms that reflect externalities *and* refract within themselves, creating different colors, patterns, and arrays, casting off in different directions. What we see depends on our angle of repose ... Crystallization, without losing structure deconstructs the traditional idea of "validity" (we feel how there is no single truth, we see how texts validate themselves), and crystallization provides us with deepened, complex, thoroughly partial, understanding of the topic. Paradoxically, we know more and doubt what we know. Ingeniously, we know there is always more to know. Richardson 2000, *Writing : a method of inquiry*, 934

<sup>61</sup> **Consultant**, n. .A person qualified to give professional advice or services, e.g. in problems of management or design. Oxford English Dictionary. Second edition, 1989; online version June 2012. Accessed 2012-08-09 <http://www.oed.com.ezp01.library.qut.edu.au/view/Entry/39956>

their professional practice. They were screened according to their experience (They were over 40 years old and had more than ten years of significant professional practice). The interviews were audio recorded (All questions and interview summaries can be seen in **Appendix (Ap\_)**<sup>62</sup> C - Interviews).

The consultants' (interviewees') questions served to evaluate pertinent opinions to corroborate (or not) my previous practice in other countries. The questions differ to be appropriate to the interviewees' specific expertise/knowledge covering different practice grounds. It is normal in architectural/urban design practice to ask different questions to each consultant (in this case interviewees) focusing in their specific practice.

The third type of information was obtained through meetings where sketches were presented; these sketches included architectural/urban design concepts to be used in the final proposal. The meetings worked as peer reviews to obtain constructive critiques of the design process and different approaches to solving design dilemmas. Internal peer review meetings were also conducted within QUT. Only written records of these meetings were kept.

### 2.3 MEANS

This section lists, and briefly describes, the methods used in this inquiry: the reflective journal, the hand drawings, the computer software and the writing choices. As described in the following section (2.4), these methods were used within a cyclic sequence to develop and evaluate the urban design prototypes and the urban design model.

#### *Reflective journal*

Architecture is born by a sketch. When the sketch is pleasant and causes surprise, architecture – if well conducted – can reach the superior level of a *œuvre d'art* ... Once, in Paris, I began a study for a musical centre for Rio de Janeiro. As an experience, instead of sketching on separate sheets, I drew on a roll of tracing paper that I unrolled, little by little, in accordance with the development of the sketches. Surprisingly, the solution emerged before the end of the roll.<sup>63</sup>

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<sup>62</sup> The referencing of appendices will use this type of abbreviation

<sup>63</sup> Niemeyer 1993, *Conversa de arquiteto*, 9. Quoted translated by Raul Carvalho

Oscar Niemeyer<sup>64</sup>

The working journal for this investigation had neither the ambition to produce a higher architectural level, nor did it fit on a single roll of tracing paper; rather, it is a batch of bits and pieces of paper assembled during the whole process of inquiry, recognising that “the act of journal writing is a rigorous documentary tool”.<sup>65</sup> It had a note-taking format when recording supervisors' meetings, lectures, peer-reviews, informal conversations, television documentaries and ubiquitous reflections. It had a graphic format when the ideas are expressed in concise preliminary sketches (made in the most varied situations using miscellaneous available media, ranging from paper napkins to sketching software) and printing images from best practice sources to be (re)collated together. Finally, it had a photographic format when recording existing built examples (either good or bad) that could be used as a reference.

The journal served as a noted memory, frequently registering new ideas, at times collating relevant precedents, sometimes reproducing utopian delusions, or simply acting as a bin for ideas in progress. Although, the journal had its significant importance in keeping an account of memories and reflexions, it was not assumed as an examinable element of the practice component of this inquiry. Yet, the most relevant images and sketches have been used to illustrate the Drawing Set.

### ***Hand sketches***

After I receive a commission, if it is a small project, after a few days I present sketches that are still very vague. Together with the sketches, I give schemes of the functional organization. So these sketches are in a way my first ideas fixed through an instrument [drawing] [*sic*]. I also use these drawings to provide hypothesis for a reaction from my client so he can be more precise and say “no I don't want this, I want more in another direction,” and so and so.<sup>66</sup>

Alvaro Siza<sup>67</sup>

The most basic tool of this inquiry was the human hand, used to produce the

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<sup>64</sup> Oscar Niemeyer (1907-2012) was the patriarch of the modern architecture movement in Brazil. He designed the main buildings of Brasilia.

<sup>65</sup> Janesick 2000, *The choreography of qualitative research design*, 392

<sup>66</sup> Robbins 1994, *Why architects draw*, 153

<sup>67</sup> Alvaro Siza Vieira (1933 – ) is a Portuguese architect to whom it was awarded the Architecture Pritzker Prize in 1992 for his urban renovation project for Chiado, a historical commercial area of Lisbon (Portugal) that was mostly damaged by fire in 1988.



sketches.<sup>68</sup> Freehand drawings are of enormous importance in an architectural design process. They are present from the beginning of the process as spontaneous rough drawings representing alternative design ideas, to the end of the process when they assist the dissemination process by synthesising and representing the project *parti* in a few expressive lines.

The importance of the relationship between hand, eye and brain as a cognitive architectural development has been described by several authors; however, it is not an objective of this inquiry to describe this development in detail.<sup>69</sup> The practice of sketching contributes to the building of interactive memories in developing the spatial intelligence vital to the collage of a rich spatial baggage used in producing a master architectural project. Moreover, most important for this practice-based inquiry, is the value of sketches as a way of generating reflection, a process that Donald Schön describes as 'design conversations'.<sup>70</sup> With the use of translucent tracing paper, this process generates the multiplication of layers, creating visual distances from each drawing stage and generating both predictable and unforeseen design opportunities.

Because of its power of cognitive stimulation, the sketch in this inquiry was an obligatory instrument as an essential reflective medium in defining and clarifying ideas; these ideas were subsequently developed with the use of selected software.

### **Software**

A lot of work that is done for larger office buildings is done in model form, not in

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<sup>68</sup> "A rough drawing or delineation of something, giving the outlines or prominent features without the detail, esp. one intended to serve as the basis of a more finished picture, or to be used in its composition; a rough draught or design. Also, in later use, a drawing or painting of a slight or unpretentious nature." "sketch, n.". OED Online. September 2012. Oxford University Press. Accessed 2012-11-30 <http://www.oed.com.ezp01.library.qut.edu.au/viewdictionaryentry/Entry/180766>

<sup>69</sup> See, among others, Lima, *et al.* 2010, *The Value of Architectural Sketches*; Lima 2009, *Architectural sketches: the skill in th field*; Pallasmaa 2009, *The thinking hand : existential and embodied wisdom in arthitecture*; Sennett 2008, *The craftsman*; Perrone, *et al.* 2006, *The sketches and the design process in architecture*; Edwards 2005, *The use of drawing in architectural design: some recent experiences from UK practice*, Jonson 2002, *Sketching Now*; Herbert 1992, *Graphic Processes in Architectural Study Drawings*; Galle and Kovács 1992, *Introspective observations of sketch design*

<sup>70</sup> "Designing ... has the conversational structure of seeing-moving-seeing, where the second 'seeing' involves recognition of unintended as well as intended consequences, and where unintended consequences fall into domains other than those in which the problem and its prospective solution are initially formulated." Schön and Wiggins 1992, *Kinds of seeing and their functions in designing*, 143

drawing form. I use drawing to get some very basic ideas started, but these will immediately be translated into clay models ... We rarely use drawings alone to communicate because we find that clients do not have the ability to read them. So we work largely with models.<sup>71</sup>

William Pedersen<sup>72</sup>

Even though I worked with clay models in Pedersen's office, and strongly believe in their cognitive value in developing large building projects, this inquiry used computer software for its three-dimensional studies. This choice of (appropriate) software was a result of the limitations of hand drawings in acquiring high precision in a limited time, as well as the expectation of a final graphic product. It was necessary to use software that would work on a city scale, and between the roughness of the hand drawings and the more precise definition of the finished proposal.<sup>73</sup>

### ***Writing***

In this investigation, the primary duty of the written component was to describe both the parameters that served to establish the design framework, and the steps taken to produce the practice component. Thus, the written form became a tool to explain, communicate, and disseminate the outcomes in a credible and easy to understand flow.<sup>74</sup> Mixed genres' best describes the style used in this written component, as it allows the writer to draw "freely on his or her productions from literary, artistic, and scientific genres often breaking the boundaries of each of those as well. In these productions the scholar might have different 'takes' on the same topic ... as a postmodernist deconstruction of triangulation".<sup>75</sup>

Acting as writer of a professional report – in this case, the exegesis – I used

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<sup>71</sup> Pedersen interviewed in *Why architects draw*. Robbins 1994, *Why architects draw*, 224,230

<sup>72</sup> William Pedersen (1938-) a winner of several AIA prize, is the principal design partner of Kohn Pedersen Fox Associates, an American architectural practice focused in the production of large building projects worldwide (35 countries in 2012).

<sup>73</sup> The choice was Autodesk® Revit® Architecture 2013, a Building Information Modelling (BIM) software.

<sup>74</sup> "Validity in quantitative arena has a set of technical microdefinitions, and the reader is most likely well aware of those. Validity in qualitative research has to do with description and explanation and whether or not the explanation fits the description. In other words, is the explanation credible? In addition, qualitative researchers do not claim that there is only one way of interpreting an event. There is no one 'correct' interpretation." Janesick 2000, *The choreography of qualitative research design*, 393

<sup>75</sup> Richardson 2000, *Writing : a method of inquiry*, 934

the first voice to make my personal input clear.<sup>76</sup> Quotes are inserted as a written tool if they complement the written text in an appropriate way.<sup>77</sup> In addition, metaphors<sup>78</sup> are used as a storytelling device to develop the interest of the reader by creating a link between the text and their imagination.

## 2.4 PROCEDURES

You start by sketching, then you do a drawing, then you make a model, and then you go to reality – you go to the site – and then you go back to drawing. You build up a kind of circularity between drawing and making and then back again ... This is very typical of the craftsman's approach. You think and you do at the same time. You draw and you make. Drawing ... is revisited. You do it, you redo it, and you redo it again.<sup>79</sup>

Renzo Piano<sup>80</sup>

Piano's words explain part of the circular procedure used in this enquiry, of which the core method is 'design as a process' (**S\_2.1**). The course of action is divided into four major tactics that perform a recursive procedure similar to computer programs routines:<sup>81</sup> formulation, synthesis, analysis and evaluation (**DS\_2 – Action routine**).<sup>82</sup>

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<sup>76</sup> The use of the third person may also lead also with what Evans and Grubba call 'thesise', a way some writers have to complicate sentences aiming to impress mythical examiners. Ibid., 156,159

<sup>77</sup> To make clearly visible that a quote is being used I adopted the double quotation marks for it. Single quotation marks are used for: quotations inside quotations; to indicate the enclosed words are a title in a book or a paper in a journal; words which the meaning are dubious or discussible in the context. Book and journal titles are indicated in italic. Ibid., 168

<sup>78</sup> Laurel Richardson gave a good definition of what a metaphor is in 'Writing: a method of inquiry': "As this metaphor about metaphor suggests, the essence of metaphor is experiencing and understanding one thing in terms of another." Richardson 2000, *Writing : a method of inquiry*, Thadani 2012, *Medalists Steven Peterson and Barbara Littenberg*, 926

<sup>79</sup> Renzo Piano quoted by Edward Robbins in *Why architects draw*. Robbins 1994, *Why architects draw*, 126

<sup>80</sup> Renzo Piano is an architect, co-author (with Gianfranco Franchini) of the project for the Centre Georges Pompidou in Paris. He was awarded the Pritzker Architecture Prize in 1998 for his example project for the Kansai International Airport.

<sup>81</sup> Routine: "A section of a program that performs a particular task. Programs consist of modules, each of which contains one or more routines. The term routine is synonymous with procedure, function, and subroutine." <http://www.webopedia.com/TERM/R/routine.html>

<sup>82</sup> "This attaching, circular metamorphosis can be aborted by CAD. Once points are plotted on-screen, the algorithms do the drawing; misuse occurs if the process is a closed system, a static means-end-the "circularity" of which Piano speaks disappears. The physicist Victor Weisskopf once said to his MIT students who worked exclusively with computerized experiments. 'When you show me that result, the computer understands the answer, but you don't think you understand the answer.'" Sennett 2008, *The craftsman*, 40-41; Victor Weisskopf quote in Turkle 1997, *Seeing through computers: education in a culture of simulation*, 81

### ***Formulation (diagnosing)***

The research question was identified and the initial quantitative component planned and implemented by: gathering relevant information on Brisbane (such as its history, planning policies, mapping, digital bases); gathering information on housing typologies; and rationalising all of this information for the evaluation criteria which stressed the relationships between courtyard housing typologies and the lenses of inquiry.

### ***Synthesis (action planning)***

In the synthesis stage of the inquiry, the quantitative results were synthesised and theorised. Courtyard housing types suited to the other topics of the inquiry criteria were selected. Exemplar urban contexts were selected as a way of testing the adaptability to the lenses of inquiry. A collage of hand sketches allowed for testing of the primary environmental building issues of orientation, ventilation, and topography. Relationships between the international urban cases under study and the realities of Brisbane's architectural/urban industries were explained. Finally, open-ended questions were raised by drawing the variants that could be used in meetings with consultants.

### ***Analysis (action taking)***

The qualitative approaches that were used to explore, hypothesise and clarify the design process included: obtaining ethical consent to access consultants; using hand drawings for the placement of streets, and for defining distances and open spaces within city contexts; refining sketch plans, sections and perspectives of courtyard housing buildings; sending public domain questions (about the challenges and opportunities in the urban design process of Parque EXPO, Lisbon) to urban promoters; travelling to Beijing to observe architectural/urban matters and collect open-ended data; choosing one type of computer software for sketch drawing development, and another to disseminate the results of the inquiry among diverse audiences; estimating the weight of the exegesis to limit and frame the practice component; meeting with consultants, and carrying out peer-reviews to

clarify conceptual issues; and, finally, writing the first draft of exegesis.

### ***Evaluation***

The quantitative and qualitative data obtained in the previous steps were assembled to evaluate: the design and development of courtyard housing typologies; the developed courtyard housing types when applied to the city fabric; the size and contents of the written component; the graphic outputs and their appropriateness for the foreseen outcomes; the suitability of preliminary methods for making appropriate changes; and the inquiry process as a whole, within the expected timeframe (**DS\_2 – Methodological Chart, and Course of action**).

### ***Reformulation***

At this point, the routine had completed a full cycle. A new cycle then began, implementing efficacy and improving key issues such as the relationship between courtyard housing types and city structure, the passage from computer sketches to final computer drawings, and the definition of the final presentation for the target audience.

### ***(Re)synthesis***

The interim results of the previous cycle (for re-selecting the courtyard housing types for final prototype development) were re-synthesised, with an assembly plan for Bowen Hills (Brisbane), a format for presentations, and the reformulation of questions for consultants.

### ***(Re)analysis***

The previous steps were re-analysed to refine relationships between architectural and urban elements, and to prepare for the meetings with consultants and peer-reviews with colleagues.

### ***(Re) evaluation***

This step involved consideration of the expert consultation and how this

would shape/re-shape final decisions with regard to drawing methodology, writings, and graphic outlines.

### ***Prototypes***

The last step in the cycle was the production of the final textual and graphical design descriptions.

### ***Scale up and study effectiveness***

After each cycle of actions, the selected information was summarised and interpreted to scale up the selected courtyard housing types to be inserted in the collage plan.

## **2.5 ANALYSIS**

Analysis was undertaken by viewing and reflecting on drawings, which ranged from hand sketches to architectural and urban design schemes developed with the aid of computer software, in a process known as 'reflection-in-action'. The analysis progression is explained and detailed in **C\_5** ('Design Framework').

## **2.6 ETHICS**

The interview format was approved by QUT Ethics: Protocol Number 1200000416. (A copy of this document is included at the end of **Ap\_C - Interviews**). Before the interviews, each interviewee was informed of the specific questions they would answer. They were also informed that both their names and their company names would be identified to strengthen the evidence, and as a source for corroboration of the research findings. Each interviewee signed an individual consent form to demonstrate their acceptance of these conditions.

Most importantly, this inquiry strove to follow an ethical course of action that would benefit the majority without compromising the privacy rights of individuals.

## Chapter 3: Precedents

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This chapter reviews significant precedents, with the objective of finding relevant design references to be applied to the proposals of this inquiry. The first section (**S\_3.1**) explains the design precedents; section **3.2** reviews courtyard housing precedents (**S\_3.2.1** Courtyard houses, **S\_3.2.2** Communal courtyard housing, and **S\_3.2.3** Conceptual and typological synthesis). **Section 3.3** analyses two plan precedents in Beijing and Lisbon, and **S\_3.4** identifies housing precedents in Brisbane.

### 3.1 DESIGN PRECEDENTS

This section clarifies the key design precedents that have influenced the scope and direction of this inquiry. Colin Rowe's teachings, for example, are the foundation of my (and many others') professional stance as an architect and urban designer. Furthermore, his insightful vision, tools and procedures served as the scaffold on which to mould the urban design prototypes proposed in this inquiry. His words – such as those below – are still a constant stimulus for reflection on, and conjecture about architectural practice:

Indeed one could fear that the architect as a 'bricoleur' is, today, almost too enticing a programme – a programme which might guarantee formalism, ad hocery, townscape pastiche, populism and almost whatever else one chooses to name. But ... The savage mind of the bricoleur! The domesticated mind of the engineer/scientist! The interaction of these two conditions. The artist (architect) as both something of a bricoleur and something of a scientist!

... For the predicament of architecture – which, because it is always, in some way or other, concerned with amelioration, by some standard, however dimly perceived, of making things better, with how things ought to be, is always hopelessly involved with value judgements – can never be scientifically resolved, least of all in terms of any simple empirical theory of 'facts'. And, if this is the case with reference to architecture, then, in relation to urbanism (which is not even concerned in making things stand up) the question of any scientific resolution of its problems can only become more acute.<sup>83</sup>

Colin Rowe

Rowe was one of the most important architects in the teaching of

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<sup>83</sup> Rowe and Koetter 1978, *Collage city*, 104-105

Architecture and Urban Design in the USA after the middle of the twentieth century. As a former pupil of Rudolf Wittkower (1945)<sup>84</sup> and Henry Russell-Hitchcock (1952), Rowe was already an accomplished architectural critic when, in 1954, he joined the University of Texas (Austin) to teach in the newly autonomous School of Architecture. With a group of young architects, later named the 'Texas Rangers', Rowe restructured the school's architectural curriculum.

The new curriculum emphasized space rather than form. Students visualized space using phenomenology and transparency through use of both two-dimensional and three-dimensional exercises. Students re-discovered history-using precedents as idea generators. Context became an important architectural consideration; regionalism was seen as a force impacting design. Design process was emphasized ... This was radically different from the prevailing attitudes that were devoid of history, regionalism and phenomenology ... The impact of this curriculum reverberates years later both in the U.S. and Europe.<sup>85</sup>

In 1962, Cornell University invited Colin Rowe to benchmark the Master of Architecture in Urban Design. Rowe's exceptional capacity for engaging teaching increased during the time he taught at Cornell.<sup>86</sup> Rowe had an outstanding memory for historical facts and examples that he constantly mentioned as his starting reflexions. Yet, he was always adamant that once architects/urban designers built an initial argument, they should thereafter compare it with a multitude of other contemporaneous alternatives. This method assisted Rowe's students to deal with alternatives, and to develop greater intellectual consciousness and clarity.<sup>87</sup>

In association with the Cornell Urban Design Studio students, Rowe initiated three architectural-urban theories that have since been associated with the studio:

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<sup>84</sup> At the Warburg and Courtauld Institutes in London.

<sup>85</sup> Caragonne 1995, *The Texas Rangers : notes from an architectural underground*, xi. The other members of the group were Bernhard Hoesli, John Hejduk, Robert Slutzky, Lee Hodgden, John Shaw, and Werner Seligmann. As the Texas Rangers dispersed, after a few years of the program's initiation, "they disseminated their new ideas and their pedagogies were adopted and adapted by other schools. Bernhard Hoesli went to Eidgenossische Technische Hochschule (ETH) in Zurich, John Hejduk to Cooper Union, and Colin Rowe to Cornell." Werner Seligmann (BArch Cornell) was later (1976-90) the Dean of the School of Architecture at Syracuse University.

<sup>86</sup> Much more could be written here about Rowe's captivating personality, admirable teaching and ubiquitous friendship. The writings could include my personal experiences as student and friend as well as many other descriptions made by his students, colleagues and friends. Unfortunately this is not the right place to do it. For anyone interested in knowing more about Rowe's personality, an initial good source would be the words of the speakers (early students and colleagues) in the Colin Rowe Memorial held in his honor on February 6, 2000, at the Carnegie Institution of Washington.

(<http://www.youtube.com/user/philipshandler?feature=watch>)

<sup>87</sup> Caragonne 1995, *The Texas Rangers : notes from an architectural underground*, 8-17



Contextualism, Collision City, and Collage City. While the theories shared the same critical ground of the studio designs, they did not exclude others' theoretical alternatives; rather, they proposed diverse ways of envisioning contemporaneous urbanistic trends.<sup>88</sup>

In the early years of the studio, the students attempted to convey Modern Architecture, albeit using the urban design principles of the traditional city. The Contextualism theory attempted to provide an alternative to the Modern Architecture *zeitgeist*, mainly, in its overall fixation on the proposition that buildings are objects that are separate from the compact texture of the nineteenth century cities.<sup>89</sup> Thomas Schumacher, one of Rowe's students (Cornell 1963) and later professor at Princeton University and University of Maryland, recalled that the first name for Contextualism was Contextualism, a term combining Context and Texture, and originally used by Steven Hurtt and Stuart Cohen in the 1960s. The general purpose of the urban design studio by then was to identify the urban inadequacies of Modern Architecture, while at the same time trying to accommodate its stylistic rules within the traditional city. In the 1930s, the Amsterdam School had proved this to be possible.<sup>90</sup>

The Gestalt concept of figure-field structures was utilised as a figure-ground method<sup>91</sup> to enhance the perception of urban fabric and urban edges. This concept was combined with Rowe and Slutsky's theories relating to building façades to produce the final volumetry applied on the urban design proposals.<sup>92</sup> Many of these projects were published by Steven Hutt in 1983 in *The Cornell Journal of Architecture*, twenty years after the birth of the studio; also, after Rowe left Cornell, his own descriptions of the students' projects were recollected by Alexander

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<sup>88</sup> Hurtt 1983, *Conjectures on urban form : the Cornell Urban Design Studio 1963-1982*, 55

<sup>89</sup> Ibid.; Koetter and Rowe 1980, *The Crisis of the Object: The Predicament of Texture*

<sup>90</sup> Schumacher 1971, *Introduction - Contextualism : Urban Ideals + deformations*, 294

<sup>91</sup> Hurtt 1983, *Conjectures on urban form : the Cornell Urban Design Studio 1963-1982*, 58. For a better explanation of the figure-ground tool see: Copper 1967, *The figure/grounds*; Copper 1983, *The figure/grounds*; Trancik 1986, *Finding lost space : theories of urban design*, 97-106; Graves 2009, *The genealogy of cities*; Jenkins 2008, *To scale : one hundred urban plans*

<sup>92</sup> For a discussion of these theories see: Rowe, *et al.* 1997, *Transparency*, and Rowe 1976, *The mathematics of the ideal villa, and other essays*

Caragonne for the book *Urbanistics* in 1996.<sup>93</sup>

The Collision City theory attempted to analyse the order and design of cities with reference to the social, political and formal values raised by the positive competition among political, social and economic institutions. The theory endeavoured to understand the complexities of esteemed urban forms beyond their picturesque attributes.<sup>94</sup>

The Collage City Theory acknowledged the relevance of urban forms that represent and illustrate the cultural architectonic values of timeless cities: a direct opposition to the “antihistorical, antistylistic, and antielectic tenets of Modern architecture”.<sup>95</sup> In this theory, the city was seen as an arrangement of small territories ruled by self-organised directives and balancing functions, which could be regarded as “fragmentary enclaves”.<sup>96</sup>

The theory had strengths and weaknesses, as pointed out by David Grahame Shane, one of Rowe’s many students, in his seminal book *Recombinant Urbanism*:

The strength of the *Collage City* concept was that it could accommodate fragments originating in many different systems and organized in many different ways while respecting the internal organization and ecology of each. *Collage City* provided a working method for the handling of a fragmented, multicentered city model through its vision of an incremental growth system comprised of distinctive, competing, self-centered enclaves. Each enclave recorded a separate, incremental layer of city growth. This system of representation could, later, easily be computerized.

The weakness of *Collage City* was that the relationships between the enclaves were not examined in detail [and] the question was thus how to coordinate the various fragments and allow for individual expression ...

Yet, in my opinion, as discussed in the case of Parque das Nações (**S\_3.3.2 - Summary: Parque das Nações**), the main weakness of the theory can be addressed and efficiently overcome in architectural/urban design practice if detailed urban plans are appropriately coordinated. Given this condition, I agree with Shane that the theory constitutes a relevant normative for urban design when shared by

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<sup>93</sup> Hurtt 1983, *Conjectures on urban form : the Cornell Urban Design Studio 1963-1982*; Rowe 1996, *Urbanistics*

<sup>94</sup> Hurtt 1983, *Conjectures on urban form : the Cornell Urban Design Studio 1963-1982*

<sup>95</sup> Ibid.

<sup>96</sup> Shane 2005, *Recombinant urbanism : conceptual modeling in architecture, urban design, and city theory*

multiple urban designers with diverse agendas, within a coordinated planning context. That is, the Collage City model enables “individual designers to proceed with their fragment with a minimum of coordination with others, closely mirroring the activities of free-market operators in large-scale subdivisions (as in the case of New Urbanism)”.<sup>97</sup>

The book *Collage City*, which Rowe wrote with Fred Koetter, has been considered one of the most relevant publications about urban design. Their manuscript was ready for publication by 1973; however, the search for appropriate accompanying images delayed publication until 1978.<sup>98</sup> The book assembled the architectural-urban theories described above, almost as a journal of the ideas Rowe had developed with his students in the first ten years of the Cornell Studio. However, the book did not include the Studio's projects, which would have helped to illustrate Rowe's speculations about the three-dimensional features of the theories described in the book. Moreover, the book did not refer to the many articles Rowe wrote about the importance of façades in architecture and urban design while he was teaching at the University of Texas. As fragments, these articles were later (1996) assembled by Caragonne in *Cornelliana*.<sup>99</sup>

In my opinion, the reading of *Collage City* alone, without the knowledge of these articles, would never give an outside reader (that is, someone from outside the Studio) a complete understanding of all Rowe's conjectures as they applied in the practice of architecture. Nor would it give the reader a sense of the significance of the Cornell Urban Design Studio as the embryo of the emergent concepts of urban design in the last quarter of the twentieth century.<sup>100</sup> Besides the academic

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<sup>97</sup>Ibid., 130-135

<sup>98</sup> Rowe and Koetter 1978, *Collage city*, 186

<sup>99</sup> Rowe 1996, *Cornelliana*

<sup>100</sup> Rowe's studio at Cornell influenced significantly the teaching of Urban Design in the USA in the end of the twentieth century for it continued disseminating the ideas that surfaced in Austin as well as it became one of the principal sources of a new generation of teachers and practitioners. Among the vast group of architects that studied with Colin Rowe at Cornell it may be relevant to mention the best known in the eastern academic circles: David Grahame Shane, Roger Sherwood, James Tice, Klaus Herdeg, Steven Hurtt, Tom Schumacher, Alan Chimacoff, Steven Peterson, Michael Schwarting, Barbara Littenberg, Tim Wood, Stuart Cohen, Tom Beeby.

Peter Eisemann, though not a student at Cornell, was strongly influenced by the Texas Rangers' ideas during Rowe's brief passage by Cambridge University (1959-62). It is known that was under the patronage of Rowe and the support of Philip Johnson that Eisemann created the Institute of

work produced by the Studio, the *Collage City* methods also had a direct influence on the urban design projects of Fred Koetter and Susan Kim, Michael Dennis, Steven Peterson and Barbara Littenberg. Roger Trancik, who has taught contemporaneously at Cornell with Rowe since 1982, suggested in the book *Finding lost space* three approaches to urban design theories could work together to provide an integrated urban design.

The first of these is the (already mentioned) Figure-ground Theory. The second is Linkage Theory, which recommends a structure that orders spaces through a network or a system of linear connections: "These lines are formed by streets, pedestrian ways, linear open spaces, or other linking elements that physically connect the parts of a city."<sup>101</sup> The third is Place Theory, which "goes one step beyond figure-ground and linkage theories in that it adds the components of human needs and cultural, historical, and natural contexts. Advocates of Place Theory give physical space additional richness by incorporating indigenous forms and details in its setting."<sup>102</sup> These theories served to fill some of the gaps in

Architecture and Urban Studies "in the guise of an alternative program of architecture and urban design in New York City ... Yet, though much of Eisemann's early indoctrination by Rowe may have elicited in him a certain ostensible sympathy toward principles the Texas School had sponsored – the spatial basis of architecture and the importance of historical precedent and environmental context – it was rather the structural form that most attracted his attention." Caragonne 1995, *The Texas Rangers : notes from an architectural underground*, 400,404. See Rowe's articles when in Cambridge in Rowe 1996, *Texas, Pre-Texas, Cambridge*

<sup>101</sup> The Linkage Theory implies the assemblage of connecting determinant lines of force in creating a spatial datum. These are a combination of site lines, organizational axes, directional flows of movement or building edges. In the book *Investigations in collective form*, Fumihiko Maki explained that these lines connect layers of activity that can be identified in three different scales of formal types defined as compositional form, megaform and group form. Of importance in Maki's work is the suggestion that the structure of public spaces should be pre-established before the planning of buildings and individual spaces with special concerns to movement flows and connections. In Trancik 1986, *Finding lost space : theories of urban design*, 97, 106-111; Maki 1964, *Investigations in collective form*, 29

<sup>102</sup> Trancik 1986, *Finding lost space : theories of urban design*, 97.

The theories of Critical Regionalism corroborated this assertion. See for instance Frampton 1983, *Prospects for a Critical Regionalism*; Lefaivre and Tzonis 2003, *Critical Regionalism: Architecture and Identity in a Globalised World*

The Place Theory requires from the urban designer an accurate understanding of the cultural and human characteristics in relation to a specific physical space. To accomplish these, a public space should include local historical symbols and fragments that express, encompass and exist in the environment it grew out of. Very important in assembling these are the boundaries, or definite edges of the spaces that should frame the local social set of activities. As such, each public space should have flexibility to allow user manipulation permitting changes of comfort of familiarity and continuity of the local lifestyle over time.

*Collage City*, and became widely used in the Cornell Urban Design Studio projects in the 1980s.

For the reasons given above, the approaches presented in *Collage City* are not considered sufficient means for meeting all the demanding needs of most contemporary urban development programs. However, when the size of the urban development requires the intervention of various urban designers in large-scale fragments such as urban detail plans, they can be combined with other theories under the synchronization of a strategic urban design plan.

As recognised by his students and colleagues, the Collage City Theory marked only a specific time in the evolution of Rowe's teachings, which started with an innovative approach to the teaching of architecture in the 1950s, and progressed to the teaching of Urban Design, a discipline that he pioneered in the 1960s. Rowe's beliefs evolved over time with the progression of the work of his students and colleagues, in a legacy that is usually referred to as the 'Cornell Method'.

Steven Peterson (2012) explained this evolution from the initial ten years of the studio (the 1960s) when Rowe's programme developed methods to explore how city design could avoid the shortcomings of Modern Architecture, to a later demonstration (in the 1970s) of the use of building blocks and streets that catered for a broader range of architectural approaches and styles. This was exemplified in the proposal for the *Roma Interrotta*<sup>103</sup> competition.<sup>104</sup>

A further evolution can be seen in the 1980s when Rowe applied the concepts of linkage theory and urban green structure to explain the urban design schemes presented in "Comments on IBA reports".<sup>105</sup> These explanations were developed, amended and illustrated by Raul Carvalho in his Master's Thesis.<sup>106</sup> Likewise, the line of work developed in the Cornell Studio in the 1980s demonstrated a larger concern with accessibility, sense of community, and net densities.

Nonetheless, as agreed by most of his peers and students, the core of Rowe's

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<sup>103</sup> Architectural Design Profile 1979, *Roma Interrotta*

<sup>104</sup> Thadani 2012, *Medalists Steven Peterson and Barbara Littenberg*

<sup>105</sup> Rowe 1982, *Colin Rowe - Gutachten zum IBA - Neubaugebiet*; Rowe 1983, *Comments on the IBA proposals*. See also description of IBA Berlin in **S\_3.2.2**, p. 107

<sup>106</sup> Carvalho 1985, *Urban design proposal for West Berlin*

thought imbedded in the Cornel Method

...was the belief in the influence of context, the transferability of historic precedent to contemporary situations and the universality of formal *partis* as the organizing core to all architecture no matter what time, place or style.<sup>107</sup>

The collage procedure used in this inquiry is extracted from Rowe's teachings and writings that are not specifically related to the theories and methods espoused in *Collage City*. Rather, it is part of the 'design as a process' strategy that also emphasises space rather than form; that uses precedents as exemplar generators; that recognises urban context as an important architectural consideration; and that considers regionalism as a force impacting design.<sup>108</sup>

The collage procedure is comparable to the concept of *bricolage* that Rowe used when referring to Lévi-Strauss's book, *La pensée sauvage (The savage mind)*.<sup>109</sup> In this context, the *bricoleur* is assumed here as someone who collects all available images and (re)combines them within an improvisation process that responds both to conscious (program/lenses) and subconscious (practice data recollection/intuition) parameters.<sup>110</sup> In other words, using the available physical matter (*matière*) and means of execution (*moyens d'exécution*), the *bricoleur* builds up a specific universe where he/she acts as the only manager of diversity and choice.

The matter (*matière*) was created by the dwelling type plans, using the available means of execution (*moyens d'exécution*) to make a volumetric *bricolage* that materialised the dual-side edge of the building. This edge defined the external spaces, the voids. The assembly of these voids with the buildings (internal versus external, courtyard versus street), structures and defines the urban design prototype unity of this inquiry. Thus, I acted as a *bricoleur*, collecting images from the precedents and (re)combining them in response to the subconscious feedback of my professional practice and to the conscious parameters of the research objectives.<sup>111</sup>

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<sup>107</sup> Thadani 2012, *Medalists Steven Peterson and Barbara Littenberg*

<sup>108</sup> Caragonne 1995, *The Texas Rangers : notes from an architectural underground xi*

<sup>109</sup> Lévi-Strauss 1962, *La pensée sauvage*; Lévi-Strauss 1972, *The savage mind*

<sup>110</sup> C\_2 - Research outline

<sup>111</sup> C\_2 - Research outline

Accordingly, the collage of historic examples was ‘practised’ by gathering both block and dwelling typologies within a broad time span, albeit focusing on twentieth century best practice examples. The choice of the appropriate types was made by a trial-and-error system of collage, supported by intuition provided by over twenty years of architecture/urban design practice. As demonstrated in the following chapters, the influence of context was recognised; historic precedents were transferred to contemporary situations; interview feedback and current architecture/urban design guides and theories were considered; and formal *partis* were applied in developing the architecture/urban design schemes. To support the development of the urban design prototypes and their insertion in the Collage Plan, however, the direct application of each of these influences was considered through the lenses of inquiry.

Given the extension of urban design as a multidisciplinary practice, the large amount of theoretical work published (generally as academic papers) from the postmodern movement to today, tends to identify and fill theoretical gaps in various bodies of knowledge. This body of work cannot serve as a comprehensive guide for practitioners for various reasons. For example, they might have limited access to research sources, or have limited research time in which to address the vast amount of urban design publications that encompass urban morphology, and environmental strategies and the real estate market, to cite but a few of practitioners’ most common interests.<sup>112</sup> A specific example of urban morphology research is, for instance, the work developed by the Krier brothers,<sup>113</sup> and, among many others, an example of the work in environmental strategies and the real estate market could be Adams and Tiesdell’s recent book *Shaping Places*.<sup>114</sup>

In the absence of a comprehensive theory that would serve all the housing market parameters for different local techniques, cultural discrepancies, and environmental conditions, therefore, practitioners often feel more comfortable in

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<sup>112</sup> See **S\_2.1** - Initial challenges

<sup>113</sup> Krier 1984, *Urban components*; Krier 1998, *Architecture : choice or fate*; Krier, et al. 1983, *The polycentric city*; Krier 2003, *Typological and Morphological Elements of the Concept of Urban Space*; Krier 1979, *Urban space (Stadtraum)*; Krier, et al. 2003, *Town spaces : contemporary interpretations in traditional urbanism : Krier.Kohl Architects*

<sup>114</sup> Adams and Tiesdell 2013, *Shaping places : urban planning, design and development*

following local government guides (generally based on theoretical grounds) that recommend in detail what and how new developments should be implemented and built.

The method, theories, and professional guidelines described above were “collated” to establish the theory framework of this inquiry. The additional literature (theory and practice) relevant to the design process of this inquiry is mentioned across the following chapters, and most specifically in **C\_5** (Design framework) and **Ap\_E-G**. A summary of the informing theories related to the three lenses of inquiry are presented in **DS\_5**.

Lastly, the written component of this work, with its continuous integration of quotation and original text, is itself an evolving ‘collage’ research process.



## 3.2 COURTYARD HOUSING PRECEDENTS

Based on the reasonable assumption that knowledge of the past can inform the new interventions, this section explores the history of courtyard housing<sup>115</sup> from its earliest use to the present day. The most important question prompting this exploration is directly related to following two sections: **How and why has courtyard housing been a permanent housing typology in city structures worldwide?** After the initial comments, Section **3.2.1** describes and comments the evolution of the courtyard house and Section **3.2.2** explains the development of communal courtyard housing across time. The following section (**3.2.3**) analyses conceptual and typological aspects. The selected examples in both **Sections 3.2.1** and **3.2.2** are discussed in detail; the most significant observations from these examples are consolidated in a comprehensive list at the end of each of these sections.

The literature reviewed for the two first two sections is extensive. The cited works are referenced both in the notes, and in the “Works Cited” section. The most significant publications relating to **Section 3.2.1** are *6,000 years of housing*;<sup>116</sup> *Courtyard housing: Past, present and future*;<sup>117</sup> *History of urban form: before the industrial revolutions*;<sup>118</sup> and *Courtyard housing and cultural sustainability: Theory, practice, and product*<sup>119</sup>—to mention but a few.

Significant references related to **Section 3.2.2** are *Modern housing prototypes*;<sup>120</sup> *Courtyard housing in Los Angeles: A typological analysis*;<sup>121</sup> *The European perimeter block: The Scottish experience of courtyard housing*;<sup>122</sup> *Urban forms: the death and life of the urban block*;<sup>123</sup> and *Dwelling in the metropolis: Reformed urban blocks 1890–1940 as a model for the sustainable compact city*.<sup>124</sup>

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<sup>115</sup> See definitions on **S\_1.3**, p. 3

<sup>116</sup> Schoenauer 2000, *6,000 years of housing*

<sup>117</sup> Edwards 2006, *Courtyard housing: Past, present and future*

<sup>118</sup> Morris 1979, *History of urban form : before the industrial revolutions*

<sup>119</sup> Zhang 2013, *Courtyard housing and cultural sustainability: Theory, practice, and product*

<sup>120</sup> Sherwood 1978, *Modern housing prototypes*

<sup>121</sup> Polyzoides, et al. 1982, *Courtyard housing in Los Angeles: A typological analysis*

<sup>122</sup> Edwards 2006, *The European perimeter block: The Scottish experience of courtyard housing*

<sup>123</sup> Panerai, et al. 2004, *Urban forms: the death and life of the urban block*

<sup>124</sup> Sonne 2009, *Dwelling in the metropolis: Reformed urban blocks 1890–1940 as a model for the sustainable compact city*

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How can man withdraw himself from the fields? Where will he go, since the earth is one huge unbounded field? Quite simple; he will mark off a portion of this field by means of walls, which set up an enclosed finite space over against amorphous, limitless space ... For in truth the most accurate definition of the urbs and the polis is very like the comic definition of a cannon. You take a hole, wrap some steel wire tightly around it, and that's your cannon. So the urbs or polis starts by being an empty space...and all the rest is just a means of fixing that empty space, of limiting its outlines...The square...this lesser rebellious field which secedes from the limitless one, and keeps to itself, is a space sui generis of the most novel kind in which man frees himself from the community of the plant and the animal...and creates an enclosure apart which is purely human, a civil space.<sup>125</sup>

Jose Ortega y Gasset

Before the domestication of plants and animals during the Neolithic Period,<sup>126</sup> primitive bands of nomads migrated seasonally, according to the availability of food. Their dwellings were light, ephemeral, easy to erect, and commonly arranged with their main openings facing a communal space. To subsist in the hunting and gathering system, it has been estimated that each person needed an area of 1800-130,000 hectares (ha), depending on the climatic conditions.<sup>127</sup>

Bands evolved to tribes and tribes to agrarian folk communities, the latter subsisting on herds and planted crops. In this social evolution, much smaller areas were needed for subsisting, requiring 50 to 244ha per person in tribal systems, and only a few hectares per person in folk communities. Accordingly, these communities developed a primary notion of property, first in a more communal way in the tribal organisation, and then in a more individual fashion in agrarian communities, generating semi-permanent family occupations of the land.<sup>128</sup>

Fences became necessary to establish a space where each family would dwell,

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<sup>125</sup> Ortega y Gasset 1932, *The revolt of the masses; authorized translation from the Spanish* quoted in Koetter and Rowe 1980, *The Crisis of the Object: The Predicament of Texture*, 140

<sup>126</sup> The Neolithic Period occurred in diverse timings (ca.6500 BC-ca.1600 BC) in different areas of the world according to different factors including but not limiting to the technical and social development of the communities. Dani, *et al.* 1999, *History of civilizations of Central Asia*; Twiss 2007, *The Neolithic of the southern Levant*

<sup>127</sup> Schoenauer 2000, *6,000 years of housing*, 15

<sup>128</sup> According to Schoenauer folk community is the name of a social organization of a sedentary society which uses semipermanent huts and houses, subsisting mainly by the cultivation of staple crops. Members of these communities used to know the use of the elementary plow, not yet reaching either the use of more sophisticated plows or other farm tools. *Ibid.*, 57

protecting itself as well as its grain and animals from the outside world. Generally, windowless round huts had their entrances facing a central space and were either connected or surrounded by a fence. Fences evolved to walls, at a height (generally above eye level) adequate to provide privacy for the living and working spaces within. The spaces formed by these agrarian compounds were the first courtyards in history (**Fig.1**).

Agriculture then evolved to a more advanced stage where food was produced by fewer people, using more specialised tools. This system generated a surplus of food that required larger areas for storage before the products could be transported to distant markets. Population density could vary from a few persons per hectare to hundreds; this density depended on a combination of factors, including climate attributes, soil characteristics, land utilisation processes and prevailing economic conditions.

Permanent settlements became possible, and required the utilisation of larger agricultural areas for rotating crops and allowing the fields to lie fallow. The continuous use of specific parcels of land saw the notion of property evolve into a strong concept of individual land ownership. The size of these parcels would depend on the level of agricultural development. Moreover, a larger number of family members would be required if the supply of necessary tools was limited. The typical dwelling in this permanent occupation was more comfortable in terms of room sizes and internal climate control. Buildings were now erected using materials that were more durable, and the compound allowed for larger spaces for barns, stables and storage. While construction materials differed according to geographic contexts, the compound structure remained consistent: a dwelling with stables and other ancillary buildings enclosing an outside space.

The social organization consisted of families housed in agrarian compounds, generating political hierarchies that would grow in size and importance from villages to towns, and then to counties and nations. Starting around 3500 BC, the evolution of some of these societies meant that their agricultural production exceeded their subsistence needs. This created a 'social surplus' and the

consequent 'urban revolution'.<sup>129</sup> People not working in agriculture initiated the manufacturing and commercialisation of goods, which might be considered the starting point of the four earliest world civilisations: Mesopotamia, Egypt, Indus and China. All four civilisations were located in fertile river valleys between the 20°N and 35°N latitudes. In some cases, these valleys were bordered by high mountains and vast deserts, which provided sufficient protection from eventual attacks by nomadic tribes. Besides the fertility provided by seasonal flooding, the rivers made communication and commerce possible.

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<sup>129</sup> Childe classified ten criteria that facilitated the urban civilizations. In Childe 1950, *The Urban Revolution* ; Ben-Shlomo and Garfinkel 2009, *Sha'Ar Hagolan and new insights on Near Eastern proto-historic urban concepts*, 190

### 3.2.1 Courtyard houses (CH)

#### *Early civilisations*

The courtyard house developed as both a rural and urban prototype. The adoption of the rural courtyard compounds in the permanent settlements was logical, for the basic living concept of the internal court worked well within the geographically diverse city contexts. Schoenauer argues that four types of factors contributed to the ready acceptance of the courtyard house type in the ancient settlements for thousand years: psychosocial (privacy/property), economic (density/land value), climatic (sun/wind protection), and religious (internal paradise/sky spiritual access).<sup>130</sup>

The Sumerian Civilisation arose around 3500 BC as a result of the agglomeration of many agricultural communities in the valleys of the Tigris and Euphrates rivers. Between 3000 BC and 2700 BC, villagers began a large migration towards larger nuclei, creating cities. The city-states of Mesopotamia, such as Babylon and Ur, had an assembly of religious elders with the authority to nominate a city ruler with the powers of a king. In its period of prosperity (ca.2100 BC), Ur had a gross density of 320 persons per hectare (ppha), and its typical urban dwelling had rooms around a central court<sup>131</sup> (**Fig.2**).

The Nile Valley Civilisation began around 3600 BC when the existent *nomes* (provinces) coupled animal domestication with crop storage. Menes unified the settlements along the valley (ca.3100 BC), building Memphis to function as the capital of his new kingdom. From this time, housing in Egypt grew along alluvium

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<sup>130</sup> Schoenauer's reasons for nominating these factors are further defined: "First, there was a psychosocial consideration: the inward oriented dwelling provided privacy for neighbors in respect to both household activities and material possessions. Second, there was an economic factor: the fortifications surrounding ancient cities greatly restricted the amount of land available for housing, and the court-garden house permitted the greatest density, barring multistoried development, which, at that time was technologically inconceivable. Third, climatic conditions favored the court-garden house in contrast to the detached dwelling exposed on four sides to the sun and weather, the court-garden house was attached to other dwellings and was protected on all but the narrow, shaded, and wind protected alley side giving access to the house. Moreover, the court could readily, through the use of water and planting provide a micro-climate. The fourth factor had a religious connotation: The open interior court garden had an affinity with man's image of paradise or oasis in the wilderness; its two lateral dimensions were defined but its third dimension, its height, was limitless." Schoenauer 2000, *6,000 years of housing*, 98

<sup>131</sup> *ibid.*,102-104

land, usually around palaces/temples and funerary buildings. The rooms had different ceiling heights for different seasons (for example, low ceilings for the winter). Wind was captured and directed through a system that included windows, domes and roofs. Towns such as Kahun (ca.2650 BC) were built to accommodate the transient houses and services required for the construction of the pyramids. Housing was then organised in a gridiron, and houses had small yards in front of the entrance door and at the back<sup>132</sup> (**Fig.3**).

The Indus Valley Civilisation (Harappan Civilisation) flourished from ca.2150 BC; however, it came to an abrupt end in ca.1750 BC as a result of either natural events (such as extreme flood or drought) or human actions (such as Aryan invasions).<sup>133</sup> Even though archaeologists have discovered more than one hundred Indus settlements since 1920, historians do not have a detailed knowledge about the origins of this civilisation, and still have not deciphered the Indus script. To date, the largest cities found are Harappa, Kalibangan and Mohenjo-Daro. The Indus Valley Civilisation was the first ancient civilisation to build a city grid using straight streets. However, the gridiron was not yet used as a physical instrument to build the city as a whole, but only to build a specific area of the city: the workers' camp. Courtyard houses are clearly identified in the excavation plans of Mohenjo-Daro<sup>134</sup> (**Fig.4**).

Clay seals found in the above cities are evidence of commercial relations among their civilisation.<sup>135</sup> It is possible that these relations contributed to the

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<sup>132</sup> The traditional design of Egyptian houses (3000 BC) is characterised by its inward oriented design where the courtyard was used basically for providing natural light and ventilation. Commonly had up "to four iwans (sitting rooms) open onto the court which usually contained fountains or trees. In other rooms the height of ceilings depended on function. In the winter rooms with low ceilings (and therefore more easily heated) were used for sleeping and domestic purposes. Meeting and sitting rooms had high ceilings. The circulation of air was controlled through use of a shukhsheikha, a series of windows in a dome over the central hall, or a malkaf an open shed at the highest point of the house covering an air shaft leading to the iwan or sleeping rooms. The roof of the shed was inclined at an angle designed to divert wind downward toward the airshaft." Toulon 1980, *Climatic considerations in the design of urban housing in Egypt*, 74-84

<sup>133</sup> Morris 1979, *History of urban form : before the industrial revolutions*, 14

<sup>134</sup> *Ibid.*, 15-17

<sup>135</sup> Cylinder seals were used were used as an administrative tool to control the inviolability of the commercial goods. Sparavigna 2009, *Ancient Egyptian Seals and Scarabs* [http://www.lulu.com/items/volume\\_68/5655000/5655978/7/print/5655978.pdf](http://www.lulu.com/items/volume_68/5655000/5655978/7/print/5655978.pdf) ; see also [http://www.britishmuseum.org/explore/highlights/article\\_index/m/mesopotamian\\_cylinder\\_seals.aspx](http://www.britishmuseum.org/explore/highlights/article_index/m/mesopotamian_cylinder_seals.aspx)

dissemination of courtyard house typologies in ancient times. The courtyard houses in the Mesopotamian, Egyptian and Indus rivers civilisations were an average size of around 50m<sup>2</sup>. Their forms were squared, embracing the court, or elongated, placing the courts in the entrance and/or at the end of the house (**Figs. 5 and 6**). Even though Sumerian and Egyptian workers received social respect and humane treatment<sup>136</sup>, the ancient “civilisations did not provide the political, governmental, social, and – most important – psychological conditions which would create the need for gathering places.”<sup>137</sup> These conditions were introduced with the later Greek concept that the individual and the state could be separated, and have differentiated spatial settings for the conduct of their affairs. The square (plaza) then appeared as a special gathering place for the people.

### ***Classical civilisations***

While courtyard houses have been uncovered in the archaeological excavations (1901-2009) at Knossos and Gournia on Crete (2000 BC), it was not until the Hellenic period (900 BC - 400 BC) that courtyards became commonplace in Greek cities. The houses at the beginning of this period consisted of a single room, occasionally with an attached porch. Domestic activities would take place inside the room or in its adjacent outside spaces. In the middle of the eighth century, these households started turning inwards, with the addition of two or three rooms around a private outdoor space that was not yet completely enclosed. It is possible that this sudden change was caused by a “defined conception of the private sphere and a desire to assert control over the space used by the household, while the increased provision of space for storage may reflect a greater emphasis on the ideal of self-sufficiency as a way of avoiding dependence”<sup>138</sup> (**Fig.7**).

Pericles’ governance (461 BC-429 BC) provided the Greek civilisation with the necessary stability to bring the Hellenic Age to a higher intellectual level in the fifth century BC. Science and method “had taken their place with statesmanship, poetry

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<sup>136</sup> Hiorns 1958, *Town-building in history: An outline review of conditions, influences, ideas, and methods affecting planned towns through five thousand years*, 12

<sup>137</sup> Zucker 1973, *Town and square : from the agora to the village green*

<sup>138</sup> Westgate 2007, *The Greek house and the ideology of citizenship*

and philosophy in moulding Hellenic life in the direction of systematization".<sup>139</sup>

Hippodamus of Miletus was commissioned by Pericles to design the layout of Piraeus, the new Athens port-town, launching a career that merits the title 'father of town planning'.<sup>140</sup> The gridiron, which he used in all his city plans, is testament to the influence of his master, the geometrician Pythagoras. Public spaces were designed to be spacious and splendid, and intended to facilitate daily interaction, conversations and exchange of ideas among large numbers of people. The house was designed for the evening, for family dining and for drinking parties (*symposium*). According to Socrates (469 BC-399 BC), the perfect house ought to be cool in summer and warm in winter, with an appropriate size to safely keep the owners' essential possessions.

By the fifth century BC, all courtyards were hidden behind walls with access from the street through a single entrance sometimes screened by a wall (*herkos*) to provide privacy. The façades displayed only small, high windows used mainly for cross-ventilation purposes, but did not have any kind of decoration to indicate the wealth of the owner; this could be seen as a collective demonstration of accordance with the emergent ethos of egalitarianism in Greek city-states (*polis*; pl. *poleis*).<sup>141</sup> In the *polis*, "the Platonic-Aristotelian principle of the subordination of the personal interest to the public good was the true wisdom".<sup>142</sup>

A good example of housing conforming to this egalitarian principle is Olynthus. Fifty years after its destruction by the Persians (in 479 BC), its inhabitants used a gridiron plan to rebuild the city. City blocks measured about 91.5x36.5m, making two rows of five dwellings. "The lighting courtyard of the houses was planned on the south side with a pillared opening admitting sunshine at the north

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<sup>139</sup> Hiorns 1958, *Town-building in history: An outline review of conditions, influences, ideas, and methods affecting planned towns through five thousand years*

<sup>140</sup> Hippodamus date of birth unknown, making difficult to affirm that he made the initial plan of Miletus reconstruction or the later plan for Rhodes, which is until today a matter of disagreement between renamed historians.

<sup>141</sup> Different from the other city-states of this period, the Greek city-states developed the conception of polis, where the nucleated settlements shared with their rural dwellers the concept of equal values embedded in citizenship.

<sup>142</sup> Hiorns 1958, *Town-building in history: An outline review of conditions, influences, ideas, and methods affecting planned towns through five thousand years*, 37



end. The plans show the wide variations of arrangement made possible within the unit area of each house, so that no two are exactly alike”<sup>143</sup> (Fig.8).

One of the innovative features of the *polis* was related to its control of growth and expansion. After a city reached a certain size, population growth was restricted and a new *polis* was established within a determined distance. Although this policy was focused on the internal unity and coherence of the polis, there was also the more practical requirement of maintaining an ecological balance between the city's population and the food production in surrounding rural areas. As the fertility of Greek soil was underprivileged, and the area of political influence of the *poleis* began to overlap, the newest one needed to be sited in territories further afield. As a consequence, Greek settlers colonised large areas on the shores of the Aegean Sea, as well as on the coastal areas of Southern Italy (*Magna Graecia*).<sup>144</sup>

Prevailing through time as the most important of the Greek city-states, Athens was the source of new ideas. However, while its public buildings were splendid, its housing construction growth was chaotic, tracking its topographic lines and infilling the building gaps caused by war damage without any planning. It is not known when detached columns were introduced into Greek architecture as a way of providing a covered area around the courtyards. The peristyle, “a range of columns surrounding a building or open court”<sup>145</sup>, appears in the excavations of some Athens' houses dating from the fifth-fourth century BC; in some cases, there was a minimal use of columns in compact spaces (Figs. 9 and 10). With the amalgamation of the Greek and Roman cultures – which was made possible by the Greek colonies in south-western Italy – one can speculate that the peristyle had been either a development of the Roman atrium, facilitating the construction of larger courtyards, or an upgrade of the oriental courtyard.

Either by martial coercion or by diplomatic involvement, Philip II of Macedon brought almost all of mainland Greek city-states under a Macedonian hegemony. This legacy allowed his son, Alexander the Great (356 BC-323 BC), to conquer new

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<sup>143</sup> *ibid.*, 32-33

<sup>144</sup> Cartwright 2013, *Magna Graecia*

<sup>145</sup> Peristyle: [From the Greek *peri*, ‘round’, and *stylos*, ‘column’] a range of columns surrounding a building or open court. The Concise Oxford Dictionary of Art Terms.

territories and found new cities in Mesopotamia, Persia, Egypt and India, and thus creating the Macedonian Empire. In the new Macedonian cities, the residents were primarily Greek, as were the urban planning principles determining the public and private spaces cross-bordered by the gridiron street pattern.

In the building of most of these Hellenic towns at this time, the mature qualities of Greek and Græco-Roman urbanism were present, strongly influenced by Hippodamian planning concepts of public and private spaces. The most remarkable city of this period was Alexandria, positioned in the Nile Delta in a site adjacent to the island of Pharos and the lake of Mareotis, which provided excellent conditions for maritime trading. The city plan, designed by the Dinocrates, located the principal buildings near the waterfront, creating an extraordinary sequence of public spaces.<sup>146</sup> **(Fig.11)**. The Hellenistic Age lasted from 323 BC to 146 BC, when the Greek lands became part of the Roman Republic.<sup>147</sup>

Pompeii is the “most potent and comprehensive example of urban living in the mature phase of antiquity ... it may well stand as a late, and in some senses supreme, example of a Greek *polis*” **(Fig.12)**. When covered by Vesuvian ashes in AD 79, it had an estimated population of between 25 000 and 30 000 living inside the city’s double wall (64.6 ha); this represented a density of ca.425ppha.<sup>148</sup> Excavations show clear evidence of a planned street layout with shops (*taberna*), some with living accommodation above, located in front of houses on the main streets. House distribution shows a blend of smaller and larger houses in the same area, representing the absence of predetermined areas for wealthy owners. Only larger houses had either a rear garden (*hortulus*) or a peristyle court garden; however, all the houses, even the smallest ones, had an atrium **(Fig.13)**.

The Latin word ‘atrium’ meant originally, a ‘place made black by the smoke’, but became generally utilised to designate a small hall or court open to the sky, “sometimes colonnaded with four or more columns supporting the roof, and rooms

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<sup>146</sup> Hiorns 1958, *Town-building in history: An outline review of conditions, influences, ideas, and methods affecting planned towns through five thousand years*, 42

<sup>147</sup> The late phase of Greek city-building merged gradually into Roman influences evolving to Roman practice without any significant historic line of division. *Ibid.*, 44

<sup>148</sup> *Ibid.*, 45

opening on to the colonnade. In some Roman examples there is a central pond or basin to collect rainwater<sup>149</sup>. Its central space is an evolution of the hilly Etruscan dwellings where, in addition to its cooking functions, fire was essential for heating the interiors.<sup>150</sup> The hearth was placed in a typically circular plan shelter with no hole in the conical roof; the smoke was retained inside, creating a black warm cloud. The height of the front door was slightly above the height of an average-sized man and was generally divided vertically in two pieces, thus allowing the excess smoke to find its way out when the top part of the door was open. When the front door was closed, excess smoke from the fire left the hut via small holes in the roof. The space had a wooden platform placed slightly higher than the front door where cereals were laid out and meat hung to dry in the internal hearth smoke.

In time, the dwelling plan became rectilinear, with the central space widening out to an opening in its roof, which granted light and ventilation to the small rooms (*cubicula*) placed at the sides. The hearth was relocated in one of these rooms, the kitchen (*culina*). Directly beneath the opening in the roof (*compluvium*), which was structured on brackets fixed in the surrounding walls, a shallow pool (*impluvium*) occupied the centre of the atrium, collecting rainwater and providing visual and thermal comfort to the house. With the increasing acceptance of this house type (*domus*) in the urban context, this space acquired a social role, evolving into a social reception area (sometimes with frescos on the walls and lavish decoration). Either because of the social role of the atrium or a preference for the axial house designs, the screen wall placed in the entrances of the dwellings by previous civilisations was removed from the Roman house.<sup>151</sup>

By the time Vitruvius wrote the *Ten books on architecture* in the first century BC, the classification and definition of the *domus* atrium and the peristyle in archetypal ideal measures, were already embedded in the Roman house (**Fig.14**).<sup>152</sup>

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<sup>149</sup> Darvill, Timothy. "atrium." In *The Concise Oxford Dictionary of Archaeology*. : Oxford University Press, 2008

<sup>150</sup> The Etruscan civilisation (800-100 BC), distinguished by its unique language, had their settlements in the north-west region of Italy, becoming part of the Roman Empire in the 1st century BC.

<sup>151</sup> Schoenauer 2000, *6,000 years of housing*

<sup>152</sup> Vitruvius and Morgan 1960, *Vitruvius : the ten books on architecture*

The Italo-Hellenistic architecture needed more space, and the ideal house concepts of Pompeii became difficult to realize with the population growth in the Early Roman Empire (in the first century AD). This growth created the need for compact town houses, “often with an upper story around the atrium and with galleries facing the street. Valuable street frontages were converted into shops, and many of the wealthiest families moved out of town altogether”.<sup>153</sup>

The excess of construction in Rome was just one of the reasons for the decline of the city. The overindulgence of Roman society was incompatible with the emergent Christian doctrine hence, the first Roman emperor to convert to Christianity decided to live in the ancient city of Byzantium, sited in the Bosphorus Strait. In AD 395, the Eastern Roman Empire (Byzantine Empire) became completely separated from its Western component when Constantine (AD 272-AD 337) established Constantinople (Byzantium) as its capital. Theodosius II (AD 408-450) expanded the city, building an effective system of defensive city walls; these made the city resistant to foreign sieges until 1453, when it fell at the hands of the Ottoman Empire. Architectural typologies in Constantinople, including courtyard housing, were based on the Roman-Hellenistic concepts, while also integrating Persian influences.

The Sassanid Empire was centred in present-day Iran from the third to the seventh century AD. It inherited the cultural traditions of Parthia and the Greek architecture brought by Alexander the Great, being expanded by the 60 new cities founded by Seleucus.<sup>154</sup> In ancient Iranian cities, the traditional courtyard house accommodated issues of climate and culture, and religion (which began to dominate in the seventh century with the advent of Islam). The courtyards were used to provide separate space for males and females, and wealthy families had multiple courtyards for this purpose. In response to the hot and dry climate, the Iranian courtyards were adjacent to towers called *badgirs* (wind-catchers). Between the courtyards and the *badgirs*, a room without doors (a *talar*) functioned as a

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<sup>153</sup> Ward-Perkins 1977, *Roman architecture*

<sup>154</sup> Seleucus I – Nicator: The Macedonian General who after the death of Alexander the Great created the Seleucid Empire out of the eastern conquests of the Macedonian Empire.

ventilated sitting room (**Fig.15**).<sup>155</sup> The cultures of ancient Greece, Rome and Byzantium were influenced by the early Iranian garden tradition; this, in turn, might well have been influenced by the gardens of Mesopotamia.

### ***Arab civilisation***

Lasting from the sixth to the seventh century AD, the Byzantine-Sassanid conflict exhausted both empires, and facilitated the sudden emergence and expansion of the Arab conquests. The conquerors maintained the fortification walls and public baths (*hammans*); however, the Islamic way of life called for changes in public spaces. The mosque (*jami'*) – as the central city space – incorporated judicial, educational and recreational functions in addition to its religious role, and took over the agora location in almost all Hellenic cities. Colonnaded streets closer to the mosques became bazaar streets (*suq*), and basilicas developed into market halls for more precious goods (*qaysariyyah* or *khan*). The latter, being part of the *suq* precinct, was utilised as “caravansarai-like storehouses with lodgings in the upper level for merchants”.<sup>156</sup>

In the Umayyad Caliphate,<sup>157</sup> the architectural/urban elements were redefined according to the political/religious customs of the Islamic culture, and public institutions and houses were designed around an open central court.

In fact, by its confined nature the courtyard is a feasible urban form, often small and unpretentious, lending itself to high density. The Islamic garden and courtyard share many characteristics and balance each other. Both reflect a profound sense of place. The garden ... expresses the concept of paradise, and it is often symbolically divided in four parts ... Courtyards are usually square, or nearly so, and symbolize stability ... In a garden, water is contained in tanks, and its shape determined by channels, chutes and fountains; in a courtyard there is more restraint and water is contained in a pool or trickled from a fountain.<sup>158</sup>

While the climatic similarity of all territories within the Arab empire gave continuity to the ubiquitous use of the courtyard house, differences in house plans

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<sup>155</sup> Memarian and Brown 2003, *Climate, culture and religion: aspects of the traditional courtyard house in Iran*, 4

<sup>156</sup> Schoenauer 2000, *6,000 years of housing*, 145-147

<sup>157</sup> The Umayyad Caliphate (seventh to eleventh century AD) was an Islamic territory spreading over 13,000,000m<sup>2</sup> at its greatest extent (AD 750), which made it one of the largest empires in the world. It had its capital in Damascus until the eighth century AD, when Cordoba (Spain) became the capital.

<sup>158</sup> Lehrman 1980, *Earthly paradise : garden and courtyard in Islam*, 17-21

resulted from the orthodoxy of the religious tradition, the geographical location and the urban density. The Islamic urban house inherited from Mesopotamia and Parthia, for example, saw separate areas for genders: the *selamlik* for male visitors and the *haramlik* (*harem*) reserved for women and children. In small houses, the former occupied the ground floor and the latter the upper floor, where trellised bay windows facing the street allowed for ventilation and privacy; the latter was also enhanced by a wall placed at the entrance of the house.

Islamic religious laws governed city building development, determining that no individual could overlook a neighbour's property, nor could they “interfere wilfully with a neighbor's right of access to his property, although immediate neighbors, but traditionally he is not required to make allowances for through traffic to ease accessibility from one neighborhood to another”.<sup>159</sup> As a consequence, the medieval Islamic city grew informally, creating irregular building sites within a mazed network of streets (**Fig.16**).

Baghdad was an exception to this general procedure. Founded in AD 762 as capital of the Abbasid Caliphate, and strategically located to be part of the east-west caravan route, it established the centre of Islamic civilisation, becoming one of the world's greatest cities of the time. It followed a circular design contained by three concentric fortifications, with a large central area reserved for a mosque and a palace.

The residential areas, established by the space between the second and third wall, were divided into four equal sections by four vaulted streets dedicated to retail, and connecting the four city gates with the public central space. Ring streets bordered the city walls, and smaller radial streets were for traffic access (**Fig.17**). Following the Parthian-Sassanid tradition, the city was located on the winding banks of the Tigris River, facilitating the efficiency of the traditional wind-catchers utilised for the natural ventilation of houses.

Ventilation was an essential consideration in determining the way that traditional Baghdad house compartments were utilised; this utilisation varied

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<sup>159</sup> Schoenauer 2000, *6,000 years of housing*, 174-175

according to the seasons of the year and the daily temperatures. House divisions had multifunctional uses, and scarce furniture was moved between rooms or from the basement to the terrace, according to the need for thermal comfort<sup>160</sup> (**Fig. 18**). In the city of Samarra, in the Abbasid era, the nineteenth-century palace contained *iwan*,<sup>161</sup> encircling walls, canals, pools and fountains, all within a formal framework of esplanades and courtyards.

The Umayyad Caliphate expanded to Spain, Portugal, Southern France, Turkey, Uzbekistan and Kyrgyzstan in the north, to Yemen and Oman in the south, to Morocco in the west and to China and India in the east. It is relevant to acknowledge the absence of courtyards in Europe after the fall of the Roman Empire; this was because the houses needed to be compacted inside the medieval fortified walls, and courtyards became a privilege of citadel palaces and Christian monasteries. However, the housing concept in the southern regions of Spain and Portugal did not follow the same fate. For more than 700 years, inspired by Muslim technology and design, the al-Andalus<sup>162</sup> rulers (AD 711-AD 1492) promoted the construction of outstanding courtyard buildings, such as mosques and palaces with elaborate gardens.<sup>163</sup>

Cordoba, well known for its flowering *patios* (courtyards), became the capital of the al-Andalus territory under the rule of the Umayyad Caliphate of Cordoba in AD 716. With an estimated population of half a million people in the tenth and eleventh centuries, it was one of the most important political, economic, financial and cultural centres of the world. However, security issues may have been the reason for the foundation (in AD 936) of the city of Madīnat al-Zahrā, sited 7km west of Cordoba, in the foothills of Sierra Morena.<sup>164</sup> Some 1200 years before the

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<sup>160</sup> *ibid.*

<sup>161</sup> *Iwan* is defined as a vaulted hall or space, walled on three sides, with one end entirely open. See Appendix A, Glossary of terms, for complete description.

<sup>162</sup> The Umayyad Caliphate territory was reduced to Spain and Portugal, after the Abbasids family massacred most members of the Umayyad caliph family in 750. Al-Andalus was the Arabic name given to this territory. With the cooperation between Christians, Muslims and Jews, it became a very important cultural and economic state both in the Mediterranean Basin and in the Islamic world.

<sup>163</sup> The Cordoba Mosque and the Alhambra palace in Granada are the most famous representatives of these categories. Hoag 1977, *Islamic architecture*, 77

<sup>164</sup> Pavon Maldonado and Consejo Superior de Investigaciones Científicas (España) 1990, *Tratado de arquitectura Hispanomusulmana. Vol.3, Palacios* 28

construction of Canberra and Brasilia, ‘Abd al-Rahman III, the new Emir of Cordoba, wanted to build an administrative city that would establish a prudent distance between his court and the turmoil of the old capital.

Urban design, architecture and artisanship had a significant role during the twenty-five years of construction of this new political and administrative capital that aimed to emphasise all the grandeur of the al-Andalus, thus rivalling the palatial city of Samarra (near Bagdad). Buried for over a thousand years, the city is today being slowly re-built through archaeological work which, day by day, uncovers more *munya* (courtyard villas)<sup>165</sup> (**Fig.19**).

Other large towns of al-Andalus were Seville, Granada, Jaen, and the less mentioned Madina Mayurqa (Palma) on the island of Majorca. The latter was incorporated into the Roman Empire in 123 BC; it became part of the Emirate of Cordoba in AD 902, and was one of the most extensive cities in twelfth century Southern Europe.<sup>166</sup> In contrast to the rectangular peristyle courtyards of the kingdoms of Granada and Aragon, the courtyards in Palma lost part of their columns in favour of more service rooms on the lower floor, the sound of the Islamic water feature was replaced by a silent well, and decorative tiles were never used. A transparent iron gate defined the limits of privacy, allowing for ventilation through the *zaguán* and for the vision of the robust stairs connecting the courtyard with the living spaces on the upper floor<sup>167</sup> (**Fig.20**).

When the Arab Empire expanded to Anatolia (Turkey), another northern frontier of the Umayyad Caliphate in AD 750, courtyard houses were already being used there, having been previously introduced by the Hittites since the eighteenth century BC.<sup>168</sup> Also by that time, in India – the south-eastern frontier of the Muslim

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<sup>165</sup> Anderson and Rosser-Owen 2007, *Revisiting al-Andalus-perspectives on the material culture of Islamic Iberia and beyond*, 43

<sup>166</sup> Lucena, et al. 1999, *Palma architecture guide*, 16

<sup>167</sup> *Zaguán* is a covered space near the entrance door, which serves the functions of vestibule.

<sup>168</sup> The traditional Turkish House was formed after the arrival of the nomadic Turks from the Middle East. The housing type has spread through the Southern Anatolia to the Balkans, encompassing a large area of social and cultural typology. Important elements of this Ottoman House are the courtyard and the hayat-sofa (hall). Zeren and Karaman 2011, *Analysis of construction system and damage assessment of traditional Turkish house – Case study of timber framed Kula houses*; 2002, *Recent developments in Hittite archeology and history*



Empire – the use of courtyard housing was already an old tradition. It had been brought by the Hindus Valley Civilisation, continued in the Aryan invaders' rural settlements, approved by the Parthian conquerors' housing concepts, and carried on in dwelling models used in the cities founded during the Macedonian occupation.

### ***Hindu civilisation***

The Islamic invaders brought to India the concept of the symmetric court as a balanced, earthly paradise, introducing the use of water features and the control of light and shadowing. They introduced cantilevered screen windows above the streets, allowing for both permanent ventilation and visual access to the street from inside. Like the Bagdad houses, the distribution of rooms permitted their interchangeable functioning throughout the day, depending on the temperature of the rooms (from the terrace to the ground floor) at a particular time.

A natural ventilation system similar to the ones used in ancient Yazd (Iran) and Bagdad was also used in India. These airflow circuits initiated in the courtyards were connected to wind 'scoops' placed on the roof to catch the wind and impel it down a shaft. Randhawa provides a proficient explanation of the system:

The scoops' being on the roof at considerable height decreases the entry of dust and water pots are kept in their air circuit for cooling. Often the windows in the rooms open into the scoop shaft for ventilating, though at different heights for maintaining privacy. At night, cool air comes down the courtyard and flushes the air in the rooms. The high ceilings of the rooms aid in keeping them cool in summer, as the angle subtended by the roof to the floor is less than that with a lower ceiling. Also, high ceiling rooms have a greater volume of air which takes more time in becoming stale, and thus manage with less aeration when outside temperatures are in the extremes.<sup>169</sup>

The Hindu and Muslim courtyard house typologies had the same privacy aims, using screen walls in the entrance and separating public and private spaces inside the houses. One difference was the Hindu household value of social status, which was manifested in the dwelling's proximity to the city ruler's palace, and in its external decoration. Yet, the traditional Indian House per se did not carry the most importance; rather, its component—the courtyard (*agan* or *uthan*), where the

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<sup>169</sup> Randhawa 1999, *The Indian courtyard house*, 34

family spent most of their time—was highly significant. The rooms in the house served mostly as storage and as shelter from the weather's rigors.

Some features were common in all Hindu houses in accordance with the *vastu shastra* principles concerning the positioning of the house and the distribution of the rooms.<sup>170</sup> Nevertheless, “the courtyard house form in India was not based on blind conformity and there was tremendous innovation in the design of such homes, known variously in different regions – *haveli* in northern India (where they were prominent), *nalukettu* in Kerala, *rajbari* in Bengal and *deori* in Hyderabad”.<sup>171</sup>

Thus, given persistent ransacking by invaders coming from the north-west, the inhabitants of northern India built large multi-courtyard *haveli* with high protective characteristics, but without extensive external decoration (**Fig.21**). Less fortified was the wooden structure of the one-floor *nalukettu* in the southern regions, where its entrance was accessed by a raised veranda with lateral benches to accommodate visitors, and the court's opening to the sky was sometimes limited to an *impluvium* above a rainwater cistern, reminiscent of the Roman atrium (**Fig.22**).<sup>172</sup>

Indian culture, which spread throughout Java to Bali during the Majapahit Empire (thirteenth to sixteenth century AD),<sup>173</sup> has been central to determining the rules for all Balinese building construction. The mountain houses in Bali, for example, have been built with external walls and have been grouped around a communal space. The seaward Balinese dwellings differ from these, however; their pavilions are partially enclosed by screen walls and the few closed pavilions of the compound are built only for the use of newly-weds and the patriarch. Additionally, the layout, size, and proportions of all buildings forming the house compound are ordered by a set of complex rules (*asta kosala kosali*), which include auspicious orientation principles.<sup>174</sup> The principal pavilion, the family temple, and the kitchen

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<sup>170</sup> *Vastu shastra* is an ancient set of rules relating building plot and building elements to the earth resources, establishing criteria for auspiciousness.

<sup>171</sup> Randhawa 1999, *The Indian courtyard house*

<sup>172</sup> Mitra 1982, *Rural house types and village settlement patterns*

<sup>173</sup> Encyclopædia Britannica. Accessed 2013-11-30

[www.britannica.com/EBchecked/topic/358901/Majapahit-empire](http://www.britannica.com/EBchecked/topic/358901/Majapahit-empire)

<sup>174</sup> The definition of orientation in Bali is rather spiritual as it is explained by Eiseman using the meaning of the Balinese words: “Orientation in Bali begins with the sacred mountain, Gunung Agung, ... the dwelling place of the Hindu gods. Toward the mountain is called *kaja*. Because Gunung

have fixed functions according to their auspicious placement; nevertheless, the compound attends to the basic principles of communalism, extended family comfort and architectural flexibility.<sup>175</sup>

“The home, a living thing, must be harmonious with the body of the family patriarch ... Before the traditional Balinese architect, the *undagi*, does anything else, he takes various measurements from the body [primarily the fingers] of the household. The most important measurements are those governing the construction of the pillars, for it is their dimensions that will control the size of the buildings.”<sup>176</sup> The primary elements of a small compound have a central rectangular courtyard framed by four pavilions, all positioned within a surrounding wall where privacy is guaranteed by the appropriate height (above eye level) of both the external wall and the screen wall (*aling aling*) in front of the main entrance (**Fig.23**). Coincidentally, these are also the key elements of the Chinese courtyard house.

### ***Chinese civilisation***

Chang’an (today's Xi'an), the capital of the Tang Empire – strategically positioned as the starting point of the Silk Road and connected to the recently completed Grand Canal network – was one of the largest cities of the world (along with Constantinople and Baghdad), with a population of more than one million.<sup>177</sup> The walls were built immediately after the completion of the royal palace because the ancient civilisation considered the city walls and the city as the same entity, using the same name (*cheng*) for both. Walls were simply the dividers of the contained element, hierarchically defining the limits of country, city, palace,

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Agung is in a fairly central location, *kaja* is a variable direction. It is north for inhabitants of South Bali and south for those who live in North Bali. Whether north or south, it is always "up", the sacred direction toward God. Antipodal to *kaja* is *kelod*, seaward, toward the lower elevations and away from the holy mountain. *Kelod* is "down", less sacred than *kaja*, even impure. The second-most sacred direction, after *kaja*, is *kangin*, "east", the direction from which the sun, an important manifestation of God, rises. *Kangin's* opposite to the west, *kauh*, is correspondingly less sacred”.

Eiseman Jr 1990, *Bali, sekala and niskalap*3

<sup>175</sup> Wijaya 1984, *Balinese architecture - towards an encyclopaedia*55

<sup>176</sup> Eiseman Jr 1990, *Bali, sekala and niskala*, 9-10

<sup>177</sup> Jessica, *et al.* 2011, *China*

courtyard house and pavilion.<sup>178</sup>

The type of housing enclosed in these walled and gated wards is unknown, as its wooden architecture did not survive the devastation in AD 904. Even though no single style defines the Chinese house, it is possible that the wards were filled by a fair proportion of courtyard houses, a type (of more than twenty varieties) that can be traced back to China for three thousand years.<sup>179</sup>

In the Qinling region on the Yellow River Valley, once the cradle of the Chinese civilisation, a rectangular hole was excavated below ground level, and the doors and windows of accompanying rooms and storage spaces opened into it (**Fig.24**). Cool in the summer and warm in the winter, these underground dwellings have been an example of sustainability since the Iron Age and are still housing more than thirty million people.<sup>180</sup> It is possible that the origin of these natural dwellings can be traced further back to Neolithic settlements, such as the ones excavated in Banpo (east of Xi'an) where the floor of the houses were a meter below the ground.<sup>181</sup>

These troglodyte cellular structures were inconspicuous in the landscape and so provided relative protection against human threats (**Fig.25**). Being an uncovered void, their main function was to provide light and ventilation to their adjacent cave

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<sup>178</sup> Schoenauer 2000, *6,000 years of housing*, 121

<sup>179</sup> I believe it is relevant to list these diversified shapes of CH to inform future prototype studies. Kapp's quote is selected for this purpose because of its perceived accuracy: "The shapes of courtyards in central Shanxi, for example, have tended to be rectangular as opposed to square; those in southeastern Shanxi have two – or even three – storied buildings on the sides of the courtyard; and in central Shaanxi the roofs of side rooms of courtyard-style houses slope only on one side. In Ningxia, courtyards of the Hui nationality tend not to be oriented toward the south; and in Jilin, courtyard houses used by people of Manchu descent are generally oriented westward and have heatable platforms on three sides that address the needs of Manchurian winters. Like much architecture in Qinghai, courtyard-style houses have been made of mud-earth and topped by flat roofs. Residences of the Bai in Yunnan have four courtyards enclosing a large, central one, all five with their own skywells. In Yunnan, courtyard-style residences of the Naxi people also often have five courtyards, with covered arcades in front. Houses whose dominant features are skywells remain in Jiangsu, Zhejiang, Anhui, Jiangxi, Hebei, Hunan, Fujian, and Guangdong – in other words, mainly in southeastern China. Among them, too, are variations and unique styles, such as *yikeyin*, or 'one seal'. A form of multistoried courtyard structure that houses multiple families within it and resembles a fortified compound may be circular or quadrilateral in plan. These odd shapes are found among the Hakka (Kejia) people in Fujian, Guangdong, and southern Jiangxi. In Yongding county of Fujian, another variety of grouped courtyard houses has hipped roofs of different heights. Knapp and Lo 2005, *House, home, family : living and being Chinese*, 26-27

<sup>180</sup> This estimative includes the cave dwellings existent on the hills, without courtyards. From: Golany 1990, *Design and thermal performance - Below-ground dwellings in China*

<sup>181</sup> Jessica, *et al.* 2011, *China*

openings. Measuring some 20 m<sup>2</sup> to 30m<sup>2</sup>, the floors of these open spaces were carved 6-7m below the rustic soil around them.<sup>182</sup> Two important elements inside these courtyards were the well, to capture the rainwater, and the tree, to provide shade in the summer. The entrance was a gateway accessed by stairs or a ramp (**Fig.26**).

The ancient Chinese architectural system categorized six structural types of buildings: house, temple, palace, city, tomb and garden. Writings, although a non-structural element, would also be considered a category when describing and illustrating rules and processes of building construction (**Fig.27**). All the categories applied the ancient precepts of *fengshui* (wind and water) which, as did the *vastu shastra* in India and the *asta kosala kosali* in Bali, establishes rules for choosing the most auspicious spatial settings. These spatial settings comprise “two fundamental geographic attributes: a 'site' – the actual space occupied by the structure – and its 'situation' – the location of the site in relation to its brother surroundings”.<sup>183</sup> The *fengshui xiansheng* (geomancer), who was traditionally regarded as knowing the mysteries of heaven and earth, used an instrument called *luopan* to guide him in finding the ideal building site.<sup>184</sup> In some cases, the spatial settings could be slightly different according to the owner's family lineage.<sup>185</sup>

Just as there were characteristics defining the most auspicious spatial settings for dwellings, there were also rules governing the structure of the dwelling itself. Accordingly, it was believed that “The template for an auspicious dwelling was the shape of a body with two outstretched or embracing arms, as with analogous and brother fengshui configurations (**Fig.28**), as are seen in the floor plans of courtyard-style houses”.<sup>186</sup> It was further believed that “The court is the heart of the oriental urban house and no single word in another language can equal the poetry of its

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<sup>182</sup> Blaser 1995, *Courtyard House in China : Tradition and Present*

<sup>183</sup> The name *fengshui* mean wind and water. Its conceptual roots are mentioned in classic Chinese literature like the Shujing (Book of Documents) reporting to the Zhou Dynasty (1100 – 770 BC). Knapp and Lo 2005, *House, home, family : living and being Chinese*, 99

<sup>184</sup> 'The *luopan*, also called *luojing*, is a saucerlike block of wood with a magnetized south-pointing needle at its center; hence the appellation "compass".' *ibid.*, 103

<sup>185</sup> Lu and Jones 2000, *House design by surname in Feng Shui*, Akkerman 2000, *Harmonies of Urban Design and Discords of City-form: Urban Aesthetics in the Rise of Western Civilization*

<sup>186</sup> Knapp and Lo 2005, *House, home, family : living and being Chinese*, 120

Chinese name [*tianjing*] which, translated, is 'the well of heaven'; this well provides the house with light, air and rainwater".<sup>187</sup>

The word *jia*, along with the meaning of 'multigenerational household', "refers to one of the stepped-roof purlins, the horizontal longitudinal timbers needed to support the common rafters of a rising roof ... As a fundamental measure of width, *jian* is the span between two lateral columns or pillars that constitutes a bay"<sup>188</sup> (Fig.29). *Jian* has also a more extended meaning, for it can be interpreted as the volumetric void formed by the floor and a minimum of four columns, with the walls wrapping it as a skin, and forming the smallest Chinese dwelling module. This minimal structure might sometimes represent a household in an early stage of family formation, or one recently moved to one area.<sup>189</sup>

The smallest dwelling commonly found in northern China, however, is made by three *jian* with openings facing south. In southern China, the *jian* is wider and the depth of the bays is deeper, being the overall depth commonly increased by a row of three *jian*. In both types, the number of *jian* is always an odd multiple, generally three, five or seven (Fig.30).<sup>190</sup> Accordingly, as the family becomes prosperous, dwelling additions differ in the "northern prototypical *yuanzy* courtyard type open space from its condensed southern cousins, the *tianjing*, or 'skywell type', and its variant the compact *yikeyin*, or 'seal style' "(Fig.31).<sup>191</sup>

In 1976, archaeological evidence of the utilisation of completely enclosed courtyards in the Zhou period was found 100km west of Xi'an in the excavation of a sophisticated building complex with three courtyards. An engraved stone from the Han period, previously discovered in the Yinan tomb in Shandong, depicted a two-court *tingyuan*, highlighting the spatial attributes of the *siheyuan*: the hierarchical organisation of space, the axuality with the balanced symmetry, and the orientation

<sup>187</sup> Schoenauer 2000, *6,000 years of housing*, 121

<sup>188</sup> Knapp 2000, *China's old dwellings*, 22

<sup>189</sup> *ibid.*, 21,22

<sup>190</sup> Chinese people had believed that buildings should have odd numbers of units in order to create balance and symmetry to a building (according the *Huitu Lu Ban Jing*, a fifteenth-century carpentry manual from the Song Dynasty – AD 960-1279). *Ibid.*, 22

<sup>191</sup> **Figure 31** shows the key building form expansions, the top one as a result of 'enclosing' [*wei* 围] (northern China) and the bottom one resulting from excavating' [*wa* 挖] (southern China) an open space. *ibid.*, 28

to the north (**Fig.32**).<sup>192</sup> The *siheyuan*, generally translated into English as a 'quadrangle', is an uncovered yard with parallel buildings on the four sides, where each of the buildings facing south (horizontal in relation to the north-south axis) is called a *jin*. Thus, a two-*jin* quadrangle comprises two courtyards forming a larger *siheyuan* (**Fig.33**).

The width of the courtyards in southern China is normally equal to the size of the central module (*jian*) of the *jin* (**Fig.34**) whereas, in the north, the Beijing quadrangle court has the same width of the three-*jian* building placed on its north side. Adequate ventilation was always provided, either with narrower courtyards or with more generous ones (such as the Beijing *siheyuan* courtyard), which generally account for 40% of the total ground area (**Fig.35**).<sup>193</sup>

For more than three thousand years, Beijing, capital of the People's Republic of China (since 1949), has been an intermittent stage for several human settlements, beginning with the Zhoukoudian cave system where the Peking Man (*Homo erectus pekinensis*) lived in its vicinity (750,000 BC-200,000 BC).<sup>194</sup> Sometimes under different names, it was the capital of the Liao, Jin, Yuan, Ming and Qing dynasties, eventually becoming the capital of the Republic of China (1912 AD-1928 AD). With the name Dadu, the new capital of the Mongol Empire (Yuan Dynasty, 1279 AD-1368 AD) was built, applying the *Kaogong ji* planning principles of the Zhou period.<sup>195</sup> Dadu's plan determined the *hutong* gridiron where the *siheyuan* court type began its development. In the following Ming and Qing (1644 AD-1911 AD) dynasties, they consolidated the housing structure, and this structure became the veins and the cells of Beijing.<sup>196</sup>

At that time, there were primarily three types of *siheyuan* in Beijing; their size and form corresponded to the social status of the family householder. Four buildings formed a small (one-*jin*) *siheyuan*, a rather simple layout with one court

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<sup>192</sup> *ibid.*, 32

<sup>193</sup> *ibid.*, 33,34

<sup>194</sup> Thanjan 2010, *Pebbles*, 3

<sup>195</sup> Jessica, *et al.* 2011, *China*

<sup>196</sup> Hutong as a name is believed to have its origins in the Mongol language, meaning water well. In Beijing it means a small alley that would vary in width from 40cm to a maximum of 9m (9.8 yards). *Hutong Alleys*, 8

and one gate located in the southeast corner of the court (**Fig.36**).<sup>197</sup> A medium-sized *siheyuan* compromised an inner courtyard and an outer courtyard. They were separated by a wall and linked through a gate located in the partition wall, along the central axis on the southern side.

So, as an experience, after entering the main gate, guests would see a spirit (screen) wall ahead and, after turning left, they would be confronted by doors and windows facing north. Known as ‘north-facing houses’ or ‘south houses’, these shelters were used by servants and guests, and for storage. With the permission of the patriarch, the guests would turn right to pass through The Gate of Hanging Flowers (*chuihuamen*), entering the main courtyard. On both sides of this gate, there were accommodations rooms with verandas, where the east wing was used by the sons and the west wing for the daughters. On the north side of the courtyard was the main pavilion, reserved for the eldest person with the highest authority. No male guests were allowed behind this pavilion because single girls were accommodated with the female servants in the last row of rooms facing south, forming a backyard.

Large *siheyuan* were also called *shenzhay dayuan* (deep residence, big courtyard).<sup>198</sup> These had several courtyards with rock gardens and pools in the main axis, as well as side courtyards and elaborate gardens. Rare flowers planted in the courtyards provided multi-coloured decoration and pleasant odours throughout the year. These compounds were reserved for royal relatives, noble families and high-ranking officials. If there was an incident involving family rules, family affairs, or praise and punishment, the leader of the family would hold a family meeting in the ancestral hall. Often magnificently built as the *jin* of the southern *courtyard*, it displayed the family reliquaries as a way of emphasizing clan and god authority authority of God.

Feudal families had an essential role in the preservation of ethics and social order. As the typical dwelling of feudal families, the quadrangle became the physical location supporting this social order: “Within the cellular form of a *siheyuan*, the

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<sup>197</sup> Jianbin 2008, *Affections for the siheyuan* 2008, *Affections for the siheyuan*

<sup>198</sup> 2005, *Hutong Alleys: former residences of celebrities*, 35



spatial manifestations of open or closed, front or back, and above or below not only echoed but also helped regulate traditional Chinese social relationships.”<sup>199</sup> Accordingly, the *siheyuan* typology evolved, determining building locations directly related to their functions: living, study, social activities, fellowship and meetings, worship and social ethics and morality. Living was the main function of the quadrangle where very strict rules applied to the hierarchical distribution of rooms.

As study was considered the most important achievement in a person’s life, teachers came to tutor younger family members in the study room, frequently located by the garden. The lack of appropriate space in smaller dwellings (*one-jin siheyuan*) required extended social celebrations to be made in a neighbor's larger *siheyuan* (two or more *jin*). Those houses generally had a living room located in the southern courtyard area where the head of the family would await guests. In most of these dwellings, the living room and study room were the same.<sup>200</sup>

Korean families had similar kinship. Accordingly, their dwellings displayed a similar hierarchical sequence of rooms, which took the veneration of elders and women’s privacy into account; however, Korean culture influenced some changes in the building layout. Even though *fengshui* canons were drawn on, for example, rigid symmetry in relation to a central axis was ignored when sitting a building compound around a courtyard. The building structure was assembled by an odd number of *kan*, a construction module similar in size to the Chinese *jian*. Known as *ondol* in Korea, the heating method of warming the floor through smoke became widely used after the middle of the seventeenth century.<sup>201</sup> The building techniques of the northern Chinese courtyard remained similar in Korea.<sup>202</sup>

The Korean peninsula worked as a corridor for introducing Chinese culture to Japan. The importance of Chinese city planning in Japan is demonstrated by the influence of the Chang'an city plan in the layout of Tokyo and Nara. One important difference in city planning between China and Japan is that, in the latter, feudal

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<sup>199</sup> Knapp 2000, *China's old dwellings*, 34

<sup>200</sup> Ma 2008, *Beijing si he yuan jian zhu = The architecture of the quadrangle in Beijing*

<sup>201</sup> The *ondol* is a hypocaust '[Gr. *hypokauston*, from *hypo*: 'under' and *kaiein*: 'to burn'] "a room or place heated from below". Fikret, *et al.* 2011, *Hypocaust*

<sup>202</sup> Gibbs, *et al.* 2011, *Korea*

lords were not allowed to build town walls. This policy intended to constrain the feudal lords' endeavours to attain excessive regional power. In the ninth century, Buddhist monks brought the courtyards from China to Japan and built temples using courtyard building structures; these remain today as exemplars of ninth century Buddhist architecture.

