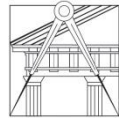




LISBOA

UNIVERSIDADE  
DE LISBOA



FACULDADE DE ARQUITETURA  
UNIVERSIDADE DE LISBOA

Título da Tese  
**UrbArch Emptiness – Lisbon Riverside**  
From theoretical foundation to analytical application by 3D Solid  
Representations of Open Public Spaces

Ramo de Doutoramento: Arquitetura  
Especialidade: Teoria e Prática do Projeto

Nome da Doutoranda: Ljiljana Čavić

Nome do Orientador: Doutor Jorge Filipe Ganhão da Cruz Pinto

Nome do Coorientador: Doutor José Nuno Dinis Cabral Beirão

**Constituição do Júri:**

**Presidente e vogal:**

Doutora Ana Marta das Neves Santos Feliciano, Professora Auxiliar,  
Faculdade de Arquitetura da Universidade de Lisboa

**Vogais:**

Doutor Jorge Filipe Ganhão da Cruz Pinto, Professor Catedrático,  
Faculdade de Arquitetura da Universidade de Lisboa;

Doutor João Carlos Vassalo Santos Cabral, Professor Associado,  
Faculdade de Arquitetura da Universidade de Lisboa;

Doutora Teresa Marquito Marat-Mendes, Professora Auxiliar, ISCTE –  
Instituto Universitário de Lisboa;

Doctor of Philosophy Jorge Alberto Lopes Gil, Assistant Professor,  
Chalmers University of Technology;

Doutor Carlos Jorge Henriques Ferreira, Professor Auxiliar, Faculdade  
de Arquitetura da Universidade de Lisboa

Tese especialmente elaborada para a obtenção do grau de doutor

Documento definitivo

Março, 2018



## Acknowledgements

Since October 2012, when this research\* started, I got in touch with several people who profoundly influenced the research direction making this journey and its output unique and possible.

I would start with mentioning my scientific supervisor and friend, prof. Jorge Cruz Pinto, whose investigation and own interest in notion of emptiness within urban and architectural practices, together with his perspicacity, criticism, relentless creativity and sense of conceptual accuracy profoundly inspired the research. I would also like to express my deep appreciation to prof. José Nuno Beirão, whose scientific and pedagogic dedication, constant pursuit of precision and methodological validity turned this research practically applicable and achievable.

Moreover, I would like to express my gratitude to several other professors: prof. Alexandra Quintas, prof. João Cabral, prof. Nuno Nabais; prof. David Vale; prof. Graça Moreira; prof. Jorge Ribeiro; to colleagues: Rusne Sileryte, André Chasar, Rui Van Zeler, Alexander Gerner and to dear friends: Rita Jacinto and Rita Martins, whose interest and involvement made the process possible.

I would also like to thank to my sister, my parents and my life partner who went with me through this important phase of my academic and personal development. Finally, I want to thank to my son, whose arrival set an inflexible deadline that architects undoubtedly need.

\*The presented research was completed with financial support of FCT, Fundação para a Ciência e Tecnologia Portugal in form of PhD scholarship with a reference SFRH/BD/76730/2011.

## **Abstract**

In the nowadays tightly built environment we recognize the unbuilt part of urban-architectural space as its gradient and structural element, which influences its **formal and functional qualities**. Based on the references of urbanism, architecture and human geography and in order to analyse Open Public Spaces through the prism of its unbuilt part, the study **proposes, defines and captures** the notion of urban-architectural emptiness – **UrbArch Emptiness**. It starts from a **theoretical analysis of emptiness** wherefrom the UrbArch Emptiness was conceptualised. It further develops a way to represent the realm of the negative of built environment by objectifying it into novel **3D solid representations** (Convex, Solid and Fragmented Voids) which are combined with already existing **View field representations** (Isovist and Viewsheds) and applied on case study of Lisbon Riverside.

These representation models are used for capturing **attributes** of Open Public Spaces by approaching their measurable **properties** which are further related to spatial experiences and usages as expressions of **spatial qualities**. The expressions of qualities are inferred through first person in-situ **phenomenological analysis** and **natural observation** wherefrom correlations between Open Public Spaces' quantitative properties and qualities were preliminarily established.

Combining **qualitative and quantitative methodologies**, the research takes the 3D solid representation and investigates the role of UrbArch Emptiness in generating qualities of Open Public Spaces in Lisbon riverside. To do so research: a) Introduces the concept of Emptiness as inspirational and theoretical basis of research (chapter 2); b) Defines objectified focus of research – UrbArch Emptiness (chapter 3); c) Develops models for Open Public Spaces representation and analysis based on UrbArch Emptiness (chapter 4); d) Defines specific Open Public Spaces' attributes to be approached (chapter 5); Applies the methodology wherefrom correlations between attributes, qualitative properties and spatial qualities are preliminarily established (chapter 6).

**Key words:** UrbArch Emptiness, Open Public Spaces, Representation Models, Lisbon Riverside, Attributes, Properties, Qualities



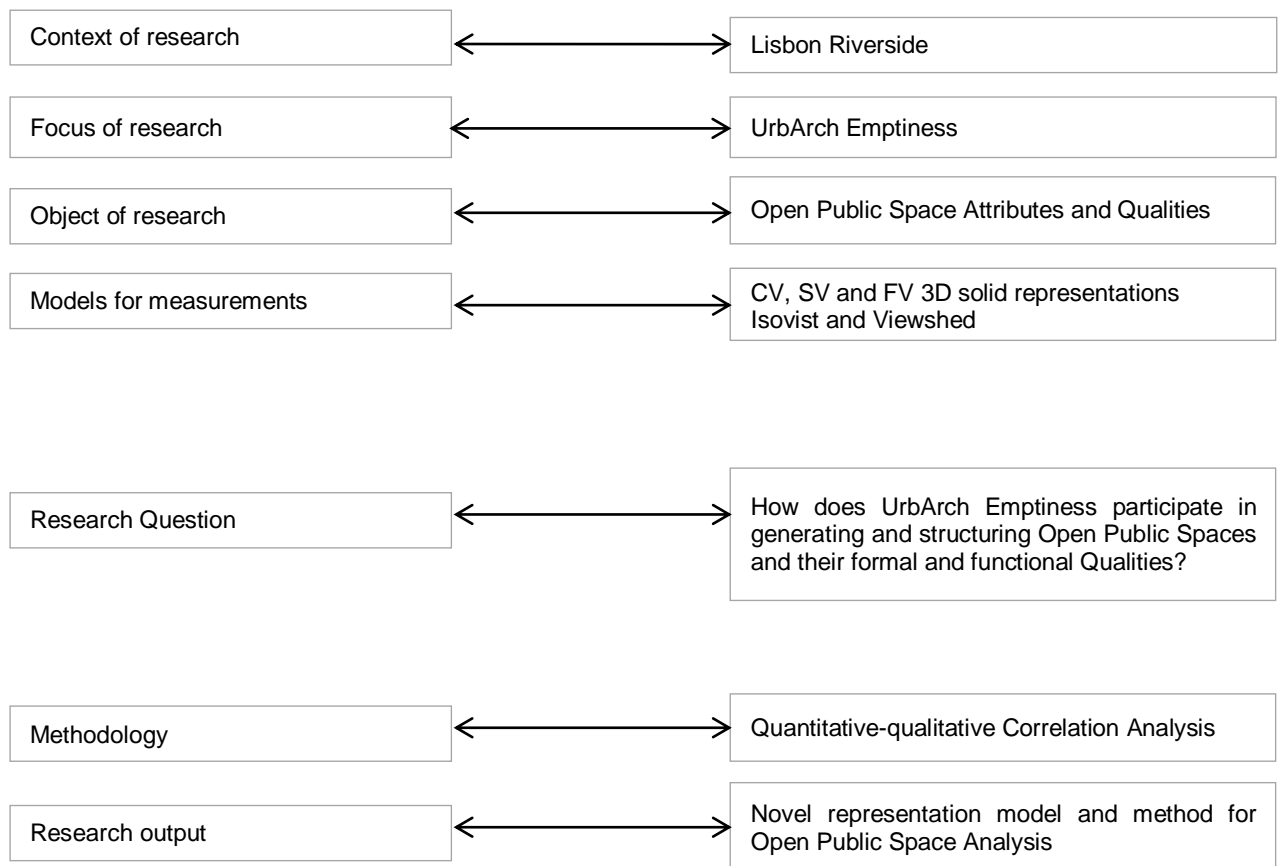


Figure 1 Research Guidelines

# Index

|                                                                                |                              |
|--------------------------------------------------------------------------------|------------------------------|
| URBARCH EMPTINESS – LISBON RIVERSIDE .....                                     | ERROR! BOOKMARK NOT DEFINED. |
| ACKNOWLEDGEMENTS.....                                                          | I                            |
| ABSTRACT .....                                                                 | II                           |
| INDEX.....                                                                     | IV                           |
| INDEX OF FIGURES .....                                                         | IX                           |
| INDEX OF TABLES.....                                                           | XIII                         |
| <b>1. INTRODUCTION.....</b>                                                    | <b>1</b>                     |
| 1.0. AUTHORS' BRACKETING.....                                                  | 2                            |
| 1.1. RESEARCH INSPIRATION .....                                                | 3                            |
| 1.2. RESEARCH DRIVERS .....                                                    | 4                            |
| 1.3. RESEARCH IN NUTSHELL.....                                                 | 6                            |
| 1.4. FOCUS, OBJECT AND CONTEXT OF RESEARCH .....                               | 7                            |
| <i>Focus of Research - UrbArch Emptiness.....</i>                              | <i>7</i>                     |
| <i>Object of Research - Open Public Space .....</i>                            | <i>9</i>                     |
| <i>From spatial attributes towards properties and qualities.....</i>           | <i>10</i>                    |
| <i>Spatial Context – Lisbon Riverside.....</i>                                 | <i>12</i>                    |
| <i>Temporal Context – Past, Contemporaneity, Future .....</i>                  | <i>14</i>                    |
| <i>Multi-Scale approximation toward subject.....</i>                           | <i>15</i>                    |
| 1.5. RESEARCH QUESTION AND HYPOTHESIS.....                                     | 17                           |
| 1.6. RESEARCH AIMS .....                                                       | 17                           |
| 1.7. METHODOLOGY .....                                                         | 18                           |
| <i>Research Methods Scheme.....</i>                                            | <i>20</i>                    |
| <i>First Methodological Phase – Theoretical Analysis .....</i>                 | <i>21</i>                    |
| <i>Second Methodological Phase - Critical and Correlational Analysis .....</i> | <i>23</i>                    |
| <i>Third Methodological Phase – Practical Synthesis.....</i>                   | <i>25</i>                    |
| 1.8. RISKS OF THE RESEARCH.....                                                | 27                           |
| 1.9. IMPORTANCE OF OUR RESEARCH .....                                          | 27                           |
| 1.10. DISSEMINATION .....                                                      | 28                           |
| 1.11. CHAPTERS EXPLANATION.....                                                | 30                           |

|                                                                                              |           |
|----------------------------------------------------------------------------------------------|-----------|
| <b>2. THEORETICAL ANALYSIS OF EMPTINESS.....</b>                                             | <b>33</b> |
| 2.0. ON EMPTINESS.....                                                                       | 34        |
| <i>Buddhist's full emptiness as manifestation of everything and manifested in everything</i> | 35        |
| <i>Taoists breathing emptiness and built environment</i>                                     | 38        |
| <i>Atomists' Emptiness and Movement</i> .....                                                | 39        |
| <i>Plato Space/Emptiness Converging and Overlapping</i> .....                                | 42        |
| <i>Aristotle's Void and Emptiness</i> .....                                                  | 45        |
| <i>Stoic's Extracosmic Empty Space</i> .....                                                 | 51        |
| <i>Horror Vacui</i> .....                                                                    | 53        |
| <i>From Extracosmic Void towards Extracosmic Space</i> .....                                 | 55        |
| <i>XVI and XVII century Non-scholastic - Infinite Space and Emptiness</i> .....              | 57        |
| <i>Summary of Historical Concepts of Emptiness</i> .....                                     | 60        |
| 2.1. EMPTINESS IN URBAN-ARCHITECTURAL DISCIPLINES .....                                      | 63        |
| <i>Architecture of Emptiness</i> .....                                                       | 65        |
| <i>Building by erasing architecture</i> .....                                                | 69        |
| <i>Building by Hollowness</i> .....                                                          | 72        |
| <i>Building by Un-building</i> .....                                                         | 75        |
| <i>Instability of Emptiness</i> .....                                                        | 79        |
| <i>Fullness of emptiness - Radiance of Objects and Density of Emptiness</i> .....            | 82        |
| <i>Articulation and Tempo of Emptiness</i> .....                                             | 84        |
| <i>Space-Limit</i> .....                                                                     | 88        |
| <i>Latency and Potentials of Emptiness</i> .....                                             | 91        |
| 2.2. EMPTINESS AND BUILT CONTEXT .....                                                       | 92        |
| <i>Built Environment between Natural and Manufactured Setting</i> .....                      | 93        |
| <i>Built environment and Breathing emptiness</i> .....                                       | 101       |
| <i>UrbArch emptiness and nature-city process</i> .....                                       | 105       |
| <i>Place – Landscape – Space</i> .....                                                       | 109       |
| <i>Emptiness and Open Public Space</i> .....                                                 | 116       |
| <i>Different types of UrbArch emptiness</i> .....                                            | 122       |
| 2.3. EMPTINESS IN LISBON RIVERSIDE .....                                                     | 123       |
| <i>Terreiro do Paço – The Representative Emptiness</i> .....                                 | 123       |
| <i>Bélem and multileveled Emptiness</i> .....                                                | 126       |
| <i>Lisbon – A city of the Riverside</i> .....                                                | 128       |
| <i>Metropolis and beginning of Industrial Emptiness</i> .....                                | 129       |

|           |                                                                              |            |
|-----------|------------------------------------------------------------------------------|------------|
| 2.4.      | FROM THEORETICAL FOUNDATIONS TOWARDS RESEARCH'S MAIN CONCEPTS                | 133        |
|           | <i>Absolute emptiness</i> .....                                              | 133        |
|           | <i>Absolute Space</i> .....                                                  | 135        |
|           | <i>Specific space</i> .....                                                  | 137        |
|           | <i>Specific emptiness</i> .....                                              | 138        |
|           | <i>Between Specific and Absolute Emptiness</i> .....                         | 140        |
|           | <i>Between Emptiness and Void</i> .....                                      | 142        |
| 2.5.      | CONCLUSIONS ON THEORETICAL FOUNDATION OF RESEARCH.....                       | 143        |
| <b>3.</b> | <b>DEFINITION OF URBARCH EMPTINESS.....</b>                                  | <b>147</b> |
| 3.0.      | URBARCH EMPTINESS AS MANIFESTED ARTEFACT .....                               | 148        |
| 3.1.      | URBARCH EMPTINESS AS REFLECTION OF ITS FULL ANTIPODE.....                    | 149        |
| 3.2.      | LIMITS.....                                                                  | 152        |
|           | <i>Conceptual limits</i> .....                                               | 152        |
|           | <i>Urban-architectural Limits</i> .....                                      | 155        |
|           | <i>Depth of limits</i> .....                                                 | 157        |
|           | <i>Semantic and structural level of limits</i> .....                         | 159        |
|           | <i>Explicit vs implicit limits</i> .....                                     | 160        |
|           | <i>Limits of UrbArch Emptiness and Open Public Space Types</i> .....         | 162        |
| 3.3.      | CONCLUSIONS ON URBARCH EMPTINESS.....                                        | 164        |
| <b>4.</b> | <b>THE MATERIALISATION OF THEORY - REPRESENTATION MODELS FOR OPEN</b>        |            |
|           | <b>PUBLIC SPACES BASED ON URBARCH EMPTINESS .....</b>                        | <b>167</b> |
| 4.0.      | REPRESENTATION OF SOLIDIFIED URBARCH EMPTINESS.....                          | 168        |
|           | <i>Abstract</i> .....                                                        | 168        |
|           | <i>Introduction</i> .....                                                    | 169        |
| 4.1.      | DEFINITION OF 3D SOLID REPRESENTATION MODELS .....                           | 170        |
|           | <i>I Solidification of UrbArch emptiness</i> .....                           | 173        |
|           | <i>II Convex Spaces</i> .....                                                | 175        |
|           | <i>III 3D-informed Convex Spaces</i> .....                                   | 177        |
|           | <i>IV Research approximations – Convex, Solid and Fragmented Voids</i> ..... | 180        |
|           | <i>V Open Public Space Properties</i> .....                                  | 191        |
| 4.2.      | FIELD-BASED REPRESENTATION OF URBARCH EMPTINESS .....                        | 193        |
|           | <i>Isovists</i> .....                                                        | 195        |

|                                                                                             |            |
|---------------------------------------------------------------------------------------------|------------|
| <i>Viewshed</i> .....                                                                       | 197        |
| 4.3. CONCLUSIONS ON REPRESENTATION MODELS.....                                              | 198        |
| <b>5. OPEN PUBLIC SPACE ATTRIBUTES.....</b>                                                 | <b>201</b> |
| 5.0. ABSTRACT .....                                                                         | 203        |
| 5.1. INTRODUCTION .....                                                                     | 205        |
| 5.2. PROBLEM STATEMENT.....                                                                 | 206        |
| 5.3. IMPORTANCE OF SPATIAL ATTRIBUTES AND CATEGORIES.....                                   | 207        |
| 5.4. AMBIGUITY OF PUBLIC SPACES .....                                                       | 208        |
| 5.5. OPPORTUNITY FOR REFOCUSING URBAN AND ARCHITECTURAL PRACTICES ON<br>USERS.....          | 210        |
| 5.6. METHODOLOGY .....                                                                      | 211        |
| 5.7. DATA GATHERING .....                                                                   | 213        |
| 5.8. DATA ANALYSIS - FROM DATA CODING TO SPATIAL ATTRIBUTES AND<br>CATEGORIES.....          | 214        |
| 5.9. CODING BY SYSTEMATISATION OF DATA – TOWARDS ATTRIBUTES.....                            | 215        |
| 5.10. CODING BY DISCIPLINARY LEVEL – TOWARDS CATEGORISATION.....                            | 216        |
| 5.11. CODING BY TYPES OF WORDS – TOWARDS MEASURABILITY.....                                 | 218        |
| 5.12. MEASURABILITY OF ATTRIBUTES.....                                                      | 221        |
| 5.13. CONCLUSION ON OPEN PUBLIC SPACE ATTRIBUTES.....                                       | 223        |
| 5.14. FROM COMPLEXITY TOWARDS FEASIBILITY – NARROWING OBJECT OF<br>RESEARCH .....           | 228        |
| <b>6. CAPTURING OPEN PUBLIC SPACES ATTRIBUTES BY APPROACHING URBARCH<br/>EMPTINESS.....</b> | <b>233</b> |
| 6.0. CASE STUDIES CHOICE.....                                                               | 236        |
| 6.1. CAPTURING GEOGRAPHICAL AND NATURAL CATEGORY.....                                       | 237        |
| <i>Abstract</i> .....                                                                       | 237        |
| <i>Introduction</i> .....                                                                   | 238        |
| <i>Methodology</i> .....                                                                    | 240        |
| <i>Natural environment in Portuguese urbanism</i> .....                                     | 242        |
| <i>Natural advantages and Lisbon’s Riverside</i> .....                                      | 243        |
| <i>Constructed Topography of Contemporary Lisbon</i> .....                                  | 244        |
| <i>Choice of Natural Advantages in Lisbon Riverside</i> .....                               | 245        |

|           |                                                                                                              |            |
|-----------|--------------------------------------------------------------------------------------------------------------|------------|
|           | <i>Topography and Open Public Space Characterisation</i> .....                                               | 246        |
|           | <i>Visual Amplitude and Open Public Space Contextualisation</i> .....                                        | 253        |
|           | <i>Conclusions on Capturing Geographical and Natural Category</i> .....                                      | 262        |
| 6.2.      | <b>CAPTURING ARCHITECTURAL AND URBAN CATEGORY</b> .....                                                      | 265        |
|           | <i>Abstract</i> .....                                                                                        | 266        |
|           | <i>Urban-Architectural Open Public Space Attributes</i> .....                                                | 266        |
|           | <i>Spaciousness</i> .....                                                                                    | 268        |
|           | <i>Openness</i> .....                                                                                        | 278        |
|           | <i>Conclusions on Capturing Architectural and Urban Category</i> .....                                       | 290        |
| 6.3.      | <b>CAPTURING BEHAVIOURAL CATEGORY - FROM OPEN PUBLIC SPACE ATTRIBUTES TO QUALITIES</b> .....                 | 295        |
|           | <i>Qualitative reflexion on Lisbon Riverside</i> .....                                                       | 301        |
|           | <i>Conclusions on Capturing Behavioural Category - From Open Public Space Attributes to Qualities</i> .....  | 335        |
| <b>7.</b> | <b>CONCLUSIONS AND FINAL CONSIDERATIONS</b> .....                                                            | <b>339</b> |
| 7.0.      | <b>FROM THEORETICAL FOUNDATION TOWARDS PRACTICAL APPLICATION - FROM EMPTINESS TO URBARCH EMPTINESS</b> ..... | 341        |
| 7.1.      | <b>ON REPRESENTATION MODELS</b> .....                                                                        | 343        |
| 7.2.      | <b>ON 3D SOLID REPRESENTATIONS AS RESEARCH OUTPUT</b> .....                                                  | 345        |
| 7.3.      | <b>ON URBARCH EMPTINESS AND OPEN PUBLIC SPACES ANALYSIS</b> .....                                            | 346        |
| 7.4.      | <b>ON OPEN PUBLIC SPACES TYPOLOGY</b> .....                                                                  | 348        |
| 7.5.      | <b>ON FUTURE WORKS</b> .....                                                                                 | 350        |
| 7.6.      | <b>ON RESEARCH LIMITATIONS</b> .....                                                                         | 352        |
| 7.7.      | <b>ON URBARCH EMPTINESS – TOWARDS ARCHITECTURE OF EMPTINESS</b> .....                                        | 353        |
| <b>8.</b> | <b>GLOSSARY OF CONCEPTS USED</b> .....                                                                       | <b>357</b> |
| <b>9.</b> | <b>BIBLIOGRAPHY</b> .....                                                                                    | <b>363</b> |