### ***Inca civilisation***

Further afield in South America, it is possible that the knowledge of courtyard housing structures used by Peru's ancient Mochica civilisation was passed on by Japanese and Taiwanese people who visited before the arrival of the Spanish conquerors.<sup>203</sup> The exposure to these civilisations that had already built courtyards may be the reason why pre-Colombian Inca civilisations were noted for their courtyard housing structures of various sizes. These structures, called *kancha*, are constructed by arranging residences or work areas around courtyards. Located in the Cusichaca River valley between Machu Pichu and Ollantaytambo, Patallaqta is a relevant example of a planned *kancha* complex because of its importance as an administrative centre, albeit supported by satellite housing groups functionally related to the central administration; it consisted of 112 buildings that formed different sizes of *kancha*, indicating the hierarchical ranking of its residents (Fig.37).<sup>204</sup>

By 1532, the Inca Empire stretched along the west coast of South America for more than 4,000km between Chile and Ecuador. The Incas had sophisticated building techniques. However, with the exception of the city of Cuzco – where the Inca emperor lived – the Incas did not develop a large urban concept. This “lack of cities may, however, result from a planned policy of territorial control. It seems that the nucleus of control was more important than the great city”.<sup>205</sup> Nevertheless, by the time of the Spanish occupation (Cuzco-1533), some of the administrative centres – such as Ollantaytambo and Chucuito – already exhibited a regular

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<sup>203</sup> 2009, *Genetic evidence links Peru's ancient Mochica culture to Japanese, Siberian and Taiwanese peoples*

<sup>204</sup> Gasparini and Margolies 1980, *Inca architecture*,

<sup>205</sup> *Ibid.*, 68

planning grid. This characterised the urban concept of the final years of the Inca Empire, and suggested an increasing concern with precise principles of order (**Figs. 38 and 39**).<sup>206</sup>

Different urban principles of order, which were based on the Laws of Indies documents issued by the Spanish King Felipe II in 1573, were brought to America by Spanish colonisation as it is explained in section **S\_3.2.2**. The Laws of Indies established an ordered layout for the new colony's cities where the size of the blocks varied according to the neighbourhoods, which were designed in consideration of economic, social, and topographical parameters. Yet, it is important to note that in both principles of order (Inca and Spanish), the regular planning grid had dimensions appropriate for the implementation of courtyard house shapes<sup>207</sup> in accordance with the functions and activities required of each courtyard.

The Spanish courtyard house types were built by wealthy families; they had large footprints and tended to have a quadrangular form. They were built in both urban and rural contexts, albeit with adaptations to suit the different climatic needs of the scattered Spanish colonies. In southern California (1895-1930) for instance, one could mention the *patio* house model developed. This was a pastiche of either the Spanish quadrangular patio house or the native dwellings of the Pueblo tribes from Mexico.<sup>208</sup> As such, it demonstrated the easy adaptation of the courtyard house in North America where it was framed by two distinct cultural backgrounds.

### **CH: twentieth century**

Until the nineteenth century, large quadrangular courtyard houses, such as the French *hôtels*<sup>209</sup> and the Dutch *hofjies*<sup>210</sup>, were also built in the cold European climates. However, small courtyard houses built for cold climates made their first

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<sup>206</sup> Gasparini and Margolies assert that these principles of order did not have Spanish influence for two reasons: "first, because we know the plan of Ollaytaytambo is Inca, and second because the many examples of Spanish planning never depart from a rigidly squared grid plan. None of them is similar to Ollantaybo and Chucuito." *ibid.*, 71, 77

<sup>207</sup> See **S\_3.3.3** (p. 123) for the discussion of form and shape.

<sup>208</sup> Rapoport 1976, *The Pueblo and the Hogan: a cross-cultural comparison of two responses to an environment*

<sup>209</sup> Dennis 1986, *Court and garden: from the French hôtel to the city of modern architecture*

<sup>210</sup> Hekker 1965, *Hofjies in Holland*

appearance in the twentieth century, mainly in northern Europe.<sup>211</sup> Their compact grouping allowed for the implementation of urban densities higher than the ones facilitated by the standalone typologies, in areas where the building heights were limited to 1/2-storeys by municipal codes. The examples selected from this point on belong to this group as they fit the size patterns utilised in the courtyard house prototypes of this study.

### Atrium house

The origin of the twentieth century courtyard house in northern Europe was the Roman *domus*, previously described. Its utilisation in the twentieth century had, in general, a rather simplified symmetric approach and both house and courtyard were generally square. Even though a water element (sometimes a larger pool) was placed in the atrium, this area was frequently planted. Some examples had an arcade around them, combining in just one open space the elements of the ancient *atrium* and *peristyle*. The latter was commonly replaced either by the space around the house or by a garden located on one side of the house. However, the main difference from its precedent was that it was conceived as a standalone building, generally with windows on the sides.

The atrium house was commonly found sited on large lots exposed to strong winds, as justified by Charles Voysey: "Hence the garden court, which is planned to catch the sun without the wind. Being entirely enclosed, all the doors can be left open at night, so that a family desiring to sleep in the open air can enjoy it to their heart's content."<sup>212</sup> In England, a pioneering example is Edwin Lutyens' Orchard House at Godalming (1899 - **Fig.50**). Worthy of mention also is the minimal open space proposed by the Frenchman Tony Garnier in a house with seven bedrooms and a studio, which was published in *Une cité industrielle*<sup>213</sup> (1904 - **Fig.51**). By 1931, the German Gebhard Apprich proposed a house with a courtyard surrounded by a glass-walled corridor that provided views of the courtyard from the rooms

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<sup>211</sup> Macintosh 1973, *The modern courtyard house: a history*

<sup>212</sup> Charles Voysey quoted in *ibid.*<sup>22</sup>

<sup>213</sup> Garnier c1989, *Une cité industrielle: étude pour la construction des villes*

(**Fig.52**).<sup>214</sup> A later example is Eduardo Souto Moura's house in Alcanena, Portugal (1992). Based on a Roman villa ruin nearby, the house is divided by functions into three sections, and further encloses the courtyard on the fourth side with a tall wall (**Fig.53**).

One can consider variations of the atrium house, where only three sides of the courtyard are built. After World War II, in England, there is the example of Antony Chitty's house at Churt (**Fig.54**), or the house designed by Clive Entwistle in collaboration with Le Corbusier exhibited at the Women's Fair in London (1938 - **Fig.55**). Furthermore, an interesting variation of the atrium house was built by Alvar Aalto at Muuratsalo (1953) to serve as his summerhouse. In this case, the variation was the combination of the atrium house square concept with an L-shaped courtyard plan (**Fig.56**).

#### Binuclear house (Zero-Lot)

The courtyard house that was separated into two distinct areas was named as 'binuclear' by Marcel Breuer in 1943.<sup>215</sup> Resident in Cambridge (Massachusetts) since 1937, Breuer defined it as "a house with living and sleeping separated into two blocks, with the entrance the connecting link between the two. Breuer's binuclear houses were oriented outwards, as was expressed by their butterfly roofs; however, the term is used here for introspective houses also."<sup>216</sup> Brought to America by the immigrants from Europe, the functional articulation of the binuclear patio house plan is based on the atrium house. The examples mentioned

At the beginning of the twentieth century, innovative forms were developed by architects who used either one quadrangular courtyard – such as seen in Charles and Henry Greene's 'Bandini House' (Pasadena, 1903 - **Fig.40**) – or two or more courtyards, such as those seen in H. H. Harris's 'Lowe House' (Altadena, 1934 - **Fig.41**) and Rudolf Shindler's 'House at Hollywood' (1921 - **Fig.42**). However, up until World War II, these spacious house models were seen by East Coast architects

<sup>214</sup> Macintosh 1973, *The modern courtyard house: a history* 25

<sup>215</sup> Breuer 1943, *On a binuclear house*

<sup>216</sup> Macintosh 1973, *The modern courtyard house: a history* 16

as “exotic and not fitting for other parts of the country”.<sup>217</sup>

By 1940, however, the 3-storey Hamby and Nelson ‘Fairchild House’ in Manhattan was designed in two parts, with a patio between the parts and a ramped access as connection on one side (**Fig.43**). The 7.5m wide lot pioneered this compact model of a courtyard house, of which the most known example is Chester Mansel’s own house in Five Fields (Massachusetts), designed in 1953. Built on a wider lot (10m), this design facilitated better views from the rooms to the wider courtyard by decreasing the width of the corridor between the sections (**Fig.44**).<sup>218</sup>

Most relevant to this study is the example that Karl Langer proposes in his short book *Subtropical Housing* (published in Brisbane in 1944). In this example, the courtyard between the two functional parts is designed for “outdoor living and social entertainment”, and the backyard is planned as a “children’s play area in full view of the kitchen” (**Fig.45**).<sup>219</sup> The house was divided into two blocks, and evolved to include lengthier floor plans with more courtyards. The design developed by Serge Chermayeff with his students in Harvard, and used for his own house in New Haven, is an example of this development (**Fig.46**).<sup>220</sup>

There are many possible illustrations of recent 2-storey projects where courtyards separate the houses’ functions. To name but a few, there is Lola Domenech’s (2004) house on Minorca Island (**Fig.47**); Adam Haddow’s (2003) Sydney Boathouse Terraces at Glebe harbour (**Fig.48**); and Fairweather Proberts’ (2008) Subtropical Town House, designed for the Queensland University of Technology’s (QUT) Centre for Subtropical Design *charrette* (**Fig.49**).

### L-Shape

Macintosh commented that the origin of the L-shaped courtyard house was the single aspect courtyard house designed by the Berliner Hugo Häring in 1928 (**Fig.57**). This house was first built for the Werkbundsiedlung Lains building

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<sup>217</sup> Ibid. 15

<sup>218</sup> Ibid. 17

<sup>219</sup> Langer 1944, *Sub-tropical housing* Plate II

<sup>220</sup> Chermayeff and Alexander 1963, *Community and privacy; toward a new architecture of humanism*

exhibition (Vienna, 1932); it was located next to the L-shaped courtyard house designed by the Austrian Anton Brenner (**Fig.58**). Häring's house was described then by the magazine *Moderne Bauformen*: "... the one-storey building has almost no aspect on three sides, and one side with large windows looking into the garden. The north wall of the next house is quite blank to the garden, increasing its habitableness".<sup>221</sup> However, as the single aspect courtyard house was not very successful, the concept was modified by two Bauhaus staff members, the director Hannes Meyer and the instructor in housing and town planning Ludwig Hilberseimer.<sup>222</sup>

Hilberseimer improved the design of the L-shaped house interior in his Growing House (1930); however, as there was not a private outdoor space and the rooms looked outwards, the house did not fulfil the definition of a true courtyard house (**Fig.59**).<sup>223</sup> In the following year, The Growing House was modified, using the binuclear and expansibility concepts in a 'true' courtyard house: the Type E House (**Fig.60** and **Fig.61**). This is the classical model of the L-shaped courtyard house, which has hardly been improved upon since that time".<sup>224</sup> A larger but rather minimalist scheme of this type, probably based on Hilberseimer's schemes, was Mies van der Roë's 'Row House' designed in 1931 when he was director of the Bauhaus (**Fig.62**).

By 1930, Hilberseimer studied density values in low-rise (2-storey) CH by designing an urban layout with a ratio of 50% site occupation. He used a terraced pattern of Type E houses with footpath access, but excluding public open spaces, parking, and garages. He found that the scheme had a density of 324 persons per hectare (ppha). He compared his housing scheme with a 10-storey slab block pattern, applying the same standard shadow angle to establish the spacing of the blocks; the results showed that residential density was equal in both cases.<sup>225</sup> Later in Munich (1932), Uli Seeck showed that the construction costs of his 16 L-shaped

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<sup>221</sup> Quote in Macintosh 1973, *The modern courtyard house: a history* 28

<sup>222</sup> Ibid. 30, 31

<sup>223</sup> According to Macintosh, these are the two essential defining attributes of a courtyard house. Ibid.31

<sup>224</sup> Ibid.32

<sup>225</sup> Ibid. 35

housing (1-storey) scheme were no higher than the cost of a scheme using 2-storey houses.<sup>226</sup> This comparison demonstrated that the L-Shape courtyard houses could achieve high densities at no extra construction cost.

During the Great Depression (1929-31), most European countries were determined to eliminate unhealthy city slums and to produce low cost mass housing for the rural workers that migrated to the industrial cities. Even though the most formal solutions to address this need were found in increased building heights and pavilion type solutions influenced by the Garden City movement,<sup>227</sup> Germany sought to create new types of both low and high-rise housing. The German government at that time had policies that limited building heights to four storeys, and incentivised the building of one-storey houses with gardens. This generated strong opposition from some architects.

Walter Gropius's main objection to low-rise housing was its inherent low density which created longer commuting distances, and increased the amount of time that workers had to spend both in transportation and in house/garden maintenance. Conversely, as Hilberseimer thought that both solutions should coexist, all of his projects included a mix of both low and high densities to provide choice for householders. He argued that, "low-rise housing with gardens is the most suitable type for families with children, while for childless couples and single people high-rise housing with communal facilities where possible is the best type of housing".<sup>228</sup>

After 1938, Mies and Hilberseimer disseminated the courtyard designs in their teachings at the Illinois Institute of Technology in Chicago. In 1957, they produced 'Cluster Houses for Detroit', a housing group scheme consisting of repeatable clusters of different sizes houses (**Fig.63**). In the 1940s in Britain, Walter Segal disseminated the single aspect and the L-shaped courtyard types in both one and 2-storey versions in his published schemes. With 1-storey (138ppha) and 2-storey variations (250ppha), one of these schemes provided access to the house through

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<sup>226</sup> Ibid. 35

<sup>227</sup> **S\_4.2.3**, p. 95

<sup>228</sup> Macintosh 1973, *The modern courtyard house: a history* 34



the courtyard both from the street and from the common green area that was proposed to separate the groups of aligned houses (**Fig.64** and **Fig.65**).<sup>229</sup> Roger Walters, previously Segal's assistant, designed a proposal for 2-storey houses (170 units – 104ppha) in Aldershot. This design aligned the second floor axis with the north-south direction to achieve higher sun penetration in the courtyard and living areas (**Fig.66**).<sup>230</sup>

The first large grouping (156 units) of L-shaped courtyard housing built in Europe was Adalberto Libera's (1952) variable size houses at Tuscolano (Rome), which incorporated a large public space (**Fig.67, Fig.68**).<sup>231</sup> One of the first grouped schemes built in Britain came later (1956); it was designed by Frank Perry Housing at Leith Fort in Edinburgh. The split-level houses were grouped around a central public space, forming a cluster that could be repeated; the public space here was accessible by the surrounding houses and had just one street access (**Fig.69**). Other contemporaneous layout schemes of housing clusters and public spaces served by a legible network of pedestrian paths and roads, were the Albertslung scheme in Denmark, which comprised 986 L-shaped houses with paved public spaces (1963), and Gela New Town (1962) in Sicily, which offered large green spaces within the housing clusters (**Fig.70**).<sup>232</sup>

#### Prestonpans Experiment, Scotland

Two experimental L-shaped housing schemes in Scotland are important to mention, not only for their cluster design, but for the findings of residents' evaluations of their general performance one year after construction.<sup>233</sup> The government commissioned the projects and the survey to the Edinburgh University Architectural Research Unit for the purpose of verifying if courtyard housing types could serve as exemplars for future public housing. The first scheme built in Prestonpans (1962) comprised 45 houses (**Fig.71**); the second scheme (47 houses)

<sup>229</sup> Segal 1948, *Home and environment*

<sup>230</sup> Macintosh 1973, *The modern courtyard house: a history*

<sup>231</sup> Ibid. 33

<sup>232</sup> Ibid. 42

<sup>233</sup> The tenants were local people living previously in pre-fab pavilion houses with one or 2-storey; they were selected by the date of application to the public housing services and by their immediate housing needs.

was built at Dundee in 1965.

The density of the scheme was 111ppha; the pedestrian pathways and public open space areas occupied 55% of the site; roads occupied 34%; and vehicular circulation/parking 11%. A primary school was built in an adjacent lot. A secondary school and convenience stores were located 800m from the site.<sup>234</sup> Car parking spaces (there were no garages) were provided in the surrounding streets at a ratio of one car per dwelling. The public space network was constituted by one central planted space, and two smaller, paved spaces (vennel courts). To respond to the climate, some of the pedestrian vennels (pathways) were covered. After typological research in Europe, the choice of house layout was based on Adalberto Libera's 1-storey houses in Rome,<sup>235</sup> although the Spanish version provided a more direct access to the courtyard (**Fig.72**). Almost all of the houses had separate entrances, one of which was through the courtyard.<sup>236</sup>

The residents' reports were positive. The adaptation to the courtyard type was straightforward, and the level of satisfaction was high (90%). The main reasons for satisfaction were the privacy, the single-storey attribute and the easy housekeeping. Most popular complaints were that the courtyard fences were easy to climb (by children); the existence of a kitchen/living room divider; the high cost/inefficiency of the underfloor heating; and the thermal comfort problems caused by draught and condensation inside the dwellings. The dual access to the houses pleased the tenants, although the courtyard access was frequently more utilised (by bicycles, services, and children). The size of the courtyards (7.3x5.8m) was also considered adequate. Eighty percent of the householders cultivated lawns; however, the clothes drying area for larger families interfered with the children's activities.<sup>237</sup>

Relevant to the use of the courtyards and the sequence of exterior spaces was the children's pattern of play. Children under 3 years old (38%) used the courtyard

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<sup>234</sup> Edinburgh University Architectural Research Unit 1966, *Courtyard Housing, Inchview, Prestonpans* 15

<sup>235</sup> Macintosh 1973, *The modern courtyard house: a history* 43

<sup>236</sup> Edinburgh University Architectural Research Unit 1966, *Courtyard Housing, Inchview, Prestonpans*, 16

<sup>237</sup> *Ibid.* 17

“either in a pram or a play pen”. Children aged 3 to 10 years (46%) were divided into two groups: children aged 3 to 5 years had the playing activities limited to their own courtyards (and those of neighbor friends) and on the adjacent vennel (lane) or vennel court; children aged 5 to 10 years ranged fairly freely across the whole housing scheme, which included both the central planting plaza and the adjacent service areas. Children aged 10 or over had little or no demand for play space within the housing scheme because they had freedom to utilise other areas nearby (e.g. public playgrounds).<sup>238</sup> Nevertheless, the vennel courts were considered inadequate in size ( $\approx 8 \times 8$ m) to serve as an optional space for children to play with their prams/tricycles, and the plants provided by the city council were inefficient in providing the intended acoustic/visual privacy. The size of the flora species planted in the central public space was inappropriate, they were not well positioned with regard to children’s use of the space, and little maintenance was provided by the city council.

Walking to/from the car parking was satisfactory, however, one third of the car owners kept their cars in neighbouring friends garages located at a 5/7-minute walking distance to avoid the likelihood of car damage caused by the children. Noise was not considered a problem for the residents, who in fact found the housing compound quieter than their previous housing locations. However, some residents mentioned that double glazing or other methods of sound reduction could be considered in those parts of a scheme where noise is likely to be greatest, particularly if the adjoining houses are to be occupied by elderly tenants.<sup>239</sup> Some of these housebound tenants also complained they could not view people outside because of the small size/position of the windows facing the vennels, and this led to psychological isolation and consequent depression.

However, these few shortcomings did not compromise the sense of privacy. In fact, a fifth of the housewives mentioned they had made ‘new friends’ among the residents, and three quarters declared that, in one year, they had made

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<sup>238</sup> Ibid. 37

<sup>239</sup> Ibid. 29

acquaintances with neighbours, whom they could ‘stop and talk to’.<sup>240</sup> The vennel courts and the central planted space served to facilitate socialisation and some of the women took scheduled turns to supervise their children in the open space. The main conclusion of both reports was that “...the majority of housewives were well satisfied with the courtyard house type and with what it had to offer.”<sup>241</sup>

### PREVI Experiment, Peru

The previous experiments demonstrate tenants’ satisfaction with a courtyard house layout – a layout that was predetermined without their participation. By contrast, the example of **PR**oyecto **E**xperimental de **V**ivienda (PREVI), or ‘experimental housing project’, offered the householder a choice of house type before its construction. In 1965, the architect-president of Peru, Fernando Belaúnde Terry, created a program to produce social housing for people who lived in Lima’s slums (*barriadas*). With the approval of the United Nations (UN) in 1967, twenty-six architects (13 Peruvian,<sup>242</sup> 13 international<sup>243</sup>) were invited to present low-rise, high-density proposals for a competition that would select three projects for the construction of 1500 dwellings in three phases. construction

The process was originally intended to select only one prototype that was to be repeated in a large-scale social housing development. The prototype brief aimed to offer a core house model consisting of one room plus the essential dwelling utility areas (living, dining, kitchen, bathroom and service patio). Thereafter, the owners were free to expand the residential unit as family growth demanded, and their financial situation allowed. The prototype plot had to be 80-150m<sup>2</sup> for an effective occupation between 60-120m<sup>2</sup> providing flexibility for future

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<sup>240</sup> Ibid. 49

<sup>241</sup> Edinburgh University Architectural Research Unit 1968, *Privacy and Courtyard Housing*, i

<sup>242</sup> Miguel Alvaríño; Ernesto Paredes; Miró-Quesada, Williams, Núñez; Gunter, Seminario; Morales, Montagne; Juan Reiser; Eduardo Orrego; Vier, Zanelli; Vella, Bentín, Quiñones, Takahashi; Mazzarri, Llanos; Cooper, García-Bryce, Graña, Nicolini; Chaparro, Ramírez, Smirnoff, Wiskowsky; Crousse, Páez, Pérez-León

<sup>243</sup> James Stirling (UK); Esquerra, Samper, Sáenz, Urdaneta (Colombia); Knud Svensson (Denmark); Atelier 5 (Switzerland); Toivo Korhonen (Finland); Charles Correa (India); Herbert Ohl (Germany); Kikutake, Maki, Kurokawa (Japan); Iñiguez de Onzoño, Vázquez de Castro (Spain); Hansen, Hatloy (Poland); Aldo van Eyck (the Netherlands); Candilis, Josic, Woods (France); Christopher Alexander (US).

accommodation of eight children of different ages and an elderly couple (in addition to the householders).<sup>244</sup>

However, after the selection of three winning projects,<sup>245</sup> the jury<sup>246</sup> decided that, rather than nominating just one prototype to replicate multiple times, the development area would accommodate a collage of the 26 proposals, assembled to build a neighbourhood with 467 dwellings (**Fig.73**).<sup>247</sup> While it would be of great interest to discuss and compare each of these developed projects in terms of typologies, construction techniques, and urban layouts, it is more relevant (for this current study) to focus on the concepts of the built urban plan, and in three courtyard house projects.

The urban layout (and initial construction) was led by Peter Land (UN), who coordinated a national/international multidisciplinary group to produce a refined network of public spaces, easily accessible from each dwelling, and articulating diverse modes of transportation. The urban design established the foundations of an unfinished plan that would be completed by its community to build a free-market-designed neighbourhood with a thriving economy.<sup>248</sup>

The urban layout considered three significant strategies, as described by García-Huidobro et al:

- A pedestrian axis that connects educational and sports facilities and the main park. Running through the centre of the neighbourhood, the pedestrian street activates and defines its core, allowing any public transport to stop to make the whole system more efficient.
- A network of small plazas and pedestrian passages based on the relationship between the urban unit (the plaza) and the social unit (the self-organising community). This urban/social connection promotes the

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<sup>244</sup> The architects were expected to propose appropriate methods and technology to support the progressive construction of seismic resistant, energy efficient and cost effective buildings. Main contractors would build the core model and would provide technical advice and assistance to the families in completing their houses. Aalam 2012, *PREVI, Experimental Housing Project, Lima, Peru. Part I*

<sup>245</sup> Atelier 5, Kikutake-Kurokawa-Maki and Herbert Ohl; Christopher Alexander's entry was supported by a split jury

<sup>246</sup> Peter Land (UN), José Antonio Coderch (Spain), Halldor Gunnlogsson (Denmark), Ernest Weissmann (UN), Carl Koch (USA, UIA), Manuel Valega (Peru), Ricardo Malachowski (Peru), Eduardo Barclay (Peru) and assistants Darío González (Peru) and Álvaro Ortega (UN)

<sup>247</sup> García-Huidobro, et al. 2011, *The Experimental Housing Project (PREVI), Lima: The Making of a Neighbourhood 27*

<sup>248</sup> Ibid. 28

collective care and maintenance of public space, allowing the plazas to serve as an extension of the domestic space. This plaza and passage scheme also articulates the different clusters formed by the original projects.

- Traffic separation, with perimeter roads, cul-de-sacs and parking areas – a layout that does not interrupt the pedestrian network of public spaces. Avoiding the fragmentation of traditional street layouts in this way means significantly reduced air and noise pollution, and increased safety, improving quality of life.<sup>249</sup>

The three courtyard houses chosen here as good examples of the three typologies previously described: a binuclear courtyard house designed by Kikutake, Maki, Kurokawa of Japan (**Fig.74**); an atrium house by James Stirling from England (**Fig.75**); and an L-shaped house by Esquerra, Samper, Sáenz, Urdaneta from Colombia (**Fig.76**). The three houses accomplished the pre-established prototype brief, while also achieving economies in the water systems and maximising natural ventilation.<sup>250</sup>

The three designers used pre-fab concrete modules in the basic unit model. The large panels used by the first two, however, could not be used in future additions to the house once the main contractors' cranes had left the site; nor could they be moved to more suitable positions during the growth of the house because of their structural function. More effective, for instance, was the structural T beam used by Esquera, which allowed the wall built under it to be removed according to the functional changes in the use of the metamorphic spaces. Nevertheless, some of the architects' designs for smaller modules were fabricated *in situ*, integrated local materials, used contemporaneous modes of construction, and proved to be the most resilient construction process for the whole neighbourhood.<sup>251</sup>

Yet, it was James Stirling who accurately predicted the social behaviour of the future residents. The result was that his prototype was the most requested and the one that displayed "PREVI's finest qualities of occupancy."<sup>252</sup> Important in this overall preference were the separate kitchen, and the growth area (foreseen for the first two stages of growth: 4 to 6, and 6 to 8 persons), which was suggested to be

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<sup>249</sup> Ibid. 28

<sup>250</sup> Aalam 2012, *PREVI, Experimental Housing Project, Lima, Peru. Part I*

<sup>251</sup> EquipoArquitectura (EqA) 2008, *Time builds!*

<sup>252</sup> Ibid.

created by the use of a movable wall. All the rooms were planned to allow cross-ventilation by placing openings on opposite walls. The access to the house included two front entrance doors: one door led to the living/social area so important for the Peruvian communities to receive friends and neighbours; the other was functional, connecting to the house circulation area via the courtyard and the staircase. Each group of four houses had a central service patio for common services.

Lastly, yet importantly, Stiling's growth system proved to be the most appropriate for the low-income nuclear family's growth stage (from 4 to 8 persons), which was all planned for the ground floor. The house later expanded to a floor above, either providing for a separate dwelling or for additional living spaces and bedrooms for a larger family; part of the ground level could then accommodate other functions (e.g., a shop).<sup>253</sup>

The construction of all the basic unit modules was completed by 1977. While the first concern of the householders in the basic unit was to increase security and to add individual touches, most of the houses located on the main internal paths added retail spaces as a complementary source of family income. These spaces were either rented or operated by the owner's family. This promoted both the foundation of social networks, and an improvement in domestic economy through the integration "of 'income units'; that is, independent houses or facilities which families can use to increase their income. Examples of this include the multifamily house and, to a greater extent, the 'hyperhouse'. In the latter case, the value of the house lies not only in its capacity as a home, but also in its potential for generating income and strengthening the family's economy. It thus represents an optimal approach to social investment in housing issues."<sup>254</sup> This concept was most relevant for the urban design prototypes, namely, the L-Shape.

In the last forty years, PREVI neighbourhood has become self-sufficient and is coordinated by community leaders who are trained by council officers, architects

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<sup>253</sup> Aalam 2012, *PREVI, Experimental Housing Project, Lima, Peru. Part I*

<sup>254</sup> Hyperhouse is defined as "...the capacity of such houses to have a multidimensional programme or complementary uses that can generate an income through the inclusion of small businesses or rooms for rent." Endnote in García-Huidobro, *et al.* 2011, *The Experimental Housing Project (PREVI), Lima: The Making of a Neighbourhood*, 31

and social sciences students. It became “a housing laboratory containing so many design ideas that was so diverse and adaptable that it can probably never be repeated,”<sup>255</sup> “a shift from a dogmatic modernist approach to housing ... to one that capitalises on the evolutionary, organic nature of informal settlements”.<sup>256</sup>

Unlike the expansible houses designed in the 1930s in Europe, where “the pattern has remained for families to move to a bigger house rather than enlarge the one they already occupy”,<sup>257</sup> in PREVI, “people didn't move out as their financial situations improved. Residents stayed, and turned a housing estate into what feels like a middle-class community; ... its residents go about their lives feeling lucky that they live where they do”.<sup>258</sup> While these facts show that expansible courtyard houses can provide general satisfaction, a further question that needs to be addressed is: Can they be achieved voluntarily, through affordable and feasible change, and the available construction techniques?

### **Summary: CH precedents**

Drawing on the examples discussed above, this summary identifies (in list format annotated with my comments) the most important issues/features related to the urban design prototype components of buildings, courtyards, blocks and streets. These are:

<b>Buildings</b>
<ul style="list-style-type: none"> <li>▪ Socrates defined that a perfect house ought to be cool in summer and warm in winter (<u>This is still a reality today</u>)</li> <li>▪ In ancient Greece, to maintain privacy, façades displayed only small, high windows used mainly for cross-ventilation purposes; similar conditions are currently provided by single-loaded corridor systems that provide limited cross-ventilation through high windows facing elevated pathways (<u>With regard to this inquiry, this approach was considered insufficient for subtropical climate requisites</u>)</li> <li>▪ In ancient Bagdad ventilation was an essential consideration in determining the way the house sections were utilised because house divisions had</li> </ul>

<sup>255</sup> McGuirk 2011, *PREVI: The Metabolist utopia*

<sup>256</sup> Ibid.

<sup>257</sup> Macintosh 1973, *The modern courtyard house: a history* 32

<sup>258</sup> McGuirk 2011, *PREVI: The Metabolist utopia*



### ***Buildings***

multifunctional uses; this utilisation varied according to the seasons of the year and the daily temperatures (This flexibility depends on the mobility of the furniture, and this is rather difficult to accomplish in contemporary societies)

- Also in Bagdad, people moved between rooms or to the terrace, according to their need for thermal comfort (In subtropical climates, balconies placed on both sides of the double orientation residential units provide for this movement)
- In ancient Egypt wind was captured and directed through a system (In this inquiry, this is achieved through the utilisation of double orientation dwelling units)
- In Cordoba and Palma de Mallorca, air-permeable iron gates define the limits of privacy and allow for ventilation (A similar system is used in this study, in the wind tunnels that access the shared courtyard of the CCH, and in the courtyard accesses of the L-Shape dwelling)
- The strategy of having the residential unit entrances accessed by a raised veranda with lateral benches to accommodate visitors was used in ancient India (This was adapted in this study as a solution to accessing the ground floor dwellings of the CCH)
- The study room, frequently located next to the garden in the Chinese siheyuan, emphasises the value of having visual and physical access to a private/semiprivate space from the dwelling units (CCH Double offers an equivalent covered area between the two courtyards)
- Some courtyard houses (e.g. the 20th century binuclear houses) had living and sleeping functions in two separate blocks (This could be used today; however, extreme compartmentalization would increase construction costs significantly)
- Courtyards in cold climates were planned to have solar exposure while, at the same time, providing protection against cold winds (This strategy is also used in the urban design prototypes developed for this study)
- Low-rise housing with gardens was recognised in some precedents as being the most suitable housing type for families with children (This was taken into consideration in the design of the courtyards in this study)
- Many of the previous examples had separate entrances from the street to the house and from the street to the courtyard (This feature is applied in the CH developed in this study)
- Successful features exemplified in the Prestonpans Experiment were privacy, the single-storey attribute, and easy housekeeping (These are taken into consideration in the design of both the dwellings and the courtyards in this study)

### ***Buildings***

- The key resident complaints arising from the Prestonpans Experiment were transparent courtyard fences, the kitchen/living room divider, and small windows to the public spaces (These were avoided in the design of the prototypes)
- Dwelling expansions to accommodate new family members or to be rented as a source of income could be accommodated on an upper floor (In the current designs, retail space aligned with the street could serve as a complementary source of family income)
- Comparisons of the costs of courtyard houses and other low-rise types have been mostly inconclusive in the 20th Century (This raises a suggestion for further research)

### ***Blocks***

- The ancient Greek strategy was to limit the size of a polis and, thereafter, to develop a new polis (with relative autonomy) within a determined distance (This can be compared with the compact and multiuse characteristics of TOD addressed in this study)
- The blend of smaller and larger houses in the same area, represents the absence of predetermined areas for wealthy owners in ancient cultures (This can be compared to TOD's aim of social diversity today)
- A balance between economic planning and free market design was achieved in PREVI (This served as best practice evidence for the CH prototypes)
- The network of small plazas and pedestrian passages (based on the relationship between the urban unit [the plaza] and the social unit [the self-organising community]) was a feature of both the PREVI and Prestonpans Experiments (These were significant precedents for the design of the CH prototypes)

### ***Streets***

- The colonnaded bazaar streets were closer to the mosques (This suggested the possibility of a similar precinct around multimodal stations)
- A plan determined the Chinese *hutong* gridiron where the siheyuan court type began its development; similar plans to accommodate courtyards were previously established for the pyramid workers in Egypt, and for the Greek colonies in the Mediterranean (This corroborates the importance to plan for a gridiron according to courtyard housing typologies)

### ***Streets***

- The pedestrian axis connects educational and sports facilities and the main park crossing the centre of the neighbourhood in the PREVI plan (This served as the basic concept for the CH lane network)
- The pedestrian street that activates and defines PREVI's core plan allows for an informal connection to public transport, and renders the whole system more efficient (This notion became a guideline for both the CH and CCH public transport network)
- Traffic separation, with perimeter roads and parking areas forming a layout that does not interrupt the pedestrian network of public spaces was adopted in both PREVI and Prestonpans Experiments (The same concept is applied in the Collage Plan)

### ***Private courtyards***

- The previous examples identify the preference for a private sphere, and the desire to assert control over the space used by the household (This is recognised through design in this study)
- The atrium space in the Roman culture acquired a social function, evolving into a social reception area (This socially functional space can be compared to the private/semi-private courtyards proposed in this study)
- In the examples of Islamic gardens, water was contained in tanks; its shape was determined by channels, chutes and fountains that helped to control light and shadow to provide an earthly paradise (These elements and forms are applied in the courtyards designed for the prototypes in this study)
- Ancient courtyards were characterised as a void, or a void in the ground with a well to capture the rainwater and a tree to provide shade in the summer, thus creating the image of 'the well of heaven' (These elements assume great importance in the prototype courtyard designs)
- The Chinese two-jin quadrangle comprised two courtyards, forming a larger courtyard (*siheyuan*) (This was the precedent for the CCH double)
- In ancient civilisations, courtyard size and form corresponded to the social status of the family householders (The association of courtyards with distinction or status could help to fulfil individuals' sense of identity in today's society also)
- In the large Chinese siheyuan, rare flowers planted in the courtyards provided multi-coloured decoration and pleasant aromas (The selection of appropriate species for the CCH by landscape architects/botanists will also provide this)

<b><i>Private courtyards</i></b>
<u>outcome)</u>

Discussions about how these topics are utilised in the current design are documented in **C\_ 5** and in the Appendices. The courtyards attributes reviewed in this section are further discussed in section **S\_3.2.3**.

### 3.2.2 Communal courtyard housing (CCH)

This subsection identifies the architectural dimensions and overall characteristics of both successful and not-so-successful examples of communal courtyard housing in urban contexts. Many other examples could be mentioned to corroborate the current choices; however, these would only serve as repetition of the main issues already pinpointed. The description is made across time, albeit with a closer attention to the resilience of the communal courtyard housing in twentieth century Europe.

#### *Early precedents*

An early precedent of communal courtyard housing was recently unveiled (1989-2004) in the archaeological site of Sha'ar Hagolan in Israel,<sup>259</sup> dated 6400–5800 BC. The 20ha settlement precedes the civilisations described in the previous section (3.2.1) by three millennia, and is located close to the intersection of the boundaries of the current states of Israel, Jordan and Syria. The excavations show a hierarchy of main and secondary streets, the former paved with pebbles and built with water drainage channels on the sides, thus indicating a high level of settlement planning. Unlike other contemporaneous settlements, there is evidence that the streets were first built with long straight walls on each side. These walls provided the property limits for large land parcels (settlement blocks) owned by one family/clan, and compartments were progressively built adjacent to them.<sup>260</sup> Important for this study, is that one might consider this land parcelling as one of the earlier cases of a street network planned to accommodate communal courtyard housing (Fig. 77).

The housing blocks are partitioned into smaller areas where singular size rooms surround a central courtyard. While the rooms are not usually connected, some are arranged in pairs, with one used as a living room and the smaller one as a

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<sup>259</sup> Ancient Palestine

<sup>260</sup> Garfinkel, *et al.* 2011, *Sha'ar Hagolan: A Major Pottery Neolithic Settlement and Artistic Center in the Jordan Valley*

(paved) storage room. As such, it can be assumed that each unit of two rooms was a nuclear family household and that, according to its size, the communal courtyard structure housed either an extended family or a clan.

The courtyard was the stage for communal activities; in some cases, it would comprise 50% of the compound area (225-710m<sup>2</sup>). It served as access to the single compartments and the double room units, and had access from the street through just one entrance, which was located in front of the largest double unit. This key location allowed the householder of this unit (larger than the others) to control the entrance and to assure the compound's privacy.<sup>261</sup>

In the beginning of the fifth millennia BC, Anatolia<sup>262</sup> and the eastern Levant<sup>263</sup> had two different settlement models that used courtyard housing. One model was made by small courtyard houses built against each another with only a few passageways between them; access to the households (through roofs using ladders) was unstructured (e.g. Çatal Hüyük, Anatolia).<sup>264</sup> The other model was a network of built streets planned to frame communal courtyard housing. The former model disappeared, given its inappropriateness to the settlement's growth, and the need to consider the developing transportation modes arising from the domestication of animals and the invention of the wheel. The latter model shows the evolution of a social organisation through the communal utilisation of the space external to the grouped households. In earlier settlements, the nuclear families carried out family activities in the spaces adjacent to the sheltered areas (10-15m<sup>2</sup>), but mostly without the help of fencing to indicate land partitions.<sup>265</sup>

The Sha'ar Hagolan plan established the distinction between 'urban' property domains – the private (nuclear families units), semi-private (communal storage rooms and courtyard), and public (streets and open spaces) – in a legible sequence of spaces and activities. The model also pioneered the use of hierarchical street systems that provided the alignment of building walls, producing allotments of

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<sup>261</sup> Ben-Shlomo and Garfinkel 2009, *Sha'Ar Hagolan and new insights on Near Eastern proto-historic urban concepts*

<sup>262</sup> Asia Minor

<sup>263</sup> Syria-Palestine

<sup>264</sup> Mellaart 1975, *The Neolithic of the Near East*, 98-111

<sup>265</sup> Flannery 2002, *The Origins of the Village Revisited: From Nuclear to Extended Households*

quarters or *insulae*, similar to those used in the future larger civilisations in the Early Bronze Age II (3000-2000 BC), and described in **S\_3.2.1 (Fig.77)**.<sup>266</sup>

### ***Roman insulae***

The Latin term *insula* (pl. *insulae*) has been used in the urban literature with diverse meanings. The most accepted meaning from the literature specialising in Roman settlements is 'street block'.<sup>267</sup> However, other sources tend either to define it as multi-storey individual dwellings placed side by side along a street block,<sup>268</sup> or as a "freestanding building separated from other buildings by spaces on its four sides, with no indication of whether the feature takes up an entire city block or merely a portion of it".<sup>269</sup> These two different meanings are relevant in indicating that the term could be used either for building blocks, or for one building with central courtyards, erected as independent bodies and separated by spaces from larger/longer city blocks.

*Insulae* are also referred to as rental properties made of small individual compartments (*cella*) built to house poor families. Some of these buildings had communal courtyards used as garden space, with side paths used to access the multiple *cellae*; some examples of these can be seen in the ruins of Ostia, Italy (**Fig.78**). Some *insulae* were built to accommodate shopfront units (*tabernae*), with associated dwellings located either behind or above them. This mixed-use function was an early establishment of the Live-Work type that was further used in the Asian shop houses in some of the northern courtyard housing in India and Europe.

Rome's fire of AD 64 provided the chance to replan large areas of the city, and to consolidate housing typologies using a right-angle layout to build apartment buildings limited to 20m in height, and forming perimeter blocks. Inside Aurelian Walls (1386ha), it is estimated that the city had 970ha dedicated to housing. The

<sup>266</sup> Mellaart 1958, *The End of the Early Bronze Age in Anatolia and the Aegean*, 191

<sup>267</sup> Storey asserts that this is the correct meaning of *insula* because it is "defined by the concept of the *ambitus*, a walking space that 'isolates' a structural configuration." in Storey 2004, *The Meaning of 'Insula' in Roman Residential Terminology*, 54

<sup>268</sup> Storey 2002, *Regionaries-Type Insulae 2: Architectural/Residential Units at Rome*; Calza 1914, *La preminenza dell' 'Insula' nella edilizia romana*, 417

<sup>269</sup> Storey 2004, *The Meaning of 'Insula' in Roman Residential Terminology*, Panerai, et al. 2004, *Urban forms: the death and life of the urban block*, 54

two housing types were the *domus* (with an atrium and, sometimes, a peristyle),<sup>270</sup> and the *insula* (building block).<sup>271</sup> The *domus* suffered a metamorphosis because of the need for higher urban densities, resulting in what Caniggia and Maffei called ‘synchronic variants’; in other words, “the same 'house concept' in situations less fitting than with the type itself”.<sup>272</sup>

Called ‘Row Houses’, these buildings were grouped side by side along the streets, forming an *insula* with a central courtyard; originally, their façades were 5-6m in width. They then evolved in multiples of their original width – 10-12m, 15-18m, and 20-24m – adding stories, and installing stairs between the housing units. This resultant housing type is referred to as ‘In-line House’ and corresponded to what Caniggia and Maffei considered basic building types.

When originally built, row houses accommodated one single family between their ground floor and roof whereas in-line houses represented the need for greater dwelling density, placing several families in a single building: one on each floor in the 10-12 meters type, two in the 20-24 meters type and, therefore, increasing the number of stories.<sup>273</sup>

Even though the ‘in-line house’ type was placed side by side around the blocks, the central open space was sub-divided into small parcels that were assigned to the ground floor residents and not used as a communal courtyard. The stairs to the *coenacula*<sup>274</sup> (apartments) gave access to just two units per floor, thus allowing the units to have windows facing both the street and the central open space. The importance of this housing typology for this inquiry is that the back façade of the *insula* building(s) faced the courtyard space; this facilitated natural light and cross-ventilation throughout the dwellings. This building type shows an

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<sup>270</sup> S\_3.2.1, p. 49

<sup>271</sup> Morris clarifies that the largest number of Roman residents housed in the *domus* in the middle of the fourth century AD was 1797, compared with 46 602 housed in the *insulae* (consisting of an average of five flats with at least five or six occupants in each flat). Morris 1979, *History of urban form : before the industrial revolutions*, 45

<sup>272</sup> Caniggia and Maffei 2001, *Architectural composition and building typology : interpreting basic building*, 76

<sup>273</sup> Ibid., 88

<sup>274</sup> This definition of *coenacula* is given by Storey: “This term originally appears to have been applied to dining rooms, which were commonly found on the second floor of residences. Soon, any upstairs room could be called a c[o]enaculum; by the first century B.C., the referent of the term had changed, and its meaning seems to have been completely transferred to the equivalent of the modern term "apartment," although the origin of the word as a dining room was still recognized.” Storey 2004, *The Meaning of 'Insula' in Roman Residential Terminology*, 51



early example of the double edge characteristic described in **Chapter 5 (Fig.79)**.

The ten centuries after the end of the Roman Empire, commonly referred as Medieval Ages (500-1500 A.D),<sup>275</sup> required the European 'cities' to be highly fortified by perimeter walls. This extreme densification permitted only scarce ventilation wells for the majority of the residents. Communal courtyards were a privilege of either noble or monastic communities' members in palaces and monasteries.

### ***Spanish colonial cities***

The Spanish colonisation in the sixteenth century created the opportunity to rethink ways to build new towns. These 'principles of order' in Spain were institutionalised by a comprehensive assembly of laws – The Laws of Indies (Leyes de las Indias). These laws were contained in nine books issued by the Spanish Crown (Felipe II – 1573) to regulate social, political, and economic life within the new Spanish colonies in America and the Philippines. Book IV was dedicated to the planning, implementation, and administration of the new settlements.

The new colonies were economically, politically, and religiously dependent on Spain; therefore, the urban planning determined by the Laws was authoritarian and centralist.<sup>276</sup> The rigid gridiron plan – with a central plaza where the administrative, commercial, and religious buildings dominated public events – was an assertion of these characteristics.<sup>277</sup> Therefore, the 'principles of order' were a framework ruling how a city layout should be implemented rather than prescribing the form of a city (e.g. physical structure).<sup>278</sup>

The parcels inside a block were related to the predominant block characteristics: open, closed, and composed. Considering that most of the buildings

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<sup>275</sup> Also named Dark Ages, this period began by the end of the Roman Empire, which occurred in different times according to the Roman troops retreat in diverse geographical locations; one could assume here this period would be 500-1500 A.D, therefore finishing in the Italian Renaissance period.

<sup>276</sup> Saavedra 1980, *Las Leyes de Indias: Observations of its Influence in the Physical Space in the Latin American Colonial Cities*, 20

<sup>277</sup> Also a plan that could be laid out using unskilled people without training in surveying (e.g. soldiers and laymen) *ibid.*, 21

<sup>278</sup> *Ibid.*, 21-22

were not set back from the street, these characteristics were related to the shape of the buildings in bordering streets, and to the internal distribution of solids and voids (**Fig.80**). The closed block type (perimeter block) was mostly parcelled with a series of lots, with one side facing the street and the other facing a central open space; this facilitated cross-ventilation in the buildings. Generally, the four corner lots had two sides facing the streets, without access to the interior open space of the block. Frequently, these square areas accommodated either a courtyard building (e.g., a private house or public institution) – because the courtyards facilitated the building airflow – or narrow lots that were used for retail. The dimensions of the lots were primarily related to the social and economic composition and location of the neighbourhood within the city, and to the geographical location of each city.<sup>279</sup>

### ***Lisbon Plan***

In eighteenth century Europe, the housing compactness inside the medieval town walls led to decreasing levels of ventilation and natural light. This condition added to deficiencies in the water supply and inadequate sewage. Lisbon was one of these cases, until the 1755 earthquake provided the opportunity to rebuild the city according to contemporaneous urban design principles.<sup>280</sup> These innovative principles integrated a network of public spaces comprised of a hierarchy of wide streets linking the pre-existent open spaces. The street layout is a rectangular gridiron forming 4-storey (17-25m height) perimeter blocks (70x25m) containing a very narrow ventilation well (45x2m); the longitudinal axis of the blocks was oriented North/South to maximise the exposure to the predominant northern winds on the façades.<sup>281</sup> This example of a perimeter block used the yard between buildings simply as an air/light well, and its functional effectiveness decreased on the floors closer to the ground given the reduced yard width ( $\approx 2\text{m}$ ) (**Fig.81**).

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<sup>279</sup> Ibid. 23

<sup>280</sup> França 1989, *A reconstrução de Lisboa e a arquitectura pombalina*, 8

<sup>281</sup> Córias e Silva, et al. 2001, *Accounting for the 'block effect' in structural interventions in Lisbon's old 'Pombaline' downtown buildings*

### ***Paris Plan***

The industrial revolution in the nineteenth century required the rural migrants to be accommodated close to the urban industries. However, to build new housing typologies, it was necessary to plan for a proper street network that would frame the reformed city blocks accordingly. This was accomplished by Haussmann's plan for Paris (1850) that established a dialectical relationship between the buildings and the road network. The plan changed the notion of 'route' within a technical concept of modernisation and sanitation that aimed to distribute facilities and to allow for their future expansion in the urban structure, mostly under the control of the bourgeoisie.

The reform of the blocks' layout included a network of *perceés* (openings) in the urban fabric that connected the large squares, train stations and key public buildings. The *perceés* were planned as a compromise to produce property and urban edges, attending to that network, and not intended to provide communal spaces in their interior (**Fig.82**).<sup>282</sup> The plan was very important in laying out a pioneering urban green structure along the new buildings; this green structure also provided for natural light and airflow. Disappointingly, the new housing units neither contemplated the inclusion of CCH, nor allowed for social diversity as the previous urban fabric did, thus forcing the 'least favoured by fortune' who had lived in the demolished buildings to move to the city periphery.<sup>283</sup>

### ***Barcelona Plan***

Until the end of the eighteenth century, Barcelona was able to accommodate its population (ca.80 000) within the medieval walls. After that time, the city did not have the space for the needed infrastructure, and the dwellings did not have enough ventilation. At this point, the city had a higher density (856ppha)<sup>284</sup> than Paris (400ppha), and both the drinking-water supply and the sewage system were inefficient. Epidemics broke out four times in the nineteenth century, and created a

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<sup>282</sup> Panerai, *et al.* 2004, *Urban forms: the death and life of the urban block*, 6, 7, 11, 162

<sup>283</sup> See **S\_4.2.1**, p. 181

<sup>284</sup> For the working class, this represented an area of 10m<sup>2</sup> per person

very low average life expectancy.<sup>285</sup>

The large plan field around the city was vacant; however, this was a military reserve where building construction was forbidden. This forced the small industries and the new workers' neighbourhoods to be built inside Sants and Gràcia, the closest settlements. In June 1859, after the demolition of the walls (1854-56), the Spanish government appointed Ildefons Cerdà i Sunyer to implement his urban plan for the expansion of the city.<sup>286</sup> Cerdà was a civil engineer and a *diputado* (member of the parliament) in Madrid where he had been influenced by the liberal and radical ideas of the time. He proposed building an egalitarian city, applying the principle of social diversity to provide equal access to quality housing; his drafts (1855) included four apartment types for the middle and upper classes (120-180m<sup>2</sup>), and six types for the working classes (69-103m<sup>2</sup>).<sup>287</sup> His idea that housing prices could be adjusted to different wages was an innovative one.<sup>288</sup>

The plan structure was defined by a gridiron formed by chamfered corner blocks – which Cerdà named *intervia* (interway). This prototype considered the relationship between buildings, the space between them, public open spaces and streets. The preferred dimensions (113.3x113.3m) were calculated by a mathematical formula based on the number of square metres per person and the number of inhabitants per house. Cerdà established a 4-storey building height limit and fixed the widths for both the space between buildings (56m) and the standard street (20m - 10m for sidewalks).<sup>289</sup> In addition, the building corners were cut at 45°

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<sup>285</sup> The epidemics broke out in 1834, 1854, 1864 and 1870, and 3% of the population died on each occasion; the average life expectancy was 38.83 for the wealthier classes, and 19.68 for the working class. Pallares-Barbera, *et al.* 2011, *Cerdà and Barcelona: The need for a new city and service provision*, 124

<sup>286</sup> Ajuntament de Barcelona 2013, *Historia del Eixample de Ildefons Cerdà, precursor del urbanismo racional moderno*.

<sup>287</sup> Neuman 2011, *Ildefons Cerdà and the future of spatial planning: The network urbanism of a city planning pioneer*, 126

<sup>288</sup> Pallares-Barbera, *et al.* 2011, *Cerdà and Barcelona: The need for a new city and service provision* 124

<sup>289</sup> The formula used to calculate the length of the side of the block was:

$$x = \frac{2pv - 2bd}{d} \pm \sqrt{\frac{4pv}{d^2} (pvf - 2bdf - b^2d - df^2)}$$

where  $x$  = length of block side;  $p$  = m<sup>2</sup> per person;  $v$  = persons per house;  $b$  = street width;  $d$  = building height; and  $f$  = building lot depth. *Ibid.* 125

angles (20m long), creating octagonal blocks.<sup>290</sup>

Larger avenues and boulevards were designed to be 30m and 50m wide, thus establishing a 3-level street hierarchy. The main avenues connected the existing settlements with the wide roads that were designed to accommodate the steam tram. The bevelled street corners provided an easy traffic flow, maximised visibility, enhanced airflow, and created distinct façades with unusual framing edges.<sup>291</sup> Street corners became legible city 'squares'.

In synthesis, the 1859 plan proposed:

- Distance between the buildings in the block (*intervía*)
- Buildings only on two sides of each block
- 16m (4-storey) height limit of buildings
- Public parks within 1500 m of each block
- A great park of 3.5 × 1.5 km at the northeast edge of the expansion (Besós River)<sup>292</sup>

Some blocks were planned to be public spaces, and others to accommodate services and equipment. In the cities created under the Laws of the Indies, space did not allow residential blocks to be near the central plaza.<sup>293</sup> Cerdà, however, endeavoured to equally distribute housing and streets throughout the city fabric, and to place services and amenities within walking distance of all housing blocks. The *intervía* had just two buildings (10-20m deep), occupying 40% of the block on two opposite sides and accommodating private yards and green spaces between them. Pedestrian pathways connected the inner open spaces independently of the street network. The whole plan was an extensive urban green structure (**Fig.86**).<sup>294</sup>

By 1863, Cerdà made the first change in the block parcelling to adapt it to the realities of the housing market activated by the emerging economies.<sup>295</sup> The

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<sup>290</sup> Neuman 2011, *Ildefons Cerdà and the future of spatial planning: The network urbanism of a city planning pioneer*, 125

<sup>291</sup> *Ibid.*, 127

<sup>292</sup> *Ibid.*, 128; Bohigas and Ministerio de Obras Públicas y Urbanismo; España 1986, *Reconstrucción de Barcelona*, 60-63

<sup>293</sup> Occupation of the centre of the Spanish colonial cities was a prerogative of the political and religious powers, which pushed the residential blocks out of the centre. Saavedra 1980, *Las Leyes de Indias: Observations of its Influence in the Physical Space in the Latin American Colonial Cities*

<sup>294</sup> Pallares-Barbera, *et al.* 2011, *Cerdà and Barcelona: The need for a new city and service provision*, 126

<sup>295</sup> Neuman 2011, *Ildefons Cerdà and the future of spatial planning: The network urbanism of a city planning pioneer*, 127

permission to build in only two sides of the block extended now to three sides and the buildable area back from the street extended from the initial 20-24m to 25-28m; this meant a decline in natural light and ventilation inside the apartments.<sup>296</sup> From 1860 to 1976, the increasing population and the greedy housing market influenced the City Council to make progressive allowances in lot occupation and building heights.

Finally, in 1976, certainly too late to save a large number of courtyard spaces, the Plan General Metropolitano reduced the parcel occupation to 70%, the height of the constructions inside the courtyards to 4.5m and the maximum height to 20.75m (7-storey). These new dimensions were (re)considered appropriate for the relationship between the width of the streets and the length of the blocks.<sup>297</sup> Since 2012, the Barcelona Council has been establishing public spaces in the interior of the blocks in a proportion of one public space to nine blocks to provide residents with access to public green space (plazas) that are no more than 200m from their dwellings.<sup>298</sup> This is a recommended strategy to enhance liveability in courtyard housing prototypes.

Because of the extensive construction that in-filled every vertical space of the street edges to a maximum equal height, building up an almost continuous skyline, Cerdà's plan has been criticised for its monotonous geometric repetition of buildings, street after street, without allowing for any permissible visual variety.<sup>299</sup> This streetscape monotony could be avoided if the building heights were varied. This variation would also enhance solar exposure for both courtyards and streets.

Nevertheless, Cerdà's Plan was an innovative urban model to be considered in light of the urban growth plan, which he defined as the process of parcelling,

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<sup>296</sup> *Ibid.*, 127

<sup>297</sup> In 1860, the plan allowed the parcels to have 50% occupation and 16m maximum height; by 1890, the allowed occupation increased to 70% and the maximum height to 20m. By 1941, the maximum height was 23m and the occupation of the courtyards was allowed to have constructions 4.4m high. From 1950 to 1976, the height increased to 24.4m plus two levels of recessed attics, and the building in the courtyards could be 5.5m high. Bohigas and Ministerio de Obras Públicas y Urbanismo; España 1986, *Reconstrucción de Barcelona*, 60

<sup>298</sup> Barcelona Field Studies Centre 2013, *Barcelona Urban Development and Change*

<sup>299</sup> Bohigas and Ministerio de Obras Públicas y Urbanismo; España 1986, *Reconstrucción de Barcelona*, 63

constructing, and urbanising.<sup>300</sup> Moreover, Cerdá created a new urban culture, linking this city – renowned for its character and its healthy population – with the rest of the world.

### ***Glasgow Plan***

Acting as City Architect for Glasgow, John Carrick led the Improvement Scheme for Glasgow (1866) with the aim of providing appropriate buildings for rehousing poor families. Carrick adapted the traditional tenement type – 4-storey buildings ('In-line House' type) with a common stair serving two apartments per floor – to form a perimeter block with a central courtyard/garden. The prototype was successful because it used repeated construction elements, had efficient land utilisation ratios, contributed to a new social and sanitary order, and responded to the climatic settings (**Fig.83**).<sup>301</sup>

The dimensioning of this prototype had a rather more simplified formula than Cerdá's in that it established the relationship between courtyard, building heights and street width; this formula is significant in the design of CCH prototypes (**Fig.84**). Based on a municipal regulation that determined that the height of the buildings should be equal to the width of the streets, a 4-storey perimeter block required streets 12m wide, because the usual height of a storey was around 3m (10ft). As the width of the courtyards was regulated to be one and a half times the building height, by applying the 10m width (30ft) generally utilised in the building prototype, a 4-storey perimeter block would produce an 18m (60ft) width courtyard within a 38m square perimeter block – 50m, including the streets.<sup>302</sup> The minimum width of the courtyards guaranteed visual privacy between the front windows.

The block's length and width were adjusted both to achieve effective ventilation – by designing the axis of the courtyards parallel to the prevailing winds (SW in Scotland – and to maximise the exposure of the courtyards to the sunlight. The ideal balance of these two factors was difficult to achieve because, at times, the

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<sup>300</sup> Sola Morales 1993, *Les formes de creixement urbanà*

<sup>301</sup> Edwards 2006, *The European perimeter block: The Scottish experience of courtyard housing*, 125

<sup>302</sup> Ibid. 125-126

street layout had to consider sloppy topographies that forced the streets to follow a radial design not favourable to the wind direction (**Fig.85**).<sup>303</sup> This balance can be achieved in subtropical climates by the implementation of ventilation tunnels.<sup>304</sup>

Nevertheless, some of the new plans were designed for perimeter blocks with public courtyards served by internal streets, using the traditional English arrangement of parallel service routes to give double access (front and back: principal and service) with hierarchically different importance. These internal paths were accessed by public entrances to the interior of the blocks; in my view, this blurs the boundary between the public realm and the semi-private realm of the courtyards.

### ***CCH: twentieth century***

At the beginning of the twentieth century, the growth of the new manufacturing economies spread the urban need to create more accommodation for the industry workers' families in Europe and the Americas. Generally implemented close to the industrial buildings, the housing supply was scarce and inappropriate. The housing typologies that were produced to meet the quick demand were diversified. One type was the communal courtyard housing type. It formed a rectangular block with windows in all the external façades; however, it was not always served by streets on all sides.<sup>305</sup>

In Europe, the buildings generally had 2/4-storeys with just one entrance to the central courtyard; this gave access to the units through external stairs and galleries, frequently made of iron (**Fig.87**). Although these courtyards had a reduced width (4-6m), it was most common for the women to sit in front of the ground floor units to chat with the neighbours while watching their children play.<sup>306</sup> The use of similar housing types occurred in most of the industrial European cities.

In the Americas, analogous types were found in all industrial cities of the

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<sup>303</sup> Ibid. 126-127

<sup>304</sup> **S\_5.1**, p. 232

<sup>305</sup> Antunes 2002, *Habitação Operária - Patios e Vilas de Lisboa: A experiência da cidade operária industrial*

<sup>306</sup> Palma da Silva 2012, *'Limen' - a soleira: Estudo do espaço de transição interior/exterior da habitação relações sociais e identidade*



Portuguese and Spanish colonies; however, in the USA, they were mostly located on the west coast. In California, the early twentieth century population growth and the economic recession encouraged builders to look for an affordable, easily built housing typology. Communal courtyard housing turned out to be the logical answer to accommodate the immigration of aging retirees and a younger generation searching for the Hollywood lights in Los Angeles. The lack of amenable public spaces led to citizens' perception of the possibility of building their fantasy dreams around a semi-private void.<sup>307</sup>

This perception often mirrored the elements of the courtyards of southern Spain. However, in most cases, the communal yards were no wider than the European industrial models mentioned above. Besides the main purpose of facilitating natural light and ventilation, the reduced courtyard served almost exclusively to provide a landscaped access to the units, and to maintain a level of privacy commonly guaranteed by an iron gate at the street entrance. These gates were similar to the ones utilised in the Cordoba courtyards seen in the previous section (**Fig.88**).<sup>308</sup>

In some of the most industrialised cities on the east side of the US, the Garden City Movement<sup>309</sup> led to the re-focusing of attention on courtyards with surrounding housing, as a sustainable housing solution for the North American cities. However, such examples were mostly of courtyards with public access, as in the 1936 Harlem River Houses (**Fig.89**)<sup>310</sup> and the Five Blocks Plan presented by Clarence Perry to house a thousand families (**Fig.90**),<sup>311</sup> both located in New York. These utopian housing developments were never built because of the economic, social, and political issues related to their very large scale.

Nonetheless, the 1933 Hillside Houses in Palmer Shannon, New York (**Fig.91**) and the 1928 Phipps Garden Apartments (4/6-storeys) located inside the Sunnyside Gardens social housing development (Queens), should be mentioned here. The

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<sup>307</sup> Polyzoides, *et al.* 1982, *Courtyard housing in Los Angeles: A typological analysis*

<sup>308</sup> *Ibid.*

<sup>309</sup> See **S\_4.2.1 - The evolution of urban green spaces**

<sup>310</sup> Laurence 2006, *The Death and Life of Urban Design: Jane Jacobs, The Rockefeller Foundation and the New Research in Urbanism, 1955–1965*

<sup>311</sup> Perry 1929, *The neighbourhood unit* 107-110

latter achieved national and international recognition for being a planned community arranged around landscaped open courtyards.<sup>312</sup> The development was undertaken by the Regional Planning Association of America (RPAA), and constituted a built example of communal courtyard housing where the courtyard had appropriate dimensioning and adequate planting of varied trees to serve as a functional community space (**Fig.92**).<sup>313</sup> Also relevant was the use of multiple vertical stair halls that accessed paired units on each floor to maximise cross-ventilation. However, neither of the projects above foresaw the inclusion of ground floor retail areas as a way to increase the street's liveability.

### Block reform

From the 1880s to the 1940s in Europe, the building block acquired a greater role in the inner cities as the most important typological component of the city fabric. The small block dimensions, and the greater number of streets facilitated by them, allowed for the maximum exploitation of retail on the ground floor. Accordingly, the size and complexity of the blocks depended on their proximity to the city core: the bigger blocks that allowed for wider central yards were a greater distance from the city core, either in new or rebuilt areas of the city's outskirts.<sup>314</sup>

Areas under development adopted the new plans to reform the urban blocks. As the mild climate of Southern Europe did not require a large amount of sunlight for urban housing, the courtyards were small and their utilisation as a communal space was very rare. However, in northern Europe, the urban plans foresaw larger building blocks, where the central open space was commonly used by the residents as a semi-private space (e.g., in Vienna, Amsterdam, Copenhagen, London, Frankfurt and Berlin, to name but a few).

### *Vienna*

By 1900, in Vienna, Camillo Sitte published *Greenery within the city* (which

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<sup>312</sup> Kurshan, *et al.* 2007, *Sunnyside Gardens Historic District : designation report*, 145-161

<sup>313</sup> "Long-time resident Lewis Mumford called Sunnyside Gardens 'an exceptional community laid out by people who were deeply human and who gave the place a permanent expression of that humanness.'" *Ibid.*, 5-6

<sup>314</sup> Krier 1984, *Urban components*

was included as an appendix in his 1889 seminal book *City planning according to artistic principles*).<sup>315</sup> Sitte proposed that all the vegetation in a city could be divided into two categories: the decorative greenery and the sanitary greenery. The latter would be found in the sheltered interior of large perimeter blocks, away from “the dust and noise of the streets”.<sup>316</sup> The influence of Sitte in Viennese urban planning and in socialist political trends<sup>317</sup> encouraged the construction of five communal courtyard housing projects (1901) that picked up the typology of the traditional baroque courtyard (*Hof*) previously used in institutional buildings and suburban housing blocks. The 4/5-storey building project by Theodor Bach and Leopold Simony had 392 apartments arranged around green courtyards with playgrounds (**Fig.93**).<sup>318</sup>

Later (1919-34), the Social Democrats’ policies created a comprehensive public housing program, which mostly incorporated the *Hof* typology (63,000 apartments). The *Höffen* generally provided only a few retail units facing the streets, but incorporated many communal facilities (laundries, kindergartens, maternity clinics, health-care offices and libraries) that were served by the public transportation network.<sup>319</sup>

It was common to divide the *Höffen* into multiple courtyards; the first example was the Fuchsenfeldhof (1922–25) (**Fig.94**). The size of these courtyards, and the consequent size of the block, could be credited to the multi-functionality of both the courtyards and the block, which introduced the quality of mirroring the public open space (the square/*piazza/plaza*) inside the private housing compound.<sup>320</sup> However, the size of the blocks and their architectural monumentality that was recognisable as a distinct building type could also

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<sup>315</sup> The original book was published in German in 1889. Sitte 1965, *City planning according to artistic principles*

<sup>316</sup> Sitte 1965, *Greenery within the city*, 183

<sup>317</sup> Collins and Collins 1965, *Camillo Sitte and the birth of modern city planning*

<sup>318</sup> Sonne 2009, *Dwelling in the Metropolis: Sitte, Hegemann, and the International Dissemination of Reformed Urban Blocks 1890–1940*, 250

<sup>319</sup> Panerai, et al. 2004, *Urban forms: the death and life of the urban block*, Sonne 2009, *Dwelling in the Metropolis: Sitte, Hegemann, and the International Dissemination of Reformed Urban Blocks 1890–1940*

<sup>320</sup> Sonne 2009, *Dwelling in the metropolis: Reformed urban blocks 1890–1940 as a model for the sustainable compact city*

represent the working class desire for social recognition and power that confronted the bourgeois Viennese society of the time.<sup>321</sup>

The most emblematic example of the *Hof* typology is the Karl Marx Hof – the symbol of the Red Vienna – a 7-storey affordable apartment compound (1200 units, 35-45m<sup>2</sup>) designed by Karl Ehn (1927). The *Hof* is located along a main railway, close to a train station that provides access to the city and the country, and defines an entirely new neighbourhood typology. The one kilometre site is only 30% occupied, and comprises a north-south oriented housing structure framing the widely planted public courtyards which give access to the street through five monumental archways (**Fig.95**).<sup>322</sup>

These maxi blocks ran counter to the city's objection to the privatisation of too much of the public realm. This privatisation was seen to decrease public permeability and to weaken the relationship between buildings and city. One way to avoid this was to plan for a balance between public and semi-private courtyard spaces, as achieved in the Rabenhof (1925-28, 1000 apartments), designed by Schmid and Aichinger.<sup>323</sup> While the spaces created in front of the continuous building structure are visually related to the surrounding façades, however, the character of the semi-private spaces becomes unclear given the extended permeability facilitated by the car accesses and pedestrian passageways (**Fig.96**).

By 1993, the Women's Office of the City of Vienna commissioned the architects Peretti-Podreka-Prochazka-Ullmann to plan a communal courtyard housing project to meet the everyday requirements of the Viennese women. The 360 units compound (Frauen-Werk-Stadt I) was carefully planned from the details of the floor plans to the urban layout, including "a kindergarten, integrated disabled apartments, a communications centre, six integrated old person's apartments as well as retail units along Donaufelder Strasse" (**Fig.112**).<sup>324</sup>

Particular attention was given to the provision of natural light, appropriate

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<sup>321</sup> Blau 1999, *The architecture of Red Vienna, 1919-1934*

<sup>322</sup> Architekturzentrum Wien 2008, *Housing in Vienna: Innovative, Social and Ecological* 14-16

<sup>323</sup> Sonne 2009, *Dwelling in the metropolis: Reformed urban blocks 1890-1940 as a model for the sustainable compact city*

<sup>324</sup> Architekturzentrum Wien 2008, *Housing in Vienna: Innovative, Social and Ecological* 36-37

ventilation, and diversity of outdoor views for both the residential units and the circulation areas. Each building of the complex building block was arranged to frame a network of green spaces with different characteristics (such as garden courtyards, play meadows and small plazas, all connected by arborized pedestrian pathways). The sequence of spaces constitutes stepping-stones that integrate the secondary structure of the existing urban green structure.<sup>325</sup>

Three years later (2000), the great success of this project motivated a competition for a second project for Troststrasse 73–75 (Frauen-Werk-Stadt II). The winning project by Ganahl-Ifsits-Larch was built by 2004. The building has 140 units, of which 42 include facilities that enable maximum autonomy for the elderly, albeit allowing for external professional assistance at the units when required. The ground level accommodates retail areas, with one barrier-free access to the courtyard (**Fig.113**).<sup>326</sup> The free choice of communal courtyard typology guaranteed its appropriateness for the women's requirements.

### *Amsterdam*

The *Hof* typology also influenced the planning of the reformation of Amsterdam's urban blocks. Of the blocks with large courtyards that are based on Hendrik Petrus Berlage's urban plan (1914-40) for Amsterdam, two are selected to examine here. The first is the Amstel block that was conceived as the general prototype for the spatial organisation. This type of block allowed different architects to work side-by-side, all conscious of the urban spaces, the design of the façades (with special attention given to the block corners generally occupied by shops), and the building heights (4 floors). These features were all recommended by the Housing Law of 1901, and influenced by The Amsterdam School of Urban Architecture that was based on the concept of the block. "The Amstel block is formed by a continuous perimeter of buildings, which encircle a central – usually rectangular, unbuilt – space, its width varying between 40 and 45 metres up to 60

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<sup>325</sup> Ibid. 37

<sup>326</sup> Ibid. 96

metres in some cases.”<sup>327</sup>

Until 1930 in Amsterdam, the interior of the courtyards comprised a small central pathway giving access to individual areas of the ground floor dwellings. After 1930, these narrow pathways changed to an enlarged passageway – a semi-private area. This area was generally gardened, and was located in a central communal space used by all block residents, albeit with the maintenance and appropriation of smaller areas for ground floor householders (**Fig.97**). This appropriation “shown by the definition of the gardens or of their substitutes (the balconies) through objects, decoration, paving, flowers etc.”, along with “the narrow alternating projecting bays, which correspond to the staircases and the kitchens, and wide bays, corresponding to the balconies”,<sup>328</sup> contributed to personalising and individualising the dwellings and the internal façade as an intimate block edge.

The example of the Spaardammerburrt planning area (1913-21) was also chosen for its relevance to this study. Of particular interest is that the new social housing developments were created adjacent to the new central rail station; the building blocks were created to accommodate central courtyards; and the three architects<sup>329</sup> involved in individually designing the blocks worked in harmony to produce a large urban block composed of distinct smaller ones in a collage process.

The overall plan had an adequate urban scale based on the concept of the Flemish *Hof* building type assembled around a central public space, which introduced the intended suggestion of a town inside the metropolis. The front of the 5-storey blocks had an average length of 100m, but with porticos placed between the streets that allowed for the crossing of the courtyards (20m). The first perimeter block built measured 70x85m externally, enclosing a larger courtyard (55x75m) that was committed to the communal activities of the neighbourhood. The triangular perimeter block close to the railway included a post office and a school (**Fig.98**).<sup>330</sup> For the accessibility of the railway, the high density, and the sense of community created by the

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<sup>327</sup> Panerai, *et al.* 2004, *Urban forms: the death and life of the urban block* 81

<sup>328</sup> *Ibid.* 86

<sup>329</sup> The architects were M. de Klerk, H. J. M. Walenkamp and K. P. C. de Bazel

<sup>330</sup> Panerai, *et al.* 2004, *Urban forms: the death and life of the urban block*

The Piraeus building was constructed at the end of the twentieth century (1994) in the former Amsterdam docklands at KSMN Island, 3km from the Amsterdam Central Station. Designed by Hans Kohloff and Christian Rapp, the Piraeus was built to the edge of one of the blocks (56x170m) as part of a 'symmetric' structure of communal courtyard housing separated by a paved small soccer field space. It is partitioned into two different courtyard structures, which are not accessible from the street. It frames a public space around a 19th century 3-storey dock building, and creates a pedestrian passage between the streets.

The western courtyard (25X48m) was designed as an open space for the residents to enjoy; the eastern courtyard is smaller, and was designed as a garden visible from the apartments.<sup>331</sup> The volume is modelled from 4-storeys (south) to 9-storeys (north) to guarantee the efficiency of the sun's penetration into the courtyards and apartments. The brickwork and the repetitive continuity of the steel-framed folding windows recall the austere façades of the 19th century dockland warehouses. Car parking is accommodated underneath the building, with access from the main street on the north. This reduces the circulation of cars between the southern façade and the water (**Fig.111**).<sup>332</sup>

The Piraeus is a mixed-use building, comprising 18 shops and 304 apartments. It has a net density of 221dph, and is composed of a large variety of apartment types (56 different layout plans)<sup>333</sup> that assure both diversity of personal choice and social mix, "and that's one of the things that makes this building so successful. The building seems to house all the differences you find in the street, and this variety makes it part of the street, and a part of the city".<sup>334</sup> The entrances are clearly marked by their recess intercalating the south shops, and by their verticality and recess on the north side, where the ground floor is elevated approximately 1.2m to guarantee the visual privacy of the lower windows. Two large lobby entrances mark the corners of the block in the south façade. Each vertical access serves two dual-aspect apartments per floor, and the building width between façades is

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<sup>331</sup> Mcinerney 2014, *Piraeus*

<sup>332</sup> Ibid.

<sup>333</sup> Ibid.

<sup>334</sup> Buxton 2009, *Gerard Maccreanor revisits the Piraeus building in Amsterdam*

approximately 16m, allowing for good cross-ventilation.<sup>335</sup>

### *Copenhagen*

Scandinavian cities followed the block reform trend, while adding the architectural language of Nordic Classicism. There are many examples of communal courtyard housing in Stockholm, Gothenburg, Oslo, Helsinki and Copenhagen. Located in the Danish capital and designed by Kay Fisker (1923). However, the Hornbaekhus is selected here because it is an enduring success as CCH because of its high quality architecture.<sup>336</sup> The motive for this housing development was the Hornbaekhus Cooperative Housing Association's will to offer affordable housing in a democratic political context.

Unique by its rational design, its strict alignment to the street edge, and its endless repetition of a simple window, this 5-storey building (net density 138dph; 290 apartments; studios, 1BR, 2BR and 3BR) is on a large urban block (75x185m), framing a green courtyard (55x165m). The ground floor level (35% footprint) is about 1.2m higher than the street footpath and the courtyard; this guarantees privacy to the ground floor apartments, allows for natural light and ventilation to the basement, and accommodates shared spaces for work and entertainment.<sup>337</sup> Retail areas are limited to the corners of the block.

Nonetheless, it is the communal courtyard – designed by G. N. Brandt to offer a large number of activities – that carries the greatest importance for the resident community. The large courtyard accommodates a basketball court, a small-netted soccer court, sandpits, and BBQ areas. The residents can easily supervise the children playing in the three differently designed playgrounds, and on the bicycle pathways (**Fig.99**).<sup>338</sup> “Another factor which contributed to the success of this block is the way the property was managed: as the private housing cooperation offered special rights to the tenants, the inhabitants developed a sense of responsibility and

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<sup>335</sup> Mcinerney 2014, *Piraeus*

<sup>336</sup> Mcinerney 2014a, *Hornbaekhus*, Sonne 2009, *Dwelling in the metropolis: Reformed urban blocks 1890–1940 as a model for the sustainable compact city*

<sup>337</sup> Mcinerney 2014, *Big City Life: High Density Pleasure*

<sup>338</sup> Large-roofed sheds provide for storing and repairing bikes. Mcinerney 2014b, *Hornbaekhus*



neighbourhood.”<sup>339</sup>

### *London*

Housing in London at the beginning of the twentieth century was mostly associated with the Garden City Movement that influenced the implementation of peripheral housing estates built with standalone suburban housing typologies. Nevertheless, it is important to mention the interventions promoted by the London County Council (LCC) to provide adequate housing for the working class and reform slum areas within the city.<sup>340</sup>

One of these cases was the Bourne Estate in Camden (1905), designed by Ernest Hadden Parkes and others, as a large 6-storey perimeter block with six slab buildings (also 6-storeys) located inside the large court, forming north-south oriented gardened courtyards about 15m wide, where at least one room had a view to the courtyard.<sup>341</sup> As for the Glasgow examples, the block accommodated a car path along the interior edge of the buildings, and had access from the streets through monumental public gates resembling the ones in the Vienna *Höffen*.

The calm of the courtyards balanced the retail along the major streets and contributed to the development’s liveability (**Fig.100**). The compound was partially destroyed during World War II. However, it is now a Camden Grade-II listed housing estate project for regeneration, commissioned to Mathew Lloyd Architects to provide two new blocks with 75 units.<sup>342</sup> A tennis court and a shared gardened courtyard were recently built, in recognition of the importance of creating spaces for communal activities inside the perimeter block.<sup>343</sup>

Some of the formality and monumentality of the Viennese *Höofen* could also be found in the work of G. Topham Forrest in the China Walk Estate in Lambeth

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<sup>339</sup> Sonne 2009, *Dwelling in the metropolis: Reformed urban blocks 1890–1940 as a model for the sustainable compact city*

<sup>340</sup> Colquhoun 2008, *Riba book of British housing: 1900 to the present day*

<sup>341</sup> Sonne 2009, *Dwelling in the metropolis: Reformed urban blocks 1890–1940 as a model for the sustainable compact city*

<sup>342</sup> <http://www.bdonline.co.uk/matthew-lloyd-gets-planning-for-camden-estate/5054614.article>

<sup>343</sup> Sonne 2009, *Dwelling in the metropolis: Reformed urban blocks 1890–1940 as a model for the sustainable compact city*

(1934). Here again, the buildings face an internal car path framing a public garden courtyard (**Fig.101**).<sup>344</sup> However, the most monumental example of CCH in London is Dolphin Square in Westminster (1937), designed by Gordon Jeeves and targeting ‘high class’ residents. The residential complex, with 10 stories/1310 apartments built on a 2.9ha lot, was intended to accommodate 3000 people (428dph).

The overall *parti* was to build a series of ‘houses’ arranged around a large courtyard that would provide for relaxation and recreation. For relaxation, the courtyard provides open gardens, a winter garden, and a palm court; a recreational centre offers restaurants, bars, a gymnasium, a swimming pool and squash courts. Other amenities are spread throughout the buildings: a children’s centre and nursery, library, music room, beauty parlour, laundry depot and various shops and services (e.g., luggage rooms and a valet service).<sup>345</sup> The compound is still considered a privileged housing estate, as the Dolphin House Serviced Apartments (ranging from studios to 3br apartments) are in high demand for short/long term rental. This demonstrates that this communal courtyard housing “is a telling example of how architectural quality can sustain a long-lasting success” (**Fig.102**).<sup>346</sup>

### *Frankfurt*

Although CCH examples can be found in many other German cities such as Hamburg and Munich, Frankfurt is chosen here for its recognition of communal courtyard housing as a functional/cultural housing option, even though the city had been known as a paradise for modern architecture projects. The need for public housing closer to the new industries (1925-30) generated the development of a large number of *Siedlungen* (settlements). These were not intended to be autonomous villages, but rather, housing districts in a larger industrial context with a minimum of locally provided facilities.<sup>347</sup>

Given the number of projects needed for immediate construction, the town

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<sup>344</sup> Gray and Winslow 1946, *Housing and citizenship: a study of low-cost housing* 64,69, 70

<sup>345</sup> Development Planning Services 2008, *Dolphin Square*

<sup>346</sup> Sonne 2009, *Dwelling in the metropolis: Reformed urban blocks 1890–1940 as a model for the sustainable compact city* 128

<sup>347</sup> Panerai, et al. 2004, *Urban forms: the death and life of the urban block* 95

planning office, under the direction of Ernst May, “provided a public service of architecture and city planning whose duties providing went beyond sketch themes and development control of projects. The concentration of powers and the means of implementation in the municipality avoided both the dispersal of responsibilities and any gaps between different levels of intervention”.<sup>348</sup> May was partly influenced by the Garden City Movement<sup>349</sup> initiated (1898) by Ebenezer Howard in England. However, he also wanted to maintain urban unity, which he did by avoiding the circular concentration of green areas around the centre, and replacing them with a green structure of private/semi-private/public gardens, market gardens, public parks, forests, and rural land radiating from the city centre.<sup>350</sup>

Three main housing types were used in the developed urban plan: the *Zeilenbau*<sup>351</sup> surrounded by public green areas; and two variations of the perimeter block used in Amsterdam – one with a small pathway giving access to large private gardens, and another with smaller private gardens with a larger semi-private space between. One example of the latter is the 4-storey perimeter block in Niederrad, close to the railway. Designed by May to maintain the continuity of the nineteenth-century city fabric, the block courtyard has both small areas of private space appropriated for the ground floor units, and a larger area in the centre of a semi-private garden for the use of all block residents (**Fig.107**).<sup>352</sup>

### *Berlin*

In Berlin, James Hobrecht expected to transfer part of the public costs of the streets to private developers, anticipating that they would build the internal streets in the very large blocks of his 1862 urban plan.<sup>353</sup> This publically accessed green connection between the buildings was similar to the one proposed in Cerdá’s initial plan (1859). However, in the absence of public legislation to ascribe this

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<sup>348</sup> Ibid. 91

<sup>349</sup> See **S\_4.2.1**, p. 184

<sup>350</sup> Panerai, et al. 2004, *Urban forms: the death and life of the urban block*

<sup>351</sup> **Ap\_A - Glossary**

<sup>352</sup> Panerai, et al. 2004, *Urban forms: the death and life of the urban block* 95

<sup>353</sup> Sonne 2009, *Dwelling in the metropolis: Reformed urban blocks 1890–1940 as a model for the sustainable compact city*

responsibility, the streets were not built and the yards were occupied by sequential rows of private backyards. This explains the size and the lack of permeability of the large Berlin blocks.

Perhaps under the influence of Josef Stübben's concept of the enclosed layout of urban blocks, Alfred Messel was the first architect in Berlin (1890-1905) to build perimeter blocks (Blockrandbebauung). By so doing, he attended to the working class's expectations of having access to infrastructure, healthcare, education, and entertainment closer to their homes. Messel acquired two urban blocks to construct mixed-use 6-storey buildings with large communal courtyards that integrated restaurants, bakeries, and other shops, as well as services such as libraries and nurseries to improve both the quality of neighbourhood life and the sense of community (**Fig.103**).<sup>354</sup>

The 6-storey mixed-use buildings of Albert Gessner also became renowned, not only for the large green courtyards, but also for the generic floor plans and the generous room heights. These provided for adaptability in the conversion of the apartments to office spaces (and back) without high remodelling costs. The apartments in these buildings still achieve high prices in the property market and, again, serve to corroborate their building typology as a housing model that is resilient to urban change. **Figure 104** shows a ventilated/lightened solution to the block corner in Gessner's building at Berlin-Charlottenburg (1906–07).<sup>355</sup> This solution avoided the less acceptable solution of avoiding building in the corner of the block and thus decreasing the residential density. Positively, the dimensioning of the apartments areas and ceiling heights foresaw the possibility of converting the apartments into office spaces, demonstrating an emerging trend for Live-Work.

The Greater Berlin competition (1908–10) raised many experimental solutions for the urban block. Innovative was the work of Bruno Möhring and Rudolf Eberstadt (3rd Prize), who proposed a large perimeter block limited to 5-storey buildings along the main streets. In the interior of the block, however, the height of the buildings was reduced to 3-storeys around an internal ring road (all buildings

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<sup>354</sup> Ibid.

<sup>355</sup> Ibid.

framed long courtyards), and again reduced to 2-storeys around the central green space. It is also relevant to mention Hermann Jansen's (1st Prize) proposal for the concept of the 6-storey uniform façades to constitute 'long walls' alongside streets that were slightly curved to contribute to more attractive architectural street perspectives (**Fig.105**).<sup>356</sup>

The 1920s brought to Berlin the avant-gardism of the Neues Bauen materials that Erwin Anton Gutkind utilised in his 3/5-storey mixed-use perimeter block Sonnenhof in Berlin-Lichtenberg. Access to the 266 apartments was through the courtyard, where a nursery separated the two different landscaped spaces (**Fig.106**).<sup>357</sup>

By 1984 – following the tradition of architectural international exhibitions (1910, 1931 and 1957) and the 1977 proposal of Josef Paul Kleihues – the Parliament of West Berlin promoted the International Building Exposition 1987 (IBA, Internationale Bauausstellung) with the theme 'The inner city as a place to live' (Die innerstadt als Hohnort). With the aim of celebrating Berlin's 750th anniversary and being the catalyst for a change in the city's image, international architects were invited to submit plans for 8500 housing units (3000 new/5500 renovated) for the expected demand of the new capital of the German Democratic Republic after the city's administrative union (1989).<sup>358</sup>

Led by Kleihues and created for the purpose, Berlin's New Building Section acted as a statutory authority mediating both the constraints of the housing/planning authorities and the interventions of IBA. Developers had to respond to a project already defined by the city planners in terms of the specific criteria related to the building and its future tenants: IBA's preliminary building design, cost estimates, and subsidy level. Their responses took the form of financial proposals. Successful proposals promised the highest quality of construction and guaranteed the lowest possible rent levels. At IBA's suggestion, the city selected subsidy levels that favoured those groups most in need of housing, and respected

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<sup>356</sup> Ibid.

<sup>357</sup> Ibid.

<sup>358</sup> Miller 1993, *IBA's "Models for a City": Housing and the Image of Cold-War Berlin*

the idea of a mixed-income community.<sup>359</sup>

IBA intervention in commercial spaces was limited to the ground level of the housing projects. The renovation of older neighbourhoods had to subscribe to IBA's conservative approach to block plans that recommended the preservation of the previous urban plans, the existing building heights, and traces of historical architecture. The final architectural and urban design results were very favourable for the city image and its integration with the eastern size as a new capital of the German Democratic Republic in 1989.<sup>360</sup>

Relevant for this inquiry was "the development of a communal identity among the residents".<sup>361</sup> This was made possible by changes to the design of the communal courtyards, which enabled them to be used as semi-private rather than public spaces. However, some of the courtyards were clearly abandoned, and public access sometimes occurred, because the working class residents (with limited resources) could not maintain them.<sup>362</sup> IBA's democratic intention to provide public access and block permeability through the courtyards was appropriate, given the size of the perimeter blocks. However, this strategy led to a lack of differentiation between the *res publica* and the *res privata*<sup>363</sup> and, consequently, to the loss of clear legibility of the public realm and the "impoverishing of the urban spatial morphology".<sup>364</sup>

### Tabula rasa developments

#### *Nowa Huta*

After World War II, countries under the direct influence of the Soviet Union created a new city model based on socialist concepts, "usually built to accomplish a single specific purpose: to house the workers of a large steel complex or mine, to

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<sup>359</sup> Ibid.

<sup>360</sup> Barrows 2010, *Reinventing Traditionalism: The Influence of Critical Reconstruction on the Shape of Berlin's Friedrichstadt*; Miller 1993, *IBA's "Models for a City": Housing and the Image of Cold-War Berlin*

<sup>361</sup> Miller 1993, *IBA's "Models for a City": Housing and the Image of Cold-War Berlin*

<sup>362</sup> Hudson 2013, *IBA | Architecture In Berlin*

<sup>363</sup> **S\_3.2.3**, p. 123

<sup>364</sup> Rowe 1983, *Comments on the IBA proposals* 121

relieve congestion in an adjacent industrial area, or to serve as a regional administrative center”. Examples are “Nowa Huta and Nowe Tychy in Poland, Sztalinvaros in Hungary, Dimitrovgrad and the new resort cities along the Black Sea in Bulgaria, Havirov and Vorosilov in Czechoslovakia, Titograd and Velenje in Yugoslavia.”<sup>365</sup>

Nowa Huta was built to symbolise the essence of the socialist urban model – an ideal socialist industrial city using a structure of communal courtyard housing for the workers of the first steel plant built in Poland, the Lenin Steelworks (Huta imienia Lenina – HiL). The chosen site for the city’s location was midway between the main road and the railways connecting Ukraine to the industrial Silesia region in Poland. It was positioned 7km northeast of the city of Cracow, in an effort to change the image of the bourgeois Cracow to that of a working-class city, and thus replacing socialist with market practices.<sup>366</sup>

Accordingly, Nowa Huta’s urban plan was designed by a team led by Tadeusz Rembiesa on a *tabula rasa* basis. It was to be built in accordance with a six-year construction strategy (1949-55), and was to house 200 000 people. The plan is reminiscent of some Renaissance/Baroque cities where the main streets radiate from the Central Square, and are framed by colonnaded buildings on three sides. It also copied the 1920’s American concept of ‘neighbourhood units’ that was similarly used in England at that time.<sup>367</sup>

The 3/7-storey residential clusters were built around communal courtyards, generally with the minimum width of around 20m, and with gates allowing for public access from/to the *allée* type avenues. This macro approach to communal courtyard housing represented the formal application of the socialist rules for a compact housing compound which, although more economical for the street network, was planned to promote the interaction of residents in the gardened spaces, to create a stronger socialist community, and to facilitate the supervision of children (**Fig.108**).<sup>368</sup> Communal facilities (social, cultural, and sporting) were

<sup>365</sup> Fisher 1962, *Planning the City of Socialist Man* 251, 255

<sup>366</sup> Ryder 1990, *Growth pole policy in Poland and the Lenin steel-works*

<sup>367</sup> Morris 1997, *British town planning and urban design: principles and policies*

<sup>368</sup> Zajac and Kotodziejczyk 2014, *Welcome to Nowa Huta!*

provided by the Lenin Steelworks and other facilities such as grocery stores, pharmacies, and day-care centres were located in the centre of each neighbourhood.<sup>369</sup> This system of providing basic facilities near the workplace was similar to the one applied in the Chinese *danway*.<sup>370</sup>

As 80% of Nowa Huta's inhabitants were of rural origin, their adaptation to the new housing concept was difficult. The socialist planners did not provide a distinct rural-like area within the new housing development to serve as a temporary reception location, or to allow the newcomer to adjust progressively to the urban lifestyle, albeit while maintaining some rural ways. Nor did the socialist system provide for the appropriation of private areas for the ground floor households, because that would be counter to the principle of equal housing conditions.<sup>371</sup> These, in my opinion, were significant shortcomings in the socialist planning of Nowa Huta's CCH.