## Index of figures

|                                                                                                                                                                                                                                                                                                                   |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Figure 1</b> Research Guidelines.....                                                                                                                                                                                                                                                                          | III |
| <b>Figure 2.</b> Pedro Moura Pinheiro, Riverside, [Online] Available from:<br><a href="http://www.flickr.com/photos/pedromourapinheiro/4416871476/">http://www.flickr.com/photos/pedromourapinheiro/4416871476/</a> , [Accessed 13th<br>February 2013].....                                                       | 1   |
| <b>Figure 3</b> Open Public Space Attributes, Properties and Qualities.....                                                                                                                                                                                                                                       | 11  |
| <b>Figure 4</b> Research Objectives and correspondent Methodological phases .....                                                                                                                                                                                                                                 | 19  |
| <b>Figure 5</b> On Emptiness - Emerging, author's drawing .....                                                                                                                                                                                                                                                   | 32  |
| <b>Figure 6</b> On Emptiness - Dome, author's drawing .....                                                                                                                                                                                                                                                       | 49  |
| <b>Figure 7</b> On Emptiness - Nature, author's drawing .....                                                                                                                                                                                                                                                     | 67  |
| <b>Figure 8</b> Oribe Tea House by Kengo Kuma, Available at:<br><a href="http://kkaa.co.jp/img/2011/12/oribe_05.jpg">http://kkaa.co.jp/img/2011/12/oribe_05.jpg</a> accessed at 18.12.2016 .....                                                                                                                  | 71  |
| <b>Figure 9</b> Donald Judd, Untitled (1980-84), Chinati Foundation, Marfa, Thailand [Online]<br>Available from: <a href="http://dalebriantaylor.files.wordpress.com/2012/04/judd-concrete.jpg">http://dalebriantaylor.files.wordpress.com/2012/04/judd-concrete.jpg</a> ,<br>[Accessed 14th February 2013] ..... | 74  |
| <b>Figure 10</b> Gordon Matta-Clark, Bronx Floors: Threshole 1972, 2 black and white<br>photographs, Each 356 x 508 mm .....                                                                                                                                                                                      | 78  |
| <b>Figure 11</b> Stoa in Athen, by Jamie Brown, available from<br><a href="http://www.lightphonics.co.uk/Blog/Rhythm">http://www.lightphonics.co.uk/Blog/Rhythm</a> accessed at 18.12.2016 .....                                                                                                                  | 87  |
| <b>Figure 12</b> Space-Limit, pintura, Jorge Cruz Pinto .....                                                                                                                                                                                                                                                     | 90  |
| <b>Figure 13</b> Built environment between natural and manufactured settings, author's<br>drawing .....                                                                                                                                                                                                           | 95  |
| <b>Figure 14</b> Grande Cretto, Alberto Burri, Gibellina, 1989.....                                                                                                                                                                                                                                               | 98  |
| <b>Figure 15</b> Anselm Kiefer, Buch (The Secret Life of Plants), 2002, Mixed media on lead,<br>Page Dimensions: 77 x 57 x 1", Diameter of open book: 113".....                                                                                                                                                   | 100 |
| <b>Figure 16</b> RPM-1200, Chu Enoki, accessed on 23.11.2015<br><a href="http://chuenoki.com/works.html">http://chuenoki.com/works.html</a> .....                                                                                                                                                                 | 108 |
| <b>Figure 17</b> Baltic Film and Media School, Salto Architects, available at:<br><a href="http://www.salto.ee/baltic-film-and-media-school/">http://www.salto.ee/baltic-film-and-media-school/</a> accessed on 09.02.2016 .....                                                                                  | 118 |
| <b>Figure 18</b> Process of concretisation - from Absolute Emptiness, through Space towards<br>Specific Emptiness .....                                                                                                                                                                                           | 133 |
| <b>Figure 19</b> Kazimir Malevich_1918_Suprematist-Composition_PLZ-161<br><a href="http://imgkid.com/white-on-white-malevich.shtml">http://imgkid.com/white-on-white-malevich.shtml</a> accessed 5.6.2015.....                                                                                                    | 134 |
| <b>Figure 20</b> Process of concretisation - From Absolute Emptiness to Absolute Space                                                                                                                                                                                                                            | 135 |
| <b>Figure 21</b> Critical Whiteness, from<br><a href="http://www.whiteonwhite.eu/index.php?/project/whiteness/">http://www.whiteonwhite.eu/index.php?/project/whiteness/</a> accessed at 15.12.2016.                                                                                                              | 136 |
| <b>Figure 22</b> Process of concretisation - From Absolute Emptiness to Specific Space..                                                                                                                                                                                                                          | 137 |
| <b>Figure 23</b> Specific emptiness as a part of Specific space .....                                                                                                                                                                                                                                             | 138 |

|                                                                                                                                                                                                                                                            |     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Figure 24</b> L.L. H&J from <a href="http://yana-a-art.tumblr.com/post/105439908867">http://yana-a-art.tumblr.com/post/105439908867</a> accessed at 15.12.2016 .....                                                                                    | 139 |
| <b>Figure 25</b> Nicolas Alan Cope photography, available at <a href="http://cargocollective.com/cope1">http://cargocollective.com/cope1</a> accessed at 18.12.2016 .....                                                                                  | 145 |
| <b>Figure 26</b> UrbArch Emptiness grasped as Field or Solidified Object .....                                                                                                                                                                             | 150 |
| <b>Figure 27</b> Light, Wills, available from <a href="https://www.flickr.com/photos/willsun/5148550136/in/photostream/">https://www.flickr.com/photos/willsun/5148550136/in/photostream/</a> accessed at 20.12.2016 .....                                 | 151 |
| <b>Figure 28</b> Emptiness, Wills, available from <a href="https://www.flickr.com/photos/willsun/5469022465/in/photostream/">https://www.flickr.com/photos/willsun/5469022465/in/photostream/</a> accessed at 20.12.2016 .....                             | 154 |
| <b>Figure 29</b> Offices in Zamora, Alberto Campo Baeza, available from <a href="http://www.campobaeza.com/offices-for-the-junta-de-castilla-y-leon/">http://www.campobaeza.com/offices-for-the-junta-de-castilla-y-leon/</a> accessed at 20.12.2016 ..... | 158 |
| <b>Figure 30</b> Brick country house, Mies Van der Rohe, from “Mies van der Rohe: European works” 1986 .....                                                                                                                                               | 163 |
| <b>Figure 31</b> UrbArch Emptiness and Representation Models.....                                                                                                                                                                                          | 168 |
| <b>Figure 32</b> Rome map by Giambattista Nolli, detail, <a href="https://commons.wikimedia.org/wiki/File:Nolli_detail_pantheon.jpg">https://commons.wikimedia.org/wiki/File:Nolli_detail_pantheon.jpg</a> accessed on 10.5.2017 .....                     | 173 |
| <b>Figure 33</b> Central Lisbon 3D Solid Representation Model.....                                                                                                                                                                                         | 174 |
| <b>Figure 34</b> Convex Spaces examples, available from <a href="http://www.favelas.20m.com/paper.htm">http://www.favelas.20m.com/paper.htm</a> accessed at 20.12.2016.....                                                                                | 176 |
| <b>Figure 35</b> Solid Representation Model of Terreiro do Paço, Ribeira das Naus 3D....                                                                                                                                                                   | 178 |
| <b>Figure 36</b> Projection of Explicit Limits into Implicit Ones .....                                                                                                                                                                                    | 179 |
| <b>Figure 37</b> Process of encoding of 3D Information .....                                                                                                                                                                                               | 182 |
| <b>Figure 38</b> Convex Voids, Solid Voids and Fragmented Voids .....                                                                                                                                                                                      | 184 |
| <b>Figure 39</b> Constriction of 3D solid representation model.....                                                                                                                                                                                        | 184 |
| <b>Figure 40</b> Possible construction of Solid Voids, from (Beirão et al., 2015).....                                                                                                                                                                     | 187 |
| <b>Figure 41</b> Poço do Bispo Dock.....                                                                                                                                                                                                                   | 190 |
| <b>Figure 42</b> Content of Convex, Solid and Fragmented Voids Models .....                                                                                                                                                                                | 191 |
| <b>Figure 43</b> Isovist from Poço do Bispo.....                                                                                                                                                                                                           | 196 |
| <b>Figure 44</b> “Calculating a viewshed” from <a href="http://www.innovativegis.com/basis/mapanalysis/topic15/topic15.htm">http://www.innovativegis.com/basis/mapanalysis/topic15/topic15.htm</a> accessed on 22.12.2016 .....                            | 197 |
| <b>Figure 45</b> Chapter main objective .....                                                                                                                                                                                                              | 201 |
| <b>Figure 46</b> Completing Experts imperatives with Users’ .....                                                                                                                                                                                          | 202 |
| <b>Figure 47</b> Emerging public space in Lisbon Riverside.....                                                                                                                                                                                            | 205 |
| <b>Figure 48</b> Emerging public usages in Lisbon Riverside .....                                                                                                                                                                                          | 208 |
| <b>Figure 49</b> Santa Apolónia, Lisbon .....                                                                                                                                                                                                              | 210 |



|                                                                                                                                                                                                                                    |     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Figure 50</b> Disciplinary frameworks and levels of research .....                                                                                                                                                              | 216 |
| <b>Figure 51</b> Spatial categories and attributes .....                                                                                                                                                                           | 218 |
| <b>Figure 52</b> Linguistic types and related spatial attributes.....                                                                                                                                                              | 219 |
| <b>Figure 53</b> Approached Categories and Scales .....                                                                                                                                                                            | 230 |
| <b>Figure 54</b> Slope shape adapted from (Sheng, 1990) .....                                                                                                                                                                      | 247 |
| <b>Figure 55</b> Places implanted at convex slope – a) Lisbon (Portugal), b) Ostuni (Italy), c) Macchu Picchu (Peru), d) Cordes sur Ciel (France), author’s drawing.....                                                           | 248 |
| <b>Figure 56</b> a) Warka, ‘the White Temple’ in Uruq (Iraq), b) Ur ziggurat (Iraq) and c) Tower of Babel, author’s drawing.....                                                                                                   | 249 |
| <b>Figure 57</b> Importance of scale in place implantation, author’s drawing.....                                                                                                                                                  | 250 |
| <b>Figure 58</b> Place-landscape relationships in Lisbon Riverside: 1. Terreiro do Paço, 2. Ribeira das Naus, 3. Praça do Município 4. Campo das Cebolas 5. Cais do Sodré 6. Santos 7. Jardim Dom Luis, author’s illustration..... | 252 |
| <b>Figure 59</b> Place-Landscape-Space Visual Amplitude and Experiential Wholeness, author’s illustration .....                                                                                                                    | 253 |
| <b>Figure 60</b> Jardim de Belém - Visual amplitude reaches horizon.....                                                                                                                                                           | 259 |
| <b>Figure 61</b> . Spaciousness /Openness and Spaciousness/Compactness Relationship                                                                                                                                                | 271 |
| <b>Figure 62</b> Convex Spaces as Representation of Facades' Average Height and Angle                                                                                                                                              | 272 |
| <b>Figure 63</b> SVF / Angle correlation .....                                                                                                                                                                                     | 273 |
| <b>Figure 64</b> Spaciousness captured through several Properties .....                                                                                                                                                            | 275 |
| <b>Figure 65</b> Same openness percentage with different view type .....                                                                                                                                                           | 281 |
| <b>Figure 66</b> Wave analogy applied to Open Public Spaces rhythm.....                                                                                                                                                            | 282 |
| Figure 67 High, Mid and Low-Spaciousness .....                                                                                                                                                                                     | 290 |
| <b>Figure 68</b> Spaciousness, Solidification and Portuguese Linguistic notions.....                                                                                                                                               | 291 |
| <b>Figure 69</b> A) Praça do Município - Low Openness (weak field) B) Ribeira das Naus - High Openness (strong field) .....                                                                                                        | 292 |
| <b>Figure 70</b> Openness and Notion of Field.....                                                                                                                                                                                 | 293 |
| <b>Figure 71</b> Examples of authors’ diagrams made during Natural Observation, above Ribeira das Naus, bellow Cais dos Santos.....                                                                                                | 298 |
| <b>Figure 72</b> Terreiro do Paço - Author’s drawing .....                                                                                                                                                                         | 301 |
| <b>Figure 73</b> Ribeira das Naus - Author's drawing.....                                                                                                                                                                          | 311 |
| <b>Figure 74</b> Lisbon panorama with the departure of S. Francisco de Xavier to India, beginning of the 18th century, source: Lisboa Manuelina - Helder Carita.....                                                               | 314 |
| <b>Figure 75</b> Praça de Municipio - Author's drawing.....                                                                                                                                                                        | 317 |
| <b>Figure 76</b> Campo das Cebolas - Author's drawing.....                                                                                                                                                                         | 321 |
| <b>Figure 77</b> Cais do Sodré - Author's drawing .....                                                                                                                                                                            | 325 |
| <b>Figure 78</b> Cais de Santos - Author's drawing.....                                                                                                                                                                            | 329 |
| <b>Figure 79</b> Gradual process of conceptual narrowing of Emptiness into UrbArch Emptiness .....                                                                                                                                 | 341 |

|                                                                                                                  |     |
|------------------------------------------------------------------------------------------------------------------|-----|
| <b>Figure 80</b> Process of concretisation of Absolute Emptiness, through Space towards Specific Emptiness ..... | 342 |
| <b>Figure 81</b> UrbArch Emptiness as Field and Solidified Object and corresponding representations .....        | 342 |
| <b>Figure 82</b> UrbArch Emptiness as Field and Solidified Object and corresponding methods .....                | 343 |
| <b>Figure 83</b> Convex, Solid and Fragmented Voids Models .....                                                 | 345 |
| <b>Figure 84</b> Attributes, Properties and Qualities of Open Public Spaces .....                                | 346 |
| <b>Figure 85</b> Spaciousness and Openness in Central Lisbon riverside.....                                      | 349 |
| <b>Figure 86</b> UrbArch Emptiness and Open Public Space Types .....                                             | 349 |

## Index of tables

|                                                                                                                       |     |
|-----------------------------------------------------------------------------------------------------------------------|-----|
| <b>Table 1</b> Usage of terms Attribute, Properties and Qualities.....                                                | 11  |
| <b>Table 2</b> Primary and Secondary Case Studies .....                                                               | 12  |
| <b>Table 3</b> Research Methodological phases, Objectives and Methods adopted .....                                   | 20  |
| <b>Table 4</b> Defining 3D solid representation models .....                                                          | 172 |
| <b>Table 5</b> Applied convexity type .....                                                                           | 180 |
| <b>Table 6</b> Representation Models description.....                                                                 | 182 |
| <b>Table 7</b> Equipment Elements Types.....                                                                          | 189 |
| <b>Table 8</b> Some of possible properties extracted from CS, CV and SV models.....                                   | 192 |
| <b>Table 9</b> Research phases, methods and outputs.....                                                              | 212 |
| <b>Table 10</b> Disciplinary levels and corresponding users' responses.....                                           | 217 |
| <b>Table 11</b> People - in - place complexity.....                                                                   | 217 |
| <b>Table 12</b> Linguistic types and related spatial qualities – examples.....                                        | 220 |
| <b>Table 13</b> Measurability of Attributes .....                                                                     | 225 |
| <b>Table 14</b> Public space attributes and categories .....                                                          | 227 |
| <b>Table 15</b> Usage of terms Attribute, Properties and Qualities.....                                               | 233 |
| <b>Table 16</b> Primary and Secondary Case Studies .....                                                              | 236 |
| <b>Table 17</b> Characterisation and Contextualisation of Open Public Spaces .....                                    | 242 |
| <b>Table 18</b> Type of Slope in Case Studies of central riverside .....                                              | 251 |
| <b>Table 19</b> Viewshed analysis - Place contextualisation in potentiality and actuality /<br>from Google Earth..... | 257 |
| <b>Table 20</b> Isovists (360°) from 7 case studies of Lisbon Riverside.....                                          | 261 |
| <b>Table 21</b> Structural and Semantic Urban-Architectural Attributes.....                                           | 267 |
| <b>Table 22</b> Application of Convex, Solid and Fragmented Voids.....                                                | 267 |
| <b>Table 23</b> Attribute of Spaciousness captured by Convex, Solid and Fragmented Voids<br>.....                     | 271 |
| <b>Table 24</b> Classification of Open Public Spaces by Area and Angle properties .....                               | 276 |
| <b>Table 25</b> Classification of Open Public Spaces by Angle .....                                                   | 277 |
| <b>Table 26</b> Attribute of Openness captured by Convex and Solid Voids.....                                         | 278 |
| <b>Table 27</b> Attribute of Diversity captured by Convex and Solid Voids .....                                       | 280 |
| <b>Table 28</b> Capturing Spatial Qualities Expressed through Usages they provide .....                               | 299 |
| <b>Table 29</b> Capturing Spatial Qualities of Terreiro do Paço .....                                                 | 301 |
| <b>Table 30</b> Capturing Spatial Qualities of Cais das Colunas .....                                                 | 307 |
| <b>Table 31</b> Capturing Spatial Qualities of Ribeira das Naus.....                                                  | 312 |
| <b>Table 32</b> Capturing Spatial Qualities of Praça de Município .....                                               | 318 |
| <b>Table 33</b> Capturing Spatial Qualities of Campo das Cebolas.....                                                 | 322 |
| <b>Table 34</b> Capturing Spatial Qualities of Cais do Sodré .....                                                    | 326 |
| <b>Table 35</b> Capturing Spatial Qualities of Cais de Santos.....                                                    | 330 |





Figure 2. Pedro Moura Pinheiro, Riverside, [Online] Available from: <http://www.flickr.com/photos/pedromourapinheiro/4416871476/>, [Accessed 13th February 2013]

## 1. Introduction

The research recognises unbuilt part of built environment as vital and fraught part of Open Public Spaces. To demonstrate that finding, research takes following shape:

1. After the research **overall introduction** (chapter 1)
2. The research starts with **theoretical introduction** of notion of **Emptiness** (chapter 2.0) for further clarification and systematisation of research's triggers and inspirational concepts
3. It further defines the very focus of the observation and research main topic – **UrbArch Emptiness** (chapter 3) which corresponds to the realm negative of built environment
4. Based on the findings on UrbArch Emptiness it develops **Representation Model** for Open Public Spaces analysis (chapter 4) which objectify the realm of the negative of built environment into 3D solid representations
5. and used them for **capturing quantitative properties** of Open Public Spaces in Lisbon Riverside which depict several Open Public Space **attributes** taken from inquiries made to public space users (chapter 5)
6. Further, some correlation between attributes, measured by capturable properties, and expression of qualities is established wherefrom the developed methodology and representation model are verified on Study of cases in Lisbon Riverside (chapter 6)
7. Finally, some correlation and final consideration are highlighted (chapter 7).

## 1.0. Authors' Bracketing

The author's interest for the notion of Emptiness has started during her academic education and completion of the Diploma project – The Museum of Contemporary Art in Vojvodina. The work was based on the investigation of the idea of contemporary museum and its possible relationships with local industrial heritage, discovered on the proposed location. Using the not built space of the industrial complex and pronouncing it as a main museum gallery, the work tried to shift the prior-learnt way of designing architectural space being focused on the positive and generative qualities of Emptiness.

Further, with a group of young architects the author established the movement Neodeconstruction - experimental theoretical framework that was trying to deal with and to critic the contemporary architectural local practice. Neodeconstruction has obtained several exhibitions as critical platforms for architectural and social trend-context that conceals distorted social and political structure behind it (<https://neodeconstruction.wordpress.com/category/neodeconstruction/>). Those analyses have led to the belief that such a local architectural practice might be unnecessary and that instead of it Not-building should be planed as a solution.

In short, author understands concept of Emptiness as fertile and inspirational thus possibly useful in redesigning the contemporary urban-architectural agendas and paradigms. Taking off the focus from materiality of built, the research leans towards the importance of what material have moulded. It examines the unbuilt part of our surrounding as a constructed element which is, by being moulded, also built.

## 1.1. Research Inspiration

The author's interest about Emptiness and possibility for its more proximate observation and application in urban and architectural practices found its inspiration in Lisbon Riverside which, because of its vastness and hollowness appeared as a very suitable context for cherishing and developing that interest. The size of river Tagus, which due to its scale pushes away another shore to the distance of horizon; the topography which is orientated towards the River and inclined in direction of its immensity; the popups of infiniteness which are catchable at the western riverside giving us preview of proximity of Atlantic ocean, are only few specificities that prove Lisbon Riverside as a case in which emptiness could be comprehensively studied.