Furthermore, the Socialist planners were not successful in restraining the population growth in Nowa Huta. This caused the equalisation of housing space (per capita) to decrease, and the standardised small unit space and sanitation (maximum 50m<sup>2</sup>) soon became inadequate for the workers' family growth. In addition, the standardisation of faulty construction methods (based on the use of early pre-fab concrete technology) limited the possibility of changing the apartment floor plans. As in other socialist cities, larger families were housed "in units clustered together adjacent to service areas for the families".<sup>372</sup> Not surprisingly, this became an obstacle "to regulate in a socially correct way the standard of satisfaction of housing needs."<sup>373</sup> Therefore, the lack of vision in providing floor plans that could

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<sup>369</sup> Stenning 2000, *Placing (Post-)Socialism: The Making and Remaking of Nowa Huta, Poland*

<sup>370</sup> **S\_3.3.1 - Housing**

<sup>371</sup> Yet, the rural newcomer housed in a temporary shed closer to the construction fields with very limited privacy "was unwittingly engaged in building the socialist future". Fisher 1962, *Planning the City of Socialist Man* 262

<sup>372</sup> *Ibid.* 252

<sup>373</sup> Adding to the fact that State enterprises built housing compounds for selected social groups, these factors highlighted the inefficiency of the socialist concept of 'urban uniformity' through 'neighbourhood units' that advocated an equalitarian dispersal of the population throughout the urban fabric, without regard to political or economic status. Partly as the result of these issues, and partly as the result of the socio/cultural refusal to accept the imposed socialist policies that were in complete contrast to the Polish traditions (such as the prohibition of churches on the site), Nowa Huta became one of the principal centres of the political movement Solidarity. This movement



accommodate family growth was a huge deficiency in the CCH planning.

With the political and economic changes in the following decades,<sup>374</sup> Nowa Huta, which was planned and created to be an independent town, has inevitably become a suburb of the liveable Cracow, where many of the former HTS workers found new jobs. Although it has lost most of the leisure and market spaces earlier supplied by the steelworks, the neighbourhoods have maintained the basic central facilities previously implemented by the original plan.

A recent ethnographic research study shows that “residents praise the accessibility of all essential services as well as the amount of green space in the district”,<sup>375</sup> and reject moving for “socialist-era housing neighborhoods (especially those built in the 1960s and 1970s, characterized by high-rise buildings made from pre-fabricated concrete), are popularly perceived as ugly and undesirable places to live, both because of their association with the previous regime and because subsequent postsocialist governments have not adequately kept up the existing housing stock”.<sup>376</sup> The study further indicates that although Nowa Huta has been seen since the 1950s “as a marginal part of Cracow, commonly associated with crime, especially soccer-related violence ... many Nowa Huta residents in fact see their district as a good place to live”.<sup>377</sup>

Although the development of the road connecting with Cracow has brought some new amenities closer to the town, there is a high demand for more places to eat, drink, and socialise. Accordingly, the current district governments are working together to have the town listed as a UNESCO heritage site based on its

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turned the ‘ideal socialist city’ in one of the main Polish sites against the socialist ‘realism’. Ibid. 262-264

<sup>374</sup> In the 1970s, Lenin Steelworks had approximately 43 000 workers, and Nowa Huta had around 250 000 inhabitants. Later, given the political and market changes, the steelworks decreased production and, consequently, unemployment, unknown during the socialist period, arrived. Presently, there are approximately 3500 workers in the steelworks (now called HTS - Huta Tadeusza Sendzimira), the majority of whom still live in Nowa Huta, which is now inhabited by 230 000 people. Stenning 2003, *Shaping the Economic Landscapes of Postsocialism? Labour, Workplace and Community in Nowa Huta, Poland* 763, 771

<sup>375</sup> Pozniak 2013, *Reinventing a Model Socialist Steel Town in the Neoliberal Economy: The Case of Nowa Huta, Poland* 119

<sup>376</sup> Ibid.118

<sup>377</sup> Ibid.119

architectural and urban design merits.<sup>378</sup> They expect that this distinction will make a large contribution to the valuation of the town identity, and attract tourism benefits as a catalyst for the development of local retail ventures, and the consequent street liveability.<sup>379</sup>

### *Runcorn Southgate*

Not as successful was the public courtyard housing model designed later by James Stirling at Southgate at Runcorn New Town, sited between Liverpool and Manchester (finished 1976). The town was planned as part of the post-1961 third-generation New Towns strategy, counting on an innovative mass transit system. The 5-storey estate (1500-unit/6000-resident) allocated one third of its apartments to two or three persons, another third to maisonettes for four or five, and another third to maisonettes for five or six. The apartments were dispersed evenly throughout the buildings to avoid the concentration of specific groups (e.g., social and/or age groups).<sup>380</sup>

Ground floor houses were planned for larger families (5-6 people), with bedrooms on the floor above, and dining/living areas facing private gardens. Maisonettes had access to the elevated pathways, living rooms with large balconies facing the courtyards, and bedrooms above. Smaller apartments (for 2/3 people) were on the top floors. The terraced apartments' layout permitted cross-ventilation, and had all living rooms oriented to south or west, facing the courtyards.

The buildings accommodated the elevated walkways on the street sides (that is, the south and east); streets were laid out in a cul-de-sac system to prevent noisy through-traffic; and views of the cars and car parking were screened by street trees and landscaped banks. The street grid was planned to access only two sides of the square courtyards (91.44m - 300ft), which had their dimensions based on precedents such as the squares in Bath and Edinburgh in the 18th century

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<sup>378</sup> Ibid.

<sup>379</sup> Zawada 2013, *4 bln PLN Plan to Develop Krakow's Nowa Huta District*

<sup>380</sup> Morris 1997, *British town planning and urban design: principles and policies* 113-122

(Fig.109).<sup>381</sup>

The housing model was both recognised<sup>382</sup> and criticised<sup>383</sup> by Stirling's peers. Independently of the diverse architectural criticism, the housing model was not accepted by residents either. Since the first constructions in the 1970s, the maisonettes were clearly unpopular for their lack of backyards and their overshadowing by the upper apartments. This criticism led Stirling to add private gardens to the ground floor 'houses' for the final phase. General criticism was directed at the commissioning Warrington and Runcorn Development Corporation for not revising the earlier phases according to the residents' opinions, the technical issues related to the buildings' poor insulation, and the private costs of the district heating system.<sup>384</sup>

Community criticism was largely directed at architectural elements such as the elevated pathways, the windows (either round or with round corners), and the coloured GRP (glass-reinforced plastic). The residents stated their displeasure at living inside 'washing machines'<sup>385</sup>, and named the housing development 'Legoland'. Margaret Davies, chairperson of the residents' association, stated that "the architect either had a brainstorm or was suffering from acute depression".<sup>386</sup>

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<sup>381</sup> Arnell, *et al.* 1984, *James Stirling, buildings and projects* 133

<sup>382</sup> Werner Seligman, Dean of the School of Architecture at Syracuse University commented in 1976: "The integration of historical precedent as part of the equation distinguishes Runcorn from the housing experiments of the 1920s. Runcorn posits the rational design procedure and historical precedent as well as an interplay between quantitative analysis and intuitive response. While the ideas behind the grid may be distantly related to computer technology, the use of historical precedent can be seen as the desire for continuity." in Seligmann 1976, *Runcorn: Historical precedents and the rational design process*

<sup>383</sup> However, Matthew Whitfield (Architectural Investigator at English Heritage) wrote in 2011: "... Stirling devised a scheme that in fact subverted these historic precedents as well as some contemporary architectural norms ... Concrete frames cast in-situ were filled with pre-cast concrete panels whilst multi-coloured coloured glass-reinforced plastic (GRP) cladding was used extensively to enliven elevations and introduce a hi-tech note to the scheme, one of the earliest uses of such a material in the UK ... Other than the neophile use of GRP and the overall impression that this might be housing for new planetary exploration as much as for a new town in the north, Southgate gained distinctiveness from its emphatic, legible geometries, not least in the large circular windows used across both phases. Multiple references are called to mind by this inventive elevational device, from the nautical (not to say cosmonautical) inspiration of the nearby Mersey and the imagined seafaring blood of the new town's overspill population, to a spirited exploration of classical Vitruvian geometrical theory spliced with some Kandinski and the interplay of colour and form ..." In Whitfield 2011, *Stirling in Runcorn*

<sup>384</sup> Wood 1989, *Jim's Runcorn housing in shock demolition vote*

<sup>385</sup> Morris 1997, *British town planning and urban design: principles and policies*

<sup>386</sup> Wood 1989, *Jim's Runcorn housing in shock demolition vote*

However, the system of courtyard spaces pleased the majority of the residents **(Fig.110)**.<sup>387</sup>

Runcorn Southgate failed for the same reasons that the socialist Nowa Huta did: the use of unappropriated technology (that is, unchangeable concrete panel divisions); the imposition of a new housing typology without considering community habits and preferences; the insufficient provision of small areas of private gardens; and a limited supply of mixed-use areas. However, the communal courtyards were praised by the majority of residents in both urban development cases.

### *Arcades-du-Lac*

Another example of post-modern housing that uses communal courtyards, is the Arcades-du-Lac, a contemporaneous development (1972) designed by Ricardo Bofill, and located in the new town of Montigny le Bretonneux, approximately 2km from the town centre and the railway station (7km from Versailles and 30km from the centre of Paris). The housing structure is divided into two areas. One borders the adjacent artificial lake and forms communal courtyards as “an ironic turning around of ... the urban, social utopian ideal of the last century, a Versailles for the masses”.<sup>388</sup> The other, the ‘viaduct houses’, is built over the water as a neo-roman aqueduct, double-imaged by its artificial lake reflection.<sup>389</sup>

“Bofill's aim was to instill a sense of collective civic pride by his historical borrowings. He sought to recall a past and to recontextualize it in a new urban

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<sup>387</sup> By the 1980s, many families moved out, the units fell empty, and the urban development became society's undesirables, the ground of extended drug use and criminality. In 1989, without consulting either the community or the architects, the developers decided to demolish all the buildings. This was mainly because the estimated costs to repair and maintain the buildings for the following fifteen years were greater than the estimated costs to build a new urban development. Pearman 2010, *Georgian precedents, modern realities: or, what went wrong at Runcorn?*

The whole demolition finished by 1990 and the existing residents requested a low-density housing model that used a traditional semi-detached typology applied in a cul-de-sac layout. With the new name of Hallwood Park, the redevelopment was commissioned to Merseyside Improved Homes, who built a combination of houses comprising 3/4BR (255) and 1BR (16). Rudlin and Falk 2003, *Sustainable urban neighbourhood: building the 21st century home*

<sup>388</sup> Hutcheon 1986, *The Politics of Postmodernism: Parody and History* 201

<sup>389</sup> Huxtable 2008, *On architecture: collected reflections on a century of change*

setting with a system of proportions and textures”.<sup>390</sup> Reducing the construction costs with an elaborate rationalisation that utilised sophisticated pre-fab techniques, Bofill was concerned with both the use of classicist architectural elements (such as columns, pediments, and cornices),<sup>391</sup> and the visual effect of the concrete panels. These were “tinted several shades of earthy brown and alternated with brown ceramics, in an attempt to tune into the vernacular of the French street, to avoid the disruptive effect of those grey, blank modernist structures”.<sup>392</sup> However, the use of large pre-fab panels constrained the internal distribution of space, and “some of the apartments leave a great deal to be desired in terms of convenient internal planning”.<sup>393</sup>

Nonetheless, both the fact that people can go down to the underground parking directly from their apartments, and the decision to avoid the inclusion of bars, restaurants, and shops to create a more ‘elitist’ community contributes to the permanent emptiness of the public streets, which are generally used only by visitors.<sup>394</sup> While Bofill had a greater understanding of pre-fab concrete technology (of both its joinery and visual effects) in the Arcades-du-Lac, he did not overcome its lack of flexibility with respect to internal wall changes, as it was a shortcoming also in Runcon and Nowa Huta. A positive aspect, however, was the choice of 4-storey buildings to frame the courtyards; this was proved by Martin and March to be the most efficient way to provide sun exposure in the rooms during the winter.<sup>395</sup>

Bofill considered the residents’ preferences in providing a discriminative CCH that fails to provide for liveability both in the semi-private courtyard spaces and in the public open spaces, because its design is incompatible with extended outdoor activities. He designed a car-dependable model distant from workplaces and amenities, thus targeting an exclusive society. This is clearly a model to avoid in designing CCH for social diversity, liveability and sustainability.

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<sup>390</sup> Hutcheon 1986, *The Politics of Postmodernism: Parody and History* 201

<sup>391</sup> Schuman 1986, *Utopia Spurned: Ricardo Bofill and the French Ideal City Tradition* 26

<sup>392</sup> Hutcheon 1986, *The Politics of Postmodernism: Parody and History* 201

<sup>393</sup> Broadbent 1996, *Emerging concepts in urban space design* 255

<sup>394</sup> Ibid. 255

<sup>395</sup> Martin and March 1972, *Urban space and structures*

### *Tallet 8 (8 House)*

Already built in the 21st century (2006-2010), the 8 House (Tallet 8) was designed by the Bjarke Ingels Group (BIG). Located in Richard Mortensens Vej, a new planned expansion of Orestad, 7km south from the centre of Copenhagen, the building is easily accessed by bicycle and public transportation (the new mini-metro takes 12min to Copenhagen Central Station, and 10min to the airport). It is a mixed-use building (475 dwellings: town houses/apartments/penthouses + 10 000m<sup>2</sup> office space + retail)<sup>396</sup> framing two courtyards that form a stylised footprint of the number 8, with the main axis oriented south-north. The northern courtyard is bound by office spaces; hence, the building heights around it purposely favour the sun penetration on the higher internal façades only. The larger southern courtyard was planned as a more communal space, with large sun exposure on the ground (**Fig.114**).

Even though the courtyards can be publically accessed, this example was chosen because it attempts to produce a vertical townhouse village accessible by ramped pedestrian/cycling pathways. Also important are the front yards of these dwellings (170), private appropriations of space that allow for individualization of furniture and choice of plants for the provided planters.

Tallet 8 is an exemplary housing proposal. It has been recognised by many awards, including the 2012 AIA Institute Honor Award for Architecture. The award jury commented: “People really ‘live’ in this newly created neighborhood with shopping, restaurants, an art gallery, office facilities, childcare, educational facilities and the sound of children playing. This is a complex and exemplary project of a new typology.”<sup>397</sup>

### **Summary: CCH precedents**

The examples described above include features relevant to this study. Specifically, this summary now highlights (in list format, annotated with my comments) the features that are most important to the components (buildings,

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<sup>396</sup> Mcinerney 2014, *House 8*

<sup>397</sup> The American Institute of Architects 2012, *8 House*

courtyards, blocks and streets) of the urban design prototypes.

### ***Buildings***

- The Roman *taberna* house type was an early example of the Live-Work house type that has since been used worldwide (This housing type was adapted to design the row houses of the CCH double with the innovation of accessing the communal courtyard for family enjoyment)
- The Roman 'In-line House' stairs to the *coenacula* gave access to two units per floor, thus allowing the units to have windows facing both the street and the central open space (This early appearance of the point access building with double orientation apartments was considered the appropriate type to guarantee both the thermal comfort and the lifestyle of the Brisbane subtropical context)
- The Glasgow Plan policy established that the height of the buildings should be equal to the width of the streets (This was considered as insufficient to guarantee sufficient solar exposure in subtropical streets and pathways)
- Hilberseimer believed that high-rise housing with communal facilities was the best type of housing for childless couples and single people. (While this may apply to the former group, in my view, older people living alone would prefer to live in CCH, as corroborated by the examples of the Frauen-Werk-Stadt I-II buildings in Vienna)
- In Runcorn, ground floor houses were planned for larger families (5-6 people) with bedrooms on the upper floor, and dining/living areas facing private gardens; In China ground floors with private gardens are also the preference for the families with elderly members
- Panerai et al. affirm that small private gardens or their substitutes (the balconies) in Amsterdam contributed in personalising and individualising the dwellings (The internal façade has also been shown to be an intimate block edge in other CCH examples such as the Liesing Residential Quarter project in Vienna)
- Broadbent states that parking spaces underneath solve a fundamental problem: the accommodation of cars close to where people live without cluttering, or even destroying, the scale of the urban spaces is appropriate for the enhancement of the urban green structures (However, multiple entries to this kind of parking can jeopardise either the courtyard spaces [if access is by the internal edge through the courtyard], or disrupt pedestrian movement on the sidewalks if the garage doors are placed on the street edge)
- The courtyards in Stirling's project both for Runcorn and PREVI seemed to please the majority of the residents (In my opinion, the centralised garden pavilion of Runcorn limited the courtyard space which, in turn, limited the

## ***Buildings***

number of outdoor activities)

- If one compares Stirling's projects in Runcorn and PREVI, it can be noted that both had issues related to large pre-fab concrete walls at the inefficient junctions (This was less noticeable in the PREVI small house core that was later adjusted with local construction techniques)
- Stirling assumed that the same 'modern' architectural elements (including the grey, blank modernist structures) would be positively accepted in different socio/cultural contexts (Even though his round windows were viewed in PREVI as a distinctive element, in Runcorn they were considered an aggressive imposition on the residents' concept of cultural housing; therefore, in the Runcorn project, Stirling failed to anticipate the technical and social consequences of his buildings and ideas)
- Boffil was mostly successful in the Arcades-du-Lac in using pre-fab concrete for both the advanced control of assemblage techniques, and in the strategies used to apply colour and architectural elements appropriate to the local lifestyle; moreover, Boffil succeeded in establishing a clear distinction between public and semi-private spaces within the courtyards and fully private spaces within the blocks themselves (This distinction was also made in the urban design units of this inquiry)
- Boffil's courtyard designs aimed to produce picturesque gardens, rather than to provide spaces for the residents' (mainly children's) outdoor activities (Courtyard designs in this inquiry go one step further in planning for both microclimate moderation and outdoor activities compatible with the subtropical climate)
- The example of the Hornbaekhus building in Copenhagen showed that the ideal courtyard space for an extended amount of activity could be inappropriate in terms of ventilation and block permeability within the Brisbane subtropical context
- When implementing culturally acceptable architectural elements and appropriate courtyard spaces, these examples emphasise the value of recognising local lifestyle, independent of contemporaneous architectural concepts or aesthetics (This value was respected in the design of both buildings and courtyards in this study)
- Martin and March's<sup>398</sup> calculations evidence that 4-storey courtyard buildings are the most efficient way of covering the ground in terms of sun penetration of each room in cold climates (This fact was further applied in this inquiry, with the studied relationship between building heights and courtyard dimensions appropriate for subtropical climates)
- The examples of the Frauen-Werk-Stadt I-II in Vienna showed contemporary

<sup>398</sup> Martin and March 1972, *Urban space and structures*



### ***Buildings***

women's preferences for CCH that integrates a kindergarten, apartments for the disabled, a communications centre, apartments for the elderly, and a ground level that accommodates retail areas and barrier free access to the courtyard (This corroborates the fact that the strategies of personal choice and diversity of social mix applied in the designed CCH prototypes in this study are appropriate to courtyard housing developments)

- The example of IBA in Berlin and Parque das Nações in Lisbon demonstrated that the invitation to international architects to plan projects for new housing developments can work as a catalyst for a change in a city's image and attract new residents and future visitors

Cerdá planned for social diversity, proposing 4 housing types for the middle and upper classes, and 6 housing types for working classes; this was the appropriate proportion for contemporary Barcelona (This inquiry proposes a diversity of housing choices adequate to Brisbane's housing market context in offering one, two and three bedroom dwellings)

### ***Blocks***

- Sha'ar Hagolan's model established the distinction between 'urban' property domains – the private (nuclear families units), semi-private (communal storage rooms and courtyard), and public (streets and open spaces) – in a legible sequence of spaces and activities (I believe that this is still the best approach to the implementation of courtyard housing)
- Early perimeter blocks in Europe did not consider courtyards as spaces for outdoor activities; the length and width of blocks were adjusted using minimum dimensions to achieve effective ventilation by designing the axis of the courtyards parallel to the prevailing winds (This is completely inadequate for a subtropical lifestyle)
- Carrick's plan (for Glasgow) implemented a 4-storey perimeter block to produce an 18m (60ft) wide courtyard within a 38m square perimeter block – 50m including the streets. This commonly generated regular perimeter courtyards framed by 4-storey buildings arranged on the street's edge according to a gridiron (This inquiry replicated these relationships in the urban design prototypes)
- In my opinion, the traditional English arrangement of parallel service routes to give double access (front and back, principal and service) blurs the distinction between the interior and exterior spaces, and the public and private realms (This study supports the clear separation of the public and private/semi-private realms)
- Cordoba courtyards use an iron gate at the street entrance to guarantee

### **Blocks**

privacy, and naturally place services and amenities within walking distance of all housing blocks (CCH prototypes follow this example)

- Cerdá created a new urban culture by bridging the gap between the urban roles and functions of a metropolis and a healthy lifestyle (Accordingly, the Collage Plan adapts the courtyard prototypes to the subtropical lifestyle)
- This inquiry also utilises Cerdá's urban growth outline concepts in the proposed processes of parcelling, constructing, and urbanising
- The Phipps Garden Apartments (4/6-storeys) served as an example of communal courtyard housing where the courtyard had appropriate dimensioning and adequate planting of varied trees to serve as a functional community space (This was essential in all courtyards design in this inquiry)
- Leon Krier asserted that maxi-perimeter blocks in Europe and USA sacrificed too much of the public realm to private space, thus decreasing public permeability, and weakening the relationship between buildings and the city (This was considered when dimensioning the CCH in this study)
- In Frankfurt, the concentration of power in the municipality prevented the dispersal of responsibilities and any differences between levels of intervention; this was also the case in the IBA Plan to rebuild Berlin and in the plan to build Parque das Nações in Lisbon
- Nowa Huta was built as an ideal socialist city, using a structure of residential clusters around communal courtyards to promote the interaction of residents in the gardened spaces; however, these spaces were gated to guarantee the internal security of the precincts
- Following the American concept of 'neighbourhood units' that was similarly applied in England, Nowa Huta precincts included grocery stores, pharmacies and day-care centres in the centre of each neighbourhood (These kinds of facilities are included in the design of all the urban design units in this inquiry)

### **Communal courtyards**

- Since Sha'ar Hagolan, communal courtyards were the stage for family/clan activities, although these spaces diminished quantitatively and qualitatively with the evolving compactness of the settlements (The CCH in this inquiry proposes to reactivate the social stage function of semi-private courtyards)
- The minimum width of the courtyards utilised to guarantee visual privacy between fronting windows in the Glasgow Plan was 18m. (This dimension was also utilised as a minimum distance between buildings in the Bowen Hills TOD previously proposed by ULDA)

### ***Communal courtyards***

- At the beginning of the twentieth century, the reduced courtyard width (4-6m) both in California and Europe served almost exclusively to provide a landscaped access to the dwelling; although the reduced courtyard space was not appropriate for outdoor activities, it was most common for women to sit in front of the ground floor units to chat with the neighbours while watching their children play (In my opinion, this custom can be accommodated in both the CCH courtyards and the group-public spaces of CH in subtropical contexts)
- In 20th Century California, some courtyard spaces served to build the residents' dreams around a semi-private void (This can still be achieved today with the proposed courtyard housing)
- Camilo Sitte affirmed that all the vegetation in a city can be divided into two categories: the decorative greenery and the sanitary greenery [the sheltered interior of large perimeter blocks] (This belief corroborates the current concepts of urban green structures)
- In Socialist Vienna, it was common to divide the *Höffen* into multiple courtyards (This is replicated in this inquiry in the CCH double)
- The size of the *Höffen*, and the consequent size of the block, could be credited with the multi-functionality of both the courtyards and the block, and the feature of mirroring the public open space (the square/piazza/plaza) inside the private housing compound (I believe that this created a lack of distinction between the public and a working class realm that was then justified by a socialist society; however, it would be inappropriate in contemporary Brisbane society)
- After the urban block reform in Amsterdam, semi-private areas were generally gardened and used as a central communal space by all the block residents; however, some smaller areas were maintained for private use (This strategy was replicated on the CCH prototypes)
- Dolphin Square in Westminster is a telling example of the way in which architectural quality can sustain long-lasting success (However, similar block size would be incompatible with Brisbane's subtropical lifestyle)
- IBA (Berlin) demonstrated that CCH could serve as a catalyst to enhance the sense of community and that the construction policies managed by a statutory authority was vital to guarantee the quality and the timeline of construction.

Discussions about how these topics are utilised in the current design are documented in **C\_5** and in the Appendices. The courtyards attributes reviewed in this section are further discussed in section **S\_3.2.3**.

### 3.2.3 Conceptual and typological synthesis

The graphic synthesis of courtyard attributes is included in Drawing Set, page 4 (DS\_4)

The history of architectural and urban culture is seen as the history of types. Types of settlements, types of spaces (public and private), types of buildings, types of construction ... The dialectics of buildings and urban spaces, of solid and void, of private and public realm can no more be exclusively seen as the result of political, social and economical constraints, but as the result of rational intention of culture.<sup>399</sup>

Leon Krier

Krier's comment introduces the complexity of classifying types. As seen earlier, Macintosh claims that a 'true courtyard house' must have two specific conditions: it must have rooms with windows that look inwards; and it must enclose a private outdoor space. However, the classification of private and semi-private courtyards as a comprehensive housing taxonomy that takes into account proportions, size and form in relation to social, cultural and climatic parameters over a large period of time is a vast undertaking. To date, this task been only partially accomplished by a few researchers. Even Amos Rapport<sup>2</sup> acknowledged that his analysis of two hundred 'potential courtyard houses' examples located in more than forty countries since the Neolithic Period,<sup>400</sup> and documented in *The nature of the courtyard housing: a conceptual analysis*, was only a starting point for understanding the nature, the possible manifestations, and the potential relevance (now and in the future) of courtyard housing.<sup>401</sup>

With the aim of clarifying what was meant by 'courtyard housing', and identifying its main attributes, Rapoport posed a series of sceptical questions. Rather than requiring an immediate answer, the questions were posed to motivate further systematic work that employed multiple criteria structured by comprehensive principles of categorisation. Although such a comprehensive taxonomy is out of the scope of the current study, this section does clarify the common attributes of 'courtyard housing' in the forms of courtyard houses (CH) and

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<sup>399</sup> Krier 1978, *The reconstruction of the city*

<sup>400</sup> Rapoport is the author of an extensive list of publications relating environment, culture and housing. See Miller 1972, *A bibliography of the writings of Amos Rapoport*

<sup>401</sup> Rapoport 2007, *The nature of the courtyard housing: a conceptual analysis*, 68

communal courtyard housing (CCH), and with respect to their function both as households and as part of the urban fabric.

Before proceeding with the description of the courtyard housing attributes, however, I should reference the conceptual difference between ‘form’ and ‘shape’ that is crucial to the analysis of the courtyard house precedents, as defined by Rapoport: “Form refers to the fundamental organization of space (as well as time, meaning and communication). In this regard, changes in shape and/or materials are less fundamental than relationships among domains...It follows that a court can be square, rectangular, round or amorphous, and its boundaries can be defined in different ways.”<sup>402</sup> The spatial organisation of space (form) of the courtyard house is oriented inward, to one (or more) uncovered void(s). Therefore, this form is fundamentally distinct from the houses that face outward and establish a closer relationship with the public domain. Accordingly, these singular forms have generated two different settlement types that have coexisted for eight thousand years.<sup>403</sup>

A household is, for the most part, a private domain, the *res privata*: a concept related to the human ambition to be independent from the public domain, the *res publica*.<sup>404</sup> This autonomy is established in wide-ranging cultures by the communal rules and/or government laws of prevailing institutions as a means of social organisation.<sup>405</sup> The discourse surrounding the difference between ‘private property’ and ‘private domain’ is a complex one. Generally, however, the private domain is extended to the limits of the private property.<sup>406</sup> Nevertheless, these limits have been physically articulated in various ways, depending on factors such as the way in which the dwelling symbolised the owner’s autonomy, and the strictness of the ties between the private and public domains in each community. Rapoport explains “...the forms of these linkages (and hence intermediate domains) further

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<sup>402</sup> Ibid., 58

<sup>403</sup> Ibid., 58

<sup>404</sup> A more detailed discussion about *res publica* versus *res privata* in Kaminski 1991, *Res Publica, Res Privata* 349, Note 8,

<sup>405</sup> Hirshleifer 1980, *Privacy: Its Origin, Function, and Future* 649-669

<sup>406</sup> Rapoport 1977, *Human aspects of urban form: towards a man-environment approach to urban form and design* 289-298

tend to vary more than either the dwelling or settlement, and change more over time. These are often studied in terms of the sequence of outdoor spaces – e.g., cul-de-sacs, streets, avenues, neighborhoods, etc.; or fence, gate, path, steps, porch, door and hallway.”<sup>407</sup>

What has distinguished the traditional courtyard house from the houses that face outward – with more permeable boundaries and less privacy – is that the only opening in the built boundary is a door and/or screen wall that works as a strict transition or ‘lock’ between domains. This peculiar privacy mechanism is independent of the shape of the domains and can be considered as the first of the attributes of courtyard houses.<sup>408</sup> This attribute classifies dwellings previously mentioned – such as the Bagdad courtyard house, the Beijing *siheyuan*, and the Bali compound – as a part of the courtyard houses group.

It is relevant to note, however, that the privacy attribute only applies if the boundary walls are high (that is, above eye level at the ground level). Therefore, the continuous enclosing structures guarantee that privacy is maintained in all the property limits, allowing for controlled access only at the ‘lock’ checkpoint(s). Accordingly, this visual privacy depends on the equivalent heights of the adjacent buildings, and limits the mixing of courtyard houses with medium and high-rise typologies. Subsequently, it also constrains the net density of the neighbourhood.

In this inquiry, the concept of visual privacy was an adaptation of the perception of ‘enclosure’ described by Spreiregen in the *Architecture of Towns and Cities*. Spreiregen affirms that, “our normal frontal field of view in a space determines the degree of enclosure – the sense of space – which we feel. The feeling of enclosure, whether channel or reservoir, is largely determined by the relation of viewing distance to building height as seen by our normal frontal field of view”.<sup>409</sup> However, this criterion does not contemplate other privacy considerations such as those related to noise privacy, which seem to be ubiquitous in any kind of compact settlement.

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<sup>407</sup> Rapoport 2007, *The nature of the courtyard housing: a conceptual analysis*, 58

<sup>408</sup> Ibid.

<sup>409</sup> Spreiregen 1965, *Urban design: the architecture of towns and cities*, 75

Independent of the ‘limiting walls with a lock’ form, the shape of buildings inside the walls would control the natural air flow inside the courtyard, either by enclosing the courtyard connecting the corners in colder climates (for example, in the Beijing *siheyuan* and the English atrium house) or opening the corners in warmer climates (as in Balinese and southern Indian compounds). The ‘lock’ type varied with time and across cultures, and included opaque double doors with screen walls (Baghdad) and transparent iron gates (Palma de Mallorca), to name just two of many variations.

Further considerations of privacy should be considered with respect to CCH, where the concept of privacy might be amended by other factors according to cultural canons. Factors that also need consideration in these housing types is how a communal courtyard can be currently shared, and the dimensions that would achieve various levels of privacy both inside the dwellings and inside the courtyards. Additionally, as seen in the previous examples, current concerns about the cost of achieving thermal comfort in some climatic conditions might be greater than privacy concerns when the location of the dwelling guarantees the family’s security. These issues are further discussed in **Chapter 5**.

The second attribute of the courtyard house could be the central location of the courtyard, which serves both as access to other spaces and as a gathering space. However, this could raise an important question: Are interior/covered spaces, such as the ancient Etruscan circular hearth spaces that might be the origin of the courtyard as a central open space;<sup>410</sup> some contemporary Korean apartments where the central area works functionally as the traditional Korean courtyard;<sup>411</sup> or even the new atria buildings with the communal court covered with skylights, equivalent to courtyards?<sup>412</sup>

At this point, it is appropriate to add a third attribute—a view of the open sky – as a condition for a space to be defined as a ‘courtyard’. This special ground space should always be open to the sky – the perennial void – to induce the spiritual

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<sup>410</sup> See **S\_3.2.1**, p. 49

<sup>411</sup> Lee 1991, *Continuity and consistency of the traditional courtyard house plan in modern Korean dwellings*

<sup>412</sup> Saxon 1986, *Atrium buildings : development and design*

notion of the ‘earthly paradise’ or ‘well of heaven’. The controlled environment facilitates the benefit of privacy and beauty and, in a figurative way, it also allows for the virtual ownership of the sky space above.

The fourth attribute is that the space formed by the courtyards is a setting for human activities. It is part of a system of settings, which begins in the most intimate dwelling space (such as the alcove or the bedroom) and continues in the sequence of public settings external to the dwelling (such as recreational, commercial, and religious spaces).<sup>413</sup>

Whether a house type is a courtyard house or not depends on pre-established attributes. Even though the four characteristics of the courtyard house discussed above (privacy, means of access, a bridge to the sky, and setting) are the attributes frequently found in many different periods and locations, others could be added to the list.

A fifth attribute, for example, could be the differentiation of the courtyard house as an urban ‘row house’ – that is, it is attached to the neighbour’s houses with party walls – or as a more ‘rural’ atrium house (previously seen) that stands alone on a large periphery lot. The ‘row house’ is commonly mentioned as being more ‘efficient’ in terms of distribution of spaces within an urban lot. However, the efficiency, which in the past was related either to limited construction techniques (such as those in ancient cities in China) or to building codes (such as those in early twentieth century Germany), is difficult to compare with the efficiency of the high-density CCH typologies (such as the classic Dolphin Square in Westminster or the recent Tallet 8 in Copenhagen). In this inquiry, this attribute will be related to the minimum lot area necessary for both CH and CCH to achieve the practical goals related to the lenses of inquiry.

Even though the size and functions of the courtyards have been primarily related to the owners’ wealth, the sixth attribute for this brief taxonomy could be the size of both CH and CCH combined with their function and with their hierarchical sizes in the cases of multiple courtyards within a housing compound.

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<sup>413</sup> Rapoport 1990, *Systems of activities and systems of settings*



Accordingly, the courtyard size influences the type and quantity of elements (organic and inorganic) occupying the ground area. As previously reviewed, the most constant element has been water, generally collected by the adjacent roofs and greenery. From the buried courtyards of the Yellow River Valley in China to the courtyards of the Umayyad Caliphate, the water has been limited either to a single well, or expanded to large gardens with channels, chutes and fountains; similarly, the greenery has varied from random flower pots to wide lawns and large trees.

These basic elements add up to the open sky and the unsealed ground, inherent characteristics of the most discussed attribute of the courtyards: the capacity of the courtyard housing to be climatically adaptable to specific sites, or even further, the capacity of the courtyard design to moderate a preferred microclimate inside the courtyard. As natural airflow and solar exposure have to be controlled according to the courtyard housing location and climate, courtyard dimensioning and wind catching strategies might become very significant in guaranteeing thermal comfort both inside the courtyard space and in the housing compartments facing it.

To complete this brief list of attributes, one could conclude that the sixth courtyard housing attribute is the “emphasis on individual identity” of the residents. This is because the courtyard house, when an inconspicuous part of the urban fabric, is “not as effective in communicating meanings externally as are free-standing houses ... Increasingly, as identity, social relations, status, and the like have become more heterogeneous, varied, flexible and dynamic, the meanings projected by dwellings have become even more important”.<sup>414</sup>

Accordingly, it is essential to associate this attribute with the territoriality that CCH can provide in establishing additional communal areas to regain the pleasure of face-to-face contact that is sometimes lost within the neighbourhood,<sup>415</sup> as in the example of the buildings commissioned by the Women’s Office of the City of Vienna. Furthermore, the association of individual identity and territoriality could be expanded by the location of the dwelling in the urban context, where the quality

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<sup>414</sup> Rapoport 2007, *The nature of the courtyard housing: a conceptual analysis* 65

<sup>415</sup> Esser 1978, *Designed Commuality: A Synergic Context for Community and Privacy* 21

of the public realm of the neighbourhood precinct and the size of the semi-private courtyards emphasise individual identity as a representation of distinction.

The previous sections have demonstrated that individual identity is a factor in the personalization of both ground floor gardens and upper balconies. However, individual identity did not appear to be an important factor in the courtyard façade (the internal edge); indeed, completely anonymous street façades could have been seen to be the preference for courtyard housing located in a pleasant urban context; such was the case with the earlier-mentioned Hornbaekhus and Piraeus buildings. This might be explained by the possible relationship between anonymity and privacy, where the former is accomplished by the continuity of architectural elements (such as windows and balconies), and the latter is achieved by the proximity of the dwellings' compartments. In any case, the Double-Edge concept (developed later in this inquiry)<sup>416</sup> can cater for both preferences in the same dwelling/building: the street façade can respond to the preference for anonymity, while the courtyard façade can accommodate identifiable personal features (such as flowerpots and furniture).

From a spatial perspective, however, it can be established that the most important characteristic of the courtyard as an architectural component is its capacity to be a singular place. As a semi-public, semi-private, or private domain, this special place has been contained by its edges, which have been traditionally built to act as theatre sets for the staging of multiple outdoor activities. Accordingly, the concept of 'place' is narrowly connected to closeness and privacy where the "absence of, or a perceived threat to an existing state of privacy is psychologically very disturbing".<sup>417</sup>

From a psychosocial perspective, the courtyard has traditionally been used, both publically (by the wider community) and privately (by families), as a social catalyst to gather people. This characteristic was demonstrated by the previous examples of CCH, and typically related to the gathering of the elderly, women, and children. The analysis of the dimensions and preferred designs to maximise these

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<sup>416</sup> S\_5.1.4 – Blocks, p. 229

<sup>417</sup> Sneddon 1986, *Privacy in Residential areas : A development control dilemma* 16

courtyard functions are given in **C\_5** (Design Framework).

As already seen, either laid down in an organic spread, or determined by a rigid grid in modular alignments, the urban fabric had voids that were created by courtyards spaces. As in a block of Swiss cheese where the holes are not cheese but are yet an intrinsic part of the cheese, courtyards are not a built fabric but are also an intrinsic part of it. The holes in the Swiss cheese are known as 'eyes'; similarly, it makes sense to think that the courtyards are the eyes of the cities, staring at the esoteric sky. Thus, it has been argued in the literature that the best characteristic of a courtyard is its void.

This, however, is a simplistic definition, a two dimensional approach, commonly applied in figure-ground primary analyses. Figure-ground drawings have two fundamental limitations: they neglect the vertical dimension and, even more importantly, omit the graphic representation of vegetation (even in two dimensions).

Courtyard voids should accommodate landscape elements as a fundamental volumetric presence; in this way, the courtyard loses its 'voidness' and becomes an elaborated volume that can be an inherent part of the urban green structure, rather than simply a part of the built fabric. In this study, therefore, a courtyard is defined as 'an uncovered space enclosed by building(s) and tall wall(s)' (with height above eye level at the ground level).

### 3.3 PLAN PRECEDENTS: BEIJING AND LISBON

The previous sections identified the typological precedents of courtyard housing; the current urban plans presented in this section now serve to introduce complementary information related to maintaining (Beijing) and creating (Lisbon) courtyard housing in urban areas. The selected sites are similar in size, however, they are designed for completely different cultural and urban contexts.

Shichahai in Beijing is a consolidated area filled with traditional courtyard typologies that are protected by a recent conservation plan.<sup>418</sup> Parque das Nações in Lisbon is a renowned urban design intervention (1995-2010) made in a *tabula rasa* development over a brown-field. An understanding of the two plans provides comprehensive data on plan management and the conditions necessary for successful housing implementation. The two plans were chosen for the peer and public recognition of their effective management in accomplishing their implementation objectives.

Relevant summaries of each plan can be found in the end of the following sections (**S\_3.2.1** and **S\_3.2.2**). Comparisons and analysis of the two plans are located in **S\_3.3.3**.

#### 3.3.1 Shichahai, Beijing, China

The old city of Beijing was chosen for this study because of its impressive mixture of courtyard house typologies that have structured the whole city throughout its history. The Shichahai area was selected for its diversity of land-uses, its minimalistic road structure, the use of its lakes for entertainment, and for its capacity to attract retail and tourism visitors based on its architectural inheritance and its urban density. The Shichahai Conservation Plan is reviewed to inform the policies related to the strategies to maintain the existent social/cultural characteristics as a way to contribute with the liveability and sustainability of the whole area.

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<sup>418</sup> Beijing shi gui hua wei yuan hui 2002, *Conservation planning of 25 historic areas in Beijing old city = Beijing jiu cheng er shi wu pian li shi wen hua bao hu qu bao hu gui hua / Beijing Shi gui hua wei yuan hui*

**Table 1. Baseline information: Shichahai Conservation Plan**

<b>Project name</b>	Conservation Planning of 25 Historic Areas in Beijing Old City: Shichahai Area
<b>Project type</b>	Conservation plan
<b>Location</b>	North-west side of The Forbidden City
<b>Date approved</b>	1992
<b>Construction to be completed</b>	N/A
<b>Size</b>	301.57ha
<b>Planning team</b>	Beijing Municipal City Planning Commission and School of Architecture at Tsinghua University
<b>Client</b>	Beijing Municipal Government
<b>Managed by</b>	Beijing Municipal Government

### **Context**

#### Planning

It was relevant to identify Beijing's planning background to frame the Shichahai Conservation Plan. The description of this material is located in **Appendix D.1**.

#### Urban structure

Beijing (literally meaning 'northern capital') is one of the four municipal-provinces of the thirty-one provinces of China. The city's total municipal population was 9 million in 1980, and had increased to 19.6 million by 2010.<sup>419</sup> The heart of the capital is its historical core, which is spread over an area of 62.5km<sup>2</sup> and is home to a population of 1.3 million people,<sup>420</sup> representing a population density of 258ppha.

Beijing has had a mono-centric structure, served by a ring road system since the 1957 Master Plan, which programmed four road rings to serve the urban developments, with three of these connecting to the suburban areas, and eighteen roads radiating from the centre. The first ring road existed from 1924 to 1951, and was defined by the first six roads around The Forbidden City, which were served by tramlines. The second ring road was mostly built (1967-92) over the demolished

<sup>419</sup> According to the 2011 census (Beijing Statistic Bureau), 86% is classified as urban population.

Yang, *et al. Beijing*, 1

<sup>420</sup> Yan 2004, *Urban spatial patterns and infrastructure in Beijing*

ramparts of the Imperial City wall.<sup>421</sup> The third ring was completed two years later in 1994, the fourth ring was completed in 2001, the fifth in 2003 and the sixth was fully opened to traffic in 2012.<sup>422</sup>

The ancient urban structure of Beijing was defined by *hutong* and *siheyuan*. A *hutong* is a small alley varying in width from 40cm (Xialaba *Hutong*) to 9m (Fig.115).<sup>423</sup> As seen in S\_3.2.1, *siheyuan* is the typical Beijing dwelling that varied in size according to the hierarchical importance of the householder. *Hutong* and *siheyuan* were the veins and the cells of older Beijing.<sup>424</sup> Their massive construction started as part of the strategy used by Haiyun, Genghis Khan's grandson, to populate the Grand Capital of the Yuan Dynasty (1260-1368). By 1949, Beijing had 6000 alleys – 1330 being recognized as *hutong*<sup>425</sup> – and the city fabric of *hutong* and *siheyuan* occupied 1300ha.<sup>426</sup>

The term *hutong* is believed to originate from the word *hottog* in Mongolian, meaning 'water well'. It is also possible that it came from the Yuan Dynasty *hulong* (fire lane) or *longtong* (open lane). These terms refer to the gaps between the old buildings, which were used to prevent fire enveloping the building blocks in case of a city fire.<sup>427</sup> To make possible the north-south orientation of the *siheyuan*, the *hutong* developed along the east-west direction, commonly 60m to 70m apart. The threshold between the *hutong* and the urban dwellings was celebrated by gates built under a code of various architectural designs that represented a rigid

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<sup>421</sup> Campanella 2008, *The concrete dragon : China's urban revolution and what it means for the world*, 114

<sup>422</sup> Yang, et al. *Beijing*, 5

<sup>423</sup> The streets' type in old China was defined by their width: "A 36-meter-wide road was called a big street. An 18-meter-wide one was called a small street. A 9-meterwide lane was called a *hutong*. The shortest one is just 10 meters long, and the narrowest *hutong* is only about 40 centimetres wide." Zhuo 2012, *Hutong and Siheyuan in Beijing*

<sup>424</sup> "...the design of the city and the design of courtyards – the basic units of Beijing – are both part of a complete plan... every *hutong* is comprised of many courtyards, and each courtyard is comprised of a number of rooms. These rooms are the basic units of the city: rooms became courtyards, courtyards became *hutongs*, *hutongs* became communities, and communities became the city. Since there were certain ratios between the rooms, courtyards, and *hutongs*, a lot of the construction materials could be prefabricated, making construction simpler and more convenient." Wang 2006, *Hutongs and Beijing*

<sup>425</sup> China Heritage Project - The Australian National University 2005, *Beijing: the fate of the old*

<sup>426</sup> Zhang 1997, *Informal construction in Beijing's old neighborhoods*, 88

<sup>427</sup> Foreign Languages Press 2005, *Hutong Alleys: former residences of celebrities*

household hierarchy:<sup>428</sup> “Almost without exception, the residential districts filled the gridiron street network of the city. The residential 'super blocks' had an average size of about 750x750 meters (55ha). Rapid transportation and commercial activities were accommodated along the perimeter streets.”<sup>429</sup>

Some of the policies of the 1991-2010 Plan included the specification of the 33 aspects of the historical Beijing framework, the renovation of the older central city, and the allowance for large-scale residential buildings in the suburban periphery, including the satellite towns. Overall, it was the ambition of the Beijing planners to direct new urban development towards a humanistic city conception, pinpointing ecological qualities on a walkable scale.<sup>430</sup>

Demonstrating the targeted new trends of master planning in implementing 'Ecology-Living-Production Spaces', the greater Beijing Plan 2004-2020 re-emphasises the polycentric concept of satellite towns, and foresees three new major and larger developments for this type. It is a plan on a regional scale with two axes, two development belts (western and eastern) and multiple urban centres, with an estimated population of over half a million for the major centres by 2020.<sup>431</sup>

In addition to these developments, the most recent TOD located between Beijing and the seaport Tianjin, was made by the architectural practice SOM (Skidmore, Owings & Merrill LLD) who won the Beijing Bohai Innovation City Competition at the beginning of 2012. SOM's project chief designer described the urban design proposal:

Beijing Bohai Innovation City establishes a new model of transit oriented development at an unprecedented scale ... The new district will leverage the high-speed rail to bridge two major metropolitan areas and create a sustainable urban environment that concentrates walkable, compact densities around transit stations, while still preserving existing agriculture and green space.<sup>432</sup>

For the context of this inquiry, it is important to notice that SOM's urban design proposal suggests an extensive use of courtyard buildings (**Fig.116**).

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<sup>428</sup> Wang 2006, *Hutongs and Beijing*

<sup>429</sup> Zheng 1995, *Urban Renewal in Beijing - Observation and Analysis*

<sup>430</sup> Gu, et al. 2010, *China's master planning system in transition: case study on Beijing*, 17

<sup>431</sup> Ibid.,

<sup>432</sup> Rosenfield 2012, *SOM Wins Master Plan Competition for Beijing Bohai Innovation City*"

## Housing

For centuries, the typical Beijing residence was the *siheyuan*, generally translated to English as ‘quadrangle’. As the translation suggests, it is a housing unit with buildings placed on four sides of a courtyard forming a built quadrangle. It was the main architectural form of dwelling houses, in which Beijing inhabitants lived from generation to generation.<sup>433</sup>

In the 1950s' migration, the government accommodated the rural workers mostly within the *danwey* precincts, a spatial form developed in the Mao era (1949-76) and partly embedded in the Soviet planning directives. This communal model of social organisation supplied all the needs of the workers within a walkable distance, generally within a walled space. This work-unit model was used for industrial centres, government complexes, research institutes, hospitals and universities, making *danwey* users 90% of China's urban population in the 1960s.<sup>434</sup> Spatially, “the *danwey* compounds bore a striking resemblance to 'ancestral' forms of Chinese urbanism – especially the courtyard house which in turn miniaturized many of the spatial design principles seen in larger scale in Chinese walled cities”.<sup>435</sup> The recycling of such earlier urban architectural traditions is a function, Bray argues, of “a mimetic effect in which familiar forms are reinvoked to secure the boundaries of new modes of social life”.<sup>436</sup>

Starting in the 1950s, when accommodation in a *danwey* was not feasible, the government accommodated the workers in the *siheyuan* of original resident families. Additions were initially forbidden but, after the 1976 earthquake, extra space was necessary to accommodate the unsheltered population, and the previous prohibition was ignored.<sup>437</sup> The construction of shabby additions throughout the

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<sup>433</sup> See **S\_3.2.1** (p. 61) for a referenced description of *siheyuan* types and their uses

<sup>434</sup> Campanella 2008, *The concrete dragon : China's urban revolution and what it means for the world*, 191

<sup>435</sup> Ibid.,191

<sup>436</sup> The *danwey* architecture/urban design model had a comprehensive role in the urban worker's life. The *danwey* building compound was generally set up in an orthogonal grid enclosed by a perimeter wall. Besides including working spaces and residential accommodation, the compound included a school, meeting hall, day-care facilities, infirmary, bathhouse, and a canteen for communal meals. Ibid., 191; Bray 2005, *Social space and governance in urban China : the danwei system from origins to reform*, 199-200

<sup>437</sup> He 1990, *Living Conditions in Beijing's Courtyard Houses*, CITATION?



courtyards to increase the number of sheltered compartments changed both the social and spatial characteristics of the *siheyuan*, because the new housing structure increased the occupation of the typical *siheyuan* floor space from one family to 10-40 families. This converted *siheyuan* typology was named *dazayuan*. (Fig.117) <sup>438</sup>

The compound of several *dazayuan* was named *dayuan*, a new 'unwalled' community model planned to accommodate people in central areas adjacent to their work place. These compounds pretended to create a 'socialist big family' ideology which, nonetheless, "went far beyond the traditional concept of family; it was actually a community which had made possible the enclosed management of the *danwey* ... As a community of closely related people, the compound provided its residents a small but comprehensive collective way of life".<sup>439</sup> It was a 'jam-packed' way of life for, in some districts south of Tiananmen Square, the population density rose to 570 ppha.<sup>440</sup>

The planning concepts brought by the Soviets during Mao's governance were reviewed under the housing directives implemented by post-Mao planning in the 1980s. The first plan aimed to achieve a ratio of 7:3 between housing and services, under the new concept of 'residential district', by the year 2000. In the period 1979-83, the new government built 23.5 million square meters of housing, which represented 46% of the acreage built on in the Mao era. These new constructions increased the per capita living space in Beijing from 4.57m<sup>2</sup> to 5.68m<sup>2</sup> in that period, targeting 9m<sup>2</sup> by the end of the 1990s.<sup>441</sup> The housing developments comprised high-rise buildings serviced by parks, playgrounds, and public spaces. Companies bought entire building floors to accommodate their employees, maintaining the existing habit of close-living with co-workers that was introduced by the *danwey* and the *dazayuan* living experience.<sup>442</sup> However, these new housing locations did not maintain their proximity to the work-unit, and the *danwey* system began its inevitable collapse.

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<sup>438</sup> Goldman and Ratti 2004, *Beijing: the lost city?*, 211

<sup>439</sup> Jiang 2009, *China Housing: the Dilution and Reformation of Collectiveness*

<sup>440</sup> Ibid.

<sup>441</sup> Sit 1999, *Social areas in Beijing*

<sup>442</sup> Gaubatz 1995, *Changing Beijing*, 87

From the end of the 1970s, several schemes were introduced to rehabilitate central districts to supply better conditions for those in dilapidated housing. In 1990, the Beijing Municipality launched the Old and Dilapidated Housing Renewal Program (ODHR) to accelerate renewal and to provide satisfactory dwellings for the residents of the city's historical core.<sup>443</sup> The initial goal was to rehouse the original householders in the same residential area, upgrading their housing conditions at low market-rate costs.<sup>444</sup> However, in the mid-1990s, as a consequence of the general urban growth model adopted by local governments (described above in 'Conservation background'), residents were no longer rehoused in the residential area in which they lived; rather, they were relocated far out on the city's fringes.<sup>445</sup>

At the beginning of the program, 3/4-storey courtyard housing began replacing the *dazayuan* in the *hutong* areas, and a few relevant projects require mention in the sites Xiaohoucang, Ju'er *Hutong*, and Hubeikou.<sup>446</sup>

Of the three projects, the Ju'er *Hutong* neighbourhood rehabilitation is the most relevant for this enquiry as it is an example of the contemporary use of a low-rise courtyard housing type, which can accomplish the same housing density as high-rise housing.<sup>447</sup> The objective of the project was to rebuild the area rather than

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<sup>443</sup> Zhang and Fang 2003, *Politics of housing redevelopment in China: The rise and fall of the Ju'er Hutong project in inner-city Beijing*, 77; Zhang 2008, *Steering towards growth: Symbolic urban preservation in Beijing, 1990-2005*, 192

<sup>444</sup> Campanella 2008, *The concrete dragon : China's urban revolution and what it means for the world*, 149-150

<sup>445</sup> "In 1990 Beijing undertook a massive demolition of courtyard housing within the old city - a 62.5-square-kilometre area inside the Second Ring Road - where the city wall, moat and gates once were. About 40 per cent of the old city area was levelled by 2002. Concerned that the old Beijing would be totally lost, conservationists contacted journalists and lobbied bureaucrats, but progress in formulating and implementing heritage plans addressing traditional housing was slow, while development accelerated." 2005, *Beijing: the fate of the old*

<sup>446</sup> "Among the showcase projects are three sites in the former walled-city area: Xiaohoucang, Ju'er *Hutong*, and Hubeikou. Each project contains low-to-medium-rise structures set in courtyards and surrounding landscaped areas. In contrast with the geometrically repetitive work-unit housing, the façades are varied with different-sized windows, balconies, and overhangs. Unlike much pre-1979 housing, each apartment has its own kitchen and toilet. These projects use pre-existent social and service infrastructure such as schools and health-care facilities. They are usually occupied either by long-time area residents or by new residents whose employers have purchased apartments in the projects. In Gaubatz 1995, *Changing Beijing*, 87

<sup>447</sup> Wu 1999, *Rehabilitating the old city of Beijing : a project in the Ju'er Hutong neighbourhood*

renovate the very dilapidated existing buildings (**Fig.118**).<sup>448</sup> However, limited by the residential density requirements, the courtyard space seems to be too narrow; this “may generate a feeling of privacy invasion for the residents whose windows face each other. It will also probably be overshadowed for most of the time during the year. Too much space can be as much a problem as too little. Neighbours on opposite sides of this area will probably never get to meet each other”.<sup>449</sup>

During a field study in 2010, I noted that even though these buildings made use of the courtyard for light and ventilation, the ground floor unit doors did not open to the space, as in the *siheyuan*. The doors were generally located in the staircase halls, thus constraining direct access to the space. For this reason, or because of the new customs of Chinese society, these courtyards now function as open atriums, used mainly for bicycle parking and storage. Nevertheless, the tradition of having trees and flowerpots in the courtyards is maintained (**Fig.119**).

### **Site analysis**

The Shichahai historical and cultural conservation district is located in the northwestern part of the old town of Beijing, and covers two districts (DongCheng District and XiCheng District), three street committees (ChangQiao, XinJieKou and AnDingMen), and thirty-three neighborhood committees. It is one of the 25 areas included in the Historical and Cultural Conservation Plan approved by the municipal government in 1992. It has a gross area of 301.57ha – the largest of all conservation areas – representing approximately 30% of the total conservation plan.<sup>450</sup> It has a population of ca.105 100 distributed in roughly 42 800 households; this corresponds to an urban density of ca.142.0dph (dwellings per hectare), and indicates an average of 2.45 people per dwelling (**Fig.120**).<sup>451</sup>

<sup>448</sup> The project was commissioned to Professor Wu Lingyong from Qinghua University as the chief designer of a multidisciplinary team in 1987. The project occupies an area of 8.2ha, and it is divided into four phases.

<sup>449</sup> Zhang 2006, *New courtyard houses of Beijing: direction of future housing development*, 138

<sup>450</sup> Beijing shi gui hua wei yuan hui 2002, *Conservation planning of 25 historic areas in Beijing old city = Beijing jiu cheng er shi wu pian li shi wen hua bao hu qu bao hu gui hua / Beijing Shi gui hua wei yuan hui*, 139

<sup>451</sup> Hudong: [www.hudong.com](http://www.hudong.com) (largest web encyclopaedia in Chinese Language) Accessed 2010-10-24 <http://www.hudong.com/wiki/%E4%BB%80%E5%88%B9%E6%B5%B7%E8%A1%97%E9%81%93>.

The construction of the actual Shichahai Lakes *Qian Hai* (Front Sea), Hou Hai (Back Sea) and Xi Hai (Western Sea) began 800 years ago, slightly earlier than the building construction that started during the Yuan Dynasty (AD 1279-1368). In the following centuries, the area was occupied by a *hutong* structure containing *siheyuan*, princely mansions, and temples.<sup>452</sup> Even though Shichahai is often referred to as Hou Hai, the word literally means 'Ten Temple Lake', because of the ten temples in the area, some remaining until today (Guangji Temple, Huitong Temple, Huoshen Temple, and the Taoist Guangfu Guan temple). The lakes were built during the Yuan Dynasty as part of the old Grand Canal network made by rivers and smaller canals, and facilitating the fluvial transportation of rice from the southern provinces to northern China. This entire area also became the commercial 'backyard' of The Forbidden City, a large and very popular shopping environs.<sup>453</sup> The Shichahai area today maintains its shopping characteristics, which are now largely directed at tourism. In a selection of China's most beautiful places by the Chinese National Geography magazine, Shichahai ranks among the top five most beautiful areas in China.<sup>454</sup>

### ***Plan highlights***

#### Decision making, planning and development

After 1984, the Beijing Planning Commission, the government of the Xicheng District, the Shichahai Park Administrative Office, and the Architecture School at Tsinghua University assembled a workgroup to preserve the architectural values of the Shichahai district. This planning activity emphasised the historical and cultural value of the Shichahai conservation district. The main purpose of the workgroup

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<sup>452</sup> "Princely mansions (*wangfu*) fall into a grey zone in the eyes of Beijing heritage planning, being neither *siheyuan* houses nor grand palace buildings... A map of the Qianlong period (1736-1795) indicates that Beijing contained 42 mansions for princes of the *fuguogong* rank and above, although a textual source - *Xiaoting zalu* - indicates that there were 89 mansions belonging to princes of this ranking down to the end of the subsequent Jiaqing period (1796-1820). Only 22 still remain standing in *hutong* alleys in the area around Shichahai and Beihai lakes, and of these only eight are in any state of preservation. Only two have been officially partly opened to the public." 2005, *Beijing: the fate of the old*

<sup>453</sup> Wang 2006, *Hutongs and Beijing*

<sup>454</sup> *Shichahai Historic and Cultural Scenic Zone—A Live Museum of Traditional Beijing* 2012, *Shichahai Historic and Cultural Scenic Zone—A Live Museum of Traditional Beijing*

was to identify the problems in the existing master plan, produce detailed planning control and tourism planning to determine clear objectives and methods, and to propose protection principles under the government's main directives regarding heritage protection.<sup>455</sup>

In the master plan approved by the Beijing Municipal City Planning Commission in 1992, the Shichahai district was clearly evaluated as an “historical cultural touring beauty spot”.<sup>456</sup> The plan's general guiding ideology for this district was the integration of protection, renovation, exploitation (tourism) and management. Meanwhile, the protection and planning for this historical and cultural conservation district needed to be made on the basis of Beijing's urban comprehensive planning, the controlled detailed planning for the Xicheng district, and the readjustment planning for Beijing old town's road network. Furthermore, it needed to be consistent with the preservation planning for adjacent street areas, namely, NanLuoGuXiang Lane and DiAnMenNeiDaJie Avenue. In addition, as part of this planning activity, a *status quo* investigation into the 300ha district – specifying quality, scene, height, the property of all properties as well as the population and plants of every courtyard – was conducted to address the gaps in past planning and to provide basic information for new planning and management.

#### Conservation program for Shichahai

The Master Plan for the Shichahai Historical and Cultural Conservation District was approved by the municipal government in 1992. It relied on rigorous national and international surveys (UNESCO and Asia Urbs) that identified social and architectural values. The planning team involved local government leaders, planning experts, and residents' representatives.

By 1992, the urban structure of the Shichahai area still largely consisted of *hutong* and many small, medium, and large *siheyuan* that could be renovated under the Conservation Plan recommendations. The larger and medium *siheyuan* were considered of historical architectural value and are included in the Plan in four

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<sup>455</sup> Beijing Municipal City Planning Commission and School of Architecture at Tsinghua University 2002, *Conservation planning of 25 historic areas in Beijing old city (Shishhai Area)*, 140

<sup>456</sup> *Ibid.*, 140

categories, according to their relevance as Cultural Relic, Protected Architecture, Ameliorative Architecture or Reserved Architecture (**Fig.121**).

The Conservation Plan targets for Shichahai are to:<sup>457</sup>

- Maintain the original urban structure, spatial scale, and urban texture
- Protect cultural relic buildings to promote more scenic effects
- Protect and recover building surfaces and colours
- Develop green areas and squares, and improve various landscape systems
- Repair residences to meet contemporary living demand
- Protect the trees, small articles, and sight galleries

The supporting policies of protective planning and management aim to enhance:

- Management and policy support
- Propaganda education and public participation
- Tourism economics and integrated development
- Team building and management systems

### ***Significance of the conservation plan***

The plan is significant as it illustrates the Beijing Municipality's role in protecting the architectural, social, and cultural values of the city related to its ancient culture, albeit allowing for tourism development. Meanwhile, the plan is relevant to this study as it recognises the importance of preserving courtyard house types as examples of the traditional Chinese lifestyle, and because its targets (as listed above) can serve as exemplars in planning the single-house urban design prototypes. It is also relevant to the various residential densities related to the typologies.

### **Limitations**

In my view, the plan is very comprehensive in proposing land-use that is sensitive to preservation issues, albeit allowing for a road network update. The main limitation is that the many planning institutions in charge do not have enough administrative cohesion to enforce and control the urban policies they created

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<sup>457</sup> Beijing shi gui hua wei yuan hui 2002, *Conservation planning of 25 historic areas in Beijing old city = Beijing jiu cheng er shi wu pian li shi wen hua bao hu qu bao hu gui hua / Beijing Shi gui hua wei yuan hui*

through the plan.<sup>458</sup>

**Summary: Shichahai Conservation Plan**

Although administrative institutions already exist at a local and municipal level, these institutions need to work closely together to benefit all aspects of the original urban fabric, and not simply individual monuments. Local and municipal policies should emphasise, through applied exemplars and media exposure, Shichahai authentic cultural values as a neighbourhood. Furthermore, they need to do this from a long-term local economic perspective, as a way of reducing the greed for short-term gains.

Policies should also monitor the beneficial balance between residents' interests and consumers' demands; this balance, for instance, might include a requirement for a minimum number of local employees in commercial activities, which would provide a direct economic return to the original community as a Live-Work process, and reduce the general practice of hiring temporary *hukou* migrants.

To preserve the typological features of the urban fabric, local and municipal administration rules should maintain the courtyard houses' original external characteristics; this should involve more than the superficial façade intervention in the main *hutong* and in the units facing the lake. Funds and technical training could be made available to the original inhabitants so that they could undertake a continuous reconstruction intervention that would plan for a more organised occupancy of the original courtyard house. This could allow for the renting of rooms to external small families or single persons, and the generation of revenue, which could be partly reinvested in the preservation of the courtyard house as one of the main elements of the original urban fabric. The continuous 'redevelopment' of the façades should be required to follow a catalogue of vernacular typological adornment to diminish the use of extravagant ornaments, mainly in the buildings facing the lake and the main *hutong*.

These facts and recommendations demonstrate the need for a single

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<sup>458</sup> See **Ap\_D.1 – Conservation plans background** for evidence of this statement

statutory authority to manage the implementation of the planning policies, while taking into consideration the interests of the local community. (This is later noted in the case of Subi Centro TOD - **S\_4.3.1**, p.197).

The traditional *siheyuan* is inappropriate to the city's need for higher density, and it is only feasible as a dwelling for those of high social status.<sup>459</sup> The *dazayuan* has both the disadvantages of failing to meet density requisites, and the disadvantage of unhealthy housing conditions. However, the *danwey* – as a communal model of social organisation, which supplied all the needs of workers within a walkable distance – is an urban model without any need for public transportation. The *danwey* is a good example of an innovative work-unit high-density model, albeit maintaining the cultural and spatial design principles of the Chinese walled cities. The *danwey* is an interesting precedent; it has considered the required Live-Work and multi-use attributes that have been developed for the urban design prototypes of this inquiry.

The new enterprise developments (1990s) maintained the existing custom of close-living with co-workers that was introduced by the *danwey*, and also met the demand for high-density. However, these new neighbourhoods supplied urban spaces but failed to maintain the proximity to work-units and led to a reduction in 'green-land' on the city's periphery.

Most important for this inquiry is the Ju'er *Hutong* project of Beijing which (hereafter mentioned as New Courtyard Houses of Beijing) accomplishes high residential density values using low-rise courtyard housing (**Figs.122, 123, 124**).<sup>460</sup> This project served as a housing system precedent on which the CCH/Double prototype was based.

The dimensions of the 'super blocks' (750x750m – 55ha) determined by the boundary streets designed in the initial planning of the city are still appropriate for public transportation, and allow for the circulation of busses/subway which are always within a walking distance of less than 400m from any point inside the 'block'.

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<sup>459</sup> This statement is corroborated by Hong Zhan interview. See Appendix C.

<sup>460</sup> Zhang 2011, *Courtyard houses of Beijing: past, present, and future*



It is relevant to note that this accessibility network served as an exemplar for this inquiry because of its low car dependency, its pedestrian lanes (*hutong*), and its group-public spaces that work as plazas. In addition, the concept of having a 'boundary street' that concentrates public transportation within a short walking distance aligns with the main Subtropical Boulevard located in the boundary of the Collage Plan precinct.

Finally, yet importantly, it is necessary to monitor the landscape architecture interventions for public spaces so as to reject westernised open space projects, and to support the characteristics of the traditional Chinese gardens of Beijing in the Shichahai context.

Additional analyses are discussed in **S\_3.3.3**, Plan comparisons and analysis: Shichahai and Parque das Nações

### 3.3.2 Parque das Nações, Lisbon, Portugal

The capital of Portugal was chosen as an urban context because of its inherited practice of developing traditional architecture and following the examples of the courtyard house typologies introduced by the occupations of both the Roman Empire and the Umayyad Caliphate.<sup>461</sup> Additionally, Lisbon features the successful Parque das Nações, which is a world-recognised exemplar of urban development. It incorporates contemporary architecture/urban design into a unique strategic market transformation of a large urban area. In so doing, it mirrors the procedures mentioned by Adams and Tiesdell's book *Shaping places: urban planning, design and development* for the production of a "radically transformed place and a set of real estate markets spanning development, occupation and investment that reflect and underpin its vitality".<sup>462</sup>

The Lisbon example also provides concrete evidence of how the process of expanding both the ecological base and the public state<sup>463</sup> can be successfully applied as a sustainable strategy to a contemporary residential development. The descriptions below complement the previous examples<sup>464</sup> by extending the amount of planning detail and management strategy, with the objective of identifying potential qualities to apply to the proposed Collage Plan. Lastly, yet importantly, the site has similar characteristics to the site used in the Collage Plan:<sup>465</sup> a brown-field with accessibility limitations (**Fig.125**).

**Table 2.** *Baseline information: Parque das Nações*

<b>Project name</b>	Parque das Nações
<b>Project type</b>	Environmental, Urban Development, Urban Design
<b>Location</b>	North-eastern area of Lisbon, 9km from CBD
<b>Date designed/planned</b>	1993
<b>Construction completed</b>	2010
<b>Size</b>	350ha <sup>466</sup> – 5km of Tagus riverfront
<b>Urban Designers (Detail Plans)</b>	Tomás Taveira (DP1); Manuel Salgado (DP2); Troufa Real (DP3); Duarte C. Melo and Maria Manuel G. Almeida (DP4);

<sup>461</sup> See **S\_3.2.1**, p. 51

<sup>462</sup> Adams and Tiesdell 2013, *Shaping places : urban planning, design and development* 222

<sup>463</sup> Birkeland 2008, *Positive development : from vicious circles to virtuous cycles through built environment design*

<sup>464</sup> See all examples on **S\_3.2.2 - Communal courtyard housing**

<sup>465</sup> The Mayne Rail Yards area, described in **S\_3.4**, p. 245

<sup>466</sup> Parque EXPO uses different values for the redevelopment area. I adopted this (350ha) because it is the one used in the table of urban parameters serving as comparative basis. See **Table 3**

	Antonio Cruz and Antonio Ortiz (DP5).
<b>Client</b>	Parque EXPO
<b>Managed by</b>	Parque EXPO

## ***Context***

### Planning background

Before analysing the Parque das Nações Plan, it is important to understand Lisbon's planning background in relation to international exhibitions along the Tagus River. This description is provided in **Ap\_D.2**.

### ***Site analysis***

The boundaries of the Redevelopment Area (RA) were determined by the Tagus River on the east side, the Trancão River to the north, and the interregional railway on the west. Like a peninsula, the site allowed access to the rest of the city from one side only: the southern neighbourhood of Braço de Prata. The land was almost flat, having only a slight inclination from the city towards the river.

The similarities to the Mayne Rail Yards (Bowen Hills, Brisbane) site – the industrial use and the land contamination – can be noted here. Considering that decontamination of the Portuguese land was possible, it would also be feasible to apply a similar process to the Brisbane site.

### ***Plan highlights***

#### Decision Making

Parque EXPO was the manager for the whole Redevelopment Area (350ha) and reported solely to the Portuguese government. All the buildings within the RA were required approval by Parque EXPO before being submitted to the Lisbon City Council. Procedure protocols between both entities were studied to mitigate bureaucratic issues and approval timings.

The overall financial/economic process was focused on the concept of 'zero cost', which holds that the combined costs of the acquisition of private lands,

decontamination, infrastructure, and public spaces have to match the revenue from the sale of the new allotments.<sup>467</sup> Accordingly, it is relevant to note the institutional and financial models adopted:

### *Institutional*

- Main principle: one management body for the whole area (Parque EXPO)
- De-assignment of real-estate assets public domain status under the jurisdiction of the Port Authority (1993)
- Specific urban planning regime for RA (1993)

### *Financial*

- Minor direct involvement of public funds
- Dependence on private project finance
- Guarantees from the Portuguese state<sup>468</sup>

### Planning/developing

The overall concern of planning/development was to create high quality urban space, integrating a wide degree of urban 'multi-functionality'; that is, the entire development needed to integrate the fundamental urban functions: housing, services, commerce and leisure. These were then accomplished by an urban/real estate concept based on 'centrality' (the creation of a new urban polarity in the Lisbon Metropolitan Area) and 'quality of life' (the development of a high quality of urban life).

The following principles were determinant in achieving these goals:

- The creation of an organisation – from the outset – to guarantee coordination during the EXPO'98 period and the transition to the post-expo period (Parque EXPO)
- Parque EXPO's establishment of a monitoring system for the plan and the impact of the operation (1993-2012)
- Integration of EXPO'98's infrastructure and public space into the overall plan of Parque das Nações
- Long-term maintenance of the urban plan guidelines/parameters, the consistency of which constituted a factor of trust for investors and economic agents in general
- Creation of 'anchor' public facilities with easy accessibility to/from the metropolitan area (e.g. Orient multi-mode station, the Atlantic pavilion,

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<sup>467</sup> Parque EXPO 2010, *Parque EXPO*, Parque EXPO 2010, *Parque das Nações: Re\_inventing the territory*

<sup>468</sup> Parque EXPO 2010, *Parque das Nações: Re\_inventing the territory*

the Knowledge pavilion, The Camões theatre and the Lisbon Oceanarium)

- The commissioning of each of the important pavilions directly to worldwide recognised architects, and planning for them to be permanently integrated into the Parque das Nações
- Creation of a clear planning concept for a 'new centrality' (that is, a new urban polarity in the Lisbon Metropolitan Area)
- Development of a strategy that took advantage of the attraction of EXPO'98 for the overall plan through:
  - Creating dynamics in terms of the habits of the population
  - Creating branding
- Ensuring multi-functionality, unique architecture and public space designed for the local level
- Fast urban planning, projects, and licensing
- Innovative and effective infrastructure<sup>469</sup>

The entire development was planned to create ideal infrastructure from the outset. All infrastructure used for EXPO comprised the initial phase of a very efficient network system. Ultimately, this involved the construction of a grid of main infrastructure networks in subterranean technical galleries.<sup>470</sup> This innovative feature has access points every 100m for maintenance workers, and every 400m for equipment, thus ensuring that this equipment can be maintained and repaired without the need for road and traffic restrictions (**Fig.126**).<sup>471</sup>

### Design

At the end of 1993, the Urbanization Plan for the RA began under the responsibility of architect Luis Vassalo Rosa, with Parque EXPO as the promoter. This development of “referential architecture and strongly symbolic architecture which the World Exposition makes possible constitutes a central element of the Urbanization Plan, with its contribution to making the urban space remarkable, singular and consolidated”.<sup>472</sup>

Parcelling the land and deciding on an ideal grid layout with efficient car parking was carefully planned, and the previous road network was utilised for the

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<sup>469</sup> Ibid.

<sup>470</sup> The tunnelled galleries include networks of: water supply, automated collection solid waste, , irrigation, fire service, centralized thermal energy distribution, electric power and advanced telecommunications. Separate drainage recycling networks for domestic and rain water along with domestic gas distribution, low tension public lighting and street signal lights have a separated network layout outside the galleries.Ibid.

<sup>471</sup> 1999, *Parque das Nações, Urban design principles*

<sup>472</sup> Vassalo Rosa 1996, *EXPO'98: the city of Lisbon*, 51

EXPO event. Luis Rodrigues, Parque EXPO Prospecting and Design Director, described this process:

### *Lot sizes*

The whole of the land area/real estate component of the Parque das Nações was developed on the basis of prospective market studies so as to understand and anticipate relatively clearly the supply and demand levels possible in the area. The Urban Plan defined macro parcels that then were divided into lots upon the basis of the developers' initiative and interest. The dimensions of the parcels/lots, and their buildable capacity, took into account the occupation indices defined on the basis of the Urban Plan, which figured in the indices in effect in the rest of the Lisbon urban area, so as to provide total continuity and coherence to the urban fabric (Parque das Nações vs. surrounding area). These macro parcels, aside from their having the capacity to accommodate multiple uses, articulate with the rest of the areas, namely the public space and the roadway network. Above all, an effort was made to give the parcels flexibility so as to oversee market development without, however, subverting or compromising the overall concept associated with the Urban Plan.<sup>473</sup>

### *Underground Parking*

The design of the underground parking structure was based on the parameters specified in the indices provided by the Lisbon City Hall. It was also intended that, in matters regarding this component, the Parque das Nações would not end up as an exceptional zone but as an area in harmony with the rest of the Lisbon urban area. Obviously, a number of traffic and mobility studies were carried out, permitting an assessment/adjustment of the offerings possible. As for public parking, there was also a concern to guarantee, as much as possible, a good rotation in parking (to maximise the daily occupancy rates) by locating them near areas that are consistently busy both day and night.<sup>474</sup>

### *Streets layout*

The streets layout is based on a rectangular grid with transverse connections with the city and with the riverfront, thus guaranteeing the permeability of the area. This grid, aside from being highly legible, ensures the maintenance and potential of the vista point system. On the other hand, in particular cases the grid was also limited by the morphology of the land area. Though it is mostly flat, there was, however, a 'need' to introduce a diagonal street (to the south) to accommodate the more elevated area of Cabeço das Rolas, and a more 'organic' route (to the north) which would follow the limits of Tejo Park and the old sanitary landfill that was there at the time. The roadway grid is also characterised by a de-densification from the riverfront towards the interior (pedestrian area – closest to the river; intermediate area – local transit; densest area – more intense traffic and crossings). Lastly, it should also be pointed out

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<sup>473</sup> Rodrigues 2010, *Parque das Nações-Urban design concepts*

<sup>474</sup> Ibid.

that the design of the roadway grid was also limited by the zone that hosted EXPO'98 (the central area around the Doca dos Olivais) and which today is home to the great majority of public equipments and facilities with the greatest capacity as attractions.<sup>475</sup>

An ideal urban density was not pre-established because this was not required by Lisbon City Council for this specific Urban Design approval. The city council determined a Gross Construction Area for the entire Redevelopment Area:

The number of apartments was not planned. In order to respond to the demand, the developers were free to decide the size of the apartments and, consequently, the number. E.g.: a developer buys a parcel with 3,000m<sup>2</sup> of residential area. He has the option of designing the project accordingly to his information/perception of market demand (larger areas per apartment = less apartments; smaller areas per apartment = more apartments). Flexibility was one of the key principles of the plan, and this measure allowed the continuous adaptation of the project to the market evolution. Indeed, in the beginning, the market demanded smaller apartments (singles and young couples willing to live a “new experience”) but progressively, with the consolidation of the project, there was a shift to bigger apartments. The constant was the ‘Gross Construction Area’ defined in the plan.<sup>476</sup>

This flexibility provided security for developers and their land investment as they could use the market demand to their advantage in establishing their sales strategies. A large number of parcels were pre-sold, even before the Urban Plan’s approval.

### *Parque das Nações Urban Parameters*

**Table 3.** Review of the Urbanization Plan of EXPO’98 Redevelopment Area (RA)

<b>Total Area (TA) of RA</b>	3,502,700m <sup>2</sup> (350ha)
<b>Total Area of Buildable Land in the RA</b>	1,251,175m <sup>2</sup> (36% – 125ha)
<b>Total Area of Unbuildable Land in the RA</b>	2,251,525m <sup>2</sup> (64%)
<b>Total Area of Buildable Pavement (BP)</b>	2,493,741m <sup>2</sup> (70% RA)
<b>Housing</b>	1,239,465m <sup>2</sup> (50% BP)
<b>Commerce</b>	636,479m <sup>2</sup> (25% BP)
<b>Retail + Amenities</b>	198,670m <sup>2</sup> (8% BP)
<b>Public Facilities</b>	330,983m <sup>2</sup> (13% BP)
<b>Accommodation + Amenities</b>	38,183m <sup>2</sup> (2% BP)
<b>Urban Equipment/Infrastructure</b>	24,269m <sup>2</sup> (1% BP)

<sup>475</sup> Ibid.

<sup>476</sup> Ibid.

<b>Industry/Warehouses</b>	25,692m <sup>2</sup> (1% BP)
<b>Index of Total Usage</b>	0.70 = 2,493,741m <sup>2</sup> /3,502,700m <sup>2</sup>
<b>Index of Public Space</b>	0.56 = 1,966,400m <sup>2</sup> /3,502,700m <sup>2</sup> = (Area of Public Urban Space + Dock + Quay Bridge)/RA Area
<b>Green areas</b>	1,156,075m <sup>2</sup> (33% RA)
<b>Riverside boardwalk, pedestrian and road ways</b>	708,325m <sup>2</sup> (20% RA)
<b>Water Space</b>	102,000m <sup>2</sup> (2.9% RA)
<b># of inhabitants (estimative)</b>	25,000 (200hab/ha net buildable land)
<b># of workers (estimative)</b>	22,500 (189job/ha net buildable land)

Source: *Parque das Nações: Reinventing the territory*. 2010. Lisbon: Parque EXPO.

### *Site and detail plans*

The plans in **Fig.127** show the evolution of the Redevelopment Area in two phases: during, and after EXPO'98.

After city council approval of the Urban Plan Regulations for the precinct as a whole, the land was divided into six areas. A Detail Plan (DP) was then commissioned (without public competition) to five Architecture offices in Lisbon. The sixth area (DP6) was commissioned to a Landscape Architecture office for the project development of an urban park.

One characteristic of these DPs was the large use of the courtyard typology in designing the buildings. This was not required, either by Parque EXPO or by the city council; rather, it was the result of the architectural teams' spontaneous recognition that the courtyard building type was the appropriate typology for the site.

### *Detail plan 3*

Detail Plan 3 (DP3) was reviewed and used as a typological reference in this inquiry, because it was predominantly comprised of regular courtyard housing buildings. The site is located on the southern side of Parque das Nações. It has an area of 31.9ha and Residential Gross Construction Area of 249 029m<sup>2</sup> (**Fig.128**). Assuming an average size family of three persons living in 120m<sup>2</sup>, it can then be



deduced that there are around 6200 people living in 2075 apartments in the DP3 area. This resulted in an estimated urban density of ca.188ppha or ca.65dph.

Apartment typologies, courtyard and block dimensions, car parking and garage access points, building heights, and street sections were analysed as a way of extracting appropriate examples for the urban design proposal for this inquiry (C\_5).

### *Role of designers*

Having provided the descriptions above, it is relevant to assert that the role of designers was invaluable in the entire urban development process; indeed, they were involved in all projects, from the smallest graphic details to the definitions of the urban environment. It is also important to mention that for the first time in Portugal, it was a requirement that landscape projects could only be developed by registered landscape architects.<sup>477</sup>

### *Maintenance and management*

Parque EXPO has maintained infrastructure for public use and urban public services in Parque das Nações with a high level of quality. Nevertheless, by the decision of the Council of Ministers in July 2012, the urban management of the area will be assigned to the Lisbon City Council after the creation of Oriente Parish, which will comprise the whole area of Parque das Nações.

### User/use analysis

In the period between 1993 and 1998, when the urban plans and projects for the permanent buildings were released, the proposals for the establishment of a permanent urban design model, based on an ephemeral preconception and the international character of the buildings, was received with public and press indifference.<sup>478</sup> For many, however, EXPO'98 was “seen not only as a way of promoting the country and its capital, but above all as a catalyst in the functional

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<sup>477</sup> At the time of the EXPO projects, landscape projects could be developed by other professionals as architects and engineers.

<sup>478</sup> Sat 1996, *Foreword*, 7

and urbanistic regeneration process of Eastern Lisbon".<sup>479</sup>

### Peer-reviews/criticism

The urban redevelopment was recognized by the media in numerous publications, and was peer-recognised through several merit awards.<sup>480</sup> Some permanent pavilions were also awarded, thus providing meritorious evidence of valuable architectural contributions. Additionally, as a result of its successful Urban Planning/Development, Parque EXPO as a planning company has performed many consultancies for international EXPO and exhibition projects, including: EXPO 2008 (Zaragoza, Spain); 5<sup>th</sup> World Water Forum 2009 (Istanbul, Turkey); and EXPO 2010 (Shanghai, China). Moreover, Parque EXPO has been a consultant for several urban development projects.<sup>481</sup>

### ***Significance and uniqueness of the urban design***

The whole process was effectively orchestrated through a central institution that managed the urban design proposals of different architectural practices (Detail Plans) to produce an overall plan internationally recognised for its quality. The significant issues for this inquiry were the overall administrative conception and the urban design principles.

### Limitations

It is unclear whether the initial success achieved at the Parque das Nações

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<sup>479</sup> Gaspar 1996, *Of eastern Lisbon*, 16

<sup>480</sup> Barcelona Meeting Point (Spain) – Best International Urban Project – Parque das Nações (1997); Valmor Prize (Lisbon, Portugal) – Public Spaces of Parque das Nações (1998); Real Estate Magazine (Spain) – Best Iberian Urban Project – Parque das Nações (1999); Order of Engineers (Portugal) – One of the “100 Most Notable Civil Engineering Works built in Portugal during the 20th Century” – Parque das Nações (2003); and Tourism Gold Medal (Portugal) – Parque EXPO (2008). See complete list of merit awards in the following link. Accessed 2012-09-25

[http://www.parqueexpo.pt/conteudo.aspx?lang=ing&id\\_class=221&name=Merit-Awards-](http://www.parqueexpo.pt/conteudo.aspx?lang=ing&id_class=221&name=Merit-Awards-)

<sup>481</sup> Urban development and environmental requalification (Recife-Olinda, Brazil), Revising of the urban and territory planning for the Algiers *Wilaya* (Algiers, Algeria), Requalification and improvement of the centre of Khedive's (Cairo, Egypt), Requalification and improvement of the urban sea front (Cidade da Praia, Cape Verde), and Preparation study for a major urban renewal operation of the Meknès Medina (City of Meknès, Morocco) among others. See complete list of projects in the following link. Accessed 2012-09-25

[http://www.parqueexpo.pt/conteudo.aspx?caso=projetos&lang=ing&id\\_class=246&name=International-Projects-#ctl00\\$ContentBody\\$Lista1\\$Listagem](http://www.parqueexpo.pt/conteudo.aspx?caso=projetos&lang=ing&id_class=246&name=International-Projects-#ctl00$ContentBody$Lista1$Listagem)

public spaces could be sustained at the high level achieved by the Parque EXPO administration after the area's urban management was assigned to the municipality of Lisbon (2012).

***Summary: Parque das Nações Plan***

The strategies described above gave Parque EXPO the autonomy to accomplish its goals in the pre-established deadline (2010). The entire 350ha was designed, planned, and built to the highest quality standard in just 17 years. It may be said that the timing was crucial, as the new (usable) area was offered to the housing market in a period of economic growth when Portugal was accepted into the European community, and received considerable European grants for specific developments. It can be added that the housing flexibility – restrained only by the gross construction area – along with the simplified process for construction approval had stimulated developers' initiatives. Thus, the ideal balance between fixed and flexible construction ratios and facilitated construction approvals needed to be prearranged to provide developer confidence in the local housing market, while at the same time, guaranteeing sustainability and liveability. In my view, these are important normatives in contemporary developments, and have been taken into account in the Collage Plan recommendations.

However, these factors alone are not enough to explain the success of the Parque das Nações urban development. In my opinion, it was the liveability that the whole precinct offered citizens that made a significant market difference among the other real estate offers within the metropolitan area. The term 'citizen' is used here because the precinct was not designed for the residents' use only, but for everybody's use, including all metropolitan, national, and international visitors. However, as was the case in IBA (Berlin), many renowned contemporary architects contributed to this architectural project. I do believe that the invitation to both local and international architects is an effective strategy to attract national/international visitors, and to guarantee innovation in contemporary architecture.

In terms of housing typologies, the most important issue was the architects/developers' spontaneous preference for the courtyard housing typology,

a preference not motivated by any compulsory requirement. I believe that, besides being a traditional Portuguese typology, the establishment of a reasonable/feasible gross construction limit conjugated with a limited footprint aligned with the streets forced the projects to adopt a less greedy ambition to build high. Consequently, the use of the courtyard housing typology became the obvious choice in offering the desired quality for these urban design proposals. Therefore, for the contemporary implementation of courtyard housing, it is highly significant that a balanced combination of gross construction and building footprint allocation/ratio is pre-established in new developments.

In Detail Plan 3 (DP3-Parque das Nações), the access to residents' parking is made through one single access point to each courtyard, which distributes the cars to the garages under the buildings. The advantages are the minimisation of driveways, with the benefit of better streets and the offer of external, free off-street parking for visitors. This situation arose because, to achieve sales of the dwellings, the developers needed to provide enough private parking spaces for the large number of cars owned by the Portuguese middle-high/high social classes. In this example, courtyard housing is intimately linked to individual car ownership, as it is in similar car-dependent societies worldwide.

In DP3, the peripheral use of the courtyards by cars detracts from their qualities and deters people from using them (**Fig.129**). These specific courtyards were definitely not designed to be spaces that encourage parents to bring a child to play on the lawns in the winter or under the trees in the summer; almost all courtyards were simply designed as garden displays to be contemplated and enjoyed from apartment windows. Some do not even have trees, while others are simply expressions of a pictographic design (**Fig.130**). Thus, these courtyards do not accomplish the basic communal courtyard conditions – privacy, safety, and the provision of an extended setting for activities – considered essential in this inquiry. Thus, they were excluded as examples in the design of the CCH prototypes.

Parque EXPO facilitated the building of a distinctive place and marketed it as suitable for a middleclass family who could be part of an elite social group and, secluded by physical barriers, could realise the dream of owning part of a public

realm paradise. If one accepts this reasoning, the alleged impossibility of placing the rail yards underground may have been an intentional strategy to decrease direct access to the (bordering) low-income housing structures. For me, although the overall results are recognised as positive, the housing development generated an elitist territory controlled by a few precinct ‘gates’, inhabited by smart citizens who drive powerful cars, and who count on servants from outside the neighbourhood to assist their national and international guests. As such, I believe the plan failed in assuring social diversity and affordable housing equity. Given the overpricing of land caused by high quality urban standards, this is one of the risks that TODs face worldwide.

Despite these shortcomings, the example of Parque das Nações has important lessons for this study. These are, mainly: its concerns for passive design and respect for natural resources; the implementation of an urban green structure; the application of the hallmarks of TOD; and the creation of flexible construction rules that combine fixed gross construction and building footprint ratios (albeit leaving decisions about apartment sizes to the developers and housing market demand).

Lastly, yet very importantly for this inquiry, is that the urban design proposals worked together in a neighborhood scale as a *Collage City* theory example “for the handling of a fragmented, multicentered city model through its vision of an incremental growth system comprised of distinctive, competing, self-centered enclaves [where] each enclave recorded a separate, incremental layer of city growth”.<sup>482</sup> The realisation of the whole plan, effectively working as a summation of its individual detailed plans and urban components, demonstrates that it is possible to overcome the main disadvantage of Rowe’s *Collage City* theory mentioned by Shane.<sup>483</sup> Through best practice, the plan for Parque das Nações validated that enclaves can be examined in detail, and that the coordination of their various parts can allow for successful individual layers of growth if a statutory authority manages the urban development accordingly.

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<sup>482</sup> Shane 2005, *Recombinant urbanism : conceptual modeling in architecture, urban design, and city theory*, 130-135

<sup>483</sup> See S\_3.1 – Design precedents

### 3.3.3 Comparative analyses: Shichahai and Parque das Nações plans

Although their strategic plans are different, the first impression one has is the liveable character of both areas. Both the Parque das Nações and Shichahai sites have reasonable conditions for walking. The aerial view of Shichahai shows private and public spaces with trees composing an extended urban green structure. In the winter, the CH urban fabric of Shichahai mitigates the uncomfortable prevailing northwest wind; however, the low temperatures and the midday winds can still be very unpleasant when walking by the frozen lakes. In the summer, at midday, walking through the *hutong* is very uncomfortable, because there are no shadows and the city fabric blocks the prevailing southeast wind. At that time of the day, however, it is pleasing to walk under the trees around the lakes where the breezes are strongest. Bicycles are largely used, and drivers have a strong respect for cyclists. Shichahai, like almost all ancient neighbourhoods of Beijing, has mature trees located inside the courtyards, along the main streets, and around the lakes; this is comparable to the mature vegetation on the traditional standalone lot types in Brisbane.

The concern to shade the street parking spaces is noticeable from the aerial views of Parque das Nações. Although the north-south streets provide several lines of trees, and some east-west streets even have two lines of trees – one over the parking spaces and another on the pedestrian paths – a large number of east-west streets have only one line of trees, over the parking spaces. Indeed, when this development was built, cycling was rather viewed as a sport and certainly not as a day-by-day means of commuting. Bicycle lanes are not clearly indicated on the streets, there are few bicycle parking racks, and many bike thefts. This is definitely not an encouraging scenario for the minimisation of car use. Thus, these factors were important to consider when planning for legible and permeable walking and cycling conditions in the Brisbane Collage Plan.