In Lisbon, the proposed introduction of the phenomenon of Emptiness in urbanism and architecture, suggests a control of extensive building practice for sake of thoughtful revelation of landscape, preservation of views, and respect towards historical sites. It is also deemed an important component in enhancing uniqueness of Lisbon's spatial experience by enabling alternation of claustrophobia and agoraphobia between traditional small-scale Lisbon's neighbourhoods and its vast River and Riverside areas. The configuration of Lisbon's terrain allows existence of numerous viewpoints towards river Tagus, where high density of built structure and narrow streets make permanent alternation of contraction and expansion, exchanging a feeling of River's presence with surprising breath-taking when we actually face it. These phenomenological specificities consolidated the selection of Lisbon Riverside as a framework of our investigation.

Even though in urbanism and architecture, both full and empty are generative and constructive spatial elements, we primarily approached the empty one<sup>1</sup>. For that

---

<sup>1</sup> The importance of moulded space and its prevail over built structures is clearly present in a discourse of Jugendstil architect, August Endell as Álvarez cited: "Whoever thinks of architecture, always understands, firstly, the constructive elements, the façades, the columns, the ornaments. All these, however, are secondary. What is important is not form,

reason, we addressed phenomenon of Emptiness not as collateral in the process of conceiving and building urban and architectural space, but as its valuable and gradient element. Even though UrbArch emptiness is not physically built space, architects should create it just the same. Taking this into consideration, we found important to investigate **tools and methods** that can upgrade our **comprehension, production and creation of UrbArch emptiness** in order to **improve Open Public Spaces qualities**.

## 1.2. Research Drivers

Later architectural discourses reveal an increasing interest about 'non-building' approaches. Books such as J.Hill's "Immaterial architecture" (2006), O.Bouman's and R.Van Toorn, "The invisible in architecture" (1994) O. Bouman's, K.L.Thomas' "Material matters" (2006), together with articles such as Utaiwatananont and Aruni's "Suan Mokkh: The Architecture of Emptiness", show shift in attention towards unbuilt and invisible part of our surroundings<sup>2</sup>.

Similarly, urban studies also address unbuilt part of surrounding as potentially useful for development of uncontrolled and creative usages (Solà-Morales, 2002), restoration of wildlife, city resilience and biodiversity (Baines, 1986). In 2007, Lisbon's Triennial of

---

but its opposite, space, the void that extends between the walls, that is limited by them, but whose vitality stands out above them. Whoever is capable of feeling space, its directions and its size, whoever hears music in these movements of emptiness, for him are opened the gates of an almost unknown world" (Alba, 1990).

<sup>2</sup> "The increasing interest in interface of materiality has to do with a shift towards the experience of the space by all the senses; not only vision...The visual is and has probably always been within the western civilization the primary sense culturally contemplated. In recent architectural examples, materiality is not overpowered by form; it creates effects and atmospheres, it navigates the user by activating his touch, smell or aural sense" (Karandinou, 2007,p.1). "The increasing interest in interface of materiality has to do with a shift towards the experience of the space by all the senses; not only vision...The visual is and has probably always been within the western civilization the primary sense culturally contemplated. In recent architectural examples, materiality is not overpowered by form; it creates effects and atmospheres, it navigates the user by activating his touch, smell or aural sense" (Karandinou, 2007,p.1).

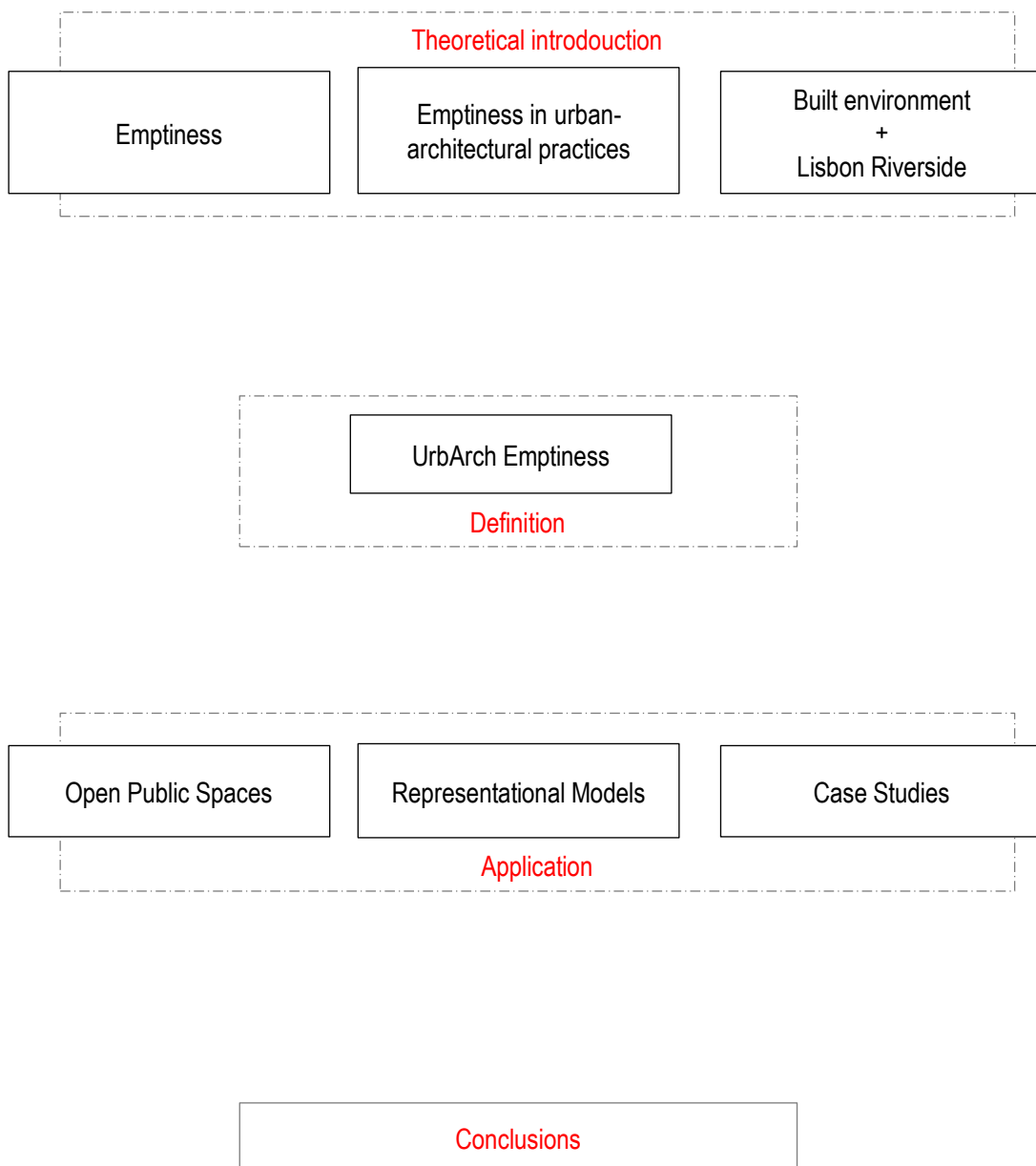


Architecture focused on Urban Voids allowing several authors to show different but predominantly positive, points of view on Urban Voids phenomenon. Sofia Morgado (2005) developed a thesis on urban voids of Lisbon Metropolitan Area showing the urban relevance of "*Protagonismo de la ausencia*" in balancing contemporary city. She argued that unoccupied spaces determine various stages of urban development leading to the metropolitan status. This premise is unquestionable in case of Lisbon, which is formed around a large unoccupied central space: the Tagus Estuary. In proceedings from Trienal de Arquitectura (2007) João Rodeia points that Urban Emptiness is never actually empty – "Urban is always something", a respiration space of the city necessary to be kept. Jose Mateus, see Urban Voids as biggest city resources full of memories and collective imaginary. Pedro Janeiro describes them as breathing spaces that should be thought as a silence in music, Luis Pedro Sa as spaces of contemplation of city. These positive accounts on unbuilt part of our environment, together with overall rise of consciousness about waste and overproduction control, consolidated the main research target dislocating its focus from built towards unbuilt part of surrounding.

These positive accounts on unbuilt part of our environment together with overall raise of consciousness about control of waste and overproduction set the main research target dislocating its focus from built towards unbuilt surrounding. Even though, unbuilt part of environment has been extensively present in urban, architectural and geographical discourses, a more systematic study which would account for its theoretical background, representation difficulties and application potential seem to be missing. The research therefore rethinks the concept of unbuilt part of environment and for that purpose defines notion of UrbArch Emptiness through exploration of its conceptual and formal limitations. Moreover, it approaches issue of UrbArch Emptiness representation and develops 3D solid models which are further applied to Open Public Spaces analyses.

### 1.3. Research in Nutshell

The research proposes the notion of UrbArch Emptiness as generative and informative part of built environment. It defines the notion proposing some preliminary validation of its importance for urban-architectural disciplines in general and comprehension of open public spaces in particular.



## 1.4. Focus, Object and Context of Research

### Focus of Research - UrbArch Emptiness

As proposed by the research the integrated notion of UrbArch Emptiness accounts for indissociable relationship between **urban space** and **architectural and natural limits** which define it. Said differently, UrbArch Emptiness represents the phenomenon which unifies urban voids, natural limits and architectural volumes addressing their intrinsic dependence, depicting their conjoint proportions and overall scale. Urban voids denote places of urban occurrences which provide framework and background for public life. Their size can be expressed through so called cubage or cubic capacity, which together with its topography and full elements that can be expressed in occupied volumes, defines the specific character of a city. This unity, made by architectural pieces which compose a city, and unbuilt space whose morphology penetrates and shapes its architecture is what Nuno Portas terms “architecture of city<sup>3</sup>” (Portas, 1968).

Concerning disciplinary frame and scales where the question of UrbArch Emptiness is developed and applied, we considered not only urban or architectural, but the area where these two fields overlap into urban-architectural framework. It accounts for both, urban vessel and surrounding architectural forms approached not as isolated and self-standing objects but as defining borders for scenography for urban life. Architectural facades, buildings’ functions, their symbolic values, morphologic and typological specificities (such as galleries, porches, patios), are reflected in UrbArch Emptiness, the same way urban spaces with their topology, proportions, views and natural advantages are.

---

<sup>3</sup> “Arquitectar a Cidade”, translated by author

In short, UrbArch Emptiness represents the area where urban and architectural spaces join into unified phenomena of approachable, liveable, publicly accessible space. The work addresses these unbuilt cells aiming at their definition and better comprehension without especially focusing on any urban layout or particular plan that traced them. However, it approaches specific unification possibilities of unbuilt cells into more complex spatial agglomerations that can demonstrate characteristics of the layout they are inscribed in. It is due to these multi-scale characteristics that we proposed both multilevel research approximations (global, local and human) and multilevel representation models (Convex, Solid and Fragmented Voids).

Focusing on UrbArch Emptiness, the research ultimately aims at displacement of focus of urbanism and architecture from built to unbuilt, where the built would serve the empty and the empty would, in return, enhance the built. UrbArch Emptiness is thus approached as a structural, formal and functional spatial component rather than residual space intended to work as the receptacle for a built mass. It is seen as constructive element of built environment in general and open public spaces in particular – ‘being empty’ is deemed a vital and fraught part of our built environment the same way ‘being built’ is.

Starting from this postulate, we gathered information on UrbArch Emptiness; systematised it and provided a glossary, theoretical foundation, application basis and previous practical validation for its observation and analysis. After introducing notion of Emptiness in general (chapter 2) and defining UrbArch Emptiness as specific apprehensible and catchable object of research in particular (chapter 3) we developed representation models (chapter 4) for comprehension of gathered Open Public Space attributes (chapter 5) and observed them from the prism of its unbuilt part (chapter 6) aiming at understanding how UrbArch Emptiness influences Open Public Spaces Attributes and as such contributes to generating Open Public Spaces Qualities.

## **Object of Research - Open Public Space**

There are several notions that concentrate on outdoor urban spaces as stages for public life such as: public space, public domain, place, urban open spaces, etc. The multiplicity of notions depicts existence of numerous perspectives which can be taken before phenomenon of negative of built structure in which urban life occurs.

We decided not to use the notion of 'public space' due to its predominantly social connotation which lacks a spatial designation and it is often tightened rather to broader social than to specific spatial phenomena. Since it accounts for more than spatial ideas including all the spaces in which public life takes place, such as virtual ones, the usage of 'public space' designation was avoided. Another stimulating designation of 'urban open spaces' is defined by Thompson (2002) who explains that 21st century open spaces should respond to new lifestyles, values and attitudes towards nature and sustainability. It should encompass green networking linking urban with recreational area and better accessibility responding to ageing demographic trends (Thompson, 2002, p.60).

To define terminology around the subject of the research we joined the terms of 'public space' and 'urban open space' into 'Open Public Space'. On one side the proposed notion represents diverse types of publicness accounting for urban spaces that are commonly used regardless their administrative ownership, including spaces that are privately managed collective spaces that function as public space<sup>4</sup>. On the other, it includes all open and unbuilt spaces that offer spatial framework for both traditional and emerging usages.

---

<sup>4</sup> For the same reason some authors have chosen to use the term of 'public domain' representing all places that are 'perceived as public' (Hwang and Koile, 2005, p.273).

## **From spatial attributes towards properties and qualities**

The work approaches three levels of Open Public Spaces depictees: attributes, properties and qualities, which are the main components of the methodological proposal and bearing structure of research application and practical part. While attributes are approached as characteristics “attributed” to space, properties are measurable features that explain those attributes. Further, qualities are defined as attributes linked to a certain spatial occurrence. Said differently, qualities are attributes put in a specific functional, political or social context.

When addressing space, we often project over it a certain prism of interest and interpretation that is reflected in attributes we search to observe – the attributes correspond to our way of observing reality. To address those attributes, a selection of measurable properties was needed. Finally, to make use of both attributes and properties, the interpretation of their contribution in qualities of specific context was necessary.

To define attributes, or spatial imperatives that are nowadays relevant in Open Public Spaces we conducted a survey directed to users and combined it with findings from literature review. In this way we defined spatial attributes which gave an actuality to our methodological approach and faced it with nowadays comprehension of Open Public Space. That way, we: 1) provided a register of space attributes that are important to be considered for a more comprehensive reading of open public spaces and to 2) established a guideline to further assess how these attributes are influenced by UrbArch Emptiness of Lisbon Riverside.

To define properties for capturing attributes, we dug into literature and works of other researchers who already established correlations between certain attributes and their explanatory properties. After having Open Public Space attributes we developed models for Open Public Spaces representation where from quantitative properties

linked to specific attributes were measured. In this way, quantitative properties of specific attributes were inferred and their correlation with expression of qualities was enabled.

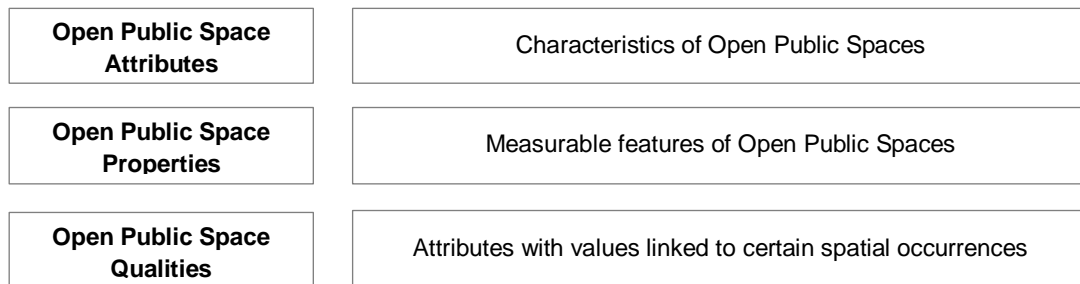


Figure 3 Open Public Space Attributes, Properties and Qualities

Terms attributes, properties and qualities were used in the research as following:

Table 1 Usage of terms Attribute, Properties and Qualities

|                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Open Public Space Attributes</b></p> <p>Characteristics of Open Public Spaces without attributed qualitative weight. They become expression of qualities when their specific value is linked to a certain positive spatial occurrence.</p> | <p>Ex. Spaciousness is an Open Public Space attribute which might be deemed as either positive or negative spatial occurrences depending on its signification and contextual purposefulness.</p>                                                                    |
| <p><b>Open Public Space Properties</b></p> <p>Measurable features of Open Public Spaces which give an insight into specific value of Open Public Space attribute.</p>                                                                            | <p>Ex. Attribute of spaciousness is found correlated to measurable properties of Open Public Spaces such as Area and surrounding building Height. Spaces with big area and low surrounding building have higher value of Spaciousness Attribute and vice versa.</p> |
| <p><b>Open Public Space Qualities</b></p> <p>Attributes with specific values inferred from properties' measurements which can be tied to a certain spatial occurrence.</p>                                                                       | <p>Ex. High value of spaciousness attribute is deemed linked to good recreational usages.</p>                                                                                                                                                                       |

## Spatial Context – Lisbon Riverside

The main spatial context of the research is **Lisbon Riverside**, more specifically several Open Public Spaces situated in between Belém and Poço do Bispo. Precisely, the research places special attention to Open Public Spaces of **central Lisbon Riverside** as the main study of cases which are chosen due to the following reasons: 1) diversity of spatial typologies that might be found within the area (from several traditional formalised squares to various emerging non-traditional and non-formalised Open Public Spaces) and 2) the increasing importance of riverside in nurturing 21<sup>st</sup> century spatial usages due to new lifestyles, values, attitudes towards nature and sustainability. The variety of Open Public Spaces within central Lisbon Riverside enabled a set of diverse case studies for both, theory construction and verification. When necessary beside the primary case studies situated in central Lisbon Riverside, secondary examples were introduced (Table 2).

*Table 2 Primary and Secondary Case Studies*

| <b>Primary Case Studies</b>            | <b>Secondary Case Studies</b> |
|----------------------------------------|-------------------------------|
| Terreiro do Paço with Cais das Colunas | Terreiro do Trigo             |
| Ribeira das Naus                       | Rua da Alfândega              |
| Praça do Município                     | Rua dos Bacalhoeiros          |
| Campo das Cebolas                      | Jardim de Belém               |
| Cais do Sodré                          | Poço do Bispo                 |
| Santos                                 |                               |
| Jardim Dom Luis                        |                               |

In harbour-cities, due to transportation related technological changes, decline and displacement of industries which dictated the obsolescence of the traditional urban waterfronts, the waterfront redevelopment is a major part of the competitive agenda, claims Hall (1991a).



*“Lisbon is an extended city placed along the Tagus River. A water city that in past centuries has been strongly related to fishing activities, exploration of the oceans and maritime trading both national and international. The waterfront has been in the cultural and commercial heart of the city” (Garcia, 2004).*

Of 18 municipalities that compose the LMA, 16 have one or more waterfronts: 6 of them by the sea and 10 of them along either the Tagus or the Sado rivers estuaries. Hence, the Riverside is of the utmost and inevitable importance both in Lisbon’s municipal and metropolitan discussions and policies<sup>5</sup>. In the ancient times, the current territory of Lisbon Riverside used to be mostly flooded by the river Tagus and quite different from its present form. The natural changes of the silting up the river together with human made land fills, as open, plane and empty spaces, constructed outside of the proper urbanised area, were during the history fundamental in the continuous adaptation of the city using the river according to the specific requirements and circumstances from each epoch (Durão, 2012a).

The importance of UrbArch Emptiness in generating Open Public Spaces of Lisbon Riverside is evident in success and interest this area has nowadays, though its growth can be followed throughout historical development of our framework space. From its

---

<sup>5</sup>The importance of Riverside question can be seen, as well, through the importance of the different actors interested in its improvement and exploitation: Lisbon’s Port Administration (APL, Administração do Porto de Lisboa), Lisbon’s town hall technical services (CML, Câmara Municipal de Lisboa), Parque Expo, Ordem dos Arquitectos, the Public, with their objectives, through several projects and proposals (POZOR, anti POZOR, Expo 98, post EXPO 98, The competition for Ideas 1988), shows a high interest in Lisbon’s waterfront. There are several recent landmarks publicized by urban-planning and architecture institutions that show the importance of Lisbon’s fluvial and maritime façade, among others: The competition for Ideas, Project of Belém Cultural Centre, The strategic Plan and Lisbon Master Plan, Pozor, EXPO’98, Pós EXPO’98, PNPOT, PROT – AML. As described by Costa, in his thesis “Riverside between projects”, processes of industrialisation and post-industrialisation led the Lisbon Riverside toward a fragmented, territorially extensive, heterogeneous and diverse reality (Costa, 2007, p.14)

beginning, Lisbon's characteristic positioning turned its Riverside into the most dynamic area of the city (Carita, 1999). Linked to the marine and port commercial activities since the Middle Ages, Riverside was an area of vital importance for Lisbon's inhabitants. It was providing them by food, work, and trade possibilities and later by colonially gained wealth. Its positive, promising and hopeful connotation made it attractive for development of various strategies and investments. Even though the Open Public Spaces of Lisbon Riverside, such as Praça do Comercio, have been changing during history, UrbArch Emptiness here proposed to be addressed in more details, remained their constructive element.

## **Temporal Context – Past, Contemporaneity, Future**

Regarding the temporal context, the research in general approaches three times: past, present and future.