In Parque das Nações, the urban fabric is much looser than in Shichahai for it is composed of larger public spaces and wider streets. The prevailing northwest wind facilitates a good walk in the summer, but can be rather uncomfortable in the winter with the higher wind speeds. Nevertheless, since the planning of EXPO'98,

Parque EXPO has pursued the objective of building an overall pleasant landscape as a valuable asset of the public realm. Most of the street trees were planted after EXPO in line with new building construction and consequently the east-west streets do not yet have ample shade. Until the trees mature to a reasonable size (say, in 15 years) walking will be thermally uncomfortable in the summer and largely unprotected from the wind in the winter.<sup>484</sup> However, planting mature tree species in the entire precinct was both climatically and economically unfeasible.

Access to public transportation is effective in both Shichahai and Parque das Nações, and only a few areas are more than 400m away from the nearest bus access point. In Parque das Nações, public transport is the main means of access for almost all people who work in services and sales, and for clerks, cleaners and food preparation personnel. These workers come from other areas of the city because they do not have the financial means to buy/rent units in Parque das Nações. These factors show that neither the Parque das Nações nor the Shichahai plan is successful in providing conditions for the majority of the residents to work close to their residences. Buses provide the most accessible network in both cases; however, they are still limited in quantity and quality. Subway lines are accessible in the two avenues running east-west on the northern and southern limits of the conservation plan area of Shichahai; access requires an average walking distance of 600m.

The central transportation node in Parque das Nações (Gare do Oriente) provides access to buses, subway and railway; however, Gare do Oriente is 1.5km away from the southern limit of the precinct, and 3km away from its northern limit; furthermore, the buses that service these areas do not adhere to their schedules. The fact that only 1% of its residents chose Parque das Nações for its public transportation services, and that 75% use private automobiles to access jobs and/or education, underscores the strong preference for the use of private cars. Its housing and public realm qualities were the main reason that 66% of its residents chose

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<sup>484</sup> The north-south streets and the public spaces were planted before the EXPO'98. The east-west streets have been planted according to the building construction after that.

Parque das Nações.<sup>485</sup> This is evidence that, although a multimodal station will be centrally located, the efficiency of the connecting bus routes is a significant factor in accomplishing the public transport network planned for the local TOD. This has been taken into consideration in the Collage Plan to support both the connectivity requisites of TOD, and the bus and train network currently planned for Brisbane's public transportation network.

The approach to transit management in each case, however, is completely different and reflects the cultural differences between the two contexts. In Shichahai, almost all cars are excluded from the precincts; however, they do have limited access to the larger courtyard houses. Walking, cycling, and public transport (provided by subway and busses available in the main streets surrounding the lakes) are the main means of locomotion, as parking in internal streets is almost non-existent. The streets in front of the lake accommodate many shops and restaurants; however, the internal *hutong* have high walls, few doors, and limited social activities take place outside the traditional Chinese courtyard houses. Although this example of having shops and restaurants in front of a valuable landscaped space was recognised in the Collage Plan, unlike the *hutong*, the lane structure of the CH prototypes had to be designed to provide enhanced liveability through active edges, and the extended social activities provided by the proposed group-public spaces and key retail and service facilities.

Yet, Shichahai served as an example of vernacular courtyard houses with double courtyards within a compact neighbourhood. This opened up an applied perspective for the double courtyard described by Donia Zhang in *Courtyard houses of Beijing*, served as a starting point from which to decide the basic dimensions for the communal courtyard/double prototype (**Figs. 122, 123 and 124**).<sup>486</sup>

The streets, blocks and courtyard housing buildings built in Parque das Nações were a relevant reference for this inquiry, as an example of a contemporary neighbourhood recognised for its urban qualities locally (residents), nationally (Portugal) and internationally (visitors). The initial dimensions of the CCH/single

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<sup>485</sup> Boieiro and Lopes 2011, *Mobilidade Urbana : Uma questão de planeamento ou de mentalidade?*

<sup>486</sup>



prototype were based on the courtyard housing built in Parque das Nações (**Figs. 128, 129 and 130**). Moreover, some building blocks in Parque das Nações served also as an example of communal courtyard housing as part of a contemporary model of Urban Design.

Overall, lessons for the Brisbane Collage Plan from these two examples are their diversified network of accesses; an awareness of the need to create/maintain multi-use diversity to promote a liveable/sustainable community; the cautious control of new/existing urban densities; and recognition of the need for new/existing urban developments to create/maintain local identity for both residents and visitors.

Following their best practice perspectives, the plans for both Shichahai and Parque das Nações have contributed to the selection of the qualitative and quantitative parameters used in the urban prototypes. Accordingly, both precedents served as relevant benchmarks to guide this inquiry in its aim to contribute to more sustainable and liveable communities.

### 3.4 BRISBANE HOUSING PRECEDENTS

#### 3.4.1 Early housing typologies

The Queensland Undue Subdivision of Land Act of 1885 set the minimum size of allotments at 16 perches (404.8m<sup>2</sup>); this would often result in allotments with a frontage of 10m (half a chain) and a depth of 40m (two chains).<sup>487</sup> The Act had the objective of preventing the over-crowding of dilapidated dwellings and workshops in some areas of the inner city – which was identified by sanitary experts as one of the causes of an existing epidemic – from spreading to suburban allotments. Given the high demand for land provoked by the escalating immigration, land speculators were subdividing tracts of land in minimal allotments, often in swampy or flood-prone areas around the Brisbane River, thus increasing the danger of disease, especially typhoid fever.<sup>488</sup>

Unfortunately, the Act was rather incomplete for it did not establish zoning for the subdivisions, nor it define how landfill and drainage should be executed, nor what type of building could be built on the allotments. One consequence of the Act's inadequacy was the inappropriate design of roads and drainage. Pressed by the media, the Brisbane City Council applied new standards for sewerage and drainage, sometimes using compulsory demolition.<sup>489</sup> However, the minimum size of the allotments generated the widespread desire for larger lot areas and wider streets.<sup>490</sup> A general consequence of the Act was that groups of similar houses were built together, and separated by a party wall in the boundary of the lot.<sup>491</sup> A structural urban outcome was the establishment of a city block type with the width of 80.4 meters (four chains).

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<sup>487</sup> Watson 1985, *An overview of the Brisbane house.*, 11;

<sup>488</sup> For a description of public health conditions in Brisbane see Gregory and Thearle 1985, *Casualties of Brisbane's growth : infant and child mortality in the 1860's.*, 57-70 and Cazalar 1985, *When the plague came to Brisbane*, 79-87

<sup>489</sup> Davison 1988, *New, brawny, uneven and half-finished : Brisbane among the Australian Capital Cities*, 158-159

<sup>490</sup> Laverty 2009, *The making of a metropolis : Brisbane 1823-1925*, 50

<sup>491</sup> Watson 1985, *An overview of the Brisbane house.*, 14. After the 1864 fires, new constructions in the town center were required to have fireproof walls in their façades. Sumner 1985, *The Brisbane house in historical context*. 32

Moreover, an important repercussion of the Act was the indirect creation of developer bias in excluding two housing typologies. One bias is evidenced by the reduced number of terrace houses, even though the Act did not forbid their construction, as the Mansions in George Street and the Terraces in Petrie Terrace show (These were built after 1885).<sup>492</sup> Nevertheless, the Act “laid down that terrace-type housing could not be sold as separate buildings”.<sup>493</sup> Terrace-housing then was more suitable for rental, requiring wealthy speculator-landlords and a market demand by working-class tenants. However, the concept of renting a house was incompatible with the citizens’ widespread ambition of land ownership.<sup>494</sup> The construction of the housing type ceased with the 1890s’ economic recession, although both residents and developers believed in its climatic suitability that was provided by cross-ventilation.<sup>495</sup>

Another typology that was not used was the courtyard house.<sup>496</sup> The initial British, Welsh, Scot and Irish immigrants – with the exception of a few British Army officers and fewer cultured squatters – were probably never exposed to the typology. It should be noted that the minimum lot frontage width, along with the resultant long depth (to accomplish the 16 perches minimum established by the Act), meant that the implementation of a climatically appropriate courtyard housing typology was unfeasible. Consequently, there is no evidence of the courtyard housing taking shape in Brisbane at that time.

Traditional housing in Queensland can be listed concisely in four categories according to the predominant wall material: canvas, bark, slab (split) and sawn board (excluding masonry). These precarious dwellings represented a hierarchy of types, which were intimately related to what newcomers could afford. They were of poor standard of construction and deteriorated within a short span of time. The slab houses were commonly built by sawyers, but also by home handy-men.<sup>497</sup>

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<sup>492</sup> Watson 1985, *An overview of the Brisbane house.*, 13

<sup>493</sup> Allom 1985, *The small Brisbane house.*, 21-22

<sup>494</sup> Sumner 1985, *The Brisbane house in historical context.*, 32

<sup>495</sup> Sumner, 1985 #1858, 32

<sup>496</sup> The hospital erected in 1926, initially built as a standalone building, became a courtyard building with later functional additions. Steele 1975, *Brisbane Town in convict days, 1824-1842*, 69-71

<sup>497</sup> Fisher uses several quotes to describe people experiences of living in each one of these dwelling types along with a detailed description of the building materials, which are not part of this study. See

Besides variations in size and type, dwellings could include interim additions; even tents could have cloth room partitions and chimneys.

Important to note here is that the main construction material was timber, and that the dwelling type was a standalone unit. This was due to the large amount of available softwood and hardwood. Softwood ('scrubs') required hard work to convert into slabs and was less durable, but the process was manageable using basic bushman's tools.<sup>498</sup> Hardwood (mostly eucalypt) was early used for framing; however, it became most used in horizontal slabs after the introduction of the first steam sawmill (built by William Pettigrew in 1853). An alternative to the use of wood in roofing became available with the introduction of galvanized iron in 1856, replacing the ironbark shingles. Although masonry had always been a preferable but expensive solution, it required labour that was more skilled. Hence, masonry was used only on a few official buildings and residences.<sup>499</sup>

Whatever material was used, the dwellings were usually detached.<sup>500</sup> The exceptions would be the few terrace houses and the early buildings in the inner city. The Live-Work typology combining business/small retail with housing was a common practice in the inner city buildings with narrow façades; however, larger commercial and wholesale undertakings occurred later in multistorey buildings with wider frontages (1880s).<sup>501</sup>

After the 1870s, detached dwellings evolved from the spontaneous rural constructions of two ubiquitous house types that shared a similar structure:<sup>502</sup> the

Fisher 1991, *Brisbane's timber houses in Queensland context : towards a dynamic analysis*, 84-96. Neither is part of this study the consequences of the use of some materials – like the weathered paint containing lead applied on veranda railings – in public health. See Thearle and Gregory 1985, *Saving the children : Brisbane medical triumphs of the 1890's.*, 71-77

<sup>498</sup> The most used species were the Hoop Pine also known as Moreton Bay Pine (*Araucaria cunninghamii*) and the Bunya Pine (*Araucaria bidwillii*) Watson 1985, *An overview of the Brisbane house.*, 12

<sup>499</sup> Powell 1998, *People and trees: a thematic history of South East Queensland with particular reference to forested areas, 1823-1997*, 13

<sup>500</sup> Fisher 1985, *In search of the Brisbane House*, 45

<sup>501</sup> Fisher 1988, *Old Frogs Hollow : Devoid of interest a den of iniquity.*, 25

<sup>502</sup> "A typical house frame of this period, and often until the Second World War, consisted of a small number of uprights only, at openings and corners, morticed and tenoned to bottom plates, joined by one or two rails, and the whole sheeted with tongued and grooved, v-jointed boarding." Watson 1985, *An overview of the Brisbane house.*, 15;

two-room cottage with the roof either hip or gable-shaped, and the four-room house with a roof that formed a quadrangular pyramid. The latter is commonly named the 'Queenslander' house type.

The square plan and the pyramidal roof had been used broadly in the colonies prior to its general utilisation in Brisbane.<sup>503</sup> The ubiquitous veranda served to provide a continuum from the inside spaces and to bring in the outside experience.<sup>504</sup> With a width varying from 6 feet (1.83m) to 8 feet (2.44m), the veranda has been one of the most permanent architectural elements in all dwellings. Its permanent spatial contribution – allowing for the entry of low sunrays in the winter, and supplying shaded spaces freshened by sea breezes in the summer – motivated an intense conviviality, modelling the way of life of the residents who would even use it to sleep in the summer, using canvas curtains to establish privacy.<sup>505</sup> In smaller dwellings, verandas first appeared appended to the façade, then added to the back and, when the lot permitted, along the side(s) of the house. In the wealthier houses – provided with fireplaces, chimneys and elaborate roof forms, and mostly located in extensive grounds overlooking elaborate gardens – the veranda would wrap around the whole residence.<sup>506</sup>

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<sup>503</sup> "The British colonial bungalow, West Indian, French and American plantation houses have been mentioned as likely models for early subtropical and tropical Queensland housing. While sometimes quite different in materials and construction, it would appear that these do have some relationship in plan form to the four square cottage so common in Brisbane." Allom 1985, *The small Brisbane house.*, 21

<sup>504</sup> The word comes from the Hindi *varandā*, meaning an "open porch or an enclosed area in the front of the house where visitors are received". *Encyclopædia Britannica Online*, s. v. "veranda," accessed 2012-04-25,

<http://www.britannica.com.ezp01.library.qut.edu.au/EBchecked/topic/625820/veranda>.

Barbara Brooks explores the origins and variations of the word and its first mention as word by the Portuguese Vasco da Gama when reporting his voyage to Calicut in 1498. Da Gama brought to Portugal (later forwarded to the colony of Brazil) "the a form of verandahs, those deep wood framed verandahs on Kerala houses". See Brooks 2008, *In search of Verandahs*, 3-4 . The verandah was introduced in England as an architectural element in the 17th century by British army personal returning from military service in India. Sumner 1985, *The Brisbane house in historical context.*, 30

<sup>505</sup> Gregory 1994, *Lifesyle*, 6-7. The use of the verandah as a sleeping place in the summer was practiced in other colonial places in the world with similar climatic conditions in America like in southern United States and northern Brazil. For a detailed description of the healthy advantages see Hailey 2009, *From sleeping porch to sleeping machine : Inverting traditions of fresh air in North America*

<sup>506</sup> Hogan 1985, *The elite Brisbane House.*, 23

It is quite logical that the use of stumps was introduced to resolve level changes. As many of the roads were built over ridges, to have the entrance door at street level implied the rising of the house at the back. Later, the space under the house became handy for toilet and kitchen spaces, along with storage. In the 1860s, architect Benjamin Backhouse introduced the use of a metal sheet, applied between the footings and the raised structures, to make white ants visible when they were negotiating the metal to access their galleries inside the wood. Furthermore, architect Richard Suter – who lived in the West Indies before his arrival in 1865 – “advocated the use of raised floors for improving ventilation”.<sup>507</sup> Such was the value attributed to these issues that a large number of dwellings were built above the street level, even without the topographical need.

However, raising the house to have both the benefit of air flowing under it and breezes on the verandas would not create comfort inside the typical dwelling when summer temperatures ranged from 20°C to 30°C. Indeed, “The actual fall in indoor temperature would be so small that it would be imperceptible to a building's residents ... [for] ... the major heat gain in a single-storey building is not through the walls but through the roof, and these were almost universally of imported corrugated iron”.<sup>508</sup> In the winter, with temperatures varying between 10° C and 15° C, the cold wind would get inside the houses through the holes in the metal roof, the wooden floor and the timber walls, producing unforgettably cold memories.

While this was more of an insulation issue than a material one, doubling the timber walls and insulating both the floor and the roof was expensive; hence, insulation was hardly ever used. Verandas could only be of effective use in summer or winter if their orientation was favourable according to the Earth's hemisphere. This was not always the case, given the incompatibility between the gridirons and the existent topography.<sup>509</sup> Therefore, the Brisbane house type was generally

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<sup>507</sup> Watson 1985, *An overview of the Brisbane house.*, 15-16

<sup>508</sup> Sumner 1985, *The Brisbane house in historical context.*, 30

<sup>509</sup> Saini 1985, *The Brisbane house in environmental context.*, 35

inappropriate for Brisbane's climate, and failed to provide climatic comfort for its occupants.

Variations of this house type, along with new styles based on it, became fashionable before World War 1; however, the preference for the basic 'Brisbane house' type continued popular.<sup>510</sup> Therefore, popularity could be attributed to the “combination of social, economic, architectural, technological, environmental, and personal factors which fostered its development and ensured its success”.<sup>511</sup>

The commandant's house, erected in Redcliff in 1824, was a timber dwelling with verandas on all sides and a prominent ridge suggesting “the rectilinear or English nature of the plan, rather than the later Queensland style squared plan”.<sup>512</sup> As the cottage was a prefabricated model, it was easily dismantled and transported up river in 1825, to be reassembled in what is now Queens Park.<sup>513</sup> Such housing was later replicated when “Timber production in the early 1900s became more specialised, and larger companies survived where smaller ones struggled. Specialised sawmills, often using complicated ancillary machinery such as tramways, developed. The Brisbane Valley mill of Brown and Broad produced material for the prefabricated housing market”.<sup>514</sup>

Prefabricated homes were used in Queensland after World War II when the rapid population growth demanded a large housing expansion. The quick assembly process of the prefabricated models allowed the delivery of a large number of units in reduced time. In the 1950s, “Queensland [was] the first State to sign contracts to import European prefabricated houses made to Queensland designs ... At the peak in 1950, more than 2,000 families lived in temporary accommodation in

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<sup>510</sup> For a comprehensive understanding of the various Brisbane house styles over time see Rechner 1998, *Brisbane house styles 1880 to 1940 : a guide to the affordable house*. For a complete description of living the "Queenslander" see Fisher and Crozier 1994, *The Queensland house : a roof over our heads*

<sup>511</sup> Fisher 1985, *In search of the Brisbane House*, 50

<sup>512</sup> Allom 1985, *The small Brisbane house.*, 21; Riddel 1994, *Design*, 50

<sup>513</sup> The house was prefabricated in Sydney and transported to Redcliff by boat. Riddel 1994, *Design*, 50; Gregory 1994, *Lifesyle*, 8

<sup>514</sup> Powell 1998, *People and trees: a thematic history of South East Queensland with particular reference to forested areas, 1823-1997*, 41

Queensland".<sup>515</sup> The Queensland Housing Commission was created in 1945, aiming to provide affordable, secure and appropriate housing.

Housing typologies in Brisbane had remained the same, and timber was the most favourable material for single dwellings until the Second World War, when significant technological, social and economic changes took place. Water was more a concern for its excess than for its scarcity, being more related to appropriate drainage and its health benefits rather than to the prevention of flooding, the costs of which affected mainly the poorer owners who lived on low-lying land. By the 1950s, 40% of the families maintained still the procedure of building their own house progressively according to their family size and economic conditions, now with the increased utilization of brick walls and tile roofs to maximise insulation conditions and minimise long-term maintenance costs.<sup>516</sup>

Referring to Brisbane housing typologies of the past, Fisher resumed:

What we have, therefore, are successive generations of predominant housing types, each one linked to a particular socio-economic cycle. When finance and fashion took a downturn the housing styles of the day became ossified, and then redundant until the economy and population increase demanded better accommodation. While later and larger species often remained on the ground, the earlier and lesser varieties had difficulty in surviving. Apart from widespread ignorance, neglect, disfigurement and destruction, the subtropical elements and beastly borers took their toll of traditional timber housing.<sup>517</sup>

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<sup>515</sup> 2012, *The 1950s : A house to call our own*

<sup>516</sup> "The average house consisted of two or three bedrooms, one living area, kitchen and small bathroom and the toilet and laundry were sometimes located outside. The design was simple and economical – most homes were built without features like verandahs and fireplaces and two-storey houses were very rare ... Many families tried to cut the cost of their home by building it themselves. In the 1950s, over one-third of all new houses were owner-built. Families often lived in a small shed while building their new home and later converted this shed into a garage ... As the supply of building materials gradually improved throughout the 1950s, brick homes and red tile roofs began to appear." *The impact of changing technology on everyday life - Housing* 2012, *The impact of changing technology on everyday life - Housing*

<sup>517</sup> Fisher 1991, *Brisbane's timber houses in Queensland context : towards a dynamic analysis*, 89



### 3.4.2 Later housing context

It has been rather difficult to determine the origin and the definite reasons for the choice of elements that constituted the Brisbane house as a prototype; however, the economic status of Brisbane immigrants has always been a factor in their settlement process. Arriving with limited money, the newcomers would attain the most affordable 'roof over their heads' to shelter their families. Therefore, the development of a cheap and quick-to-build stereotype, which permitted expandable additions over the backyard of the 16 perch lot, was appealing and valuable in the process of social status ascendance (**Fig.146**).<sup>518</sup>

In 2009–10 there were approximately 21.6 million people, or 8.4 million households, living in private dwellings in Australia, up 23% on the number of people in private dwellings in 1994–95. There was a larger increase in the number of households over this period (up 28%), reflecting a decrease in the average household size from 2.7 to 2.6 persons per household. The average dwelling size increased over this period from 2.9 to 3.1 bedrooms per dwelling ... Brisbane housing costs were only 15% higher than the rest of Queensland, which had the highest non-capital city housing costs in Australia ... This is influenced by Queensland's high level of urban settlement outside of Brisbane.<sup>519</sup>

On January 2012, Queensland Communities Department director-general Linda Apelt asserted that too many large homes were added to the state's stock after World War II. Apelt explained that the 3BR houses built after 1945 by the Housing Commission became inappropriate for the then public housing demand for 2BR dwellings.<sup>520</sup> Even though she declared that in Queensland 31,315 persons are waiting for a 'roof over their heads', *The Courier Mail* asserted that the number was closer to 70,000. The newspaper added – based on the figures released by the Communities Department – that almost half of the empty public houses (680dw) in

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<sup>518</sup> "Both types were capable of considerable extension, especially towards the rear where additional rooms, kitchens and washhouses might be detached, semi-detached, skillioned or gable-winged, or simply incorporated beneath the main floor. Both were also capable of embellishment, particularly in balustrading, shading, fencing and paintwork. And in effect both varieties had four essential axes - in and out (core to verandah), up and down (main floor to subspace), front to back (verandah to verandah) and side to side (public to private)." *Ibid.*, 83

<sup>519</sup> Australian Bureau of Statistics (ABS) 2011, *Housing occupancy and costs 2009-10*, 4, 10

<sup>520</sup> "Figures released to *The Courier-Mail* show that almost half the 680 public houses currently sitting empty are three-bedders." Helbig 2012, *Public housing too big for poor families, according to Queensland Government*

2012 were 3BR units, while 5617 single people were living in 3BR dwellings, and 14 863 singles were still queuing in a public housing waiting list.<sup>521</sup>

In the 1950s, the general interest in the housing market was first concerned with affordability and the feasibility of making progressive additions, where the space underneath the house was utilised and appreciated. Verandas were essential to a way of life that was intimately related to both the front garden and the backyard. As the lots were generally 40m deep, the backyard guaranteed visual distance from the neighbours, with trees providing shade and privacy. However, since 1990, Brisbane City Council has approved larger house footprints within housing allotments, thus causing a change in the traditional 4-bedroom layout.<sup>522</sup>

By the 1990s, the private housing market demanded a larger number of compartments and two garage spaces; this demand eliminated the space underneath the house. The size of the lots shrank, and the traditional Brisbane backyards were replaced by a small (9-12m<sup>2</sup>) Private Open Space (POS). In addition to these changes, City Councils required only a minimum distance (commonly 1.5-2m) to the property limits. Thus, this parcelling model created a leftover space around the dwelling that made scarce allowance for privacy, airflow, and natural light (**Fig.147**).<sup>523</sup>

Current dwelling house<sup>524</sup> alternatives to the Queenslander type are 2-storey buildings such as row houses with either a small backyard or a front yard and '4-6 packs', which have four to six dwellings grouped around a central open space that serves as car access to the individual garages. Multiple dwelling<sup>525</sup> alternatives are generally 2-storey compound types sometimes called 'townhouses' (4-10+ units), and tower types comprising either single-orientation units that do not provide for

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<sup>521</sup> Ibid.

<sup>522</sup> An example is the Brisbane City Plan 2000 Small Lot Codes. See details in Hall 2010, *The Life and Death of the Australian Backyard*, 110

<sup>523</sup> Examples of this are shown in *ibid*.

<sup>524</sup> **Dwelling house:** "A residential use of premises for one household that contains a single dwelling. The use includes outbuildings and works normally associated with a dwelling and may include a secondary dwelling" (Brisbane City Plan 2014, Schedule 1 Definitions)

<sup>525</sup> **Multiple dwelling:** "Premises that contain three or more dwellings [units] for separate households" (Brisbane City Plan 2014, Schedule 1 Definitions)

ideal ventilation, or single-loaded corridor systems that provide limited cross-ventilation through high windows facing elevated pathways.

Given the tighter current economic climate and the diminishing number of children in contemporary families, the Garden City dream of a four bedroom, two-garage suburban house seems to be rather a pipe dream. If one reflects on the historic cycle of housing typologies in Brisbane (as described by Fisher and cited earlier) and compare it to the current state of inadequate housing types, it can be expected that some of the existing typologies will be gradually replaced by new ones. Even though these existing typologies might serve as options, it is clear that there is space for an alternative typology that caters for the present demand for smaller plan layouts, includes private and semi-private gardens, is close to the city centre and which, eventually, can be expanded when it is affordable for the residents. Courtyard housing offers such alternative typologies.



## Chapter 4: Lenses of inquiry

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This chapter serves to identify the current scenario in which courtyard housing is to be tested. This contextual scenario is (re)viewed through the three lenses of inquiry, albeit influenced by the precedents previously described in **C\_3**. Metaphorically, the precedents are used as a scaffold to mould the protagonist (courtyard housing) that will play within the *mise en scène*<sup>526</sup> created by the lenses of inquiry. The lenses are listed in the order in which they were employed in the design process. Sections **4.1**, **4.2**, and **4.3** describe the lenses (Subtropical Design, Urban Green Structure, and Transit Oriented Development). A table summarising the key findings from each lens of inquiry is included at the end of each of these sections. **Section 4.4** assembles (also in table format) the filtered elements that make up the criteria for the urban design prototypes in **Chapter 5**.

### 4.1 SUBTROPICAL DESIGN

This section introduces subtropical design as the lens of inquiry that first assisted the development of the prototypes. It describes subtropical climate characteristics in passive design for a subtropical city context with both building and urban space concerns. The text serves as a base for creating subtropical design criteria to apply to the urban design prototypes (**S\_5.1**). The question to answer here is: How can courtyard housing be designed to provide an adequate microclimate within a subtropical urban context?

In essence:

Design for South East Queensland must be informed by the essentially subtropical nature of our environment if it is to be appropriate and sustainable. While a dynamic and innovative local vernacular design vocabulary has evolved in response to these conditions, it has largely been confined to low density residential applications, and needs to be reassessed in terms of its application to contemporary conditions and a wider range of built forms including medium and

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<sup>526</sup> "The arrangement of scenery and stage properties in a play; the setting or surroundings of an event or action." *mise en scène* in *New Oxford American Dictionary*, edited by Stevenson, Angus, and Christine A. Lindberg.: Oxford University Press, 2010. Accessed 2013-08-30 [http://www.oxfordreference.com/view/10.1093/acref/9780195392883.001.0001/m\\_en\\_us1268342](http://www.oxfordreference.com/view/10.1093/acref/9780195392883.001.0001/m_en_us1268342)

high density residential, and commercial and retail contexts.

The fundamental challenge for developing principles for appropriate subtropical design in South East Queensland is to make explicit how our built environment can best express our relationship with the environment, as this is in many respects a defining feature of our lifestyle and identity.<sup>527</sup>

Centre for Subtropical Design<sup>528</sup>

#### 4.1.1 Climate

The Köppen climate classification is the most popular climate classification worldwide. The classification assumes a native vegetation-based system as the best expression of climate, combining average ratios of temperatures and precipitation. The scheme separates climates into five main groups (A, B, C, D and E) to which is added “a second letter, f (no dry season), w (winter dry), or s (summer dry), and a third symbol (a, b, c and d), indicating the warmth of the summer or the coldness of the winter”.<sup>529</sup> In this investigation, the focus will be on Group C – Temperate/mesothermal – humid subtropical climate (Cfa), as it is the Köppen classification for Brisbane (AUS) (**Fig.131**).

By 2000, Stern et al. completed a more objective assessment of the Australian climate, classifying six main climate zones, and further dividing these zones into 27 groups (**Fig.132**).<sup>530</sup> Brisbane is located in the ‘Warm Humid Summer, Mild Winter – Zone 2’ of the Building Code of Australia (BCA). This is “a more comfortable version of the hot humid climate. Summers in this zone are warm and humid; in most parts of the zone, summer will be rainy. Winters are mild, with less rain, and sunny. Coastal areas may be subject to decaying tropical cyclones. The summer climate is rather stressful, because of the high humidity. The body's natural cooling system (the evaporation of perspiration) does not work well, because the air **already** [*sic*] holds so much water vapour that it cannot hold much more”.<sup>531</sup> These conditions

<sup>527</sup> Centre for subtropical design 2004, *Subtropical values and principles of subtropical design for the South East Queensland Region*, 4

<sup>528</sup> "The Centre for Subtropical Design is an international collaborative research centre at the Queensland University of Technology. It is contributing new evidence on why climate matters as a design generator in the 21st Century." <http://www.subtropicaledesign.org.au/>

<sup>529</sup>. *Climate classification 2013. Encyclopædia Britannica Online. Retrieved 2013-04-13, from <http://www.britannica.com.ezp01.library.qut.edu.au/EBchecked/topic/1703397/classification>*

<sup>530</sup> For the objective description of the Australian climates see Stern, et al. 2000, *Objective classification of Australian climates*

<sup>531</sup> *Warm humid summer, mild winter, Australian Bureau of Meteorology Online. Accessed 2013-04-14: <http://www.bom.gov.au/climate/environ/housedesign/WSMW.shtml>.*

corroborate the importance of catching summer breezes to maximise cross-ventilation in the design of residential units.

In Brisbane, it is expected that the number of hot days (above 35°C) will be continuously increasing, along with the reduction of cold nights, over the next 50 years.<sup>532</sup> “This is consistent with the global trend of increasing average temperatures. Globally the 10 hottest years on record have all occurred in the last 15 years.”<sup>533</sup> Accordingly, designing for a particular climate requires attention to relevant overseas design solutions that could improve building design characteristics in the climatic environment of the study. Therefore, it was considered relevant in this inquiry to consult passive design solutions used in other climates, including a hot summer Continental climate (Dwa) (Beijing, CHN), and a subtropical Mediterranean climate (Csa) (Lisbon, PRT).

#### 4.1.2 Design

The relationship with the exuberant nature and the freedom to have the dwelling windows open in a straightforward connection between inside and outside are inherent values for most Australians independently of the dwelling typology they live on. However, the subtropical climate of the SEQ region proportionates a larger period during the year that this connection could be enjoyed with the windows open using appropriate natural ventilation/light than in the northern tropical climate and the cooler climates of the south.

Possibly the most appropriate keyword for the Australian subtropical lifestyle is ‘informality’, which might be understood in the context of ‘regional subtropical urbanism’ – collectively known as ‘relaxed urbanism’. The latter can be defined as “collections of small buildings, a variety of street scapes, wide veranda spaces, shade trees, and vistas to landscape and natural surroundings”; a lifestyle “afforded by openness and a strong relationship to green spaces ... with a focus on

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<sup>532</sup> “Brisbane is likely to experience an increase in the annual mean minimum temperature from the current 20°C to 20.3-22°C by 2030 and 20.8-26 °C by 2070.” Low Choy, et al. 2010, *Climate change vulnerability in South East Queensland: a spatial and sectoral assessment*, 13

<sup>533</sup> Karoly, et al. 2013, *Off the charts: Extreme Australian summer heat*

indoor/outdoor activities and permeable living spaces”.<sup>534</sup> These are the characteristics to attend to when designing buildings and open spaces for a subtropical climate city.

### ***Thermal comfort***

As seen in **S\_3.2.1**, one of the first people to attribute an appropriate design to the subtropical climate of Brisbane was Karl Langer in 1944. His short book, *Subtropical Housing*, stresses the importance of the subtropical climate and its relationship with the physical effort expended inside the house in performing domestic tasks. As such, after the roof has been taken into account, housing design should provide sustainable conditions of thermal comfort that can be simply defined as “that condition of mind which expresses satisfaction with the thermal environment”.<sup>535</sup>

Although thermal comfort has been difficult to measure because of its dependence on the subjective perception of both environment-related and person-related factors (that is, physiological and psychological factors), software tools can now evaluate thermal comfort satisfaction using these variables. In the environment-related conditions, air temperature is generally the first indicator of thermal comfort that most people consider significant. However, three more conditions should be considered: air velocity, humidity, and radiant temperature. In person-related factors, the factors generally considered most important are clothing, insulation, and metabolic heat.<sup>536</sup>

Among others, Olgay, Givoni, Fanger, Sayigh and Marafia,<sup>537</sup> and Nicol and Humphreys have been contributing to thermal comfort prediction models for architecture projects.<sup>538</sup> The analysis of Sabery et al. is interesting because it

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<sup>534</sup> Bajracharya, et al. 2010, *Greening transit oriented development and subtropical design*, 154

<sup>535</sup> British Standard BS EN ISO 7730; Office of Regulatory Services 2012, *Work Safe ACT: Thermal Comfort*

<sup>536</sup> Ibid.

<sup>537</sup> Reference tables developed by Carl Mahoney and John Martin Evans to guide how produce appropriate design for different climates.

<sup>538</sup> Olgay and Olgay 1963, *Design with climate: bioclimatic approach to architectural regionalism : Some chapters based on cooperative research with Aladar Olgay*; Fanger 1970, *Thermal comfort: analysis and applications in environmental engineering*; Givoni 1976, *Man, climate and architecture*, Givoni 1994, *Passive and low energy cooling of buildings*, Givoni 1998, *Climate considerations in*



compared the thermal models above and identified that Olgyay, Givoni and Mahohey contributed the most design advice related to thermal comfort.<sup>539</sup>

Of importance since 1923, has been the contribution of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), namely through their Standard 55, which has been periodically published between 1966 (*Thermal Comfort Conditions*) and 2010 (*Thermal environmental conditions for human occupancy*).<sup>540</sup> Significant in the 2010 edition is the enhanced attention to the elevated air movement, which includes extended provisions to support the notion that an increase in air movement augments occupants' tolerance of higher temperatures. The calculation method has been simplified to create clear requirements for the application of interior fans (ceiling and other) for comfort cooling.<sup>541</sup> This opens the doors for housing designers to include fans in their projects to be used on extremely hot days when passive cooling is insufficient.<sup>542</sup>

## ***Buildings***

### Indoors

Heating/cooling represents an average 40% of Australian households' energy use. This high figure is the result of poor natural light, airflow and insulation.<sup>543</sup> Each of Australia's 6 zones and 27 climatic groups should adopt its own set of location-specific design approaches. It could be considered that general passive design topics might apply to all of these climates with adequate changes in the dimensioning of insulation, cross-ventilation and north-facing windows in habitable rooms/areas. A fourth approach, the existence and dimensioning of east and west facing windows, is more dependent on regional/local climatic characteristics. In essence,

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*building and urban design; Sayigh and Marafia 1998, Chapter 1—Thermal comfort and the development of bioclimatic concept in building design; Nicol and Humphreys 2002, Adaptive thermal comfort and sustainable thermal standards for buildings, Humphreys, et al. 2007, Field Studies of Indoor Thermal Comfort and the Progress of the Adaptive Approach.*

<sup>539</sup> Saberi, et al. 2006, *Thermal Comfort in Architecture*

<sup>540</sup> Nevins and McNall 1973, *ASHRAE thermal comfort standards*

<sup>541</sup> ASHARE 2010, *Standard 55-2010 -- Thermal Environmental Conditions for Human Occupancy (ANSI approved)*

<sup>542</sup> For more information about fan uses see Arens, et al. 2009, *Moving air for comfort*

<sup>543</sup> Milne, et al. 2013, *Heating and cooling*

achievement of thermal comfort is controlled by insulation of the building envelope and the position and dimensioning of windows (**Fig.133**).

Appropriate insulation will differ according to the building's regional location, as well as the local availability of materials. The new materials introduced at the beginning of the twentieth century contributed to the vernacular revival of traditional materials at the end of that century, and offered contemporary designers ample opportunities to provide suitable insulation solutions. Today, governments worldwide have compulsory regulations for the use of adequate insulation in new buildings. In the past, however, houses were built with insufficient insulation. With the climbing price of electricity, energy bills became less affordable, encouraging the owners of old buildings to consider improving wall and window insulation using government rebates when available (**Fig.134**).

In terms of climate, it seems that the question needing to be asked is: “How can the house modify the ambient/exterior conditions, so that indoors is usually more comfortable than outdoors?”<sup>544</sup> The colder the winter, the greater is the importance of facing the living area windows to the north (in the southern hemisphere) or to the south (in the northern hemisphere). Ideally, the most recommended design approach would be to face all housing units to the preferred cardinal direction, and to control the variability of the light and wind admitted by the windows. However, this is not always achievable, given factors such as natural constraints (such as topography and lot disposition), and programme issues (such as panoramic views and urban developers’ preferences). Therefore, when using courtyard housing typologies it is spatially incompatible to face all the rooms to the preferred direction. Inevitably, in warm-humid and hot-humid climates, the design of courtyard housing will have to accommodate the east and west-facing windows and manage the morning and afternoon sun conditions with the use of louvers (**Fig.135**).

For passive cooling, air movement should be maximised and, generally, “cross ventilation is most effective for air exchange (building cooling) and fans for air

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<sup>544</sup> Comfortable, Low energy Houses, *Australian Bureau of Meteorology Online*. Accessed 2013-04-14: <http://www.bom.gov.au/climate/environ/housedesign/index.shtml>

movement (people cooling)".<sup>545</sup> Accordingly, the best option to diminish energy consumption is to design housing units with access to two building façades to allow for cross ventilation. The corridors and walls in the interior of the unit should be planned to maximise airflow, and the veranda's sidewalls should preferably be tilted to better capture the summer breezes and direct them inside, or louvers should be used for this effect (**Figs. 136 and 137**). Fans could be used instead of air conditioning to balance the individual thermal comfort-inducing air movement when the natural breezes are insufficient. During the winter, controlled cross-ventilation (amount and duration) is known to promote health benefits (**Fig.138**). Thus, all the units designed for the purpose of this inquiry emphasise the creation of cross-ventilation through the maximisation of natural airflow (**Fig.139**).

### ***Outdoors***

The control of the natural airflow is also vital to guarantee thermal comfort inside the courtyards in both winter and summer. As per the interview with John Taylor,<sup>546</sup> the ideal airflow in a courtyard should be achieved by using appropriate openings (air tunnels) on the ground floor of the communal courtyard building. These openings should be properly dimensioned and located to respond to prevailing summer breezes. The correct positions should be found by conducting wind tests for each courtyard housing block.

Building heights should allow the sun to provide winter solar exposure ideally on half of the area of the courtyards. Bodies of water – preferably using collected rainwater – would provide evaporative cooling, and trees and shadowing structures would supply shade. In large courtyards, different surfaces can be designed to improve air movement. East-west streets should have winter solar exposure on the southern pathway, and all streets need to be planted with shade trees to promote “walkable journeys that are legible, memorable and comfortable”.<sup>547</sup>

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<sup>545</sup> "An air speed of 0.5m per second equates to a 3 degree drop in temperature at relative humidity of 50 per cent."Reardon and Australian Greenhouse Office 2010, *Your home : Australia's guide to environmentally sustainable homes. technical manual*

<sup>546</sup> **Ap\_C.1.4** - John Taylor is Principal/Owner at Engineering Air Science Pty Ltd – engineering and scientific consultancy – Brisbane, Australia. <http://www.engineeringairspace.com/>

<sup>547</sup> Richards and Kennedy 2004, *Subtropical Neighbourhood Design*, 19

### 4.1.3 Summary table: Subtropical design

Courtyard housing can provide an adequate microclimate within a subtropical urban context if properly dimensioned to address both indoor and outdoor thermal comfort. The design of the buildings needs to consider solar orientation and passive ventilation, and to allow for smooth transition between indoors and outdoors. The design of the courtyards should include a special space for outdoor activities, and the use of appropriate organic and inorganic elements to provide a pleasant environment day and night, and throughout the year. Through all of the aspects previously described, courtyard housing can, and should, contribute to the subtropical lifestyle.

Table 4 synthesises the Subtropical Design findings as a lens of inquiry. The design considerations are explained in **C\_5** and discussed in **C\_6**.

**Table 4.** *Lens of Inquiry 1: Courtyard Housing and Subtropical Design*

<b>Benefits</b>	<b>Required Conditions</b>
<ul style="list-style-type: none"> <li>▪ Provide open space within an urban context – offers people a very close contact with a green environment in a daily life</li> </ul>	<ul style="list-style-type: none"> <li>▪ Courtyards should be mainly landscaped</li> </ul>
<ul style="list-style-type: none"> <li>▪ Creates a microclimate – possible to calibrate accordingly to the seasonal needs for human comfort</li> </ul>	<ul style="list-style-type: none"> <li>▪ Design with appropriate:               <ul style="list-style-type: none"> <li>- Orientation of blocks, buildings and courtyards</li> <li>- Dimension of courtyards</li> <li>- Height and permeability of edges (buildings, walls)</li> <li>- Planting for seasonal shading</li> <li>- Surface treatment and planting for gradients in temperature and humidity</li> <li>- Water elements for seasonal different needs</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>▪ Enhance the diversity of open spaces within the urban system</li> <li>▪ Improve conditions for outdoor lifestyle</li> </ul>	<ul style="list-style-type: none"> <li>▪ Courtyard as shared space but not public</li> <li>▪ Dimensions of courtyard and its Landscape design compatible for the required uses (CCH)</li> <li>▪ Private courtyard as an alternative to the traditional backyard (Courtyard Houses)</li> </ul>
<ul style="list-style-type: none"> <li>▪ Compatible with solar orientation and ventilation requirements for open spaces and indoor living places</li> </ul>	<ul style="list-style-type: none"> <li>▪ Buildings and houses oriented to maximize winter sun capture</li> <li>▪ Shading trees and features in courtyards, streets and façades of buildings/houses</li> <li>▪ galleries, verandas, esplanades and other indoor/outdoor transition spaces</li> <li>▪ Double orientation units and houses – provide cross-ventilation and seasonal choice for living</li> </ul>

<b>Benefits</b>	<b>Required Conditions</b>
	spaces <ul style="list-style-type: none"> <li>▪ Edges permeability – studied to improve summer breezes and avoid winter winds</li> <li>▪ Suitable courtyard design to assure control for sun exposure, ventilation and humidity levels</li> </ul>
<hr/>	
<b>Limitations</b>	
<ul style="list-style-type: none"> <li>▪ May result in lack of ventilation within the courtyards and consequently also in indoor spaces if not appropriately designed</li> <li>▪ Topography may be an issue, compromising the adequate solar orientation and ventilation requirements</li> </ul>	

## 4.2 URBAN GREEN STRUCTURE

This section introduces the public urban green spaces and their role within green structures as the second lens of this inquiry. The question to answer here is: How can courtyard housing provide an effective private and semi-private green space configuration, while contributing to a wider sustainable urban green structure?

The underlying idea is: we need to consider the green aspects of planning as a physical structure forming an integral part of the city (e.g. green belts or green corridors), as a network of 'green' elements, as a physical infrastructure playing a role in water management, in the urban micro-climate and in biodiversity, and also as a social infrastructure for leisure, relaxation, human interaction and other social activities. Therefore, green structure is not equivalent to green areas.<sup>548</sup>

Bernard Duhem<sup>549</sup>

The comment of Duhem emphasises that the effectiveness of an urban green structure is based on a network both ecological and actively multifunctional for social activities as part of a system of settings that the courtyards should complement and enhance. The following section discusses the implementation of an urban green structure through a comprehensive sequence of public, semi-private and private spaces. It also discusses the importance of such a structure to public health, and to the provision of an ecological network within the urban fabric.

### 4.2.1 The evolution of urban green spaces

European urban parks were private until the nineteenth century, and were a privilege reserved for the ruling classes. In their *Theory of garden art*, Hirschfeld and Parshall demonstrated that nineteenth century public parks had an important role to play in urban green structures because they provided for diversified outdoor activities that improved public health. However, to moderate the effects of crowding and unhealthy air in densified urban areas, integrated natural areas had to be both small scale—for example, individual backyards—and large scale, such as parks.<sup>550</sup>

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<sup>548</sup> *Green structure and urban planning* 2005, *Green structure and urban planning*, 13

<sup>549</sup> Bernard Duhem is Chairman of the European Co-operation in the field of Scientific and Technical Research (COST)

<sup>550</sup> Hirschfeld and Parshall 2001, *Theory of garden art*, 31

In England, the implementation of public parks<sup>551</sup> was definitely a response to the public health decay brought about by the industrialisation boom and the related decline in living,<sup>552</sup> and suggesting that a similar plan would be a “*beau ideal* of a capital for an Australian or European union” (Fig.140).<sup>553</sup> After 1830, in recognition of the importance of green spaces for the city's health, the English government created commissions to secure open spaces and public walks near densely inhabited urban areas. One of the first public parks in England was Birkenhead Park.<sup>554</sup>

In France, the urban improvements made after the 1779 revolution contributed only to the embellishment of a few urban areas; they were not part of a comprehensive plan to reduce the high urban density (about 1000 ppha) and improve the deficient sanitary conditions that contributed to the death of thousands during the cholera epidemics (1832 and 1853). Indeed, “The only decent streets ran parallel to the river or ringed the city ... The rich and wellborn went from one *hôtel*, built between court and garden, to another, only descending from their coaches when safely inside the *porte cochère*, away from the public filth ... The center of gravity of their residences was the inner garden, part of whose charm was the illusion of not being”.<sup>555</sup> Therefore, the French *hôtels*<sup>556</sup> (courtyard houses), while contributing to the health of cities as green spaces, were a privilege of the wealthy classes.

The concept of equity engendered by the French revolution only became a reality with the implementation of public green spaces in 1853, when Napoleon III commissioned Baron Haussmann, as *Préfect* of the Seine, to make substantial

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<sup>551</sup> In simple terms, I see a public park as public land devoted to recreational activities of all the people.

<sup>552</sup> The name of the plan was *Hints for Breathing Places for the Metropolis, and for Country Towns and Villages, on fixed Principles*. Johnson 2012, *Observations on J. C. Loudon's beau ideal town of 1829*

<sup>553</sup> Henderson 2008, *William Light's Adelaide: The genius of place and plan*, 6

<sup>554</sup> Designed by Joseph Paxton and Edward Kemp, 1845

<sup>555</sup> The term *hôtel* (in italic) is used here and thereafter meaning an aristocratic residence and is seen as courtyard house type of a pre-industrial city. The type evolved morphologically (Baroque, Rococo and Neoclassical) from the sixteenth century to the nineteenth century making use of two courtyard spaces: one related to the carriages access to the street, and another private commonly implanted as a formal garden. See Dennis 1986, *Court and garden: from the French hôtel to the city of modern architecture*

<sup>556</sup> Houses of the French ruling classes generally presenting a front yard for the horse carts access and a picturesque courtyard

infrastructure reforms in Paris, including a new sewerage and water supply network. Haussmann also hired Adolphe Alphand to make significant improvements to the previously royal parks, making the Bois de Boulogne a showpiece. The success of this venture gave impetus to the refurbishment of Bois de Vincennes, Parc Monceau and the Luxembourg Gardens, which all opened to the public in the 1860s.<sup>557</sup>

However, the parks reform was not sufficient to create a continuous green structure because it was unfeasible to plant trees on the narrow Parisian streets.<sup>558</sup> The essential links in the park system were the new *boulevards*, which connected the green spaces across the city. Created through a process of enforced demolitions, these wide streets were extensively planted with trees, completing a green network, bringing air and light to the newly built housing, and inviting the citizens for pleasant walks.<sup>559</sup>

In America, Central Park New York (1857), designed by Frederick Law Olmsted and Calvert Vaux, became an exemplar of public parks as essential components of urban green structure.<sup>560</sup> Olmsted, who had previously travelled to England in 1850, was strongly influenced by the features of the English Birkenhead Park,<sup>561</sup> which were applied in the development of Central Park and in his other projects thereafter.<sup>562</sup> In 1868, Olmsted and Vaux started the first two projects in their

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<sup>557</sup> For a complete description of all the public spaces see Alphand and Hochereau 1984, *Les promenades de Paris : histoire, description des embellissements, dépenses de création et d'entretien des Bois de Boulogne et de Vincennes, Champs-Élysées, parcs, squares, boulevards, places plantées : étude sur l'art des jardins et arboretum*

<sup>558</sup> This was confirmed by Robinson in 1869: "Parks and gardens are excellent in their way, but they effect only a partial good if vast areas of densely-packed streets are unrelieved by green open spots where wholesome air may obtain a vantage ground in its ceaseless work of removing impurities." Robinson 1869, *The parks, promenades, & gardens of Paris, described and considered in relation to the wants of our own cities, and the public and private gardens*, 112

<sup>559</sup> See **S\_3.2.2**, p. 89

<sup>560</sup> A public competition for the design of the layout of a park in the central area of Manhattan was promoted in 1857, and the winners were Frederick Law Olmsted and Calvert Vaux. Newton 1971, *Design on the land : the development of landscape architecture*, 269-271

<sup>561</sup> Olmsted highlighted the positive elements of Birkenhead Park that he applied in his projects: "Besides the cricket and an archery ground, large valleys were made verdant, extensive drives arranged plantations, clumps, and avenues of trees formed, and a large park laid out ... The poorest British peasant is as free to enjoy it in all its parts as the British queen." Olmsted 1852, *Walks and talks of an American farmer in England*, 81

<sup>562</sup> "The design of Central Park contained the same features as Birkenhead, although he [Olmsted] considered it far in advance of any European design: lakes, mounds, recreation areas, roads, walks



sequence of public parks as a green network—one in Buffalo (upstate New York) and the other in Riverside, by the Des Plaines River (15km/9 miles from Chicago). In Buffalo, the three available sites offered for the building of just one public park were linked by 70m-wide ‘parkways’, which Olmsted defined as “broad thoroughfares planted with trees and designed with special reference to recreation as well as for common traffic”;<sup>563</sup> however, all commercial traffic was excluded (**Fig.141**).

The Village of Riverside (650ha – 44% public land) was one of the first planned communities in the United States; it was connected to Chicago through a shaded parkway and a railway line. Olmsted and Vaux wanted to show how single-house suburbs should be for those who were looking for a natural retreat from urban turmoil (**Fig.142**). The plan was structured using curved and intercepting streets that formed scenic triangular spaces between the houses and the streets, thus establishing spaces with public functions, albeit sited on semi-private land.<sup>564</sup> This arrangement conceptualises the group-public areas implemented in the CH prototypes.

As pointed out by Karsten Jørgensen, these two projects established the basis of what could be considered the first program for green structure planning, which was thereafter used in the development of park systems in New York, Boston (Emerald Necklace; **Fig.143**) and Chicago.<sup>565</sup> All of these projects became important

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and rides and plantations. It was laid out in a style which had by this time become international.”

Clark 1973, *Nineteenth-Century Public Parks from 1830*, 37-38

<sup>563</sup> Jørgensen 2005, *The history of urban green structures*, 226

<sup>564</sup> FrederickLawOlmsted.com 2011, *Riverside, Illinois*

<sup>565</sup> Jørgensen extracted parts from Olmsted's *Public Parks and the Enlargement of Towns* (read at the *American Social Science Association at the Lowell Institute, Boston*, in 1870) building a coherent text layout: “The duty of arranging new trunk routes of communication between it and the distant parts of the town existing and forecasted. These may be either narrow informal elongations of the park, varying say from two to five hundred feet in width, and radiating irregularly from it, or . . . formal parkways. They should be so planned and constructed as never to be noisy and seldom crowded... If possible, also, they should be branched or reticulated with other ways of a similar class, so that no part of the town should finally be many minutes’ walk from some one of them; and they should be made interesting by a process of planting and decoration, so that in necessarily passing through them, whether in going to or from the park, or to and from business, some substantial recreative advantage may be incidentally gained.” Jørgensen 2005, *The history of urban green structures*, 227; Olmsted and YA Pamphlet Collection (Library of Congress) 1870, *Public parks and the enlargement of*

references in the development of green structures worldwide, and may have inspired Ebenezer Howard in the writing of *Garden Cities of to-morrow*, published in 1902 in England.<sup>566</sup>

As in the ancient Greek *polis* previously mentioned,<sup>567</sup> Howard asserted that cities should grow to a maximum size, and be surrounded by green belts. After the ideal size was achieved, the 'mother' city would create 'satellite' towns on its periphery. The book was very influential and generated the Garden City Movement, resulting in the creation of several 'green cities' (communities in the centre of greenbelts) in England and elsewhere. These green cities remain today, as is shown in the 2013 proposed plan for the deactivated Margam opencast mine in England (**Fig.144**). Larice and Macdonald commented that "...Howard's Garden City schema is notable for the number of ideas that influenced modern city planning including those of zoning, balanced communities, decentralization, greenbelts, the benefits of nature in the city, and the importance of healthy environments".<sup>568</sup>

In London (1908), however, the green ring system was criticised by Henry Lanchester as being appropriate to cities previously surrounded by obsolete fortifications (such as Vienna), but not as efficient or economically feasible as a radial system which could offer higher urban densities near the city centre. His plan was akin to the plan made by Theodor Fritsch in 1896 (**Fig.145**).<sup>569</sup> By 1910 in the RIBA conference, Rudolf Eberstadt presented a similar scheme, which was developed by Thomas Mawson in *Civic Art* in 1911.<sup>570</sup> In his book, Mawson defined (for the first time in England) the term 'park system' as "a chain of parks, gardens and open spaces connected by boulevards or parkways, or a grouping of common lands and tree planted and open spaces, parks, or gardens, arranged according to a

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*towns* : read before the American Social Science Association at the Lowell Institute, Boston, Feb. 25, 1870

<sup>566</sup> Howard 1902, *Garden cities of to-morrow* : being the second edition of "To-morrow: a peaceful path to real reform"

<sup>567</sup> Section 3.2.1

<sup>568</sup> Larice and Macdonald 2007, *The urban design reader*, 44

<sup>569</sup> Lanchester 1908, *Park Systems For Great Cities*

<sup>570</sup> Mawson 1911, *Civic art: studies in town planning, parks, boulevards, and open spaces*

comprehensive plan, and extending from the city into the open country”.<sup>571</sup>

An example of the radial system is the Five Finger Plan for the Greater Copenhagen Region (1947). The plan started as a radial scheme with five corridors (fingers) connecting to the city centre. Later, however, there was a common acceptance that the linear corridors ought to be connected through a comprehensive greenbelt scheme, thus generating a mixed green scheme model.<sup>572</sup> This amalgamation may be considered an example of the application of the concept of *continuum naturale*. This concept combined Olmsted's *continuum* of parks model with the concept of homeostasis,<sup>573</sup> to argue that a comprehensive understanding of the role of a green structure within modern cities should include the ecological principles of continuity, diversity and intensification.<sup>574</sup> These principles would be facilitated by radial green paths connected by natural green belts, creating a specific ecological connectivity appropriate to the gradual adaptation of the natural species within each urban environment.

The concept of 'greenway' emerged in the beginning of the twentieth century in the United States. The initial concept included natural and visual values in building green corridors as public parks; today, however, the highlighting in the spatial configuration of the corridors is more comprehensive and encompasses “transportation, urban wildlife, flood control, utilities, education, neighbourhood planning, and other threads of the urban fabric”.<sup>575</sup> Moreover, there was the national recognition that the greenways needed to do more than simply make local linear connections by following natural features such as ridgelines, riverfronts, or

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<sup>571</sup> Quoted by Csepely-Knorr 2011, *The Birth of the Theory of Urban Green Systems in Britain and Hungary. Correspondence between Thomas H. Mawson and Béla Rerrich concerning Urban Design Principles*, 48; from Mawson 1911, *Civic art: studies in town planning, parks, boulevards, and open spaces*, 79

<sup>572</sup> Vejre, et al. 2010, *The Copenhagen Finger Plan*

<sup>573</sup> "The maintenance of a dynamically stable state within a system by means of internal regulatory processes that tend to counteract any disturbance of the stability by external forces or influences; the state of stability so maintained." "homœostasis, n.". OED Online. March 2013. Oxford University Press. Accessed 2013-05-18

<http://www.oed.com.ezp01.library.qut.edu.au/view/Entry/88025?redirectedFrom=homeostasis>

<sup>574</sup> The concept was introduced in Portugal by Landscape Architect Francisco Caldeira Cabral in the 1940s. Caldeira Cabral 2011, *O "Continuum Naturale" e a conservação da natureza*; Magalhães 1993, *Ecological structure for Lisbon*, 159

<sup>575</sup> Macdonald 2005, *Green threads in the urban fabric*

stream valleys. They also needed to be part of larger natural networks “to provide people with access to open spaces close to where they live, and to link together the rural and urban spaces in the American landscape threading through cities and countrysides like a giant circulation system”.<sup>576</sup>

Among the many existing definitions of ‘greenway’, it is relevant to consider the one stressed by Jack Ahern: “Greenways are networks of land that are planned, designed, and managed for multiple purposes including ecological, recreational, cultural, aesthetic, or other purposes compatible with the concept of sustainable land use.”<sup>577</sup> Following this logic, it is also necessary to assume a contemporary definition of ‘green structure’ to be used as a basis of analysis.

‘Green structure’ is a rather difficult term to define because of its multifunctional characteristics in serving multiple uses in the urban environment.<sup>578</sup> In terms of landscape ecology theories, green structure may be defined as all urban areas neither sealed nor paved, including bodies of water, irrespective of their ownership.<sup>579</sup> In the context of urban design, the term can relate to the spatial structure that connects all the above areas as parts of an urban landscape continuum; however, in relation to sustainable urban development, the green structure should attend to many functions and meanings.<sup>580</sup> The following definition captures its common features: “Green structure consists of all green areas of a city, private as well as public, gardens as much as areas of meadowland, woodland as

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<sup>576</sup> Words from the report of the President’s Commission on Americans Outdoors in the USA (1987), in Ahern 2004, *Greenways in the USA: theory, trends and prospects*, 34-35

<sup>577</sup> *Ibid.*, 35

<sup>578</sup> In the introduction of the report *Green structure and urban planning* produced by the European Co-operation in the field of Scientific and Technical Research (COST), Chairman Bernard Duhem mentioned that the term is still not a recognizable term in all countries because it is even hard to translate it to some languages. *Green structure and urban planning 2005, Green structure and urban planning*, 13

<sup>579</sup> Elisabet Alm refers specifically the theories of Forman and Godron in the book *Landscape ecology*. Alm and Chalmers University of Technology 2007, *Urban Green Structure - a hidden resource*, 12; Forman and Godron 1986, *Landscape ecology*

<sup>580</sup> Some of these could be, as mentioned by Alm: "Urban climate, noise moderation, air cleaning and handle of surface water; as an indicator of environmental changes ... biodiversity – to save valuable urban species, as refuges for species from rural biotopes and as spreading corridors; social and cultural values – for health, recovering and rehabilitation, to give beauty and comfort, to give room for passivity and activity, as a cultural heritage, as an arena for citizenship, for education; gardening and allotments – as history of urban landscapes, as a social function, for life quality and beauty, providing a reserve." Alm and Chalmers University of Technology 2007, *Urban Green Structure - a hidden resource*, 13

much as parks or church yards, and even rivers, wetlands, ponds, etc.”<sup>581</sup>

Urban green structures are classified as ‘primary’ (main) and ‘secondary’. The main green structure is characterised by public natural soils (neither sealed nor paved), including all bodies of water. Its major role is to integrate the existing green areas with the new areas to be built, thus setting up a continuous green structure. The secondary green structure is composed of the (mostly) unsealed/unpaved soils of all private and semi-private urban land operating as front gardens, backyards and courtyards. The secondary structure also includes green streets and squares, which play an important role in maintaining the ecological links between private, semi-private and public spaces.

Both green structures contribute benefits to the cities, such as “green areas to increase phenological<sup>582</sup> diversity, diversity of composition, color, form and movement”.<sup>583</sup> Public parks can be part of either one of the above structures, depending on their size, character and location within the overall green structure. Because much of the city centres is widely occupied by buildings, and the open spaces extensively paved, the secondary structure decreases and the ecological continuum tends to disappear.

Magalhães asserted that the Urban Ecological Structure is composed of wet systems, dry systems, corridor systems and miscellaneous systems (backyards and courtyards).<sup>584</sup> The two latter systems constitute the secondary green structure,

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<sup>581</sup> Thorén 2000, “*The green poster*” *A method to evaluate the sustainability of the urban green structure*, 362

<sup>582</sup> “Phenology: a branch of science dealing with the relations between climate and periodic biological phenomena (as bird migration or plant flowering).” <http://www.merriam-webster.com/dictionary/phenology>

<sup>583</sup> Magalhães 1993, *Ecological structure for Lisbon*, 163-164

<sup>584</sup> Magalhães defines these systems as:

**Wet systems:** green areas or tree-lined streets in accumulation, i.e. in thalweg with a gentle lengthwise slope; riverbeds, banks and areas adjacent to water-lines still open to the air; catchment basins for rainwater upstream of hydrographic basins; lakes (including man-made ones), lagoons and ponds.

**Dry systems:** sloping areas (over 25 percent), including escarpments, quarries and gravel-pits; elements which parcel up the rural landscape, olive groves and naturally occurring dry meadows; dense forest.

**Corridor systems:** protective embankments for highways; tree-lined streets; vertical surfaces covered in vegetation.

**Miscellaneous systems:** back gardens and courtyards." *ibid.*, 165

which is the most relevant to the design process of the urban design prototypes of this study.

#### 4.2.2 Planning urban green

The previous rationalisation serves to show the importance of bringing a green network into the city as an integrated urban ecological system, and to demonstrate the long-term concerns about the importance of this strategy in urban design. It is then necessary to reflect on the way in which it can be used in urban development. One might agree with Jørgensen that

... what is needed today is ... a planning concept where the total green structure, private or public, is regarded as an integrated part of the urban fabric, and as a “tool” for urban development. A tool – not in the sense of an instrument to control the development, but the contrary: an uncontrollable ‘fait accompli’ that may enrich urbanity. A green structure may contribute to the reconciliation of the split between the quest for control and the need for individual freedom that has haunted modernity throughout its history.<sup>585</sup>

In the “Ecological structure for Lisbon”, Manuela Magalhães recognised the need to preserve the ecological structure within consolidated urban fabrics through effective maintenance of the secondary green structure. Recognising the importance of the courtyards and backyards, Magalhães suggested that they should be subjected to specific regulations that ensured they were progressively cleared of small buildings and sealed surfaces, and that the introduction of greenery and tree species appropriate to the local flora/fauna was guaranteed.<sup>586</sup>

In compact city centres that have large impermeable areas, this measure would create “an interface between the subsoil and the atmosphere, where water, gaseous products and nutrients will pass freely. Without this, the city will become increasingly dusty and dry, hotter in summer and colder in the winter”.<sup>587</sup> These vegetated voids also become important habitats for the city's birds.<sup>588</sup>

Europe suffered from a scarcity of land and the permanent need to (re)structure its old city cores. By contrast, the formation of cities in Australia had

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<sup>585</sup> Jørgensen 2005, *The history of urban green structures*, 229-230

<sup>586</sup> Magalhães 1993, *Ecological structure for Lisbon*, 164

<sup>587</sup> *Ibid.*, 164

<sup>588</sup> Sushinsky 2011, *Urban growth, biodiversity, and the extinction of experience*

the benefits of an abundance of vacant land and the colonisers' "aspirations for decency, order, health and privacy".<sup>589</sup> Since the beginning of colonisation, "Australians have had a long love affair with the outdoors – the wide open spaces where they can recreate, socialise, get close to the nature (the bush) and take advantage of an agreeable climate. This special relationship has influenced their traditional preference for the quarter-acre lot [ $\approx 1012\text{m}^2$ ] with its ubiquitous backyard".<sup>590</sup> Nonetheless, according to Tony Hall in *The Life and Death of the Australian Backyard*, from the 1990s, courtyards have been 'shrinking' in Australian cities, predominantly because of socio-economic downturns. The house is nowadays "seen more as a financial investment than as a place to enjoy. Maximising the investment is seen as maximising the floor area".<sup>591</sup>

However, as it can be seen in **S\_5.1.1** and **Ap\_B**, one might recognise that the planning system was very important in guaranteeing enough backyard space when establishing a minimum lot size for Brisbane urban development (16 perches =  $404.8\text{m}^2$ ). With subsequent changes in Brisbane's city lot codes – which either required a very small area of private open space (POS) or simply established minimum rear setbacks, and the maximisation of floor area occupancy – lots no longer had the space to accommodate a backyard. However, the appropriate dimensions of the backyards are related to both their privacy and to the activities determined by their cultural and geographic location. Tony Hall's analysis of these dimensions is given in the footnote below.<sup>592</sup>

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<sup>589</sup> Hall 2010, *The Life and Death of the Australian Backyard*, 4

<sup>590</sup> Low Choy 2010, *From green belts to green space*, 127

<sup>591</sup> Hall 2010, *The Life and Death of the Australian Backyard*

<sup>592</sup> Tony Hall lists some dimensions that were analysed in this inquiry: "The influential American writer Kevin Lynch has asserted that backyard dimensions of a minimum 40 feet (12m) x 40 feet - creating an area of approximately  $144\text{m}^2$  - is useable for sitting, playing and growing flowers (Lynch 1962) . Alternatively, an 'outdoor room' may be efficient at 20 feet (6 m) x 20 feet, generating an area of  $36\text{m}^2$ . Lynch's backyard dimensions were consistent with his suggestion for a public square of 'intimate scale', which suggests that degree of enclosure is an important feature in his backyard type. In terms of design parameters, Lynch encouraged the private open space to be intimately related to the dwelling, of suitable slope and orientation and adequate privacy: typical design parameters for the contemporary yard. In Colman's design manual '*Streets for Living*', the level of private open space is quantified as  $90\text{m}^2$  for houses of up to three bedrooms, and  $150\text{m}^2$  for houses with four or more bedrooms (Colman 1978). The highly influential design manual *Responsive Environments* (Bentley *et al.* 1985) defined a hierarchy in the size and use relationship. It asserted that  $160\text{m}^2$  is required for self-sufficiency in vegetables,  $60-100\text{m}^2$  is suitable for sitting out and children's play and  $25\text{m}^2$  is adequate only for passive activity." *ibid.*, 96; Lynch and Hack 1962, *Site Planning*; Colman

Therefore, the existence of single-houses with backyards or courtyards depended on suitable lot size codes and the establishment of maximum house footprints that would attend to the residents' lifestyle.<sup>593</sup> As backyards have been an important part of cities green structures in contributing to the ecological links that connect the city to its region, the loss of the traditional backyards represents a significant change in ecological connectivity. The use of courtyard housing in higher housing densities, however, can offer an alternative solution to ensure this vital connectivity.

#### 4.2.3 Urban green structures in Brisbane

Efforts to systematise the growth of the area that is now called the 'City of Brisbane' can be traced back to the beginning of the twentieth century, with the creation of the Queensland Town Planning Association (1914) and the Second Australian Planning and housing conference, where the influence of the Garden City concepts was noticeable. By 1928, William Earle had completed a plan for the recently created City of Greater Brisbane (1220km<sup>2</sup>), which proposed improvements to the road network utilising green belt concepts. By the end of World War II (1944), Ronald McInnis developed Earle's work, creating a plan that utilised part of the rural zoned area to constitute a wide green belt (1.6km) around the city, and allocated further urban development to satellite towns.<sup>594</sup>

Nevertheless, the plan had the opposition of interest groups, including architects, who argued that green areas should not be an obstacle to city growth; rather, they should be developed as parkland corridors radiating from the city. Adding to this opposition, other issues<sup>595</sup> postponed the green belt scheme until 1965, when the overall concept, which included open spaces and farmland assets protection, was finally abandoned and replaced by a new plan. This plan focused on

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1978, *Streets for living: a guide to better Australian residential design practice*; Bentley 1985, *Responsive environments : a manual for designers*

<sup>593</sup> Hall 2010, *Goodbye to the Backyard?—The Minimisation of Private Open Space in the Australian Outer-Suburban Estate*

<sup>594</sup> Low Choy 2010, *From green belts to green space*, 129-132

<sup>595</sup> Political changes, housing-led growth, and logistic serving of satellite towns.



population and economic growth, and was primarily supportive of road systems planning. Transportation plans made by Wilbur Smith and Associates in the 1960s showed some recognition of Brisbane's green assets, mainly its open-space corridors along watercourses; however, the approach was vague, and “there was no sense of an integrated system of open spaces”.<sup>596</sup> Nevertheless, the newly planned tree-lined streets and the “parks, forest and water resources” mapped in the transportation plans could be considered an initial base for establishing an urban green structure.

The 1976 plan seems to have taken the Wilbur Smith plan as a base, as indicated by similar mapping used for the “spatial representation of the metropolitan-scale open space”.<sup>597</sup> The plan facilitated the provision of a peripheral green buffer, the preservation of relevant physical features (for example, Mt Cootha and Mt Gravatt), and the implementation of landscaped schemes along suburban waterways (for example, Bulimba Creek).<sup>598</sup> The following 2011 plan, *The Livable City for the Future*,<sup>599</sup> served to show that Brisbane City could not do it alone with an open-space system on a metropolitan scale without the involvement of the State Government.

By 1993, as a response to this limitation, the South East Queensland (SEQ) 2001 Regional Framework for Growth Management created the Regional Open Space System (ROSS) to manage regional open spaces and outdoor recreation matters. The regional strategy was ambitious in its large spatial scale and in the required state funding (AU\$35M).<sup>600</sup> The program was halted in 1996, and replaced in 1997 by the Regional Landscape Strategy initiative which had a broad regional

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<sup>596</sup> Low Choy 2010, *From green belts to green space*, 132-133

<sup>597</sup> Ibid., 135 *City of Brisbane Town Plan 1976: Statement of Intent, Part A : the Strategic Plan 1976, City of Brisbane Town Plan 1976: Statement of Intent, Part A : the Strategic Plan*

<sup>598</sup> Low Choy 2010, *From green belts to green space*, 135;

<sup>599</sup> *The Brisbane 2011 Plan: The Livable City for the Future 1996, The Brisbane 2011 Plan: The Livable City for the Future*

<sup>600</sup> "The spatial expression of this strategy was to comprise: **Regional and Subregional Frames** - physical features that framed and gave definition to the region and its subregions; **Core Areas** - areas of the public estate (e.g. national parks) that contributed to the functions of open space due to their conservation, recreation, amenity or production values; **Linkages and Corridors** - terrestrial and aquatic links between the core areas recognised for their conservation, recreation, amenity or production values; **Resource Production Areas** - farmland and commercial forests." Low Choy 2010, *From green belts to green space*, 137

scope; however, it was not detailed enough to interact with its large number of stakeholders.<sup>601</sup>

The *Corporate Plan 2008-12: 2010 Update* (2009)<sup>602</sup> gave continuity to the general aims of the previous plan (2008), making provision for improving shading in open spaces, pathways and subtropical boulevards. Both plans recognised the importance of higher quality park design, and the public enforcement of projects to upgrade/rehabilitate local, district and metropolitan parks.<sup>603</sup> However, the plans were still most concerned with the maintenance and improvement of the existing infrastructure, and did not establish a cohesive vision for an urban green structure.

#### 4.2.4 Summary table: Urban green structure

As was demonstrated in the narrative above, private and semi-private courtyards can contribute to extending the main level of an urban green structure within the compact urban fabric of cities, as part of its invaluable secondary green level. To accomplish this, it is necessary to establish appropriate dimensions and characterisation parameters for designing courtyards and other green spaces to enforce the ecological connectivity. In this way, private, semi-private and public spaces can be successfully aggregated as a contribution to a sustainable green structure.

The rules relating to the implementation of the recommendations for building and maintaining courtyard spaces can be easily addressed. In the case of communal courtyard housing, regulations for the maintenance of the courtyards – such as the plantation/location of proper species, along with solutions to avoid impervious surfaces – can be managed by the body corporate without City Councils' mediation. As institutional directives are difficult to implement in the private realm, the correct procedures for the landscaping of courtyards in CH can be disseminated through community centres and neighbourhood schools, with the objective of creating a

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<sup>601</sup> These stakeholders ranged from farming organisations, conservation groups, indigenous groups, outdoor recreation groups, tourism interests, local government, state agencies and professional interests."Low Choy 2005, *How Green Was My City Region: The relevance of past open space planning experiences to contemporary planing for the Brisbane metropolitan region*, 14

<sup>602</sup> 2009, *Brisbane City Council Corporate plan 2008-12 : 2010 update*

<sup>603</sup> *Ibid.*, 12

communal consciousness of the significance of an urban green structure.<sup>604</sup>

The understanding of a secondary green structure as an essential part of the overall ecological system of cities is the main lesson extracted from the reviewed literature. New housing developments need to consider an appropriate balance between different scales of green space such as public parks, public open spaces and streets and private/semi-private gardens. This balance needs to be established for each different context, and a set of appropriate policies should quantify and qualify the amount of private land (that is, land that cannot be built on) that is essential to guarantee an adequate ecological continuum.

The most applicable practical approaches for this inquiry were the Finger Plan for Copenhagen (on a large scale), and the overall concept of greenway (on a small scale). These approaches were chosen because they include the concept of linearity, where the courtyards contribute to the urban green structure as stepping-stones of the ecological urban system. They become part of the secondary green structure, through the integration of green streets, boulevards, and public green spaces. The approaches are tested in the Collage Plan as a viable solution for the Bowen Hills site.

Table 5 synthesises the findings related to Urban Green Structures as a lens of inquiry. The design considerations are explained in **C\_5** and discussed in **C\_6**.

**Table 5.** *Lens of Inquiry 2: Courtyard Housing and Urban Green Structure*

<b>Benefits</b>	<b>Required Conditions</b>
<ul style="list-style-type: none"> <li>▪ Provide green spaces within urban environment</li> </ul>	<ul style="list-style-type: none"> <li>▪ Courtyards should be mostly 'landscaped'</li> </ul>
<ul style="list-style-type: none"> <li>▪ Contribute to the balance of the 'natural' water systems (storm water + storage water)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Mostly (60-80%) water permeable (planted areas, [semi]permeable paving, avoid parking underneath)</li> </ul>

<sup>604</sup> These recommendations are corroborated by Low Choy comment: " Particularly in the light of the history of past initiatives, it is strongly argued that community engagement through collaborative planning is the only feasible landscape management paradigm capable of successfully addressing the urban growth challenges facing South East Queensland and safeguarding the regional landscape values in their entirety." Low Choy 2005, *How Green Was My City Region: The relevance of past open space planning experiences to contemporary planning for the Brisbane metropolitan region*, 14; and by O'Loughlin *et al.*: "...sustainable sub-tropical city-making also needs to have a major focus on supporting collaborative efforts around building sustainable place-habitats across the cityscape tapestry." O'Loughlin, *et al.* 2006, *Catalysing design principles through the Dreaming of sustainable subtropical cityscapes: the collaborative construction of new place identities*, 6

<ul style="list-style-type: none"> <li>▪ Increase vegetation and water within the urban fabric – a contribute for the ecological connectivity of the urban green structure</li> </ul>	<ul style="list-style-type: none"> <li>▪ Courtyards mostly landscaped</li> <li>▪ Species appropriate for the ecological urban context: resilience/green structure)</li> </ul>
<ul style="list-style-type: none"> <li>▪ Enhance the urban ecological bio-system as stepping-stones of the wider urban green structure</li> </ul>	<ul style="list-style-type: none"> <li>▪ Appropriate dimensions, plant species selection, and space management to provide habitat to fauna and flora</li> </ul>
<ul style="list-style-type: none"> <li>▪ Provide shade and ameliorate environment, filter the air and sequester carbon</li> </ul>	<ul style="list-style-type: none"> <li>▪ Planting of trees and climbing plants over garden structures</li> </ul>
<ul style="list-style-type: none"> <li>▪ Preserve soil as an essential life resource</li> </ul>	<ul style="list-style-type: none"> <li>▪ Pervious and 'landscaped'</li> </ul>
<b>Limitations</b>	
<ul style="list-style-type: none"> <li>▪ Continuity of planted areas</li> </ul>	

### 4.3 TRANSIT ORIENTED DEVELOPMENT – TOD

This section discusses the hallmarks of Transit Oriented Development (see 1.3 Definitions) as lenses of inquiry. The question to answer is: Can courtyard housing typologies enhance the characteristics of TOD?

TOD has many characteristics and implied definitions. Accessibility, sense of community, mixed-use infrastructure, and density are TOD hallmarks that embed concepts from New Urbanism and Compact Cities theories. These principles are relevant to the Brisbane context as they offer an alternative model to the existing suburban sprawl and the extreme densification of high-rise apartment towers. The former has been acknowledged by Holt-Damant<sup>605</sup> as the foremost consumer of existing natural resources in Australian city suburbs, while the latter has been identified by Kennedy and Thompson<sup>606</sup> as a high consumer of energy in the context of Brisbane's subtropical climate.

TOD is also important for this inquiry for the following reasons: i) because overcoming automobile dependence is a significant issue in contemporary societies; ii) because its principles have been successfully applied in major Australian cities; and iii) because the *South East Queensland Regional Plan 2009-2031* (SEQRP)

<sup>605</sup> Holt-Damant 2004, *The outlook for sustainable transport: Sustainable solutions to increased transport challenges for Australians*

<sup>606</sup> Kennedy and Thompson 2011, *The subtropical residential tower*

identifies Bowen Hills as a potential TOD site.<sup>607</sup>

The focus of this study will be on TOD near rail or light rail stations.<sup>608</sup> The inquiry does not consider the importance of TOD implementation tools in the field of strategic urban planning within a regional context. Therefore, these tools are not included here, either in the characterisation of the framework that links TOD centres with a rapid transit base, or in the framework that stipulates where centres need to occur, and in what density and mix.<sup>609</sup> Lastly, this study does not include the funding mechanisms that could be necessary to build and/or refurbish the linkage between existing transit conditions and the centre they will service.

### 4.3.1 TOD origins and precedents

It is my very firm point of view that if we take a more systematic approach and take these “cities for people” more seriously we will find that the cities would be considerably more friendly, livable, and lively because people will be in these cities more. We will find that the cities will become more attractive because the scale will be smaller and the pace and noise is lowered. The cities would be dominated by other people, which is the most interesting thing in our lives. They would be safer because if people are using a city it will be safer. They would be more sustainable because suddenly it'd [*sic*] be much easier to make cities where we can have a good quality public transportation system, where we can walk in style and dignity to and from the station day and night in safety and have a good time doing it. A good public transportation and a good public rail, they're brothers and sisters. Finally, and this may be the most important thing, we would have natural activity built into the day.<sup>610</sup>

Jan Gehl<sup>611</sup>

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<sup>607</sup> The Transit oriented development principles for South East Queensland and the Transit oriented development precinct typology are described in the *South East Queensland Regional Plan 2009-2031* (Table 4 and 5). Queensland Government 2009, *South East Queensland Regional Plan 2009-2031*, 104-105. Two examples of TOD in South East Queensland (SEQ) are the South Bank Redevelopment (Brisbane) and the Varsity Station TOD (Gold Coast). For more information about TOD in SEQ see James 2009, *The property sector as an advocate for TOD : The case of South East Queensland*

<sup>608</sup> This research excludes TOD where structured only by bus networks (Bus Rapid Transit, BRT) as the examples used in Curitiba (Brazil), Bogotá (Colombia) or Istanbul (Turkey). Yet, this variant could be an interesting subject for further investigations of the implementation of courtyard housing in countries where the rail network is inappropriate or insufficient for the use of TODs.

<sup>609</sup> Newman 2009, *Planning for Transit oriented development: strategic principles*, 22. See this article for a description of TOD strategies being applied in the main Australian cities.

<sup>610</sup> Jan Gehl discussing the concepts he developed in his book *Cities for people* in an interview; Gehl 2013, *Interview with Jan Gehl*; Gehl 2010, *Cities for people*

<sup>611</sup> "Jan Gehl is a Danish architect and urban design consultant based in Copenhagen and whose career has focused on improving the quality of urban life by re-orienting city design towards the pedestrian and cyclist." <http://gehlcitiesforpeople.dk/about/jan-gehl/>

The origins of TOD in the USA arise were the suburbs accessed by railroad and streetcar from the late nineteenth century.<sup>612</sup> The inner suburbs of most Australian capital cities at that time also developed as TODs, where higher-density land use occurred in the built form around the main tram stops. Examples in Brisbane are the suburbs of West End and Woolloongabba.<sup>613</sup>

From a global perspective, TODs have been most developed in Europe, particularly in Scandinavia, where the 1947 'Finger Plan' of Copenhagen and the 'Planetary Cluster Plan' of Stockholm stand up as examples of best practice. In both cases, the strategy to direct urban growth to new development areas was realised through corridors serviced by rail infrastructure, generally built in advance of demand. Just as importantly, major infrastructure was directed away from existing open spaces, agricultural reserves and natural habitats, thus establishing greenbelt wedges.<sup>614</sup>

In 1997, Bernick and Cervero defined TOD as a 'transit village', a “compact mixed-use community, centered around a transit station that, by design, invites residents and workers and shoppers to drive their cars less and ride mass transit more”.<sup>615</sup> The importance of urban design becomes clear in this definition. However, many TODs require the management of new land parcels and street structures that are oriented to the rail system; however, the required practical planning and urban design for this management is beyond local government capabilities.<sup>616</sup> Moreover, local authorities might have a conservative vision and be biased towards established interests, favouring the current ruling class instead of developing a vision for more egalitarian types of urban developments.

To address this issue, a statutory authority is usually created to organise and co-ordinate the urban design process as, for instance, in the case of Parque das Nações<sup>617</sup> or Subi Centro, an awarded redevelopment of about 80ha located in the suburb of Subiaco, 3km from Perth's CBD, in Western Australia (WA). In this

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<sup>612</sup> Hondrop 2001, *Appendix B: History of Transit-Oriented Development*, 14

<sup>613</sup> Bajracharya, *et al.* 2010, *Greening transit oriented development and subtropical design*, 147

<sup>614</sup> Cervero 2009, *Public transport and sustainable urbanism : global lessons*, 23

<sup>615</sup> Bernick and Cervero 1997, *Transit villages in the 21st century*, 5

<sup>616</sup> Newman 2009, *Planning for Transit oriented development: strategic principles*, 19

<sup>617</sup> **S\_3.3.2**, p. 145

manner, the Subiaco Redevelopment Authority (SRA) was formed at the beginning of the redevelopment process (1994) – as per approval of the State Parliament – “to deliver a vital, diverse and sustainable community reflecting the existing built environment and community values,”<sup>618</sup> and to “... oversee the redevelopment project on the expectation that it be totally self-funded with initial seeding money provided by the State through loans utilizing the land as collateral ...”.<sup>619</sup>

In Subi Centro, as in Parque das Nações, besides the establishment of a set of integrated design guidelines, there was the mandatory objective of self-funding the whole process, which was largely facilitated by the fact that the State Government and the City of Subiaco owned much of the intervention area (Jolimont Industrial Area – JIA).<sup>620</sup> However, unlike the Lisbon process – where large economic, technical and bureaucratic issues prevented the under-grounding of the existing railway – in Subiaco, this negotiation became possible with the Public Transport Authority under two main conditions: that the station would be in a cost-efficient location, and no building would be placed over the railway tunnel.

While these clauses created additional constraints on the overall design in terms of block development, they also produced ancillary benefits. The railway was placed out of sight, and this generated enormous benefits in terms of permeability and accesses; in addition, the implementation of the east-west greenway became a reality with the relocation of a through-road over the railway tunnel.<sup>621</sup> SRA considered it important to plan for both cars and pedestrians in Subi Centro. This was realised by restricting vehicular access to the main public spaces during the weekends when pedestrian movement was expected to increase—a move that was later proven to be an essential contribution to the liveability of the area. It was also agreed that parking provision would be underneath the local authority roads and public buildings services.<sup>622</sup>

Of importance was the design strategy for the mix of uses: “This has been

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<sup>618</sup> Smith and SRA 2006, *Two sustainable cities - a case study of Subu Centro & Casebrook Cove*

<sup>619</sup> Howe, et al. 2009, *Retrofitting TOD and managing the impacts : the case of Subi Centro*, 67

<sup>620</sup> Davison and Rowden 2012, *“There’s Something about Subi”: Defending and Creating Neighbourhood Character in Perth, Australia*, 193

<sup>621</sup> Howe, et al. 2009, *Retrofitting TOD and managing the impacts : the case of Subi Centro*, 69

<sup>622</sup> *ibid.*, 69

achieved as vertical mix rather than horizontal and this has made this approach acceptable (such as offices above shops). It is not restricted by arbitrary plot ratios which are used elsewhere mostly as an arbitrary limit for negotiation purposes".<sup>623</sup> Therefore, as in Parque das Nações, in Subi Centro it was essential to establish guidelines for both plot ratios and built form to attend to the planned land use mix.<sup>624</sup> Nevertheless, as an essential community concern, Subi Centro was to be a supporting centre to Subiaco, not a competing one. As such, although the city could sustain an additional 20 000m<sup>2</sup> of retail space, the community proposed the limit of 10 000m<sup>2</sup> that was adopted.<sup>625</sup>

By 2013, 86% of the Subi Centro redevelopment area was completed and its management returned to the City of Subiaco's public administration.<sup>626</sup> The development started with a goal of being self-funding, but exceeded all expectations when it generated unforeseen profits for both the State and the Council.<sup>627</sup>

#### 4.3.2 Major hallmarks

There are various definitions of 'TOD' being used in many countries around the world. For the purposes of this inquiry, these definitions have been synthesised into the following definition: 'Transit oriented development projects create, by design, a framework of communities connected by a mass transit, which encourages walking and cycling as the main locomotion practice.'<sup>628</sup> Liveability is broadly related with the TOD hallmarks in a variety of manners. I personally define it shortly

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<sup>623</sup> Ibid., 69

<sup>624</sup> Ibid., 69

<sup>625</sup> Ibid., 68

<sup>626</sup> Metropolitan Redevelopment Authority 2013, *About Subi Centro*

<sup>627</sup> Land prices to the north of the railway line rose from AU\$80/m<sup>2</sup> (1994) to AU\$2700 (2005). From 1996 to 2005, more than 1000 dwellings were created, together with 70,000m<sup>2</sup> commercial and 9000m<sup>2</sup> retail floor spaces. Howe, *et al.* 2009, *Retrofitting TOD and managing the impacts : the case of Subi Centro*, 70-71

<sup>628</sup> An urban designer could contemplate the five C attributes to encourage walking suggested by the Austroads Guide to Road Design part 6A: Pedestrian and Cyclists Paths (Austroads 2009a) – connected, comfortable, convenient, convivial and conspicuous. However, I consider that an urban designer should attend to the detailed sections of the audit tool published by the Department of Transport of Western Australia to design high quality walkable spaces: pathways, crossings, street furniture and signage, personal safety, adjacent traffic, aesthetics and amenities. ARRB 2011, *Walkability audit tool*



as the utilisation of public spaces in the most attractive ways during the largest amount of time.<sup>629</sup>

However, more relevant for this inquiry than a specific definition of TOD, is that urban design should create a liveable and accessible public realm, promote variety in land use, and provide for housing diversity. It must also plan for active street frontages and integrate healthcare, education, and social services to support the planned urban density. The considerations in this section primarily concern the hallmarks of accessibility, sense of community, mixed-use infrastructure, and density.

### ***Accessibility***

The TOD concept can be seen as a 21st century reinterpretation of traditional early twentieth century neighbourhoods and village communities that recognised the train station as a community focal point, with transport connections and mixed-use land.<sup>630</sup> However, to decrease car dependency, it is necessary to rely on a reliable and time-efficient public transport network. In a rail-bus system, the rail node should be serviced by a naturally ventilated station. A main bus stop should connect to the station through a safe, sheltered pathway, and the access distances from dwellings to the station should not exceed 800m or a 10-minute walk. As suggested by Langer in *Sub-tropical housing*, this should also be the maximum distance to amenities such as primary school, kindergarten, retail areas, recreation and sports ground, health-centre and library. Langer asserted that, in subtropical climates, distances should be measured in meters, but should take the slope of the pathway into consideration. Therefore, on a slope of one in ten, the maximum walking distance would be 400m; on a slope of one in four, it would be 270m.<sup>631</sup>

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<sup>629</sup> A longer description could be the one given by the Washington State Department of Transportation (WSDOT): "Liveable Communities provide and promote civic engagement and a sense of place through safe, sustainable choices for a variety of elements that include housing," transportation, education, cultural diversity and enrichment and recreation." Accessed 2013-07-30 <http://www.wsdot.wa.gov/NR/rdonlyres/A94C2706-00C9-40C8-AACA-B71D9472A296/0/LivableCommunities.pdf>

<sup>630</sup> Department of Infrastructure and Planning 2010, *Transit oriented development: guide to community diversity*, 6; Queensland Government 2010, *Transit oriented development: guide for practitioners in Queensland*, 10

<sup>631</sup> Langer 1944, *Sub-tropical housing*, 3

A healthy, sustainable neighbourhood is also highly dependent on designing liveable streets. The edges assume a vital importance for they ought to create 'pockets of activity', to display diverse façades and scenery, and to establish the city skyline. "If the edge fails, then the space never becomes lively",<sup>632</sup> and soft edges are essential for a liveable street.<sup>633</sup> In this sense the ground floor of a building is essential for the inside/outside communication because it is located at the eye level. As Ralph Erskine advised, "always make the ground floor very rich, use all the money on the ground floor, it doesn't matter what's further up because nobody sees that".<sup>634</sup>

The edges alone, however, do not provide for walking comfort. Edges need to be served by enjoyable pathways, where human contact might develop in unexpected, sociable ways. Gehl notes that a pleasing pathway encourages healthy walking: "Only one hour of moderate exercise like walking for half an hour to work and half an hour back, or bicycling, can give you an extra seven years of life."<sup>635</sup> Gehl adds that streets should be clearly pedestrian-oriented, and their safety should always be a determinant factor. Thus, urban designers should consider social and cultural aspects in deciding which types of street and traffic/pedestrian integration would be the best combination for each location. For subtropical TOD, O'Hare adds that traditional grid layouts are the most appropriate if the buildings address the streets and urban designers maximise the streets' liveable qualities.<sup>636</sup>

To guarantee pedestrian priority, as well as the safety of both pedestrians and cyclists, cycling should be planned to consider different types of cyclists.<sup>637</sup> It has

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<sup>632</sup> Christopher Alexander further explains the typical pedestrian movement: "People gravitate naturally toward the edge of public spaces. They do not linger out in the open. If the edge does not provide them with places where it is natural to linger, the space becomes a place to walk through, not a place to stop." Alexander, *et al.* 1977, *A pattern language : towns, buildings, construction*, 600.