### **Historical perspective**

As a non-Portuguese researcher, the author felt necessity to conduct a historical study about Lisbon Riverside and deepen comprehension of the research context. In that regard we did an analysis of Lisbon Riverside from early Middle Ages to 20<sup>th</sup> century Lisbon which is because of its extensiveness excluded from the main body of the thesis.

### **Contemporary perspective**

The analysis of Open Public Spaces presented in the thesis, as a goal had understanding of contemporary Lisbon Riverside. Due to duration of PhD process analysis took several years during which some of the spaces changed substantially. To lock a temporary context and make analysis executable we approached the data from an official Lisbon map from 2010 available at Municipality of Lisbon.

### **Future implementation**

One of the research goals is to provide a new perspective and a novel methodology for observation and evaluation of Open Public Spaces which would, by focusing on UrbArch Emptiness, allow for improvements of future urban and architectural practices. The important considerations on further implementation of research and research outputs can be found in section 7.5 On Future Works.

### **Multi-Scale approximation toward subject**

Throughout the research UrbArch Emptiness is defined and conceptualised as a generating part of urban environment. It creates city image as a whole and structures Open Public Spaces as units. Its influence in Open Public Spaces of Lisbon Riverside is tracked from global-urban (contextual) to particular-architectural scale. Therefrom, its impact is understood as not limited on the exact spatial area - its radiance goes further seaward and deeper inside the city. It is continuous thus it exceeds its limits, it is transparent thus it allows visual connections between remote city parts. Beyond its formal and structural force, it also enters into fields of atmospheres, individual imagination, idealisation, poetry. Due to its nature, it participates extensively on various levels of urban-architectural contexts.

To approach its multidimensionality, our work investigates how UrbArch Emptiness contributes in forming the Open Public Space qualities of Lisbon Riverside taking into consideration three scales of approximation toward the subject:

#### **Global – Natural and Geographic Scale**

##### Chapter 6.1 Capturing Geographical and Natural Category

UrbArch Emptiness extends over architectural and urban limits, it leakages from a specific place towards further geographical and natural surroundings. In that regard UrbArch Emptiness is approached from the perspective of its natural and geographical context.

## **Local – Urban-architectural Scale**

### Chapter 6.2 Capturing Architectural and Urban Category

According to Bruno Zevi, who addressed the problem of architectural-urban dichotomy, the roles of architect and urban planner diverge and the genuine modern architect should be the urban-architect (Zevi, 1974). In this field the UrbArch emptiness can be established as a merging element which reflects both architectural and urban limits thus joins these disciplines, improves their relation and unification, and as such enhances Open Public Spaces and public contexts.

## **Human – Behavioural Scale**

### Chapter 6.3 Capturing Behavioural Category - From Open Public Space Attributes to Qualities

Moreover, UrbArch Emptiness provides necessary space for urban life thus the human perspective is recognized as equally important.

## 1.5. Research Question and Hypothesis

### Research Question:

How does UrbArch Emptiness participate in **generating and structuring Open Public Spaces** and their **formal and functional Qualities** on **contextual-global scale** (chapter 6.1 - Capturing Geographical and Natural Category), on **urban-architectural particular scale** (chapter 6.2 Capturing Architectural and Urban Category) and **human scale** (chapter 6.3)?

### In short, the research hypothesis is:

UrbArch Emptiness participates, on different scales and levels, in generating Open Public Spaces and their formal and functional Qualities (in Lisbon Riverside).

## 1.6. Research Aims

Research aims to provide a database on contribution of UrbArch Emptiness in generating Open Public Space of Lisbon Riverside (Theoretical Objectives) and to construct a methodological set for addressing UrbArch Emptiness (Application Objectives) which is practically applied (Practical Objectives) on several case studies of Lisbon Riverside.

- **Aim 1** To define UrbArch Emptiness and understand how it contributes **in the generation of Open Public Spaces** and their **Qualities** on different scales using a study of cases in Lisbon Riverside.
- **Aim 2** To develop theoretical, application and practical glossary for operating with UrbArch Emptiness and based on that to develop and test **necessary representation models** for Open Public Space analysis
- **Aim 3** To change the paradigm about UrbArch Emptiness as a residual space and receptacle of a built mass, proving it as structural, formal and functional component of Open Public Spaces and increasing consciousness on how to design the void rather than the built space.

## 1.7. Methodology

The research combines qualitative and quantitative noninterventionist methodology focusing on the phenomenon of UrbArch Emptiness in central Lisbon Riverside aiming at discovering how UrbArch Emptiness participates in generating open spaces and influences Open Public Space qualities. It does so by introducing and developing representation model necessary for that discovery.

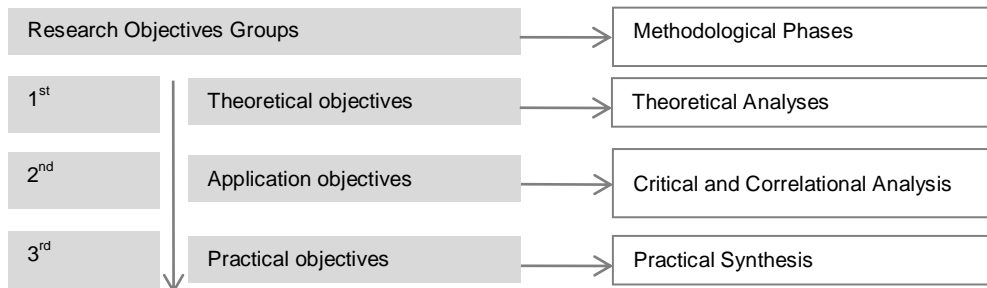
The research is divided into **3 phases** (Figure 4).

In the 1<sup>st</sup> methodological phase, research focuses on **general theoretical analyses** of notion of Emptiness through interpretative reading of literature review. Further, it aimed at definition of the **focus of research – UrbArch Emptiness** and the main **research object – Open Public Space Attributes** which are relevant in generating qualities of nowadays Open Public Space and as such used as research guidelines.

In the 2<sup>nd</sup> methodological phase, the Open Public Space attributes are narrowed on those which are more directly linked to UrbArch emptiness and Lisbon Riverside and are mouldable by disciplines of urbanism and architecture and as such useful for improvement of these practises. In this phase we also developed novel **representation models** of the negative of built environment by objectifying it into 3D solid representations. These representations correspond to extrusions of convex space representations of Open Public Space that take information from the heights of its limits to generate the extrusion – convex voids. Besides developing new representation models, in this phase we used already existing view-field based representations which were also further applied on case studies of Lisbon riverside.

In the 3<sup>rd</sup> phase, the proposed methodology is **applied on case studies of Lisbon riverside**, for capturing quantitative properties of Open Public Spaces with focus on phenomenon of UrbArch Emptiness. Those measures are then related to the expression of quality linked to a certain positive spatial occurrence from which correlation with the Open Public Spaces attributes is established.

Methodologies are structured according to research phases and defined upon corresponding objectives:



*Figure 4 Research Objectives and correspondent Methodological phases*

## Research Methods Scheme

*Table 3 Research Methodological phases, Objectives and Methods adopted*

| Methodological Phases and Objectives Groups                  |                        | Research Objectives                                                                                                                                                                                                                                                                           | Methodologies and methods adopted                                                                                                       |
|--------------------------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| 1 <sup>st</sup> phase<br>Theoretical Analysis                | Theoretical objectives | <b>TO.1</b><br>Theoretical introduction of notion of <b>Emptiness</b> (chapter 2) for further clarification and systematisation of research's triggers and inspirational concepts                                                                                                             | Literature review, Interpretative reading                                                                                               |
|                                                              |                        | <b>TO.2</b><br>Definition of the very focus of observation – <b>UrbArch Emptiness</b> (chapter 3) which corresponds to the realm negative of built environment                                                                                                                                | Literature review, Interpretative reading                                                                                               |
| 2 <sup>nd</sup> phase<br>Critical and Correlational Analysis | Application objectives | <b>AO.1</b><br>Development of <b>Representation Model</b> for Open Public Spaces analysis (chapter 4) which objectify the realm negative of built environment into <b>3D solid representations</b><br><b>Introduction</b> of existing view-field based models of <b>Isovist and Viewsheds</b> | Literature review, Convex and Solid Voids' method construction, Isovist and Viewshed introduction                                       |
|                                                              |                        | <b>AO.2</b><br>Definition of object of research - <b>Spatial attributes</b> relevant in generating qualities of nowadays Open Public Space (chapter 5)                                                                                                                                        | Literature review, Survey directed to Users                                                                                             |
|                                                              |                        | <b>AO.3</b><br>Narrowing Open Public Space attributes on those that are going to be practically addressed in case studies of Riverside Lisbon (section 5.14)                                                                                                                                  | Assessment of relevance of Open Public Space attributes in urban and architectural disciplines through critical analysis of results     |
| 3 <sup>rd</sup> phase<br>Practical Synthesis                 | Practical objectives   | <b>PO.1</b><br>Capturing UrbArch Emptiness by analysing Open Public Space <b>attributes and properties</b> (chapter 6.1, 6.2)                                                                                                                                                                 | Application of developed representation models on study of cases in Lisbon Riverside                                                    |
|                                                              |                        | <b>PO.2</b><br>Correlating measured <b>attributes and properties</b> with their expression of <b>qualities</b> inferred from first person phenomenological analysis and natural observation (chapter 6.3)                                                                                     | First person phenomenological analysis and natural observation of study of cases in Lisbon Riverside, Critical and correlation analysis |
|                                                              |                        | <b>PO.3</b><br>Conclusions (chapter 7)                                                                                                                                                                                                                                                        | Discussion on research aims and findings                                                                                                |



## **First Methodological Phase – Theoretical Analysis**

To establish a firm theoretical basis for analysis of Open Public Spaces qualities with focus on UrbArch Emptiness, we started by addressing broader concepts of Emptiness heading towards its more specific manifestations. To do so, we conducted literature review (Chapter 2.0, On Emptiness) on concepts of emptiness and other notions which are usually interchangeably used with it (ex. Void, Space). Through this concretisation process we defined the actual focus of our research, namely urban-architectural emptiness, termed shortly UrbArch Emptiness (Chapter 3 Definition of UrbArch Emptiness).

### ***Theoretical Objective 1***

---

## **Chapter 2 - Theoretical Analysis of Emptiness**

---

### ***TO.1 Clarification and systematisation of essential concepts of Emptiness through literature review and interpretative reading***

The goal of the TO.1 is delineation of notions that are in the very foundation of the research and definition of the way those were engaged and addressed. We did so from general to particular level by gradually narrowing the object of observation. Starting by a general introduction of concept of Emptiness (Chapter 2.0, On Emptiness) we defined and distinguished it from others, somewhat overlapping concepts, such as Void, Space. Further, we reflected on the concept of Emptiness in urban-architectural disciplines (2.1 Emptiness in Urban-architectural Disciplines) and on the relationship between Emptiness and its built environment and Portuguese contexts (2.2 - Emptiness and Built Context, 2.3. - Emptiness in Lisbon Riverside).

### ***Importance of objective***

The notion of Emptiness is extensive, broad and rich but also vague and ambiguous, nevertheless strongly present in various discourses from oriental mysticism to western philosophy. Therefore, it was important to clarify usage of terminology that surrounds phenomenon of Emptiness and linguistic and conceptual ambiguities to it related.

We started with literature review on Emptiness in various cultural contexts whence the difference between Emptiness, Void and Space was clarified. As output of the objective we provided a Glossary of terms and terminology (chapter 8) for a clearer conveying of our research procedure.

**Methodology and methods adopted:** Literature review, Interpretative reading

## ***Theoretical Objective 2***

---

### **Chapter 3 - Definition of UrbArch Emptiness**

---

#### ***TO.2 Definition of the focus of observation – UrbArch Emptiness – through literature review and interpretative reading***

Starting from the broad notion of Emptiness and its presence in urban-architectural disciplines, we defined the very focus of analysis and narrowed down the abstract notion of emptiness into specific urban-architectural one which belongs to the built environment and participates in Open Public Space generation (Chapter 3).

#### ***Importance of objective***

Definition of the UrbArch Emptiness as focus of research is crucial for the investigation achievability because it directs the analysis, narrows down Open Public Space attributes and inspires development of representation models.

**Methodology and methods adopted:** Literature review and interpretative reading

## **Second Methodological Phase - Critical and Correlational Analysis**

Further, to understand how UrbArch Emptiness participates in generating and structuring Open Public Spaces we developed a **Representation Models** for Open Public Spaces analysis (chapter 4) which objectify the realm negative of built environment into **3D solid representations**. To analyse Open Public Space behind representation model we had to define the object of research - **Spatial attributes** relevant in nowadays Open Public Space (chapter 5).

The second methodological phase is completed when attributes of Open Public Spaces are **Narrowed down** (Section 5.14). The selected attributes are further addressed in the **third methodological** phase using previously developed representation models for Open Public Spaces analysis.

### ***Application Objective 1***

---

#### **Chapter 3.3 – Conclusions on UrbArch emptiness**

---

##### ***AO.1 Development of Representation Model for Open Public Spaces analysis based on findings on UrbArch Emptiness***

To analyse Open Public Spaces focusing on UrbArch Emptiness we developed **Representation Model** for Open Public Spaces analysis (chapter 4) which objectify the realm negative of built environment into **3D solid representations**. Apart from 3D solid representations which we had to theoretically constructed, practically applied and tested (such as Solid, Convex Voids and Fragmented Voids) there are others which were chosen within the spectrum of existing ones (Viewsheds, Isovists).

***Methodology and methods adopted:*** Literature review and Convex, Solid and Fragmented Voids' method construction, Viewsheds, Isovist

## ***Application Objective 2***

---

### **Chapter 5 – Open Public Space Attributes**

---

#### ***AO.2 Definition of object of research - Spatial attributes relevant in generating qualities of nowadays Open Public Space***

To respond to the main research question: how does UrbArch Emptiness participate in generating and structuring Open Public Spaces and their formal and functional Qualities; it was necessary to define the attributes relevant for comprehension of Open Public Spaces. Through a survey directed to users preselected contemporary demands of public space based on literature review are tested, completed and categorized.

Since the successful usage of public space is an overall goal of thesis we used a survey directed to users for completing the imperatives' list pre-defined through literature review giving like that a social fidelity to our point of view. We conducted a survey directed to users where from we gathered attributes of Open Public Space that are deemed important by users. These were confronted with attributes of Open Public Space extracted from literature review producing a holistic list. Further, Open Public Space attributes were categorized and used as directional inputs for development of the research.

#### ***Importance of objective***

Since the work tends to understand how UrbArch Emptiness influences contemporary Open Public Space, it was necessary to define the attributes nowadays relevant in UrbArch Open Public Space. Through survey to users, together with literature review (experts' point of view), we defined **contemporary spatial imperatives** that gave relevance to the overall methodological approach.

That way, we established **a qualitative guideline** and a base point for further assessing of how UrbArch Emptiness influences these imperatives or space qualities. As well, we provided a register of space imperatives that are important to be considered to make a holistic and user orientated reading of Open Public Space. This register of demands put in front of nowadays urban-architectural space lead the research assuring its actuality and contemporary accomplishment.

***Methodology and methods adopted:*** Literature review, Survey directed to Users

### ***Application Objective 3***

---

#### **Section 5.14 – From complexity towards feasibility – Narrowing object of research**

---

##### ***AO.3 Narrowing object of research down to those that are going to be practically addressed in case studies of Lisbon Riverside***

Having defined the **focus** of research (UrbArch Emptiness), **subject** of research (Open Public Space attributes) and developed **representation models** for Open Public Space analysis we made a selection on the attributes which are more directly linked to UrbArch emptiness and Lisbon Riverside and are mouldable by practices of urbanism and architecture thus useful for improvement of these disciplines.

**Methodology and methods adopted:** Assessment of relevance of Open Public Space attributes in urban and architectural disciplines through critical analysis of results.

### **Third Methodological Phase – Practical Synthesis**

The third methodological phase puts into practice the hitherto developed theoretical and application findings. It uses the representation models developed in the **Chapter 4** focusing on the attributes which are inferred and narrowed down in the **Chapter 5** applying them on case study of central Lisbon Riverside in **Chapter 6**.

Moreover, it correlates measures of **properties and attributes** with their expression of spatial qualities inferred by first person **phenomenological analysis** and **natural observation** whence preliminary validation of importance of UrbArch Emptiness in open public space together and utility of the proposed methodology and tools were obtained. In that way, the research was completed and the final conclusions extracted (**Chapter 7**).

### **Practical Objective 1**

---

#### **Chapter 6.1, 6.2 - Capturing UrbArch Emptiness by analysing Open Public Space attributes and properties**

---

*PO.1 Analysis of Open Public Spaces of Lisbon Riverside on three levels taking into consideration attributes inferred and narrowed down in Chapter 5 and developed representation models from Chapter 4.*

##### **PO.1.1**

*Analysing the Open Public Spaces' attributes on **Geographical and Natural Level***

**Methods adopted:** topography analysis, viewshed analysis, isovist analysis

##### **PO.1.2**

*Analysing contribution of UrbArch emptiness in generating Open Public Spaces' attributes on **Urban and Architectural Level***

**Methods adopted:** Convex Void, Solid Voids and Fragmented Voids

### **Practical objective 2**

---

#### **Chapter 6.3 – Correlating measured attributes and properties and their expression of Qualities**

---

*PO.2 Correlating measured attributes and properties with their expression of Qualities inferred from first person Phenomenological analysis and Natural observation on Behavioural Level*

**Methods adopted:** first person phenomenological analysis and natural observation of study of cases in Lisbon Riverside, Critical and correlation analysis

### **Practical Objective 3**

---

#### **Chapter 7 - Conclusions and Final Considerations**

---

*PO.3 Research discussion and conclusions*

**Methods adopted:** Discussion on research aims and findings

## 1.8. Risks of the research

Since the work aimed at addressing three broad and complex phenomena, UrbArch Emptiness, and Open Public Spaces and Lisbon Riverside, on three scales (global, urban-architectural and human) it was necessary a certain reduction so that the research would be feasible. In that regard we narrowed Emptiness to UrbArch Emptiness, all inferred attributes of Open Public Spaces to those which are especially relevant for urban-architectural disciplines and Lisbon Riverside to its central zone. Besides being a factor for success of investigation, the mentioned complexity and multidimensionality of research main issues is used as a trigger for suggesting several possible directions within urban and architectural research (7.5 On Future Works).

## 1.9. Importance of our research

Within urban and architectural academic and professional practice, the research aimed at enlarging the scope of urban and architectural disciplines by changing the paradigm about UrbArch Emptiness and presenting possibilities for innovative approaches that can be conducted through comprehension and investigation on unbuilt part of built environment. This resulted in opening of a new research line at the School of Architecture at University of Lisbon, which is based on the analysis of UrbArch Emptiness within Open Public Spaces attributes and development of new methodological tools that were and are being disseminated on several workshops, conferences and scientific journals.

In short, the research produced major contribution on:

- Introduction of **UrbArch Emptiness**, as a new **multi-scale framework** for analysis and production of urban-architectural space based on theoretical and practical pillars structured around unbuilt part of built environment.

- Developing a new **Representation Model** for UrbArch Emptiness capable of simultaneously capturing several levels of detail and various spatial dimensions of Open Public Spaces.

## 1.10. Dissemination

The thesis aimed at establishing a new point of view towards importance of unbuilt part of our built environment (UrbArch Emptiness) in architectural and urban production and analysis. Its dissemination, which aimed at presentational of the main idea and validation of concepts and methodologies developed, is so far done throughout following publications and presentations:

- Verovšek, Š. and Cavic, L. (2017) '**Expressions of Spatial Quality and Local Identity in Urban Riverfronts**', *Annales, Series Historia et Sociologia*, 27(2), pp. 349–362. *Paper in Indexed International Scientific Journal (peer-reviewed)*
- Sileryte, R., Cavic, L. and Beirao, J. N. (2017) '**Automated generation of versatile data model for analyzing urban architectural void**', *Computers, Environment and Urban Systems*, 66, pp. 130–144. *Paper in Indexed International Scientific Journal (peer-reviewed)*
- Cavic, L., Sileryte, R. & Beirão, J.N., 2017. '**3D-INFORMED CONVEX SPACES - The Automated Generation of Convex Representation for Open Public Space Analysis**'. In 11th International Space Syntax Symposium. Lisbon. *Paper in International Conference Proceedings (peer-reviewed)*



- Cavic, L., (in editing). '**Urban-Architectural Emptiness in Lisbon Riverside- UrbArch Emptiness as a Qualifier of Open Public Space Characterisation and Contextualisation**'. A Imagem de Lisboa: O Tejo e as Leis Zenonianas da Vista do Mar. Lisboa. *Paper in national conference and conference proceeding, Included in the Thesis as SECTION 6.1*
- Beirão, J.N., Chaszar, A. & Čavić, L., 2015. '**Analysis and Classification of Public Spaces Using Convex and Solid-Void Models**'. In S. T. Rassia & P. M. Pardalos, eds. Future City Architecture for Optimal Living. Springer International Publishing, pp. 241–270. *Books Sections (peer-reviewed), Included in the Thesis as a part of CHAPTER 5*
- Cavic, L. & Beirão, J., 2014. '**Open Public Space Attributes and Categories - Complexity and Measurability**'. Magazine AR Architecture, Research, 2014/2 Volume XV, pp.15–24. *Paper in International Scientific Journal (peer-reviewed)*
- Beirão, J., Chaszar, A. and Cavic, L. (2014) '**Convex - and Solid-Void Models for Analysis and Classification of Public Spaces**', in Gu, N. et al. (eds). CAADRIA 2014, 19th International Conference on Computer-Aided Architectural Design Research in Asia, Kyoto, Japan: Kyoto institute of technology. *Paper in International Conference Proceedings (peer-reviewed)*
- Filomena, N., Cavic, L. & Serdoura, F., 2013. '**Evora as a open air museum - From spatial cognition to exhibits contemplation**'. In Urban Form in Territories of Portuguese Heritage Analysis, Design, Quantification. PNUM Portuguese Network of Urban Morphology. Coimbra, Portugal. *Paper in National Conference Proceeding*

## 1.11. Chapters Explanation

The research is organised in 7 chapters. **1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> chapters** serve as theoretical foundation of the research. The chapters **4 and 5** address application part of research which is to say, make passage from the theoretical towards practical part. The chapter **6** is intended for practical application and **7** for research conclusions.