<sup>633</sup> Gehl defines 'soft edge' as "a façade where a lot of things happen. It could be many doors, niches, or the vegetable seller putting out his tomatoes on the street. Soft edges could be the front yard where the kids are playing and grandma is sitting knitting just behind the hedge." Gehl 2013, *Interview with Jan Gehl*

<sup>634</sup> *Ibid.*

<sup>635</sup> *Ibid.*

<sup>636</sup> O'Hare 2011, *Subtropical transit oriented development in the emerging South East Queensland city region: How well are we doing?* 300

<sup>637</sup> Accidents between cycles are common and sometimes fatal. For more information see Graw and König 2002, *Fatal pedestrian–bicycle collisions*; Brüde and Larsson 1993, *Models for predicting*

been defined that key issues leading to conflict between pedestrians and cyclists are “inappropriate path user behaviour, poor path design and poor path maintenance”.<sup>638</sup> Furthermore, “*Austrroads, Part 6A: Pedestrians and Cyclist Paths*”<sup>639</sup> describes several cyclist types, ranging from primary school children to sporting cyclists in training”, and “*Complete Streets* divides cyclists into three, broader groups: commuter cyclists; long distance cyclists; local area cyclists”.<sup>640</sup>

Subtropical neighbourhoods should have a “legible network of pedestrian paths that facilitate orientation, casual surveillance, and opportunities to enjoy the subtropical climate while sitting outdoors with shade and rain protection”.<sup>641</sup> A ‘memorable street’ should comprise appropriate planting to provide shade for the footpath, to ameliorate the air temperature, and to provide psychological safety and protection for pedestrians.<sup>642</sup>

Furthermore, Gehl defines a city that is conducive to meeting and making acquaintances as a city that offers opportunity “for three basic human activities: seeing, hearing and talking”, because human perception is an intrinsic factor in walking, standing or sitting.<sup>643</sup> Thus, a variety of visual contacts is of enormous importance in contributing to a street’s liveability. A part of balcony areas should provide line of sight to the street; another part should allow for a reclusive preference (albeit outdoors), perhaps via the hidden spot behind a louver, which

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*accidents at junctions where pedestrians and cyclists are involved. How well do they fit?; and Mackay 1975, Pedestrian and Cyclist Road Accidents*

<sup>638</sup> Ker, et al. 2011, *Pedestrian-Cyclist Conflict Minimisation on Shared Paths and Footpaths*, 11

<sup>639</sup> 2011, *Pedestrian and cyclist paths*

<sup>640</sup> The groups of cyclists are defined as: “Commuter cyclists and long distance cyclists typically tend to travel at higher speeds and may have a higher skill level than local area cyclists. Accordingly, it is easier to incorporate their needs on busy streets. To cater for lower skill levels of local area cyclists, wider bike lanes, separate paths and slower traffic flow may all be required. The behaviour and needs of each of these groups is described below. Other types of cyclists not often considered are bicycle messengers and bicycle taxis or rickshaws. These are becoming more common, particularly in highly urbanised areas including Brisbane, and need to be considered in street design. They are generally highly skilled riders, accustomed to mixing with traffic and for the purpose of these guidelines they are considered as commuter cyclists.” IPWEA 2010, *Complete streets : guidelines for urban street design*, 19

<sup>641</sup> O’Hare 2011, *Subtropical transit oriented development in the emerging South East Queensland city region: How well are we doing?*, 295

<sup>642</sup> Richards and Kennedy 2004, *Subtropical Neighbourhood Design*

<sup>643</sup> Gehl 2010, *Cities for people*, 148

creates a controlled transparency. The views to the street from inside the house are an important factor in street safety: "There must be eyes upon the street, eyes belonging to those we might call the natural proprietors of the street."<sup>644</sup> This concept demonstrates that visual control of the streets creates a feeling of ownership; this concept can also be applied to communal courtyards.

Human contact is related to visual perception, as sight is the most developed human sense. Thus, the relationship between sensing and communicating requires the dimensioning of a social field of vision. Gehl states that, "the limit of this field is 100 meters (110 yards), the point at which we can see people in motion."<sup>645</sup> This knowledge suggests the maximum desirable distance between streets.<sup>646</sup> It has also been said by Hill that to combine higher density with lower buildings to produce pleasant streetscapes urban designers should avoid using buildings as standalone objects and have more streets with a minimum number of driveways and a maximum control where the cars get loaded. "More streets lay to lesser driveways per street, which means better streets. We can have higher density with double grids: circulation streets and car lanes load; public streets and server streets".<sup>647</sup>

A good street neighbourhood could be defined as one that achieves a "balance between its people's determination to have essential privacy and their simultaneous wishes for differing degrees of contact, enjoyment or help from the people around."<sup>648</sup> Talking is the natural continuation of visual contact. Short or long, with friends or with strangers, conversations on verandas or balconies, or on the street, are a way to be part of a semi-private play, surrounded by the city scenarios. Comfortable places to sit (for example, on benches with backs), to contemplate, and to talk are also essential for neighbourhood liveability.

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<sup>644</sup> Jacobs 1964, *The Death and Life of Great American Cities*, 35

<sup>645</sup> Gehl 2010, *Cities for people*, 35

<sup>646</sup> "The myth that plentiful city streets are "wasteful," one of the verities of orthodox planning, comes of course from the Garden City and Radiant City theorists who decried the use of land for streets because they wanted that land consolidated instead into project prairies." Jacobs 1964, *The Death and Life of Great American Cities*, 185

<sup>647</sup> Timothy Hill, see interview in **Ap\_C.1.2**

<sup>648</sup> Jacobs 1964, *The Death and Life of Great American Cities*, 59

### ***Sense of community***

Community involvement in planning an urban precinct is “fundamental to achieving successful community change. Through engagement, the needs, fears and aspirations of both new and existing communities can be identified and addressed”.<sup>649</sup> A sense of community within a neighbourhood can be understood as “the degree to which a person feels that they belong to a readily available, supportive and dependable social structure”.<sup>650</sup> The concept of neighbourhood was earlier defined the Garden City Movement as the “internal structuring of the towns around school catchments with residential enclaves giving access to the segregated pedestrian network leading to schools, shops and playgrounds without risk from traffic [Barton, 2000].”<sup>651</sup> Yet, community life should not be restricted to the middle and outer suburb as the inner city areas can provide a liveable and sustainable option for it.<sup>652</sup>

The *Transit oriented development: guide to community diversity* published by the Queensland Government in 2010 defined the key objectives in creating communities in the State:

A fundamental principle of urban planning is that communities function best when quality of life and access to the community’s resources are enjoyed by all its members. It makes good planning sense to integrate rather than exclude. The collective urban experience is that concentrated social disadvantage is problematic. The social and economic costs associated with spatial segregation and concentrated disadvantage are well recognised. Less well documented are the advantages to individuals, governments and the development industry of achieving community diversity.<sup>653</sup>

The guide highlighted also the importance of providing affordable housing because it “increases the diversity of the local workforce, and avoids problems where workers cannot be found due to high housing and travel costs”.<sup>654</sup> Accordingly, the report asserted that ‘diversity’ was the keyword in developing new

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<sup>649</sup> 2010, *Transit oriented development: guide to community diversity*, 24

<sup>650</sup> CSD, et al. 2009, *Sense of community*, 1

<sup>651</sup> Saeidi and Oktay 2012, *Diversity for Better Quality of Community Life: Evaluations in Famagusta Neighbourhoods*, 496; Barton 2000, *Sustainable communities : the potential for eco-neighbourhoods*

<sup>652</sup> Heywood 2010, *Community voices, votes and actions*, 252

<sup>653</sup> Department of Infrastructure and Planning 2010, *Transit oriented development: guide to community diversity*, 5

<sup>654</sup> Ibid., 5

communities, and recognised the need for an appropriate design to achieve the diversity goal. Therefore, urban designers should increase the appeal and desirability of TODs as precincts to visit, and to work and live in. Furthermore, conscious design would facilitate: housing diversity to cater for the needs of different householders at diverse stages of life; employment diversity in creating spaces for various cultural, business, service and tourism activities; recreational diversity in developing outstanding precincts to encourage healthy outdoor activities for both residents and visitors; and “neighbourliness and the opportunity for people to know one another”.<sup>655</sup> These concepts align with the principles of social inclusion and participation, cultural adequacy, economic effectiveness and ecological protection, recently published by the Geneva UN Charter on Sustainable Housing (2014).<sup>656</sup>

Responses of participants in the study, *High-Density Liveability Guide*<sup>657</sup> – undertaken by the Centre for Subtropical Design (QUT), using data supplied by Brisbane residents – indicate that, while they might not talk frequently to their immediate neighbours, they enjoy the sense of community that their broader neighbourhood offers. The survey demonstrates also that social interaction reduces social isolation and enhances community networks. Thus, one might claim that courtyard housing could contribute to creating and maintaining a sense of community because

... the courtyard is more than a physical arrangement of space ... offering a communal frame supportive of family situations and advantageous for city management in sustainable land use and planning practice ... For the newly arrived, young, and somewhat naive migrant, the courtyard configuration can offer privacy as well as a safe, controlled, and shared space in an unfamiliar urban situation. Further, the courtyard provides a supportive environment and a setting where information about possibilities for living and working in the city can be exchanged.<sup>658</sup>

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<sup>655</sup> Ibid., 6

<sup>656</sup> UNECE Committee on Housing and Land Management 2014, *The Geneva UN Charter on Sustainable Housing*, 2

<sup>657</sup> CSD, et al. 2009, *High-density liveability guide*

<sup>658</sup> Goethert 2010, *More than a pattern : the contributions of the courtyardhouse in the developing world*, 173

### ***Mixed-uses***

Land uses ought to meet the daily needs of the local community. A good-practice mix co-locates a range of residential, commercial, retail, and service land use according to the precinct type, and aims to establish a variety of services to cater for the diverse needs of a liveable community.<sup>659</sup>

#### **Retail and commercial**

Retail, when placed on the ground floor of buildings, is very important in creating liveable streets. Based on a study of Copenhagen shopping streets, Jan Gehl affirmed (in *Cities for people*) “that the activity level in front of active façades is seven times greater than in front of passive façades”.<sup>660</sup> Gehl categorises the ground floor façade design according to its level of activity, based on both the width of the units and the number of doors per 100m. An active façade – the highest (A) category – would have small units, with 15-20 doors per 100m, and the friendly façade (B) would have relatively small units, with 10-14 doors per 100m.<sup>661</sup>

Main street edges might all be filled by retail but the design of secondary streets might consider a mix of housing and retail units on the ground floor. In these cases, retail would be preferably placed on and near street corners for greater visibility, both to the street (from indoors) and from the street to attract the public's attention.<sup>662</sup> Commercial spaces, as suggested in the Subi Centro TOD, should make a vertical mix with retail, where offices would preferably be placed above the shops. Nonetheless, floor plans for retail/office spaces should be flexible to allow the diversity of market demand. The floor plans should then be proposed as open spaces to allow for a variety of subdivisions.

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<sup>659</sup> Gehl 2010, *Cities for people*, 19

<sup>660</sup> *Ibid.*, 79

<sup>661</sup> Gehl does not establish a direct criteria for the width of the units, however if one designs for twenty retail 'doors', each unit will have 5m width. The other categories are: C – mixture, large and small units, 6-10 doors/100m; D – boring, large units, 2-5doors/100m; E – inactive, large units, 0-2 doors/100m. *Ibid.*, 241

<sup>662</sup> As seen previously in the Subi Centro case, the amount of retail floor space is dependent on the retail market demand but the community may always have the last word. See Howe, *et al.* 2009, *Retrofitting TOD and managing the impacts : the case of Subi Centro*, 68

### Live-Work and SoHo: Home-based business

The shop house type is an ancient urban typology, where work activities are undertaken at street level and the level above is for living. This type has been used for more than two millennia and, for the most part, bordered the main streets of the ancient cities of Europe until the twentieth century. In ancient Roman cities, houses with central courtyards became incompatible with urban needs, and many street frontages were converted into shops with upstairs housing and a backyard.<sup>663</sup> In the nineteenth century, this typology occurred mostly in Southeast Asia and Southern China; for example, in Singapore, Penang, Macau, Guangzhou, and Hong Kong.<sup>664</sup> In Brisbane, the use of the shop house type was known in the nineteenth century. Some of these buildings still exist; for example, the Pollocks' shop house (1860s) and the Hillyards' shop house (1865) in Stanley Street, Woolloongabba, and the John Young shop house (1870s) in Princess Street, Petrie Terrace.<sup>665</sup>

In the second half of the twentieth century, the use of shipping containers superseded the loft warehouse building type in America's main ports of New York and San Francisco. These floor spaces came to be used by artists who worked and lived in them, sometimes under illegal rental contracts. However, the utilisation of these abandoned city areas for housing created a revitalisation benefit, and encouraged council regulation.

Home-based businesses have been extended to include several activities. A white-collar business is commonly referred to as 'Small Office/Home Office' (SoHo). This term may be defined as "a business that is operated out of a business owner's residence and can be located in an established office within the residence".<sup>666</sup> In

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<sup>663</sup> Some of the northern cities of Italy, namely Milan and Como maintained the courtyard type as the main element type in the urban fabric. Caniggia 1963, *Lettura di una città : Como*

<sup>664</sup> Ho Yin 2009, *Pre-war Tong Lau: A Hong Kong Shophouse Typology*

<sup>665</sup> See the links below for images and description:

<http://www.yourbrisbanepastandpresent.com/2012/11/clarence-corner-woolloongabba.html>,  
<http://www.yourbrisbanepastandpresent.com/2012/11/hillyards-shop-house-woolloongabba.html>,  
[http://www.mustdobrisbane.com/arts\\_culture/history\\_architecture/youngs\\_shop\\_house.asp](http://www.mustdobrisbane.com/arts_culture/history_architecture/youngs_shop_house.asp).

<sup>666</sup> Before the spread of large-scale businesses in the 19th century, most businesses were considered as SoHo. Entrepreneurs running this type of office include lawyers, consultants and freelancers who might not require a formal office to meet clients. A small office/home office is considered a microenterprise since it typically has fewer than ten employees and is categorized one notch below a 'small business.' " Investopedia 2013, *Small Office/Home Office - SOHO*



some countries, such as the USA and Australia, SoHo taxation is treated differently from the traditional tax system because a SoHo operates out of a home.<sup>667</sup> In 2012, 68% of small and micro businesses were home-based, and represented about 2 million people.<sup>668</sup>

### Residential

#### *Floor plan areas*

Housing preferences vary from country to country, and from culture to culture. What would be an appropriate floor plan to use in one context could be inappropriate somewhere else. I reviewed a small sample of apartment plans for social housing in different countries (Australia, Ireland, United Kingdom, Portugal and Brazil) and noticed a large discrepancy in apartment areas in each country. Therefore, I concluded that – to study a housing prototype in a specific country, or even a specific city or suburb – it is advisable to work with local floor plan parameters. Even so, these parameters differ from developer to developer, generally in direct relation to the value of the land. proliferation

The challenge of making the appropriate choice of unit floor plan areas for the Australian scenario was that the for-profit and the not-for-profit sectors have different market views. The basic difference is that “the motivation of the for-profit procurer is to maximise its profits whilst the not-for-profit procurer is attempting to maximise the supply of appropriate dwellings for long term tenancies, for tenants with income constraints.”<sup>669</sup> The different approaches generate different outcomes, which become noticeable in a number of issues, such as the use of the floor space ratio, the dwelling mix, the dwelling sizes, the

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<sup>667</sup> Another definition of ‘home-based business’ is provided by the Australia Taxation Office, which classifies it into two types:

- at home; that is, you carry out most of the business’ work at your home – for example, a dressmaker who does all their work at home, with clients coming to their home for fittings
- from home; that is, the business does not own or rent any premises other than your home – for example, a tiler who does most of their work on clients’ premises but does not have any other business premises." ATO 2012, *Home-based business*, 3

<sup>668</sup> Strong 2013, *Home-Based Biz People Taking Over Australia*

<sup>669</sup> Milligan, et al. 2009, *Innovation in affordable housing in Australia: Bringing policy and practice for not-for-profit housing organisations together*, 103

particular/general client group targeted, the extension of term management, the running costs, and the awareness of universal design.<sup>670</sup>

This difference, in terms of floor area in Brisbane, was confirmed by Richards in an interview conducted in 2013.<sup>671</sup> He provided the following statistics: For-profit apartment areas: Studio 30-35m<sup>2</sup>; 1BR: 48m<sup>2</sup> (without balconies); 2BR: 58-68m<sup>2</sup>; (no 3BR) – half of the apartments do not have balconies; not-for-profit apartments: 2BR – 72m<sup>2</sup>; and 3BR – 105m<sup>2</sup>, plus balconies.

### Types

In 2012, the 2BR apartment type was most in-demand in inner Brisbane (58% of total sales), followed by the 1BR type (32%), and the 3BR type (9%) (**Fig.156**).<sup>672</sup> The increasing demand for smaller units is attributed partly to the ageing of the Australian population, and partly to the increasing number of single and young

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<sup>670</sup> Differences between for-profit and not-for-profit approaches are defined by Milligan:

**"A greater awareness of universal design.** In general, the not-for-profit sector would seem to have a greater awareness of the goal to use universal design. This awareness probably derives from their social mission and is linked to their client groups and the incidence of long term tenancies.

**Using the floor space ratio.** In contrast to what a for-profit developer may have done (For-profit developers usually argue to increase the FSR), [a not-for-profit company] is not motivated by a desire to maximise its profits, rather it is focussed on the community outcomes of its developments and has flexibility to use a site in a way that provides good outcomes for long term tenants.

**Dwelling mix.** For-profit developers' dwellings contain more bedrooms, reflecting the preference amongst investors and first home purchasers for larger dwellings (and because a for-profit developer will usually make a greater profit on a two-bedroom dwelling than on a one-bedroom dwelling).

**Dwelling sizes.** Not-for-profit developers design smaller dwellings (for each bedroom category). They do this by using smart design. Moreover, the different needs and expectations of their tenants (compared to the for-profit client) allow them to construct smaller dwellings.

**Designing for long-term management.** The not-for-profit developers do not walk away from any design limitations, they have to manage them for the time they hold the property. For this reason, not-for-profit providers think harder about issues like sound attenuation between properties.

**Running costs.** Not-for-profit providers focus on environmental issues and life-cycle management of properties. They are interested in reducing the running costs of their buildings, particularly in public areas, because they have to manage the running costs of the building during its lifetime. For this reason, they act a lot more like procurers of commercial buildings, than like traditional residential developers. They are also interested in reducing the utility charges for their tenants for both social reasons and for the positive impact, these reductions can have on the incidence of rent arrears.

**Designing for a particular client group.** In comparison with the for-profit sector, which designs its general residential accommodation product for a variety of need groups, the web catalogue of development projects indicates that a significant number of the projects are designed for particular target groups (e.g. people with a disability), resulting in some very specific design features in properties." *ibid.*, 103-104

<sup>671</sup> Richards interview in **Ap\_C.1.1**.

<sup>672</sup> Walker, *et al.* 2013, *Market Report: inner Brisbane apartments*

people living alone in the inner-city areas.<sup>673</sup>

To test courtyard housing as urban design prototypes, this study used plans designed for one-, two- and three-bedroom apartments and implemented them in the prototypes in proportion to the sales percentages given above. Since the demand for courtyard house houses is still large in Brisbane, this inquiry found the need to test the feasibility of courtyard housing within the inner city, despite the assumption of lower residential density (which is generally the outcome of this type of housing).<sup>674</sup>

### **Density**

TOD communities should be planned to have high residential density. However, there are many possible figures to quantify 'low', 'medium' and 'high' housing density. These numbers are related to different contexts and can be analysed according to diverse factors; however, a discussion of these factors is not within the scope of this research. This study is focused on the Brisbane context and at least three local references are worth mentioning in this regard.

In *High-Density Liveability Guide* previously mentioned, "... 'high-density' is defined as 30 or more dwellings per hectare [dph] and includes flats, units, apartments, terraces, villas and townhouses".<sup>675</sup> James Tuma, national director of Urbis, an Australian interdisciplinary consulting firm, considers 1-20dph to constitute low density; 30-50dph, medium density; and above 60dph, high density.<sup>676</sup> On the other hand, Peter Richards argued that in his architecture practice (Deicke Richards) he considered low-density 1/2-storeys – 15-25dph;

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<sup>673</sup> "The trend to smaller households is partly driven by the ageing of the population, which tends to result in more single and two person households. This will inevitably lead to a greater demand for smaller housing with good access to shops, transport and services such as health. Increasing affluence, and more single and young people living alone are also major contributors to the increased demand for housing. These changes in household type and therefore occupancy rates mean that total demand for housing will be greater than population growth and a wider mix of housing types will be required." NSW Department of Planning 2005, *City of Cities: A Plan for Sydney's Future*, 24

<sup>674</sup> Over the year ending December 2011, Brisbane City Council had 1,994 new courtyard house houses approvals, which represented about 30% of the total number of approvals Office of Economic and Statistical Research 2012, *Population and Dwelling Profile: Brisbane City Council*

<sup>675</sup> CSD, et al. 2009, *High-density liveability guide*

<sup>676</sup> Personal communication, October, 2010

medium-density 3/4-storeys – 25-100dph; high-density 8/10-storeys – 200dph.<sup>677</sup>

The above statements help to show that the views regarding housing density measures may vary, even within the same city context. Indeed, these discrepancies provide space to reflect that density is nothing but a measure and does not serve as a design recipe. It is relevant to note that a higher residential density does not necessarily mean tall buildings. A housing type can have varying net residential densities according to site coverage, street layout and dwelling size. However, residential density does not include essential qualitative factors that enhance a sense of place such as its architectural quality, the landscaping and the amount/presence of vehicular traffic.<sup>678</sup>

Nevertheless, it is necessary to settle on an appropriate measure to reference in this study. The density definition that better suits the evaluation of the prototypes performed in this study comes from Landcom – a New South Wales (NSW) Government property developer that works with the private market to produce quality housing:

Net residential density, 'the built form' [is] the ratio of the number of dwellings to the area of land they occupy including internal public streets, plus half the width of adjoining access roads that provide vehicular access to dwellings.<sup>679</sup>

The use of 'net residential density' is appropriate in the design and development of urban design prototypes because it can be applied to different urban scales, from the lot size to the suburban area. Furthermore, it provides a practical indication of the intensity of the built form, and is the appropriate measure for describing urban development at a streetscape scale.<sup>680</sup>

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<sup>677</sup> Quoted from Peter Richards interview conducted in 2013. Peter Richards is Director at Deicke Richards – [multi-disciplinary architecture & design practice](#) – Brisbane. See Appendix C.

<sup>678</sup> Landcom 2011, *Residential density guide*, 6

<sup>679</sup> *Ibid.*, 10

<sup>680</sup> *Ibid.*, 12. "Net residential density can also be used as an *averaging statistic* over a larger area. This can be useful when evaluating a mix of building types across a precinct or working with population density thresholds. For example, if your aim is to encourage housing diversity, a precinct with a planned *average* net residential density of, say, 25dw/ha may be made up of many different building types that are constructed at different *actual* net residential densities. These could range from 10dw/ha to 50dw/ha on a site by site basis. When applied over the entire precinct, however, the *average* net residential density achieved would be 25dw/ha."

### 4.3.3 Summary table: TOD

As has been shown, courtyard housing typologies could enhance the hallmarks of TOD. However, to respond appropriately to these hallmarks, it is necessary to establish the criteria to address the appropriate proportions of, and the level of implementation of, these hallmarks. The most relevant elements for this study have been identified as accessibility, sense of community, mixed-uses and density. A synthesis of these elements is presented in **S\_4.4 (Lenses of inquiry working together: Design framework criteria)**.

The Subi Centro TOD was a significant precedent because of its community participation in the decisions of the administrative Subiaco Redevelopment Authority, and for its (recognised) successful implementation. The Subi Centro TOD case also helped to clarify the dimensioning of the housing units to meet the market demand, while also recognising the measures most required for accessible housing units. Important also in this section were the possibilities of reducing car usage for commuting to work: the Live-Work (SoHo) and shop-house concepts.

Table 6 synthesises the findings related to TOD as a lens of inquiry. The design considerations are explained in **C\_5** and discussed in **C\_6**.

**Table 6.** *Lens of Inquiry 3: Courtyard Housing and TOD Hallmarks*

Benefits	Required Conditions
<ul style="list-style-type: none"> <li>▪ Increase net residential density</li> </ul>	<ul style="list-style-type: none"> <li>▪ Appropriate:               <ul style="list-style-type: none"> <li>block/courtyard dimensions</li> <li>streets width</li> <li>number of storeys</li> <li>unit (dwelling) dimensions</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>▪ Suitable for mixed-uses and flexible for management</li> </ul>	<ul style="list-style-type: none"> <li>▪ Flexible design at ground floor level</li> <li>▪ Take advantage of corners for uses other than residential</li> <li>▪ Shared courtyard as alternative access – allow different uses in the same building or house</li> <li>▪ Use courtyard house typologies (single house scale) for uses other than residential – mixed use blocks</li> </ul>
<ul style="list-style-type: none"> <li>▪ Diversity in property               <ul style="list-style-type: none"> <li>- Private/Shared spaces (Communal courtyard block)</li> <li>- Facilitate the management of mixed-uses</li> <li>- Allow shared parking (underground + silos)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ Controlled access street/courtyard and residential buildings contacting with street and courtyard (Communal courtyard Block)</li> <li>▪ Courtyard including private open spaces for ground floor level – assuring privacy, alternative</li> </ul>

Benefits	Required Conditions
<ul style="list-style-type: none"> <li>- Allow for multifunctional access</li> <li>- Provide safety &amp; enhance community sense without compromising privacy</li> </ul>	<p>access to buildings and a mainly shared space (Communal courtyard Block)</p> <ul style="list-style-type: none"> <li>▪ Controlled access to lanes within the block (courtyard houses Block)</li> <li>▪ Pedestrian access to parking and community facilities in shared spaces</li> </ul>
<ul style="list-style-type: none"> <li>▪ Compatible with an urban human scale               <ul style="list-style-type: none"> <li>- Walkable and cycl0.00</li> </ul> </li> </ul> <p>eble environment based on public transport inter neighbourhoods or widely</p> <ul style="list-style-type: none"> <li>- Medium and low rise building forms</li> <li>- Minimized impact on cars presence</li> </ul>	<ul style="list-style-type: none"> <li>▪ Block dimensions considering walkable distances and visual human perception</li> <li>▪ Buildings height allowing visual and sensitive perception from up to the ground and from the ground (street or courtyard) up to the sky</li> <li>▪ Shared car-parking to minimize on-street parking</li> <li>▪ Diverse streets profiles managing traffic, on-street parking, cycling and pedestrian uses</li> <li>▪ Permeable urban grid, enhancing connectivity, safety and legibility</li> <li>▪ Diverse and attractive street façades, mixed use access and controlled perception of the courtyards.</li> </ul>
<ul style="list-style-type: none"> <li>▪ Develops Community Sense               <ul style="list-style-type: none"> <li>- Provides a shared open space, complementary of the units private open spaces and of the public realm (Communal courtyard Block)</li> <li>- offers a proximity of houses access which might increase neighbours contact (courtyard houses Block)</li> <li>- compatible with the inclusion of community facilities</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ Appropriate courtyard dimensions – big enough for units privacy, small enough for people to contact (Communal courtyard Block)</li> <li>▪ Courtyard character different and complementary of the street – both should be attractive; streets and lanes should also offer opportunity for community engagement</li> <li>▪ Amenities using streets, lanes and courtyards as complementary open spaces are indispensable</li> <li>▪ Courtyard typologies well suit many community facilities at any scale (e.g. Library, kindergarten, church)</li> </ul>
<b>Limitations</b>	
<ul style="list-style-type: none"> <li>▪ May result in a barrier effect between courtyard and street</li> <li>▪ The street might get empty of pedestrians if the courtyard become a more attractive competitor</li> <li>▪ Social or cultural incompatibility may result in:               <ul style="list-style-type: none"> <li>- emptiness of the courtyard as a shared space</li> <li>- lack of privacy (noise or other)</li> </ul> </li> </ul>	

#### 4.4 LENSES OF INQUIRY WORKING TOGETHER: DESIGN FRAMEWORK CRITERIA

Darryl Low Choy – in the report “Climate change vulnerability in South East Queensland: a spatial and sectoral assessment” – argues that the urban designer has an important role in implementing appropriate open spaces that will diminish the impacts of climate change:

Enhancing quality of life and maintaining the region’s liveability whilst managing population growth and addressing climate change are key challenges for SEQ’s planning process ... In summary, the preliminary spatial vulnerability assessment for SEQ re-enforces the region’s susceptibility to key climate change related impacts such as extreme heat, extreme rainfall and coastal hazards and the need for adequate preparation and response through adaptation measures ... Urban design can play a key role in reducing such vulnerability through managing elements of the urban fabric that can reduce the occurrence of heat island effects which can be intensified during periods of extreme heat. Hence, urban planning can encourage urban design to take careful consideration for the choice of urban materials and their thermal properties, for the allocation of urban green spaces and types of vegetation in use, to improve air flow and ventilation, and the reconfiguration of impervious surfaces (Coutts et al 2010; Stone & Norman 2006).<sup>681</sup>

By 2012, the Council of Mayors (SEQ) published a booklet – *Open Space and Medium Density Living: Toolkit* – that provided guidance “on integrating open space provision through development at the individual site level as well as through local area planning”.<sup>682</sup> The toolkit is based on the concept of a 'SEQ Place Model' which was “designed to promote a more compact urban form, including increased availability and diversity of housing for people of all income levels, walkable neighbourhoods, attractive mixed use communities, access to transportation choices, reduced car dependency, and protecting our natural landscapes”.<sup>683</sup>

The SEQ Place Model type adopted in this study is the Urban Neighbourhoods type (P5), which is centred on the key terms: ‘higher density’, ‘walkable’, and

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<sup>681</sup> Low Choy, et al. 2010, *Climate change vulnerability in South East Queensland: a spatial and sectoral assessment*, 38, 46; Coutts, et al. 2010, *Changing urban climate and CO2 emissions: implications for the development of policies for sustainable cities*; Stone and Norman 2006, *Land use planning and surface heat island formation: A parcel-based radiation flux approach*

<sup>682</sup> The publication was conceived to augment the “guidance provided in the *Next Generation Planning Handbook* (Council of Mayors (SEQ), 2011a) and the SEQ Place Model; as well as the *Neighbourhood Planning Toolkit*, the *Medium Density Model Planning Scheme Code* and the *Principles for Sustainable Medium Density Infill Housing in SEQ Guidelines*, delivered through the *Liveable Compact Cities Project*.” John Gaskell Planning Consultants and Andrea Young Planning Consultants 2012, *Open Space and Medium Density Living: Toolkit*, *ibid.*, 1

<sup>683</sup> *Ibid.*

‘mixed-use neighbourhoods’.<sup>684</sup> The suggested preferred criteria for supplying and dimensioning of the green spaces for this Place Model type are extensively discussed in the *Open Space and Medium Density Living: Toolkit*. The latter served as a foundation for testing the green spaces dimensions to utilise in this inquiry.

The lenses of inquiry are extremely important to this inquiry because of the qualitative and quantitative information they provided. The table below frames and summarises the topics used to build the design framework criteria that are applied to the urban prototypes in the following chapter.

**Table 7. General criteria topics**

<b>Subtropical design</b>	<b>Green structures</b>	<b>Hallmarks of TOD</b>
<u>Solar orientation</u>	<u>Green Spaces</u>	<u>Accessibility</u>
Building shape and orientation	Dimensions	Street character
Building height	Character/structure/composition	Comfort/safety
Courtyards dimensions	Vegetation /soil/water - incidence/form/quality	Walking/cycling
Street width	Uses	Public transport/time-efficiency
Shade solutions	Property statute	Parking (cars, bicycles)
<u>Ventilation</u>	<u>Connectivity</u>	<u>Sense of Community:</u>
Block permeability	Water systems (permeability)	Streets/courtyards/other open spaces
Building’s natural air flow	Biological systems(flora/fauna)	Private/public/shared building and open spaces
Units connecting street/courtyard	Human commuting (walking, cycling, driving)	Safety and legibility
Room partitions	Human perception	Amenities, services, Facilities (kind/scale)
Wind catch solutions		
Window/door size and location		
Privacy screens		<u>Uses</u>
Courtyard character		Mixed-uses
		Private/public
<u>Transitions Spaces</u>		Shared property
<u>(in↔out):</u>		Flexibility
Balconies/verandas		Suitability
Terraces		
Roofs		<u>Density</u>
Patios		Block dimensions
Galleries/corridors		Courtyard dimensions
		Number of storeys
		Housing/apartment typologies

<sup>684</sup> Ibid., 15



## Chapter 5: Design framework

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Nothing is original. Steal from anywhere that resonates with inspiration or fuels your imagination. Devour old films, new films, music, books, paintings, photographs, poems, dreams, random conversations, architecture, bridges, street signs, trees, clouds, bodies of water, light and shadows. Select only things to steal from that speak directly to your soul. If you do this, your work (and theft) will be authentic. Authenticity is invaluable; originality is non-existent. And don't bother concealing your thievery - celebrate it if you feel like it. In any case, always remember what Jean-Luc Godard said: "It's not where you take things from, it's where you take them to."<sup>685</sup>

Jim Jarmusch

The words of film director Jim Jarmusch are representative of the degree of freedom architects and urban designers can adopt when developing a new project, and his words corroborate the process of *bricolage* previously described by Lévi-Strauss.<sup>686</sup> However, although the collage procedure could be applied on all scales – from the dimensions of a small room to the appropriate proportions of different urban contexts – and despite the currently ubiquitous assistance of computerised sources, the traditional process of sketching/reflecting (that is, design as research) is still the most valuable approach, if combined with technical, cultural, and environmental research (**C\_2**).

The choices and (re)interpretations of the theoretical and best practice sources (the precedents) become, then, the determining factor in shaping the urban design prototypes to test courtyard housing as a subtropical urban design model in the Collage Plan. Accordingly, this specific design research determines *a priori* the appropriate views against which to analyse and test each prototype. These views work as clear lenses of inquiry that frame and limit the critical design parameters to test and apply the most practical outcome.

The design framework of this inquiry adopted this procedure: the data from the previous chapters was analysed, and final choices (for example, of dimensions and room arrangements) were compiled and synthesised (**Ap\_E-G**). This

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<sup>685</sup> Jarmusch 2004, *Nothing is original*

<sup>686</sup> **3.1 Design precedents**, p.36

compilation and synthesis took into account issues related to its evaluation, interpretation and adequacy to this inquiry to be further tested in the design process previously defined (**C\_2**).

**Section 5.1** presents the descriptive results of the CH and CCH prototype developments and compares them accordingly; and, lastly, **Section 5.2** explains the elaboration of the Collage Plan in assembling the prototypes as an urban design model.

## 5.1 URBAN DESIGN PROTOTYPES

Architectural theories are in a state of inadequacy. They are not coping well with today's ever changing and complex situation. Conventional architectural theory and practice no longer satisfies our needs. New theories are emerging in rapid succession, which are eye dazzling, but in reality they just as mud reflect confusion in both ideological and artistic concepts. Just as one critic has stated: "We simply cannot afford another century in which the tastes of the public and those of its aesthetic commentators are as dramatically divergent as they have been during the years of modernism".

Liangyong Wu<sup>687</sup>

This inquiry selected two scales of courtyard housing to test in urban design prototypes: courtyard houses (CH - dwelling houses) and communal courtyard housing (CCH - multiple dwellings). Both groups were developed in two different prototypes to offer diversity of choice. It is recognised that other examples could be tested; however, the chosen ones were identified (during the design process) as the most appropriate for the requirements of this specific research.

Intrinsically, the urban design prototypes are design schema for representing a group of buildings, including their private/semi-private open spaces and their access. Each prototype represents a built form – an urban net unity that includes buildings, courtyards, internal lanes and other public spaces, and half the width of adjoining access roads – that serves to measure and compare parameters such as net residential density, land uses, open/green spaces, parking, and the adjacent streets. The urban net unity can be seen as analogous to the concept of Unity

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<sup>687</sup> Liangyong Wu is Professor of Architecture and Urban Planning, Director of Centre for Human Settlements, and Director of the Institute of Architectural and Urban Studies, Tsinghua University, Beijing, China. In Wu 2009, *Looking forward to architecture of the new millenium*, 54

suggested by Microsoft Patterns & Practices to appropriately address issues handled by software designers engaged in component-based software engineering.

In this type of inquiry, one can use the urban net unity “in a variety of different ways to help decouple the components of your applications, to maximize coherence in components, and to simplify design, implementation, testing, and administration of these applications”.<sup>688</sup> This component-based process “emphasizes the separation of concerns in respect of the wide-ranging functionality available throughout a given ... system”.<sup>689</sup> Future research in this area could use the concept of urban net unity in the development of urban design prototypes through computer simulations.

### 5.1.1 Components

The components of the urban design prototypes are buildings, courtyards, blocks, and streets. These components were established at the outset, and their attributes were to be moulded and informed by knowledge gained from the precedents, the interviews, the theory, and best-practice examples. The aim was to determine the ideal attributes of each component for each prototype. During the different stages of the design process, information relating to each component was placed in labelled ‘containers’ and subsequently classified and interpreted to establish their quantitative/qualitative relationships within the urban net unity (such as building heights with streets/lanes/courtyard widths; and block dimensions with street grid).

This information was then distributed in lists and tables that served to filter and balance the importance of each data item to the final prototypes.<sup>690</sup> The outcomes of these tables are the ‘Attributes and ratios tables’,<sup>691</sup> these tables are preceded by the reasoning and criteria that generated the design. The drawing number (**DS\_ [No]**) indicates the page number in the **Drawing Set**.

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<sup>688</sup> Microsoft Developer Network 2015, *What Is Unity?*

<sup>689</sup> Bose 2010, *Component based development : Application in software engineering 2*

<sup>690</sup> **Ap\_E - G**

<sup>691</sup> **S\_5.1.5**, p. 234

### 5.1.2 Expert consultations (Interviews)

The experts selected to clarify issues related to Brisbane architecture and urban design were: Peter Richards (Director at Deicke Richards, a Brisbane multi-disciplinary architecture & design practice) for his expertise related to Urban Design and TOD in SEQ; and Timothy Hill (Partner at Donovan Hill, a Brisbane multi-disciplinary architecture & design practice – 1992-2013) for his know-how in housing in Brisbane. Hong Zhang (Principal at Standard Architecture, a multi-disciplinary architecture & design practice, Beijing, China) was interviewed to explain the Chinese housing context in relation to both ancient and current courtyard housing typologies. John Taylor (Principal/Owner of Engineering Air Science Pty Ltd, an engineering and scientific consultancy, Brisbane) was interviewed with respect to natural airflow mechanisms and the feasibility of their application to courtyard housing in subtropical Brisbane.<sup>692</sup>

I also acknowledge the personal communications of Luis Rodrigues (Parque EXPO Prospecting and Design Director) who, while not directly interviewed, voluntarily contributed significant public information concerning Parque das Nações via email.<sup>693</sup>

The experts' (consultants') diverse questions served to evaluate individual opinions to corroborate (or challenge) my previous practice in other countries.<sup>694</sup>

### 5.1.3 Prototype design framework criteria

The table below contains the prototype components with a list of associated topics – including concepts from the three lenses – Subtropical Design, Urban Green Structure and TOD hallmarks – that were considered in the development of each prototype. While most topics apply to all prototypes, the reference [CCH] is added when a specific topic is limited to the Communal Courtyard Housing group, and [CH] is added when it is limited to the Courtyard Houses.

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<sup>692</sup> The questions and the relevant feedback retrieved from these interviewees are located in **Ap\_C**.

<sup>693</sup> **S\_3.3.2**, p. 148-149

<sup>694</sup> The interviewees agreed (in a signed form) to be quoted, and to have their names and company names divulged to add authenticity, and to enable corroboration of the research findings. The QUT Human Ethics Approval Certificate can be found in **Ap\_C**.

**Table 8. Prototype design framework criteria**

Prototype components	Associated topics
<b>Blocks</b>	<ul style="list-style-type: none"> <li>• Sun orientation (maximize winter sun – residences/courtyards)</li> <li>• Green spaces (private, communal, public)</li> </ul>
Dimensions	<ul style="list-style-type: none"> <li>• Liveable streets and courtyards</li> </ul>
Orientation	<ul style="list-style-type: none"> <li>• Compatibility with traditional Brisbane block dimensions</li> <li>• Net density (maximize)</li> <li>• Human scale perception</li> <li>• Walking accessibility</li> <li>• Parking – linear on street plus basement [CCH] or plus in site [CH]</li> <li>• Privacy/community (balance and control)</li> <li>• Private and shared spaces – in buildings and courtyards. [CCH]</li> </ul>
<b>Buildings</b>	<ul style="list-style-type: none"> <li>• Sun orientation (maximize winter sun – residences/courtyards)</li> <li>• Ventilation (maximize natural airflow – residences/courtyards)</li> </ul>
Dimensions	<ul style="list-style-type: none"> <li>• Double-Edge<sup>695</sup> condition (contact with street and courtyard)</li> </ul>
Storeys	<ul style="list-style-type: none"> <li>• Transition spaces (balconies, galleries)</li> </ul>
Typologies	<ul style="list-style-type: none"> <li>• Green roofs</li> <li>• Human scale perception-buildings height [CCH]</li> <li>• Net density (maximize)</li> <li>• Mixed-uses (especially ground floor and corners)</li> <li>• Diversity/Flexibility (units type and dimensions, uses)</li> <li>• Parking (shared basement) [CCH]</li> <li>• Privacy in the dwellings</li> </ul>
<b>Courtyards</b>	<ul style="list-style-type: none"> <li>• Sun exposure (maximize winter sun – residences/courtyards)</li> <li>• Protection for summer sun (trees, other shade structures)</li> </ul>
Dimensions	<ul style="list-style-type: none"> <li>• Natural airflow (seasonal control)</li> </ul>
Character	<ul style="list-style-type: none"> <li>• Ground permeability (maximize)</li> <li>• Vegetation and Water (high incidence, suitable forms)</li> <li>• Privacy</li> <li>• Amenity and safety</li> <li>• Human scale perception</li> <li>• Uses (diversity, flexibility and suitability)</li> <li>• Sense of community [CCH]</li> <li>• Net density (maximize)</li> </ul>
<b>Streets</b>	<ul style="list-style-type: none"> <li>• Sun exposure (varied during the year and the day)</li> <li>• Green structure connectivity</li> </ul>
Dimensions	<ul style="list-style-type: none"> <li>• Vegetation (high incidence, diversity of forms)</li> </ul>
Character	<ul style="list-style-type: none"> <li>• Human scale perception</li> <li>• Accessibility (walk, cycling, public transport and car traffic)</li> <li>• Shared streets (commutation, amenities - varied functions weight)</li> <li>• Linear on street car parking (minimize impact)</li> <li>• Comfort, safety, legibility (considering the different uses)</li> <li>• Sense of community</li> <li>• Compatibility with traditional Brisbane block dimensions</li> <li>• Net density (maximize)</li> </ul>

<sup>695</sup> S\_5.1.4 – Blocks, p. 119

#### 5.1.4 Prototypes analysis

The criteria developed in **Chapter 4**, and listed in Tables 4-6 (see **S\_4.1**, **S\_4.2** and **S\_4.3**), framed the conditions required for determining the general topics. **Table 7** then framed and summarised the topics used to build the design framework criteria that are applied to the urban prototypes in this chapter. This section presents the outcomes of the application of these criteria to the design of the prototypes. The topics located in **Appendix\_G** provide the considerations related to prototype dimensions and characteristics. These could be used in future research to compare to other housing typologies.

##### *Design limitations*

The amount of detail in the urban design prototypes is limited to that which is necessary to answer the research questions; therefore, they do not intend to constitute a comprehensive architectural proposal. For the same reason, the design resolution of the courtyards is limited to a schematic planting concept – without botanic specifications – sufficient to indicate the functional and spatial objectives related to the courtyard attributes seen through the lenses of inquiry.

Balcony dimensions, namely their width, are indicative only, as these should be studied case by case according to a balcony's solar orientation and geographic location. Openings for natural light and ventilation provision are also represented indicatively by large opening areas. Again, appropriate opening dimensions should be technically adjusted to the conditions of each location (such as, topography, orientation, and predominant winds), and should respond to local thermal codes to consider energy savings. In a future research, the dimensioning of the windows and thermal insulated glass panels (initial investment) should be evaluated in terms of cost-benefit, taking into account to the local prices for energy (long-term expenses) at the geographical location of the projects.<sup>696</sup>

Specific ratios for the implementation of retail/commercial areas are not

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<sup>696</sup> The use of insulated glazing is generally avoided by builders given its high cost. In Europe the use of insulated glazing has been enforced by government codes given the high prices of energy and do represent a considerable economy in the long term family expenses

included in the objectives of this inquiry, as these would vary according to the specific urban context and the time of implementation. Rather than quantifying retail/commercial areas, this inquiry is concerned with qualifying them in terms of the appropriateness of their internal areas and their location. Nevertheless, what is of relevance is the indicative flexibility of the prototypes to meet the diversity of community demands.<sup>697</sup>

### ***CH prototypes***

The courtyard house prototype is seen in this inquiry as a group of courtyard houses, the internal public laneways/open spaces between the houses plus half the width of the streets around the group as it relates to the definition of Net Residential Density.<sup>698</sup> To attend to Brisbane residents' preference for single-houses, two prototypes have been developed, using courtyard houses. They both have the objective of achieving social and functional diversity; however, they are typologically very different. One is called 'Zero-Lot'<sup>699</sup>; the other is called 'L-Shape'.

#### Zero-Lot

This type has 2-storeys, and could be built in two phases if a family's finances required it. It has a small courtyard in the middle of the house and a backyard. The type was developed based on the precedents described in **S\_3.2.1**: the Shop House (China) (**Fig.148**) and the Machiya House (Japan) (**Fig.149**). The binuclear house type, Adam Haddow's Boathouse Terraces (2009) and Fairweather Proberts' Subtropical Town House (2008) were also reviewed, although they did not include retail/office areas in their ground floor plans (**Figs.44, 48, 49**). The Zero-Lot was studied in two different urban design prototypes, here called 'Back-to-back' and 'Double-lane'.

In the Back-to-Back option, the front façade faces both laneways; however, the backyard side aligns to the backyard side of another house. In the Double-Lane

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<sup>697</sup> In Subiaco, for instance (**S\_4.3.1**, p. 198), the retail area that was economically feasible to build, was greater than the area the local community approved for actual implementation.

<sup>698</sup> **S\_4.3.2 – Density**, p.209

<sup>699</sup> Some similar types are also called Row Houses

option, the houses face the laneways on both front and backyard sides, which may function as a front yard with a low height fence. These two conditions currently exist in terrace houses in Australian residential areas, where the front yard works as an interface between public and private territories.<sup>700</sup>

### L-Shape

The L-Shape courtyard house can have 1/2-storeys; it facilitates a more spacious courtyard than the Zero-Lot, and allows for an entrance directly from the laneway in addition to the main dwelling entrance. Some of the L-shaped types mentioned in **S\_3.2.1** served as references for this type. The precedents reference the CH designs of Alvar Aalto (1953), Ernest Göhl and Anton Brener (1932), Hugo Häring (1928) and Ludwig Hilberseimer (1930), among others (**DS\_19-24**).

### **CH group analysis**

#### Buildings and blocks

The two Zero-Lot options include a room adjacent to the entrance, which can be used for a small home office/workshop/retail or as a ground floor bedroom space; this provision accomplishes one of the Gold Level requirements of the *Livable Housing Design Guidelines* and provides an option for a Live-Work opportunity facing the lane.<sup>701</sup> The ground floor windows and the bedroom balconies enable the casual surveillance of lanes/streets, and contribute to the character of the neighbourhood (**DS\_13-16, 21-24**). Both Zero-Lot options were designed to fit into half (5m) the width of the traditional 'Queenslander' allotment (10m); both options also share similar internal areas and are distributed across two floors. The two private open spaces (courtyard and backyard) allow for natural cross-ventilation and daylight in all compartments.

The Back-to-Back option was studied in two lot sizes to fit two different block

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<sup>700</sup> For Melbourne examples see Gehl 1976, *The interface between public and private territories in residential areas*

<sup>701</sup> "...a space on the ground (or entry) level that can be used as a bedroom ... of at least 10m<sup>2</sup> with one wall a minimum length of 3m; ...provides for a minimum path of travel of at least 1000mm on at least one side of the bed." In 2012, *Livable Housing Design Guidelines* 15



layouts. One version fits the traditional Brisbane block size and road infrastructure. Its lot size (5-40m) is half that of the traditional Queenslander lot (10-40m), resulting in a net residential density (34dph) that is twice as large as the density ratio (17dph) of the Queenslander type. This version accommodates a covered car space and driveway access for a visitor's car. The other version is about a quarter the size of the typical Queenslander lot size (5-21m).

The differences between these two versions are the size of the external areas and the car parking solution. The larger lot version is presented in plans and sections (**DS\_14**); however, it was not assembled as an urban design prototype. The reason is that although its implementation would be straightforward in terms of the Brisbane city fabric, as it sits on half of the traditional Brisbane allotment, it would work simply to double the lot's occupancy. Therefore, it is not an appropriate fit for an urban design model that provides public spaces, reduces car dependency, and provides a more compact result than the 5-21m lot version (**DS\_13**).

The L-Shape responds to the demand of the Brisbane market for 1BR and 2BR dwellings, while providing the option to expand to meet any growth in family numbers/members or budget, as was a common in 1950s.<sup>702</sup> To address this demand, my designs show a courtyard house model with a 2BR dwelling on the ground floor, and a 1BR dwelling on the level above. Both dwellings have independent access from the laneway, the ground level unit has access to the courtyard, and the level above has access to a private terrace on the rooftop (**DS\_21**).

The use of the top floor for commercial purposes is possible and straightforward. Another option could be to join the two floors (through simple architectural changes) to create a 3BR dwelling. Therefore, this versatile housing type is innovative in bringing to Brisbane a housing model that expands to meet the family's needs. It incorporates 'income units' that work within the 'hyperhouse' concept (previously mentioned),<sup>703</sup> and demonstrates that it delivers a sustainable

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<sup>702</sup> As seen in the examples of Brisbane housing (**S\_3.4.1**) p. 160-166, PREVI and Prestonpans housing experiments (**S\_3.2.1**), p. 74, 71

<sup>703</sup> **S\_3.2.1**, p.77

and compact urban design model for rapidly growing cities with subtropical climates.

### Streets and parking

The adopted street network for both CH and CCH is based on what I called Double-Grid, as it is composed of two types of streets. One type is designed primarily for pedestrian utilisation, envisioning a pleasant pedestrian realm where cars have restricted access; these streets were conceived under the concept of Streets-for-Living.<sup>704</sup> The other is designed with the aim of achieving a balanced sharing of the street by pedestrians, bicycles, buses and cars; these are here called 'Mixed-use-Streets' in accordance to the New Urbanism theories (**DS\_12, 20, 28, 36**).<sup>705</sup>

As such, the lanes within the CH prototypes have a dedicated usage: cars are only allowed temporarily for downloads/uploads that service both houses and shops, to facilitate movement of disabled persons and for emergency public services (ambulances, fire prevention cars, etc.) (**DS\_12, 20**). This design approach creates walkable, liveable, and safe streets, which are appropriate to Brisbane's subtropical outdoor life style. In both cases, the streets complement the courtyards, by creating green corridors to connect the urban green structure and extend the ecological continuum (**DS\_54**).

The CH urban design prototypes exclude parking in individual garages, because this would compromise the quality of the public spaces. This low car dependency model has been successfully applied in low-rise developments in

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<sup>704</sup> "Streets for living service predominantly homes, but on an incidental scale they have many other uses too: shops, schools, community halls and parks, to name a few. They may also contain offices, universities, hospitals and other uses, but this is not their focus. They are places for being active, meeting people, walking, cycling, going to work, going to school and going shopping. All these activities can originate in a street for living." IPWEA 2010, *Complete streets : guidelines for urban street design*, 103

<sup>705</sup> "Mixed-use streets contain a mix of residential and commercial uses, as well as occasional shops, services and community facilities. The key difference between these streets and main streets is their residential component. Mixed-use streets, while containing a wider variety of uses than streets for living, must still be designed to accommodate the needs, and protect the amenity of residents. They will, by nature, commonly have more traffic, more pedestrian activity and more public transport than streets for living and this must be dealt with in a manner that delivers a street character which provides a great living environment, as well as a viable commercial and retail opportunity." Ibid., 95

different cultural contexts (Scotland, Peru, China and Portugal); the community members become responsible for the partial maintenance of the open spaces in front of their properties as an extension of their residences or café esplanades, for instance.<sup>706</sup> Accordingly, these two prototypes include a sequence of public spaces in a safe group-public environment that enhances a sense of community.

One initial floor plan option for the L-Shape shows a covered carport; however, this option was abandoned when I decided to provide the courtyard house prototypes with limited car access, following the example of Shichahai<sup>707</sup> Prestonpans, and PREVI (DS\_21).<sup>708</sup> This strategy was applied to the CH prototypes also, because it is not feasible to allocate parking underneath the buildings without sealing the courtyard ground. In these cases, parking can be sought in both street and car silos to be located nearby (5-minute walking). Constraining the car traffic in the perimeter streets reduces air pollution and increase safety inside the prototype.

#### Private courtyards

To fully achieve the predetermined criteria for green structures, the proposed courtyards ought to be mostly landscaped and, ideally, 60%-80% water-permeable. Solid slabs (to serve as parking roofs beneath the courtyard areas) must be avoided, and all indispensable paving needs to be semi-permeable to maintain the fundamental, natural water system. Above all, the natural top soil should be preserved and maintained as an essential life resource.

The two types of CH required different approaches, given their characteristics; however, both types include the traditional elements utilised in the reviewed precedents: water and greenery. Water is used to explore its thermal mass characteristics and its evaporative cooling potential. The latter is accomplished with water bodies/chutes, and the former with the utilisation of rainwater tanks, which

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<sup>706</sup> In Brisbane, the public lawn between the street and the private property is maintained by the adjacent property owner; in Portugal and China the householders brush and wash the paved public space in the lane in front of their property where they sit to chat, watch the children and even eat, drink and play cards.

<sup>707</sup> S\_3.3.1, p.130

<sup>708</sup> S\_3.2.1, p. 71, 74

store heat/cold to provide ‘inertia’ in moderating temperature fluctuations.<sup>709</sup>

The L-Shape greenery includes one deciduous tree, and deciduous plant species that cover the pergola to provide shadow in the summer and sun exposure in the winter. There are shrubs along the fences, and a small lawn (or permeable paving). The Zero-Lot courtyard has reduced greenery, given its size and location; however, the enclosed backyard – under the concept of ‘enclosure’ described in **S\_3.2.3** – has shrubs along the fences, and a small lawn (or permeable paving). The design of both courtyards is descriptively sketched in **DS\_59**.

The parameters influencing the design of the CH courtyards are:

<b>CH Zero-lot courtyards</b>
<ul style="list-style-type: none"> <li>▪ moderation of microclimate:               <ul style="list-style-type: none"> <li>○ water features for summer microclimate amelioration</li> <li>○ backyard for winter sun exposure</li> <li>○ shadows controlled by vegetation species in backyard</li> </ul> </li> <li>▪ visual interface from downstairs/upstairs</li> <li>▪ central access to courtyard</li> <li>▪ living room access to backyard</li> <li>▪ activities in backyard:               <ul style="list-style-type: none"> <li>○ limited activities on external backyard for adults</li> <li>○ 3/5yo children’s static games</li> </ul> </li> <li>▪ mobile furniture pergola shadows</li> </ul>

<b>CH L-Shape courtyards</b>
<ul style="list-style-type: none"> <li>▪ moderation of microclimate:               <ul style="list-style-type: none"> <li>○ water features for microclimate amelioration</li> <li>○ shadows controlled by tree species selection</li> <li>○ bio-retention drains for storm water</li> </ul> </li> <li>▪ visual interface downstairs/upstairs rooms</li> <li>▪ central access</li> <li>▪ activities in courtyard:               <ul style="list-style-type: none"> <li>○ limited activities for adults</li> <li>○ 3/5yo children’s static games</li> </ul> </li> <li>▪ mobile furniture under shadows</li> </ul>

<sup>709</sup> “Thermal mass acts as a thermal battery. During summer it absorbs heat during the day and releases it by night to cooling breezes or clear night skies, keeping the house comfortable. In winter the same thermal mass can store the heat from the sun or heaters to release it at night, helping the home stay warm.” in Your Home – Thermal mass <http://www.yourhome.gov.au/passive-design/thermal-mass>

### ***CCH prototypes***

The communal courtyard housing types studied are named ‘Communal Courtyard/Single’ and ‘Communal Courtyard/Double’. The main intention in developing two different types is to provide housing diversity. The other reason is to vary both the longitudinal dimension and the solar orientation; this facilitates the application of the typologies on Brisbane blocks oriented either north-south or east-west, as both have been designed to fit the width of the Brisbane traditional city block (80m average) as a parameter.

The Roman Row House typology is applied in the CCH/Double, and the In-line House (point access) typologies utilised in most of the twentieth century CCH examples<sup>710</sup> are applied in both prototypes (**Figs.92, 150**). The prototypes have different courtyard sizes and lot arrangements; both include areas for retail and offices.

#### CCH/Double

This type has lower building heights (2/3/5-storeys), two courtyards, and slightly smaller apartments than the CCH/Single. The type was developed based on the precedents of the traditional Beijing *siheyuan* (**Fig. 33, 35 and 36**),<sup>711</sup> and on projects developed from it, such as the Ju’er Hutong project at Beijing which (New Courtyard Houses of Beijing – **Fig. 119 and 122-124**), which accomplishes high residential density values using low-rise courtyard housing.<sup>712</sup>

The 2-storey side accommodates Row Houses based on the Roman *taberna* type, which facilitates a family business (retail/office) on the ground floor and

locates the dwelling behind facing the courtyard and above facing both courtyard and street.

#### CCH/Single

This type has greater building heights (4/5/7-storeys) than the CCH/Double; it

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<sup>710</sup> S\_3.2.2, p. 94-116

<sup>711</sup> S\_3.2.1, p. 60

<sup>712</sup> S\_3.3.1 – p. 213

was developed based on rectangular CCH floor plans such as those in the *insulae* of Ostia (4th century BC - **Fig. 78**), the Plan Cerdá prototypes in Barcelona (1859 - **Fig. 86**), the Hornbaekhus in Copenhagen (Kay Fisker, 1923 - **Fig. 99**), and the Siedlung Niedrrad in Frankfurt (Ernst May, 1928 - **Fig. 107**), to cite a few.

### ***CCH group analysis***

#### Buildings

The challenge of arranging buildings around communal courtyards is that there are units in the north-south direction and units in the east-west direction. Since the prevailing summer breezes in Brisbane come mainly from the east-southeast, the model tests show that the best compromise for better orientation/ventilation for all the units is to rotate the building plans to a position that will maximise the solar exposure and the ventilation through the balconies. Louvers can be used on the balconies to mediate both these factors. This study shows that these courtyard housing apartments can acquire good standards of natural light and ventilation with this approach (**DS\_13-16, 21-24, 29-32, 37-40**).<sup>713</sup>

The search for ideal building heights in this inquiry is anchored around the maximisation of the winter solar exposure as a public health benefit, along with the maximisation of visual connections between the apartments and the street/courtyard rather than the maximization of the private developers' profits generated by higher buildings.

The design of all units in this study has incorporated silver and gold level design elements from the Liveable Housing Design Guidelines to ensure the greatest usage for the most people (universal design principles).<sup>714</sup> These elements increase the ease of adaptability to future modifications should more accessibility be required to the rooms. To achieve the preferred conditions, and to correlate these with appropriate accessibility, it is essential to provide appropriate dimensioning, starting with the dimensions of accessible bathrooms (**DS\_13-16, 21-24, 29-32, 37-**

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<sup>713</sup> McGee, *et al.* 2015, *Passive Design - Your home : Australia's guide to environmentally sustainable homes. technical manual*

<sup>714</sup> Livable Housing Australia 2012, *Livable Housing Design Guidelines*

**40).** In addition to these characteristics, almost all the units were designed to be suitable for Live-Work (SoHo) uses. In some cases, these considerations required the studied unit size to be larger than the size of other units currently offered in the housing market.

This study has adopted a ratio of one (36%), two (50%) and three-bedroom (14%) apartments in an equivalent proportion to the Brisbane Inner City apartment sales figures in 2012 (**Fig.156**). The prototypes include also a limited number of three-bedroom penthouses with vertical access to the roof. The rooftop above these units can be maintained by the owner of the penthouse, and provide the opportunity for landscaped areas and Jacuzzis, a common practice (among others) in Rio de Janeiro and Barcelona. Besides accommodating the required mechanical equipment, the remaining rooftop area can provide shared areas. These could include covered spaces surrounded by communal gardens or urban farms, where the residents could enjoy planting vegetables and flowers, while at the same time enjoying the external views.

Land use diversity is accomplished with the provision of areas to be used by retail (block corners, ground floor), commerce (block corners, upper levels) and services (block corners, ground and/or upper levels). Housing diversity is provided by location (all floors) and by size (1BR, 2BR and 3BR) (**DS\_11, 19, 25, 27**). Live-Work is also successfully included as a mixed-use alternative, with proposals for 'shop houses' along the streets edges and SoHo premises within the residential units.<sup>715</sup>

### Blocks

The size of the communal courtyard prototype is limited to 80m in width (maximum), to fit the average width of the traditional Brisbane block. Therefore, the external dimensions of the courtyard housing depend on the observance to the criteria to create the built block edges. The height of the buildings in the northern, eastern, and western sides of the CCH prototypes was tested using sun path simulations to guarantee the appropriate solar exposure on the courtyard and balconies. On the southern side, the building heights aimed to allow for the

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<sup>715</sup> **S\_4.3.2 - Mixed-uses**, p. 205

apartments on the opposite side of the street to have proper light exposure in the winter, and for the streets to be partially exposed to the winter sun (**DS\_63-64**).

The dwellings being in contact with both edges of the building (courtyard and street), previously called Double-Edge,<sup>716</sup> is a significant aspect of the design of the communal courtyard housing prototypes. Besides their double orientation attribute that enhances cross-ventilation, the Double-Edge dwellings provide visual access to both courtyard and street, thus maximising passive surveillance. They also allow residents to have an anonymous presence on the street edge through their inconspicuous yet distinguishing furnishing of windows, balconies, and ground floor gardens (for example, with flower pots and furniture), thus manifesting their claim for identity. This claim for identity is further explained by Fabio Pollice that asserted, "...identity can be considered a consequence as well as a cause of territorialization processes".<sup>717</sup>

In the case of CCH courtyards, the views to the communal space from the courtyard building edge increase both the individual attachment to the courtyard space, and the relationship with the community that shares the space. Other housing types, such as the ones that use the 'single-loaded corridor systems' or the 'double-loaded corridor systems', do not aggregate all of these attributes.<sup>718</sup>

### Streets and parking

The street network proposed for the CCH prototypes is the same Double-Grid utilised in the CH areas.<sup>719</sup> However, unlike the parking solution for the CH areas, I

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<sup>716</sup> **S\_3.2.3 - Conceptual and typological analysis**, p.128

<sup>717</sup> Pollice defines 'territory' as a relational space, "that grows in time as the product of a process of cultural sedimentation; the engine of this process is the identity relationship between a community and the space occupied by the community. As a matter of fact, the space becomes the territory of an actor as soon as it is involved in a social relationship of communication...The development of economic and productive collaborative relationships, the preservation of environmental and cultural resources, and the integration of different social and ethnical components in a coherent and united community, are all goals that require the creation of an identity space, the creation of the *place*." Pollice 2006, *The role of territorial identity in local development processes*, 1, 11; see also Oliveira, *et al.* 2010, *Territorial identity and development: From topophilia to terraphilia*

<sup>718</sup> Apartment type classifications as per Roger Sherwood definitions, in Sherwood 1978, *Modern housing prototypes*; see **Ap\_A - Glossary**

<sup>719</sup> **S\_5.1.4 - CH group analysis - Streets and Parking**, p.224



have incorporated underground parking as a shared space underneath the CCH buildings; this allows higher land-use efficiency and easier access from the dwellings. Moreover, I propose a solution to accessing the underground parking from the street – a solution that has been adopted in many cities (for example, in Brisbane and Lisbon). This approach consists of a driveway parallel to a building's façade that directs the cars to the parking underneath the building, without impinging on either the pedestrian pathways or the building façades (**Figs.154, 155**).<sup>720</sup> However, the planning of parking access locations, and the dimensioning of underground parking levels and their specific locations, are beyond the scope of this study.

### Semi-private courtyards

The criteria applied in the design of the CCH courtyards mirror the ones earlier described for the CH private courtyards in relation to the permeability of the soil and the utilisation of both greenery and water (that is, thermal mass and evaporative cooling).

The greenery includes both deciduous and evergreen tree species – the former to provide shadows in the summer and sun exposure in the winter, and the latter to provide shadow throughout the year. There are shrubs along the private gardens, and a large lawn (that could be mixed with permeable paving) to provide a space for outdoor activities. This activity area is separated from the access to the ground floor dwellings through the elevation of the pathways; this guarantees both an extended space for activities and visual privacy for the dwellings.

Water is incorporated in larger areas of the CCH courtyards than in the CH private courtyards. This provides enhanced moderation of microclimate, a greater audio and visual experience, and more space for outdoor activities. The larger raingardens can both perform a comprehensive function as a bioretention drain, and provide a visual contribution if adequately designed.

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<sup>720</sup> This solution has been largely used in historic cores with a successful integration of street and pathways. However, I agree with Peter Richards, that the aesthetic/functional success of this solution is a matter of design. In the interview, to exemplify, Richards indicated a good and a bad design solution for this type of access inside Brisbane CBD. See **Ap\_C.1.1**

The design of both courtyards is descriptively sketched in **DS\_60**.

The parameters influencing the design of both CCH courtyards are:

<b>CCH courtyards</b>
<ul style="list-style-type: none"> <li>• moderation of microclimate:               <ul style="list-style-type: none"> <li>○ shadows controlled by tree species' selection</li> <li>○ water features for microclimate moderation</li> <li>○ bio-retention drains for storm water</li> </ul> </li> <li>• Double-Edge:               <ul style="list-style-type: none"> <li>○ visual interface from windows/balconies on both dwelling edges</li> <li>○ cross ventilation from tunnels and units</li> </ul> </li> <li>• privacy from street movement</li> <li>• central access to ground floor units</li> <li>• free activity space for adult and 5-7yo children</li> <li>• covered spaces to support outside activities</li> <li>• furniture under shadows adjacent to water tanks</li> </ul>

Effective levels of airflow in the courtyards can be easily created with the appropriate openings on the ground floor level. The location and dimensioning of these openings will depend upon the topography, the prevailing winds and the surrounding built elements. However, to guarantee accurate results, wind tests should be performed *in situ* and/or off-site with the use of professional computer software.<sup>721</sup>

To test the tunnel dimensions suggested by Taylor, I conducted limited preliminary digital tests with the basic mass models of the prototypes, using an elementary airflow simulator to show the importance of these tests in courtyards built for subtropical climates. The first test showed airflow improvements arising from the use of airflow tunnels located on the ground floor. Two versions of the communal courtyard double prototype (one with tunnels, and another without) were virtually located on the site (Bowen Hills) to perform the test. It was then clear that the tunnels suggested by Taylor (wider than their height by a ratio of 3 or 4 as a minimum) created a noticeable improvement in the courtyard airflow (**Fig.151**). Further simulations were performed to adjust the efficiency of the tunnels' locations in each prototype. Even though indicative only – given the experimental

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<sup>721</sup> See John Taylor interview in **Ap\_C**

character of the software utilised – these simulations show the methodological importance of undertaking such tests in future courtyard housing projects (**DS\_65-66**).<sup>722</sup>

The results have shown that reasonable levels of natural ventilation can be achieved in the summer. In the wintertime, the openings can be closed to protect against the cold winds. Sun path tests (performed using computer software) verified that the building heights were appropriately designed to guarantee solar exposure in winter. In the summer, shade is guaranteed via the plantation of trees and the installation of shade structures (**DS\_63-64**).

To guarantee a sustainable flora-fauna habitat in shared courtyard spaces, the maintenance or modification (if ineffective) of the original landscape project principles should be controlled by a landscape architect nominated by the body of owners. While the choice and introduction of plant species would be determined by the nominated landscape architect, the maintenance of the vegetation in front of the ground floor units could be assigned to the respective, adjoining households.<sup>723</sup>

Best practice examples of this kind of private appropriation are the communal courtyard housing in Parque das Nações (**Fig.152**), and some of Rob Krier's courtyard options in the Liesing Residential Quarter project (1985) in Vienna (**Fig.153**).<sup>724</sup> The resulting mosaic of minimalistic landscape interpretations will mirror the front yards of Brisbane houses, and will contrast and complement (sometimes with surprising spontaneity) the methodical landscape design of the courtyard. Courtyard gardens can thus create peaceful places for relaxation or contemplation, and are a reminder of the ancient Chinese conception expressed in the word *tianjing* – 'the well of heaven'.

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<sup>722</sup> Taylor advised that: "The main recommendations to allow for ventilation in a courtyard would be to understand the meteorological conditions of the site, and in particular the seasonal variations in wind conditions and temperature that may exist and exploit this knowledge to position openings that enhance ventilation during warmer months and restrict ventilation during cooler months." In Appendix C

<sup>723</sup> In an earlier urban design projects (Portugal, 2000-2007), I demonstrated that this kind of personal involvement strengthens the connections among the dwelling owners, the land, and the shared spaces.

<sup>724</sup> Krier, *et al.* 2003, *Town spaces : contemporary interpretations in traditional urbanism : Krier.Kohl Architects*, 157

Therefore, the proposed courtyards can enhance the urban ecological bio-system, acting like 'stepping stones' to the wider urban green structure. They will provide shading, filter the air, and sequester carbon through the planting of trees and climbing plants over garden structures and walkways. Proper space management and suitable plant species selection should be detailed for each courtyard, in a comprehensive landscape project that allows for a sustainable flora-fauna habitat.

### 5.1.5 Attributes and ratios tables

The tables bellow list the attributes and ratios elected to design the prototypes previously described in this chapter.

#### ***Urban Design Prototype 1: CH/Zero-Lot/Back-to-Back***

##### Prototype attributes

**Table 9.** Description: CH/Zero-Lot/Back-to-Back

(DS\_11, 13, 15, 16)

Component /uses	Dimensions (per block)	Characteristics
<b>Blocks</b>	<ul style="list-style-type: none"> <li>• Area 7,680m<sup>2</sup> 96mx80m</li> <li>• Sub-block width 35m</li> <li>• Area per lot 110m<sup>2</sup> 5mx22m</li> </ul>	<ul style="list-style-type: none"> <li>• Courtyard houses - residential/other uses</li> <li>• Lanes and other public open spaces</li> </ul>
<b>Buildings</b>	<ul style="list-style-type: none"> <li>• Storeys 2</li> <li>• Footprint 64m<sup>2</sup> /lot 3,824m<sup>2</sup> /block</li> <li>• Build up area 128m<sup>2</sup> /lot  6,768m<sup>2</sup> /block</li> </ul>	<ul style="list-style-type: none"> <li>• 3 bedrooms</li> <li>• Courtyard oriented to North</li> <li>• Houses/apartments open to street/lane and to courtyard/backyard)</li> <li>• Natural ventilation in all compartments</li> <li>• Living areas connected to courtyard/backyard</li> <li>• Other uses – within houses modules</li> <li>• Shade structures (to avoid summer sun)</li> </ul>
<b>Courtyards Backyards</b>	<ul style="list-style-type: none"> <li>• Area per lot 46m<sup>2</sup></li> <li>• Area per block 2,116m<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Private spaces</li> <li>• Permeable ground (most of the area)</li> <li>• Vegetation – large incidence (3 levels + climb plant supports)</li> <li>• Deciduous trees (Winter sun/Summer shade)</li> </ul>

Component /uses	Dimensions (per block)	Characteristics
		<ul style="list-style-type: none"> <li>Water elements (drainage/storage + amenity)</li> </ul>
<b>Streets, Lanes, other Public open spaces</b>	<ul style="list-style-type: none"> <li>Streets Width 20m</li> <li>Area 4,320m<sup>2</sup></li> <li>Lanes Width 8m (N – S)</li> <li>10m(E–W)</li> <li>Area 1,820m<sup>2</sup> (includes related public open spaces)</li> </ul>	<ul style="list-style-type: none"> <li>Shared streets (traffic/public transport/in-line parking/cyclists/pedestrians/amenities)</li> <li>North-South lanes (car access to houses, cycling, walking, amenities)</li> <li>East-West lanes (only priority car access, cycling, walking, amenities)</li> <li>Direct Sunlight every day of the year (at least on one side of the street or lane)</li> <li>Trees – different sizes (deciduous where winter sun is essential)</li> <li>Water elements (drainage/storage + amenity)</li> </ul>
<b>Parking</b>	<ul style="list-style-type: none"> <li>Basement 44cars 1,440m<sup>2</sup></li> <li>On Street 52cars</li> </ul>	<ul style="list-style-type: none"> <li>Shared basement car park – access from the street</li> <li>Pedestrian access to basement on public open space</li> <li>On Street parking – linear</li> </ul>
<b>Uses</b>	<ul style="list-style-type: none"> <li>Residential: 3 Bed 43units</li> <li>Community facility 330m<sup>2</sup></li> <li>Other uses 8-16units 880m<sup>2</sup> (Build up areas)</li> </ul>	<ul style="list-style-type: none"> <li>Mixed-uses – within the block</li> <li>Residential, amenities, retail, community facilities, commercial, services (connected to the street or lane)</li> <li>Compatible uses – considering the main residential community</li> <li>Community facilities – balancing with the blocks around (kindergarten, library, health centre, etc.)</li> <li>Live-Work in residential units</li> </ul>

### Prototype ratios

**Table 10.** Ratios: CH/Zero-Lot/Back-to-Back

(DS\_11, 13, 15, 16)

Component /uses	Ratios p/ha	Characteristics
	Net area: 11,600 m <sup>2</sup> (block+street)	
<b>Net Density</b>	<ul style="list-style-type: none"> <li>Residential 37 dph</li> <li>Other uses 13 units/ha</li> <li>Total 50 units/ha</li> </ul>	<ul style="list-style-type: none"> <li>3 bedroom</li> <li>55 m<sup>2</sup> /unit</li> <li>Different uses</li> </ul>

Component /uses	Ratios p/ha Net area: 11,600 m <sup>2</sup> (block+street)	Characteristics
<b>Community Facilities</b>	<ul style="list-style-type: none"> <li>Build up area 284m<sup>2</sup> /ha</li> </ul>	<ul style="list-style-type: none"> <li>Shared space</li> <li>Kindergarten, library, etc.</li> </ul>
<b>Open spaces</b>	<ul style="list-style-type: none"> <li>Streets: 3,724m<sup>2</sup> /ha</li> <li>Lanes: 1,568m<sup>2</sup>/ha (incl. other public open spaces)</li> <li>Private spaces 1,820m<sup>2</sup> /ha</li> <li>Green spaces 5,880m<sup>2</sup>/ha</li> </ul>	<ul style="list-style-type: none"> <li>Shared streets</li> <li>Lanes - traffic conditioned</li> <li>Courtyard and Backyard</li> <li>Courtyards and backyards; Lanes; Streets (excluding carriageways)</li> </ul>
<b>Parking</b>	<ul style="list-style-type: none"> <li>Total 82 cars/ha</li> <li>Basement 38 cars/ha</li> <li>Street 44 cars/ha</li> </ul>	<ul style="list-style-type: none"> <li>Shared basement car park</li> <li>Linear street parking</li> </ul>

### **Urban Design Prototype 1: CH/Zero-Lot/Double-Lane**

#### Prototype attributes

**Table 11.** Description: CH/Zero-Lot/Double-Lane

(DS\_11, 13)

Component /uses	Dimensions (per block)	Characteristics
<b>Blocks</b>	<ul style="list-style-type: none"> <li>Area 8,200m<sup>2</sup> 82mx100m</li> <li>Sub-block width 22m</li> <li>Area per lot 110m<sup>2</sup> – 5mx22m</li> </ul>	<ul style="list-style-type: none"> <li>Courtyard houses – residential/other uses</li> <li>Lanes and other public open spaces</li> </ul>
<b>Buildings</b>	<ul style="list-style-type: none"> <li>Storeys: 2</li> <li>Footprint: 64m<sup>2</sup>/lot 3,264 m<sup>2</sup>/block</li> <li>Build up area 128m<sup>2</sup>/lot 6,528m<sup>2</sup>/block</li> </ul>	<ul style="list-style-type: none"> <li>3bedrooms</li> <li>Courtyard oriented to North</li> <li>Houses open to street/lane and to courtyard/backyard</li> <li>Natural ventilation in all compartments</li> <li>Living areas connected to courtyard/backyard</li> <li>Other uses – within houses modules</li> <li>Shade structures (to avoid summer sun)</li> </ul>
<b>Courtyards Backyards</b>	<ul style="list-style-type: none"> <li>Area per lot 46m<sup>2</sup></li> <li>Area per block 2,070m<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>Private spaces</li> <li>Permeable ground (most of the area)</li> <li>Vegetation – large incidence</li> </ul>

Component /uses	Dimensions (per block)	Characteristics
		<ul style="list-style-type: none"> <li>(3 levels + climb plant supports)</li> <li>Deciduous trees (Winter sun/Summer shade)</li> <li>Water elements (drainage/storage + amenity)</li> </ul>
<b>Streets, Lanes, Public open spaces</b>	<ul style="list-style-type: none"> <li>Streets Width 20m</li> <li>Area 4,440m<sup>2</sup></li> <li>Lanes Width 8m (north/south) 10m (east-west)</li> <li>Area 2,530m<sup>2</sup> (includes related public open spaces)</li> </ul>	<ul style="list-style-type: none"> <li>Shared streets (traffic/public transport/in-line parking/cyclists/pedestrians/amenities)</li> <li>North-South lanes (car access to houses, cycling, walking, amenities)</li> <li>East-West lanes (only priority car access, cycling, walking, amenities)</li> <li>Direct sunlight every day of the year (at least on one side of the street or lane)</li> <li>Trees – different sizes (deciduous where winter sun is essential)</li> <li>Water elements (drainage/storage + amenity)</li> </ul>
<b>Parking</b>	<ul style="list-style-type: none"> <li>Basement 44cars 1,440m<sup>2</sup></li> <li>On Street 52cars</li> </ul>	<ul style="list-style-type: none"> <li>Shared basement car park - access from the street</li> <li>Pedestrian access to basement on public open space</li> <li>On street parking – linear</li> </ul>
<b>Uses</b>	<ul style="list-style-type: none"> <li>Residential: 3 Bed 43units</li> <li>Community facility (Build up area) 330m<sup>2</sup></li> <li>Other uses (Build up area) 6 -12units 660m<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>Mixed-uses – within the block</li> <li>Residential, amenities, retail, community facilities, commercial, services (connected to the street or lane)</li> <li>Compatible uses – considering the main residential community</li> <li>Community facilities – balancing with the blocks around (kindergarten, library, health centre, etc.)</li> <li>Live-Work in residential units</li> </ul>

### Prototype ratios

**Table 12.** Ratios: CH/Zero-Lot/Double-Lane

(DS\_11, 13)

Component /uses	Ratios p/ha	Characteristics
	Net area: 12,240 m <sup>2</sup> (block+street)	
<b>Net Density</b>	<ul style="list-style-type: none"> <li>Residential 35 dph</li> <li>Other uses 10 units/ha</li> <li>Total 45 units/ha</li> </ul>	<ul style="list-style-type: none"> <li>3 bedroom</li> <li>55 m<sup>2</sup> /unit</li> <li>Different uses</li> </ul>

Component /uses	Ratios p/ha Net area: 12,240 m <sup>2</sup> (block+street)	Characteristics
<b>Community Facilities</b>	<ul style="list-style-type: none"> <li>Build up area 284m<sup>2</sup> /ha</li> </ul>	<ul style="list-style-type: none"> <li>Shared space</li> <li>Kindergarten, library, etc.</li> </ul>
<b>Open spaces</b>	<ul style="list-style-type: none"> <li>Streets: 3,620m<sup>2</sup> /ha</li> <li>Lanes: 2,067m<sup>2</sup> /ha (incl. other public open spaces)</li> <li>Private spaces 1,7600m<sup>2</sup> /ha</li> <li>Green spaces 6,237m<sup>2</sup> /ha</li> </ul>	<ul style="list-style-type: none"> <li>Shared streets</li> <li>Lanes - traffic conditioned</li> <li>Courtyard and Backyard</li> <li>Courtyards and backyards; Lanes; Streets (excluding carriageways)</li> </ul>
<b>Parking</b>	<ul style="list-style-type: none"> <li>Total 78 cars/ha</li> <li>Basement 36 cars/ha</li> <li>Street 42 cars/ha</li> </ul>	<ul style="list-style-type: none"> <li>Shared basement car park</li> <li>Linear street parking</li> </ul>

## Urban Design Prototype 2: CH/L-Shape

### Prototype attributes

**Table 13.** Description: CH/L-Shape

(DS\_19, 21-24)

Component /uses	Dimensions (per block)	Characteristics
<b>Blocks</b>	<ul style="list-style-type: none"> <li>Area 8,080m<sup>2</sup> (80mx101m)</li> <li>Area per lot 200m (14,15mx14,15m)</li> <li>Sub-block 28,3m (width)</li> </ul>	<ul style="list-style-type: none"> <li>Courtyard houses – residential/Live-Work</li> <li>Retail, amenities, commercial, community services</li> <li>Laneways and other public open spaces</li> </ul>
<b>Buildings</b>	<ul style="list-style-type: none"> <li>Storeys 1-2</li> <li>Footprint houses 106m<sup>2</sup> /lot 3,520m<sup>2</sup> /block</li> <li>other uses 99m<sup>2</sup> /lot 1,096m<sup>2</sup> /block</li> <li>Build up area houses 173m<sup>2</sup> /lot 3,460m<sup>2</sup> /block</li> <li>other uses 99m<sup>2</sup> /lot 1,361m<sup>2</sup> /block</li> <li>Terraces: 49m<sup>2</sup> /lot 980m<sup>2</sup> /block</li> </ul>	<ul style="list-style-type: none"> <li>Courtyard exposed North</li> <li>Houses open to both sides (street/courtyard)</li> <li>Natural ventilation all compartments</li> <li>Allows progressive construction</li> <li>1 bedroom and 2 bedrooms</li> <li>Living areas connected to courtyard or terraces</li> <li>Live-Work suitable</li> <li>Other uses in modules with the same scale</li> </ul>



Component /uses	Dimensions (per block)	Characteristics														
		<ul style="list-style-type: none"> <li>Shade structures (to avoid summer sun)</li> </ul>														
<b>Courtyards</b>	<ul style="list-style-type: none"> <li>Area per lot 74m<sup>2</sup></li> <li>Area per block 1,628m<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>Private spaces</li> <li>Permeable ground (most of the area)</li> <li>Vegetation – large incidence (3 levels + climb plant supports)</li> <li>Deciduous trees (Winter sun/Summer shade)</li> <li>Water elements (drainage/storage + amenity)</li> </ul>														
<b>Streets, Laneways, Public open spaces</b>	<ul style="list-style-type: none"> <li>Streets               <table border="0"> <tr> <td>Width</td> <td>20m</td> </tr> <tr> <td>Area</td> <td>4,420m<sup>2</sup></td> </tr> <tr> <td colspan="2">(applicable per Block)</td> </tr> </table> </li> <li>Lanes               <table border="0"> <tr> <td>Width</td> <td>7m (east-west)</td> </tr> <tr> <td></td> <td>8m(north-south)</td> </tr> <tr> <td>Area</td> <td>2,387m<sup>2</sup></td> </tr> <tr> <td colspan="2">(includes other public open spaces)</td> </tr> </table> </li> </ul>	Width	20m	Area	4,420m <sup>2</sup>	(applicable per Block)		Width	7m (east-west)		8m(north-south)	Area	2,387m <sup>2</sup>	(includes other public open spaces)		<ul style="list-style-type: none"> <li>Shared streets (traffic/public transport/linear parking /cyclists /pedestrians/amenities)</li> <li>North-South lanes – car access to houses, cycling, walking, amenities</li> <li>East-West lanes – priority cars only, cycling, walking, amenities</li> <li>Direct sunlight every day of the year (at least one side of the street/ lane)</li> <li>Trees: different sizes; deciduous (where winter solar exposure is critical)</li> <li>Water elements (drainage/storage + amenity)</li> </ul>
Width	20m															
Area	4,420m <sup>2</sup>															
(applicable per Block)																
Width	7m (east-west)															
	8m(north-south)															
Area	2,387m <sup>2</sup>															
(includes other public open spaces)																
<b>Parking</b>	<ul style="list-style-type: none"> <li>Street 48cars</li> </ul>	<ul style="list-style-type: none"> <li>Street parking – linear</li> </ul>														
<b>Uses</b>	<ul style="list-style-type: none"> <li>Residential 40units</li> <li>Community facilities (Build up area) 544m<sup>2</sup></li> <li>Other uses (Build up area) 990m<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>2 bedrooms-ground floor – 1 bedroom-upper floor</li> <li>Mixed-uses – within the block</li> <li>Residential, amenities, retail, community facilities, commercial, services (connected to the street or lane and courtyard)</li> <li>Compatible uses – considering the main residential community</li> <li>Community facilities – balancing with the blocks around (kindergarten, library, health centre, etc.)</li> <li>Live-Work in residential units</li> </ul>														

### Prototype ratios

**Table 14.** Ratios: CH/L-Shape

**(DS\_19, 21-24)**

Topic	Ratios p/ha		Characteristics
	Net area: 12,100m <sup>2</sup> (block+street)		
<b>Density</b>	<ul style="list-style-type: none"> <li>▪ Residential 33 dph</li> <li>▪ Other uses 9 units/ha</li> </ul> <hr style="width: 20%; margin-left: 0;"/> <ul style="list-style-type: none"> <li>▪ Total 42 units/ha</li> </ul>	<ul style="list-style-type: none"> <li>▪ 1 and 2 bedroom</li> <li>▪ 99 m<sup>2</sup>/unit</li> <li>▪ Different uses</li> </ul>	
<b>Community Facilities</b>	<ul style="list-style-type: none"> <li>▪ Build up area 450m<sup>2</sup> /ha</li> </ul>	<ul style="list-style-type: none"> <li>▪ Shared space</li> <li>▪ Kindergarten, library, etc.</li> </ul>	
<b>Open spaces</b>	<ul style="list-style-type: none"> <li>▪ Streets 3,650m<sup>2</sup> /ha</li> <li>▪ Lanes 1,970m<sup>2</sup> /ha (include other public open spaces)</li> <li>▪ Courtyards 1,310m<sup>2</sup> /ha</li> <li>▪ Green spaces 5,700m<sup>2</sup> /ha</li> </ul>	<ul style="list-style-type: none"> <li>▪ Shared streets</li> <li>▪ Lanes – traffic conditioned</li> <li>▪ Courtyard – Private space</li> <li>▪ Courtyards and backyards; Lanes; Streets (excluding carriageways)</li> </ul>	
<b>Parking</b>	<ul style="list-style-type: none"> <li>▪ On Street 40 cars/ha</li> </ul>	<ul style="list-style-type: none"> <li>▪ Linear street parking</li> </ul>	

**Urban Design Prototype 3: CCH/Double**Prototype attributes**Table 15.** Description: CCH/Double**(DS\_27-32)**

Component /uses	Dimensions (per block)	Characteristics
<b>Blocks</b>	<ul style="list-style-type: none"> <li>▪ Area: 7,500m<sup>2</sup> 75mx100m</li> </ul>	<ul style="list-style-type: none"> <li>▪ 5-storeys apartment buildings (South side of the block)</li> <li>▪ 3-storeys apartment buildings (middle of the block)</li> <li>▪ 2-storeys townhouses (North side of the block)</li> <li>▪ 2 courtyards</li> <li>▪ Basement parking</li> </ul>
<b>Buildings</b>	<ul style="list-style-type: none"> <li>▪ Storeys: 2/3/5</li> <li>▪ Width: 15m</li> <li>▪ Footprint: 5,025m<sup>2</sup></li> <li>▪ Build up area 15,450m<sup>2</sup></li> <li>▪ Balconies 2,031m<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>▪ Largest front exposed North</li> <li>▪ Residential units open to both sides (street/courtyard or courtyard/courtyard)</li> <li>▪ Natural ventilation in all units compartments</li> <li>▪ Balconies in both sides of the units</li> </ul>

Component /uses	Dimensions (per block)	Characteristics
	<ul style="list-style-type: none"> <li>Roof gardens 2,025m<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>Connections street/courtyard (gates at ground floor level)</li> <li>In-Line buildings (1stair/lift for two apartments per floor)</li> <li>Roof gardens over the 3-storey buildings</li> <li>Shade structures (avoid summer sun)</li> </ul>
<b>Courtyards</b>	<ul style="list-style-type: none"> <li>Courtyard A: 1,125m<sup>2</sup> (45mx25m)</li> <li>Courtyard B: 1,350m<sup>2</sup> (45mx30m)</li> <li>Total area 2,475m<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>Private spaces (ground floor units) and Shared space (the largest area)</li> <li>Permeable ground (most of the area)</li> <li>60% get sunlight every day of the year</li> <li>Airflow tunnels – ground floor level</li> <li>Vegetation – large incidence (3 levels + climb plant supports)</li> <li>Deciduous trees (Winter sun/Summer shade)</li> <li>Water elements (drainage/storage + amenity)</li> </ul>
<b>Streets</b>	<ul style="list-style-type: none"> <li>Width 25m</li> <li>Area: 5,625m<sup>2</sup></li> <li>Façades: <ul style="list-style-type: none"> <li>South 12doors+1tunnel</li> <li>North 9doors+1tunnel</li> <li>East 15doors</li> <li>West 13doors+2tunnels</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Shared streets (pedestrians/cyclists/traffic/amenities)</li> <li>Façades Actives (S and E), Friendly (W and N)</li> <li>North-South: symmetric streets ( traffic collector; public transport; parking access, street parking, cycling, walking)</li> <li>East-West: asymmetric streets (traffic limited, cycling, walking, amenities)</li> <li>Sunlight direct every day of the year (at least on one side of the street)</li> <li>Trees – different sizes (deciduous where winter sun is essential)</li> </ul>
<b>Parking</b>	<ul style="list-style-type: none"> <li>Basement 114cars 3,560m<sup>2</sup></li> <li>Street 16cars</li> </ul>	<ul style="list-style-type: none"> <li>Shared basement car park</li> <li>Car access to basement - ramps on the street</li> <li>Pedestrian access to basement on courtyards and shared building spaces</li> <li>Street parking – linear</li> </ul>
<b>Uses</b>	<ul style="list-style-type: none"> <li>Residential: 80units <ul style="list-style-type: none"> <li>29-1Bed</li> <li>40-2Bed</li> <li>11-3Bed</li> </ul> </li> <li>Community facility 750m<sup>2</sup></li> <li>Other uses 40units 3,000m<sup>2</sup></li> </ul> <p>(Retail, Amenities, Commercial, Services)</p>	<ul style="list-style-type: none"> <li>Mixed-uses – all building typologies</li> <li>Amenities/ Retail – ground floor (connected to the street and courtyard)</li> <li>Retail/Services – ground floor</li> <li>Commercial – building corners in upper levels</li> <li>Elderly – ground floor</li> <li>Community facilities (ground floor between courtyards)</li> <li>Live-Work – Row houses</li> </ul>

## Prototype ratios

**Table 16.** Ratios: CCH/Double

(DS\_27-32)

Topic	Ratios p/ha Net area: 12.000m <sup>2</sup> (block+street)		Characteristics
<b>Density</b>	• Residential	64 dph	• 1,2 and 3 bedroom • 75 m <sup>2</sup> /unit
	• Other uses	30units/ha	
	• Total	94 units/ha	• Different uses
<b>Community Facilities</b>	• Area	625 m <sup>2</sup> /ha	• Shared space • Connecting the courtyards
<b>Open spaces</b>	• Streets:	4,500m <sup>2</sup> /ha	• Shared streets and traffic conditioned
	• Courtyards	1,980m <sup>2</sup> /ha	• Private spaces (ground floor units) and shared spaces
	• Green spaces	5,100m <sup>2</sup> /ha	• Streets, courtyards and roof gardens
	• Private spaces	1,625m <sup>2</sup> /ha	• Balconies and private areas in the courtyards
	• Shared spaces		• Courtyards and roof gardens
<b>Parking</b>	Total	104 cars/ha	
	• Basement	91 cars/ha	• Shared basement car park
	• Street	13 cars/ha	• Linear street parking

## **Urban Design Prototype 4: CCH/Single**

### Prototype attributes

**Table 17.** Description: CCH/Single

(DS\_35-40)

Component /uses	Dimensions (per block)	Characteristics
<b>Blocks</b>	• Area: 8,000m <sup>2</sup> 100x80m	• 7-storeys apartment buildings (South side of the block) • 5-storeys apartment buildings (East and West sides of the block)

			<ul style="list-style-type: none"> <li>4-storeys apartment building (North side of the block)</li> <li>1 courtyard</li> <li>Basement car parking</li> </ul>
<b>Buildings</b>	<ul style="list-style-type: none"> <li>Storeys: 4/5/7</li> <li>Width: 18m</li> <li>Footprint: 5,184m<sup>2</sup></li> <li>Build up area 27,720m<sup>2</sup></li> <li>Balconies 3,552m<sup>2</sup></li> <li>Roof gardens 2,370m<sup>2</sup></li> </ul>		<ul style="list-style-type: none"> <li>Largest front exposed North</li> <li>Residential units open to both sides (street/courtyard)</li> <li>Natural ventilation in all compartments</li> <li>In-Line buildings (1stair/lift for two apartments per floor)</li> <li>Balconies and roof gardens</li> <li>Connections street/courtyard (gates at ground floor level)</li> <li>Shade structures (to avoid summer sun)</li> </ul>
<b>Courtyard</b>	<ul style="list-style-type: none"> <li>Total area 5,084m<sup>2</sup> (82mx62m)</li> </ul>		<ul style="list-style-type: none"> <li>Private spaces (ground floor units) and Shared space (the largest area)</li> <li>Permeable ground (most of the area)</li> <li>60% get sunlight every day of the year</li> <li>Airflow tunnels – ground floor level</li> <li>Vegetation – large incidence (3 levels + climb plant supports)</li> <li>Deciduous trees (Winter sun/Summer shade)</li> <li>Water elements (drainage/storage + amenity)</li> </ul>
<b>Streets</b>	<ul style="list-style-type: none"> <li>Width 30m (east-west) 25m(north/south)</li> <li>Area 6,500m<sup>2</sup></li> <li>Façades:               <ul style="list-style-type: none"> <li>South 18doors+1tunnel</li> <li>North 14doors+1tunnel</li> <li>East 13doors</li> <li>West 8doors+1tunnel</li> </ul> </li> </ul>		<ul style="list-style-type: none"> <li>Shared streets (pedestrians/cyclists/traffic/amenities)</li> <li>Façades Actives (S and E), Friendly (W and N)</li> <li>North-South – symmetric streets ( traffic collector; public transport; parking access, on-street parking, cycling, walking)</li> <li>East-West – asymmetric streets (traffic limited, cycling, walking, amenities)</li> <li>Sunlight direct everyday of the year (at least on one side of the street)</li> <li>Trees– different sizes (deciduous where winter sun is essential)</li> </ul>
<b>Parking</b>	<ul style="list-style-type: none"> <li>Basement 180 cars 5,400m<sup>2</sup></li> <li>Street (per Block) 16cars</li> </ul>		<ul style="list-style-type: none"> <li>Shared basement car park</li> <li>Cars access from the N-S streets</li> <li>Pedestrian access on the spaces connecting street, courtyard and buildings</li> <li>On Street parking – linear</li> </ul>
<b>Uses</b>	<ul style="list-style-type: none"> <li>Residential 20-1Bed 122units 96-2Bed 6-3/4Bed</li> <li>Others 70units 75m<sup>2</sup> /unit</li> <li>(Retail, Amenities, Commercial,</li> </ul>		<ul style="list-style-type: none"> <li>Mixed-uses all around the block</li> <li>Amenities/ Retail – ground floor (connected to the street and courtyard)</li> <li>Retail/Services – ground floor</li> <li>Commercial – building corners in upper levels</li> </ul>

Services)

• Elderly – ground floor

Prototype ratios**Table 18.** Ratios: CCH/Single**(DS\_35-40)**

Topic	Ratios p/ha Net area:13,750m <sup>2</sup> (block+street)		Characteristics
<b>Density</b>	• Residential	88 dph	• 1,2 and 3 bedrooms • 75 m <sup>2</sup> /unit
	• Other uses	51 units/ha	
	• Total	139units/ha	• Different uses
<b>Open spaces</b>	• Streets:	4,727m <sup>2</sup> /ha	• Shared streets and traffic conditioned.
	• Courtyard	2,048m <sup>2</sup> /ha	• Private spaces (ground floor units) and shared space
	• Private spaces	2,809m <sup>2</sup> /ha	• Balconies; Private space in the courtyard
	• Green spaces	6,675m <sup>2</sup> /ha	• Courtyards; roof garden; streets (excluding carriageways)
<b>Parking</b>	Total	186cars/ha	
	• Basement	175 cars/ha	• Shared basement car park
	• Street	11 cars/ha	• Linear street parking

## 5.2 COLLAGE PLAN

This section explains the Collage Plan drawings that are presented in the Drawing Set (**DS\_43-76**).

### 5.2.1 Context

This is a brief synthesis of the site context; a more comprehensive approach of Brisbane's planning context is described in **Ap\_B**.

In nineteenth century Brisbane, the patterns of residential segregation were small, and manifested in the separation of rich and poor by social "enclaves defined by 'front' and 'back' streets or by hill and flat".<sup>725</sup> Following the advent of mass transportation, whole neighbourhoods gained class labels. In the 1880s, Fortitude Valley and South Bank were described as 'workingmen's suburbs', while Toowong was considered a 'civil servants' suburb'.<sup>726</sup> Bowen Hills, however, had a more elite population given its elevated topographic area (the hill), locating large Queenslanders (some existing and historically preserved) that housed important members of the Brisbane community.<sup>727</sup>

#### ***Site: Mayne Rail Yards, Bowen Hills***

At the beginning of the twentieth century, the Roma Street Rail Yards had insufficient space to accommodate the growth of the Queensland rail network. Therefore, by 1927, the locomotives were transferred to the new depot location, the Mayne Rail Yards. To comply with the contemporaneous model for railway villages, three cottages were built near the Bowen Hills Station to house railway workers.<sup>728</sup> Moreover, the land subdivisions that took place in Herston in the 1910s and 1920s enabled railway workers to purchase housing near the rail yard, allowing

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<sup>725</sup> Davison 1988, *New, brawny, uneven and half-finished : Brisbane among the Australian Capital Cities*, 157; gunter's chain = 20.108 m; perch (p) = 25.3 m<sup>2</sup>

<sup>726</sup> Ibid., 157; Lavery 1988, *South Brisbane : the making of a city*, 63; gunter's chain = 20.108m; perch (p) = 25.3m<sup>2</sup>

<sup>727</sup> **Ap\_B - Bowen Hills and Booroodabin**

<sup>728</sup> *Booroodabin : A sesquicentenary history of Breakfast Creek, Bowen Hills, Newstead and Teneriffe, 1823-2009* 2009, *Booroodabin : A sesquicentenary history of Breakfast Creek, Bowen Hills, Newstead and Teneriffe, 1823-2009*, 21

them to cycle or walk daily to their jobs (**Fig.157**).<sup>729</sup> Bowen Hills Station was built in 1971 between Mayne Junction and the old Bowen Hills Station, which were both closed as a result of the expansion of the Mayne rail yards<sup>730</sup> Part of the site of the Mayne Junction Station is now covered by the Inner City Bypass in the western corner of Abbotsford Road and Edmondstone Road.<sup>731</sup>

The Mayne Rail Yards site is almost flat, with inclinations varying from 1% to 5% from east to west. The prevailing winds blow from southwest in the winter and northeast-southeast in the summer. The terrain is largely free of flooding, with the exception of the areas immediately adjacent to Breakfast Creek and a small area on the north-eastern side.<sup>732</sup> The main site constraints are the current physical barriers: Breakfast Creek, railways, and the elevated inner city bypass which, as in the example of Parque das Nações, isolates the brown-field precinct from the rest of the city. The Collage Plan establishes efficient ways in which to activate connections and integrate the precinct into the city context.

### 5.2.2 Bowen Hills TOD

To lay out the Collage Plan, this study utilised the area of the Mayne Rail Yards, which are located on the north-western boundary of the Bowen Hills Urban Development Area, which was formerly managed by the Urban Land Development Authority (ULDA). The Queensland Government established the ULDA under the provisions of the ULDA Act (2007) to identify urban development areas (UDA) within the state of Queensland and “to plan, carry out, promote or coordinate and control, the development of land in those areas”.<sup>733</sup> The subsidiary aim was to help provide affordable housing through a range of options that could cope with the changing needs of the community.

Bowen Hills was identified as a potential TOD site by the South East Queensland Regional Plan (SEQRP) (2005-2026), and the UDA was declared by the

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<sup>729</sup> Hacker and Spinaze 2007, *Herston : Recollections and reminiscences*, 96

<sup>730</sup> *Bowen Hills and Mayne* 2011, *Bowen Hills and Mayne*

<sup>731</sup> See the whole description of the process in **Ap\_B - The Maine Rail Yards**

<sup>732</sup> *Brisbane Interim Flood Response, LGA1000-0025-1 Sheet 5* 2009, *Brisbane Interim Flood Response, LGA1000-0025-1 Sheet 5*

<sup>733</sup> Queensland Government 2007, *Urban Land Development Authority Act 2007*, 20



Ministry of Infrastructure and Planning in March 2008. ULDA appointed the practices of Deicke Richards and EDAW/AECOM to compile the Bowen Hills UDA Master Plan Report in 2008. In 2010, ULDA published the UDA Development Scheme, which defined precinct areas and policies. This document was an important source for this inquiry.

In May 2012, Queensland Premier Campbell Newman announced that the Queensland Government would start transferring planning powers from ULDA back to (17) local governments. Newman added that the first ones to be transferred would be the Brisbane UDAs, Bowen Hills included. The Ministry of Economic Development Queensland was created (through a State Act on November 2012) to replace the ULDA. Accessed on 2013-07-30, the 'Urban Development' page of the Economic Development Queensland (EDQ) website shows only two urban development projects in progress, and Bowen Hills TOD is not one of these.<sup>734</sup> These facts unveiled the opportunity to propose an alternative TOD scheme, utilising courtyard housing.

### 5.2.3 Urban Design Principles

The urban design principles listed below outline the design framework for the Collage Plan as an urban design model that applies the specific requisites of the lenses of inquiry to the Bowen Hills site. The main sources are listed below.<sup>735</sup>

#### ***Key sources***

The Bowen Hills Urban Development Area Development Scheme and the Bowen Hills Urban Development Area Master Plan Report were important to an understanding of basic concepts and objectives.<sup>736</sup>

More recent plans consulted were the Brisbane City Plan 2000, for

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<sup>734</sup> See <http://www.dsdp.qld.gov.au/economic-development-queensland/urban-development.html>

<sup>735</sup> It would be very difficult to nominate all the sources of the immense amount of information that served to constitute the criteria for the Urban Design Principles listed below. Many of these sources related to both the prototype design and the lenses of inquiry have been mentioned in previous sections, and recorded in the Works Cited section; other sources are listed in the Appendices tables.

<sup>736</sup> ULDA 2009, *Bowen Hills Urban Development Area Development Scheme*; Deicke Richards and EDAW AECOM 2008, *Bowen Hills Urban Development Area Master Plan Report*

information related to city planning issues, the “Open Space and Medium Density Living Toolkit,<sup>737</sup> and the South East Queensland Regional Plan 2009-2031 (SEQRP), for information related to regional concerns.<sup>738</sup> Related to TOD, the most relevant documents were the *Transit oriented development: guide for practitioners in Queensland*,<sup>739</sup> *the Bowen Hills Urban Development Area Master Plan Report*,<sup>740</sup> *Yeerongpilly Transit Oriented Development: Detailed Plan of Development*,<sup>741</sup> and *Varsity Station Village: A transit oriented community*.<sup>742</sup>

Two important documents relating to street layout was the report *Complete streets: Guidelines for urban street design*<sup>743</sup> and *Centres Detail Design Manual*.<sup>744</sup> Lastly, was the information retrieved from the analysis of the Bowen Hills mapping studies.<sup>745</sup> This mapping was essential to an understanding of the current site context in relation to topography, accessibility, open spaces (green structures), morphology/urban edges, grid lines, and density (DS\_45-46).

### **Principles**

<b>Leading Urban Design Principles</b>
<ul style="list-style-type: none"> <li>▪ create a compact, self-reliant, diverse and interconnected community, using courtyard housing typologies</li> <li>▪ promote a healthy lifestyle, encouraging physical activity and social interaction</li> <li>▪ provide efficient public transport systems and promote pedestrian and cycle linkages</li> <li>▪ provide above ten percent of net site area as public space (excluding public parks) in the form of plazas, amphitheatres, community meeting rooms, public facilities and services, social services, public gardens, and pocket parks</li> </ul>

<sup>737</sup> John Gaskell Planning Consultants and Andrea Young Planning Consultants 2012, *Open Space and Medium Density Living: Toolkit*

<sup>738</sup> Brisbane (Qld.). Council. 2000, *Brisbane city plan 2000*; Queensland Government 2009, *South East Queensland Regional Plan 2009-2031*

<sup>739</sup> Queensland Government 2010, *Transit oriented development: guide for practitioners in Queensland*

<sup>740</sup> Deicke Richards and EDAW AECOM 2008, *Bowen Hills Urban Development Area Master Plan Report*

<sup>741</sup> Deicke Richards and DMA 2014, *Yeerongpilly Transit Oriented Development: Detailed Plan of Development*

<sup>742</sup> Deicke Richards, et al. 2009, *Varsity Station Village: A transit oriented community*

<sup>743</sup> IPWEA 2010, *Complete streets : guidelines for urban street design*

<sup>744</sup> BCC 2000, *Centres Detail Design Manual*

<sup>745</sup> The base maps were made with the collaboration of students from QUT DEN510 Semester1, 2012

### ***Lens of inquiry 1: Subtropical Design Principles***

#### Design criteria concerns:

#### **Solar exposure, solar orientation, ventilation, transition spaces (in/out connectors) and open spaces**

- contribute to the qualities that distinguish the Brisbane character and identity as a unique living environment
- enforce the city's subtropical setting, defined by its open spaces, natural habitat, and way of life
- provide designed outdoor open areas as 'outdoor rooms,' developing a sense of enclosure using landscape and built forms
- develop each public space with a unique character, specific to its use, site, and subtropical climate
- vary building heights based on their orientation, to provide outdoor spaces (public/semi-private/private) that allow for both shade and exposure to sunlight
- vary street width according to northern building height:
  - 25m wide street → 5-storey
  - 30m wide street → 7-storey

### ***Lens of inquiry 2: Green Structures Principles***

#### Design criteria concerns:

#### **Green space characteristics and ecological connectivity:**

##### green space characteristics

- implement public park spaces (to meet population-based park criteria when required)
- use autochthon vegetation and large shade trees in public spaces
- combine vegetation types (trees and shrubs) at the edge of parking areas to partially screen parking lots and structures from public spaces
- implement 'rain-gardens' (bio-retention systems), scaled and adapted to a range of confined spaces and urban situations
- build green spaces that serve as appropriate transitions from lower to higher density, using trees and landscaping to soften scale differences

##### connectivity between different ecologies

- implement green structure connectivity throughout main green corridors, boulevards, streets, lanes, and interior green stepping-stones
- make the indigenous landscape an important ecological, aesthetic, and unifying element throughout the neighbourhood/city
- encourage the balance between public and private spaces through access links, including CCH airflow tunnels, roof gardens, lot fronts and backs

### ***Lens of inquiry 3: TOD Principles***

#### Design criteria concerns:

#### **Accessibility, sense of community, building/land uses and net density**

##### Accessibility

##### *pedestrian and cycle linkages*

- implement pedestrian and cycle connections that support a permeable and walkable neighbourhood
- integrate the street network into the existing surrounding streets/roads and walking and cycling networks
- achieve permeability, using the grid pattern to provide both direct and legible paths
- provide diversity of pedestrian paths to avoid noise, wind, heat, rain, and traffic
- make alternative route choices clearly visible to everyone
- identify pedestrian crossings of streets or parking lots through the use of special paving
- integrate the train station with the neighbourhood through the provision of safe, well lit, and well-designed pedestrian access points

##### *street network*

- create a street network that efficiently combines pedestrian, cycle and vehicular traffic with the local landscape to produce a subtropical streetscape character
- provide vibrant Mixed-use-Streets that provide access to neighbourhood destinations, community resources, and liaise with the urban transit system
- design street layouts based on grids to provide both direct and legible multi-modal pathways to public transport, schools stops, and shops
- create a clear street hierarchy to include all modes of movement: subtropical boulevards, park parades for alleys with enhanced landscaping, and a local street network based on a Double-Grid composed of two types of streets: one type designed primarily for pedestrian utilisation (Streets-for-Living), envisioning a pleasant pedestrian realm where cars have very limited access; the other designed to achieve a balanced sharing of the street by pedestrians, bicycles, buses, and cars (Mixed-use-Streets)
- restrict garages access to the latter street type, and reduce the prominence of the garage through architectural subterfuge
- consider traffic calming to reduce neighbourhood speeding
- utilize non-vehicular lanes to provide alternative pedestrian access to residential units
- design street frontages to create architectural and landscape interest for both residents and visitors
- ensure that building entries are visible and prominent from a ground level perspective
- design features that facilitate transit service along streets, such as covered transit stops and bus pull-out areas

##### *parking*

### ***Lens of inquiry 3: TOD Principles***

- create efficient arrangements of car parking, minimizing visual impact
- provide car parking areas suitable for both vehicles and pedestrians
- design public parking areas as part of a townscape or landscape structure to create character for these areas as part of the public realm
- implement a mix of parking arrangements (such as communal areas and on-street) to efficiently manage commercial, residential, and public parking

#### **Sense of Community**

- locate primary school to create local cultural and sporting opportunities
- provide community gateways to improve neighbourhood pride and establish boundaries
- design plazas around civic buildings (such as libraries, post offices, and community centres) to enhance the character of these buildings
- provide open spaces/recreational areas that link visually/physically to the network of public spaces and/or pedestrian network
- develop an urban pattern and scale to offer choice of lifestyle and opportunities for social interaction, and to enhance community character and context
- encourage innovative designs for public buildings and landmarks both to represent a community's focal points, and to relate to the local architectural context
- ensure that all buildings (housing, retail, community facilities, and workplaces) contribute to the character of the place
- provide vibrant places to meet and interact, play, explore, and recreate

#### **Building and land uses**

##### ***station precinct***

- design a train station that is accessible, safe, functional, aesthetically pleasing, and cost effective to maintain
- station precinct should be environmentally responsible to reflect Brisbane's subtropical outdoor lifestyle as a way to reinforce local character
- incorporate multiple outdoor dining, entertainment, and recreation facilities into building and precinct design
- ensure legibility of pedestrian and vehicular circulation
- provide facilities for bus/taxi/rail interchange and private vehicle passenger set-down
- provide sheltered public transport access and shaded pedestrian pathways that allow the breeze, sunlight, and natural environment to penetrate
- provide a high standard of service to generate community pride and high levels of customer satisfaction
- ensure Crime Prevention Through Environmental Design (CPTED) principles in the station precinct, including clear lines of sight

##### ***blocks***

- implement smaller rather than larger blocks to obtain physical permeability
- use Brisbane's traditional block width (80 meters) as the minimum block width
- establish a maximum block dimension to 100 meters, based on human scale

### ***Lens of inquiry 3: TOD Principles***

#### *perception*

- implement blocks preferably with the orientation N-S/E-W; allow for an average variation of 20° in relation to the north-south direction
- ensure that housing development adjacent to industrial areas incorporates Live-Work typologies designed to soften the transition in land use

#### *public spaces*

- provide accessible, recognizable, and prominent public spaces
- build to lines to frame and define public spaces and pedestrian streets

#### *diversity of types and uses*

- enforce physical, social, and cultural diversity
- ensure neighbourhood street shopping areas that serve as walkable centres of activity
- provide housing choices for residents in all phases of life by designing a variety of unit types in multifamily projects
- encourage both vertical (stacked) and horizontal (side-by-side) mixed-use development
- build transitions in building scale which promote higher-density uses close to the train station

#### *safety*

- encourage passive surveillance (CPTED)
- encourage visible space and “eyes on the street” security through the placement of physical features to maximize visibility for users of the spaces
- define clear boundaries between public, semi-private, and private spaces
- provide pedestrian scale lighting to grant adequate security

#### Net density

- produce a compact, efficient, and environmentally responsive pattern of development
- ensure transitions of scale between higher-density development and lower density built areas
- accommodate building heights to create a smooth change from the adjacent built form

## **5.2.4 Rationale for a Collage Plan**

This explanation underlines the main reasons for the design of the Collage Plan according to the urban design principles comprehensively described above. Using the principles outlined above, my design resolutions were focused on integrating the urban design units developed for the site (Mayne Rail Yards, Bowen

Hills, Brisbane, Australia) “in a group of buildings of different or similar types indicatively put together in close association through a coherent sequence of public spaces. This, I entitled ‘Collage Plan’”.<sup>746</sup>

I have assumed that the relocation of the Mayne railway services to another location on the city periphery, and that the relocation of the current Bowen Hills train station to the previous site of the Mayne Junction Station would both be feasible.<sup>747</sup> I have also considered reasonable to redesign the remaining railways below ground level – partly in tunnels and partly uncovered – as formerly seen in the example of Subi Centro TOD. Mindful of the Subiaco Public Transport Authority’s request not to place buildings over the railway tunnel, this current plan proposes that the areas above the continuing railways be either uncovered or covered by dedicated public open spaces.<sup>748</sup>

While maintaining current line services,<sup>749</sup> the new Bowen Hills Multimodal Station also functions as a covered bus interface for the main Subtropical Boulevard bus line(s). Buses will cross the precinct only on the ‘Subtropical Boulevard’, with access to the precinct from the west, south, and (possibly) north. This bus route will have easy access from all the dwellings within a maximum distance of 300m. The rail/bus connectors provide the public transport services requested by local TOD requirements, and meet the current government policies for the train and bus network that is further supported by the existing bus lines on Abbotsford Road (**DS\_50**).

To complement the station’s centralised accessibility, and to provide external access, the Subtropical Boulevard connects to O’Connell Terrace using Lanham St (now a continuation of the main Subtropical Boulevard) on the southern side of the site. On the eastern side, it connects to Abbotsford Rd by the pedestrian pathways over the rail tracks, which include the pathway under the northern car-parking silo and through the passage at the Multimodal Station underneath the City Bypass.

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<sup>746</sup> **S\_1.5.2 – Limitations**, p. 10

<sup>747</sup> **S\_5.2.1**, p. 245 and **Ap\_B**, p. 363

<sup>748</sup> **S\_4.3.1**, p. 197

<sup>749</sup> Airport, Caboolture, Doomben, Ferny Grove, Shorncliffe, Springfield and Sunshine Coast lines

It is not planned to have car or bus access across Breakfast Creek on the west side of the precinct. A traffic shortcut such as this would jeopardise the subtropical lifestyle of both the new precinct and the western neighbourhood (Windsor). I believe there are already enough roads and bypasses to supply fast access to the western side of the city. The Collage Plan encourages walking and cycling via bridges over Breakfast Creek, thus allowing for permeability and greater enjoyment of the subtropical lifestyle (**DS\_53**).

In both CH and CCH prototypes, the streets are structured as a Double-Grid, constituted by Mixed-use-Streets and Streets-for-Living.<sup>750</sup> Working as Mixed-use-Streets, the Park Terrace and the Subtropical Boulevard cross the precinct peripherally in the north-south direction. Both are planned for the use of cars and speed-bikes; however, the Subtropical Boulevard incorporates the internal bus routes that complement the existing bus services in Abbotsford Rd. The central north-south street in the CCH area connects with the garages under the buildings through entry/exit points, which are parallel to the pathways to avoid the interruption of the pedestrian/slow-bike movement.

The two east-west streets adjacent to the Courtyard Plaza permit limited car use for disabled access, and for load/unload services for shops and emergency services (such as ambulances and fire trucks); these were considered to be Streets-for-Living. This system is intended to provide sufficient access for cars, while at the same time guaranteeing a safe pedestrian/bike network. In the CH area, the streets connect Park Terrace and the main Subtropical Boulevard. Internal access to the CH prototypes is provided by pedestrian/slow-bike lanes, thus facilitating Streets-for-Living with limited car access.

In conjunction with the water activities to be promoted on Breakfast Creek, the pleasant shades of the 'Creek Park', the permanent activity of the esplanades located on the 'Park Terrace', and the activities of the CCH courtyards, these streets create the perfect environment for a day-and-night subtropical lifestyle that certainly contributes to a liveable community (**DS\_53, 55, 57**). This special character

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<sup>750</sup> **S\_5.1.4 – [CH – CCH] Streets and parking**, p. 224, 230



would be enhanced by the diversity of flora/fauna associated with the Brisbane image and lifestyle, thus promoting its branding and attracting visitors (following the examples of Shichahai and Parque das Nações).<sup>751</sup>

Solutions to the prototypes' parking solutions have been explained in **S\_5.1**. The Collage Plan considers additional parking on the streets in both CCH and CH areas. The latter do not have individual garages for dwellings, following the example of the Prestonpans Experiment, where the residents did not require off-street parking in private garages if they could have an option for protected parking nearby the dwellings.<sup>752</sup> This protection is supplied by the car silo suggested for the CH area (**DS\_50 - Public Transport**). The new Bowen Hills Multimodal Station is also served by a naturally ventilated multistorey carpark above the ground floor. The carpark is flexibly designed to accommodate a possible future demand for extra parking spaces, allowing for the addition of other floors. Furthermore, its internal ceiling heights (3.5+m) should allow it to perform other functions in the future, if the demand for increased parking does not eventuate.

The multimodal station is centrally located in the high-density area of the site to provide access for a large number of residents, workers, and visitors; it occupies the site of the old Mayne Junction (removed in 1971 with the expansion of the Mayne Rail Yards). This large precinct is proposed as a spacious and splendid place that includes the Courtyard Plaza (mirroring the public spaces conceived by Hippodamus of Miletus in ancient Greece) "to facilitate daily interaction, conversations and exchange of ideas among large numbers of people".<sup>753</sup> It is designed both internally and externally to suit the subtropical lifestyle, providing sheltered public transport access, shaded pedestrian pathways and legible pedestrian/vehicular circulations. As a Subtropical Train Station, it has high ceilings and large east-west openings to facilitate airflow. It is planted with appropriate vegetation to provide an adequate inside/outside visual interface.

The station's ground floor gives direct access to the 2-storey Courtyard Plaza

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<sup>751</sup> **S\_3.3.1 and 3.3.2**

<sup>752</sup> **S\_3.2.1**, p. 71

<sup>753</sup> **S\_3.2.1**, p. 46

that offers food/drink, shopping, and services located under its surrounding colonnaded gallery. The car drop-off area is beneath the station's roof structure in the Subtropical Boulevard and on the central street. In the northern and southern spaces, car access is limited to loading and delivery services and emergency vehicles. Moreover, covered pathway access to the Courtyard Plaza and the Bowen Hills Station is recommended for one side of the central north-south boulevard. The exterior Plaza space should be designed by a multidisciplinary team to guarantee maintenance of the ecological characteristics, and to accommodate the seasonal variations of solar exposure and natural ventilation (**DS\_50 - Public Transport**). The station has access to the below-ground rail tracks while still maintaining its open-air characteristic, as in the example of the Subiaco Station.<sup>754</sup>

As prototypes, the urban design units show the flexibility and diversity of land uses (**DS\_1, 19, 27, 35**). However, the specific quantification and allocation of community services, commerce, and retail will have to consider factors such as the proximity of the station and community/market demands. A sketch showing the possibility of CCH achieving a high-rise condition is presented in the Drawing Set (**DS\_49**). The purpose of this specific test is to demonstrate the opportunity that CCH presents for the incorporation of higher densities. However, as shown in the solar studies, the shadows projected by the 'towers' would jeopardize the requirements of winter solar exposure adopted in this inquiry (that is, direct sun every day of the year on one side of the street and on the buildings façades) if adjacent streets are planned on the southern side of the building (**DS\_64**).

The orientation of the buildings considers the existing grid lines of the rail lines (**DS\_46 in Mapping - Grid Lines**). This is because it is considered the most efficient option for implementing the prototypes and the comparative schemes demonstrated (synthesised in **DS\_47**), and will not compromise the expectation of solar exposure and natural airflow (**DS\_63-66**).

To enhance the sense of community, the building located on the north-western side of the Courtyard Plaza is sketched to indicate a possible use of

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<sup>754</sup> **S\_4.3.1**, p. 196

courtyards in public spaces surrounded by both residential and community service buildings. Its functional uses provide continuity to the services offered by the Courtyard Plaza, and serve to mediate the building scales of the CCH/Double and CCH/Single (its location is discussed in **DS\_57, 62**). To enhance the sense of community in the Collage Plan, a primary school located in the central area of the precinct provides legible and comfortable walking access. A sports courtyard compound is suggested for the northern side of the Collage Plan to promote a healthy community (**DS\_57**).

The primary green corridors proposed in the Collage Plan, albeit with functional differences, are the existing Breakfast Creek and its adjacent area, which is planned as a public park and the main subtropical boulevard. This is not an extensive project, as it retains the existing natural characteristics of the creek. However, it does require the installation of bio-retention basins to receive the drainage from the sealed surfaces of the housing development; a park design that includes areas free of trees both for children's games, and for solar exposure in the winter; a balance of evergreen tree areas for shade activities; an area for community gardens to provide fresh vegetables and fruit; and the planting of the east side of the Park Terrace with deciduous trees to allow for solar exposure in the winter.

There are only a few recommendations for the main subtropical boulevard, because it should work as a buffer between the eastern hard edges of this intervention. As such, this green corridor was planned to decrease the noise from both the rail tracks and the car bypass. To ameliorate the impact of the rail tracks, the suggestion is to lower them to below street level, to introduce tunnels (about 50m long) on the northern limit of the creek precinct, and to use the existing tunnel under O'Connell Terrace on the southern limit. The current western service tracks are proposed to cross the precinct via a tunnel to avoid disruptions in the ecological connectivity of the precinct.

To reduce both the noise and visual impact of both the trains and the bypass traffic, the planting of dense foliage trees or shrubs on both (elevated) sides of the rail tracks is proposed. Both sides of the boulevards should also accommodate

continuous rain gardens to provide bio-retention of the drainage from sealed surfaces. The internal side of the primary boulevard, on the other hand, should be planted with dense foliage species appropriate for the local fauna, and for the supply of shade for pedestrian movement.

The secondary corridors should be planted with deciduous trees on the southern side of the streets to allow for solar exposure of the housing balconies, and medium size evergreen trees could be planted on the northern side to guarantee shade in the summer.

As well as the rain-gardens suggested for the main boulevard, the central north-south boulevard should have a plantation of deciduous trees on both sides to provide solar exposure to building windows and balconies in the winter, both in the morning (west edge) and in the afternoon (east side). The functional play of these corridors is considered in the discussion urban green structure ancillary question.

As the Collage Plan is seen in this inquiry as a showcase of the urban design prototypes working with the lenses of inquiry, density concerns were not focused on fulfilling high-density values; rather, the motivation was to demonstrate the densities that the prototypes could achieve within the lenses' parameters, including the minimum density values required by the local Queensland TOD. Density values are shown in the following **S\_5.3.4**.

### ***Comparison maps***

The comparison maps, showing the site before and after the urban design proposal, are presented in **DS\_69-76**. These drawings demonstrate the positive results of the indicative implementation of the prototypes.

The proposed figure ground indicates the expected morphological changes created by dwellings with voids inside the solids, and by adjacent dwellings with solids surrounded by voids (**DS\_69-70**).

The new accessibility map indicates the feasibility of having the precinct connected to the rest of the city with only one north-south boulevard for the main car and bus traffic; in contrast, an extensive network for cyclists and pedestrians is

proposed (**DS\_71-72**).

The green structure map clearly identifies the contribution to the ecological continuum, which will reinforce Brisbane's subtropical life style through the proposed abundance of public, private, and semi-private open spaces (**DS\_73-74**).

Finally, yet importantly, the density maps confirm the contribution of courtyard housing as an appropriate typology to help structure a compact urban environment in a subtropical climate by raising the density of already developed areas. The maps show that the CCH area accomplishes the higher density of the adjacent neighbourhood (New Farm), and the CH area achieves the density of 30% of the surrounding neighbourhoods (**DS\_75-76**).

### 5.2.5 Simulations and collage schemes analysis

The process of selection of the final Collage Plan as an urban design model included the elaboration of many collage schemes for the site, to test the feasible implementation of the urban design prototypes. These various schemes were then evaluated, and compared with existing typologies. (Although some comparisons were made before the final version of the Collage Plan described in the previous section, they have been placed after the Plan, which explains the relevant terminology; thus, comprehension is facilitated.)

#### *Collage schemes*

The three schemes presented were the ones most feasible to implement as a final choice for the Collage Plan: Schemes 1 and 2, and the Proposal (Collage Plan) (**DS\_47**).<sup>755</sup> One of the courtyard prototypes (**CH Group**) that was applied in these Scheme II was not fully developed, so is not included as a urban design unit in **S\_5.1**. This concept of grouping four courtyard houses might be a feasible solution for other geographical locations if conveniently adapted to the local lifestyle. However, it was considered inappropriate for this inquiry given to the issues related with insufficient ventilation and lack of privacy (**DS\_42**).

### ***Simulations of Brisbane's main housing typologies***

The three simulations utilised the main housing typologies in Brisbane, which are very diverse in terms of urban density: the apartment tower and the standalone pavilion. The latter was simulated using two versions (traditional and contemporary):

- The traditional standalone type within the Brisbane traditional lot (10x40m) and block (80m width) with a generous backyard (**Simulation I**)
- The contemporary standalone type, with very small backyards that have been current practice in SEQ suburbs since the 1990s<sup>756</sup> (**Simulation II**)
- The apartment tower type generally used in the Brisbane city centre and other areas in SEQ such as the Gold Coast (**Simulation III**)

The simulations were based on the whole area (34ha) of the Collage Plan, and applied the definition of 'gross residential density'. They were developed through a collage process in a sketchy interpretation of the way in which the site would be developed if the basic urban design concepts previously applied in similar site developments in the SEQ region, were deployed at the site. Therefore, the conception of each simulation was intended to be a basic speculation of a simple urban context in relation to grid streets, allocation of uses, private/public open spaces, and green spaces. Accordingly, the simulations did not intend to have the minimum detail of a master plan. However, they did serve to facilitate a general evaluation of courtyard housing as an alternative urban design model in the context of the existing models.

In all simulations, the east-west directions of the streets matched the existing street grid of the western neighbourhood. The main public spaces that ensure the connection with the wider urban structures (the park along the Breakfast creek, the railway station and the Subtropical Boulevard [on the eastern border of the site]) maintained the same area and location in all simulations and schemes, to provide a common denominator for all comparisons. One limitation of the simulations was the absence of models that considered less used Brisbane housing typologies such as terrace houses, row houses, 4/6-pack houses, and housing compounds.

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<sup>756</sup> Hall 2010, *The Life and Death of the Australian Backyard*

### ***Synthesis: simulations and collage schemes***

The table values for each simulation and scheme (**DS\_48**) present quantitative data that is also used for some qualitative evaluations (for example, the relation between the areas of public open spaces and public green spaces allowed for reasoning about the character of the streets).<sup>757</sup> Although the qualitative aspects are not accounted for in a table format, they are considered in both the simulations and the courtyard housing scheme comparisons. Thus, the table serves to list results in the context of the lenses of inquiry, to support the answers to the ancillary research questions discussed in the next chapter. The definitions that support both the table results and the analysis criteria match the definitions used in the urban design prototype table in **DS\_42**.

The basic issues addressed are:

- The subtropical context and the opportunities for an outdoor ‘subtropical lifestyle’ in conditions conducive to human comfort<sup>758</sup>
- The occurrence of green spaces and their capacity to establish an urban green structure<sup>759</sup>
- Accessibilities, safety, allocation of different uses, gross residential density, and the relationship between private and public realm (privacy/sense of community), taking into account the achievement of liveable and sustainable communities

Considering the number of dwellings and the respective gross residential density, the Collage Plan offers (1,209dw–36dph) six times more dwellings than the traditional standalone simulation (214dw – 6.3dph), and six times fewer dwellings than the tower simulation (8,000dw – 235dph).

In response to the outdoor subtropical lifestyle, the analysis focuses on the provision of open spaces along with private and public green spaces, where the summation of private green spaces makes the greater difference. The traditional standalone simulation provides a much larger area of green spaces than any other solution presented. The tower type usually does not have any private landscaped areas apart from the private and communal spaces over sealed ground (such as

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<sup>757</sup> Definition in Appendix A - Glossary

<sup>758</sup> The achievement of human comfort indoors was also mentioned related to the design of the prototypes.

<sup>759</sup> Therefore only areas with a porous ground and mainly planted are considered as green spaces.

basements, terraces and balconies), which do not contribute to the urban green structure.

However, the tower simulation shows that the overall area of open space is close to the area presented in the courtyard housing schemes. The big difference arises when one considers the ratio of private open space area per dwelling:  $14\text{m}^2/\text{dw}$  for the tower type, and  $81\text{m}^2/\text{dw}$  for the Collage Plan. This demonstrates that the courtyard schemes are largely superior in providing many more opportunities for outdoor enjoyment as an extension of the indoor private space.

This also applies to the contemporary standalone simulation where only a very small private outdoor area is suitable for living purposes. This is because most of the private open space is allocated to driveways and to the vacant spaces (located between the house and the property limits) that are required by the municipal codes. These features contribute neither to an efficient airflow, nor to personal privacy.

The areas of public space do not differ much in all simulations and schemes, the greater differences being in the ratios of public space areas per dwelling, and in the character/quality of these spaces. What makes a very large difference is the way public spaces contribute to the connectivity of the green structure, to enhancing the qualities of the urban public realm through extended opportunities to enjoy the 'subtropical lifestyle', and to achieving the hallmarks of TOD.

The ratio of public green space per dwelling in both standalone simulations ( $395\text{m}^2/\text{dw}$  for the contemporary standalone and  $575\text{m}^2/\text{dw}$  for the traditional standalone) is much greater than the ratio in the tower simulation ( $16\text{m}^2/\text{dw}$ ). This difference is triggered by the much higher density of the latter. The three collage schemes that use courtyard housing typologies present area values per dwelling for public green spaces ( $142\text{-}199\text{m}^2/\text{dw}$  of public green spaces) six to twelve times larger than the towers, and two to four times less than the traditional standalone simulation.<sup>760</sup>

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<sup>760</sup> This data may raise an economic discussion about the ratio of public areas versus number of dwellings that although pertinent is out of the scope of this study.



With respect to public open spaces, the differences are mainly related to the urban design principles of each simulation, and the logic they have applied to each simulation typology. Even though some characteristics of the public realm might be determined by each of their characteristics as urban units, this is not the case for the quantified areas (for example, the traditional standalone and tower simulations present almost the same areas of public open spaces; however, both the character and utilisation of these spaces are completely different in each case). The key issue in this comparison with respect to public open space is related to streets' grid and spatial character.

Both the traditional standalone and tower simulations present the same street grid characteristics within an extended area, even though one might find some narrow service lanes and pedestrian streets in the tower simulation, and some cul-de-sac accesses in the traditional standalone. The street width is also almost the same as much as the absence of relevant urban spaces that might be a reference within the built fabric. However, the character and scale perception of the streets is completely different, being determined by the building typology, the density, the intensity of traffic, and the allocation of urban uses other than residential.

The contemporary standalone simulation shows generous areas of public open space (231,200m<sup>2</sup>) within a street grid solution. Wide avenues allow for traffic, serve few dwellings, and provide large green areas that are not particularly suitable for human activity, neither as an outdoor extension of the dwellings, nor as urban public realm. The secondary accesses are, generally, cul-de-sac systems; they reduce accessibility, are usually largely impervious, and have very few trees. These factors compromise the achievement of a connected green structure. Furthermore, the private green areas are too small (in average 29m<sup>2</sup>/dw), and are arranged in a configuration that scarcely allows for the planting of trees.

The selected courtyard prototypes schemes supply almost the same amount of public open space (210,400m<sup>2</sup> to 225,800m<sup>2</sup>), and slightly larger areas of public green space (171,300m<sup>2</sup> to 183,000m<sup>2</sup>), when compared with the simulations. The differences lay mainly in the diversity of urban spaces, the permeability of the urban

grid allowed by the block form/sizes, and the clarity/intelligibility of the urban structure. Taking in account these characteristics, I believe the courtyard schemes have a large advantage over all the simulations.

The allocation of uses other than residential are also reflected in the characteristics of the selected schemes, which propose a larger spread of mixed-uses than those in the tower simulation, even though with differences in the scale and means of accessibility (that is more related to car accesses in the tower example). The standalone simulations are regularly based on the separation of land uses, and a concentration of uses other than residential.

## Chapter 6: Synthesis and discussion

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Reasoning is...defined as a process of understanding and exploring the relationships between the many events, objects, and ideas in our world...What we know about any particular object depends on our knowledge of *other* objects. Sometimes the connections are obvious; other times, they are much harder to see. Reasoning involves finding and expressing these connections or relationships so that each individual event, object, or idea is explicable in terms of other events, objects, or ideas.<sup>761</sup>

Matthew Allen

What follows is a synthesised and full discussion of the material and results presented and partially discussed in the preceding chapters. As such, it qualifies and interrogates all previous discussion in the light of the inquiry questions. Thus, as a Design Research,<sup>762</sup> it presents and discusses the topics related to ‘how’ and ‘why’ the findings were arrived at. The topics related to the ‘who’, ‘what’ and ‘when’ have been discussed in the previous chapters and appendices.

### 6.1 THE PROTAGONIST: COURTYARD HOUSING

#### 6.1.1 The protagonist and the stage: Courtyard housing in Brisbane

This inquiry examined courtyard housing since ancient times, and identified that it was brought to some civilisations after their territory was invaded. For example, the concept of courtyard houses (CH) was brought to Italy (Magna Græcia) with the Greek occupation and to Spain with the Moors’ occupation.<sup>763</sup> In both cases, only the standalone pavilion housing type had been previously used.

These origins of courtyard housing perhaps explain why it has not (surprisingly) been previously researched in the Brisbane context. Its absence in Brisbane can be attributed to the colonial housing concept introduced at the time of the British occupation and replicated during subsequent urban development. Thus, suburban Australian housing reflected its British cultural origins that underlined freedom through individualism, and seclusion from societal interference. The

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<sup>761</sup> Allen 2006, *Smart thinking: Skills for critical understanding and writing*, 2

<sup>762</sup> Description in **S\_2.1 – Methodology**, p. 18

<sup>763</sup> In **S\_3.2.1**, p. 47, 53

arriving residents were mainly tied to their communities through participation in religious groups and their children's school events.

Ancient civilisations in Europe and Asia opted for the CH structure, either to enforce cultural canons or to protect the family from outsiders. It can also be argued that Brisbane residents have never had these needs. Another possible reason for the absence of courtyard housing in Brisbane, as indicated in Timothy Hill's interview, might be that the street grid firstly adopted during the city's foundation was based on very large blocks (up to 450m long) with a low ratio of street edges per km<sup>2</sup> compared to other cities (such as Melbourne, Barcelona, and London). Therefore, Hill suggests that the high-rise apartment tower is the only housing typology that can achieve high residential density in Brisbane city centre, given the low 'intensity of streets'.<sup>764</sup> However, this inquiry demonstrates that courtyard housing typologies can be implemented in Brisbane's building blocks.

These long blocks were generally planned to be 80.4m (four chains) wide, having to accommodate the minimum allotment size (16 perches = 404.8m<sup>2</sup>) set by the Queensland Undue Subdivision of Land Act of 1885. This often resulted in allotments with a frontage of 10m (half a chain) and a depth of 40m (two chains). These allotments allowed for privacy and cross-ventilation through their long backyards, thus creating the tradition of standalone buildings with air around to facilitate ventilation.

Currently, houses are being designed to be closer, and the windows have become insufficient to allow for natural light and ventilation. This has resulted in an increase in energy consumption. With the decreasing quality of the standalone house type, and the increasing affordability issues related to both the acquisition of housing and transport costs, the suburban subtropical lifestyle is being abandoned.

There is an open opportunity, therefore, to introduce a feasible alternative housing type that could complement and enrich the qualities of Brisbane's subtropical lifestyle. This inquiry shows that courtyard housing is such an

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<sup>764</sup> Hill refers to 'intensity of streets' in relation to larger or smaller distances between streets, which would cause a wider or tighter street grid; for example, the street grid in the European city centres is much tighter than the street grid in Brisbane (Timothy Hill interview **Ap\_C.2**, p. 371)

alternative. To review the design outcomes of this study, it is now necessary to discuss how and why the proposed courtyard housing prototypes meet the requirements of the lenses of inquiry.

### 6.1.2 The protagonist into play

This section discusses and answers the query raised in the courtyard housing precedents sections:<sup>765</sup> *How and why has courtyard housing been a permanent housing typology in city structures worldwide?* The text is cross-referenced with the Conceptual and Typological Synthesis section<sup>766</sup> and the scheme presented in the Drawing Set (**DS\_4 - Typological Attributes**).

In the early days, it could be considered that four main factors contributed to the acceptance of courtyard housing typologies in the ancient settlements: psychosocial (privacy/property), economic (density/land value), climatic (sun/wind protection), and religious (internal paradise/sky spiritual access). However, these factors were related to the development of early civilizations and were relevant to different degrees, at different times, and in different geographical locations/climates. It should be noted also that these factors were intrinsically related to the settlements' internal and external accessibility, and to the continuous changes in modes of production and military defence strategies that were commonly caused by technological change.

Since the second millennia BC, it is evident that the mode of production of Sha'ar Hagolan was based on the communal participation of the large family/clan in the communal courtyard space. Here, the planned streets served to move the products in and out the communal unit, which also served as a unit of defence. This mode of production was completely different from the smaller family mode that was developed in the contemporaneous Çatal Hüyük. Here, the compact and informal assemblage of CH and the absence of streets sufficed as a core defence strategy for the limited mode of production.<sup>767</sup>

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<sup>765</sup> S\_3.2.1 and S\_3.2.2

<sup>766</sup> S\_3.2.3, p. 122

<sup>767</sup> S\_3.2.2, p. 83

As defence of the production and storage of manufactured goods became more important than defence of the herds and the plantations, the need to protect the inner settlement emerged. This led to the construction of city walls, which forced space to compact within the fortified settlements. This, in turn, led to a continuous reduction in the dimensions of the CH.

The extreme compactness of the European cities in the nineteenth century and its harmful consequences for community health, provided the main motive for the block reform that enabled the reappearance of the Roman *insulae* as perimeter blocks; in earlier cases, this reform was precipitated by natural disasters, such as the London Great Fire (1666) and the Lisbon earthquake (1755). Another motive for the reform was the growth of cities caused by industrialisation, and the consequent need to provide higher density housing for the working classes.<sup>768</sup>

Relevant to these two motives was the underlying need to change both the street network and the size of buildings. As the first motive was health-related, the courtyards were dimensioned and oriented simply to guarantee basic airflow and limited natural light, as was the case in Lisbon and Paris. However, the second motive was space-related, with the objective of providing wider courtyard dimensions that would guarantee solar exposure according to the severity of the winter season. The block reform policy in Glasgow was a significant example of this objective. There, the metric relationship between the building height, the courtyard size, and the width of the adjacent streets was clearly established. This strategy is similar to the one adopted to define how communal courtyard housing can be appropriately dimensioned within the concept of urban net unity that is developed in this inquiry.<sup>769</sup>

The CH 'reinvention' occurred again in the twentieth century as a higher density alternative to the standalone (free standing), terrace, and row house types. The benefit of the CH type over the latter was the provision of an open private space. CH groups were commonly adopted as a substitute for the perimeter block types when the building regulations either constrained the building heights and/or

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<sup>768</sup> S\_3.2.2, p. 88,

<sup>769</sup> S\_3.2.2, p. 93

predetermined the inclusion of an area of private open space, as seen in the previous examples of CH in Peru and Germany. These examples required the implicit planning of a comprehensive group of houses, and included group-public open spaces such as lanes and small plazas in addition to the adjacent streets.

It is time to reflect on whether the key factors that enabled the permanence of courtyard housing in ancient times are still relevant today. The most intangible and subjective factor is the 'religious' factor; that is, concepts of internal paradise, and spiritual access to the sky. This is a very personal factor, and largely depends on individual concepts of spiritualism, and individual viewing preferences. Some people, for example, would prefer a broad view of the city from an apartment. However, this could be unaffordable as 'good' views (over sea, river, or city) generally represent a significant increase in a home's value. A private or semi-private courtyard appropriately designed to represent the concept of internal paradise is certainly a less costly alternative. However, given the large number of religious/spiritual concepts within different urban contexts, the spiritual value of 'owning' the sky above the private/semi private courtyard and its association with individual spiritual access, is rather difficult to estimate nowadays.

The economic factor should be considered here in relation to density/land value, where the Communal Courtyard Housing (CCH) net densities can be highly competitive within a medium rise group, albeit still depending on the required density established by the local land use codes, and on the land use still being subject to the intrinsic value of the land where the building is located. Although not encompassed in this inquiry, economic studies that consider these variables could be a reasonable subject for further research. Nevertheless, the second consideration would be the benefits (tangible and intangible)<sup>770</sup> that the courtyard could yield in contributing to the establishment of a Double-Edge.<sup>771</sup>

The psychosocial (privacy/property) factor is still very relevant, as courtyards can provide a private/semi-private open space. The ownership of such space is

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<sup>770</sup> Tangible benefits are quantifiable in terms of dollar figures; intangible benefits are the ones more difficult to quantify in attributing a dollar figures such the value of passive surveillance. See Dossetor 2011, *Cost-benefit analysis and its application to crime prevention and criminal justice research*

<sup>771</sup> **S\_5.1.4 Blocks**, p. 229

endorsed when it is visually accessible from the rooms, and wherever the usefulness of the courtyard space adds value to the property when compared to the equivalent space around current standalone typologies, or to the limited private balcony space of apartment towers. However, there is a great difference between the privacy of an individual private courtyard and the privacy of a shared courtyard. The latter requires the identification of appropriate distances to the windows/doors and the provision of physical barriers such as fencing and vegetation on the ground floor or balconies on the upper floors to provide visual privacy from those using the shared courtyard. These barriers need to be provided to limit the proximity and the consequent visual access of the communal space users. This was the reason for designing the elevated CCH internal pathways above the central courtyard area, for locating shrub fences around the ground-floor gardens, and for respecting the minimum of 20m from building façades.

Today, the second most important features for householders (after the unquestionable privacy factor) are the benefit of natural light and airflow control (sun/wind protection/enhancement), which are incorporated in the climatic factor. This factor is extremely relevant given the increasing prices of heating/cooling worldwide. It explains why the previously mentioned examples of contemporary CCH adopted double orientation apartments with vertical point accesses. Indeed, the failure to provide efficient heating and insulation was the main reason for the Runcorn development's lack of success, and the main complaint in the Prestonpans Experiment.<sup>772</sup> In Australia, heating/cooling represent an average of 40% of household energy use, and is generally needed as the result of deficiencies in natural light, and poor airflow control and insulation.<sup>773</sup>

Therefore, one can affirm that the factors that made courtyard housing successful in the past are still important, and might be significant in choosing a courtyard housing type. Although these factors should be taken into account in other housing typologies, they are currently particularly relevant in guaranteeing the implementation of courtyard housing. Thus, they should be carefully envisioned

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<sup>772</sup> S\_3.2.1, p. 71

<sup>773</sup> S\_4.1.2, p. 175



in the design of current courtyard housing projects, albeit allowing for the necessary adaptation to the specific climate and lifestyle of different housing locations. All of these factors were taken into consideration for the prototype designs, and for the development of the Collage Plan (**DS\_4**).

Courtyard housing has been a permanent housing typology in city structures worldwide because it is capable of adapting (by design) to the continuous changes in modes of production, technologies, and lifestyles. Nevertheless, along with the extinction of courtyard space by the continuous infill of additional rooms that occurred in the medieval city-states, or in Beijing with the conversion of the *siheyuan* in *dazayuan*,<sup>774</sup> there is another danger to the survival of courtyard housing typologies: the lack of appropriate space for their implementation, as further explained below.

It should be noted that, from antiquity to the present, planning strategies with respect to allotment dimensions, building blocks, building heights, and road networks predetermine the implementation of courtyard housing. Furthermore, the minimum dimensions necessary for the implementation of courtyard housing have varied across time according to the cultural housing models that reflected the lifestyle of each location. However, in the twentieth century, many of the Garden City Movement and Modern Movement allotments did not foresee the courtyard housing opportunity; nor did the early parcelling of the Brisbane building blocks in the 19th century, which almost completely removed the possibility of the adoption of the courtyard housing typologies.<sup>775</sup>

Courtyard housing survived in the twentieth century because architects/urban designers had the vision to recognise that its standards were flexible enough to accommodate the minimum dimensions required for implementation that was appropriate to the climate, culture and way of life of each city. For this reason, it could be adopted in the planning of city building blocks. Accordingly, in my view, for courtyard housing to survive in housing markets that could be sceptical about the concept, a strategic transformation plan comparable to those in Parque das Nações

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<sup>774</sup> **S\_3.2.1**, p. 135

<sup>775</sup> **Ap\_B - Brief history of Brisbane plans**

(Lisbon), Subiaco (Perth), and Southbank (Brisbane) is recommended.<sup>776</sup> **Section 6.2.3** address this topic.

It is also important to mention the support of twentieth century renowned architects – such as Chester Mansel, Serge Chermayeff and Alvar Aalto (to name but a few) – who preferred CH as the ideal typology for their own houses. Most important was the conviction of those architects who conceived and appropriated urban design principles that made CCH viable within both existing and new city fabrics. This was exemplified by Petrus Berlage in his Plan for Amsterdam, and by Ernst May who, even while standing in the crossfire between the Modern Movement visionaries and the Garden City groups in Frankfurt, designed the successfully appraised CCH in Niederrad.<sup>777</sup>

Furthermore, a variation of the publically accessed perimeter block, CCH has often been designed and implemented as the result of a predetermined choice of the typology by a developer. Such was the case of the housing cooperative created for the Hornbaekhus building in Copenhagen (1923), and the CCH Frauen-Werk-Stadt I and II (1997 and 2000) in Vienna sponsored by the Women’s Office of the City of Vienna Association.<sup>778</sup> This demonstrates that the support of a developer that recognises the attributes of courtyard housing is an important aspect in the endurance of the contemporary courtyard housing typologies.

Therefore, the belief of urban designers/planners (particularly those who occupied chief positions in city planning), architects and developers in the benefits of courtyard housing over other typologies, has been also a significant factor in the resilience of the CCH types in the twentieth century.

## **6.2 THE SCAFFOLD AND THE SCENARIO: PARAMETERS AND LENSES**

The discussion in this section is directly related to the ancillary questions (as given in the introductory chapter, and individually addressed below) related to lenses of inquiry, where sustainability is a key concern. On a broader level,

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<sup>776</sup> **S\_3.3.2**, p. 152 and **S\_4.3.1**, p. 196

<sup>777</sup> **S\_3.2.2**, p. 105

<sup>778</sup> **S\_3.2.2**, p. 98

sustainability is seen in this inquiry as a condition for achieving or maintaining a sustainable environment in “an area in which ecological integrity and basic human needs are concurrently maintained over generations”.<sup>779</sup> Accordingly, “Positive Design™ or Positive Development™ is that which expands both the ecological base (life support system) and the public state (equitable access to means of survival)”.<sup>780</sup> Additionally, specific aspects of sustainability are considered in relation to each lens of inquiry (as listed in the first chapter).<sup>781</sup>

This discussion is based on the theories, descriptions, comments and dimensions that are extensively described in Chapter 4 (Lenses of Inquiry) and Chapter 5 (Design Framework). The theories and practice guidelines that influenced dimension and placement decisions are further listed in **Ap\_D-F**, and synthesised graphically in **Lenses: Informing Theories (DS\_5)**. Hence, the following responses to the ancillary questions should be read as a reasoning process that connects the previous texts and drawings to my subsequent comments, descriptions, opinions and selected references – a process and a connection that led to my conclusions.

### 6.2.1 Revisiting ancillary question 1

***. How can courtyard housing be designed to provide an adequate microclimate within a subtropical urban context?***

*Sustainability is related to subtropical design in the development of design aspects that both maximise human comfort in a microclimate, and minimise the use of natural resources.*

In urban morphology studies, a courtyard had been commonly described as simply a void in opposition to the solidity of the buildings around it. This is an important concept with which to start this discussion. The concept is mainly a two-dimensional one. A courtyard is a 3D volume, which, even when empty of objects, is full of air. The management of the air movement inside this three-dimensional space is the first reason for the tight horizontal section of the ‘ventilation wells’

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<sup>779</sup> Forman 1995, *Land mosaics : the ecology of landscapes and regions*, 484

<sup>780</sup> Birkeland 2008, *Challenging 'best practice' subtropical design*, 1

<sup>781</sup> **S\_1.3 – Sustainability**, p. 4

being built in buildings in tropical climates – a feature generally compulsorily required by building codes in Singapore and Rio de Janeiro. These ‘air wells’ work as chimneys, using the winds in the top of the building to facilitate the extraction of humid air from bathroom windows. Undoubtedly, they increase natural ventilation and can facilitate the microclimate inside the buildings. However, the airflow effectiveness of these ‘wells’ is dependent on the degree of cross-ventilation the building might or might not have.

This was also the ventilation function expected in the ancient CH of arid climates or, on a larger scale, in the courtyards of the buildings constructed in Lisbon immediately after the earthquake, and in almost all of the buildings erected as part of Haussmann’s plan in Paris. Although these ‘courtyards’ contributed to natural ventilation, they neither offered access to natural light in the lower storeys, nor provided vacant space for extended outdoor activities.

Therefore, the usefulness of the courtyard as a place, rather than simply a ventilation well, requires dimensions and elements that are determined by the type of activities planned, and by the nature of the green space desired. Thermal comfort mechanisms and appropriate light should also be carefully considered to produce a healthy microclimate to mirror the ancient Chinese ‘Well of Heaven’ or the Islamic world’s ‘Earthly Paradise’.<sup>782</sup>

Carrick’s Glasgow Plan (1866)<sup>783</sup> pioneered the creation of city codes that designated the minimum proportions for what could be considered a healthy urban net unity of CCH for the working classes. In this plan, streets, courtyards, and buildings had interrelated dimensions that facilitated ideal ventilation and solar exposure. These parameters were adopted to dimension the different forms and scales of this inquiry’s urban design prototypes. The size and design of the courtyards facilitate the activities expected in a sustainable microclimate that facilitates thermal comfort.

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<sup>782</sup> S\_3.2.1, p. 60, 55

<sup>783</sup> S\_3.2.2, p. 93

This study followed the pre-established definition of ‘urban design model’.<sup>784</sup> In order to attend to the subtropical requisites previously adopted, and to produce a sustainable microclimate, my primary concern was to fulfil the spatial criteria of the residential units by first selecting building measures.<sup>785</sup> The dimensioning of the residential units considered the maximisation of thermal comfort, which included the alignment of internal doors with top louvers and the inclusion of large balconies with large windows and sliding louvers. Natural light was considered essential in all the studied courtyard housing dwellings. The longest apartment measures 19m including balconies; this allows all the habitable spaces to have sufficient light, despite the shadow produced by the balconies.

The proposed CCH have units in the north-south direction and units in the east-west direction, and its orientation should provide the best compromise for better orientation/ventilation of all units, taking into consideration that prevailing summer breezes in Brisbane come mainly from the east-southeast. The four prototypes demonstrate that orientation does not need to be precise, and could allow for a degree of flexibility, while attending to the local climatic requirements of passive solar heating and passive cooling. In fact, the studies showed that the orientation towards the east could provide adequate control of both sun exposure and natural airflow; however, the degree of flexibility is greater for the two CCH prototypes.<sup>786</sup>

The orientation of the traditional Brisbane long blocks, which usually have a north-south or an east-west layout, is a constraint on the degree of orientation flexibility in the Brisbane application of the prototypes. The CH prototypes are flexible enough to work in both block orientations. In the north-south cases, however, the L-Shape prototype has more limitations because it has a lower degree of orientation flexibility, and its implementation in an east-west block would not be adequate for maximising solar exposure and natural airflow.

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<sup>784</sup> From **S\_1.3** - Definitions: “A ‘prioritised structure of design thinking’ ... that seeks to fulfil spatial criteria first, and then moves to fulfil spatially-related criteria of urban form and function, and then finally deals with other types of multi-objective criteria.”

<sup>785</sup> Urban design prototype components: buildings, courtyards, blocks, and streets

<sup>786</sup> **S\_5.1.4 – CCH group analysis**, p. 222

The courtyard size, the building heights, and the width of the streets were established to guarantee considerable solar exposure in both the courtyards and the streets during the winter, and to fit the prototypes within the 80m width of the traditional Brisbane building block. To ensure that the streets have solar exposure every day of the year on at least one pathway, and the courtyards have solar exposure for at least six hours during the winter solstice, the design was tested using appropriate software (**DS\_63-64 – [CH-CCH] Solar Studies**). The courtyard design was then completed with attention given to the activities expected in the area, the degree of movement involved, circulation related to dwelling access, and visual privacy (all of which are discussed below).

Wind-driven ventilation was tested using experimental software. This indicated the methodological importance of testing and improving cross-ventilation (by using natural airflow) during the design process (**DS\_65-66 – [CH-CCH] Wind Studies**).<sup>787</sup> When appropriately dimensioned and placed to capture summer breezes and to avoid winter winds, the tests of the prototypes on their proposed site showed positive results for the wind tunnels in the CCH. The strategy of separating the dwellings using external side corridors in the L-Shape prototype, and of creating backyards that act as airflow corridors in the Zero-Lot prototypes, was shown to be favourable to the summer breezes. The tests performed on the CH and CCH groups illustrated that while the higher winds could access the courtyard space, their winter intensity could be ameliorated with the use of appropriate courtyard elements.

These courtyard elements were chosen from both ancient and contemporary courtyard garden precedents to achieve a pleasant space and to create a comfortable microclimate in each case. Water is a very important component: water bodies and water features are proposed for evaporative cooling, and water

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<sup>787</sup> I recognise that the above “results are experimental and have not been fully validated” (note written in the images of the software utilised – Autodesk Vasari). I also recognise that the use of computational fluid dynamics (CFD) modelling software applied on more elaborate volumes—with windows and balconies arranged within a street layout and adjacent buildings—might be more appropriate for detailed results conducive to construction. This could even identify the degree of contribution the cross-ventilation utilised in the dwellings would make to the courtyard ventilation. However, this level of detail is beyond the scope of this inquiry.

storage tanks (rainwater) are installed for the utilisation of the water thermal mass capabilities to contribute to temperature moderation. Although tree species are not specified, the trees are positioned according to their size and foliage characteristics (for example, deciduous vs. evergreen) to contribute to seasonal shadow. Permanent shadow can be achieved under the central building body on the CCH Double and under the garden pavilion (proposed location shown in **DS\_30**) on the CCH Single. Shrubs complement the CCH vegetation, serving as visual barriers for the private outdoor spaces.

Each of the four prototypes courtyards has essentially the same elements that have been demonstrated to be appropriate for the SEQ subtropical climate. However, the Zero-Lot courtyard was designed in recognition of its size and its limited effectiveness as a microclimate moderator in the winter. This is because the thermal mass benefits of the slim water tank and its connected tubular system are compromised in the winter by the limited solar exposure in the courtyard. To overcome this solar limitation, a small backyard was designed to serve as a microclimate moderator that facilitates at least four hours of solar exposure in the winter and increases the cross-ventilation of the dwellings in the summer. Therefore, both the size and the 2-storey nature of the Zero-Lot courtyard make it least suitable for maximising both solar exposure and natural airflow; thus, it is less effective than the L-Shape types as a microclimate moderator. However, to allow for diversity of choice, both typologies are combined, as exemplified in the Collage Plan (**DS\_57**).

A design scheme for each courtyard of the four prototypes, including the descriptions above, is presented (**DS\_59-60 - Sketches for [CH/CCH] Courtyards Design**), and serves as ‘conversational drawings’ to illustrate how each courtyard type could be designed to moderate microclimate in a subtropical urban context. The design considers the accurate building location/orientation within the Collage Plan and the respective solar studies previously mentioned, to corroborate the adaptability of the prototypes to the climatic conditions. I recognise that the qualitative and quantitative aspects of a detailed project should be developed and improved by a multidisciplinary team of specialists – which might include botanists,

landscape architects, and airflow/thermal engineers – who could maximise the microclimate moderation of the courtyards.

My comparisons with other existing typologies in Brisbane have demonstrated that the prototypes could offer a larger advantage in thermal comfort because of their passive design. The internal design of the traditional standalone type does not allow for an appropriate cross-ventilation. This deficiency is augmented in the contemporary standalone because the open space around the house is insufficient to provide wind-driven cooling. The towers type is generally designed with double-loaded corridors with single orientation apartments that are less appropriate for achieving the subtropical climatic requirement of enhancing natural airflow.<sup>788</sup>

Furthermore, the use of water and greenery as thermal moderators is restricted in the contemporary standalone because of its limited private open space; the use of the water thermal mass characteristic is largely constrained in both the traditional standalone type and the tower type due to the lack of enclosed private/semi-private spaces; and the introduction of tree species is limited in the tower type, where the semi-private spaces have sealed surfaces. Therefore, because of their ability to create significant thermal comfort both inside the dwellings and in the courtyard spaces, the prototypes of the collage schemes could more effectively support the indoor-outdoor subtropical lifestyle than the other simulations types.

Of the four prototypes, I believe that the CCH types have more advantages in working as microclimate moderators within a subtropical climate than the CH types. This is because of their higher degree of orientation flexibility, their flexibility in the location of the wind tunnels, and their larger courtyard sizes. Ultimately, the L-Shape orientation and natural ventilation are appropriate to the subtropical climate: larger courtyard/terraces facilitate the subtropical lifestyle, and provide more generous green areas than the Zero-Lot. Nonetheless, all the prototypes are designed to enhance human comfort in a subtropical microclimate, and contribute to sustainability by minimising the use of natural resources through their passive

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<sup>788</sup> S\_5.2.5 - Simulations and collage schemes analysis, p. 259



design.

As the result of the above discussion and its presentation in the Drawing Set, I believe that the four urban design prototypes are appropriately designed to recognise the opportunities and challenges of the climatic conditions in providing an adequate microclimate within a subtropical urban context. I believe also that I made the appropriate choice and use of courtyard elements (including a mix of traditional and contemporary elements) that could increase the opportunities to moderate a courtyard's microclimate. This research has tested airflow through empirical analysis to gain an understanding of the microclimate conditions of the prototypes. However, other aspects would require future empirical testing with accurate scientific simulations or even the building of the prototypes to test the design proposals.

Nevertheless, these isolated moderations of microclimate can only be effective within an urban context if they contribute to a larger network of green open spaces. The response to the following question discusses this required urban condition.

### 6.2.2 Revisiting ancillary question 2

- . How can courtyard housing provide an effective private and semi-private green space configuration, while contributing to a wider sustainable urban green structure?*

*Sustainability and urban green structures are interrelated considering that "the idea of sustainability has its origins in the science of ecology, which demonstrated the conditions essential for the ecosystems to survive in the long term".<sup>789</sup>*

It is recognised worldwide that the planning of contemporary cities should consider a green network as an integral part of their urban context. This physical structure – mostly represented by the connections of green belts and/or green corridors – plays an essential role in the urban microclimate through appropriate

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<sup>789</sup> Thorén 2000, "The green poster" *A method to evaluate the sustainability of the urban green structure*, 361

water and greenery management in its variously scaled green spaces. The green structure also contributes an ecological connectivity that provides for a social infrastructure of activities that include human interactions, leisure and relaxation. In this way, the network of green spaces accomplishes both environmental and social benefits that are considered invaluable to the health of communities.<sup>790</sup>

The Collage Plan suggests a sequence of public, semi-private and private green spaces throughout the proposed urban fabric, with the aims of enhancing public health and providing an ecological network. The performance of the urban design prototypes in accomplishing these objectives is discussed below, and illustrated in the Drawing Set (**DS\_54-56, 57, 59-62, 74**).

This inquiry applies the theories associated with Urban Green Structures, where permeable soil and water play an important role as a support for life and for the equilibrium/steadiness of the water systems. Under this logic, the first condition for the effective functioning of the courtyards is the provision of a permeable soil and vegetation. This is a constant in all courtyard prototypes proposed, where the lawn option for larger surfaces and pebbles for smaller areas are applied over a permeable soil; however, semi-permeable surfaces could be applied in areas that require greater strength for specific activities.

The second condition is the selection of appropriate vegetation species and the management of space to provide habitat for the local fauna and flora. This is essential to assure a sustainable ecological connectivity within the city, and applies the concept of *continuum naturale*, which includes the ecological principles of continuity, diversity and intensification.<sup>791</sup> However, to be successful, this requires the work of a specialised team, involving at least a biologist, a botanist, an ornithologist, and a landscape architect to ensure the selection of appropriate vegetation species/forms, and the suitability of water elements.

The third condition for the effectiveness of the courtyards as participants in an urban green structure is that they should integrate the network of adjacent

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<sup>790</sup> S\_4.2, p. 180

<sup>791</sup> S\_4.2.1, p. 188

public green spaces to establish a mutually supportive system of ecologically and socially functional settings. This condition applies to the connectivity of the secondary green structure, and should be included in urban design recommendations related to the continuity of the primary green structure.

According to these conditions, in my view, new housing developments should provide a balanced network of unsealed green spaces of various scales, such as public parks, green corridors, plazas and private/semi-private gardens. The dimensioning of this network should occur at the city planning level. This planning should institute minimum dimensions for private open spaces (POS) – preferably independent from the size of the lot; require the implementation of green plazas within a reasonable walking distance of the neighbourhood population (e.g., 500m maximum); require the planting of tree species appropriate to the local flora/fauna in streets and boulevards; and include public parks, the green area of which is related to the size of the population (minimum park m<sup>2</sup> per dwelling) within a maximum walking distance (e.g., 1000m).

This should be complemented by the creation of a communal consciousness of the significance of the urban green structure, the importance of the private/semi-private green spaces to the city's green network, and the relevance of pervious garden surfaces to the ecological connectivity.<sup>792</sup>

The suggestions presented in my Collage Plan schemes (**DS\_54-56 - Green Structure, Ecological Connectivity and Water Drainage**) emphasise that a comprehensive urban design should be concerned with these ecological issues. Furthermore, this inquiry tested Brisbane's existing housing typologies in simulations that compared the proposed courtyard schemes for the Bowen Hills site, and identified that the urban design principles utilised are appropriate to a sustainable ecological connection (**DS\_47 - Collages: Simulations and Schemes** and **DS\_48 - Comparison Table: Simulations and Schemes**).

My drawings explain the ecological structure based on a hierarchy of green corridors and demonstrate that the courtyard prototypes enhance the secondary

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<sup>792</sup> S\_4.2.4, p. 192

green structure as stepping-stones in the overall green structure, which is complemented by the primary green structure also provided by the natural linear park. The value of the ‘linearity’ of the proposed park as a green corridor is based both on its extended capacity to connect the Breakfast Creek flora/fauna, and on the opportunity to offer outdoor activities that are easily accessed (by a short 10 minute walk) in all the prototypes (**DS\_54 – Green Structures** and **DS\_55 – Ecological Connectivity**).

My simulations of the existing Brisbane typologies include the same area/location of the proposed linear park. The comparisons between the simulations and the Collage Plan (proposal scheme) showed that the urban design prototypes have a leading advantage – that is shared with the traditional standalone type – over the contemporary standalone and tower simulations: they contribute in enhancing the secondary green structure and, thus, the ecological connectivity in the city fabric. Private green space does not exist in the tower type, and is very limited in the contemporary standalone type.

Additionally, the semi-private green spaces offered by the tower type are generally located over sealed surfaces (e.g., roof gardens). Taking into consideration the ground permeability required under the urban green structure parameters, this is a great limitation of this type. Finally, the analytical comparisons show that the three collage schemes (including the Collage Plan) deliver a higher provision of public green spaces than the three simulations (**DS\_47-48**).<sup>793</sup> Therefore, I believe that the ecological connectivity and the diversity of unsealed private and semi-private green spaces provided by both CH and CCH prototypes deliver a much greater contribution to the urban green structure than the existing housing types analysed.

Although my drawings for both CH and CCH prototype courtyards demonstrate that courtyard housing can be designed to accomplish the requirements of an urban green structure, my analysis identified that the Zero-Lot courtyard contributes the least to ecological connectivity, given its small size and its

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<sup>793</sup> **S\_5.2.5**, p. 262

surrounding 2-storey walls. However, its ecological function is accomplished by its backyard (**DS\_13, 15, 59**). Thus, one can consider that the courtyard areas of the L-Shape types represent the minimum dimensions of a private courtyard that effectively accomplishes the requirements of the urban green structure (**DS\_21-22, 59**).

The CCH types equally suit these requirements. The CCH/Single has a larger courtyard area than the summation of the two CCH/Double courtyard areas, constituting a minor advantage for the water features and greenery larger areas. However, in the CCH/Double the two courtyards spaces, although visually related, can be designed to create two different green spaces: one more discreet for static activities (e.g., reading), and the other more appropriate for dynamic activities (e.g., children's games) (**DS\_27, 60**).

Thus, the answer to the question 'How can courtyard housing provide an effective private and semi-private green space configuration, while contributing towards a wider sustainable urban green structure?' is that the provision of private and semi-private green space could be effective in contributing to the urban green structure (as previously discussed) if the courtyards are designed with green space characteristics that accomplish their function as stepping-stones on a secondary green structure, complementing the ecological connectivity of the primary green structure.<sup>794</sup>

However, a comprehensive urban design plan needs to provide the fundamental ecological connections. An urban design model that includes a deliberate plan for an urban green structure is a critical factor in the overall success of the intentions earlier described. The following argument discusses the many obstacles that the urban design prototypes need to overcome in order to become a contemporary reality.

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<sup>794</sup> **S\_4.2**, p. 187, **S\_4.2.4**, p. 192, **S\_5.2.4**, p. 258

### 6.2.3 Revisiting ancillary question 3

#### **. *Can courtyard housing typologies enhance the characteristics of TOD?***

*Sustainability is related to the hallmarks (accessibility, sense of community, building/land use and net density) of Transit Oriented Development (TOD) when design provides balanced density; a diversity of housing options and mixed-use development; accessible public transportation and pedestrian structures; and public spaces that facilitate liveable communities.*

The TOD hallmarks have been applied worldwide for more than a century with different housing typologies. However, the Collage Plan of this inquiry is the first housing development proposal that incorporates both CCH and CH in a comprehensive urban design model that is planned to achieve the hallmarks of TOD in Australia. The text below discusses how the courtyard housing prototypes respond to TOD characteristics (accessibility, density, diversity/mixed use and sense of community) in the Brisbane context.

#### Accessibility

The location parameters established by the 2010 *Transit Oriented Development: Guide for Practitioners in Queensland* (QLD TOD Guide) determines that a new TOD should be implemented close to nodes or corridors with potential capacity for high levels of transit service. Hence, the selection of the Bowen Hills site is justified by the adjacency of the City Bypass and Abbotsford Rd transport corridors, and the current Bowen Hills railway station (suggested for relocation inside the Collage Plan precinct) that provide for connections to diverse rail lines, including the airport line (21min travel).

Also accomplishing the recommendations of the QLD TOD Guide, the new Bowen Hills Multimodal Station location provides high levels of intermodal connection and accessibility for cyclists and pedestrians in the station precinct, which includes the Courtyard Plaza.<sup>795</sup> Unlike the station plazas recently proposed

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<sup>795</sup> S\_5.2.4, p. 255

for SEQ TODs,<sup>796</sup> the Courtyard Plaza assumes a more centralised position in the high-density area of the CCH, thus creating two distinct types of open spaces: one more reserved and related to the interior of the courtyard, and the other formed by the spaces around the plaza building. These offer a greater diversity of opportunities for the outdoor subtropical lifestyle, and a greater opportunity for the development of retail (and services connected to it) in no more than a 10-minute walk from any of the CCH prototypes (**DS\_50**). This demonstrates that a station precinct incorporating a public courtyard building dedicated to services and retail can achieve a high degree of commercial effectiveness.<sup>797</sup>

TODs might fail in countries with a higher car dependency (for example, the USA and Australia) if town/suburb design is not flexible enough to reduce this dependency. Urban design should apply shared traffic solutions that give preference/protection to pedestrian and slow-bike movement, thus directing most car traffic to the main roads; this is consistent with the walkability principles suggested by Gehl.<sup>798</sup> As earlier mentioned, to provide for the harmonious coexistence of different kinds of commuting movements, and considering Brisbane's subtropical climatic need for thermal comfort through the control of shadows/solar exposure, I have created a permeable street grid hierarchy labelled 'Double-Grid'.<sup>799</sup>

Unlike the shopping centre concept utilised in the simulations of the Brisbane housing typologies, the Collage Plan suggests a balanced distribution of retail, commerce and services around the Multimodal Station Precinct, according to local community needs; these would bring liveability to the CCH streets area.

The Streets-for-Living provide restricted car traffic around the Courtyard Plaza, thus supporting pedestrian and slow-bike accesses. This, in turn, establishes the enhanced liveability advantage of the streets in the collage schemes over the streets around the shopping centres in the simulations of other typologies (**DS\_47**). These streets frame the public courtyard building located on the north-western side

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<sup>796</sup> e.g. Varsity Station Village and Yeerongpilly Transit Oriented Development - **S\_5.2.3**, p. 248

<sup>797</sup> The multimodal station features are fully described in **S\_5.2.4**, p. 253

<sup>798</sup> **S\_4.3.2** and **Ap\_E**

<sup>799</sup> **S\_5.1.4 [CH] Streets and parking**, p. 224

of the Courtyard Plaza, and provide an enhanced liveability that streets around shopping centres are generally unable to provide after closing time.<sup>800</sup>

The Mixed-use-Streets of the collage schemes provide faster commuting time than the Streets-for-Living. They also guarantee legible pedestrian pathways and bike lanes that are not adequately provided by the cul-de-sac access of the contemporary standalone simulation, or by the parking access lanes of the tower simulation.

Although the Mixed-use-Streets have the same functional character in both CCH and CH prototypes areas, the CH lanes have narrower widths than the CCH Streets-for-Living; this reflects the smaller scale of the CH prototypes. However, what is different from the standalone simulations is that the Collage Plan proposes a lower car dependency model without individual garages for the CH area. This was previously exemplified in the Shichahai Plan<sup>801</sup> in Beijing, and the Prestonpans Experiment in Scotland.<sup>802</sup> Hence, this current model provides for car parking in a parking silo located no more than a 5-minute walk from any of the CH prototypes (DS\_51).<sup>803</sup>

Also unlike the Brisbane typology simulations, the Collage Plan minimises the number of driveways in the CCH area by introducing two shared parking solutions: underground below the CCH buildings, and aboveground in a car-parking silo adjacent to the Multimodal Station. The driveways of the underground parking are parallel to the building's façade to improve pedestrian/bike safety on the pathways, and to give more opportunities for active building façades and more liveable street conditions than the other typology simulations. This is already successful worldwide (e.g. Lisbon) as also is the case in some Brisbane streets (e.g. Edward Street).<sup>804</sup>

Some architects believe that the most straightforward solution for Brisbane is aboveground parking because it is cheaper to build<sup>805</sup> and easier to ventilate<sup>806</sup>. In

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<sup>800</sup> S\_5.2.4, p.256

<sup>801</sup> S\_3.3.1, p. 132

<sup>802</sup> S\_3.2.1, p. 72

<sup>803</sup> S\_5.1.4 - [CH] Streets and Parking, p. 224

<sup>804</sup> S\_5.1.4 - [CCH] Streets and parking, p. 230

<sup>805</sup> See Peter Richard interview in Ap\_C.1.1

<sup>806</sup> See Timothy Hill interview in AP\_C.1.2



my view, however, underground parking is most appropriate to CCH as a shared space underneath the buildings, as it allows higher land-use efficiency and easier access; nevertheless, any design solutions should account for natural ventilation.

The courtyard housing parking solution in Parque das Nações (DP3) uses driveways within the courtyards to access the shared parking under the buildings. While this solution has the advantage of using just one driveway to access the interior of the courtyard housing blocks, the cars inside the courtyards create an intimidating intrusion, a hostile presence discouraging residents' use of the landscaped areas. Metaphorically speaking, the courtyards in Parque das Nações serve and protect cars instead of people.

The street area of the CCH prototypes is very similar to the street area of the CH prototypes. The advantage of the CCH prototypes, however, is that it can serve more people. Comparing the CH prototypes, the L-Shape and the Double-Lane Zero-Lot use similar areas for laneways. The Double-Lane layout forms wider landscaped spaces, because it provides for the direct spatial relationship of the laneways with the backyards/living areas. One could say, however, that the application of this layout in an urban design prototype is economically less efficient because the area occupied by the laneways is greater than in the Back-to-Back layout; this factor would increase the public/group expenditure on the maintenance of public open spaces.

Taking all that has been discussed into consideration, one can conclude that the four urban design prototypes and the Collage Plan respond positively to the accessibility requirements of TOD, while also exhibiting advantages over the Brisbane typology simulations.

### Density

According to the parameters established by the QLD TOD Guide, the site can be considered an 'Activity Centre' because it offers the opportunity to expand the Brisbane CBD. The Density Principle recommends medium and medium-to-high density (net 40+/140+dph) within the primary walking catchment (400m of the station core).

This is achieved by the Net Residential Density ratio of both the CCH Single (92dpa) and CCH Double (66dph) prototypes; however, the CCH Single density ratio constitutes an advantage if the demand for higher densities is a priority. The locations of the CCH prototypes in the Collage Plan equally accomplish the Density Principle in terms of the walking catchment of the station core. The Courtyard Plaza (3-storeys) and the building located on its north-western side (5-storeys) serve to mediate the building scales/densities of the CCH/Double and CCH/Single groups **(DS\_57, 62)**.<sup>807</sup>

The CH prototypes<sup>808</sup> studied here have higher net residential density when compared with the Queenslander type house (17dph). My results show that the different parcelling layouts of the Zero-Lot produced similar net residential densities (36dph for the Double-Lane layout; 37dph for the Back-to-Back layout). The L-Shape type yields a lower net residential density (33dph) than the Zero-Lot types **(DS\_42)**. However, the L-Shape house might be a more appropriate choice than the Zero-Lot type if the demand for the higher densities offered by the Zero-Lot Types is not a priority, and the preference for the larger private green space offered by the L-Shape courtyard is preferred **(Tables 9, 11 and 13)**.

The locations of the CH prototypes In the Collage Plan exceed the 400m walking catchment to the station core. Thus, their lower density places them at a disadvantage under the ideal TOD parameters of accessibility and density when compared to the CCH prototypes.

In terms of Gross Residential Density, the Collage Plan (36dph) offers six times fewer dwellings than Simulation III (apartment tower - 235dph), and six times more dwellings than Simulation I (traditional standalone - 6.3dph).<sup>809</sup> However, one should consider that – unlike the simulations of the existing types that consider just one housing typology per simulation – the courtyard schemes have a mix of low-rise and medium-rise buildings; this creates lower densities than the tower type, but

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<sup>807</sup> **S\_5.2.4**, p.256

<sup>808</sup> Recalling the concept of courtyard house prototype: a group of courtyard houses, the internal public laneways/open spaces between the houses plus half the width of the streets around the group. p. 221

<sup>809</sup> **S\_5.2.5**, p. 261

more residential diversity in a mix of dwelling houses, dwelling units, and multiple dwellings in row houses and apartments.

Accordingly, this proposed densification provides a diverse choice of residential units to accommodate different family choices of size and type, and includes a range of internal spaces that cater for various temperatures and provide external views. Moreover, the urban design prototypes accomplished the (net) density values suggested by the local TOD Density Principle; however, their design took into consideration the fact that unpleasant and/or undersized residential units in a centrally densified area might encourage residents to choose larger houses in suburban areas, thus contributing to expanding city sprawl. Therefore, one can affirm that the assemblage of the prototypes in the Collage Plan achieved an appropriate densification, while also contributing to sustainability by enhancing the other hallmarks of TOD.

#### Diversity/Mixed-use

TOD might fail, however, to deliver a diversity of land use if it does not consider the strategic placement of residential units/accesses in a flexible mix of commercial and retail buildings that can maintain street activity for the longest time possible (ideally, up to 16+ hours). This requires the planning intention of achieving a vertically and horizontally feasible mix (for example, offices above retail and both with housing on either side). This would increase access on the ground level and contribute to the street's liveability.

An important concern is the setting of guidelines for both plot ratios and built form to guarantee a controlled flexibility of uses (for example, Parque das Nações).<sup>810</sup> At the same time, it is necessary to avoid arbitrary plot ratios that could be intentionally undetermined by city planners to allow for negotiation with potential developers, who might be discouraged by inflexible ratios. However, it should be stressed that in areas close to the town/city centre, the new development should support (for example, Subi Centro)<sup>811</sup> rather than compete

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<sup>810</sup> An urban net unity includes buildings, courtyards, internal lanes and other public spaces, and half the width of adjoining access roads. **S\_3.2.2**, p. 216

<sup>811</sup> **S\_4.3.1**, p. 198

with the central area (Subiaco), to avoid high housing/retail relocations from the central area.

The implementation of the urban design prototypes as an urban net unity<sup>812</sup> that is developed by just one developing entity is essential to acquiring the communal courtyard qualities in the CCH, and the character of the group-public spaces in the CH. Preferably, the parcelling of the development should be in multi-block or block parcels developed by a funding cooperative or a single developer for the whole block. Plot-based development might occur if several developers who believe in the level of demand would create a partnership that requires the private market to buy the units in advance at a fixed price, as shown in the example of IJburg that is explained in the book *Shaping places: urban planning, design and development*.<sup>813</sup>

The courtyards in Parque das Nações exemplify a plot-based development; however, they were not constructed in a holistic approach by a unified group of developers.<sup>814</sup> As seen before in the accessibility discussion, the result was that rather than the buildings sharing single-access communal parking underneath the buildings, the courtyards become the individual lots' access to parking (not unlike the British perimeter block examples).

To accomplish a strategic but flexible mix of commercial and retail buildings that can maintain street activity the prototypes' design concentrates retail (ground floor with possible extension to the first floor) and commerce (floors above) on the corners of the buildings (CCH), and in the small plazas of CH. The rest of the CCH prototype ground floors are not allocated a fixed use, so that each prototype is flexible to the demands of the street space – even within the same neighbourhood in relation to proximity to the multimodal station, for instance – across location, time, and culture. Nevertheless, the ground floor dwellings are more appropriate for the elderly and for those with a disability.

The CCH prototypes accomplish housing diversity by offering different

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<sup>812</sup> S\_5.1

<sup>813</sup> S\_3.1

<sup>814</sup> S\_3.3.2 – Design, p. 147

apartment sizes, floor plan layouts and building heights for both the CCH/Single and the CCH/Double. Furthermore, they propose a ratio of apartment rooms (36%-1BR, 50%-2BR, and 14%-3BR) that is based on the Brisbane Inner City apartment sales figures in 2012.<sup>815</sup> Although the latter serves as a recommendation for new CCH developments, these figures need to be carefully updated according to the housing market needs at the time of construction in each location and cultural context, even within the same city. For example, the expectation of a high demand for 3BR dwellings at the beginning of the Parque das Nações construction (1995-98) dropped considerably, with a later demand for 2BR dwellings (2000-05).<sup>816</sup> In another example, a housing project recently (2015) constructed in the Brisbane CBD shows a much larger ratio of 1BR apartments ( $\approx 85\%$ )<sup>817</sup> than is indicated by the 2012 sales figures.

Although the CCH/Single has higher building heights and slightly larger apartment areas, the CCH/Double provides for the utilisation of the Row House type that was studied (with the Roman Empire's *taberna* type as being the earliest model) which can be considered an advantage in terms of diversity of form and use over the CCH/Single.<sup>818</sup> These ancient mixed-use types integrated both retail/craft and housing functions. The retail area was located in the lot front, along the streets; the housing function occupied the spaces behind and/or above it (**DS\_31**). The areas allocated to other uses (retail, commercial and services) are similar in both CCH prototypes.

One thought-provoking contribution to CH diversity is the L-Shape typology. This expandable design is influenced by German L-shaped projects and the PREVI examples.<sup>819</sup> It requires only a small initial outlay, and provides for working space either in the front room or on the floor above. In addition, within the concept of 'hyperhouse'<sup>820</sup> the upper floor can be rented to generate income for the downstairs family. This establishes a large advantage over the Zero-Lot type with

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<sup>815</sup> **S\_4.3.2**, p.208

<sup>816</sup> **S\_3.3.2**, p. 149

<sup>817</sup> Confidential source data

<sup>818</sup> **S\_3.2.1**, p.48, 85, 117, 227

<sup>819</sup> **S\_3.2.1**, p. 68, 74,

<sup>820</sup> **S\_3.2.1**, p. 77 and **Glossary**

regard to flexibility and diversity. While the Zero-Lot type can be expanded vertically in response to family growth, later construction of the second floor would be technically delicate as the dwellings are attached by a party wall. Moreover, the Zero-Lot has further design limitations in that it cannot accommodate an independent unit on the second floor (either for residential or commercial uses) as the L-Shape typology can.

Many of the CCH examples reviewed had successful childcare facilities installed on the ground floor of the courtyards.<sup>821</sup> These could also be provided in different locations in the areas indicated for retail/services/commerce/community facilities in both CH and CCH prototypes. The neighborhoods surrounding the Collage Plan precinct are well serviced by High Schools that can be accessed by public transport. However, the installation of a central primary school was considered essential in this urban design model, as informed by the large amount of literature that defends the value of young children walking to school (accompanied by their parents when younger, and alone when older) if neighbourhood safety allows.<sup>822</sup>

The two key differences between the collage schemes and the other Brisbane typology simulations in terms of diversity/mixed-uses is that the simulations consider just one residential typology and concentrate the retail/commercial uses in one main location. Therefore, the collage schemes have a large advantage in providing a mix of low-rise and medium-rise buildings. Although this generates lower densities than the towers type, the schemes achieve more diversity in providing a larger mix of land uses.

The issues just discussed demonstrate that both the courtyard housing prototypes and the Collage Plan provide a diversity of housing options and mixed-use development, while also allowing for flexible changes in the ratios of uses according to the needs of the market, the context and prevailing cultural conditions.

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<sup>821</sup> S\_3.2.2 - CCH: twentieth century, p. 94

<sup>822</sup> S\_3.2.1, p. 72; S\_4.3.2, p.199, 201;

### Sense of Community

Most of the principles applied in the Collage Plan are relevant to the implementation of other housing typologies in new developments to enhance the hallmarks of TOD tested in this inquiry. Above all, however, it is in its enrichment of a sense of community that the prototypes could make a standout difference. While the CH prototypes intend to serve the market preference for a private open space, group-public open spaces can also greatly contribute to a liveable community, as has been shown in the PREVI project and the Prestonpans Experiment for social housing.