It is important to highlight that **chapters 4, 5 and 6** are intended to work as **independent unities** that are meant to correspond to **separate publications**. This means that each of them starts from a broader theoretical introduction which further leads towards more focused observation.

There is an additional chapter which was developed during the research period: “Epistemological Network for Urban and Architectural Research”. Since its scope diverges from the main thesis focus, it was excluded from this document.

### CHAPTER 1

**Introduction** – Overall overview of the research’s main questions, issues and problems

### CHAPTER 2

**Theoretical Analysis** – State of the Art regarding Emptiness, Emptiness in urban and architectural disciplines, Emptiness and its Context, Emptiness in Lisbon Riverside

### CHAPTER 3

**Definition of UrbArch Emptiness** – Definition of the focus of research which was used to direct the analysis, narrow down Open Public Space attributes and inspire development of representation models.

### CHAPTER 4

**Development of Methods and Tools** – Definition and development of representation models and Analytical Tools for UrbArch Emptiness

### CHAPTER 5

**Defining object of research** – Definition of attributes of Open Public Spaces that should be addressed through the prism of UrbArch Emptiness

## **CHAPTER 6**

**Study of cases in Lisbon Riverside** – Application and validation of methods and tools from Chapter 4 on analysing attributes from Chapter 5 through correlation analysis between quantitative finding and their qualitative expression

## **CHAPTER 7**

**Research Conclusions**



*Figure 5 On Emptiness - Emerging, author's drawing*

## 2. Theoretical Analysis of Emptiness

The following chapter is the output of **Theoretical Objective 1 TO.1**.

It addresses the main inspirational trigger of research – notion of Emptiness that theoretically framed and motivated the research, and explains several conceptualisations of emptiness as structuring elements of our investigation. Even though the addressed concepts approach reality on levels and scales different than urban and architectural, their capacity to propose relationships overpass notion of scales offering interesting analogies for urban and architectural problems solutions.

After addressing the notion of **emptiness** in general, we shortly introduced the notion of **emptiness in urban and architectural practises (section 2.1)** where we presented several practical approaches on emptiness. Finally, the chapter addressed the notion of **Emptiness and its Context (section 2.2)** as found in the Open Public Spaces of **Lisbon Riverside (section 2.3)** as a contextual focus of the thesis. The chapter feeds the **Glossary** of terms and terminology (**chapter 8**) presented on the end of the document intended for a clearer conveying of the research procedure.

## 2.0. On Emptiness

The very **inspiration and conceptual basis** of our research is the **concept of emptiness**, which is as broad, rich, vague and as such strongly present in various discourses from oriental mysticism to western philosophy. From Buddhist and Taoist Emptiness, which does not convey any significance of lacking or voiding, to the western concept of Emptiness as part of the process of emptying out something (Watson, 2014), we find the Epicurus' notion which accounts for empty as precondition for movement and John Cage's empty of sound which allows the surrounding space to be heard as sound and instead of sound... there is Arnheim's empty but dense space between objects and Pinto's emptiness as ultimate level of creating and experiencing architectural objects.

Since classical atomism, the eastern and western perspectives on emptiness were rather different, reaching ultimately some kind of conceptual convergence. This occurrence Capra assigns to the discoveries of quantum physics which blurred what used to be clearly defined as empty surrounding full atoms (Capra, 1975). With introduction of quantum uncertainty, the questions raised by modern science shake the mechanistic point of view. The clear empty of western mind started getting approximated towards empty of eastern contingency, which is, as we are going to explain, not empty at all.

The diverse comprehensions of the concept of emptiness on one side show emptiness' potential and fertility to acquire meanings, on the other, they announce its capacity to transcend and slip from any meaning at all. In that regard, the following section introduces notions of emptiness from various cultural contexts; it reviews various concepts linked to it, highlights those which are in the very foundation of our research and explains the way these are being employed. It also clarifies the use of terminology

which surrounds emptiness and provides some disambiguation by assembling a Glossary intended for a clearer conveying of the research.

The section starts by focusing on Buddhist's emptiness whose 'dependent origination' is established as one of the foundations of our research pointing at the potential of Emptiness to encompass anything and become everything. Further, we addressed Taoist's Emptiness as part of empty-full 'breathing process' and a vessel for its occurrence. Therefrom we inferred two main notions of Emptiness further employed in our research: 1.the Absolute Emptiness which is seen as an ultimate vessel of everything; 2. the Specific Emptiness as part of full-empty opposition.

Further, we introduced western notions of ancient Greek Emptiness through philosophies such as atomists', Plato's and Aristotle's when we introduce emptiness-space ambiguity and clarified emptiness-void distinction. After making an introduction of diverse notions of Emptiness and other conceptually 'close' ideas, we defined 4 ideas crucial for research development: Absolute and Specific Space, together with Specific and Absolute Emptiness.

### **Buddhist's full emptiness as manifestation of everything and manifested in everything**

To explain the amplitude of the concept of Emptiness we find important to start with eastern thoughts, especially Buddhist and Taoist whose positive attitudes towards this vast phenomenon led to intense and interesting approaches throughout their tradition. It is within these accounts, their positive and glorifying attitude towards of Emptiness that our research found its basis and its main inspiration.

Buddhist thought, is claimed to be "the home of the most developed philosophy of emptiness" (Watson 2014, p.31, par.1). It accounts for Emptiness as ultimate home of everything whose fullness is reflected in its impossibility to be determined and

separated from anything. The fertility of the eastern Emptiness is expressed in an important notion of Buddha's teaching – *paticca samuṭpadda* or 'dependent origination' which highlights the importance of everything in the generation of something. In Buddhist reality, there is a condition of an absolute inseparability between apparently separated elements – everything is part of the whole and as such is unified through impermanency and constant change.

In Buddhist tradition, the empty refers to Emptiness of the solid sense of self, which is otherwise seen as disconnected from the wholeness of the overall 'dependent origination'. The separation and artificial independence occurs through individualisation and self-glorification. In Early Buddhist texts of Ñānamoli and Bodhi, the process of emptying from the imposing self is understood as the path for liberation that can free the essence from illusion of "permanence and certainty that can never be achieved" (Watson 2014, p.38, par.1). It is within this emptiness of individual boundaries that self becomes a part of entangled mat of reality. Emptiness is thus seen as ultimate reflection of wholeness.

Based on Buddha's teaching on emptiness of self, the better-known concept of *Śūnyatā*<sup>6</sup> or Emptiness of all phenomena would arise. Nothing is essential or enduring since it makes part of everything else. To describe this concept, Watson invoked the thought of Vietnamese Buddhist teacher, Thich Nhat Hanh:

*"If you are a poet, you will see clearly that there is a cloud floating in the sheet of paper.  
Without a cloud, there will be no rain; without rain, the trees cannot grow; and without*

---

<sup>6</sup>Emptiness literally translates the Sanskrit *śūnyatā*. While variously interpreted, it always points to the absence of some ontological feature of substance or essence that living beings mistakenly superimpose upon phenomena. Many but not all types of Buddhism teach that the ultimate nature of all things is in fact just this absence". (<http://www.oxfordbibliographies.com>)



*trees, we cannot make paper. The cloud is essential for the paper to exist” (Watson 2014, p.41, par.7, p.42, par.1).*

Here, the sense of wholeness is seen as the most important characteristic of all of its parts, which is to say, the context and the other elements are the structuring components of each self.

Because of the overall dependence between everything in the world, Buddhist discourse highlights the importance of impermanency and permanent change thus impossibility to grasp any phenomenon with certainty for any longer than for an experiential instant. If we focus merely on this part of eastern argument about phenomena, the notions of impermanency and dependent origination negate a possibility for any conclusive observation, thus impossibility of scientific conclusions as western tradition understands it.

**To summarise**, the Buddhist’s concept of fullness of Emptiness, contained in its dependence on other elements is one of research’s main triggers. We thus used a concept of Emptiness as manifestation of everything and manifested in everything whence we adopted Emptiness’ capacity of being potentially manifested through perceivable things and as such potentially graspable. The quality of dependent origination of Emptiness inspired search for observation of this apparently non-graspable phenomenon.

## **Taoists breathing emptiness and built environment**

From Taoists' account, we acquired a notion of Emptiness as being part of a permanent process of 'full-empty' process of building environment.

In the Taoist tradition, there is the same positivism and glory attached to the concept of Emptiness we find in Buddhist accounts. However, there are substantial differences between these two lines of thought. In Taoism, Emptiness is an opposite pair to fullness, which together define complementarity in the same way yin and yang, being and non-being, feminine and masculine do so. There is a dynamic unification between fullness and emptiness though permanent flow from one to the other. This notion is a reflection and consequence of so called *chi*, or breath-energy which allows for different stages between complementary oppositions to occur throughout breathing-in and breathing-out processes (Watson 2014, pp.52-53).

It is the process between any apparent oppositions in which it is revealed their sameness and common origination. It is through full-empty gradation that their inseparability and similarity come to manifestation. Following Taoist notions, the Emptiness is as full, stable or robust as fullness, and fullness is equally impermanent and fertile as its empty opposite. In the phenomenon of city, this can be transposed to the changes between fully built and unbuilt environment which ultimately belong to the same wholeness structured as equilibrium between these composing oppositions.

The notion of constant impermanency influenced by opposites which hold them in natural oneness, is an important idea in our investigation. Built environment, which is the contextual framework of the work, is seen as dynamic interplay between empty-full, built-unbuilt, which define its position on the scale between abstract extremes of untouched natural environment and one which is fully occupied by objectivized human action, such as cities, manmade structures, art.

**To summarise**, two Taoist notions which significantly inspired our research are: 1) the breathing process, known as *chi*, which keeps complementary oppositions, such as emptiness-fullness, in unbreakable oneness 2) cyclicity of that process which is characteristic for city life and permits both, its renewal and lasting. These are used in city comprehension as positioned on the scale between **natural** and **manmade** environment. By understanding the proportion between built and unbuilt part of our surrounding, we can grasp the naturalness of built environment<sup>7</sup>.

### **Atomists' Emptiness and Movement**

Differently from eastern notions, the issue of emptiness that runs throughout the history of western philosophical thought, was rather contentious and referred directly or indirectly to classical atomism and its three major protagonists – Democritus (ca.460 BC – ca.370 BC), Epicurus (341 BC – 270 BC) and Lucretius (ca. 99 BC – ca. 55 BC). Through conceptualisation of 'atoms and emptiness' as true elements of what exists and generically correspond to 'something and nothing', they were primarily responsible for introduction of emptiness into western philosophical and scientific debate (Ribas i Massana 2008, p.3) Their accounts were also responsible for the declaration of a debate centred around 'full-empty' opposition which differently from Taoist's equilibrium led towards their conceptual separation and ontological disjunction.

---

<sup>7</sup> The Taoist notion of cyclicity of built environment is also informative for our research. It is used in understanding the ageing of a place through its permanent formulation and reformulation. There are places which are 'young' and still in the first circle of their life. There are others which have been reformulated several time thus have various cycles behind them which thickened the strata of their significance. Through various usages acquired in several eras, these multi-cycled places show capacity for multifunction and capacity to give answers various requests.

Differently from Taoist's account in which fullness and emptiness were equally fertile as parts of the same ontological nature, in western thought the existing reality was divided between some corpuscles, completely full, solid and the emptiness which is the absolute lack of fullness. The textures visible or detectable in a different gradation would be merely the result of the combination of atoms and void, depending on their number, their form and their movement (Ribas i Massana 2008, p.4).

According to atomists the emptiness is, firstly, the logical and complementary conclusion of postulate of atoms, of the limit on the divisibility of things, of the impossibility of the division taken to infinity. This system, described as mechanistic, comes down to the mechanical interaction between atoms (with empty intervals in between them) and their spatial arrangement resulting from this interaction. In Aristotelian terms (367 BC-347 BC), all changes that he classifies in four types: substance, magnitude, quality and place – can be reduced to the one type – change of place or change of place that atoms are occupying. Qualities are thus, translations of the atomic arrangements and the emanation (which is also atoms in motion) that emerge from the bodies (Ribas i Massana 2008, p.5).

Moreover, emptiness is seen as a necessary interval between the atoms and the condition for freedom of movement. Here, the atomists retake the Melissus<sup>8</sup> argument about the mutual dependence between movement and emptiness which claims that an obvious observation of existence of movement leads to conclusion of the necessary existence of emptiness. In that line of thought, Epicurus provides an identification of empty space, beyond the simple concept of void, as the interval between atoms crucial

---

<sup>8</sup> Melissus of Samos, 5th century BC

for movement to occur. He says in his Letter to Herodotus<sup>9</sup>: “If there was not what we call emptiness, intangible space and nature, the bodies would not have where to be or where to move” (Ribas i Massana 2008, pp.4,5). He says that emptiness is an intangible space, which is from imperceptible nature, whose quality is incorporeal and it offers no resistance to movement.

The atoms-void principle is the main premise for *vacuism* which would remain unchanged in the atomistic doctrine. In the future, and based on this Epicurean precedent, one of the arguments of the *vacuists* would consist in highlighting the possibility of understanding the Space as an entity itself, regardless of whether all or some places are occupied by bodies. Therefore, Space would actually be understood as empty – which is the concept that would be defended in the future (Ribas i Massana 2008, p.6,par.1). This would assist to the prefiguration of the highly disputed issue about conception of Space as an entity independent (or not) of the bodies, a problem that had been addressed by Aristotle and with different responses discussed until today (Ribas i Massana 2008, p.5).

Atomist’s inspired definition of full-empty separation and their acceptance of empty intervals is crucial for our research since it allows for definition of built antipodes as limited entities thus separable from continuity of tangled reality. The atomist full-empty divisibility is an important postulate of our research because it supports mutual definability of full and empty opposites allowing emptiness to be grasped – the notion of Emptiness distinguishable from fullness enables Emptiness’ tangibility through observation of its built antipode. Without the atomists’ conceptualisation which permits

---

<sup>9</sup> Translation by author, from Carta a Heródoto, Epicurus in Biografica del Vacio, Ribas i Massana: “Si no existiera lo que llamamos vacío, espacio y naturaleza impalpable, los cuerpos no tendrían dónde estar ni dónde moverse, cuando aparecen en movimiento”.

observation of reality through discontinuity, any scientific observation of emptiness would actually be challenged.

**To summarise**, for our research the atomists' theories, even though focused on a scale different from urban, had a considerable impact. Their influence is twofold. On one side the idea of discontinuity between atom and void supports the possibility for **conformation of emptiness** (see further discussion on UrbArch emptiness) as distinct thus graspable notion of built environment. On another, there is an important notion which associates Emptiness with movement thus usage of space. This focuses on the necessity for Emptiness in enabling motion as essential for definition of a social Open Public Space, because without movement a place cannot be apprehended nor other human can be met.

### **Plato Space/Emptiness Converging and Overlapping**

In his Dialog Timeous, Plato (428/427 BC – 348/347 BC) addressed the problem of Space (χώρα), which would be used for affirmation of its independence (Ribas i Massana, 2008, p.8, par.5). In fact, the secular discussion about entity of Space practically began with Plato's conception and consequent Aristotle's replicas, whose influences reach to the modern philosophical debate.

Even though recognized as crucial in establishment of Space as an entity independent from body, Plato's conception has various overlapping points with eastern idea of Emptiness. As described in Timeous, space is considered an intermediate between 1) the absolute one - that is not a subject of change, and 2) the relative one - the sensible

world in which generation occur. It is an intermediate that participates in the immutability and simultaneously receives the mutability of sensitive world<sup>10</sup>. "...a third Kind is ever-existing Place, [52b] which admits not of destruction, and provides room for all things that have birth..." This quality of Plato's space to be a background and to participate in unfolding of sensitive world recalls the idea of Tao's emptiness from

---

<sup>10</sup> "[51e] Now these two Kinds must be declared to be two, because they have come into existence separately and are unlike in condition. For the one of them arises in us by teaching, the other by persuasion; and the one is always in company with true reasoning, whereas the other is irrational; and the one is immovable by persuasion, whereas the other is alterable by persuasion; and of the one we must assert that every man partakes, but of Reason only the gods and but a small class of men. This being so, we must agree that One Kind [52a] is the self-identical Form, ungenerated and indestructible, neither receiving into itself any other from any quarter nor itself passing anywhither into another, invisible and in all ways imperceptible by sense, it being the object which it is the province of Reason to contemplate; and a second Kind is that which is named after the former and similar thereto, an object perceptible by sense, generated, ever carried about, becoming in a place and out of it again perishing, apprehensible by Opinion with the aid of Sensation; and a third Kind is ever-existing Place, [52b] which admits not of destruction, and provides room for all things that have birth, itself being apprehensible by a kind of bastard reasoning by the aid of non-sensation, barely an object of belief; for when we regard this we dimly dream and affirm that it is somehow necessary that all that exists should exist in some spot and occupying some place, and that that which is neither on earth nor anywhere in the Heaven is nothing. So because of all these and other kindred notions, we are unable also on waking up to distinguish clearly the unsleeping and truly subsisting substance, owing to our dreamy condition, [52c] or to state the truth—how that it belongs to a copy—seeing that it has not for its own even that substance for which it came into being, but fleets ever as a phantom of something else—to come into existence in some other thing, clinging to existence as best it may, on pain of being nothing at all; whereas to the aid of the really existent there comes the accurately true argument, that so long as one thing is one thing, and another something different, neither of the two will ever come to exist in the other so that the same thing becomes simultaneously [52d] both one and two.

Let this, then, be, according to my verdict, a reasoned account of the matter summarily stated,—that Being and Place and Becoming were existing, three distinct things, even before the Heaven came into existence; and that the Nurse of Becoming, being liquefied and ignified and receiving also the forms of earth and of air, and submitting to all the other affections which accompany these, [52e] exhibits every variety of appearance; but owing to being filled with potencies that are neither similar nor balanced, in no part of herself is she equally balanced, but sways unevenly in every part, and is herself shaken by these forms and shakes them in turn as she is moved."

which everything graspable arises. Future accounts in western tradition would be greatly inspired by the Plato's Space focusing on its possibility to be a container and independent entity from bodies inside it. The generating relation between empty space and sensitive bodies, praised by Taoists, would rather be overlooked. Even though the Plato's notion of Space accounts for dependence between space and body in the similar way Taoist Emptiness does, it is from his conception that the basis for the tradition which conceptualised space as separated entity from the bodies would arise.

The concepts of emptiness as vessels for things' emergence are present in Eastern and Western traditions with some differences which substantially distinguish these two accounts. The Taoist Emptiness is inseparable from a subject, because emptiness is beyond everything as a root for everything to unfold. Everything emerges in the Tao which as an empty vessel serves for partaking of both spiritual and material dimensions (Watson, 2014, pp.52-55). Differently, in Atomists' account Emptiness is container where corporeal particles are placed within inanimate framework.

In the later history of western thought, any appeal to the consideration of an independent entity called space, a distinct entity of bodies or matter and as such empty, directly or indirectly is based upon the platonic reference. Similarly, any consideration of space as homogeneous and geometrical entity and therefore empty, would also have Plato's geometrism as an origin (Ribas i Massana, 2008, pp.8,9, par.5,1). Plato's Space, as a principal residence, points to two seemingly contradictory concepts: the void and matter. Both, the void and matter, effectively participate in this double condition of permanence and mutability: the void remains unchanged while accepting different bodies, the matter, is the only substrate common to all bodies. That's why Aristotle, in his theory of space, in which he refuses void, accuses Plato for confusing the space with the bodies inside it, which is what Taoist philosophy deliberately argues and defends. For Aristotle, atomist were confusing the space and



the void and Plato was confusing the space and the matter (Ribas i Massana, 2008, p.8, par.2).

**To summarize**, due to their conceptual similarity Plato's Space and Eastern notion of Emptiness mutually overlap which often lead towards their linguistic mix-up. It was therefore important to draw attention to this space-emptiness confusion based on ambiguity of their conceptual limits which enables possibility for their substitutable usage. If we compare Eastern Emptiness and Plato's Space we find that on some level these concepts converge towards conceptual similarity thus can be seen as somewhat equivalent and used as synonyms.

Although conceptualised as ultimate vessels for emergence of anything that exists in reality, the eastern notion tends to lose observational framework negating perception as possible way of apprehending reality, while the western notion is grounded on observation and the way that the framework for the observation is being established. Inspired by this differentiation, in our systematisation of research main concepts (see chapter 2.4), we draw a line between Absolute (undefined) Emptiness and its conceptual cognate – Absolute Space which presupposes introduction of observational framework thus initiation of concretization of Absolute Emptiness.