CCH has the advantage of larger and safer semi-private spaces in which to share activities; this makes them more suitable for the fostering of social relationships and a sense of community. Yet, as seen above, in both CH and CCH cases, the ‘Double Edge’ condition offered by the urban design prototypes can provide benefits that other typologies cannot. These benefits include the opportunity of a wider passive surveillance of both the public realm and the shared spaces (semi-private and group-public) by all residents.

In the CCH/Double, the two courtyards communicate through the wide opening in the ground floor of the central building volume; this duplicates the perception of the enclosed space. As in the Chinese *siheyuan*, the space covered by the central volume could have the function of a central hall and serve as a venue for residents’ events and meetings, or could simply be a peaceful study area by the garden (**DS\_27**).

Since the time of the first settlement mentioned in this study (Sha’ar Hagolan),<sup>823</sup> the sharing of a communal space has been intimately related to shared activities and to the amount of space related to particular activities. Over time, these activities have changed, as have the dimensions and characteristics of the space required for them, and the privacy demands related to them. Traditionally, a private/semi-private open space had a communal function, because individuals did not have a reason or the economic means to have an open space simply for his/her

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<sup>823</sup> **S\_3.2.2**, p. 83

pleasure. Most commonly (historically), private open spaces have been predominantly used by families, under the auspices of community consensus.

It is acceptable, however, that this individual open space could contribute to an extension of the individual mode of production, as very successful artisans have demonstrated. Nevertheless, these examples are rare and many artisans in Europe are still using the public space in front of their houses to manufacture their products in densified environments. Thus, it is inevitable that the ever-present reality of the 'live over the store' (house/shop) type of housing has worldwide acceptance.<sup>824</sup>

Depending on the type of product(s) sold in the 'store', such Live-Work housing types could serve as busy community meeting spaces where neighbourhood relationships are enhanced. Although, historically, these housing types still had internal courtyards (as in China and Japan), in some other countries, the Roman *taberna* type, which uses an enclosed space at the back, was more common. Given the tighter current economic climate, people now tend to live and work in the same space. This is facilitated by the many computer-based jobs that require a smaller work area. In Australia 68% of micro and small businesses are home-based.<sup>825</sup>

The Live-Work dwelling (SoHo) is a sustainable option as it avoids travel to a workplace. The inclusion of Live-Work dwellings in all new housing developments is a recommendation that applies to all housing types. In the CH proposed here, the front room can function as a workspace. The CCH offers the additional advantage of a nearby communal space in which to socialize and relax in work breaks. Such a facility is recognised as a healthy option for home workers as it serves to minimise their psychological isolation.

Elderly CCH residents, particular those living on the ground floor, can also minimise their isolation by participating in courtyard activities. Today, elderly people tend to want to stay in their original homes to maintain their community contacts. For this reason, the dwellings envisioned as part of this inquiry are

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<sup>824</sup> S\_4.3.2 - Live-Work and SoHo: Home-based business, p. 206

<sup>825</sup> S\_4.3.1, p. 207



designed to maximise internal and external accessibility.

Other potential beneficiaries of a communal courtyard (and Live-Work dwellings) are the rising number of single parent families. In some countries, such as Australia, these parents have to deal with the high price of childcare services, and many seek to be professionally productive without leaving their homes. New immigrants without local acquaintances could also benefit, as their social integration would be facilitated by the social interactions in the shared courtyard space.

Under this view, the CCH prototypes have a social advantage because the larger number of families sharing the communal courtyards can generate more opportunities to make acquaintances and create relationships than the fewer families living in the CH prototypes who share the group-public outdoor spaces. However, the CH offer the advantage of offering an individual green space in addition to the opportunity of sharing the group-public area; in the CCH types, this is only possible for those living in the ground-floor units with private gardens.

Nevertheless, for the residents' children, the CH group-public spaces can be seen as a safer alternative to the polemically discussed *cul de sac* that is still valued in the housing market of many countries, including Australia. This is because the shared courtyards have some of the advantages of the intrinsic public realm of the *cul de sac* (for example, limited traffic, and passive surveillance of children and external visitors), without its main disadvantages of lack of block permeability for pedestrians, and remote access to other public spaces and neighbourhood dwellings. Comparing the Zero-Lot options, the Back-to-Back layout provides more privacy to the living areas, forms more defined streetscapes, and is consequently more efficient in delivering a sustainable and compact urban design prototype.

Moreover, the limited car traffic lanes (Streets-for-Living) provided in the collage schemes enable a small-scale retail/commerce implementation around the local group-public plaza. This could be extended along the Multi-use-Streets to provide basic facilities (e.g., grocery stores, pharmacies, and day-care centres), and

to improve the local street network liveability, as in the example of Nowa Huta.<sup>826</sup>

Thus, among other personal preferences such as location in a particular neighbourhood, public transport access, or a dwelling's floor plans, both the CCH and the CH proposed in this inquiry offers residents the opportunity to effortlessly, visually, and physically access a safe and pleasant space where they can form relationships and create a micro community as an extension of the family nucleus. For instance, elderly people can supervise their neighbor's children and receive affective care in return. Thus, the collage schemes provide closer communal spaces compared to the commonly distant community facilities provided by the standalone simulations, and more sociable spaces compared to the condominium areas of the tower type.

Furthermore, the low and medium rise buildings of the CCH around the courtyards enhance the sense of ownership of the shared place that is visually accessible from the internal edge windows. This creates a far greater sense of participation than the shared spaces of the apartment towers that are not visually accessed by apartment owners, or the limited view to the street provided by the front windows of the contemporary standalone typology.

Therefore, considering all of the factors discussed above, I believe that both the urban design prototypes and the Collage Plan have advantages over the other typologies in enhancing a sense of community. I can thus conclude that courtyard housing can easily meet TOD requirements in providing for a balanced density, a diversity of housing and mixed-use options, accessible public transportation, and a walkable network of appropriately designed public open spaces with active street edges. All of these features enhance the liveability of the planned communities.

### 6.3 THE PROTAGONIST AND THE PLAY

***• How does the deployment of courtyard housing typologies contribute to sustainable compactness in cities with a subtropical climate?***

*“A sustainable community is one that is economically, environmentally, and*

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<sup>826</sup> S\_3.2.2, p. 108

*socially healthy and resilient. It meets challenges through integrated solutions rather than through fragmented approaches that meet one of those goals at the expense of the others.*<sup>827</sup> Accordingly, “Positive Design™ or Positive Development™ is that which expands both the ecological base (the life support system) and the public state (equitable access to the means of survival)”.<sup>828</sup>

This (main) research question has been largely answered in the previous sections. What follows now are final deductions arising from a scrutiny of the interaction of courtyard housing with the topics discussed

In the seventy years since the publication of *The Subtropical Housing* by Karl Langer (1944) in Brisbane, theories related to subtropical design have not significantly evolved.<sup>829</sup> Avoidance of the fatigue caused by the summer heat inside the most unsustainable Queensland dwelling, was largely previously solved by occupying the space underneath the dwelling during the day and sleeping on its veranda at night. Recently, the desire for more internal space, and the need for privacy from the street and the closer neighbours, pointed to one solution only: air conditioning.<sup>830</sup> This was seen as an affordable solution, given the low price of energy and the high cost of renovating a house that might need to be sold one day.

Recent improvements in construction materials and energy saving devices that have somewhat redeemed badly planned developments, are not sufficient to address the main reality: the exhaustion of natural resources and the current impossibility of compensating nature for our increasing consumption. Added to the scarcity of natural resources and the resultant increase in their value, the paucity of space has also forced us to rethink the current segregation of human and natural functions. These factors have also led the world to reflect on the benefits of sharing both the existing resources and the available space using an ancient approach – the communitarian one.

The awareness of our past mistakes, and the realisation that continuing,

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<sup>827</sup> Institute for Sustainable Communities 2013, *What is a Sustainable Community?*

<sup>828</sup> Birkeland 2008, *Challenging 'best practice' subtropical design*, 1

<sup>829</sup> S\_4.1.2, p. 173

<sup>830</sup> S\_4.1.2, p. 174

unchecked consumption is unfeasible, leads to one conclusion: the urgent need for the sustainable maintenance of our natural environment and the redesign of urban developments considering an ecological approach. The implementation of courtyard housing has been tested in this inquiry and demonstrated that it can be a contribution to positive urban development. Nevertheless, it is important to discuss the influence of the lenses of inquiry in the process, and to demonstrate how they work together to provide the best solution.

Early TOD developments are exemplified in the Spaardammerburrt area in Amsterdam (1913-21), in the Karl Marx Hof in Vienna (1927-33) and, most recently, by Parque das Nações in Lisbon (1995-2010) and Subi Centro in Perth (1994- ), to name but a few. Although the first two examples are not classified in the reviewed literature as TOD, they did provide rail access to high-density courtyard housing equipped with minimum basic facilities (e.g., day-care centres, post office, communal laundries) for the working class.<sup>831</sup> Current concepts of TOD include the demand for a diversity of social classes residing in the one area, thus eradicating the economic bias that classified the neighbourhoods of the twentieth century according to the economic standing of their residents.<sup>832</sup>

However, the international prerogatives fell somewhat short of addressing the Australian context, and needed to be amended to address local climate and lifestyle requisites. In the first two examples just mentioned, for instance, the successful (long) internal dimensions of the communal courtyards that provided protection from cold winds are not appropriate for the Brisbane context as they block the summer breezes and constrain the pedestrian network.

A significant amendment to the SEQ Regional Plan (2009-2031) is the inclusion of climate-responsive design to minimise energy consumption through maximising the solar orientation of buildings. Further concerns related to the quality and appropriateness of different types of public spaces (including parks) for the subtropical climate were raised by the Centre for Subtropical Design (2010). As the result, additional criteria were added to highlight the importance of features such

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<sup>831</sup> **S\_3.2.2**, p.99, p.98

<sup>832</sup> **S\_3.2.2**, p. 94; **S\_3.3.2**, p.154

as a high-quality public realm, a visible pedestrian network, and multipurpose linear parklands.

This illustrates that local institutions recognise that it is essential that housing developments consider climatic factors and the related need for passive design, and the lifestyle factors that create a sustainable and liveable outcome. Moreover, the recognition of the need to implement an efficient urban green structure to both enhance the ecological connectivity and healthy outdoor activity, motivated the production of governmental documents such as the *Corporate Plan 2008-12: 2010 Update* (2009) published by the Brisbane City Council.<sup>833</sup>

As seen in the previous discussions, an effective courtyard housing model that responds to Positive Development™ concepts – either in Australia or in other subtropical climates – needs to be closely coordinated by local governments to incentivise developers to embrace architectural and climate-responsive urban design criteria.<sup>834</sup> Both the urban design prototypes and the Collage Plan accomplish this by focusing on the importance of passive design applied to Brisbane’s subtropical climate and lifestyle. However, the use of local TOD guides is sometimes insufficient to accomplish a whole set of sustainable compactness and liveable urban design principles that include both passive design and urban green structure concerns. This could be achieved by the urban design prototypes proposed in this inquiry.<sup>835</sup>

The creation of similar comprehensive policies appropriate to each location can be facilitated by the institution of a multidisciplinary team to coordinate and manage new developments. This could be in the form of a statutory authority, with the mandatory objective of coordinating and self-funding the entire development process. These statutory authorities should define essential criteria, establishing planning and construction rules that combine passive design, urban green structure, and adequate TOD concerns. While aiming for these sustainable benefits, they also need to attract developers by allowing for a smart ratio of flexible changes that can

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<sup>833</sup> **S\_4.2.3, p. 190**

<sup>834</sup> Discussed in **S\_6.2.1, S\_6.2.2, S\_6.2.3**

<sup>835</sup> **S\_5.2.3 - Urban design principles, p.247**

respond to market demand, and by providing a facilitated construction approval process. The success of such authorities has been demonstrated in the case of the Parque das Nações (Parque EXPO) and Subiaco (Subiaco Redevelopment Authority) developments.

The benefits of the Collage Plan as a subtropical urban design model are corroborated by the comparisons made with the main housing typologies in Brisbane: the traditional standalone, the contemporary standalone and the apartment tower. In summary, the key benefit of courtyard housing schemes over the existing typologies would be the contribution to the subtropical lifestyle. This was concluded based on the quantitative figures presented on the ‘Comparison Table: Simulations and Schemes’ (DS\_48) and on the qualitative considerations discussed in Simulations and Collage Schemes Analysis (Section 5.2.5).

Based on these, when compared with the three main housing typologies currently in Brisbane, the Collage Plan provides more opportunities to contribute to subtropical design, urban green structures, and TOD criteria, and could deliver a more sustainable and liveable urban design model for Brisbane.

The implementation of the urban design prototypes in subtropical climates worldwide, furthermore, depends on the size of existing blocks allowing sufficient space for the designed courtyards to achieve their microclimate goals, to accommodate social activity and to improve communities’ health. Yet, this should be complemented by the adjacent green spaces to guarantee the comprehensive ecological connectivity of the urban green structure.

Moreover, the location of the block should allow for a sustainable relationship between a favourable solar orientation and prevailing winds. In the case of the CCH, this could possibly be achieved by changes in the building heights and in the location/dimension of the wind tunnels. However, implementation of the CH requires a different degree of orientation flexibility. Although the Zero-lot permits a wider implementation range in relation to the north, the L-Shape prototype requires a more flexible orientation to the prevailing wind.

The implementation of the prototypes in similar climatic conditions will

depend on other local factors such as the crime statistics, social status, and land value of a particular location. Taking subtropical São Paulo in Brazil as an example, I believe the implementation of CCH would be most feasible in a wealthy neighbourhood. This is exemplified by the successful Dolphin Square building in London, where the shared courtyards provide a very convenient and safe landscaped environment for the children and elderly residents. In my view, the L-Shape's expandable characteristics and easy accessibility through the courtyard are more likely to be successful in a less affluent neighbourhood, as seen in the PREVI example in Peru. The Zero-Lot, on the other hand, is more likely to succeed in a middle class neighbourhood.

It also needs to be said that the safety of the public transportation and pedestrian networks of many neighbourhoods could strongly limit the implementation of TOD characteristics. Furthermore, the achievement of a comprehensive green structure would be virtually unfeasible in less affluent neighbourhoods and favelas (slums).

As has been presented through the explanation of precedents, and tested by design, both CH and CCH prototypes can be grouped as a contemporary urban design model that could contribute to a community that is “economically, environmentally, socially healthy and resilient”<sup>836</sup> in expanding both the ecological base and the public state. Important however, would be the demonstration of the feasibility of sharing both natural resources and space in a communitarian approach that creates the opportunity to enhance both liveability and a sense of community.

It is concluded, therefore, that the urban design prototypes and the Collage Plan could make an effective contribution in Australia and other subtropical locations if the recommendations given above (in the discussion of the answers to the ancillary questions) are addressed. However, it is essential that these recommendations would be addressed within a coordinated strategic plan that encompasses all aspects of Positive Design, including local housing market preferences and local cultural considerations.

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<sup>836</sup> S\_1.3, p.4

While largely accepted at present, urban developments need to be adapted to suit the social and natural conditions of each location. The deployment of courtyard housing typologies, for example, can contribute to sustainable compactness in cities with a subtropical climate in the same way that it has been a resilient typology in other locations for eight thousand years. Through design, courtyard housing has adapted to the contemporaneous conditions created by climate, natural resources, lifestyle (social and cultural) and modes of production. This study has clearly demonstrated that it could also adapt to, complement, and enhance these conditions in the Brisbane context.

However, it is the conjugation of the inflectional forms prearranged by the lenses of inquiry that endorse the success of the courtyard housing typologies in the morphological urban play.



## Chapter 7: Conclusion

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This research aimed to demonstrate that courtyard housing typologies can contribute to liveable and sustainable urban communities in subtropical climates. It achieved this goal with the creation of an urban design model that combines courtyard housing with sustainable subtropical design, urban green structures, and TOD criteria.

More specifically, the study aimed to show that courtyard housing typologies are appropriate for Brisbane, where they are currently (and surprisingly) almost non-existent. Accordingly, I have shown that courtyard housing typologies are sustainable and liveable housing options when aligned with the sustainability concepts of Positive Design™ and Positive Development™. Moreover, I have also shown that the urban design prototypes can be positively applied within similar contexts in other parts of the world.

The practice-based methodology used in this study was appropriate for: i) designing the prototypes through the process of collecting and analysing available samples; ii) exploring the qualities of these samples; iii) generalising the findings; iv) grouping these findings according to consensual criteria; and, finally, v) refining/re-defining, and clarifying these processes to confirm the hypothesis. The use of this procedure in a recursive procedure (action routine –as generally used for similar design processes) was revised, with contemporary concepts used for developing software routines to compare and synthesise repetitive evaluation tasks. The action routine was essential for (re)evaluating items on the methodological chart, and thus facilitating the accomplishment of the course of action (**S\_2.1 and Drawing Set page 2 [DS\_2]**).

I managed the research process by working as a *bricoleur* does – collecting all available images and (re)combining them within an improvisation process that responds both to conscious (the program/lenses of inquiry) and subconscious (practice data recollection/intuition) parameters – to perform a series of sequential

tasks which, in practice, are generally distributed across a design team. These tasks were further enhanced by practice skills and new technology tools, and captured in collage form. Drawing on Colin Rowe's design notions and the Cornell Design Method (**Design Precedents – S\_3.1**) that I have utilised in my professional practice for over twenty years, I demonstrated that the collage process is an appropriate and efficient process in a practice-based research of this type.

Interviews with leading architects were important in clarifying concepts related to the feasibility of courtyard housing's implementation in Brisbane, Beijing and Lisbon according to building and block sizes, and to the thermal comfort instigated by natural airflow. Even though research participants were sceptical about the theme's focus on the challenges of courtyard housing design in different contexts, they provided invaluable information for the development of the prototypes and the Collage Plan. For instance, Peter Richards' own interest in the typologies developed after his first interview, and he became a 'guest critic' of this study. Furthermore, he has generated his own series of professional schemes under the title 'Courtyard Housing Taxonomy', and plans to apply the concept in his Brisbane architecture/urban design practice. In the same vein, John Taylor (the Air Science engineer interviewee) recently requested all my research references related to courtyard housing ventilation, and these will serve as supporting literature in a current consultancy he has been commissioned to undertake. These recent examples indicate that this research is significant to related disciplines, and suggest that the deployment of courtyard housing in subtropical climates is a much-needed addition to the housing industry/practice in these locales.

The selection of the three lenses of inquiry proved to be effective in providing a framework for the ancillary questions that tested the literature through the practice component, and in interrogating the themes in the exposition (that is, the written component) of the exegesis. The ancillary questions, in turn, served to provide a structure and a layout for both the exposition and the drawings (the practice component).

The first ancillary question – How can courtyard housing be designed to provide an adequate microclimate within a subtropical urban context? – was

answered by my proposition and illustration that subtropical design strategies can be applied to the utilisation of courtyard housing typologies. This application involves the adequate dimensioning of courtyards to provide winter solar exposure; the provision of double orientation dwellings with wide balconies that support views to both public and private/semi-private landscaped spaces; and the use of medium/low rise buildings and varied streetscapes. I have shown that these attributes could contribute to the mitigation of indoor/outdoor cooling and heating; to enhancing the permeability of living spaces; and to encouraging indoor/outdoor activities, which are intrinsic characteristics of Brisbane's subtropical lifestyle. In addition, the study combines traditional and contemporary landscape elements within the courtyards that could moderate their microclimate and increase thermal comfort.

This research clarified that the current courtyard housing attributes (**DS\_3**) could be used – in association with the relevant theory and best practice guidelines (**DS\_4**) – to respond positively to the requisites of both subtropical climate and lifestyle, in each specific urban design prototype (**DS\_9, 17, 25, 33**). Accordingly, these prototypes were tested through design to offer sustainable conditions inside/outside each dwelling (**DS\_12-15, 20-23, 28-31, 36-39**). The courtyard design demonstrates that its maximisation of thermal comfort conditions and ecological integrity could contribute a sustainable and liveable dwelling within the hierarchical system of the city's housing typologies (**DS\_57, 58**).

This study's findings align with the literature in confirming that:

- a. Courtyard housing prototypes should be defined, acknowledged, and underlined by a balance of typological attributes that respond to local contexts;
- b. It is critical to adhere to a pre-established ratio between the heights of the buildings, the width of the streets, and the dimensions of the courtyards to maximise winter solar exposure in accordance with local climatic conditions;
- c. Courtyards should provide conditions for passive cooling in the

summer, and wind protection in the winter;

- d. The recent/compact standalone housing type does not successfully meet the climatic and lifestyle requisites of subtropical climates.

The findings that do not align with the literature show that:

- a. CCH courtyard dimensions can be planned to provide climatic and visual benefits, but cannot provide the appropriate conditions to serve as an extendable space for recreational and lifestyle activities;
- b. Street widths can be determined independently of building heights in subtropical climates;
- c. Courtyard housing is suitable for dry subtropical climates, but is not recommended for humid subtropical climates;
- d. Shared spaces provided by apartment towers over car parks or terraces may provide the same microclimatic benefits that CCH courtyard spaces provide.

The second ancillary questions – How can courtyard housing provide an effective private and semi-private green space configuration in contributing towards a wider sustainable urban green structure? – was answered by demonstrating how the use of courtyard housing will be a significant benefit for Brisbane’s urban green structure.

Specifically, I have demonstrated that courtyard housing provides private/semi-private green spaces supportive of living systems within the built fabric. I have further demonstrated that this concept can continue through an extended network of public green spaces within the urban environment. This network, in turn, connects to wider natural systems to combine the human and natural functions that are essential for sustainable and liveable environments. This is particularly relevant in the inner suburbs surrounding the Brisbane CBD, where private green spaces are almost non-existent. Like the traditional backyards in Brisbane’s suburban areas, courtyards can ensure and enhance the natural flora/fauna, which is essential to the provision of an ecological continuum.

This inquiry is significant in that it demonstrates that courtyard housing can have an important role in creating a secondary green structure, which both complements the primary green structure and enhances ecological connectivity, if such housing is appropriately designed with areas of unsealed ground and specifications that respect the local flora (**DS\_50, 53, 54, 57, 58**). The Collage Plan demonstrates that a linear 'Creek Park' would make an important contribution to maintaining and enhancing the primary urban green structure, which is further supported by the subtropical boulevards and the courtyards that support the secondary green structure.

This study's findings support the literature evidence that the role of an urban green structure can only be accomplished with the ecological balance provided by both primary and secondary green structures. It also shows that, contrary to evidence in the literature, spaces located on sealed surfaces (for example, apartment tower typologies) can enhance urban green structures.

To answer the third question – Can courtyard housing typologies enhance the characteristics of TOD? – I argue that the courtyard housing prototypes are significant as they do incorporate and could enhance the TOD hallmarks. One of the reasons given for this argument is that the combination of CCH and CH can offer a diversity of land-use in an appropriate balance if it efficiently and harmoniously incorporates retail, commercial, service, and residential infrastructure that responds to local market demands.

I have demonstrated this point by presenting a range of apartments and houses of various typologies and sizes, which can be organised in various combinations to suit the neighbourhood's social integration. The dwelling designs provide sustainable benefits (such as energy savings and private/semi-private open spaces) that could add significant value to the private realm, and healthy and liveable communities that contribute to the intangible value of the public realm. These contributions are indications that the proposed courtyard housing prototypes could achieve a competitive position in the Brisbane real estate market.

Regarding the TOD hallmarks, this study's main significance is that it

demonstrates that CCH has the capacity to provide semi-private communal spaces, which offer an ideal stage for the formation of acquaintances, relationships, and neighbourly collaboration. Consequently, CCH could have advantage over other housing typologies in its ability to anchor a sense of community. The CH prototypes also offer this type of social stage through the inclusion of group-public plazas. Additionally, the height of the buildings and the 'double-edge' concept applied in the design of both CCH prototypes, provide more control of the public space than the apartment tower typology.

If suitably designed for the purpose, other housing typologies could also enhance the application of TOD characteristics. However, this inquiry argues that the proposed assemblage of courtyard housing prototypes presented in the Collage Plan can not only incorporate the significant TOD characteristic of accessibility, mixed use, and density, but could further enhance the sense of community offering semi-public spaces in the CCH prototypes and group-public spaces in the CH prototypes (**DS\_55-58**).

With regard to accessibility, this study demonstrates that the mediation of the Double-Grid of streets, in conjunction with a central multimodal station and a public plaza, is an important strategy in implementing a safe, hierarchical pathway network that enhances walkability, cycling, and efficient public transportation. It demonstrates that courtyard housing prototypes are able to provide walkable, safe and liveable public spaces throughout a legible, permeable and varied pathway network designed for mixed-use settings within a low/medium-rise building environment. Moreover, it demonstrates that courtyard housing's (net) density satisfies the medium/high-density values of local TOD requisites, and can be considered an 'activity centre' in the Brisbane housing context. Finally, it demonstrates that it is feasible to implement courtyard housing under the density goals of a compact community, and still attain an appropriate balance among building heights, urban blocks, courtyard dimensions, and dwelling sizes.

The study's findings align with the literature in:

- a. Recognising the importance of the human scale in the dimensioning of

- the blocks and the activation of the street edges;
- b. Supporting the value of passive surveillance for crime prevention through environmental design (CPTED);
  - c. Identifying the difficulties in attracting commercial/retail implementation according to the TOD dimensions, and of providing flexible diversity of uses – ranging from the ‘convenience centre’ type to the ‘activity centre’ type – in each prototype to match the TOD dimensions in response to contextual factors;
  - d. Recommending the creation of a simplified government development application process for TODs;
  - e. Recommending the single ownership of TOD sites, and their management by an autonomous statutory authority from inception to completion, in order to significantly improve their quality and delivery time.

The significance of the Collage Plan is that it provides the synthesis that demonstrates that courtyard housing prototypes can satisfy the requisites of the lenses of inquiry. It also demonstrates how these lenses might interrelate to provide sustainable and liveable communities (**DS\_55-56, 59-60**). The Collage Plan further demonstrates that Brisbane's orientation, and the width of many of its traditional blocks, can accommodate the urban design prototypes studied here (**DS\_42**). Accordingly, the findings do not align either with Timothy Hill's interview statement that the ‘intensity of streets’ is the only option for high-rise apartment towers, or with Leon Krier's statement in “Urban Components” that the courtyards implemented in small European blocks can provide enough balance between public space and courtyard gardens.<sup>837</sup>

Moreover, the Collage Plan serves to show the importance of courtyard housing prototypes in facilitating positive outcomes in energy efficiency, and the maximization of thermal comfort through the control of both natural airflow and

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<sup>837</sup> Krier 1984, *Urban components*

solar exposure. The compromise between ideal building orientation and prevailing winds was addressed in situ with wind simulations and design strategies, to validate the location of the prototypes within the preferred site. Solar and wind studies tested each prototype, and the final building settings illustrate that winter wind protection and summer breezes can be controlled through design mechanisms that contribute to the thermal comfort of the residents who use the courtyard space (DS\_61-64).

### ***Significance***

The relationship between sustainability, residential density, and housing typologies has previously been investigated in several studies; however, this inquiry more specifically focused on the utilisation of courtyard housing typologies under the lenses of subtropical design, urban green structures and transit oriented design. The value of establishing a relationship among these three components for new urban developments is promoted by Bajracharya et al. in “Greening transit oriented development and subtropical design” (2010).<sup>838</sup> However, this study represents the first application of their theory to be tested by design in Australia, in an urban design model that utilises both Communal Courtyard Housing (CCH) and Courtyard Houses (CH), and through a process such as the one verified in this inquiry.

This process intersected theory and practice by combining the lenses of inquiry with housing typologies, to plan and design a subtropical neighbourhood, using quantitative and qualitative urban design methods. The outcome of this intersection – a set of drawings of a comprehensive urban design scenario and its written justification – tested the feasibility of the courtyard housing typology, specifically, in response to the need for spatial, liveable and sustainable conditions for residential densification in a subtropical climate.

Therefore, this study is significant in that it offers an alternative to the current development patterns that perpetuate urban sprawl and over-densified city centres. By maximising the urban infill sites [brown-field] around railway corridors, the design research study shows that the urban design prototypes could satisfy

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<sup>838</sup> Bajracharya, et al. 2010, *Greening transit oriented development and subtropical design*



sustainable compactness, liveability, and social diversity in subtropical climates. The framework for the study draws on historical theory and critical practice captured through the drawings presented in the Drawing Set.

The apartment and house plans proposed in this study were developed in a collage procedure that incorporates concepts from a very large number of apartment/house types investigated over time. Nevertheless, these plans are innovative in that they are designed and dimensioned to create the appropriate attributes under the scope of the three lenses of inquiry. They also incorporate the principles of Live-Work and SoHo (small office/home office) spaces (to support the current trend towards an individual productivity mode), and the Liveable Housing Australia guidelines that encourage the creation of inclusive spaces.<sup>839</sup>

### ***Evidence of new knowledge***

This research makes a significant and unique contribution to architectural and design practice, and to the current body of research in the fields of Architecture and Urban Design. Specifically, the study:

- Articulates an original design approach in creating and applying comprehensive criteria to test courtyard housing against the premises of Subtropical Design, Urban Green Structures, and Transit Oriented Development – significant factors in the building of sustainable, liveable and socially diverse communities in compact city centres with a subtropical climate;
- Contributes to the consideration and provision of spatial efficacy, social diversity, and equity in future urban developments;
- Proposes, for the first time in Australia, an entire development incorporating both Communal Courtyard Housing (CCH) and courtyard houses (CH), in line with the requirements of Transit Oriented Development;
- Contributes innovative apartment and house floor plans with attributes appropriate to the scope of the three lenses of inquiry, the principles of Live-

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<sup>839</sup> S\_5.1.4, p. 228

Work and SoHo (small office/home office) spaces, and the universal design principles that meet the guidelines of Liveable Housing Design.

### ***Limitations of this study***

The plan definitions are indicative only, and are limited to representation in a preliminary collage. Similarly and understandably, the complexity of a master plan is beyond the scope of this research.

### ***Directions for future research***

Innovative planning prototypes are strong and fruitful platforms for future research in their field/s of application. This study is certainly no exception. Application/adoption of its outcomes will further require:

- A cost-effectiveness analysis of the courtyard typologies proposed, compared to existing high-rise typologies in Brisbane
- The development of studies to evaluate the economic viability of the urban design prototypes within local housing markets
- Studies to define the typologies' practical architectural/urban limitations and solutions, using urban design prototypes in terrains with higher topographic inclinations
- Studies to identify the social/cultural values related to the private/communal spaces provided by courtyard housing in diverse subtropical locations
- Studies using computational fluid dynamics (CFD) modelling software applied on more elaborated volumes – with windows and balconies arranged within a street layout and adjacent buildings – to provide more detailed results that are conducive to construction
- The development of proposals for a coherent and comprehensive urban green structure for Brisbane through the identification of its primary and secondary green structures, and the determination of formal regulations to specify and ensure their maintenance

I believe that the continuation of this research in these stages could lead to an exciting future for urban development in Brisbane – development that not only meets the current liveability, sustainability and social diversity guidelines, but which also serves to both retain and ‘brand’ Brisbane’s quintessentially subtropical lifestyle.



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# Appendices

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## Appendix A: Glossary of terms

**Amenity:** The qualities of a location in regard to noise, vibration, dust, odour, air quality, lighting, daylight, glare, breezes and shade, freedom from hazard or risk of threats to health and well-being of occupants, and the uninterrupted ability to use and enjoy the land for the purpose it was designed, that may be affected by the level, time and duration of activities on nearby sites or the impacts of natural hazards, including spatial and temporal impacts.

<http://eplan.brisbane.qld.gov.au/CP/Definitions#Amenity>

**(New) atrium:**

A high interior usually having a glass roof and surrounded by several stories of galleries or the like.  
*Random house dictionary of the English language*

A centroidal, interior, daylight space which organises a building.

Bednar, Michael J. 1986. The new atrium, The McGraw-Hill building types series. New York: McGraw-Hill. ix

**Brief for Architectural Services:** the project brief is the document that provides the instructions to the project team of what the Client expects from a project ... It is a document that provides the necessary information to describe the rationale, purpose, goals, costs, risks, constraints and time and performance requirements of a project.

*Preparation of a Brief for Architectural Services.* 2011. NSW Government Procurement Practice Guide. Sydney: NSW Government. <http://www.nswprocurement.com.au/Procurement-System-for-Construction/Standard-form-documents/Consultancy-services/Preparation-of-Brief-for-Architectural-Services-v1.aspx>.

**Climate:** the sum or synthesis of all the weather recorded over a long period of time. It tells us the average or most common conditions, (the mean temperature, the prevailing wind...) or extremes (the greatest rainfall, strongest wind...) or counts of events (the number of rainy days) or probabilities (how likely are three consecutive hot days in January?)

<http://www.bom.gov.au/climate/environ/other/climweather.shtml>

**Cour d'honneur** (court of honor): is the architectural term for a three-sided courtyard, created by flanking the main central block, or *corps de logis*, with symmetrical advancing secondary wings containing minor rooms.

[http://en.wikipedia.org/wiki/Cour\\_d'honneur](http://en.wikipedia.org/wiki/Cour_d'honneur)

**Design (urban) prototype:** is a conceptual schema for representing a class of a generalized grouping of elements, derived from like design cases, which provides the basis for the commencement and continuation of a design. Design prototypes do this by bringing together in one schema all the requisite knowledge appropriate to that design situation.

**Double-loaded corridor:** A corridor with dwellings on each side

<http://housingprototypes.org/glossary>

**Double orientation** (sometimes mentioned as **dual aspect apartments** or **full depth dwelling**):

Apartment that has openings on two sides, usually the ends.

<http://housingprototypes.org/glossary>

**Evapotranspiration:** the conversion of water to water vapour, from the soil by evaporation and from plants by transpiration; the amount of water so lost.

OED Online. March 2013. Oxford University Press. Accessed 2013-04-12

<http://www.oed.com.ezp01.library.qut.edu.au/view/Entry/65229?redirectedFrom=evapotranspiratn>

**Floor area, gross:** The floor area within the inside perimeter of the exterior -walls of the building under consideration, exclusive of vent shafts and courts, without deduction for corridors, stairways, closets, the thickness of interior walls, columns or other features. The floor area of a building, or portion thereof, not provided with surrounding exterior walls shall be the usable area under the horizontal projection of the roof or floor above. The gross floor area shall not include shafts with no openings or interior courts.

International Code Council. 2011. *International Building Code (ICC IBC 2012)*. Country Club Hills, Ill.: International Code Council. Accessed 2013-06-09. <http://archive.org/details/gov.law.icc.ibc.2012>, p23

**French hôtel:** Houses of the wealthy French society generally presenting a front yard for horse carts access and a picturesque courtyard. Dennis, Michael. 1986. *Court and garden: from the French hôtel to the city of modern architecture*. Cambridge, Mass.: MIT Press.

**Ensanche** means "widening" in Spanish. It is used to name the development areas of Spanish cities around the end of the 19th century, when the demographic explosion and the Industrial Revolution prompted the tearing down of the old city wall and the construction of neighborhoods under grid plans. Wikipedia. Accessed 2013-08-16. <http://en.wikipedia.org/wiki/Ensanche>

**Floor area, net:** The actual occupied area not including unoccupied accessory areas such as corridors, stairways, toilet rooms, mechanical rooms and closets.

International Code Council. 2011. *International Building Code (ICC IBC 2012)*. Country Club Hills, Ill.: International Code Council. Accessed 2013-06-09. <http://archive.org/details/gov.law.icc.ibc.2012>, p23

**Green space:** "Green space land, whether publicly or privately owned, consists of predominantly unsealed, permeable, 'soft' surfaces such as soil, grass, shrubs, trees and water."

James, P., Tzoulas, K., Adams, M. D., Barber, A., Box, J., Breuste, J., Elmqvist, T., *et al.* 2009. "Towards an integrated understanding of green space in the European built environment." *Urban Forestry & Urban Greening* 8 (2): 65-75. <http://www.sciencedirect.com/science/article/pii/S1618866709000144>

**Green structure:** "all green areas of a city, private as well as public, gardens as much as areas of meadowland, woodland as much as parks or church yards, and even rivers, wetlands, ponds, etc."

Thorén, Kine Halvorsen. 2000. "'The green poster' A method to evaluate the sustainability of the urban green structure." *Environmental Impact Assessment Review* 20 (3): 359-371.

<http://www.sciencedirect.com/science/article/pii/S0195925500000470>, 362

**Housing:** "Houses or buildings collectively; *spec.* property consisting of houses or other dwellings"<sup>840</sup>

**Dwelling house:** "A residential use of premises for one household that contains a single dwelling. The use includes outbuildings and works normally associated with a dwelling and may include a secondary dwelling" (Brisbane City Plan 2014, Schedule 1 Definitions)<sup>841</sup>

**Multiple dwelling:** "Premises that contain three or more dwellings [units] for separate households" (Brisbane City Plan 2014, Schedule 1 Definitions)<sup>842</sup>

**Dwelling unit:** "A single dwelling within a premises containing non-residential use(s)" (Brisbane City Plan 2014, Schedule 1 Definitions)<sup>843</sup>

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<sup>840</sup> "housing, n.1". OED Online. September 2013. Oxford University Press. Accessed 2013-11-15

<http://www.oed.com.ezp01.library.qut.edu.au/view/Entry/88956?rskey=pWHjna&result=1>

<sup>841</sup> Brisbane City Council 2014, *Brisbane City Plan 2014*

<sup>842</sup> *Ibid.*

<sup>843</sup> *Ibid.*

**Hyperhouse:** “The term refers to the capacity of such houses to have a multidimensional programme or complementary uses that can generate an income through the inclusion of small businesses or rooms for rent.” Endnote in García-Huidobro, et al. 2011, *The Experimental Housing Project (PREVI)*, Lima: The Making of a Neighbourhood 31

**Iwan:**” is defined as a vaulted hall or space, walled on three sides, with one end entirely open. Iwans were a trademark of the Sassanid architecture of Persia, later finding their way into Islamic architecture. This transition reached its peak during the Seljuki era, when iwans became established as a fundamental design unit in Islamic architecture. Typically, iwans open on to a central courtyard, and have been used in both public and residential architecture.”

<http://www.websters-online-dictionary.org/definitions/iwan>

**Lifestyle:** the type of life that you have, for example the type of job or house you have or the type of activity you like doing

<http://www.macmillandictionary.com/thesaurus-category/british/ways-of-life>

**Open space:** “... refers to land that has been reserved for the purpose of formal and informal sport and recreation, preservation of natural environments, provision of green space and/or urban storm water management.”

<http://www.healthyplaces.org.au/userfiles/file/Parks%20and%20Open%20Space%20June09.pdf>

**Private open space (POS):** An outdoor area of a dwelling or residential building or land for the exclusive use of the occupants.

<http://planningschemes.dpcd.vic.gov.au/schemes/vpps/72.pdf>

**Semi-private open space:** “consist of communal open space (shared by residents of the [housing] complex)”

[http://www.planning.act.gov.au/\\_data/assets/pdf\\_file/0018/23409/private\\_open\\_space.pdf](http://www.planning.act.gov.au/_data/assets/pdf_file/0018/23409/private_open_space.pdf)

**Public open space:** “Current definitions include local, neighbourhood district or regional open space and if considered, function is described as active or passive only. PLA WA proposes that the definitions ... [would include] community (COS), active (AOS) and environment (EOS) open space.”

<http://www.parksleisure.com.au/documents/item/1033>

**Passive design:** design that does not require mechanical heating or cooling

Reardon, Chris & Australian Greenhouse Office. 2010. “Your home : Australia's guide to environmentally sustainable homes. technical manual”, edited by Dept. of Climate Change and Energy Efficiency. Canberra.

**Point access:** Form of building access that consists of a repeating vertical core of elevators and stairs serving one or more dwellings per floor.

<http://www.housingprototypes.org/glossary>

**Privacy domains:**<sup>844</sup> “...urban hierarchy of spaces and realms for community and privacy...”

**Urban-Public** [public]: “The places and facilities in public own ship: highways, roads, paths, civic parks”

**Urban-Semi-public** [semi-public]: “The special areas of public use under government and institutional controls: city halls, courts of justice, public schools, post offices, hospitals, transportation exchanges, parking lots, garages, service stations, stadia, theaters”

**Group-Public:** “The meeting ground between public services and utilities and private property requiring joint access and responsibility: places requiring mail delivery, garbage collection, utilities control, access to fire-fighting equipment or other emergency rescue devices”

**Group-Private** [semi-private]: “Various secondary areas under control of management acting on behalf of private or public interest for the benefit of tenants or other legal

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<sup>844</sup> All quotes below until ‘Housing’ from Chermayeff and Alexander 1963, *Community and privacy; toward a new architecture of humanism* 121,122

occupants: reception, circulation, and service spaces; community gardens; playgrounds; laundries; storage; etc”

**Family Private** [private]: “The spaces within the private domain controlled by a single family that are devoted to communal family activities such as eating, entertainment, hygiene, and maintenance”

**Individual-Private**: “The ‘room of one’s own,’ the inner-most sanctum to which individuals may withdraw from their family”

**Public open space**: “Current definitions include local, neighbourhood district or regional open space and if considered, function is described as active or passive only. PLA WA proposes that the definitions ... [would include] community (COS), active (AOS) and environment (EOS) open space.”

<http://www.parksleisure.com.au/documents/item/1033>

**Public Park**: public land devoted to recreational activities of all the people

**Public Space**: “... a social space that is generally open and accessible to people. Roads (including the pavement), public squares, parks and beaches are typically considered public space. To a limited extent, government buildings which are open to the public, such as public libraries are public spaces, although they tend to have restricted areas and greater limits upon use.”

[http://en.wikipedia.org/wiki/Public\\_space](http://en.wikipedia.org/wiki/Public_space)

**Scaffolding**: temporary framework of platforms and poles constructed to provide accommodation for workmen and their materials during the erection, repairing, or decoration of a building.

Dictionary, Oxford English. “*scaffolding, n.*”: Oxford University Press.

<http://www.oed.com/view/Entry/171685>.

**Scenario**: a synoptic collage of an event or series of actions and events.

<http://en.wikipedia.org/wiki/Scenario>

**Semi-private access**: Access usually directly from vertical circulation where the entrance is to 2 to 4 dwellings per floor.

<http://www.housingprototypes.org/glossary>

**Single aspect (single orientation)**: Dwelling that has windows only along one side

<http://www.housingprototypes.org/glossary>

**Single-loaded corridor**: Plan organization where all the dwellings are along one side of the access corridor.

<http://www.housingprototypes.org/glossary>

**Solar exposure**: averaged amount of daily solar energy reaching a specific location on the Earth’s surface in a calendar month or year.

<http://www.bom.gov.au/climate/cdo/about/definitions/other.shtml>

**Subtropical design**: “The subtropical climate allows people to enjoy being outdoors all year round. Subtropical design is a way of embracing this condition in the urban environment, to achieve sustainable urbanism and maintain a sense of place. Openness and permeability and a strong engagement with the natural environment are the main characteristics of well-designed subtropical places.”

Centre for Subtropical Design. 2013. “What is subtropical design?” Accessed 2013-01-15.

[http://www.subtropicaldesign.org.au/index.php?option=com\\_content&task=view&id=18&Itemid=19](http://www.subtropicaldesign.org.au/index.php?option=com_content&task=view&id=18&Itemid=19).

**Thermal comfort**: that condition of mind that expresses satisfaction with the thermal environment Office of Regulatory Services 2012. “Work Safe ACT: Thermal Comfort”, edited by ACT Department of Justice and Community Safety. Canberra: Work Safe ACT

**Transit oriented Development:** “compact mixed-use community, centered around a transit station that, by design, invites residents and workers and shoppers to drive their cars less and ride mass transit more.”

Bernick and Cervero 1997, *Transit villages in the 21st century*, 5

**Urban density:** The number of people inhabiting an urban area

**Residential density:** The number of dwellings per hectare

**Net residential density:** “The built form' [is] the ratio of the number of dwellings to the area of land they occupy including internal public streets, plus half the width of adjoining access roads that provide vehicular access to dwellings.”<sup>845</sup>

**Gross residential density:** “...includes residential uses, local roads plus local non-residential land uses such as parks and schools.”<sup>846</sup>

**Urban fabric:** The physical aspect of urbanism, emphasizing building types, thoroughfares, open space, frontages, and streetscapes but excluding environmental, functional, economic and socio-cultural aspects

[http://en.wiktionary.org/wiki/urban\\_fabric](http://en.wiktionary.org/wiki/urban_fabric)

**Way of life:** a typical way in which a person or group lives

<http://www.macmillandictionary.com/thesaurus-category/british/ways-of-life>

**Weather** is a description of conditions over a short period of time - a “snapshot” of the atmosphere at a particular time

<http://www.bom.gov.au/climate/environ/other/climweather.shtml>

**zeilenbau:** German term, translates as building in a line; usually applied to housing slabs several stories high, arranged in parallel rows open at the ends in an east-west orientation, type commonly associated with functionalist/neue sachlichkeit housing projects of the 1920's beginning in Germany but used in many countries. Also used as a pejorative term to describe any organization of minimalist housing slabs arranged in parallel, open-ended rows; also applied to a single minimalist east/west slab with blank ends and minimal detail.

<http://www.housingprototypes.org/glossary>

**Zhou li (Rites of Zhou):** is one of three ancient ritual texts listed among the Nine, Twelve, and Thirteen Classics of Confucianism. Though tradition ascribed the text to the political figure Zhougong (flourished 12th century BC), the work is considered by modern scholars to have been an anonymous utopian “constitution” written perhaps about 300 BC. For many centuries **Zhouli** was joined to *Liji* (“Record of Rites”) and thus constituted one of the Six Classics (*Liujing*) of Chinese literature.

Encyclopaedia Britannica, <http://www.school.eb.com.au.ezp01.library.qut.edu.au/all/eb/article-9082372?query=zhouli&ct=null>

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<sup>845</sup> Landcom 2011, *Residential density guide*, 10

<sup>846</sup> Ibid. 8





## Appendix B: Brief history of Brisbane plans

This description served to understand the historical character of Brisbane's in the planning background and the nature of the housing models used in the city's settlement.

### Choosing the site

Lachlan Macquarie was the Governor of the British penal colony of New South Wales (NSW) from 1810 to 1821.<sup>847</sup> His radical beliefs in the reformation and readmission of ex-convicts into society promoted the appointment of some of these so-called emancipists<sup>848</sup> to positions of importance within the emergent colonial community. Macquarie's initiative, however, generated an increasing number of complaints denouncing arbitrary acts of administration, which were sent to the Secretary of State for the Colonies in London by a hostile "group of influential landholders and military officers".<sup>849</sup>

Accordingly, the British Secretary of State Henry Bathurst<sup>850</sup> was questioned about the validity of the colony as a means of convict apprehension and reformation, along with the increasing expenditures of the colony. He therefore decided to open a commission of inquiry, headed by John Bigge, in 1819. As part of other instructions, Bigge was required to consider "forming on other parts of the Coasts or in the Interior of the Country, distinct Establishments exclusively for the

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<sup>847</sup> McLachlan 2012, *Macquarie, Lachlan (1762–1824)*

<sup>848</sup> Emancipists: "convicts who had served their time or been pardoned". "By promoting emancipists of ability, Macquarie recognised that, with convicts far outnumbering free settlers, a policy of rewarding merit would contribute to the colony's welfare and ultimately its prosperity." *Exhibition: Macquarie the Governor, 1810 to 1821 Exhibition: Macquarie the Governor, 1810 to 1821*; One example of these appointments was the architect Francis Greenway who was transported to Australia after being accused of forgery in England. Greenway became the first colonial architect to receive direct commissions from Macquarie to make projects for public buildings. Herman 2012, *Greenway, Francis (1777–1837)*

<sup>849</sup> *Exhibition: Macquarie the Governor, 1810 to 1821 Exhibition: Macquarie the Governor, 1810 to 1821*

<sup>850</sup> Henry Bathurst, 3rd Earl of Bathurst, Secretary of State for War and Colonies (1812–1827) in the government of British Prime Minister Lord Liverpool. 2012, *Macquarie, Lachlan (1762–1824)*

Reception and proper Employment of the Convicts who may hereafter be sent.”<sup>851</sup>

On June 1822, Bigge produced three extensive reports where, along with many other recommendations, he proposed the location of new penal settlements to the north of Sydney for two reasons. One was the topographic features of the northern harbours, the other was the considerable distance these locations would have from Sydney “to effect an entire separation of this body of convicts from the mass of the population.”<sup>852</sup> He suggested three places for the establishment of new settlements – Port Bowen, Port Curtis (Gladstone) or Moreton Bay –emphasising the beneficial characteristics of Port Bowen. He did not visit the suggested locations but he mentioned the precise location of Moreton Bay (27°30' south latitude, 386km – or 240 miles – from Port Macquarie), probably based on the findings of Mathew Flinders explorations in 1799.<sup>853</sup>

On September 1822, Bathurst sent a despatch to the new Governor of New South Wales and Van Diemen's Land, Major-General Sir Thomas Brisbane, advising the appointment of Surveyor-General John Oxley to examine the three sites suggested by Bigge and, as a result, to present a report recommending the most adequate location for the new penal settlement. Oxley left Sydney on 23 October 1823 on board of the cutter *Mermaid*, arrived at Port Curtis (Gladstone) on 6 November and stayed 15 days, exploring the Boyne River and the land around it.<sup>854</sup>

Contrary to Bigge's recommendation, Port Bowen was never visited for, after Oxley's decision, the *Mermaid* sailed south to Moreton Bay where the expedition found the castaways Finnegan and Pamphlet on 29 November at Bribie Island.<sup>855</sup> In the first days of December, Finnegan guided Oxley as far as Goodna in a three-day exploration of the river that was named Brisbane, after the Governor's name. Other explorations included the islands in the southern part of the bay until 6 December,

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<sup>851</sup> [Enclosure No. 2.] "Earl Bathurst to Mr. Commissioner Bigge" in *Historical records of Australia* 1917a, *Historical records of Australia*, 6 (REPETITION)

<sup>852</sup> Bigge 1822, *Report of the Commissioner of Inquiry into the state of the colony of New South Wales*, 164

<sup>853</sup> *Ibid.*, 164

<sup>854</sup> Sheehan 2000, *Too good a site for a gaol*, 5

<sup>855</sup> Fisher and Brisbane History Group 1999, *Brisbane timeline : from Captain Cook to CityCat*

when the expedition sailed south to Sydney.<sup>856</sup> On his arrival, reporting to colonial secretary Frederick Goulburn in January 1824, Oxley mentions that Red Cliff was more of a strategic site, centrally located in relation to the bay, appropriate for a Military Post and Depot for Stores.<sup>857</sup> The Brisbane River, however, was regarded as ideal for a permanent settlement, namely a site near the mouth of a creek.

... I think a permanent Settlement would be more advantageously formed on the West Side of the River at the termination of Sea Reach. The River here is not fresh, but there is plenty of fresh water, the country open, and no obstacles exist from Swamps or hills to prevent ready communication with the interior either by the River itself or at a distance from it. From a hill near this last Station the entrance of the Bay can be seen; and by clearing away a few trees, a communication by Signal may be held with Red Cliff point. The ground is dry, the Soil good and it perceives the full force of the Sea breezes.<sup>858</sup>

In a letter dated 24 August 1824, Thomas Brisbane appointed Lieutenant Henry Miller as commandant of the troops in a settlement to be created in Moreton Bay. To be seen later in this section, Miller will transcend this military appointment and have a decisive role in the location of the new town.

The principal object in view in forming this establishment is to provide a place of security and subsistence for runways from Port Macquarie. You are to be guided by the judgement of the Surveyor General, who accompanies you, in the selection of a location for the new settlement. Your first attention immediately on arrival is to be directed to the choice of an airy situation contiguous to fresh water for the site of your encampment ... It being intended that the new establishment shall within a short space of time subsist entirely on its resources.<sup>859</sup>

The next day – possibly feeling special care would be required in dealing with the Australian natives – Brisbane's private secretary, J. Ovens, sends a second letter to Miller, where he justifies the British occupation of the native's land.

In order to insure an amicable understanding with the Black Natives, good faith must be ever be your guide, in your public dealings with them ... All uncivilized people have wants, which can be cheaply and honourably gratified by us; and when treated justly, they acquire many comforts by their union with the more civilized.

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<sup>856</sup> Sheehan 2000, *Too good a site for a gaol*, 5

<sup>857</sup> Steele 1975, *Brisbane Town in convict days, 1824-1842*, 5

<sup>858</sup> *Historical records of Australia* 1917b, *Historical records of Australia*, 221

<sup>859</sup> Steele 1975, *Brisbane Town in convict days, 1824-1842*, 3

This justifies our occupation on their lands.<sup>860</sup>

The native inhabitants of the Moreton Bay area were the Turrbal people. Their laws were unwritten but kept in paintings, dances, songs and stories – dreaming stories – that “passed down from one generation to the next.”<sup>861</sup> “They never developed a system of crop growing or animal husbandry, partly because of the poor soils and the dry, variable climate.”<sup>862</sup> Due to the abundance of food, the native Moreton Bay population (estimated to be 5000 people) had a sedentary lifestyle, a quite different way of life from the natives of other parts of the New South Wales territory.<sup>863</sup> The fluvial system played a substantial role in their life for they were predominantly anglers.<sup>864</sup> Turrbal people occupied the land limited north by the North Pine River, south by the Logan River, west by Moggill Creek and east by the sea.<sup>865</sup>

The most relevant Turrbal mob (clan) for this inquiry was the one led by Daki Yakka – which name became anglicised to 'Duke of York'<sup>866</sup> for “the area immediately north of the Brisbane River belonged to the Duke of York’s clan. The

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<sup>860</sup> Ibid., 4

<sup>861</sup> Barambah 2011, *Relationship and Commuality: an Indigenous Perspective on Knowledge and Expression*, 157

<sup>862</sup> O'Shea 2010, *History of Chermside and District*

<sup>863</sup> Evans 1992, *The mogwi take mi-an-jin: race relations and the Moreton Bay penal settlement 1824-42*, 10; Gregory 1996, *The Brisbane River story : meanders through time*, 3,6

<sup>864</sup> Gregory 1996, *The Brisbane River story : meanders through time*, 2

<sup>865</sup> Petrie 1904, *Tom Petrie's reminiscences of early Queensland*, 4-5; “Within the Turrbal tribe were smaller family groups, which are often referred to as “clans”. Today, rather than use the term “clans”, Aboriginal Australians use “mobs” ... Within the Turrbal country, for example, we had the Daki Yakka mob which occupied the Brisbane City to the Pine River in the north [Duke of York's clan]; the Dalaipi mob which occupied the North Pine/Caboolture areas; the Mulrobin mob which occupied the southside of the Brisbane River/Coorparoo areas; the Yerongpan mob which occupied the Yerongpilly/south-west Brisbane area; the Chepara mob which occupied the area south to Logan; and the Ningy Ningy mob which occupied the Redcliffe/Deception Bay and the Toorbul Point areas.” Barambah 2011, *Relationship and Commuality: an Indigenous Perspective on Knowledge and Expression*, 156-157

<sup>866</sup> I prefer to believe in this version of the meaning 'Duke of York' given by Barambah as she is a direct descendent of Daki Yakka. Barambah 2011, *Relationship and Commuality: an Indigenous Perspective on Knowledge and Expression*, 159; O'Shea, nevertheless, asserted that the “title came from the habit of an old Aborigine in the 19th Century who used to play a button accordion and a favourite tune of his people was ‘The Grand Old Duke of York’; gradually the name was applied to the clan.” O'Shea 2010, *History of Chermside and District*; Further, Cryle describes the leader as “... Duke of York, the acknowledged elder of the local clan. Foster Fyans the Moreton Bay military commandant ... described him favourably as 'stout old looking fellow' upward of forty years – a proud and skilful fisherman as befitted the leader of a riverine people.” Cryle 1992, *Snakes in the grass*

clan camped at various locations throughout the district. During the early years of Brisbane's development, the Duke of York's clan had a large camp at York's Hollow, now part of Victoria Park and the exhibition grounds."<sup>867</sup> The creek called Ya-wa-gara [Enoggera] – meaning a place for corroboree<sup>868</sup> – was essential for fishing and for raising a long white worm called kan-yi [kambi] in logs that they piled under the water.<sup>869</sup>

Governor Brisbane's letter to Oxley on 30 August asserted that, "in case of falling in with the natives of the country, to use every means of conciliating their good will towards you ..." But the Governor's emphasis – in five of the eight written instructions – was the request of detailed survey of the river. The botanist Allan Cunningham was nominated "to assist in the selection of a site for the settlement, and to collect specimens during the exploration of the Brisbane River".<sup>870</sup> Therefore, the brig *Amity* sailed from Sydney the next day, bringing Oxley, Cunningham, soldiers (with wives) and 29 convicts to Moreton Bay, where they arrived on 12 September. Two days later, the first convict settlement was established at Red Cliff (now Redcliffe), near Humpybong Creek.<sup>871</sup>

On the following days, Lieutenant Butler, Oxley and Cunningham surveyed the river in two rowing boats with nine boatmen and servants, marking the beginning of a period of scientific assessment of the river's natural characteristics; a work continued in 1828 by the botanist Charles Fraser. Unlike in the first exploration during the rainy season (December) in the previous year, at this time (September) – besides the extensive marks of the alluvial areas along the river – they noticed the signs of the existent drought. They camped near the mouth of the Enoggera Creek on 16 September.<sup>872</sup> The choice of the place for camping that night intended to substantiate Oxley's previous recommendation of the definite settlement

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<sup>867</sup> 2004, *Historical overview: Roma Street Parkland Precinct*, 2

<sup>868</sup> Evans 1992, *Wanton outrage*, 81; Corroboree, n.- The native dance of the Australian aborigines; it is held at night by moonlight or a bush fire, and is either of a festive or warlike character. Oxford English Dictionary, Second edition, 1989; online version December 2011. <http://www.oed.com.ezp01.library.qut.edu.au/view/Entry/41991>; (accessed 2012/02/15).

<sup>869</sup> Gregory 1996, *The Brisbane River story : meanders through time*

<sup>870</sup> Steele 1975, *Brisbane Town in convict days, 1824-1842*, 7

<sup>871</sup> Fisher and Brisbane History Group 1999, *Brisbane timeline : from Captain Cook to CityCat*

<sup>872</sup> The drought also affected the previously surveyed level of salinity to 26km (16 miles) up the river. Gregory 1996, *The Brisbane River story : meanders through time*, 4,21-22

location.<sup>873</sup> Next morning, even without finding drinkable water nearby, Oxley writes in his diary that he had found nothing to alter in his former report.<sup>874</sup> They continued the journey up the river after breakfast. As for the creek he had earlier mentioned, it was referred to as Breakfast Creek from then on.<sup>875</sup> Part of that year's exploration also led to the discovery of another river that converged with the Brisbane River. It was called the Bremer River.

By November 1824, Governor Brisbane visited Moreton Bay, bringing an executive party from Port Macquarie. "After going about thirty miles up the Brisbane River in boat, the Governor endorsed Oxley's original suggestion that the best place for a settlement on the river was the mouth of Breakfast Creek".<sup>876</sup> The settlement would have the Scottish name Edinglassie<sup>877</sup>, "however, it was decided that it was more politic to name it after the Governor of the day".<sup>878</sup> Following the agreed decision of the preferred location, Gipps instructed Lieut. Miller to move the settlement from Red Cliff (Redcliffe) to the selected location, which is now where Newstead House stands.<sup>879</sup> Surprisingly, "it seems that Miller ignored the Governor's wishes and took upon himself to select the site, near the present Victoria Bridge, 17 miles from the mouth [of the Brisbane River], instead of the 9 or 10 miles intended by the Governor".<sup>880</sup> By May 1825, Miller therefore established

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<sup>873</sup> Oxley on 28 September stated on his diary that he landed looking for water on Frew Park, Milton. He described the place as "by no means an eligible place for a station for a first settlement up the river". This has sometimes been inaccurately interpreted as being a site near Roma Street which would attribute to him the choice of that place as the recommended one for the settlement. Steele 1972, *The explorers of the Moreton Bay District, 1770-1830*, 149; Steele 1975, *Brisbane Town in convict days, 1824-1842*, 16

<sup>874</sup> Steele 1972, *The explorers of the Moreton Bay District, 1770-1830*, 134

<sup>875</sup> Thyer 2008, *Ray Thyer's 19th century chronology - years 1800 to 1900: a wonderful journey through time of the beautiful city of Brisbane, Queensland, Australia*, 12. The creek is still called Enoggera until it meets the waters from Ithaca Creek.

<sup>876</sup> Steele 1975, *Brisbane Town in convict days, 1824-1842*, 21

<sup>877</sup> Some authors mention the name as Edenglassie (see Steele 1972, 177). However, Edinglassie seems to be more correct. As mentioned by the Queensland Governor Penelope Wensley, "... Edinglassie, most likely a combination of the names of Scotland's two largest cities, Edinburgh and Glasgow. The name was bestowed by Chief Justice Forbes, but apparently 'fell out of favour with many residents' and was changed. No wonder - and thank heavens!" However, it is possible that "the meaning of 'Edinglassie' is derived from 'Eudan-glasaich' (written in old Scottish and phonetically spelt) which means, 'hill face of the pasture' or 'ley-land'." See McConchie and McConchie 1999, *Name of Edinglassie*

<sup>878</sup> 2009, *Heritage Collections-FAQ*

<sup>879</sup> Thyer 2008, *Ray Thyer's 19th century chronology - years 1800 to 1900: a wonderful journey through time of the beautiful city of Brisbane, Queensland, Australia*, 14

<sup>880</sup> Steele 1975, *Brisbane Town in convict days, 1824-1842*, 27

the Moreton penal settlement on his own preferred location.

Meanwhile, Oxley's report was sent to Bathurst who, impressed by the qualities of the described location, suggested the re-occupation of Norfolk Island for a convict establishment and disapproved the creation of a penal settlement in Moreton Bay, considering the region more appropriate for free colonisation.<sup>881</sup> Governor Brisbane did not follow the Secretary's requests, for Miller was already dispatched to establish a settlement on the banks of the Brisbane River. On 21 May, the Governor wrote to the Secretary of State, defending the establishing of the penal settlement in Moreton Bay as an introductory stage for future colonisation, mentioning the restrictions of space of Norfolk Island had to maintain a large amount of convicts as well as the inappropriateness of the place for minor offences convicts.<sup>882</sup>

Some irregularities had been found in the management of the new settlement's governmental stores, which might have caused the arrival of Captain Peter Bishop in August 1825 with orders from Governor Brisbane to replace Miller "in consequence of the little exertion manifested by me [Miller] in the duties of the appointment".<sup>883</sup> However, it is more likely that Miller's dismissal was caused by his misplacement of the settlement. By December 1825, Governor Brisbane was replaced by Lieutenant-General Sir Ralph Darling, who received the approval from Bathurst to maintain the new Moreton Bay settlement for short-term convicts, as suggested by Governor Brisbane.

Thereafter, the qualities of the site chosen by Miller were questioned. *The Australian* (18 September 1826) mentioned the redundancy of ineffectiveness in choosing the sites for the Moreton Bay settlements and asserted that the second settlement site was "badly watered" as a well had "been sunk almost to centre of the earth, and ineffectually."<sup>884</sup> The site was also appointed as having an inappropriate distance from the bay as it created navigation difficulties for larger

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<sup>881</sup> Sheehan 2000, *Too good a site for a gaol*, 9

<sup>882</sup> HRA Series I, vol. 11, 604 in Steele 1975, *Brisbane Town in convict days, 1824-1842*, 29-31

<sup>883</sup> Miller's words in a letter sent to Lieut. Col. Balfour in April 1826. *Ibid.*, 36

<sup>884</sup> *Ibid.*, 65-66. *The Australian* was William Charles Wentworth's newspaper and has no connection to today's newspaper of the same name.

boats. After a visit to Moreton Bay in September 1827, Governor Darling wrote to Secretary of State Viscount Goderich, mentioning the location of the settlement was “highly objectionable [because] the tediousness and difficulty of the access render it extremely inconvenient”.<sup>885</sup> (Fig.158)

As a conclusion, one should recognise that the choice of the Moreton Bay Penal Colony site was a consequence of a series of unattended recommendations. Surveyor Oxley never inspected Port Bowen, Lieut. Miller did not locate the penal settlement in the place indicated by Oxley and Governor Brisbane did not follow Secretary of State Bathurst's recommendation of making a free settlement on the site. The disadvantages of making the settlement in Redcliffe were evident,<sup>886</sup> but is rather difficult to conclude what opportunities and benefits would have been brought to the later development of Brisbane if the settlement had been established at the mouth of Breakfast Creek, as indicated by Oxley, and as a free colony, as recommended by Bathurst. However, one can be sure that Miller's decision definitely postponed the development of the Bowen Hills area.

### **Walled by isolation**

The period from establishment to the early 1930s was marked by an increase in the convict population, aggravated by the closing down of Port Macquarie as a penal settlement. This increased the need for building suitable shelters, along with water and food supply infrastructure. In March 1826, Captain Bishop passed the command to Captain Patrick Logan, who contributed to the construction and development of the penal settlement with obstinate efficiency. Queen Street was conceived by Captain Logan shortly after his arrival. Among other constructions, he promoted the building of the settlement's hospital, the prisoner's new barracks as well as single brick buildings.<sup>887</sup> In addition, Logan appointed botanist Charles Fraser to make a careful selection of a site to implement an agricultural station. The

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<sup>885</sup> Ibid., 79

<sup>886</sup> Redcliff was important for its strategic control of the north entrance of the bay and for serving as a storage base before the entrance of the river even though the soil was not appropriate for agriculture. It lost its importance after the survey of the South Passage of the bay by John Gray in 1825. Steele 1972, *The explorers of the Moreton Bay District, 1770-1830*, 177 note 171; Fitzgerald 1986, *A history of Queensland : from the dreaming to 1915*, 74

<sup>887</sup> Steele 1975, *Brisbane Town in convict days, 1824-1842*, 86-87



site of choice was between the Brisbane River and Serpentine Creek (Pinkenba/Airport). “Well-watered, fertile and comprising over 220 ha, the farm was also used as a place to keep female convicts. By 1830 the farm was exporting maize to Sydney. The origin of the name apparently arose from eagles being observed around the farm.”<sup>888</sup>

Logan had objections about the location of Brisbane Town for the access difficulties of ordinary vessels, proposing as a solution the establishing of a small outpost for storage at Dunwich on North Stradbroke Island.<sup>889</sup> The abundance of limestone, significant for the increasing number of constructions, gave a good reason for the establishment of a settlement on the south bank of the Bremer River in 1827. Its first name was Limestone Station, being renamed Ipswich in 1848.<sup>890</sup> Logan's extensive explorations of the Moreton Bay region – occasionally in the company of the botanist Allan Cunningham and Surveyor Lockyer – included the Logan River, the Mount Warning-Tweed area and the passage through the Dividing Range, named Cunninghams Gap, which later permitted squatters' access to the pastoral lands of Darling Downs.<sup>891</sup>

The Penal Settlement used the convicts to make buildings and to farm. The former was carried out for the construction of barracks, stores and windmills. The latter was performed in areas adjacent to the settlement in the south, east and in the northeast at Eagle Farm. **(Fig.159)** Convict labour was also used for cutting timber<sup>892</sup> and for executing public works, such as the construction in 1829 of the Wheat Creek dam built on the northern side of what is today Tank Street.<sup>893</sup> At that

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<sup>888</sup> *Eagle Farm* 2011, *Eagle Farm*

<sup>889</sup> Fitzgerald 1986, *A history of Queensland : from the dreaming to 1915*, 77

<sup>890</sup> Gregory 1996, *The Brisbane River story : meanders through time*, 20

<sup>891</sup> Fitzgerald 1986, *A history of Queensland : from the dreaming to 1915*, 78

<sup>892</sup> “As elsewhere in the colony, cutting timber had become part of the punishment regime for convicts and ‘punishment stations’ existed at Norfolk Island, Newcastle, Macquarie Harbour, Port Arthur and Moreton Bay. A sawpit measuring fifteen by seven metres was built on the edge of the Brisbane River and logs of hoop pine were floated downstream from the upper reaches of the river and sawn there.” Powell 1998, *People and trees: a thematic history of South East Queensland with particular reference to forested areas, 1823-1997*, 7

<sup>893</sup> The dam existed until the commission of the Enoggera Dam in 1866 and it was removed for the construction of Roma Street Rail Yards in 1873. The Wheat Creek culvert located under the corner of Adelaide St. and Albert St. was dismantled for the construction of the inner-northern busway (2008) and was rebuilt as a wall feature inside the bus station under King George Square.

time, the reservoir was able to store enough water for almost a year of supply. It became Brisbane's main drinking water source for the following 30 years.<sup>894</sup>

The population of Brisbane Town increased from 77 to about 1000 during the time Logan was Commandant (1926-1930). His governance, and his ability to overcome the administrative problems caused by the rapid growth, were largely recognised by Governor Darling, even though Logan's attitude concerning the convicts was very brutal. In the name of justice and discipline, he used cruel flogging to punish even minor offences, causing a large number of convict runaways from the settlement. Logan was killed in an unaccompanied journey near Mount Brisbane in October 1830. His murder was initially attributed to an aboriginal reaction to the invasion of their territory but later it was considered possible to be revenge by runaways.<sup>895</sup>

After 1932, the discovery of Darling Downs, the pastoral boom in the southern colonies and the decreasing number of convicts created enough reasons to bring freedom to the penal settlement, but administrative obstacles postponed that provision for ten years. To supply an interim condition, the "Crown Land Act of 1936 acknowledged the value of the pastoral industry to the economy sanctioning the occupation of Crown Land for a license fee of £10 a year".<sup>896</sup>

Of importance in this period was the arrival of Andrew Petrie in 1837, a civil engineer who filled "the position of superintendent or engineer of works"<sup>897</sup>. Also relevant was the building of Eagle Farm Road which, along with the first log-bridge over Breakfast Creek in 1830<sup>898</sup>, brought white civilisation closer to Bowen Hills.

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<sup>894</sup> 2004, *Historical overview: Roma Street Parkland Precinct*, 3

<sup>895</sup> Fitzgerald 1986, *A history of Queensland : from the dreaming to 1915*, 77,81,83; Steele 1975, *Brisbane Town in convict days, 1824-1842*, 147-150

<sup>896</sup> Donovan 2000, *Down rode the squatters*, 47

<sup>897</sup> Petrie 1904, *Tom Petrie's reminiscences of early Queensland*, 1-2

<sup>898</sup> According to Thyer, who made a vast research about the bridges built in the mouth of the creek, the exact date is not known. This date is commonly accepted for it is closer to the date of Eagle Farm construction. Moreover, Thyer asserts that, until the year 2000, four new bridges were built (1830, 1858, 1888 and 1958) and three rebuilt/repared (1848, 1850 and 1861) in that location. See Thyer 2008, *Ray Thyer's 19th century chronology - years 1800 to 1900: a wonderful journey through time of the beautiful city of Brisbane, Queensland, Australia*, 20-22

## Roots of freedom

By 1838, Sir George Gipps had arrived in Sydney to take up the position of Governor of New South Wales. During his eight-year administration, almost all of his attention was consumed by the difficult task of mediating the interests of the Crown and the large colony – namely in relation to the creation of land regulations to apply to the increasing number of settlers and squatters – within an unstable political context.<sup>899</sup> To look after the interests of the Crown, Gipps promoted rigorous land surveys inside and around Brisbane to avoid the land-selling issues that had happened before in earlier Australian settlements.

Free settlement meant the alienation of land in the town itself. He attempted to avoid the difficulties encountered in Western Australia by adopting the principle of survey before sale, and those which had arisen South Australia by survey combined with avoidance of a fixed price and Government discretion about the amount of land to be sold. He also wished to prevent the duplication of land claims which had plagued the early settlement of Melbourne.<sup>900</sup>

By 1839, Major Barney made a survey of Brisbane Town, mapping the existent conditions (**Fig.160**). In the same year, surveyors Robert Dixon, James Warner and Granville Stapylton were appointed to record the Moreton Bay topographical features in field books, charts and maps.<sup>901</sup> This was the beginning of the town planning process for the closing of the penal settlement and its consequent mutation to a free colony capital. The next year, Dixon presented a sketchy town plan to Gipps, using a street gridiron made by square blocks on the northern bank (10 chains side = 1 acre = 0.405 ha)<sup>902</sup> and a rectangular grid on the southern bank

<sup>899</sup> McCulloch, Samuel Clyde, 'Gipps, Sir George (1791–1847)', Australian Dictionary of Biography, National Centre of Biography, Australian National University, accessed 2012-03-05 <http://adb.anu.edu.au/biography/gipps-sir-george-2098/text2645>,

<sup>900</sup> Greenwood and Laverty 1959, *Brisbane 1859-1959 : a history of local government*, 32

<sup>901</sup> Draper 2000, *Pioneering surveyors of Moreton Bay district*, 112

<sup>902</sup> "Surveyor's chain, also called Gunter's chain, is a measuring device and arbitrary measurement unit still widely used for surveying in English-speaking countries. Invented by the English mathematician Edmund Gunter in the early 17th century, Gunter's chain is exactly 22 yards (about 20 m) long and divided into 100 links. In the device, each link is a solid bar. Measurement of the public land systems of the United States and Canada is based on Gunter's chain. An area of 10 square chains is equal to one acre." *Encyclopædia Britannica Online*, s. v. 'surveyor's chain' <http://www.britannica.com/ebchecked/topic/575448/surveyors-chain>. accessed 2012-01-26

of the river. Even though the graphic diagram had a historical value as the first attempt to plan the town, it missed the necessary detailing for an appropriate implementation. (Fig.161)

Maybe for this reason, or because he did not want to be responsible for attributing price values for the land parcels, Gipps decided to postpone the selling of Crown Land.<sup>903</sup> Accordingly, in May 1840, Gipps prohibited the establishment of new settlements within a radius of 80km (50 miles) of Moreton Bay.<sup>904</sup> Moreover, Gipps determined the need for a Government licence for any provisions to “be landed, or embarked at Moreton Bay” and that no squatters would be allowed within a distance of 80km (50 miles).<sup>905</sup> This last decision affected the shipment to England of the wool produced by the squatters who had been settling in Darling Downs since 1839 as they had brought their wool until then to Ipswich where they either shipped it by boat, using the rivers, or by drays<sup>906</sup> pulled by bullocks in rustic paths to reach South Bank. Accordingly, the Governor's despatch strongly affected their interests, provoking an immediate reaction and the creation of a dispute that proceeded in time.<sup>907</sup>

By 1841 Dixon was replaced by Surveyor Henry Wade who continued the planning of allotments for North Bank and South Bank. In the Bowen Hills area, Breakfast Creek was still used only by natives and no planning was considered for the vicinities in this period.

### Planning the town

The first Australian attempt to establish general rules for town planning was made by Governor Philip, in 1788. He recommended that wide streets and large

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<sup>903</sup> Greenwood and Laverty 1959, *Brisbane 1859-1959 : a history of local government*, 32

<sup>904</sup> Nevertheless, to provide fresh meat for Moreton Bay, "people were encouraged to take up a square mile (640 acres) of land within the settled districts for pastoral purposes. The rent was an affordable ten shillings a year but they could not enclose the land, built on it or cultivate it. "

Siemon 2001, *The Mayne inheritance*, 30

<sup>905</sup> Sheehan 2000, *The fifty mile limit*, 40-46

<sup>906</sup> A sled or cart without wheels [pulled by bullocks in the Moreton Bay region], formerly much used for dragging wood, turf, etc. "dray, n.1". OED Online. September 2012. Oxford University Press. <http://www.oed.com.ezp01.library.qut.edu.au/view/Entry/57574?rskey=PyVvjS&result=1&isAdvanced=false> accessed 2012-09-12

<sup>907</sup> Sheehan 2000, *The fifty mile limit*, 40-46

allotments were appropriate for Sydney, as the capital of New South Wales. These recommendations recognised that “space and fresh air were the surest guarantee of health in colonial colonies, especially those situated in the tropics”.<sup>908</sup> The concern with public spaces, however, was narrowly confined to the streets. This was a different urban concept from the one applied in the sixteenth century by the Laws of Indies in the colonisation of America, where main public spaces (plazas) were located at the convergence of the main streets of the gridiron (**S\_3.2.2**).<sup>909</sup>

Moreton Bay had an estimated population of 350<sup>910</sup> when it became a free settlement on 10 February 1842. By March, Governor Gipps visited Brisbane to review the surveyors' plans before the land sale. Wade's initial plan proposed streets of a width of 140 links (28.16m), which Gipps considered too wide. He made Wade reduce the width to 100 links (20.12m).<sup>911</sup> Gipps believed that “narrow streets were best suited for a warm climate”.<sup>912</sup> Andrew Petrie persuaded the Governor to allow the width of 121 links (24.35m) for the principal streets, namely Queen Street, but he was rather disappointed with Gipps' concepts of urban planning, which Petrie considered as belonging to the fifteenth or sixteenth century.<sup>913</sup> His critique of the approved plan was:

... Unfortunately the plan of its survey is not what it ought to have been, whether we look that the width of the streets, the plan in which they are laid out, or their alignment, all are alike unsuitable, untasteful, and bad, both as regards health, traffic, and architectural effect. ... Were Brisbane, as it ought to have been,

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<sup>908</sup> Davison 1988, *New, brawny, uneven and half-finished : Brisbane among the Australian Capital Cities*, 158

<sup>909</sup> "During the colonial period cities in Spanish America were thoroughly regulated by provisions in the Laws of the Indies that mandated everything from treatment of the Indians to the width of streets. The Laws required a grid pattern with geometrically regular east-west and north-south streets and a central plaza. Lots immediately adjacent to the central plaza were designated for specific buildings such as the principal church and the *cabildo* [town council or local government council], while other blocks near the plaza were assigned for residential development by socially worthy individuals. Almost by decree, increased distance from the plaza, the core of urban activity, meant decreased social and economic status for residents." Griffin and Ford 1980, *A Model of Latin American City Structure*, 398,399; Conzen 2001, *The study of urban form in the United States*, 5

<sup>910</sup> Fisher 2000, *The Brisbane scene in 1842*, 26

<sup>911</sup> Andrew Petrie had sketched a plan having streets with the width of a chain and a half [30.16m] which he showed to Gibbs (Greenwood and Laverty 1959, *Brisbane 1859-1959 : a history of local government*, 36) but, according to Mellor, Wade proposed less in his initial plan. Mellor 1960, *The changing face of Brisbane*, 355

<sup>912</sup> Andrew Petrie describing Gipps' objections to Wade's plan in a speech he gave to the Brisbane Corporation circa 1866. See Greenwood and Laverty 1959, *Brisbane 1859-1959 : a history of local government*, 35-36

<sup>913</sup> *Ibid.*, 36

planned after a model of the best seaport towns at home, the whole of the river front would have been reserved as public property, with sufficient breath of ground, for wharfs, shed, and streets.<sup>914</sup>

The absence of public spaces in Wade's plan was not resolved until 1855, when the botanist Walter Hill was appointed as superintendent of the Brisbane Botanic Gardens and an area of 3.6ha (9 acres) of land was allocated for the purpose on the southern side of the settlement.<sup>915</sup> **(Fig.162)**

It is possible that Gipps never envisioned the town of Brisbane – referred to by him as “a place that will be nothing but a paltry village”<sup>916</sup> – as the most important city of a large and wealthy region, which could be the reason of his attitude in delaying as much as he could the transition of Brisbane to a free settlement. But it could also be possible that he wanted to postpone to the following Governor the responsibility of subdividing such large amount of valuable Crown Land under the pressure of squatters.<sup>917</sup> Whatever reasons he had, as a recurrence of Miller's attitude, he used his authority to overrule the technical opinion of specialists – a civil engineer and a surveyor – regarding town planning.

Brisbane town plans thereafter were generally made by inexperienced professionals– skilled more to survey and less to plan a city – that neither foresaw the need for public spaces, nor recognised the hilly topography of Brisbane.<sup>918</sup> As in other colonies, the “fairly quickly English practice melted into a pretty *laissez-faire* commercial preference for more or less standard city grids as simple and rapid means to differential wealth creation”.<sup>919</sup>

### **Beginning the expansion**

The first land sale of Moreton Bay was conducted in Sydney in July 1842 – the price of an acre of land costing around £343.10. The first land sale held in Brisbane happened later, in 1843.<sup>920</sup> “Since housing, land and food were scarce and costly,

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<sup>914</sup> Ibid., 35

<sup>915</sup> McKinnon 1987, *The old Botanic Gardens : an historical survey 1828-1984*, 137

<sup>916</sup> Steele 1975, *Brisbane Town in convict days, 1824-1842*, 307

<sup>917</sup> Greenwood and Laverty 1959, *Brisbane 1859-1959 : a history of local government*, 32

<sup>918</sup> A most comprehensive description of Brisbane settlement and early planning is described in Appendix B: Brief history of Brisbane plans

<sup>919</sup> Conzen 2001, *The study of urban form in the United States*, 6

<sup>920</sup> Fitzgerald 1986, *A history of Queensland : from the dreaming to 1915*, 93

the magistrate granted building and squatting licenses to prospective purchasers of Crown Land."<sup>921</sup> Licences were first granted for retail use in the ground floors of the convict barracks. From the two licences to "growing vegetables for the settlement" in 1842, one was for a small farmer at Breakfast Creek.<sup>922</sup>

By 1844, Wade made a more comprehensive plan, including for land on the northern side of the reservoir, South Bank, Kurilpa and New Farm. The lots around Queen Street, along with the ones on the South Bank, were smaller, assigned mostly for retail; all the others were larger to accommodate farming utilisation. The Brisbane River was used as the main means of communication, hence, the allotments followed the its riverbank prime land, therefore no allotments were foreseen for Bowen Hills in that plan. **(Fig.163)**

After 1846, under the NSW colonial government of Sir Charles Augustus FitzRoy, Moreton Bay was designated as a port of entry, "facilities were set up for the collection of customs"<sup>923</sup> and the town received significant economic support for public works.<sup>924</sup> However, the period 1849-1859 was marked by two main issues: the preparation for the separation from the southern government and a labour shortage in the colony. The occupation of the north-eastern area of the town began by 1849 with the arrival of the first free Scottish immigrants. They arrived in the ship *SS Fortitude*, believing in Rev. John Dunmore Lang's promises of free land in the colony. The land was not granted but they were allowed to camp in tents and precarious shacks within the area that was then named Fortitude Valley, after the ship on which they travelled to Brisbane.<sup>925</sup> Immigration increased after that, as a way to supply the needed labour, and the population of the town grew from 950 in 1846 to 2103 in 1851, reaching 4395 by 1856.

Even though the growth of the city to its periphery was caused by the increasing immigration of farmers in the 1860s, "the demographic expansion in the suburbs during the 1870s, and especially during the 1880s, was due to the over-spill

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<sup>921</sup> Fisher 2000, *The Brisbane scene in 1842*, 28

<sup>922</sup> *Ibid.*, 28

<sup>923</sup> Laverty 2009, *The making of a metropolis : Brisbane 1823-1925*, 10

<sup>924</sup> Greenwood and Laverty 1959, *Brisbane 1859-1959 : a history of local government*, 44

<sup>925</sup> *Ibid.*, 45-46

of urban settlement from the central city core”.<sup>926</sup> As an example of typical urban sprawl, the neighbourhoods did not have much of a social life: “One of the main forms of entertainment afforded by the metropolis was 'promenading', particularly among the working class. Crowds flocked to the centre of the city, particularly to Queen Street, on any festive occasion.”<sup>927</sup> Immigration played a positive role inasmuch as it served to create ethnic communities and social affiliations to support the arriving immigrants. Sectarianism was a pitfall, however, particularly with respect to the reluctant acceptance of the Irish group by the existing English, Scot and Welsh communities.

The natives maintained their camp at Yorks Hollow (the site of today's exhibition grounds and southeastern Victoria Park). They were fishing, hunting and performing corroborees around nearby Enoggera Creek until the beginning of the 1950s.<sup>928</sup> In the early 1950s, as a consequence of both their unstable behaviour and the working class need for houses, the Duke of York's clan was pushed by the police to the west<sup>929</sup> on the Bowen Hills area, around Enoggera (Breakfast) Creek. The natives called the hill Barrimbin [the place of the She Oaks] but “the area was later referred to as Booroodabin.”<sup>930</sup> Following alleged thefts, the camp was attacked in 1852 and 1857, resulting in violent clashes between civilians, natives and the police. In 1859, civilians fired over the encampment – killing a native woman and hurting others – claiming “retaliation for an attempt robbery”. In October 1860, police made the Aborigines leave the camp and burned their huts down, causing their definite displacement from the southern Breakfast Creek area.<sup>931</sup> A curfew was later established, obliging all Aborigines to be at the northern side of Breakfast

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<sup>926</sup> Laverty 1988, *South Brisbane : the making of a city*, 62

<sup>927</sup> Harrison 1988, *Queen Street, North Brisbane*, 11

<sup>928</sup> Petrie 1904, *Tom Petrie's reminiscences of early Queensland*, 35

<sup>929</sup> Fisher 1992, *From depredation to degradation: The Aboriginal experience at Moreton Bay 1842-60*, 37

<sup>930</sup> *Booroodabin : A sesquicentenary history of Breakfast Creek, Bowen Hills, Newstead and Teneriffe, 1823-2009* 2009, *Booroodabin : A sesquicentenary history of Breakfast Creek, Bowen Hills, Newstead and Teneriffe, 1823-2009*, 7

<sup>931</sup> Evans 1992, *Wanton outrage*, 84-85



Creek after sunset.<sup>932</sup>

### **Early architectural practice**

Until 1859 there were few architects, or other professionals, working as architects in the area that is now 'Queensland'. In the 1860s and 1870s, architectural practice was affected by economic fluctuations in the housing market. Accordingly, "architectural practice was always seen by some architects as temporary. Most were more concerned about making a living than advancing Architecture". The scenario changed during the construction boom of the 1880s when the number of architects increased, along with their professional recognition.

Architectural education in the 1880s "was made by an apprenticeship with a practicing architect ... for a period generally of three or four years".<sup>933</sup> The first appropriate courses for architecture as a discipline – consisting of drawing (freehand and mechanical) and mathematics – started after 1881 at the Brisbane School of Arts. In July 1888, the Queensland Institute of Architects was created in an official event in the Town Hall. The first president – F.D.G. Stanley – was elected in September; however, "a building act was not realized until after the turn of the century".<sup>934</sup> Since the foundation of the Moreton Bay settlement, "more than 1200 individual architects and architectural firms are known to have worked in 85 Queensland towns in the period up to 1940".<sup>935</sup>

### **Breakfast (Enoggera) Creek**

Historically, besides the creeks, river and sea entertainment, Brisbane has been intimately tied to water, either by the excess of it or by the lack of it. Breakfast (Enoggera) Creek has been important for the city from the original aboriginal occupation to today, acting upstream as a main water supply as well as being a downstream drainage, namely in the area of the Booroodabin Swamp, near the mouth of the creek. "The water which fed the swampy areas known as

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<sup>932</sup> *Booroodabin : A sesquicentenary history of Breakfast Creek, Bowen Hills, Newstead and Teneriffe, 1823-2009* 2009, *Booroodabin : A sesquicentenary history of Breakfast Creek, Bowen Hills, Newstead and Teneriffe, 1823-2009*, 9

<sup>933</sup> Watson 1988, *Foundations : the Queensland Institute of Architects*, 111

<sup>934</sup> *Ibid.*, 109-115

<sup>935</sup> Watson 1985, *An overview of the Brisbane house.*, 17

Booroodabin, Child's and Rosetta Swamps drained out of the two larger catchment areas of Spring Hill and Red Hill/Kelvin Grove. The ridge down which Gregory terrace now runs separated Spring Hollow from York's Hollow."<sup>936</sup>

As water supply has been a concern since the establishment of the first settlement, the first water source was the creek that flowed from College Road through the Roma Street Station area to the near the City Hall building, an area called in early times by Horseponds. The free population started building houses near the creek in the 1840s and, in the 1850s, the water became muddy in the dry seasons and polluted, given the cattle access to the area. With the affluence of immigrants in the first half of the 1860s, clean water became extremely scarce and water carriers charged inflated prices to bring it from more distant sources.

The solution was to use the catchments from Taylor Range, building a dam up in the Enoggera Creek (The Gap). Concluded by 1866, the Enoggera Dam became one of the favourite sites for weekend picnics for Brisbane's population. The size of the dam was calculated to hold a year's supply of water for a population of 200,000 people. It was not enough to supply the growth of immigrants and a second dam was built on Gold Creek (1886). Finished in 1919, the first filtration system in the Enoggera Dam included a tunnelled connection with Gold Creek reservoir in order to avoid filtering duplication.<sup>937</sup> An appropriate water supply solution was one of the largest pressures to face the first council elected to govern Greater Brisbane.

Besides the lack of an appropriate water supply, one of uncontrolled effects of the city's rapid growth in the 1880s was the discharge of sewage through stormwater drains, which was conducted to the creeks and swamps, the latter causing unbearable pollution and a public health hazard. Breakfast Creek and Kedron Brook were the most affected, on the northern side of the river. Public demand for an efficient sewage system increased by the 1880s, which led the government to create the Metropolitan Water Supply and Sewerage Board in 1909. This resulted in a plan of a sewerage system, construction of which began in 1911

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<sup>936</sup> *Booroodabin : A sesquicentenary history of Breakfast Creek, Bowen Hills, Newstead and Teneriffe, 1823-2009* 2009, *Booroodabin : A sesquicentenary history of Breakfast Creek, Bowen Hills, Newstead and Teneriffe, 1823-2009*, 8

<sup>937</sup> Gregory 1996, *The Brisbane River story : meanders through time*, 76-80

and finished in 1923. The expensive but rather limited sewerage scheme considered a population of around 200,000 people, which was only a small proportion of the city's inhabitants.<sup>938</sup> (**Fig.164** and **Fig.165**)

Water supply and sewerage became a City Council responsibility in 1928, but the costly sewerage additions concluded in 1937 could not avoid the collapse of the old sewer from Pinkenba to Luggage Point. That event saw the council adopt in 1942 the strategy of dividing the city in autonomous areas served by local natural drainage systems. However, given the unexpected housing growth after World War II (5000 new houses a year), sewerage was still inefficient until 1973, when the regional sewage works were completed under Brisbane's then Lord Mayor Clem Jones.<sup>939</sup>

These “treatment works were constructed in various places including Rocklea on the upper reaches of Oxley Creek, and at Moggill and Goodna where high effluent loads were discharged to the River. Sewerage mains snaked across the city and by 1974, fewer than 5,000 houses in the Brisbane area remained without sewerage connection.”<sup>940</sup> By 1985, Brisbane was “sewered and served with a low cost and abundant water supply”,<sup>941</sup> services that Bowen Hills have been privileged to have since 1934.

### **Bowen Hills and Booroodabin**

Until the first Crown Land sale in the early 1840s, Bowen Hills was a swampy, virgin bush area with a major hill filled with casuarinas (she-oaks). However, “By the late 1850s, the open forest of Bowen Hills was being cleared for farming purposes and Herston was becoming a fashionable area for new estates and urban land speculation.”<sup>942</sup> The allotment made to the north of the Brisbane Water Reserve in ca.1850 was the first available land for sale in Bowen Hills. The major Bowen Hills road structure as it is today is already defined in that allotment.<sup>943</sup> Nehemiah

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<sup>938</sup> Ibid., 84

<sup>939</sup> Ibid., 80-88

<sup>940</sup> Ibid., 88

<sup>941</sup> Cole 1984, *Shaping a city : greater Brisbane 1925-1985*, 391

<sup>942</sup> Cryle 1992, *Snakes in the grass*, 79

<sup>943</sup> Mayne Rd., Cintra Rd., Abbotsford Rd., Hamilton Pl., Brooke Rd., Montpelier Rd., Breakfast Creek Rd., Wickham Rd. [Eagle Farm Rd. by then], O’Connell Tce., Campbell Rd. and Bowen Bridge Rd.