### **Aristotle's Void and Emptiness**

Aristotle (384 BC – 322 BC) can be considered the major influence that articulates the dominant mainstream of antivacuism in Western thought. During many centuries the opinion of Aristotle shapes the corpus of scholastic knowledge, which would be rejected due to the modern scientific revolution (Ribas i Massana, 2008, p.9, par.2). In his Physics, Aristotle was devoted to refute existence of Void arguing in favour of twofold concept of Place: as a specific container of body and body's global natural

location. His universe is a plenum of embodied places which are ordered due to their nature leaving no possibility for Void to occur.

In his account, Place and Body are dependent but they are not completely unified, they are seen to be linked together but not ontologically same. When moving throughout their natural plenum and continuity, bodies are giving place to each other which he used to prove that places differ from bodies. Aristotle argued that the Pre-Socratic Emptiness as precondition for motion and Socratic empty Space as vessel for bodies are not necessary at all. In his IV book of Physics, he claims that what exists has to have a Place (Aristotle used τόπος), for without Place there is only non-existence<sup>11</sup>. Since the existence takes body and each body is necessarily in its Place, therefore Void is a Place bereft of existence and body<sup>12</sup> which in a plenum world is not possible – therefore Void is not possible. In modern terms, Aristotle's Space is a 'relative space', a collection of Places which cannot be conceived as empty Space separable from its either content or context.

The Aristotle's criticism and refutation of Void was radical and comprehensive and served as the inspiration and basis for centuries long discussions on the topic, argue Ribas and Massana. His refutation program which accounted for: 1) separable or continuous void, 2) interstitial void and 3) extra-cosmic void, would be the guiding

---

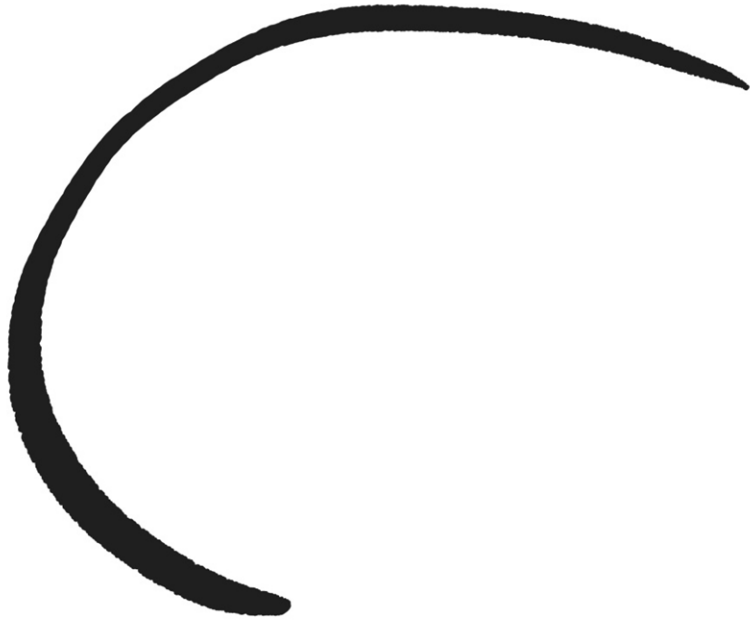
<sup>11</sup>“The physicist must have a knowledge of Place, too, as well as of the infinite — namely, whether there is such a thing or not, and the manner of its existence and what it is — both because all suppose that things which exist are somewhere (the non-existent is nowhere — where is the goat-stag or the sphinx?), and because ‘motion’ in its most general and primary sense is change of place, which we call ‘locomotion’” (Aristotle, Phys. IV.1, R.P. Hardie and R.K. Gaye).

<sup>12</sup> He raised the concern: “The void is thought to be place with nothing in it. The reason for this is that people take what exists to be body, and hold that while every body is in place, void is place in which there is no body, so that where there is no body, there must be void” (Aristotle, Phys. IV.7, R.P. Hardie and R.K. Gaye).

classification in later medieval and modern discussions on void and its gradual acceptance. The complex history of the Void's acceptance started by admitting the interstitial void, continued with the questions on the continuous void, and finally culminated with the Newton's cosmic void (Ribas i Massana, 2008).

**To summarize**, based on previously discussed accounts, both eastern and western, our approach distinguishes significantly the concept of Emptiness from concept of Void, adopting the previous as the main subject of the investigation but not neglecting the latter. As explained, the notion of Emptiness bears positive connotation both in Buddhist and Taoist tradition and like that is being reintroduced in contemporary western architectural theory (Pinto). It is deemed as a fertile and dense phenomenon, full of potential and close to the untouched nature; a multi-dimensional and complex vessel from which everything can possibly become. Differently, the Void based on Aristotelian tradition, accounts for Lack of something which due to its strong state of lacking gains qualities and starts defining itself, ex. absence of matter which creates vacuum or absence of desirable object which generates life's drive as in Lacanian *object petit a* from his psychoanalytic theory.

*This page intentionally left blank*



*Figure 6 On Emptiness - Dome, author's drawing*

*This page intentionally left blank*

## Stoic's Extracosmic Empty Space

For Aristotle, the impossibility of the existence of vacuum was linked to the connection between a body and the impossibility for the body to exist inside the Void. Since bodies were impossible to exist outside the limits of world, thus Void beyond these limits was also unconceivable. "Without the possibility of occupation by a body, the existence of vacuum beyond the world was deemed impossible" (Grant, 2008, p.105, par.1).

The Aristotelian cosmological model, based on limited spherical universe, which did not account for anything possibly beyond it, would be overpassed with Stoics' admission of extracosmic Void. While Aristotle argued against the exterior of the world and the Void of the exterior, the Stoics took his refutation program as the starting position for their argument. Hence, the important issue of Imaginary Space, only conceivable by reason, arose which implied overpassing some limitations of Aristotle's concepts, such in understanding of 'possible',

The important difference between Aristotle's and Stoics' accounts can be seen in their conceptualisations of 'possible'. The notion of possibility as conceptualised by Aristotle would be equal to the notion of 'potential' as we defined it – a possible is something that might become actual in any future time<sup>13</sup>. Differently, for Stoics a proposition was 'possible' if nothing external prevents it from being true (Grant, 2008, p.107, par.3). This means, that since there is nothing preventing Void of existing outside the world, even though it eventually cannot come into our actuality, its existence is 'possible'. In

---

<sup>13</sup> Aristotle in his *Metaphysics* has extensively addressed notions of potentiality (*dunamis*) and actuality (*entelecheia* or *energeia*) as two types of emergence of existing elements; one emerges upon a logical condition that permits existence even though nonactual, the other in reality where it is exteriorised. There, he explained that the actuality relates to potentiality as: "...building is to that which is capable of building, and the waking to the sleeping, and that which is seeing to that which has its eyes shut but has sight, and that which has been shaped out of the matter to the matter..." (Aristotle, *Θ6*,1048a,b).

this way, Stoics established relationship between divinity and emptiness – even though not verifiable in actuality God's existence turns to be 'possible' in Stoics terms. Based on this tradition, medieval theologians would in their debates about God's location, find Him a good place within the unreachable and improvable Emptiness.

When we talk about absence, we are not limited to the present real, but directed towards numerous possible. "Whereas a syntagm (presence) immediately suggests an order of succession and a fixed number of elements, terms in an associative family (absence) occur neither in fixed numbers nor in a definite order." (Saussure, 1959).

Based on the 'possibility' proposition Stoics argued about Aristotelian idea of limited world claiming that if there is an imaginable limit there must be something beyond it. In this way emerges an important issue of Imaginary Space – a space that is conceivable by reason but still beyond it, ideal but not real (Ribas i Massana, 2008, pp.16,17). This Stoics' spatial concept is important because it consists not only of what is apprehensible from reality but what is conceivable through our interpretation.

The Stoics' Imaginary Space, inspired by extra-cosmic Void, brings into conversation argumentation manner that suppress perception as the favourite way of capturing reality bringing into rational scene process of imagination and interpretation previously glorified mostly by religious and cultural myths. If we employ Stoics' imaginary space in observation of the sacral meaning of a dome and the idea of dome as a limit in religious architecture we find an interesting relation in its signification. The dome as a physical delimitation started symbolizing something that is beyond its conceivable capacity to limit. This way, the absent, Imaginary Space which does not belong to graspable reality, once it was conceptualised, gained its expression in reality. And the expression of the 'imaginary' got inscribed at the element which was used to conceptually delimit its impossibility, exactly where the discussion has initially started. The real and tangible dome started representing Imaginary and Intangible Space.



“Since its beginnings the dome has been used for religious purposes, becoming architecture’s universal expression of heaven” (Stephenson, 2005). This process of assaying a meaning to elements which represent a conceivable limitation for that meaning, such as limiting dome signifying unlimitedness, is a common process in human reasoning, ex. perception of horizon which by depicting the end of visible limits is usually linked to perception of infiniteness.

The importance of Stoic’s Extracosmic Emptiness, revealed through notion of Imaginary Space, started signifying something that is absent and behind the possibility of being grasped in reality. It stood for something more than merely for itself. It became a symbol. By transcending reality symbols become gates for entering into places of personal memories, knowledge, previous experiences but also links toward shared ideas, ritual practices and collective meanings.

**To summarize**, our research recognizes importance of Stoics’ notion of Imaginary Space which for sake of comprehension, beyond perception, requires interpretation. Due to the Stoics inspired approach towards reality we adopted a distinction between formal and symbolic qualities. These are distinguished by Oliva as structural and semantic level of surrounding world (Oliva et al., 2011). While structural level refers to geometric context of surrounding world, of semantic level rely on understanding meaning of the space person is embedded in. Encoding the first level means to: “describe the shape, size, boundary and content of the space in view” while second accounts for “meaning of the physical or pictorial world and are modulated by the knowledge of the observer” (Oliva et al., 2011).

## **Horror Vacui**

Horror Vacui – the Middle Age enthroned this principle. Expressions such as ‘nature abhorrent vacuum’, ‘horror vacui’ and ‘flight vacui’ were widespread in the fourteenth century and became an irrefutable principle for Scholastic. The exact origin of this

dictum ('nature abhors a void') is not known precisely, but its continuity is established between the classical sources and the medieval principle (Ribas i Massana, 2008).

The most explicit work where was formulated the principle of 'horror vacui' was Averroes' (1126-1198) commentary on Aristotle's *De Caelo* in which it is argued that: "in order to prevent formation of a vacuum, air would descend (when the water below was removed) and water would rise (when the air above was removed). To forestall formation of vacua, both elements would thus act contrary to their natural tendencies" (Grant, 2008, p.68, par.2). There is an important change from Aristotelian to Averroes formulation of the term that can be summarized in passing from an emphasis on the continuity of nature to emphasize the role of the vacuum. This difference, although subtle, is important: a formulation in positive terms (the continuity of nature) passed to a formulation in negative terms - the void is not possible. Roger Bacon, in the twelfth century, would be representative of the first aspect, while in the fourteenth century prevails the second formulation (Ribas i Massana, 2008).

In fact, says Duhem, Bacon is correct on one important point of Aristotle's *Physics*. To each body is assigned a natural place according to its particular nature (eg, severity or lightness). Bacon goes for a higher principle: that a body, rather than being of a particular nature, is part of a Continuum. This qualification is important because it points to the conception of the world as a fully continuous, interrelated and cohesive. This conception, supplemented by the idea of God as almost a place-holder of worldly things, would result in the quasi-pantheistic idea of divine: God was seen as the guarantor of cohesion and continuity of the world. This position of Bacon, which should be qualified more in positive terms of the principle of completeness would come to be confused with negative statements of *horror vacui* flourishing in the fourteenth century (Ribas i Massana, 2008).

## **From Extracosmic Void towards Extracosmic Space**

After Condemnation in 1277, the discussion on extracosmic void mentioned in Aristotelian and Stoics accounts was retaken, this time within theological debates which argued that God could possibly 'create' (one approach) or 'be' the vacuum beyond the world (second approach). At that moment, whichever tactic regarding extracosmic void was taken, it was directly related to God (Grant, 2008, p.116, par.2) leading to significant body of theory about emptiness in western culture to be developed through the Middle Age theological writings.

At that moment, the extracosmic void space start being designated as merely extracosmic space which is to say space-emptiness ambiguity was reintroduced. At this point it was different from the previous overlapping between notions of Plato's Space and Taoist's Emptiness which accounted for conceptual augmentation of space as a vessel to the point where it had started losing its specificities through weakening of its observational frame thus became more similar to unframed Taoist's Emptiness. Here, the process was rather inversed, it was an undefined and vast notion of emptiness which had a potential to account for everything, that was introduced an observational frame of religious standpoint thus was turned into a space. A vast extracosmic void started being outlined by the framework of religion as extracosmic space.

Throughout Grant's book *Much Ado about Nothing*, we can follow the development of western thought through the process of concretisation of vast concept of emptiness into more defined notion of space. From Roger Bacon's reaction to Aristotle's work where he defined vacuum as conceptual space beyond world in XIII century (Grant, 2008, p.106, par.1), to Jean Buridan's speculation about Aristotle plenum and impossibility for any arm to extend beyond the last sphere without constructing its own space in XIV century (Grant, 2008, p.106, par.2) we find Jean de Ripa's introduction of possibility of

place and space beyond limits of world<sup>14</sup>, Thomas Bradwardine's<sup>15</sup> equivalency between God's immensity and infinite Void space, John Major's imaginary infinite extracosmic Space in XVI century and Bona Spes' real infinite extracosmic Space<sup>16</sup>. Through these notions we followed the gradual passage from usage of Vacuum and Void, throughout extracosmic Void Space (Void-Space), towards only extracosmic Space, which Bartholomeus Amicus sees as a passage from something potentially changeable, Void, to something rather permanent, Space<sup>17</sup>.

---

<sup>14</sup>"And yet, every body and spiritual substance located beyond the world or imagined there must be conceived to have some kind of place, even though it is surrounded by no other distinct and separate surface. And if each such entity can possess its own place, or ubi definitivum, in empty space, then the distances between them ought to be measurable without the existence of intervening matter." (Grant, 2008, p.126,par.2)

<sup>15</sup>"With his five corollaries and accompanying arguments, Thomas Bradwardine established the basis for subsequent scholastic discussion of extra-mundane space. Rather than conceive imaginary infinite space as the creation of an omnipotent God whose own immensity "immensely exceeded" the infinite space of His own creation, as Jean de Ripa would have it, Bradwardine rejected the very idea that God could create an actual infinite and chose to conceive God's infinite immensity as somehow equivalent to, and therefore omnipresent in, imaginary infinite void space." (Grant, 2008, p.142,par.3)

<sup>16</sup>"By way of response to these arguments, Bona Spes introduced his own opinion, which is both radically different from all the interpretations described thus far and yet surprisingly similar. God would indeed be present in any new world He produced beyond ours and would also be present in the distances intervening between them. But He would not accomplish this by existing in an imaginary space. For God is Himself a real immense space that is indistinct from His own divine immensity. In support of this opinion, Bona Spes could do no better than invoke Saint Augustine's oft-cited remark in the Confessions (book 7, chapter 5): The world in God is like a sponge in an immense ocean. Beyond that sponge, God is extended everywhere by His substance." (Grant, 2008, p.179,par.3)

<sup>17</sup>"Few treatments of imaginary space were as thorough and significant as that formulated by Bartholomeus Amicus. His reasoned conclusions that imaginary space is a negation of resistance capable of receiving bodies and that space must be distinguished from vacuum form the foundation of his spatial theory. The latter distinction seems especially important because it made a permanent, immutable entity of space, in contrast to the potentially mutable and generable nature of vacuum. Although no other explicit discussion of the difference between space and vacuum has come to my attention (a possible exception is Otto von Guericke, who differentiated between commonly perceived vulgar three-dimensional space and the dimensionless infinite space that served as the universal container of all things;..., it is likely that other

**To summarize**, as we interpret it, the subtle change in terminology mentioned above could be read as an indication of clarification and gradual concretisation of western concepts – from the abstract and vague notion of Aristotelian extracosmic Void to Space as seen from a specific prism of God positioning. By gradual introduction of framework of God until XVI centuries, the notion of Void was exchanged for the Void-Space and finally for the Space only – with definition of an observational frame, an undefined notion of Emptiness became a concrete one. The processes of concretisation of emptiness into space and reversely undefining of space into emptiness are important research's postulates. They illuminate relationship between notion of emptiness and space pointing out to the passage from one to the other – space is conceptualised as emptiness which is introduced an observational framework; and vice versa, emptiness is space which lost its observational standpoint becoming undefined and vague.

### **XVI and XVII century Non-scholastic - Infinite Space and Emptiness**

Even though the extensive theological discussions on dependence between God's immensity and Extracosmic Space inspired diverse accounts on emptiness and space, these were sometimes deemed as neglected by non-scholastics thinkers. Grant highlights that the influence which scholastic works had on XVI and XVII centuries' scientist and philosophers is difficult to be traced but it is not be ignored.

*“Silence about, or contempt for, the large and detailed scholastic literature on infinite space does not and cannot legitimize the inference that scholastic ideas about space and God played no role in shaping nonscholastic interpretations and opinions. It only makes the determination of such influences difficult to demonstrate and document.”*  
(Grant, 2008, p.182, par.1).

---

seventeenth-century scholastic and nonscholastic proponents of absolute, eternal, and immutable, infinite space implicitly assumed a similar distinction between space and vacuum.”

What had a more obvious influence on non-scholastic thinkers were Greek and Latin treatises discovered in the XVI and XVII centuries. With Renaissance the hegemony of Aristotelian influence was diminished and Neoplatonic and atomists' traditions would be introduced initiating the changes and development of modern thought. During this period occurred the Scientific Revolution, inflection of modern thought through radical transformation of understanding of several phenomena such as natural world, universe, nature of matter, motion, means of acquiring knowledge, etc. Introduction of the heliocentric cosmological model through the Copernicus' *De revolutionibus orbium coelestium*<sup>18</sup> was an important inflexion point for the understanding of the Infinity of Space (*infinetización* of Space in the XVII century and *infinetización* of the Universe in XVIII century).

During this revolution not only the geocentric theory was substituted but also, by putting Earth in eccentric position, the hierarchy of Aristotelian elements in which the Earth as the heaviest element had to occupy the central place of Universe was questioned. During this period, a finite, geocentric and completely filled world became an infinite and a belief that the heaven and earth act upon different laws was abandoned (Applebaum, 2000). Earth and Man were not any longer seen as the lowest creations of God which to some point permitted the unification of terrestrial with celestial physics (Ribas i Massana, 2008, p.60) further strengthen by Galileo and his construction of telescope in 1609. Through telescope invention and flattening between laws applicable to Heaven and Earth the extracosmic infinite Space, hitherto merely theologically deemed, was now considered as possibly existent in actuality. It is the opening of perspective for observation that turned the Infinity possible.

---

<sup>18</sup> On the Revolutions of the Heavenly Spheres, 1543

During the Scientific Revolution through observation of the Universe, from the Imaginary infinite extracosmic Space which substituted the previously conceptualised infinite Void, the framed Infinite Space started to be grasped – through usage of telescopes the possibility for endlessness was actually observable and not merely imagined as it used to be before.

Even though the existence of Infinity, similarly to existence of Emptiness was deemed possible, its apprehension remained debateable. Galileo argued that dealing with infiniteness transcendent finite mind, thus the attributes that are applicable to finite quantities cannot be applied to infinite ones. Kant claimed that one can grasp only a 'potential infiniteness' because to assure that there is an 'actual one', one would have to perceive it as such and to do so, neither finite mind nor finite time would be sufficient (Rucker, 1995, pp.6-15).

For Aristotle, the Infinite and the Void were not potential and were different from the 'potential-actual pairs' such as waking and sleeping, stone and sculpture, eyes shut and sight which contain a realistic possibility of being realised. While sleeping one can be awoken, stone can be turned into sculpture, and the eyes shut might become a source of sight. Differently, 'the Infinite' and 'the Void' are only possible through our conceptualisation:

*“But the infinite does not exist potentially in the sense that it will ever actually have separate existence; it exists potentially only for knowledge. For the fact that the process of dividing never comes to an end ensures that this activity exists potentially, but not that the infinite exists separately” (Aristotle, Θ6, 1048b).*

The process of getting into infinity, conceptualising infinity or reaching it, exists in actuality, which according to Aristotle does not mean that infinite itself exists. Striving towards Infinite is actual, the same way striving towards absolute Emptiness is. Nonetheless, the Infinity and the absolute Emptiness stay merely ideas presented to

our intellect. Here, the conceptual idea of existence of Infinity and Emptiness serves as magnet for their pursuit which continuously keeps slipping out of pursuer reach.

Both processes, understanding of Infinity and Emptiness share usage of imagination as their mutual component. In this Much Ado about Nothingness, Grant highlights the Mutakallimuns' opinion about the relationship between imagination and understanding. These two actions – imagination (imaginatio) and understanding (intellectus) are seen to be two sides of the same coin where intellect direct our attention towards responses that are to be found and imagination based on our experience helps us in their discovery (Grant, 2 008).

**To summarize**, the apprehension of vagueness of spatial limits is employed as a possible gate which makes an experience of emptiness and Infinity possible, even though does not prove them as actual. At the moment of experiencing extensive spaces, such as oceans or deserts, one's experience is expanding towards the maximum extension of visual field which by its vagueness implies the notion of limitlessness and cherishes the need for imagination. Through reaching the vagueness of limits, in this case visual, one is inspired to pursuit the Infinity or the absolute Emptiness. This is addressed through our research as part of place-landscape-space apprehension and in more detailed explained in the following sections.

### **Summary of Historical Concepts of Emptiness**

In this section we introduced various notions of Emptiness and the various revelation this concept had throughout ideas of Buddhist's fullness, Taoist's full-empty inseparability, Atomists' and Plato's space as vessel for movements and occurrences, emptiness-void distinction, Stoics' imaginary space, middle ages' passage from Void towards Space and the Renaissance Infiniteness. These notions are seen as



observational standpoints which helped illuminate the overall phenomenon of Emptiness and inspired our investigation on various levels pointing to analogies and the relationships which might be useful as linguistic and conceptual foundations for research's accomplishment.

From the Buddhists' notion of dependent origination, we adopted the concept of Emptiness as capable of being potentially manifested through perceivable thus graspable things. This claiming is used as important premise of our research which enables reflection on UrbArch Emptiness through analysis of its built antipode. The Buddhists' concept of dependant origination was therefore employed in elements-to-emptiness exploration where full elements were seen as necessary for the specific emptiness to emerge and to be grasped. Moreover, the same concept could have been used in a different direction for emptiness-to-elements comprehension, proposing emptiness through its indetermination as capable to lead towards other elements, evoking various meanings and acquiring diverse usages.

The possibility of grasping emptiness is also supported by atomists' theories in which emptiness is seen as separable from fullness and necessary precondition for movement and occurrences. The quality for divisibility of full-empty opposition allows definition of emptiness as moulded by its full complement which in return allows its grasping.

From Taoists' emptiness, we acquired its quality of full-empty inseparability as a part of the permanent "breathing" process through which our built environment is being constructed. In that regard we observe full-empty cycles of growing and shrinking processes of built environment understanding them as important in places' aging. There are places that acquire their complete fullness much faster than others and those whose process of filling is slow and last several centuries. Moreover, there are

places which are being emptied and built several times thus overpassed several life cycles, and those that are still at their first round.

Based on Stoic's extracosmic empty space we distinguish notions of structural and semantic levels of surrounding world. And from the Renaissance infiniteness we deem apprehension of emptiness possible through apprehension of its limits.

The processes of concretisation of emptiness into space, which occurred during Middle Age, helped us in structuring the relationship between notion of emptiness and space pointing out to the passage from one to the other – space is conceptualised as emptiness which is introduced an observational framework; and vice versa, emptiness is space which lost its observational standpoint becoming undefined and vague. These emptiness-space and space-emptiness passages allowed for systematisation of historical notions into research's main concepts: **absolute emptiness**, **absolute space**, **specific emptiness** and its **specific space**. Moreover, it allowed for definition of the focus of observation – UrbArch Emptiness which is, as it is explained in the next chapter, based on the mentioned systematisation.

## 2.1. Emptiness in Urban-architectural Disciplines

In the previous chapter we introduced the main theoretical notion of Emptiness, emphasised distinction between Space and Emptiness, Emptiness and Void, but also similarity between Emptiness and Infinity. Based on that, we systematised research's main concepts into: **absolute and specific space and absolute and specific Emptiness**.

While the previous section enabled recognition of research's main theoretical notions, this focuses on **narrowing the vast and limitless notions** of emptiness to the ones manifested in spatial disciplines, primarily **urban and architectural**. The section makes an overview of **architectural and urban approaches** regarding notion of emptiness and its application and exploitation. It shows some works on **Specific emptiness** (such as Emptiness of form, or usage) but also other that explores the **passage and connection between Particular to Absolute Emptiness** (such as Space-Limit). Finally, the conceptual basis from the previous section and the disciplinary approaches from this one are employed together in definition of the very object of the research Urban-architectural Emptiness – hereafter designated as **UrbArch emptiness** (chapter 3).

Through different notions such as the “architecture of emptiness”, “invisible”, “immaterial”, “anti-object”, the notion of emptiness is considered increasingly interesting element in contemporary urban-architectural discourses, it has been given different significance and being accomplished it in different manners.

Architecture and urbanism are spatial disciplines and emptiness, as explained, can be conceptualised as a spatial construct, either its particular part (Specific emptiness) or its background vessel (Absolute Emptiness). Emptiness thus can be found in the very

base of architecture which can be confirmed through various architectural approaches that over history accounted for Emptiness as their gradient element. The variety of understanding of Emptiness depicted in the previous section is reflected in multiplicity of architectural and urban practical and theoretical works, which use Emptiness as one of their fundamental elements, addressed in this one.

We presented several urban-architectural approaches on emptiness wherefrom notions of **1)** architecture of emptiness; building by erasing, by hollowness and un-building, **2)** objecthood and fullness of emptiness, **3)** articulation and tempo of emptiness, **4)** latency and potential of emptiness, **5)** emptiness in Open Public Space, are inferred as especially important in rendering the research's postulates.

## **Architecture of Emptiness**

The extreme and self-standing emptiness designated as the **Architecture of Emptiness** (Utaiwatananont and Aruni, 2009) appears in Suan Mokkh forest temple, established in 1932 in Southern Thailand and founded by the acknowledged Thai monk Buddhadasa Bhikkhu. This forest temple embraces nature as its built shelter and natural elements as building materials thus no structure has been constructed without evident necessity – it is the landscape that defines spaces, trees act as columns and walls, earth as floor. The Suan Mokkh temple uses the naturally structured forest Emptiness as an important element for emerging urban-architectural Space. It suggests a possibility for settlement to be built with designation and decision and be given a meaning with usage and interpretation.

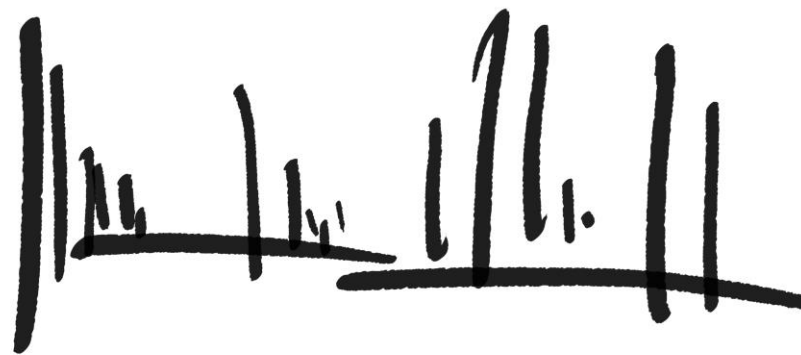
This capacity of nature to shelter and accommodate is embedded in architecture in rather substantial way and proven important in tradition of human settlement. Discovery of appropriate landscape for establishment of place implies recognition of natural conditions that in a way respond to criteria of human searching engine. The recognition of importance of 'not-building' used in Suan Mokkh temple which embraces natural conditions is lately highly present in urban and architectural practices, which look into nature to balance current urban pollution and recuperate inhabitants' well-being.

By avoiding building processes and using spatial interpretation and recognition of fertile Emptiness as a possible construction tactics, Suan Mokkh temple represents what can be called **Architecture of Emptiness**. It explores capacity of unbuilt to embrace potential usages and afford stages for diverse dwellings. Here, the Gibson's concept of **Affordance**, as an objective value of usage or interpretation which belongs neither to object nor subject, but blends them as inseparable through mutual complementarity, should be introduced.

*“An important fact about the affordances of the environment is that they are in a sense objective, real, and physical, unlike values and meanings, which are often supposed to be subjective, phenomenal, and mental. But, actually, an affordance is neither an objective property nor a subjective property; or it is both if you like. An affordance cuts across the dichotomy of subjective-objective and helps us to understand its inadequacy” (Gibson, 1986).*

We can discuss Affordance of Emptiness through its lack of constraints which makes it capable of triggering inspirations for diverse usages. By not directing usages, Emptiness provides gate for multiple possibilities. The magnitude of Emptiness' Affordance is thus defined by its non-definition and further dependent on particular cultural stance and necessities of specific society: “As an affordance of support for a species of animal, however, they have to be measured relative to the animal. They are unique for that animal. They are not just abstract physical properties. They have unity relative to the posture and behavior of the animal being considered. So an affordance cannot be measured as we measure in physics” (Gibson, 1986).

**To summarize**, the notion of **Architecture of Emptiness** introduces non-building as a possible construction tactic. It points out Emptiness' Affordance which might allow for new reflections on structuring ideas of settlements thus new modes of building. The comprehension of Emptiness opens to urban designers and architects the whole new field of constructing built environment – **build without building**. In that regard the architects and urbanism should be trained to build with emptiness.



*Figure 7 On Emptiness - Nature, author's drawing*

*This page intentionally left blank*



## **Building by erasing architecture**

Regarding UrbArch Emptiness, another tactic is adopted by Kengo Kuma and developed through his conception of 'anti-object' which surrenders to its environment, erases architecture and leaves behind only its experience. His explanation: "My ultimate aim is to 'erase' architecture because I believe that a building should become one with its surrounding" (Kengo Kuma in Bogner, 2005, 2005, p.14) explains the formal, spatial and experiential intention of his architecture which is materialised differently in his various works.

While his early works such as Kiro-San Observatory (1994) and the Kikatami Canal Museum (1994) place their bodies underground, the later adopt a different strategy. As (Baek, 2007), he situates a building with multifarious layers of transparency or translucency in the heart of a landscape, creating like that a process in which the massive body of the building evaporates into porous filters of light in a hope that it may evaporate into nothing.

Kuma's approach gives prevail to the landscape and the background aiming at architecture's complete surrender. His early works used a mimicry approach to hide architecture within the landscape attaching the landscape's natural strength to his architecture. Instead of defining a place through announcement of human settlement, Kuma bypasses the human experience of landscape which is usually mediated through place as urban skin. In his works of Kiro-San Observatory and Kikatami Canal Museum place does not exist – only the landscape does. By avoiding urban and architectural structure, he overpass place putting user directly in middle of landscape. Here, place as urban skin which mediate nature-human interaction is erased thus human-nature relation is strengthened.

The avoidance of place to open a gate toward immersion in landscape is not the only Kuma's strategy. Through usage of materials found in-situ he makes another link

between surroundings and his landscape-based architectural practise. Through textures and tactile sensations his work makes analogy to the unbuilt nature that surrounds it. Through augmentation of Emptiness and porosity it announces process of disappearance and dismantling which praise the breathing process of full-empty duality as conceptualised in Taoist philosophy.

**To summarize,** Kuma's process of erasing architecture is important for our research because it emphasises the difference between Absolute Emptiness, only conceptualised by abstraction, and urban-architectural one which is actually apprehensible. What is behind UrbArch Emptiness contains DNA of the Absolute Emptiness but it is never absolutely empty, but rather full natural and social context. In a built environment, the UrbArch Emptiness, as the opposition of urban-architectural fullness implies existence of a place and a landscape which are in their turn not empty at all.



**Figure 8** Oribe Tea House by Kengo Kuma, Available at: [http://kkaa.co.jp/img/2011/12/oribe\\_05.jpg](http://kkaa.co.jp/img/2011/12/oribe_05.jpg) accessed at 18.12.2016

## Building by Hollowness

The quality of UrbArch emptiness to give objects' protagonism back to the nature, surroundings and natural environment can be compared to what minimalists termed Hollowness. During the 1960s, the minimalists changed the relation towards object as defined and autonomous entity, by exploring object's expansion and reflection within surroundings destroying it as self-enclosed entity.

*"Its hollowness opens out to interact with the surrounding conditions of light, wall, floor, and ceiling, and further expands into the real built environment equipped with the constantly changing natural light and weather. In this 'presentment of endlessness' of the non-signifying element, meaning is never fixated and remains inexhaustible and indeterminable. For some authors, this was the very contribution of minimalism: 'the death of the author' and 'a birth of the viewer' (Baek 2007, p.2).*

Minimalism moved the focus of attention from the architectural shape to the Hollowness of objects that open up to interact with the surroundings (Figure 9). Works of Robert Morris, Donald Judd, among others, challenge the status of the author as the creator of meaning through the artwork as an object which conveys the authors' intention. The possibility of beholder to immerse into endlessness and objectlessness of environment and to experience 'a situation' makes them overpass a necessity for object as artistic manifestation which was the question that was in a different way already addressed by the modernist art. While "modernist painting has come to find it imperative that it defeat or suspend its own objecthood" minimalists' art, "aspires, not to defeat or suspend its own objecthood, but on the contrary to discover and project objecthood as such" (Fried, 1998). This was done through involvement of beholder into Situation which was being experienced in a way that observer becomes aware of his belonging to the situation thus becomes part of his own observation. This inseparability between Situation and observer put them in relation of 'special complicity' that 'work extorts from the beholder'. As Fried explains, literalism (as he calls minimalism) gives

72

up on objects for sake of observer or subject who by facing the objectlessness situation elevates the surroundings back to the object (Fried, 1998).

In his “Art and Objecthood” (Fried, 1998) Fried explores the minimalists’ experience of a place (Situation) comparing it with the experience of an Object. A subject before the Situation experiences something similar to the objecthood which distances and isolates him as a beholder. What substantiates the place as an object and makes distance between it and its beholder is endlessness, objectlessness, sheer persistence directed from the outside. The experience of a place turns to be similar to the experience of an object of art. Similarly, a piece of art could be seen, not merely as an object which keeps the observer on the distance, but also as a possible place or a Situation itself.

**To summarize**, the employment of the minimalists’ notion of Hollowness possibly elevates the **field notion** of UrbArch Emptiness to the level of an **object**. What Kuma sees as a context and landscape to which architecture should surrender, minimalists reinvent as an object. Using this notion, the UrbArch Emptiness through its field qualities of objectlessness and endlessness might isolate a beholder and like that establish its own objecthood. This process, points out the possibility of looking into unbuilt part or environment as having the object condition which makes it discontinued thus graspable. It is on this postulate, which claims that **UrbArch Emptiness as field** possesses objecthood, that our research built its methodological proposal on understanding UrbArch emptiness in relationship to Natural and Geographic Environment.



**Figure 9** Donald Judd, *Untitled* (1980-84), Chinati Foundation, Marfa, Thailand [Online] Available from: <http://dalebriantaylor.files.wordpress.com/2012/04/judd-concrete.jpg>, [Accessed 14th February 2013]

## Building by Un-building

*“Now on the face of it nothing seems more ridiculous than undoing a building. Quite the contrary. Undoing is a terribly significant approach for advancing architectural thought in this point in time. Everybody, to some extent, accepts architecture as something to look at, to experience as a static object. Few individuals think about or bother visualising how to work away from it, to make architecture into something other than a static object.” Gordon Matta-Clark (Walker, 2009, p.31)*

In the case of Gordon Matta-Clark’s work, he emptied his architecture from function and possible usage’s value giving it “an economy of non-functional use-value” as Walker explains it. He said to Liza Bear’s interview:

*“Most of the things that I have done that have ‘architectural’ implications are really about non-architecture...anarchitecture<sup>19</sup>... We were thinking about metaphoric voids, gaps, left-over spaces, places that were not developed... metaphoric in the sense that their interest or value wasn’t in their possible use...Or on a functional level that was so absurd as to ridicule the idea of function” (Walker, 2009, p.138)*

The idea of function that overpasses all possible functions by creating non-functional use-value is what Pinto terms meta-function as an attribute of Emptiness which in aesthetic appreciation unveils its capacity to enable access to metaphysical dimension.

Artist and architect Gordon Matta-Clark is probably one of the most perspicacious Architect of Emptiness that western architectural discourse have crossed with. In his

---

<sup>19</sup> Even though, the collaborative exhibition titled Anarchitecture and staged at 112 Greene Street in New York in March 1974 included works of Laurie Anderson, Tina Girouard, Suzanne Harris, Jene Highstein, Bernard Kirschenbaum, Richard Landry and Richard Nonas, the notion Anarchitecture remains almost exclusively linked to Gordon Matta-Clark (Attlee, 2007).

architectural and artistic work, he used process of emptying as one the major methodological tool.

*“These varied in scale from the cuts he made in abandoned tenements in the Bronx to create a series of works called Bronx Floors: Thresholds, his iconic rearrangement of a suburban house in New Jersey known as Splitting, and the majestic, temple-like space he created in a New York waterfront pier known as Days End” (Attlee, 2007).*

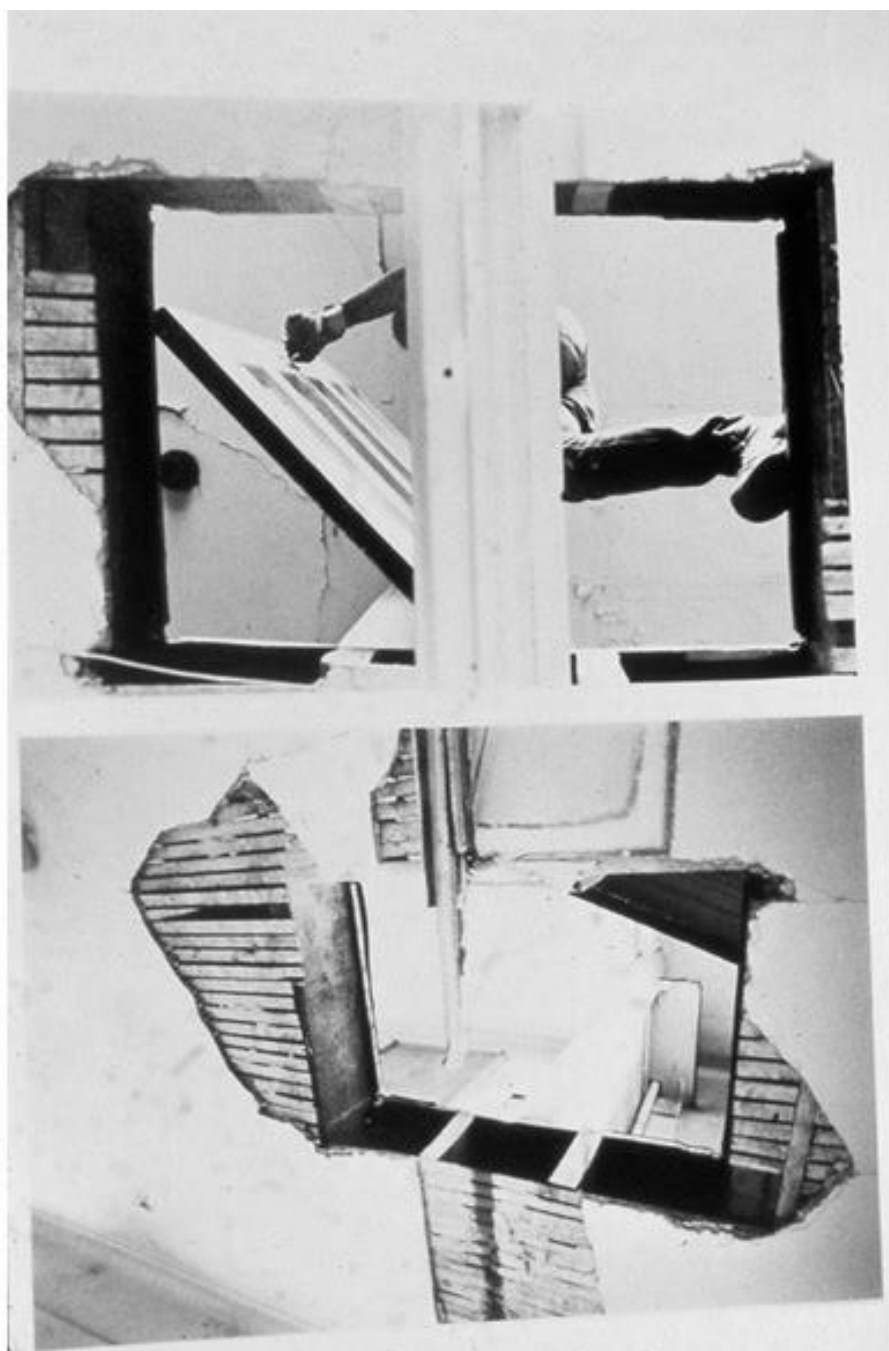
Trained as architect, he actually never designed a building as such. His work was composed of decomposing of architectural pieces through removal of its parts, walls and ceiling. Through cuts in abandoned objects, he created Emptiness that through its unexpectedness gained solidity as an object itself. It occurred not because of the formal strength but because the density of innovative spatial and functional ideas they conveyed. By removing, he created original spaces that were never inhabited before and opened views that were never seen as such (Figure 10).

His immaterial architecture was radically empty yet not voided because his constructing method was not merely to remove built but also to structure empty. If we observe his works we do not perceive a process of cleaning or voiding fullness, but imaginative gesture of thickening Emptiness which is filled by facets of life that has not been lived before. Through emptying he actually turned the space more full and dense, adding to it openings towards a new imaginary, critical and interpretative access which could not be entered before. His ‘Thresholds’ openings in Bronx Floors construct invisible rooms where we pass through and experience space in a unique and unknown way. One starts apprehending a door not merely as a horizontal passage, but as a multidimensional gate whose Thresholds’ ritual is strengthened through vertically-directed opening which allows in-height perspective already implied in rituals as such. In his note card 1146 he wrote: “A response to cosmetic design / Completion through removal / Completion through collapse / Completion through emptiness”.



The consistence of Gordon Matta-Clark's work is in various ways supported and strengthened through his writings which as communicational and interpretative construct also serve as building elements. The cultural and critical charge of his writing structures is readable through his reaction to the well-known phrases such as Luis Sullivan's one 'form-follows-function', which he distorted and changed through usage of mirror into 'form-*falls*-function' (Attlee, 2007). His reaction, gained strength not only through its signification as linguistic constructs, but also through the responsive echo the highly provocative phrases allowed for.