Bartley was the first to buy land in Bowen Hills – 14 acres of the hilltop. After that, the hill became a desirable target for wealthy citizens, who would buy lots on the top of the hills for their elaborated residences, “while the working class occupied the lower slopes and flat land”<sup>944</sup> (**Fig.166**).

George Edmonstone and Patrick Mayne – two of the aldermen elected for the first council administration in 1859<sup>945</sup> – were the owners of the largest land areas in Bowen Hills at that time (**Fig.167**). Some of the important landowners on the hilltop were: James Cowlshaw (one of the first architects in town, who built 'Montpelier', a magnificent residence that was later demolished, giving way to the iconic Cloudland Ballroom<sup>946</sup>); Captain George D. Webb (who built Cintra House, now Cintra House Galleries); and William Perry (who built Folkestone House for himself, and nearby Miegunyah House for his son – the latter now being the property of the Queensland Women's Historical Association). Perry also owned the flat land, now known as 'Perry Park', on the northern side of the hill. In 1913, his widow sold the site – originally used to maintain his herds – to the Brisbane City Council (BCC); it is, to this day, the only public space in northern Bowen Hills.<sup>947</sup>

Bowen Hills was named after George Bowen, who took the position of first Governor of Queensland in 1859. It was composed then of the land surrounding Montpelier Hill, excluding the eastern side (Newstead). Bowen Park was also named after the governor. The park “was an area of some forty acres situated roughly between O'Connell Terrace, Bowen Bridge Road and Gregory Terrace. There was an

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<sup>944</sup> *Booroodabin : A sesquicentenary history of Breakfast Creek, Bowen Hills, Newstead and Teneriffe, 1823-2009* 2009, *Booroodabin : A sesquicentenary history of Breakfast Creek, Bowen Hills, Newstead and Teneriffe, 1823-2009*, 10

<sup>945</sup> Both were prosperous graziers and competitors in selling meat in Queens Street. Mayne was one of the richest men in the colony, owning about 400ha in the CBD. He bought the 43 acres of land where is now the Mayne Rail Yards in 1851-7. Siemon 2001, *The Mayne inheritance*, 44-5 Rosamond Siemon asserts that the origin of his wealth was related a bizarre murder in 1848 – the slaughter of a timber-getter called Cox – that Mayne confessed guilty when he was dying in 1865. See Siemon 2002, *The Mayne murder mystery*; Siemon 2001, *The Mayne inheritance*, 1-14

<sup>946</sup> Still in the romantic memories of senior citizens, the Cloudland Ballroom (1940–82) was reputed to be the best dance and concert venues in the country, it also hosted memorable pop/rock concerts from the 50s. Its demolition overnight in 1982 "changed the way Queenslanders saw and valued their heritage". The site is today a gated housing complex. *Queensland's history-1900s Queensland's history-1900s*

<sup>947</sup> *A look back in time : A history of Bowen Hills -Newstead & "The Creek"*. 1996, *A look back in time : A history of Bowen Hills -Newstead & "The Creek"*., 45-47

amount of low-lying land along the watercourse, which was part of York's Hollow. In 1863, this was granted in trust to The Acclimatization Society.<sup>948</sup> The Society sold part of the land to the BCC in 1914 for a Public Recreational area and Plant Nursery. The remaining land constitutes what is today Bowen Park, the only public space in southern Bowen Hills.

The area known as Booroodabin<sup>949</sup> was first mapped by the surveyor James Warner in 1839. Forty years later, it became a ward including Bowen Hills, the northern part of Fortitude Valley, Newstead, and the southern portions of Windsor and Albion<sup>950</sup> (**Fig.168**). In 1879, the Booroodabin Divisional Board had a population of around 3500. By the beginning of the twentieth century, the metropolitan area had 21 local authorities. Given the difficulties of managing the increasing growth of the city, the process needed to be reversed, and the Greater Brisbane Scheme was conceived as a solution to the administrative fragmentation. As a pioneer of the amalgamation process, and aiming to be included in a more comprehensive city drainage scheme,<sup>951</sup> the Booroodabin Board petitioned to amalgamate with Brisbane, "but financial conditions were not propitious and the decision was later rescinded".<sup>952</sup> Booroodabin became part of Brisbane by January 1903; however, it was not until October 1925 that all wards were amalgamated under the City of Brisbane Act 1924, thus constituting Greater Brisbane.

### The Maine Rail Yards

The Roma Street Station by the early 1900s did not have enough space to

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<sup>948</sup> Ibid., 31-32

<sup>949</sup> Burudabin in Turrbal Language, meaning place of oaks. Petrie 1904, *Tom Petrie's reminiscences of early Queensland*, 316

<sup>950</sup> The area was "bounded by the Brisbane River, Cooksley Street, Sandgate Road, Albion Road, Railway line, Breakfast Creek, Bowen Bridge Road, Gregory Terrace, Brookes Street, Ann Street, Commercial Road and to the east of Brunswick Street." *Booroodabin : A sesquicentenary history of Breakfast Creek, Bowen Hills, Newstead and Teneriffe, 1823-2009* 2009, *Booroodabin : A sesquicentenary history of Breakfast Creek, Bowen Hills, Newstead and Teneriffe, 1823-2009*, 4; "Local government within the Booroodabin area came into being when the Booroodabin Divisional Board was created under the Divisional Boards Act of 1879 to provide administration and public services in areas outside municipalities ... The primary function of these boards was to provide public services and amenities as parks and reserves, cemeteries, libraries, and recreational facilities, water and sanitation, roads bridges, wharves, street lighting, public health services, town planning and a myriad of other services required by a developing area." *ibid.*, 11

<sup>951</sup> Lavery 2009, *The making of a metropolis : Brisbane 1823-1925*, 45

<sup>952</sup> Greenwood and Lavery 1959, *Brisbane 1859-1959 : a history of local government*, 354,449

accommodate the intense movement of goods created by the Queensland System Network expansions.<sup>953</sup> By 1907, Commissioner Evans recommended the purchase of land near the Mayne Railway Station to install a spacious depot to house 112 engines, a large coal storage facility, and a carriage depot more than 240m long. To realise this ambitious proposal, the company bought the land from the Mayne family and the Jackson Carrying Co, as described below:<sup>954</sup>

The Exhibition grounds had been part of a swampy area needing drainage and filling, and the area northwards to Breakfast Creek the area was no better. In 1911 the Government acquired 20ha of the low lying land, adjacent to the Mayne Junction railway station for new engine sheds, coaling and for staff amenities. Land fill was transported from excavations at Roma Street and by the end of the 1920s most of the facilities were completed. Mayne Junction had lines to Roma Street, Central, Sandgate and Ferny Grove. Bowen Hills station had a line (1897-1990) to the Teneriffe and New Farm Wharves.<sup>955</sup>

In fact, the excavations into the hill in Albert Park, as well as the excavations and levelling of the areas around today's Abbotsford Road and Mayne Road, were a rather large enterprise that took about a decade to accomplish. Over half a million cubic meters of soil<sup>956</sup> were removed from Albert Park hill, and around 120 000 cubic meters of these were moved to the Mayne Marshalling Yards.<sup>957</sup> The soil "was intended to raise the formation level of the depot by 300mm to place the bottom of the carriage pits at least 450mm above the flood level of 1890. (The 1893 level covered the carriage shed to a level of 1.3 meters so it would appear that all hoped that such a flood would never be repeated!) By mid-1912, the hill at Mayne was progressively being quarried out"<sup>958</sup> (**Fig.169**).

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<sup>953</sup> "Queensland's rail system developed as three separate networks: the Southern and Western Railway, which terminated at Brisbane; the Central Railway with its Rockhampton terminus; and the Great Northern Railway centred in Townsville. Initially, Roma Street was the terminus and main goods depot for the Southern and Western, which extended to Cunnamulla in the south-west. By the turn of the century, the main north coastline between Rockhampton and Brisbane had been completed, linking two of the main networks. The continual expansion of the network connected Roma Street to more and more towns and cities in the state." Blake 2004, *Historical overview: Roma Street Parkland Precinct*, 8-9

<sup>954</sup> *A look back in time : A history of Bowen Hills -Newstead & "The Creek"*. 1996, *A look back in time : A history of Bowen Hills -Newstead & "The Creek"*., 24

<sup>955</sup> *Bowen Hills and Mayne* 2011, *Bowen Hills and Mayne*

<sup>956</sup> "The equivalent of 110 football fields one metre high!" Blake 2004, *Historical overview: Roma Street Parkland Precinct*, 9

<sup>957</sup> *A look back in time : A history of Bowen Hills -Newstead & "The Creek"*. 1996, *A look back in time : A history of Bowen Hills -Newstead & "The Creek"*., 24

<sup>958</sup> *Ibid.*, 25

The locomotives were transferred from Roma Street Rail Yards to the new location in 1927. To be part of an existent 'model of railway village', three cottages were built near the Bowen Hills Station to house railway workers.<sup>959</sup> Moreover, the land subdivisions that took place in Herston in the 1910s and 1920s enabled railway workers to purchase housing near the rail yard, allowing them to cycle or walk daily to their jobs<sup>960</sup> (**Fig.157**).

Bowen Hills Station was built in 1971 between Mayne Junction and the old Bowen Hills Station, which were both closed as a result of the expansion of the Mayne rail yards<sup>961</sup>. Part of the site of the Mayne Junction Station is now covered by the Inner City Bypass in the western corner of Abbotsford Road and Edmondstone Road.

### **Closing note**

Much more could be said here about Brisbane housing and its development quoting the large literature sources mentioned in the Works Cited section, yet the most relevant topics have been described in the previous lines. One must then conclude that rising above all its housing challenges, Brisbane has shown its resilient virtues in climbing out of its rural sturdiness, in an overwhelming metamorphosis towards a contemporary urban character.

As added by Lavery:

The rapidity of the urban process in Brisbane was clearly demonstrated by the mushrooming population, sprawl of housing, proliferation of public and commercial buildings, increase in personal services, expansion of commercial activity, growth of manufacturing, jelling of social stratification, appearance and mitigation of social maladjustments and disorders, increasing pervasiveness of political activity, gradual improvement of educational facilities, influence of religion and presence of active churches, fecundity of social groups and institutions, development of a cultural veneer, popularity of sport and general maturation of urban society. All these developments were firmly rooted in Queensland's economic growth.<sup>962</sup>

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<sup>959</sup> *Booroodabin : A sesquicentenary history of Breakfast Creek, Bowen Hills, Newstead and Teneriffe, 1823-2009* 2009, *Booroodabin : A sesquicentenary history of Breakfast Creek, Bowen Hills, Newstead and Teneriffe, 1823-2009*, 21

<sup>960</sup> Hacker and Spinaze 2007, *Herston : Recollections and reminiscences*, 96

<sup>961</sup> *Bowen Hills and Mayne* 2011, *Bowen Hills and Mayne*

<sup>962</sup> Lavery 2009, *The making of a metropolis : Brisbane 1823-1925*, 91-2





## Appendix C: Interviews

This appendix lists the interviews questions, the summary of the answers and a final list of relevant topics to be tested. The latter reports the synthesis of the conversation, namely the parts directly related to this study.

The interviews were approved by QUT Ethics (protocol number 1200000416 - copy placed in the end of this appendix). Before each interview, the interviewees were informed of the specific questions they would answer and agreed that both their name and their company name would be identified to add value and corroborate the research findings. Each interviewee signed an individual consent form to demonstrate their acceptance of these conditions.

### ***C.1 Answers summaries***

#### **C.1.1 Peter Richards (2013)**

**Director at Deicke Richards** – multi-disciplinary architecture & design practice  
– Brisbane <http://www.deickerichards.com.au/>

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#### **1. What are the opportunities and constrains of using courtyard housing in Brisbane?**

For lower densities, there is no tradition to build buildings attached to other buildings. The mind set is separated buildings with air around them as part of ventilation. We tend to put small compact buildings with verandas around them, open to landscape: this is our tradition.

For higher densities, the typical examples we have seen are the Los Angeles courtyards, which offer a semi public entrance space with lack of privacy, without outdoor private spaces or transition spaces. There is a sealed architecture instead of an open architecture. Don't have verandas for an inside/outside communication.

We like our private living space from where we control the outside world.

When come to apartments I don't see any real constrains in using courtyards. It fits better in an urban medium rise environment. Courtyards may be associated with 2-10 (or may be less 6 or 8) storeys apartment buildings, if they suit privacy, sun and shade and if they have the right scale.

## **2. What do you consider low-density, medium-density and high-density in your architectural practice?**

In our practice, in net base, we consider: low density 1-2 storeys, 15-25 dph; medium density 3-4 storeys, 25-100 (may be 200) dph; high density 8-10 storeys, 200 dph.

We can have good subtropical housing with 5-8 storeys, single load corridors and natural ventilated apartments. Cross ventilation is more important than orientation to the North.

In Europe they have frequently one lift/stair for 2apartments. Here we don't have it; may be for cost reasons or just for cultural habit.

## **3. Can plot-ratio influence the decision of a designer in choosing a CYH typology?**

We don't work much with plot ratio at the moment, planning schemes don't provide it. Historically in Brisbane for high density we have had a plot ratio 1.5 for 10 storeys buildings-separated towers, 2.5-3.0 is the typical now. A plot ratio of 2.5-3.5 with 3 storey building is achievable with good housing form.

## **4. Public parking: underground or silo? Recommendations on parking entrances? One car per unit policy?**

Underground parking has a large impact on building cost (car space around \$50,000). The silos option doesn't have precedent in Brisbane.

Parking numbers:

- Brisbane inner city - 0.7cars/dwelling (1car/2bedrooms; 0.5/1bedroom)
- In average is feasible - 1car/unit plus ¼/unit for visitors

Parking entrances should be from secondary streets. Entrances parallel to the façades may be a good solution. It is a matter of design. A good example in Brisbane is in Edward Street, a bad one is in Elisabeth Street.

**5-6. What are the dimensions used in your architectural practice for 1Bed,2Bed and 3Bedroom apartments? What are the differences in making housing projects for a not-for-profit and a for-profit company?**

Differences in not-for-profit and for-profit are not in density: Everybody wants to do the most of the site; more people means more interesting communities and best use of land.

Not-for-profit apartments are slightly bigger: 2 bedrooms 72m<sup>2</sup> and 3 bedrooms 105m<sup>2</sup>, plus balconies.

For-profit apartments are usually a very tight planning: Studio 30-35m<sup>2</sup>; 1bedroom 48m<sup>2</sup> (without balconies); 2bedrooms 58-68m<sup>2</sup>; none 3 bedrooms; half of the apartments don't have balconies. Generally bathrooms are internal.

### C.1.2 Timothy Hill (2012)

**Partner at Donovan Hill** – multi-disciplinary architecture & design practice –  
Brisbane <http://www.donovanhill.com.au/>

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#### **1. Are there current examples of low-rise high-density urban developments in Australia?**

There are examples of low-rise high-density in Melbourne and Sydney but they are from the 19th century. I don't know any contemporary examples. The 19th century models never come up for consideration because they completely ignore cars. For density will be better to use an Australian basis (Queensland doesn't have too much high density). High-density low or medium rise need a lot of street edges per km<sup>2</sup>. From a comparative study between London, Barcelona, Melbourne, etc, we realise that the intensity of the streets has a straight relationship with density.

#### **2. What would be your observations about ideal block sizes?**

In Australia, councils pay for the streets and they are very expensive. People only look at models that accommodate cars and that require fewer streets. Local councils, influenced by developers, tend to make proposals for very large blocks (up to 250m long – with four buildings on, which have to be high-rise).

Brisbane's street grid is one of the biggest in the world – there is no money for streets! Brisbane grid doesn't have enough streets. It is difficult to do density in the CBD without big buildings because there aren't enough street edges. High density with offices is easier: part of the floor plate in offices may be 25m away from the street edge; residential space shouldn't be more than 10m away from the street edge.

Old office buildings, with small floor plates, have been converted in residential and hotels; new office buildings, with big floor plates that have been built, would be hardly converted in anything else in the future, because are too deep to get light.

A negative example is Pudong, Shanghai new city: extremely big blocks (400m).

Analysing places off successful high density (very popular to live there, long residential periods, lots of facilities, high visitation, low crime) all over the world, they have lots of streets per km<sup>2</sup>.

### **3. What would be your recommendations in designing the streets?**

To have 'nice streetscapes', lower buildings (the public complains about building heights) and higher density we need to have more streets, to avoid using buildings as separated objects, to control where the cars get loaded and to minimise the number of driveways.

Streets layout design should not be based mainly on traffic numbers. More streets lay [sic] to less driveways per street which means better streets. We can have higher density with "Double-Grids": circulation streets and car lanes load; public streets and server streets.

Lower rise + higher density = more streets !!

### **4. In your view, how should car parking be planed and implemented?**

We need to solve the car park in a more collective way, so the money and energy lost on inefficient car-park solutions, on a per site basis, may be used in the actual build fabric of the city, improving its quality.

Car parks above the ground are safer than underground parks and are natural ventilated. A linear building, 18m wide, 3m floor to floor are reusable for other uses in the future.

The single issue of managing car park have a profound impact on:

What the streets are like;

The cost of the building;

The character of the street network.

We have to define what needs collective control in order to be efficient.

In my anecdotal research by trial, collective addressed dissociated car parking works well. Forbid the cars in private property and everything will change, with better streets, better buildings, more gardens, etc...

### **5. Would it make sense to study a courtyard housing model for Brisbane?**

I think it makes a lot of sense because the town planners have been based on implications of zoning without making any research; they don't have studied the sites to know what happens when they apply the density they are after to the conditions they have. Density versus height has not been studied. The planning approach is only qualitative, ex: lower buildings, nice streets, diverse and not controlled by cars, this density, fragmentation...

Anglo-Saxon plans defend things in terms of quality not in terms of research and math, don't measure what works! (e.g. In Europe it was measured that the capacity of a dwelling to be evolved with the street is seven storeys maximum). So, there is a huge amount of the city planned for a too high rate of car-park/dwelling; car-park applied to sites where it doesn't fit!

Geometry of the site has a huge impact on the result. Plans should be related to site sizes and geometry not just to floor areas, car-park numbers and setbacks, which many times don't match with some other requires (eg. Ground floor residential units are impossible with car-park requirements).

### **6. Parque das Nações, Lisbon, Portugal**

(Comments after I showed the Master Plan for Parque das Nações)

The fundamental differences [comparing to Brisbane's developments]:

The way the procurement occur and the way it was delivered: even establishing all that things, unless you have a jurisdictional system, it wouldn't work;

Shared car-park which is difficult in Anglo-Saxon tradition;

Number of streets allows less driveways – better streets;

Efficiency in fitting blocks and streets in site, geometries and sizes.

There is obviously a great difference from an ordinary suburb to a “Prime land”.

**Phenomenal to research:**

Car parking;

Buildings with lifts or not;

Density versus cross ventilation (Zero-Lot not so good as other typologies more porous);

Apartments typologies in buildings (mix of different apartments allows mix population and works well on a physic sense – small apartments depend on door position but big apartments don’t);

Verandas in subtropical climate make a difference;

Defend and clarify the mixed-uses (not obvious in the Anglo-Saxon tradition)

Winter sun important in residences (residential buildings overcool)

Shadow interesting for offices (commercial buildings overheat):

Investigate asymmetry on streets (Shade side and sunny side);

Analyse the potential non-functional reasons;

Focus on the suburbs – powerful case to go to places other than prime land;

Chose a flat place, otherwise it may be very complicate to take conclusions;

For density will be better to use an Australian basis (Queensland doesn’t have too much high density).

### C.1.3 Hong Zhang (2012)

**Principal at Standard Architecture** – multi-disciplinary architecture & design practice – Beijing, China <http://www.standardarchitecture.cn/oldflash/index.html>

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#### **1. What is the role of the courtyard house in contemporary Chinese architecture for both courtyard house unit and communal courtyard unit?**

In my view, there is not so much a relationship with contemporary Chinese architecture. It is just a real state type, an architecture style, not related to a real living style. It is only a form. Now families want to show off their wealthy, their richness. They try to remind, to recall the old courtyard house but the relationships and the way of living in these houses are completely different from the original way of living in the Chinese courtyard houses.

It is still an important reference but there is not a tight relationship between the traditional Chinese courtyard house typologies and the contemporary Chinese architecture.

#### **2. What are the ‘Standard Architecture’ courtyard houses projects?**

The Suzhou is an interesting one. We had many discussions about the typology issues and made lots of research about the climate and the tradition of courtyard house there. The main concern has been how to reference this kind of courtyard houses and try to enrich, to fulfil them with contemporary living styles. We did extensive studies about traditional gardens in Suzhou areas, about all kind of courtyards along in this climate belt. Not only the Chinese but also the Persians have different kinds of courtyards.

We researched how the courtyards fitted with the buildings and people living styles, and then we did our proposal. It is a contemporary architecture language recalling a vernacular typology in the region. Other courtyard project we had is a Teahouse. It is something in between a house and a public building as it is for public



people [*sic*] to relax.

**3. Why to choose this particular typology, when what we see currently happening in China is the building of detached high-rise building?**

This kind of strategies and this kind of projects become possible because their context is not completely public. They are in a compound, they are not for the mass people, they are for rich people. It is selective and exclusive. What justify the choice for high-rise communal courtyard buildings in the cities are the needs for density.

In the countryside, rich people try to get their villas to show off their success. This courtyard houses symbolize their private fortunes. In the past days, the courtyard was something related with all families, for their security and other issues. Now it only recalls for something fancy.

**4. Would you consider that courtyard house, despite being a family unit with a very specific context in China, could be evocated in order to rethink a new city model, or neighbourhood model, or a gated community model?**

In my experience courtyard house has a limitation boundary in China. It has always been related to the family and the recognition of the hierarchy within the family in an integrated system. All the buildings, the spaces and the architecture elements have sequences, an order. This order is coordinated with the authority of the family.

Now that the times have changed, I think that the walls are the only thing reflected in the Chinese culture, or the fences (sometimes you can see the units through the fences). It might be an influence of the Soviet Union, but I think it is a Chinese traditional root. Now we might not be family, we are not relatives, but we still have groups, we are the same, we live together, and we need a boundary. Chinese courtyards can be very limited and if we enlarge it to a big compound to fit in the community, we cannot achieve that dense.

**5. What recommendations would you suggest to apply the courtyard house model in a sub-tropical climate condition?**

We should separate if we are in or outside the city, in the suburbs. In the city, everything needs to be compact. Outside the city, buildings should not be higher than three storeys. You may have a basement. Average site boundaries should be: length 30m to 32m – or even 40m – with 10 meters width (may be more).

Courtyard is not just a patio inside the house, is more than that. We should have a middle short courtyard and a back courtyard. In a subtropical climate, we should have more than 2 courtyards. We need to provide shade and arrange for natural ventilation.

**6. What would you consider adequate for the acknowledged socio-cultural status in relation to: average footprint; floors; landscape system?**

The only ones who can afford a courtyard house are the higher middle class or the rich. For higher middle class, footprint would be 160m<sup>2</sup>--400m<sup>2</sup> (220m<sup>2</sup> average). For rich people it is usually around 3,000m<sup>2</sup> . In average, they have 2 floors. Ideally we try to have 60% of the site for courtyards, but usually we have about 50%.

**7. Thinking of culture specifics does it vary much when using courtyard typology in China or in Tibet?**

As it happens anywhere, there are some variations, even within Tibet. That is why we always try to study what is the typology there and make our new interpretation of the courtyards, using a contemporary architecture.

#### C.1.4 John Taylor (2013)

**Principal/Owner at Engineering Air Science Pty Ltd** – engineering and scientific consultancy – Brisbane, Australia <http://www.engineingairsience.com/>

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##### **1. How can ventilation inside a courtyard be improved in the warmer months and reduced in the cooler months?**

Ventilation within a courtyard can be improved through the provision of openings through which wind can pass into and out of the courtyard. The use of multiple openings on opposite sides of the courtyard will encourage wind to pass across the courtyard. For structures taller than their local environment, the nature of fluid flow (air) over a rough surface (the ground), with a profile of mean velocity that increases with height, can lead to a local enhancement of wind velocity close to the surface due to the enhanced pressure differential cause by the higher building height wind speed.

Additionally, in many parts of the world prevailing wind conditions differ between the warmer summer and cooler winter months. These characteristics can provide the opportunity to locate ventilation openings in locations that encourage ventilation in the hotter summer months, but act relatively benignly during the cooler winter months and thus enabling the courtyard to remain sheltered through this period.

##### **2. What are the technical conditions to attend for guaranteeing appropriate ventilation inside a courtyard?**

Having not worked directly in the development of natural ventilation systems for buildings, I am not directly aware of specific standards or guidelines that provided detail on appropriate or specified minimum ventilation rates. With the variability of wind speed and direction, appropriate ventilation can never be guaranteed with or without the use of courtyards, and will to a large extent depend on the specific design of the buildings and location of openings in relation to the

typical meteorological conditions at the specific location.

Under lighter wind conditions in hotter times of the year a courtyard can provide the opportunity to generate its own ventilation through a 'thermal tower' effect, with warmer air within the courtyard rising through thermal buoyancy and being replaced by cooler air from below. With openings in the base of the tower, the cooler air is likely to be drawn through them in such a case, with the possibility of creating local airflow under more stagnant conditions.

The wind environment within a courtyard will depend upon both the prevailing meteorological conditions and the specific characteristics of the courtyards. Under lighter wind conditions, thermal heating or cooling of surfaces and then air can generate local breezes, often intermittently. However, as the wind speed increases the thermal influences become less significant with the flow structure controlled by the building characteristics in relation to the wind direction.

### **3. Where would be the preferred location for the openings?**

The locations of any openings need to be designed with respect to primarily seasonal climatic variations, that is located to enhance courtyard ventilation during hotter periods of the year and attempt to reduce ventilation during cooler periods of the year, and in particular protect the courtyard high wind cold weather events if possible. Thus, openings should be avoided on the sides of the courtyard from which stronger wind events occur during cooler months, and located to encourage wind driven ventilation for the warmer months of the year. This would require an understanding of the season variations in wind behaviour at the site as well as wind behaviour around the specific building design.

Wind flow through an opening will be driven by the pressure differential between the windward and leeward sides of the opening. Thus, an opening on the windward side of a courtyarded area will typically have the upwind side of the opening under positive pressure due to the wind force, with the downwind face under relative negative pressure due to the flow over the building forming a wake region downwind. This will cause higher wind flow through the opening. If both

faces are in a relatively negative pressure region, less flow would typically be experienced through the opening.

The use of openings at the ground level will typically provide for better ventilation of the lower levels of a courtyard. However, another consideration of developing openings for ventilation is their effect with regard to the generation of enhanced and potentially dangerous wind speeds through the openings during higher wind conditions. This could be particularly important if the openings are also used for access purposes. While Wind Standards do not specifically cover dangerous pedestrian wind conditions, some City Council's, such as Melbourne, do have regulations and methodologies with respect to this issue.

#### **4. What would be the preferred sizes?**

The preferred opening size will depend, to some degree, upon the number of openings and the specific ventilation requirements for the complex as well as functional and aesthetic issues of the complex. Generally, the larger the opening the greater the potential to assist courtyard ventilation. However, dangerous wind conditions are more likely to occur around corners or through constrained regions.

Thus, provision of openings that are wider than their height by a ratio of 3 or 4 as a minimum can assist provide regions through the middle of the opening where corner effects are not as pronounced and dangerous wind conditions less likely to occur. Narrow passageways are not recommended as they will likely restrict airflow and thus ventilation in lighter wind conditions and potentially provide for a dangerous environment during stronger wind conditions.

#### **5. What would be the main recommendations to allow for ventilation in a courtyard?**

The main recommendations to allow for ventilation in a courtyard would be to understand the meteorological conditions of the site, and in particular the seasonal variations in wind conditions and temperature that may exist and exploit this

knowledge to position openings that enhance ventilation during warmer months and restrict ventilation during cooler months. Openings should be of sufficient size to both allow for ventilation and minimise potential for the development of dangerous wind environment. The orientation of the courtyard complex should also be considered in relation to both improved ventilation and minimising the summer irradiation load on the courtyard

The use of advanced modelling tools to simulate the flow behaviour and understand the ventilation environment would also be recommended. Standard numerical tools such as computational fluid dynamics (CFD) modelling software can provide detail on typical mean flow characteristics, while more complex CFD approaches and/or physical modelling methods such as a wind tunnel can provide additional detail on turbulent flow behaviour.

## ***C.2 Relevant topics for the components criteria***

### Timothy Hill

#### *Block*

- Winter sun important for residential façades (residential buildings overcool)
- Shadowed façades are acceptable for offices (commercial buildings overheat)
- Investigate asymmetry on streets (Shade side and sunny side)
- To have pleasant streetscapes, lower buildings (the public complains about building heights) ... we need to have more streets

#### *Building*

- Verandas in subtropical climates make a difference
- Part of the floor plate in offices can be 25m away from the street edge
- Residential space shouldn't be more than 10m away from the street edge
- Mix of different apartments allows mix of – small apartments depend on door position; large apartments don't
- Density versus cross ventilation (Zero-Lot not so good as other more 'porous' typologies)

*Street*

- Higher densities imply more streets per km<sup>2</sup>
- It is difficult to achieve high density in the CBD without high-rise buildings because there aren't enough street edges
- 'Double-Grids': circulation streets and lanes; public streets and server streets
- Choose a flat place for measurable results

*Parking*

- Solve the car park issue in a more collective way
- Parks above the ground are safer than underground parks; natural ventilation
- A linear building (18m wide, 3m floor to floor); reusable for other purposes in the future

Peter Richards*Courtyard*

- When it comes to apartments, I don't see any real constraints in using courtyards; it fits better in an urban medium-rise environment

*Block*

- Courtyards may be associated with 2-10 (or maybe less, 6 or 8) storey apartment buildings, if they suit privacy, sun and shade and if they have the right scale

*Building*

- Cross-ventilation is more important than orientation to the North
- The mindset is separated buildings with air around them as part of ventilation
- In Europe, they have frequently one lift/stair for 2 apartments. Here we don't have it; may be for cost reasons or just for cultural habit
- We like our private living space from where we control the outside world
- Historically, in Brisbane, for high density we have had a plot ratio 1.5 for 10 storey buildings with separated towers; 2.5-3.0 is typical now; a plot ratio of 2.5-3.5 with 3 storey building is achievable with good housing form

*Parking*

- Brisbane inner city: 0.7cars/dwelling (1car/2bedrooms; 0.5/1bedroom)
- On average, 1car/unit plus ¼/unit for visitors is feasible
- Parking entrances should be from secondary streets

- Entrances parallel to the façades may be a good solution; it is a matter of design; a good example in Brisbane is in Edward Street, a bad one is in Elisabeth Street
- Underground parking has a large impact on building cost (car space around AU\$50 000); the silos option doesn't have precedent in Brisbane

## Hong Zhang

### *Courtyard*

- Courtyards [in China] are not for the mass of people, they are for rich people; it is selective and exclusive
- Ideally we try to have 60% of the site for courtyards, but usually we have about 50%
- The main concern has been how to reference [the traditional] courtyard house and try to enrich, to fulfil them with contemporary living styles
- Courtyard is not just a patio inside the house, it is more than that; we should have a middle short courtyard and a back courtyard
- In a subtropical climate, we should have more than 2 courtyards; we need to provide shade and arrange for natural ventilation

## John Taylor

### *Courtyard*

- Ventilation within a courtyard can be improved through the provision of openings through which wind can pass into and out of the courtyard
- The use of multiple openings on opposite sides of the courtyard will encourage wind to pass across the courtyard
- The preferred opening size will depend, to some degree, upon the number of openings and the specific ventilation requirements for the complex
- Thus, provision of openings that are wider than their height by a ratio of 3 or 4 as a minimum can assist in providing regions through the middle of the opening where corner effects are not as pronounced, and dangerous wind conditions less likely to occur
- Main recommendation: to allow for ventilation in a courtyard understanding the seasonal variations in wind conditions and temperature – to position openings that enhance ventilation during warmer months and restrict ventilation during cooler months



<b>C.3 Questions List</b>	<b>Richards, Peter</b>	<b>Hill, Timothy</b>	<b>Taylor, John</b>	<b>Zhang, Hong</b>
1. What are the opportunities and constrains of using courtyard housing in Brisbane?	■			
2. What do you consider low-density, medium-density and high-density in your architectural practice?	■			
3. Can plot-ratio influence the decision of a designer in choosing a CYH typology?	■			
4. Public parking: underground or silo? recommendations on parking entrances? One car per unit policy?	■			
5. What are the dimensions used in your architectural practice for 1Bed, 2Bed, and 3Bed apartments?	■			
6. What are the differences in making a housing project for a not-for-profit and a for-profit company?	■			
1. Are there current examples of low-rise high-density urban developments in Australia?		■		
2. What would be your observations about ideal block sizes and building heights?		■		
3. What would be your recommendations in designing the streets?		■		
4. In your view, how should car parking be planed and implemented?		■		
5. Would it make sense to study a courtyard housing model for Brisbane?		■		
6. What would be your comments about Parque das Nações in Lisbon?		■		
1. What is the role of the courtyard house in contemporary Chinese architecture for both courtyard house unit and communal courtyard unit?				■
2. What are the Standard Architecture courtyard houses projects?				■
3. Why to choose this particular typology when what we see currently happening in China is the building of detached high rising building?				■
4. What recommendations would you suggest to apply the courtyard house model in a sub-tropical climate condition?				■
5. What would you consider adequate for the acknowledged socio-cultural status in relation to: average footprint; floors; landscape system?				■
6. Thinking of culture specifics does it vary much when using courtyard typology in China or in Tibet?				■
1. How can ventilation inside a courtyard be improved in the warmer months and reduced in the cooler months?			■	
2. What are the technical conditions to attend for guaranteeing appropriate ventilation inside a courtyard?			■	
3. Where would be the preferred location for the openings?			■	
4. What would be the preferred sizes?			■	
5. What would be the main recommendations to allow for ventilation in a courtyard?			■	





University Human Research Ethics Committee  
**HUMAN ETHICS APPROVAL CERTIFICATE**  
NHMRC Registered Committee Number EC00171

**Date of Issue:** 27/8/12 (supersedes all previously issued certificates)

Dear Mr Raul Antonio Dias De Carvalho

A UHREC should clearly communicate its decisions about a research proposal to the researcher and the final decision to approve or reject a proposal should be communicated to the researcher in writing. This Approval Certificate serves as your written notice that the proposal has met the requirements of the *National Statement on Research involving Human Participation* and has been approved on that basis. You are therefore authorised to commence activities as outlined in your proposal application, subject to any specific and standard conditions detailed in this document.

Within this Approval Certificate are:

- \* Project Details
- \* Participant Details
- \* Conditions of Approval (Specific and Standard)

Researchers should report to the UHREC, via the Research Ethics Coordinator, events that might affect continued ethical acceptability of the project, including, but not limited to:

- (a) serious or unexpected adverse effects on participants; and
- (b) proposed significant changes in the conduct, the participant profile or the risks of the proposed research.

Further information regarding your ongoing obligations regarding human based research can be found via the Research Ethics website <http://www.research.qut.edu.au/ethics/> or by contacting the Research Ethics Coordinator on 07 3138 2091 or [ethicscontact@qut.edu.au](mailto:ethicscontact@qut.edu.au)

*If any details within this Approval Certificate are incorrect please advise the Research Ethics Unit within 10 days of receipt of this certificate.*

**Project Details**

**Category of Approval:** Human non-HREC  
**Approved From:** 24/08/2012      **Approved Until:** 24/08/2015 (subject to annual reports)  
**Approval Number:** 1200000416  
**Project Title:** Courtyard housing in a subtropical urban design model  
**Experiment Summary:** Assert the methodological duty of consulting multidisciplinary professionals who could clarify challenges, opportunities and best practices in an urban design process.

**Investigator Details**

**Chief Investigator:** Mr Raul Antonio Dias De Carvalho  
**Other Staff/Students:**

Investigator Name	Type	Role
A/Prof Kathi Holt-Damant	Internal	Supervisor
Prof Margot Brereton	Internal	Supervisor

**Participant Details**

**Participants:**  
Approximately 3-6  
**Location/s of the Work:**  
Agreed location



University Human Research Ethics Committee  
**HUMAN ETHICS APPROVAL CERTIFICATE**  
NHMRC Registered Committee Number EC00171

**Date of Issue:** 27/8/12 (supersedes all previously issued certificates)

**Conditions of Approval**

**Specific Conditions of Approval:**

None apply

**Standard Conditions of Approval:**

The University's standard conditions of approval require the research team to:

1. Conduct the project in accordance with University policy, NHMRC / AVCC guidelines and regulations, and the provisions of any relevant State / Territory or Commonwealth regulations or legislation;
2. Respond to the requests and instructions of the University Human Research Ethics Committee (UHREC);
3. Advise the Research Ethics Coordinator immediately if any complaints are made, or expressions of concern are raised, in relation to the project;
4. Suspend or modify the project if the risks to participants are found to be disproportionate to the benefits, and immediately advise the Research Ethics Coordinator of this action;
5. Stop any involvement of any participant if continuation of the research may be harmful to that person, and immediately advise the Research Ethics Coordinator of this action;
6. Advise the Research Ethics Coordinator of any unforeseen development or events that might affect the continued ethical acceptability of the project;
7. Report on the progress of the approved project at least annually, or at intervals determined by the Committee;
8. (Where the research is publicly or privately funded) publish the results of the project in such a way to permit scrutiny and contribute to public knowledge; and
9. Ensure that the results of the research are made available to the participants.

**Modifying your Ethical Clearance:**

Requests for variations must be made via submission of a Request for Variation to Existing Clearance Form (<http://www.research.qut.edu.au/ethics/forms/hum/var/var.jsp>) to the Research Ethics Coordinator. Minor changes will be assessed on a case by case basis.

It generally takes 7-14 days to process and notify the Chief Investigator of the outcome of a request for a variation.

Major changes, depending upon the nature of your request, may require submission of a new application.

**Audits:**

All active ethical clearances are subject to random audit by the UHREC, which will include the review of the signed consent forms for participants, whether any modifications / variations to the project have been approved, and the data storage arrangements.

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## Appendix D: Beijing and Lisbon: Planning background

### *D.1 Beijing*

This section describes the planning background of the courtyard houses from the 1990s. These previous planning decisions are relevant as they are a means of understanding the present state of the remaining traditional housing typology and the strategies applied in the current Conservation Plan to maintain a liveable and sustainable urban area. The importance of planning in Chinese history is documented thus:

Urban planning is deeply rooted in Chinese history. Formal procedures for the siting [*sic*] of the national capital and its layout started at the beginning of the Zhou dynasty (771-221 BC). The Zhou classic, *Zhou Li*, which was first published in the Han dynasty (206 BC-25 AD) but believed to contain ideas implemented in the Zhou dynasty, had codified the planning of the national capital in ancient China in its chapter 'Kao Kung Ji' (Ho, 1985). ... The traditional Chinese concept of a capital city has within it a number of distinctive features. It is the centre for linking the nation with Heaven (which may be interpreted as the destiny of the nation). It is not an economic centre. ... It serves as the political, cultural and military headquarters of the nation. ... It is the model of the nation for all matters of significance, and ranks above all other cities.<sup>963</sup>

#### Great Beijing planning precedents

At the end of the 1990s, Beijing began its preparation for the 55th Anniversary of the People's Republic of China (2004) and the Beijing Olympic Games (2008), aiming to "become a 'modernized international city of the first rank' in the period from 2010 to 2050."<sup>964</sup> The plan for the Olympic events area developed a huge 'unwalled' park space, which was uncommon in the tradition of Beijing public spaces. This break in the public spaces tradition perhaps explains that the "newest

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<sup>963</sup> Sit 1999, *Social areas in Beijing*, 458,461

<sup>964</sup> Gu, *et al.* 2010, *China's master planning system in transition: case study on Beijing*, 17

park is reportedly largely inhabited”.<sup>965</sup> The park scheme is underlined by two orthogonal axes embodying a “monumental commemorative plaza”; a traditional symbolism “to bolster national identity and reinforce both overt and covert political agendas”.<sup>966</sup> While being a motive to 'clean up' more than 1000ha of original city fabric, the plan provided an opportunity “for a nation to develop a meta-narrative of creating a global city”.<sup>967</sup>

### Conservation plans background

Since 1949, the Chinese government has been concerned with protecting China’s national heritage.<sup>968</sup> Most recently, the “Provisional Regulations Governing the Management of the Designation of Cultural Relics” was published in 2009. While China might have enough laws and regulations to protect its heritage sites, the application of these laws has posed a dilemma for the Beijing Municipal Government. In 2001, the latter published (on its official website) a document entitled 'Advancing modernisation of the municipality': a well-intentioned set of urbanisation strategies for the Five-year Plan (2001-2005), which aimed to enhance

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<sup>965</sup> Smit 2010, *Beijing transformed (again): An exploration of the 2008 Olympic Building Program - eroding the 'figure' of a city or opening public ground?*, 2

<sup>966</sup> "The office of Albert Speer (Jnr.) was commissioned to revitalise a 100 square kilometre long corridor linking the Olympic Green and Forest Park in the North, to the Forbidden Palace, Tiananmen Square in the centre of Beijing and a new „Ecological Park“ and transit terminal in the South. The imperial axis of Beijing, designed by Albert Speer Jnr. has been compared to the Hitler's vast ceremonial axis planned for Berlin and designed by Albert Speer during the 1930s. See Marvin 2008, "All under Heaven" - *Megaspace in Beijing.*"; Smit 2010, *Beijing transformed (again): An exploration of the 2008 Olympic Building Program - eroding the 'figure' of a city or opening public ground?*, note 9

<sup>967</sup> Smit 2010, *Beijing transformed (again): An exploration of the 2008 Olympic Building Program - eroding the 'figure' of a city or opening public ground?*, 1

<sup>968</sup> The first regulations were published in 1950, and addressed the preservation of heritage books and the excavations of sites and tombs. By 1951, a joint project between the national government and the Ministry of Culture established regulations which authorised provincial committees to manage heritage sites. From then on, a series of other directives were listed:

- “historical and revolutionary heritage” (1953)
- “officially protected heritage sites” (1956)
- “important entities for the protection of the national heritage” (1960)
- “historically and culturally important cities” (1982)
- “State protection of the Historic Conservation Areas” (the Law of Cultural Heritage-2004)

Merle and Peng 2003, *Peking Between Modernisation and Preservation*, ¶13-8; Yuan 2007, *The conservation of urban heritage in market China: private property, public policy and cultural heritage* 44

the “modernization level of the urban area”.<sup>969</sup> The document recognises the value of maintaining the architectural heritage of “relatively complete courtyard houses”, proposing the strengthening of repairs and renovations to these structures, “scientifically and rationally”, through the formulation of “local laws and regulations for the purpose” of protecting “Beijing as a famous historical and cultural city”.<sup>970</sup>

However, the report also stresses that the “renovation of dangerous and old residential housing in urban areas” should target the expansion of “the functions of the city as a modern international metropolis in the provision of business-related services, logistics, the hosting of conventions/exhibitions and tourism”. This seems to be a paradoxical statement because the document does not consider the use of each local *hutong* structure as a provider of social and cultural life for its original residents. The closest mentioning of the latter function is the recognition that “land use should be optimized in accordance with the cultural content and features of various historical and cultural protected districts. It is necessary to strengthen the planning and designing of new projects and standardize renovation and development”. Again, it seems unlikely that this will be accomplished in time to ensure the preservation of the courtyard compounds and to prevent the demolition of the individual “dangerous and old residential housing” in various urban areas, mainly because of the swift market forces at play.<sup>971</sup>

Moreover, by introducing the drive of ‘competitive mechanism’,<sup>972</sup> the government created a rivalry between districts and neighbourhoods; the latter were thereafter evaluated by ‘visible growth’. This created a context where

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<sup>969</sup> 2012, *Advancing modernization of the municipality*

<sup>970</sup> Ibid.

<sup>971</sup> “Three physical problems commonly existed in those dilapidated houses. First, unsafe structure, such as crumbling walls and rotting wood columns and trusses. Second, rain water accumulated in the summer time whenever there was heavy downpour, because the level of some courtyard houses was lower than the street level and also because the drainage system left from *Qing* and even *Ming* Dynasty was no longer capable of draining the water away. Finally, leaky roofs further exacerbated the former two problems. About two million m<sup>2</sup> of the houses had been listed as ‘dangerous houses’ for years, but most of them were still inhabited (Yu, 1989).” Zheng 1995, *Urban Renewal in Beijing - Observation and Analysis*; Yu 1989, *Residential Redevelopment in Beijing*

<sup>972</sup> “Beijing will, in accordance with market economic principles, introduce a competitive mechanism when it deepens reform of the operation and administration of public utilities, to allow them to become standard enterprises offering socialized services and functioning in accordance with market economic principles.” Beijing Municipal Government 2012, *Advancing modernization of the municipality*

“coalitions of the land-based elite expand the local economy and accumulate wealth through the intensification of land use”.<sup>973</sup> Consequently, this concept of urban growth collided with the concept of urban preservation.<sup>974</sup> Finally, yet importantly, by the end of the Five-year Plan (2005), the municipal government was unable to guarantee the implementation of the conservation laws and failed to create a strong and unique local administration office in each neighbourhood; instead, it divided this burden among several governmental entities.<sup>975</sup>

The government initiatives above did not solve the problem of conservation of architectural values related to old housing stock. Instead, they contributed to delaying the application of preservation laws related to Beijing's architectural heritage, because they failed to effectively manage the following related factors: i) the fate of traditional dwellings (The massive occupation and belligerent subdivisions that converted the large amount of *siheyuan* in *dazayuan* lead either to unrecoverable dilapidations or very costly renovations);<sup>976</sup> ii) the existence of private property (The unclear ownership of dwellings and the compulsory household relocation notices related to new developments reduced the motivation of householders to renovate their properties);<sup>977</sup> iii) the attitude to heritage sites

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<sup>973</sup> "The prospect of collecting revenue and enriching themselves persuaded district officials to collaborate with real-estate developers. More importantly, by replacing old structures with modern high-rises, redevelopment projects produce a kind of 'visible growth'. As the showcase of an economic boom, encouraging 'visible growth' becomes an important way for public officials to get promoted (Ma and Wu, 2005)." Zhang 2008, *Steering towards growth: Symbolic urban preservation in Beijing, 1990-2005*, 188, 191

<sup>974</sup> "Urban preservation refers to the maintenance and repair of existing historic structures, including historical monuments and vernacular dwellings. Urban growth, in comparison, is usually achieved through the demolition of old structures and the intensification of land use." *ibid.*, 188

<sup>975</sup> " Work also covers the following: strengthen the maintenance and administration of infrastructure facilities; guide, standardize and promote the development of communities, foster community organizations and establish a well-functioning community administration and service system; further deepen reform of the neighborhood system and strengthen neighborhood committees' comprehensive administrative functions; strengthen administration over areas where the urban area meets suburban areas; improve the quality of city administration supervisors so that they discharge their duties strictly in accordance with law." 2012, *Advancing modernization of the municipality*

<sup>976</sup> In 2005, " ... the restoration and upgrading of facilities in courtyard housing would cost as much as 40,000 yuan (US\$4,800) per sq m. This is roughly five times the cost to the general public of a new apartment in this area." 2005, *Beijing: the fate of the old*; Maomao and Chuan 2010, *Comprehensive Environmental Management of Historic and Cultural Blocks in Old City - A Case Study of Shichahai Area in Xicheng District, Beijing*

<sup>977</sup> "Private property in this context refers to the property of siheyuan inhabitants. It contains two sorts of property: the property of house and the property of land.



(Probably because of the ephemeral characteristic of their wooden construction, “exalted places in China tend to be valued more in terms of site than for the buildings erected thereupon”);<sup>978</sup> iv) the number of institutions in charge of preservation (Authority over the Beijing preservation of historical districts is distributed among five different bureaux; this causes administrative conflicts and slows the effectiveness of the preservation processes;<sup>979</sup> v) transportation demands (Traffic and transportation plans have tended to follow efficiency rules, disregarding the traditional structure of the city);<sup>980</sup> vi) the creation of scenery environment (The criteria for locating new green spaces regard the concepts of sequential green

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- House property: the property of most houses is private, dating from the KMT Period, even the Qing Period;
  - Land property: although, according to the Chinese Constitution, all urban land belongs to the State, the ownership and the usufruct of land are separated. In the Chinese legal system, the usufruct of land is treated as property of land. The Law of Land Administration of 2004, stipulates that the inhabitants have the private usufruct of land, namely, the property of land." Yuan 2007, *The conservation of urban heritage in market China: private property, public policy and cultural heritage*, 42; Merle and Peng 2003, *Peking Between Modernisation and Preservation*, 20

<sup>978</sup> ..."Buildings at Buddhist pilgrimage sites, places of worship for a thousand years, have typically been reconstructed many times through the centuries; Western tourists are often startled to learn that the 'ancient temple' they marvel at was proudly rebuilt in 1993 using reinforced concrete...Thus a conservation area in Beijing's Old City, so designated because it was traditionally a neighborhood of ethnic minorities, could be razed and rebuilt so long as the factor of significance – the minority community – remained in place." Campanella 2008, *The concrete dragon : China's urban revolution and what it means for the world*, 152; Lu 1997, *Beijing's old and dilapidated housing renewal*

<sup>979</sup> "In Beijing, the authority of urban preservation is dispersed between at least five municipal agencies, 4 including the Beijing Municipal Administration of Cultural Heritage (BMACH) and BMCUP [Beijing Municipal Commission of Urban Planning]. Some agencies are in charge of historic monuments, while others are responsible for the designation of preservation districts; some make preservation plans for old neighbourhoods, while others issue demolition certificates for the same areas. Public officials are careful to do only things that fall within their jurisdictional boundaries; otherwise they might be accused of violating the authority of other agencies, which is bad for both the interests of their bureaux and their career paths... As a result, the actual procedure by which the designated areas will be preserved is ambiguous. Some preservation districts are lacking basic maintenance. For them, 'preservation' means only that have not been demolished. Even worse, others are 'preserved' as part of a wholesale redevelopment approach." Zhang 2008, *Steering towards growth: Symbolic urban preservation in Beijing, 1990-2005*, 195

<sup>980</sup> In 2008, the tourism sector contributed to 5.4% of China's GDP, a percentage that the national government intends to increase to 11% – ca.58 billion US dollars – by 2020. Moreover, the *hutong* areas have been acquiring an international recognition as one the most important 'urban Chinese' heritage elements, becoming a growing tourist attraction. Merle and Peng 2003, *Peking Between Modernisation and Preservation*, 9; du Cros, et al. 2005, *Cultural Heritage Assets in China as Sustainable Tourism Products: Case Studies of the Hutongs and the Huanghua Section of the Great Wall*, 173; Gu and Ryan 2008, *Place attachment, identity and community impacts of tourism—the case of a Beijing hutong*, 638

spaces, and disregard the traditional urban fabric);<sup>981</sup> vii) trade and tourism (In order to promote tourism and consequential trade services, local governments allow retailers to renovate traditional buildings to appeal to the kitsch expectations of a large number of tourists, rather than attending to a code of elements of traditional architecture);<sup>982</sup> viii) a lack of financial resources (Local governments are responsible for promoting the urban renewal of their administrative area independent of any municipal support.

This is also the case for the building of new public infrastructure and the relocation of excessive population, which is necessary in any housing renovation to attain the minimum ratio of people/m<sup>2</sup> defined by the government housing standards; this is a heavy burden in high urban density areas where the low-income population does not generate tax revenue.); and, finally but importantly, ix) the value of land (The increasing market value of Beijing's historical core encourages developers to take advantage of the colliding interests of the above issues by creating real estate partnerships with local authorities, both district and neighbourhood, in an uncontrollable search for higher profits.)<sup>983</sup>

By 2004, the Beijing Municipal Land and Housing Administration made it possible for the *siheyuan/dazayuan* compounds to be freely marketed and privately owned.<sup>984</sup> According to the published municipal document, the free will of the new

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<sup>981</sup> An example of this is the demolition of part of the historical fabric of the Nanchizi neighbourhood to create an "emerald necklace bedecking the Imperial Palace" attending to the master plan in 1993. Campanella 2008, *The concrete dragon : China's urban revolution and what it means for the world*, 153; Lu 1997, *Beijing's old and dilapidated housing renewal*, 66-67

<sup>982</sup> Merle and Peng 2003, *Peking Between Modernisation and Preservation*, 16

<sup>983</sup> "While the interests of these different actors – heritage offices, property developers, etc. – seem to stand in opposition to each other, they are sometimes very tightly interwoven, and those who officially protect the heritage are sometimes the first to destroy it. Thus, in a list of property developers published by the Ministry of Construction, the company *Dongfang kangtai* appears as an entity that belongs to the heritage office of the district of *Dongcheng*. The plurality of the functions of administrator and entrepreneur renders the possibility of any checks and balances or any recourse to the law particularly difficult." *ibid.*, 12

<sup>984</sup> The published document stated that "...enterprises, social groups, governmental departments and individuals in and outside Beijing are allowed to purchase, sell, lease or inherit any of the *siheyuan* in the city's old downtown areas. They may also donate or mortgage a *siheyuan*, the document says. Buyers will enjoy favourable taxes and charges on land-use right transfer for the *siheyuan* trade. Under the new rules, enterprises from abroad or foreigners are also permitted to own a *siheyuan* with the same preferential treatment enjoyed by domestic buyers, unless specified otherwise by laws and regulations. In the trade, prices will be set through negotiations between buyers and sellers." 2005, *Beijing: the fate of the old*

owners – although still under insufficiently specified 'laws and regulations' – would determine the use and the degree of renovation (whether traditionally accurate or inaccurate) of any individual courtyard compound. Thus, the most preserved *siheyuan* might have a promising future because they can be converted either to smart hotel units or to boutique housing that can achieve very high prices per square metre in the Beijing land market.<sup>985</sup> On the other hand, the most dilapidated *dazayuan* will face extinction within an ineffective conservation environment, largely threatened by the greedy land market.<sup>986</sup> Hopefully, the recoverable *dazayuan* situated in areas largely visited by tourists, such as Shichahai, will have a positive effect on the tourism industry, which demands the maintenance of original dwellings as an attraction for tourism revenues,<sup>987</sup> thus facilitating coherent rehabilitation projects.<sup>988</sup>

## **D.2 Lisbon**

### Planning for (after) international exhibitions

The urban redevelopment of large areas adjacent to the Tagus River has been a familiar initiative for the city administration since the 'The Great Lisbon Earthquake' in 1755. Creating panic in the 275 000 residents, the earthquake's impact was a profound and lasting experience not only in Portugal, but also for all of Europe. Depictions of the earthquake in art and literature can be found in several

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<sup>985</sup> "As of 2006, there were approximately 7,000 to 9,000 *siheyuan* on the market in Beijing, the best preserved and most valuable of which were in Xicheng and Dongxeng districts, where a single 21,528-square-foot [*ca.*2,000m<sup>2</sup>] complex near Shichahai, a chain of lakes in the old city, sold in 2005 for nearly \$5 million [US dollars]." Campanella 2008, *The concrete dragon : China's urban revolution and what it means for the world*; Chen 2006, *Siheyuan: Old Beijing Style Appeals to Many*

<sup>986</sup> To corroborate this prediction, it can be mentioned that the municipal government completely omitted the *siheyuan/hutong* conservation in the item 'Strengthening protection of sites of historic and cultural interest' in the 2012 government report. In the report, "UNESCO world heritage sites", monuments, relics, "vacating culturally significant buildings" and even "outstanding modern architecture and important industrial heritage" are pointed to be the focus of the current government conservation concerns. *Report on the work of the Government 2012 (part III)* 2012, *Report on the work of the Government 2012 (part III)*

<sup>987</sup> Gu and Ryan 2008, *Place attachment, identity and community impacts of tourism—the case of a Beijing hutong*; du Cros, et al. 2005, *Cultural Heritage Assets in China as Sustainable Tourism Products: Case Studies of the Hutongs and the Huanghua Section of the Great Wall*

<sup>988</sup> For an example of coherent rehabilitation project based on traditional typology see "Preservation and regeneration of Beijing's courtyard houses based on typology methods." Ren and Lü 2011, *Preservation and regeneration of Beijing's courtyard houses based on typology methods*

European countries, and these were produced and reproduced for centuries following the event.”<sup>989</sup> Immediately after the earthquake, a triple wave tsunami and a large fire killed 10 000 people, and only 3000 habitable dwellings of the original 20 000 were left standing. Additionally, given the poor quality of building construction, 35 of 40 churches collapsed. The disaster occurred on the Christian All Saints Day; if it had struck around mid-day (mass time), a much larger number of people would have died under the falling ecclesiastical roofs. Portuguese people called this a 'happy disgrace' (*feliz desgraça*) at that time.<sup>990</sup>

While the earthquake was an enormous social and material disaster, it was not an architectonic catastrophe. Eighteenth-century writers described Lisbon before the earthquake as an 'African city' structured by small, dirty, and inconvenient streets, where the poor architecture was marked by very few buildings of interest. Therefore, the urban reconstruction under a new urban design proposal and the construction of a sewage network were enormous benefits for Lisbon, despite being immensely costly and difficult to monitor.

The 1940 Exhibition of the Portuguese World was motivated by the desire of the political regime of the *Estado Novo* (New State) – instituted by Prime Minister Antonio Salazar and endorsed by the Catholic Church – to confirm Portuguese 'national pride' in maintaining Portuguese catholic colonies (Africa and Timor), and “recuperating and revalidating Portugal’s glorious past, and impressing upon the Portuguese nation that its 'mission in the world' had in no way concluded”.<sup>991</sup> It was a rather controversial affirmation for a fascist regime, which did not participate in World War II’s turmoil, but was allied with democratic America.<sup>992</sup> Nevertheless, the exhibition created a reason for urban renewal and major improvements in the Belem neighbourhood, located on the western side of the city.

At the end of the nineteenth century, the north-eastern area of Lisbon was used for rural residences and farmland. “Following its quick industrialisation during

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<sup>989</sup> Kozak and James 1998, *Historical Depictions of the 1755 Lisbon Earthquake*

<sup>990</sup> França 1989, *A reconstrução de Lisboa e a arquitectura pombalina*, 8

<sup>991</sup> Sánchez-Gómez 2009, *Imperial faith and catholic missions in the grand exhibitions of the Estado Novo*, 671

<sup>992</sup> Corkill and Pina Almeida 2009, *Commemoration and Propaganda in Salazar's Portugal: The Mundo Português Exposition of 1940*

the first half of the twentieth century, [however,] it became Lisbon's area of choice for the country's first oil refinery<sup>993</sup> because the riverfront allowed the ideal conditions for a port.

By 1940, an artificial harbour was made in the riverbank to allow for the maintenance of clippers (hydroplanes) that flew between North America and Portugal. The structure was built by Pan American Airways and was popularly named 'Doca dos Olivais'. The area around it developed into an industrial/port storage area until deactivation of the clippers in the 1960s. In 1948, given the expansion of the area utilised by the port northwards, the Doca of Olivais area came under the administration of the Lisbon Port Authority.<sup>994</sup> From the 1960s, with the decrease of the import/export business with Africa and the consequent decline of the industrial and port functions, the area deteriorated and became a brown-field contaminated by industrial waste, and a stage for 'spontaneous occupations' made by precarious household huts.<sup>995</sup>

### Genesis of the project

In 1998, the motive for organising a world international fair in Lisbon was similar to the 1940 exhibition – albeit less imperialistic – with a focus on the importance of the oceans. The idea was born in 1989 when discussed between Vasco Graça Moura and Antonio Mega Ferreira as a way in which to celebrate the coming 500th anniversary of Vasco da Gama's arrival in India in 1498.<sup>996</sup> The theme was chosen in later meetings as 'The Oceans, a Heritage for the future'.<sup>997</sup>

The initiative was approved by the then Portuguese government, and the State Company Parque EXPO was then formed in 1993 with the aim of making a

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<sup>993</sup> 2012, *Parque EXPO, history*

<sup>994</sup> *Memoria institucional 2008, Memoria institucional*

<sup>995</sup> Gaspar 1996, *Of eastern Lisbon*, 16;

<sup>996</sup> Vasco Graça Moura and Antonio Mega Ferreira were the heads of the Committee designated by the Portuguese government to organise and promote events related to the Portuguese maritime journeys to discover other unknown countries located in the Indian Ocean.

<sup>997</sup> The Intergovernmental Oceanographic Conference, held in Lisbon towards the end of 1991, made contact with the proposal for the Lisbon Expo and approved a motion to support the project, and in December 1994, as a conclusion to a Portuguese initiative, the General Assembly of the United Nations unanimously approved the declaration of 1998 as the International Year of the Oceans. Mega Ferreira 1996, *Expo 98, a different Expo*, 9

self-sustaining event, its revenue to be generated from admission tickets and marketed event products. However, it was planned that the main revenue would come from real estate and allotment sales of the Redevelopment Area. In this regard, the focus was on well-managed, successful post-event urban development.

Yet, at the end of the 1980s, the Lisbon planning scenario was complex as it incorporated the Competition for Ideas for the Riverside Area (1988), the project and construction of the Belém Cultural Centre (1988-92) in the area of the 1940 Exhibition, the Strategic Plan and Lisbon Master Plan (1990-4), and the Organizational Plan of the Riverside Area (POZOR). These planning entities were all concerned with riverfront rehabilitation for residents' use, in lieu of their traditional institutional use.<sup>998</sup> This involved maintaining existing barriers – such as railways and port storages – and passing over or under them. However, the physical presence of this infrastructure was just the tip of a huge bureaucratic iceberg, which was impossible to overcome in time for the EXPO. Perhaps for this reason, the keyword used in the plans was 'permeability' and not 'accessibility'.

Immediately after the creation of the Parque EXPO, a Competition for Ideas for the EXPO '98 Site was launched for an area of 25ha within the total 350ha of the Redevelopment Area (RA). However, "The designation 'Competition for Ideas' did not correspond to its goal which was to select planners for the future commission of projects and not to select an idea to develop for the site".<sup>999</sup> Also surprisingly, the 'idea' plan for the site had to consider the Plan of Urbanization of the Zone, which had not yet been drawn; thus, most of the proposals were rather limited to the Exposition site.

The decision to locate the EXPO in the eastern area of the city was a consequence of a detailed viability study conducted by architect Francisco Silva Dias in 1990. The study evaluated the feasibility of three possible locations on the riverbanks (northern, eastern, and western) to supply the 25ha required for the event. The Parque EXPO requested Silva Dias to develop criteria for a site selection, emphasising both riverbank space quality and bureaucratic ease, which would

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<sup>998</sup> Soares 1996, *Lisbon - a riverside city looking for its future*, 19

<sup>999</sup> Vassalo Rosa 1996, *EXPO'98: the city of Lisbon*, 45

guarantee the accomplishment of the whole project in the proposed time. When Silva Dias recommended the preferred location, he mentioned that, if the promoters accepted his suggestion, they would need to accept the challenge of treating the soil that had been polluted by petrochemicals over several decades.<sup>1000</sup>

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<sup>1000</sup> Silva Dias 1990, *Primeiro relatório sobre a selecção e avaliação do impacto urbanístico de um terreno para realização da Exposição de Lisboa de 1998*, 53-7





## Appendix E: Theory and best-practice summaries from key sources

After a preliminary investigation of a large body of literature in the field, this study adopted two leading references to institute the dimensional criteria for the design of the prototypes. One reference was Jan Gehl's *Cities for people*; the other, the *ULDA Guidelines and Practice Notes no. 01, "Residential 30"*.<sup>1001</sup> The reasons for the choice of the former were Gehl's perceptive approach to the human scale in urban design, and the relevance of his studies to Australian state capitals.<sup>1002</sup> One reason for the choice of the second reference was related to its relevant position in the planning and coordination of the UDAs (Urban Development Areas) in Queensland – including the Bowen Hills UDA. The second reason for this choice was the quality of the published document, which summarises a comprehensive set of best practice guidelines; these guidelines are contained in most of the documents that have led urban developments in SEQ.

Tables 16-18 scaffold the information retrieved from the sources mentioned above.

**Table 19.** Summary from *ULDA Guidelines and Practice Notes, Guideline No. 01*

Design components	Design considerations	Urban design parameters
Block design	Orientating for climate: Capture prevailing summer breeze	Long road leg length: north-south orientation
	Access to winter sun	Long road leg length: east-west orientation
Street Design	Priority pedestrians/cyclists	Routes for vehicles and public transport; paths for cyclist and pedestrians Utility services and drainage Trees
	Legible/connected pattern	Permeable street network; legible pathway network; walkable access to bus routes from most dwellings; minimal driveway width; use

<sup>1001</sup> *Residential 30* 2010, *Residential 30*

<sup>1002</sup> Perth 1993 and 2009, Melbourne 1994, 2004 and 2010, Adelaide 2002, Sydney 2007, Brisbane 2007, Hobart 2010. By 2010, Gehl was awarded an Honorary Fellowship from the Planning Institute of Australia (PIA). In Gehl Architects 2010, *Honorary fellowship awarded to Jan Gehl*

<b>Design components</b>	<b>Design considerations</b>	<b>Urban design parameters</b>
		rear laneways
	Comfortable, convenient, safe, accessible streets	Block length - 100m max.; narrow carriageways; direct/continuous pedestrian/bicycle routes; footpath 1.5m min. width – both street sides (30dph); carriage 5.5m width (20dph), 7.5m width (20-30dph)
	Rear lanes	Access to garage/front doors; agreeable landscaped environment; 6.5m max. width; max. 140m length; no cull-de-sac; shared spaces with good passive surveillance
Park Design (a)	Functional diversity	Multi-purpose parks, smaller pocket parks throughout the neighbourhood; 12-15% neighbourhood area (30dw/ha)
	Sustainable and safe	Respect for natural elements; clear relationship: public open spaces - other land uses; passive surveillance
Building Design	Distinctive streetscape character	Built up to boundaries On-site car parking - 2.7x5.5m max. 1 driveway/ dwelling – up to 40% lot frontage; Site coverage 60-75% lot area; Front entry clearly defined Passive surveillance – one room (at least) with window(s) facing the street
	Privacy	Visual/ aural
	Outdoor lifestyle	
	-Private Open Space (POS)	Ground floor: 12m <sup>2</sup> min. 2.4m min. width; Upper floors: 5m <sup>2</sup> min.; 1.2m min. width; Accessible from the living room
	-Communal Open Space (6+ attached dwellings)	Min. 25% site area; 4m width min.; Informal surveillance from dwellings; Separated from POS- fences/ bushes
	Diversity and affordability-small dwellings	Loft style apartments, villa or terraces, small attached dwellings

Note (a): The conditions and requirements considered for Park Design at the neighbourhood scale are mostly applied in this study to shared courtyards in Communal courtyard Blocks. These courtyards would be

equivalent in scale to pocket parks.<sup>1003</sup>

The table below lists the essential information related to human scale and perception.

**Table 20. Summary of Human Scale and Perception Topics (from ‘Cities for people’)**

Topic	Classification	Explanation
Distance/ Perception	100m	Perception of human body movement
	50-70m	Identification of a person; perception of shouts (help)
	35m	Communication in one-way with a loud voice
	20-25m	Perception of facial expression; short two-way talk
	0-7m	Perception/communication using all senses
Speed/ Perception	Walk: 4-5km/h	Very good sensory contact: surroundings/people
	Run:10-12km/h	Good sensory contact: slow down for obstacles
	Cycle:15-20km/h	Good sensory contact: slow down for obstacles
	Car: 50-60km	Lack of sensory contact: people/surrounding details
Distance/ Communication	0-45cm	Intimate distance; exchange of strong emotions
	45-120cm	Personal distance; contact between family and friends
	1.2-3.7m	Social distance; exchange of ordinary information
	Above 3.7m	Public distance; formal contact; one-way communication
Edges Scale/ Character	Small scale	Exciting, intense and ‘warm’ urban environment
	Big Scale	Impersonal, formal and ‘cool’ urban environment (Large spaces/large buildings)
	Soft edges	Narrow units frontage; many doors; mixed functions; vertical rhythms
	Hard edges	Large units frontage; few doors; closed and horizontal façades

The table below lists the data from *Courtyard Houses of Beijing* (See **Fig.124**).

**Table 21. Summary from ‘Courtyard Houses of Beijing’ – Double courtyard example**

Component	Retrieved values (per block)

<sup>1003</sup> “Pocket parks, also known as minipark or vest-pocket parks, are urban open space at the very small scale ... These diminutive parks tend to act as scaled-down neighborhood parks, but still often try to meet a variety of needs. Functions can include small event space, play areas for children, spaces for relaxing or meeting friends, taking lunch breaks. etc. They can be a refuge from the bustle of surrounding urban life and offer opportunities for rest and relaxation.” Blake 2013, *Pocket parks*, 1

<b>Retrieved values (per block)</b>	
<b>Component</b>	
Blocks	3,174m <sup>2</sup> (69mx46m)
Buildings	2/3/4 storeys (apartments)
Courtyards	1,014m <sup>2</sup> (26mx19.5mx2)
Streets	2,800m <sup>2</sup> (width 26m,12m-lane)
Parking	44 cars on street parking

<b>Topic</b>	<b>Ratios p/ha (Net area: 0,60ha)</b>
Density	164 units/ha
Green space (shared)	1,690m <sup>2</sup> /ha
Streets	4,600m <sup>2</sup> /ha

Note (a): All dimensions should be increased to suit Australian parameters; appropriate proportions are applied to define criteria for communal courtyards.

## Appendix F: Floor plan areas

This appendix shows the sizes of apartments and houses in the Brisbane area used as market references parameters for the residential units design. The Brisbane Housing Company (BHC) was the developer of the apartments' samples used to make the apartments table; the data was retrieved on March 2013 from the web sites pages linked to <http://www.bhcl.com.au/bhc-projects/current-projects/>

The plans used to make the houses table were retrieved from the Economic Development Queensland web site in the "Housing Innovation and Design" page (accessed February 2013) <http://www.dsdip.qld.gov.au/housing-innovation-and-design/economic-development-queensland/housing-innovation-and-design.html>

### ***D.1 Apartments: average areas***

#### **0 Bedroom apartments**

interior area: 35 m<sup>2</sup>  
living area: 20.01m<sup>2</sup>

#### **1 Bedroom apartments**

interior area: 50 m<sup>2</sup>  
bedroom area: 11.15m<sup>2</sup>  
living area: 4.11m<sup>2</sup>

#### **2 Bedroom apartments**

interior area: 75 m<sup>2</sup>  
bedroom area: 10.93m<sup>2</sup>  
living area: 32.21m<sup>2</sup>

#### **3 Bedroom apartments**

interior area: 128 m<sup>2</sup>  
bedroom area: 8.9m<sup>2</sup>  
living area: 34.76m<sup>2</sup>

## ***D.2 Houses: average areas***

### **1 Bedroom**

interior area: 48m<sup>2</sup>  
living area: 24m<sup>2</sup>

### **1 Bedroom – SoHo (Live-Work)**

interior area: 48m<sup>2</sup>  
living area: 24m<sup>2</sup>  
office space area 21m<sup>2</sup>

### **2 Bedrooms**

interior area: 74m<sup>2</sup>  
living area: 27m<sup>2</sup>

### **3 Bedrooms**

interior area: 104m<sup>2</sup>  
living area: 32m<sup>2</sup>

### Floor plan notes

To establish design criteria for the floor plan areas, the data from was retrieved from two not-for-profit institutions. To serve for the communal courtyard housing references, the data was retrieved from the BHC (previously known as Brisbane Housing Company)<sup>1004</sup> website. Since its incorporation in 2002, this company has been recognised for the quality of its development portfolio and for its efforts in promoting affordable housing, including its participation in the National Rental Affordability Scheme (NRAS).<sup>1005</sup> For courtyard house references, the data was retrieved from the “Housing innovation and design” (Department of

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<sup>1004</sup> "The Brisbane Housing Company model was conceived by the Brisbane City Council and the Queensland State Government as an innovative response to the continuing problem of providing affordable and secure housing for low and moderate income groups in near and inner city Brisbane. Although it has no statutory responsibility for the provision of housing, the Brisbane City Council (BCC) has made a clear policy commitment to social inclusion that includes making the city an affordable place for all sections of society to live." Shelter WA 2003, *The Brisbane Housing Company Model: Issues associated with the provision of low-cost housing through a public/private partnership*  
<sup>1005</sup> The National Rental Affordability Scheme (NRAS) is a joint venture initiative of the Australian State Governments and the Commonwealth aiming to deliver 50,000 dwellings to be rented out to low/moderate income single persons and families.

State Development, Infrastructure and Planning) webpage.<sup>1006</sup> (The tables developed with this retrieved data are presented in Appendix F)

The areas (average) for apartment floor plans (interior) are:

**Studio:** 35 m<sup>2</sup> – Living: 20.01m<sup>2</sup>  
**1 bedroom:** 50 m<sup>2</sup> – Bedroom: 11.15m<sup>2</sup>, Living: 24.11m<sup>2</sup>  
**2 bedroom:** 75 m<sup>2</sup> – Bedroom: 10.93m<sup>2</sup>; Living: 32.21m<sup>2</sup>

The average areas for house floor plan are:

**1 Bedroom:** 48m<sup>2</sup> – Living: 24m<sup>2</sup>  
**1 Bedroom (SoHo/Live-Work):** 48m<sup>2</sup> – Living: 24m<sup>2</sup>; Office: 21m<sup>2</sup>  
**2 Bedrooms:** 74m<sup>2</sup> – Living: 27m<sup>2</sup>  
**3 Bedrooms:** 104m<sup>2</sup> – Living: 32m<sup>2</sup>

The areas above served as an initial guide to the dwellings' design; however, minimum dimensions have been attended to provide the dwellings with high accessibility to the rooms, with the objective of maximising safety when moving into and around them. In addition to these benefits, adherence to the criteria will make future adaptation of the dwellings more cost-effective.<sup>1007</sup> Lastly, yet importantly, additional motivation to adopt the criteria can be found in the statistical forecast that there is a 60% chance of a "house to be occupied by a person with disability ... one in five (close to 4 million) Australians currently have a disability of some type ... the number of Australians with disability will inevitably rise as the population grows and ages".<sup>1008</sup>

The dimensions below are advocated by Liveable Housing Australia (LHA), which publishes the *Livable Housing Design Guidelines*.<sup>1009</sup> The publication recommends the use of levels of performance (Silver, Gold and Platinum) which represent basic to best practice in liveable home design. This study applied the

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<sup>1006</sup> See <http://www.dsdip.qld.gov.au/housing-innovation-and-design/economic-development-queensland/housing-innovation-and-design.html>

<sup>1007</sup> "It's makes smart sense to commit to livability features when a home is first designed and built rather than wait for an unplanned need to arise. In fact, international research shows that it's 22 times more efficient to design for adaptability up front. Livability works for pregnant mums, young families with kids and people with sporting or traumatic injuries, as well as seniors, Australians with disability and their families. Livability is an investment that makes both economic and social sense." 2012, *Livable Housing Design Guidelines*, 5

<sup>1008</sup> Ibid., 10

<sup>1009</sup> "LHA champions the mainstream adoption of livable housing design principles in all new homes built in Australia."Ibid.

dimensions suggested by the Silver and Gold Levels:<sup>1010</sup>

- Door clearance: 0.85m
- Corridor/passageway/stairs clearance: 1m
- Kitchen/laundry: 1.2m clearance in front of fixed benches and appliances
- One bedroom on entry level with:
  - at least 10m<sup>2</sup> + 1 wall a minimum length of 3m
  - minimum path of travel of at least 1m on at least one side of the bed.
- At least 1 entry level bathroom (with sliding door): 2.1mx1.8m

Relevant tables in following pages

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<sup>1010</sup> Ibid.



### D.3 Apartments areas

**Table 22.** Apartments areas - The Brisbane Housing Company (BHC)

Bldg name	Unit	Bed # or m <sup>2</sup>	Living m <sup>2</sup>	Bath	Lev	Face	In m <sup>2</sup>	Out m <sup>2</sup>	Gar # or m <sup>2</sup>	Total m <sup>2</sup>	Price	NARS	# Bldg Fac.	Inter. Bath	Location
cargo	30	1		1	2	west	na	Balc.	1	76	334	y	1	y	musgrave
"	31	1		1	2	west	na	"	1	66	334	y	1	y	"
"	18	2		2	1	east	na	"	1	103	424	y	1	y	"
"	28	2		2	2	east	na	"	1	103	434	y	1	y	"
"	25	3		2	2	s/w	90	33	1(2?)	123	450	y	corner	y	"
"	23	3		2	1	n/e	na	~30	1	131	455	y	corner	y	"
"	TH	3		3	0	n/s	115	cy=15	21	151	458	y	2	2	"
aris	601	3.8x3.1 <b>11.78</b>	5.8x3.1 <b>17.98</b>	1	6	w	52	13		65		all sold	1	y	newstead
"	608	4.3x3.3 <b>14.19</b>	8.0x3.1 <b>24.8</b>	1	6	e	50	17		67		all sold	1	y	"
"	609	2.9x3.1 <b>8.99</b>	6.5x4.6 <b>29.9</b>	1	6	e	53	18		71		all sold	1	y	"
"	606	2.9x4.0 <b>11.6</b>	4.6x6.3 <b>28.98</b>	1	6	n	51	9		60		all sold	1	y	"
"	607	3.0x3.2 <b>10.56</b> 3x3 <b>9.0</b> <b>T19.56</b>	4.5x7.3 <b>32.85</b>	2	6	n/e	72	10		82		all sold	3	n	"
"	604	3.1x3.6	5.8x3.9	2	6	n/w	78	12		90		all sold	corner	y	"

Bldg name	Unit	Bed # or m <sup>2</sup>	Living m <sup>2</sup>	Bath	Lev	Face	In m <sup>2</sup>	Out m <sup>2</sup>	Gar # or m <sup>2</sup>	Total m <sup>2</sup>	Price	NARS	# Bldg Fac.	Inter. Bath	Location
		<b>11.16</b> 2.9x3.6 <b>10.44</b> <b>T21.60</b>	<b>22.62</b> 3.3x2.9 <b>9.57</b> <b>T32.19</b>												
aris	513	4.1x3.5 <b>14.35</b>	6.5x3.8 <b>24.7</b>	1	5	e	50	8		58		all sold	1	y	newstead
"	514	3,9x3 <b>11.7</b> 3.5x3.2 <b>11.2</b> <b>T22.9</b>	6.2x5.5 <b>34.1</b>	2	5	s/e	72	12		84		all sold	2	y	"
"	401	3.2x3.6 <b>11.52</b> 2.9x3.6 <b>10.44</b> <b>T21.96</b>	5.9x4.4 <b>25.96</b> 3.3x2.9 <b>9.57</b> <b>T37.53</b>	2	4	s/w	81	13		94		all sold	2	y	"
richmond	508	-	4.6x4.4 <b>20.24</b>	1	5	n/s	36	13		49	249+	y	2gal.	n	bowen hills
"	602	-	3.4x4.6 2.3x1.8 <b>19.78</b>	1	6	s/n	34	9		43	369+	y	2gal.	n	"
"	714	3.1x3 <b>9.3</b>	7.6x3.5 <b>26.6</b>	1	7	e/w	51	18		69	369+	y	2gal.	n	"
"	802	3.7x3.2 <b>11.84</b> 3x3	6.2x4.2 <b>26.04</b>	2	8/9	n/s	84	13		97	569+	y	2	2/1	"

Bldg name	Unit	Bed # or m <sup>2</sup>	Living m <sup>2</sup>	Bath	Lev	Face	In m <sup>2</sup>	Out m <sup>2</sup>	Gar # or m <sup>2</sup>	Total m <sup>2</sup>	Price	NARS	# Bldg Fac.	Inter. Bath	Location
		9.0 T20.84													
" richmond	808	3x3 9.0 3x3 9.0 2.9x3 8.7 T26.7	4.6x4.4 20.24 3.3x4.4 14.52 T34.76	2.5	8/9	e/w	128	28		156	569	y	2	y	" bowen hills
syrah	gen	2.7x2.9 7.83	4.4x3.6 15.84	1	3	e	~42	~8	1	50	329		1	y	mitchelton
quadrant	406	11 11 T22.0	32	2	4	w/s	67	20	1	87	439	n	corner	y	chermside
"	412	11 11 T22.0	30	2	4	n/e	68	21	1	89	439	n	corner	y	"
"	413	13 11 T24	33	2	4	w/s	75	12	1	87	429	n	corner	y	"

Bldg = Building

Lev = Level

In = Interior

Gar = Garage

Gal = Gallery

TH = Town home

NRAS = National Rental Affordability Scheme

Bldg Fac. = Number building façades

Inter Bath = Bathroom without natural ventilation

#### D.4 Houses areas

**Table 23.** Houses areas- Economic Development Queensland web site

bldg name	type	level	bed rooms	living area ≈m <sup>2</sup>	wc	int wc	office ≈m <sup>2</sup>	interior ≈m <sup>2</sup>	# gar or ≈m <sup>2</sup>	lot≈m <sup>2</sup>	front
Loft home	nano	2	1	24	1	-	-	48	1	53	2
Quadplex	A	1	2	28	2	2	-	79	1+1	157	1
Quadplex	B	1	2	26	1	1	-	75	1+1	155/163	C
Terrace house	1	1	1+1/2	30	1	-	-	59	1	125	1
Terrace house	2	2	2	30	2	2	-	81	1+1	111	2
Terrace house	accessible	2	3	31	2	1	-	108	1+1	146	2
Terrace house	expandable	2	2	33	1	-	-	83	1	146	2
Urban house	1	2	2	28	1	1	-	80	1*1	132	C
Urban house	2	2	2	26	1	1	-	81	1+1	105	1
Urban house	3	2	2	27	1	1	-	81	1+1	105	1
Urban house	4	2	3	33	2	2	-	100	1	105	1
Urban house	5	1	1	24	1	-	-	48	1+1	98	1
Urban house	6	1	2	24	1	3	-	59	1+1	105	1
Urban house	nano	2	2	18	1	1	-	48	1	70	1
Urban house	nano-SoHo	1+mez	1	20	2	2	12	71	1	65	C
SoHo house	1	2	1	23	2	1	40	90	1	107	2
SoHo house	2	1+mez	1	24	2	2	12	85	1+1	111	1

C=corner

mez=mezzanine

pos=private open space

≈=approximated value.

## Appendix G: Design considerations

Information obtained from various sources, including interviews, is cross-referenced in 'Design considerations' to provide appropriate dimensioning for the current Brisbane context.

### Blocks

- Long road leg length: east-west orientation provides better access to winter sun (*ULDA Guidelines*, and others)
- Brisbane's traditional blocks are 80.4m wide (average 4x20.108m [chain]), plus 20.108m [chain] of street width
- In Parque das Nações, blocks are around 100m long (average – PP3)
- Barcelona's (Plan Cerdá) blocks are 113m long
- *ULDA Guidelines* recommend a maximum block length of 100m to deliver comfortable, safe, convenient and accessible streets
- Gehl's human scale parameters consider 100m as the maximum distance to allow for the perception of human movement
- Private and shared open spaces included in CCH blocks, and a network of small plazas and pedestrian passages in CH blocks, to support a privacy/community balance
- Car parking should be contemplated within or around the block
- Network of small plazas and pedestrian passages based on the relationship between the urban unit (the plaza) and the social unit (the self-organising community)

### Buildings

- Seven-storey buildings allow direct sunlight (every day of the year) on one side of a 30m wide street (tested with sun at: 39°, 12pm, 21 June)
- Five-storey buildings allow direct sunlight (every day of the year) on one side of a 25m wide street (tested with sun at: 39°, 12pm, 21 June)
- Building height should allow for direct sunlight throughout the year in at least half of the courtyard area
- The longest façade should be oriented to the north to optimise winter sun
- Communal courtyard buildings should be less than 20m wide to allow for cross-ventilation and daylight in all habitable rooms, but wider than 15m to provide higher residential density
- Tunnels on ground floor provide ventilation in the Communal courtyards: their position should be studied to allow the entrance of breezes and protect from strong winds[Ap\_C.1.4]; gates should guarantee privacy [S\_3.2.1]
- The 'In-line House' typology allows all units/dwellings to have contact with both street and courtyard[S\_3.2.2]; provides variation in sun

- exposure (winter/summer, morning/afternoon) within all dwellings [S\_3.2.1]
- Transition spaces indoors/outdoors (crucial in a subtropical climate): Brisbane's outdoor lifestyle needs larger areas than the 5m<sup>2</sup> minimum per dwelling suggested for balconies by 'The *ULDA Guidelines*' [Ap\_E]; Balconies contribute to personalise the dwellings and the building façade [S\_3.2.2]
  - Buildings up to five storeys allow for human contact from all levels of the building and the ground (street or courtyard), as considered by Gehl [Ap\_E]
  - Visual contact dwelling- street provides safety streets [Ap\_E] and avoid social isolation, especially for elderly and handicapped [S\_3.3.1]
  - Ground floor residential in both Courtyard houses and Communal courtyards should be higher than street level: openness and visibility to street and courtyard, but privacy in the dwelling
  - Mixed-uses: retail/amenities and services on the ground floor for active streets and vibrant communities; in CH – small scale amenities, retail, offices, services or communal facilities in courtyard buildings; [S\_4.3.2; Ap\_E]
  - Offices in the corners upper levels as they can be away from the edges and don't need as much winter sun [Ap\_C.1.2]
  - Courtyard Houses and Communal Courtyard Housing should provide flexibility to create Live-Work opportunities [S\_3.3.1; S\_4.3.2]; the possibility of access through both street and courtyards facilitates the Live-Work idea in CH and CCH [S\_3.3.1; S\_3.3.2]
  - Parking in basement accommodate cars close to the residences without cluttering or destroying the scale of the urban spaces [S\_3.2.2]
  - Floor plan areas (are retrieved from local sources) regulate to local (habits) needs considering affordability, disability and liveability. See Appendix F

## Courtyards

In this study, designing the tridimensional space of the courtyards is as important as designing the buildings.

- In Parque das Nações (DP3), courtyards are 60m wide (average) and occupy 50% of the block area; in the first Cerdà Plan (1859), courtyards were planned to occupy 40-60% of the block
- *ULDA Guidelines* recommend 25% minimum site area for communal open space (more than 6 attached dwellings), and 12m<sup>2</sup> of private open space (POS) separated from the shared space for ground floor dwellings
- Bowen Hills UDA Master Plan Report suggest 18-20m as a minimum distance between building façades to guarantee visual privacy
- Gehl's studies show that 20-25m is the maximum distance from which to notice facial expression and to have a short two-way conversation (This enables interaction between people crossing the shared courtyard)
- As a result of both building height and orientation, in winter should be ensured solar exposure in 50% of the courtyard area and shade in summer should be achieved by trees and other shadowing structures

- In Communal Courtyards airflow simulations advocate the implementation of openings in the ground floor level to ensure an efficient natural airflow in the courtyard ground area (openings should be wider than their height by a ratio of 3 or 4 as a minimum).
- Fences in Courtyard Houses should be opaque and above the visibility from the street to provide privacy
- Rainwater management – maximise ground permeability to natural water system; provide collection of remaining water to be recycled

## Streets

(Note: See ‘Blocks’/’Design’ considerations for complementary information)

1. Design a street as a ‘Place’ (a subtropical urban space), rather than as a thoroughfare:

- Minimise width of driveway lanes
- Provide for linear on-street parking (reduce impact)
- Use human scale requirements
- Shared car-parking basements or silos (minimise driveways)
- Complement amenities in pedestrian areas with vegetation and water features
- Street Edges (Especially) ground floor
- Double-Grid

2. Recognise streets as part of the Urban Green Structure:

- Select appropriate amounts and species of vegetation, especially trees; bushes and other plants should be used when suitable
- Plan for deciduous trees where winter sunlight is essential for the street and the buildings
- Maximise ground water permeability on pedestrian areas (pathways and planted areas)

3. Street dimensions

### Length

- *Complete Streets* report<sup>1011</sup> recommends a maximum of 100m street length for a mixed-use street.
- Brisbane Block.
- Human Perception
- Accessibility.
- Permeability and Walkability

### Width

- The width of East-west streets depends on the building height at the southern side of the block; it should allow for solar exposure every day of the year on at least one side of the street (seven-storey building –

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<sup>1011</sup> 2010, *Complete streets : guidelines for urban street design*

30m min. width; five-storey building – 25m min. Width; two-storey houses – 8m min. lanes width)

- *City Plan 2000* building privacy requirement: “Above ground-floor a screen is required where set back less than 9m from next door window occurs”.
- Street width depends ultimately on commuting needs and other amenity functions



# Appendix H:

## Guidelines for Thesis by Creative Works



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### CREATIVE INDUSTRIES FACULTY

Practice based research can serve as a **Method of Data Collection** or a **Means of Reporting**.

#### 1.1 Practice as a Method of Data Collection

Here *Practice Based Research* is a research strategy offering up data for analysis. The practice is experimental and the results will be written up in the thesis. There is no reason for examiners to see the production.

When creative practice is used in this way the following word lengths apply:

PhD - 80,000 words

MA - 30,000 words

Normally photographic or video documentation of the creative work will be included to support and illuminate the knowledge claims made in the thesis.

#### 1.2 Practice as a Means of Reporting

Here *Practice Based Research* sees the practice stand as an examinable component of the study. The knowledge claims in the work can only be made through the symbolic language of the artistic practice. The work must be witnessed and judged by examiners for the control of artistic form demonstrated within the context of the research project. Examiners will normally be briefed on the work prior to assessing it.

2.1 The **weighting** between the practice and the written component must be specified in advance. This will be at admission for the MA and no later than confirmation for the PhD.

2.2 The weighting for the practice component shall be between 40% and 75% of the whole study. The scope and scale of the practice is to be determined by the Director of CIRAC after consultations with the candidate, supervisors and Head(s) of the appropriate discipline(s). In establishing scale, scope and the weighting between the practice and written component of the study, due acknowledgement will be paid to the expectations of both the university and the profession.

2.3 Such a weighting requires the following MINIMUM word lengths for the written component of the study:

PhD - 20,000 words (25% of 80,000 words)

MA - 7,500 words (25% of 30,000 words)

Any variation to these minimum word lengths must be approved by the Director of CIRAC after consultations with the candidate, supervisors and Head(s) of the appropriate discipline(s).

2.4 The written component will:



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- a. Articulate the central research question, intention or matter under investigation in the study.
  - b. Specify the relationship between the written component and the practice component and whether it stands as an integrated part of the whole output of the award or is intended to be published/disseminated as a stand alone output.
  - c. Set down an account of work already undertaken in the field and this work's relationship to the field and, especially at the doctoral level, demonstrate its original contribution to that field.
  - d. Outline the steps taken to address the central research question, intention or matter under investigation in the study.
- 2.5** The written component shall be in a form that communicates to the researcher's academic and professional colleagues.
- 2.6** The bound, library copy of each successfully examined thesis must be accompanied by a permanent record of the practice component. This will normally be in photographic, video, DVD or other multimedia format.

Professor Brad Haseman  
Head, Postgraduate Research Studies  
Creative Industries Faculty

## **Appendix I: Drawings**

The drawings of this study are annexed in a separate A3 binding called **Drawing Set**.  
(Practice component)