**To summarize,** Gordon Matta-Clark's work unexpectedly cracks the common perception of urban and architectural Emptiness showing innumerable ways of its interpretation. Here, it is not a novel built structure that triggers new conceptualisations and inspires further development. It is rather the removal of commonly present elements that does so. His tactic is not to add a space for a new usage, he rather removes the existing limit thus non-usage or meta-usage can appear as an alternative.



*Figure 10* Gordon Matta-Clark, *Bronx Floors: Threshole* 1972, 2 black and white photographs, Each 356 x 508 mm  
<http://www.tate.org.uk/research/publications/tate-papers/07/towards-anarchitecture-gordon-matta-clark-and-le-corbusier>  
accessed on 01.02.2016

## **Instability of Emptiness**

As introduced through minimalists' account, UrbArch Emptiness reveals a possibility to be read as a natural background on one side but also as an object on the other. This potential of object-background perceptual interchangeability is explained by Gestalt shift which addresses the moment when the perceptual change in object occurs. As noticed in Gestalt, there are certain shapes whose figurative force is strong enough in a way that they do not raise doubts about their objectness. There are other examples of objects which are more 'unstable' thus easier to be 'switched' in Gestalt perceptual shift<sup>20</sup>.

This possibility of background to gain figurative strength is widely explored by Escher's work. In his graphics, he emphasises impermanency of objects and backgrounds and their latent potential of exchanging their perceptual objectiveness. When we let our gaze to land on image parts which are not filled by first plan objects, the background starts gaining details and turning into the figure. At the same moment, figures from the first plane become blurred and pushed into the second visual plane gaining qualities of a background.

The interchangeability between object and background, their dependence and mutual compatibility is what can be learnt from works such Escher's painting titled 'Sky and Water' which highlights a substantial importance of full in generating the empty and of empty in defining the full. Here, we are witnessing the capacity of elements to be at the same time background and figures depending on observers' intentionality and point on which one pose the gaze.

---

<sup>20</sup> Such an example is well-known Rubin's vase of bi-stable image which consists of two almost equally recognizable patterns of goblet and faces. This occurs when we two elements establish a certain relationship in which they keep their mutual attraction and repulsion in sort of instable balance.

In his work on utility of emptiness, Marchsteiner calls this phenomenon positive-negative experience. This positive-negative phenomenon found in Escher's *Mosaic II* inspired by the ceramic mosaics of *La Alhambra* in Granada, involves a balanced distribution of both background and figure. Viewers see either black or white figures, depending upon the point in the drawing upon which their gazes rest (Marchsteiner, 2008, p.16).

These notions of figure or trajectory and ground or landmark are explained in cognitive linguistic as fundamental in apprehension of surrounding. Figure needs ground to be anchored in its specific categorical position. There is an interesting correlation found between person's figure-ground understanding and his or her upbringing place. Some studies discovered that the shape of place we grown up on has an influence the way we cognize the world and its composing elements of object-place. As Subirá infers, people with different upbringing place tend to conceptualise the same spatial entities distinctively. While people who are brought up in mountains would say that 'lake is on the mountain', people from flat context would rather use 'lake is in the mountain'. In the similar way in which we are born into a language, we are born into a specific landscape which influences the way we conceptualise surrounding.

"Subirá (2006) demonstrates that different geographic regions for upbringing can have a significant impact on spatial conception. Consider a picture in Figure 3, where there is a lake situated around a mountain top. His research reveals that those who are brought up in a mountain region consider a range of surrounding large hills (as in Highland of Scotland) as simply hills, but those who are raised in a flat region tend to see the same landscape as high mountains" (Toyota et al., 2012, p.4).

**To summarize,** UrbArch Emptiness has twofold importance in generating built environment. On one side it plays the role of the background, the stage in which the objecthood of other elements or business of various usages might occur. On the other,

its intensity generates its own figurative force and pull out its objecthood giving it quality of the comprehensive piece of environment. This ontological duplicity is one of the research's central subjects thus UrbArch Emptiness of Lisbon Riverside is approached twofold – as an **object** and as a **field** overlapped with background.



Figure 4 M.C. Escher, Mosaic II, [Online] Available from: <http://loganwarberg.blogspot.pt/>, [Accessed 14th February 2013]

## **Fullness of emptiness - Radiance of Objects and Density of Emptiness**

According to Pierre von Meiss, the space around objects turns not to be simply empty or devoid. A free-standing object, be it a sculpture or a building defines a more or less precise field of Radiance around them. In the discussion of the spatiality of objects, Meiss uses the analogy of radiance which depends on the nature and size of the object on one hand, and of the context on the other. Entering into this field of influence of an object is the beginning of its spatial experience (Meiss, 1990).

As Meiss argues, it is not easy to give a precise definition of Radiance of a monument, a building or an object-façade. One method which the architects sometimes use is to 'suggest the extent' of this Radiance by attributing it a concrete form and limits, designing the paving, walls and balustrades that mark the limits of the territory controlled by the object. The mere existence of such an artificial limits decided by the architects reinforces the power of the composition by depicting the invisible shield of object's Radiance (Meiss, 1990).

We agree that there is a certain strength or Radiance of objects which make them more or less imposing towards their surroundings, but we would add that Emptiness around objects might intensify or restrain that strength. The change in Radiance of Jerónimos Monastery is a great example of this phenomenon. While in the XVIII century, the Monastery had its belonging Emptiness which allowed it to radiate significantly into surroundings, the latter interventions shrank this space limiting its extension area of Radiance. What used to be an imposing occupant of waste landscape and wide riverside got constrained into an urban neighbourhood which limited its strength and partially turned its Radiance down.

In a different direction from the Radiance of objects, the UrbArch Emptiness is claimed to possess a certain quality of Density addressed by Rudolf Arnheim's (1977). In his theory architectural spaces are conceptualised as Fields of Forces which interact with

the subject on different levels of gradation, from their most visible expression to their subtlest and most “invisible” condition. This interstitial space between the buildings turns out not to look simply empty - it is infused by gradients. The distance between buildings influences the degree of their mutual relation or independence establishing a particular ration of remoteness and connectedness which affects the architectural complex as a whole. He explains that spaces are created through relationships between objects which persist in perceptual experience, even though the man in the street may not spontaneously acknowledge them.

**To summarize**, both of these concepts, Meiss’ Radiance and Arnheim’s Density of Emptiness claim that field in-between object is pervaded by influence of surrounding object thus not empty at all. This fact, is one of the research’s main presupposes on which the methodological approach on importance of built limits in definition of Emptiness and a possibility of solidification of UrbArch Emptiness is nested.

## Articulation and Tempo of Emptiness

*“The Perception of emptiness can find its analogy with music where, at any moment of time during which no music resonates, it can be said to be empty. Perceptually, however, the character of such intervals varies greatly. A run of pizzicato notes hangs together like a string of pearls because the small pauses between the tones are entirely absorbed by the continuing sequence. Longer pauses are perceived as silences, but nevertheless also as integral parts of the music. These time intervals may be entirely devoid of sound, but they are not empty. They are provided by tension” (Arnheim, 1977).*

In architecture, the Emptiness in alternation with the Matter of full physical limits shapes the space. Emptiness is to space what pause is to music and to matter what pause is to sound. The full-empty alternation produces phenomenological compositions which differ in various environments creating their uniqueness.

*“Architecture and music are arts generating environments in which emptiness, pause and rhythm define the ability of being respectively inhabited and listen to” (Pinto, 2010, p.49).*

There are places, which by their small scale and consecutive full-empty alternation in urban structure, resample *staccato* articulation in classic music where succession of short notes is clearly separated by pauses between them. There are other environments whose continuous articulation of built structure makes *legato* play of the city which is characterized by continuous and smooth passage from one to the another note eventually resting in the longer pause. These ways of playing the music could be transported to the manners of producing and experiencing the urban-architectural space.

Moreover, the music parts are further joint into musical composition similarly to urban and architectural experiential episodes which compose the spatial notions as whole.





*Legato Articulation*



*Staccato Articulation*

*John Cage's Articulation*

Apart from the Articulation between full and empty there is a quality of Tempo which, as another notion common to music and urban-architectural practices, can give us an insight into common properties of the Pause and Emptiness. The Tempo is a speed or pace of music piece which is to say how fast or slow the piece is. In this analogy there is an interesting similarity between city and music found in usage of term *andante*. The *Andante tempo* literally means 'at the walking pace' which establishes an anthropomorphic measure to the notion of sound. It is a sound whose tempo is on a human scale, on the scale of his gesture, his heart rate. The *Andante Tempo* varies from 76–108 bpm which corresponds to the normal human heart rate. Moreover, moving towards slower tempo scale, we find notions such as *Largo* and *Larghissimo* which introduce spatial concepts of broader space into musical interpretation. Once again, the music-space analogy is re-established as such.



*Presto Rhythm*

*Andante Tempo*



*Largo Tempo*

*Larghissimo Tempo*

The American composer John Cage uses the pauses in the extreme strategy pushing his composition of unfilled elements towards the extreme by turning intervals between sounds continuous thus the most important and the only composing element. Cage's 4'33" is a composition of pauses rather than of sounds, which amplifies and awakens our hearing sense of ambient around us. Unlike music, which is transferable when recorded, 4'33" is grounded on the specificities of place and atmosphere of the performance in a way that no two performances can be the same as a result.

In John Cage's works, sound and even noise can also be considered music: "There is always something to see, something to hear. In fact, try as we may to make a silence, we cannot" (Cage 1961, p.7). Fascinated by sounds that are happening in the surrounding, Cage is writing music as a silence, the same way it already has happen in architecture and sculpture, claims Cage (Cage 1961, p.7). Listening to the complete Emptiness in urban-architectural Space, we are listening to John Cage's Music of Pause.

**To summarize**, different urban tissues got different articulation between full and empty parts thus different rhythms and tempos. There are cities more similar to *legato* articulation and others that are clearly *staccato* ones. Regarding time as incorporated in spatial experiences there are different tempos, such as *andante* and *largo*. These notions are in more details approached in the section on diversity of UrbArch Emptiness.



*Figure 11* Stoa in Athen, by Jamie Brown, available from <http://www.lightphonics.co.uk/Blog/Rhythm> accessed at 18.12.2016

## Space-Limit

In his Space-Limit theoretical model, Cruz Pinto (2010) explains the passage from architectural and urban limits, towards deeper levels of reality apprehension. He depicts the process of reception of architectural piece as multileveled process which starts with apprehension of limits leading to other realms of architectural and urban forms – from limits' Appearance, to Emergency, Latency and finally Idea.

In his analogy Pinto draws parallel between this architecture-based categories and human body. Appearance corresponds to the qualities of skin and superficial aspects of body – what 'seems to be', the reality of superficialities. Going deeper, one gets into another realm of architectural and urban production and reception – the level of Emergence, which corresponds to the external form, derived from transformations. In a project, this level is revealed through the expression of drawing and in the work through materials and the actual construction. In an analogy between the categories related to architecture and the human body, Emergence is seen to be the bone structure which gives support to the Appearance.

Going deeper, we get to the Latency which as a latent metaphysical essence (ontological field) corresponds to being – an interior, invisible, symbolized aspect, a spiritual dimension, a pre-formative idea, a hidden structure. In analogy between the categories related to architecture and the human body Latency represents the whole of genetic matrices at the origin of the physiological system. And finally, there is the Emptiness as a central element which participates in all the production activities, as a bare appearance, emerging from space itself, noetic space, a hermeneutic breach of access to the latency dimension.

The circle of architectural production-reception process starts by Emptiness and ends in it, passing through different levels of reality apprehension. In this way the production-reception circle is closed and idealised-materialised spaces are blended together. This

is depicted in Pinto's conceptual painting showing the production-reception process. At the level of reception, direction of categories goes from outside towards inside, from the Appearance, throughout Emergency to Latency, aiming towards central Emptiness (Appearance>Emergency>Latency>Idea in Figure 12). In the architectural reception, visibility and tangibility, starting from cognition to evaluation and interpretation, are experienced in depth beyond gestalt and the visibility and tangibility of the present latent forces, deepening the sense of empty spaces in the different hermeneutic cleft, down to the Emptiness of meaning of nothingness and the opening to nothingness. "In this return to nothingness through interpretation the original emptiness of creation is reached, where production and reception cycle is completed" (Pinto, 2010, p.59)

It the process of production, the passage throughout the levels of reality has a reverse direction. It starts in endless inspirational abundance of nothingness and Emptiness coming to the emergence throughout Latency and Emergency reaching the Appearance and completing the total production-reception interpretational and phenomenological circle.

To summarize, in his Space-Limit conceptual model, Jorge Pinto establishes Emptiness as the central but also the surrounding element. Emptiness is present within and around but also beyond other categories and as such reappears through each and one of them as their structural component. From formal and physical Emptiness which appears in its plainness simplicity, throughout noetic Emptiness which contains invisible forces of symbolism, geometrism, inner and hidden structures, towards Supreme Emptiness of zero and infinity, indeterminacy, liberty of ego (Pinto, 2010).

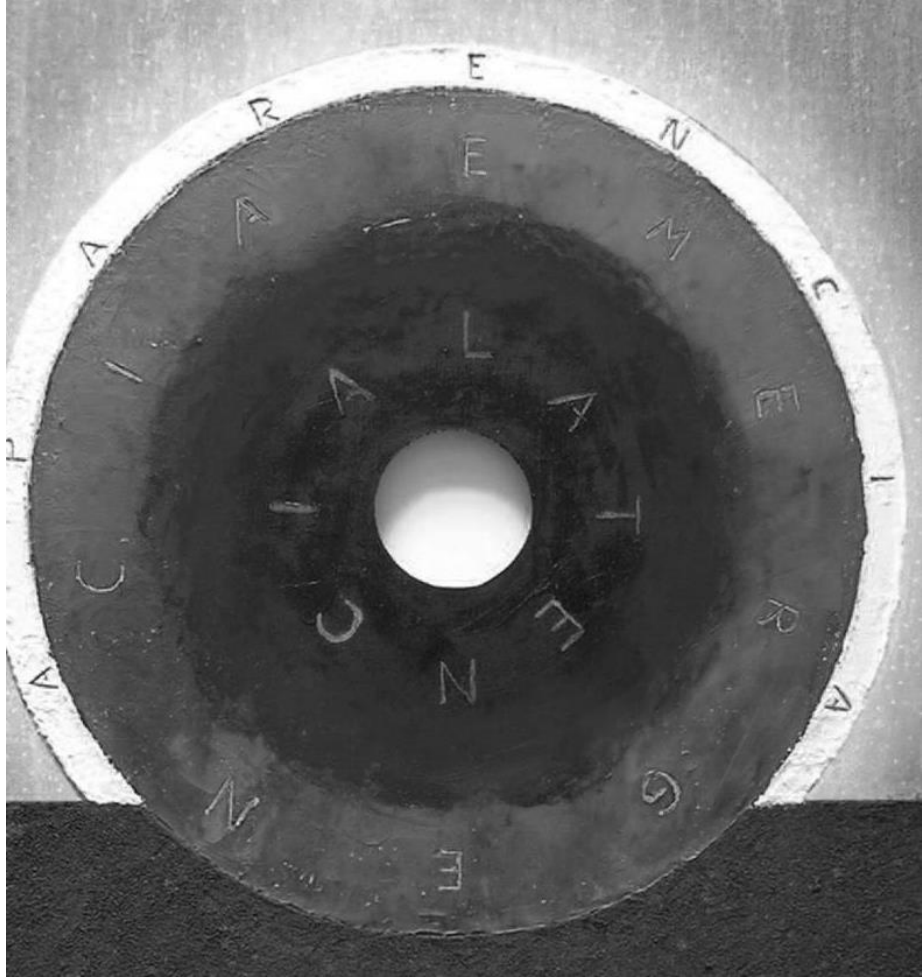


Figure 12 Space-Limit, pintura, Jorge Cruz Pinto

## Latency and Potentials of Emptiness

*“As a productive element, emptiness constitutes the imaginary breach generating repository of the new creation” (Pinto, 2010).*

The potential of Emptiness is triggered by its endless possibility to turn into whatever – to inspire and tangle imagination without limiting or orienting its interpretation. This imaginary breach that Emptiness opens turns it into a potent and latent UrbArch generator.

From Emptiness' capacity to evoke everything, emerges its potential to trigger endless world of possibilities giving it potential to become all. Here it is important to highlight a difference between notions of possibility and potential as we use them. In our terminology, potential is more probable to occur because it incorporates cultural permission or allowance for it to occur. Differently, term possible is a wider because it accounts not only for things that are likely to occur but also that are conceivable as somehow reachable, even though not actually executable (see difference between Aristotelian and Stoic 'possible' in section 2.0).

**To summarize**, once it not being completely determined, Emptiness opens possibilities for interpretation and potentials for usages. It provides a vast background for imagination. By having no boundaries, it inspires search of unsearchable permitting questioning of our own limitations – when there is no phenomenon to be explored, mind turns backwards tending to explore itself. Emptiness as conceptual voiding or object of observation provides no points for awareness to land on bringing the attention of our mind back to ourselves. Looking into Emptiness makes us looking back into ourselves and its potentials are reflections of our noetic and creative capacities.

## 2.2. Emptiness and Built Context

Within urban-architectural contexts, there is **not complete** absence of form. The **empty always coexists with built** as its formal and functional counterpart that contributes in the wholeness of our **built environment**. Each Open Public Space is a part of a specific **built environment** which is, as Specific space, a specific framework for observation of reality. As such, Open Public Spaces account for **natural context** and **human** interaction towards it. Within a built environment, Emptiness as a structural element of Open Public Spaces is together with built part an artefact of human-nature interaction that reflects specificities of localisation and social practises there established.

To better understand UrbArch Emptiness in relationship with its surrounding context we addressed three notions: 1) **Built Environment** which is a wider specific space or broader framework of observation, 2) **Open Public Space** which makes part of built environment and it is the more precise observational framework of research, 3) **Place-Landscape-Space triad** which makes link between Open Public Space and its broader Built Environment.

Based on this, in the chapter after the following, we made a contextual approximation and addressed UrbArch Emptiness within a particular context of Open Public Spaces' that are situated in the central zone of Lisbon Riverside.



## **Built Environment between Natural and Manufactured Setting**

**Built environment**, as we use it, is a broad notion which includes all kinds of realised human actions made to allow appropriation, inhabiting and usage of Natural Environment. Every Built Environment is a specific interplay between natural context and the way human interacts with, in which urban settlements are defined and places are created. Actions that are in core of Built Environment are urban and architectural which, together with other constructed and intangible cultural, political and social layers, create our living surrounding.

Through a gradual intervening over environment, diverse human settlements such as cities, towns, burgs, metropoles, megalopolis, megacities, etc., are being inscribed. Man conquers nature by invading it. He denaturalises territories by striating and occupying it. Urban settlements are thus expressions of cultural practices which materialise technological achievements and social needs through manufactured and manmade affects. Cities are technological expression of a Zeitgeist that formalises necessary conditions for inhabitation. Since they are built through cultivation of Natural Environment, they are placed between **complete nature**, which cannot any longer be found in our surroundings, and its conceptual opposition - a **totally manufactured setting**.

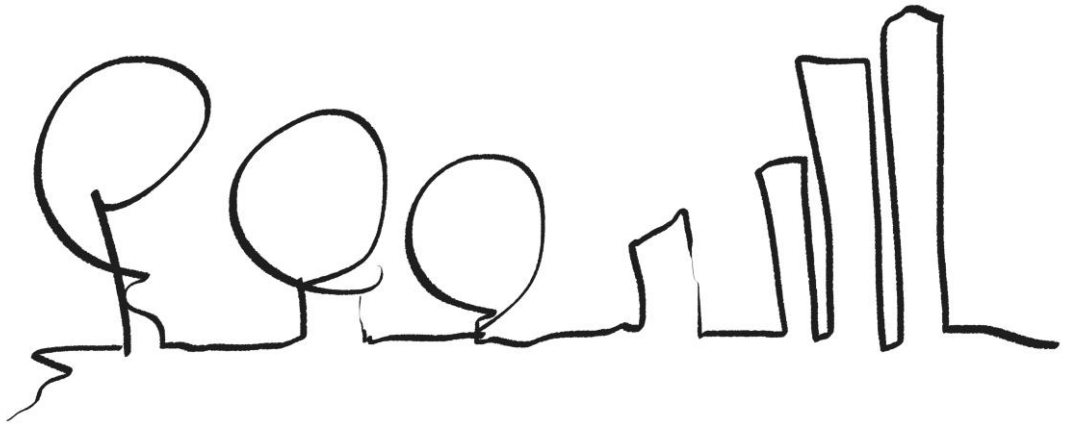
What gradually distinguishes these two extremes - **natural and manmade settlements** – is the quantity and quality of its built elements but also the quantity and **quality of its emptiness**.

Within a Built Environment there are not any complete manmade or natural settlements - built and unbuilt coexists in various proportions. However, there are places which, by preserving or over-exploring Emptiness, tend to be more similar to one of those

extremes. By excessive constructing practise, settlements can become dense and overdone artefacts which neglect human-nature relationships thus disable any possibility for in-nature inhabiting. Such an example is Kowloon Walled City in Hong Kong which inhabited 33,000 residents within its 2.6 hectares which gives 12,692 persons per hectare. When compared with other high density cities, such as Mumbai (253 people per hectare) or Istanbul's most dense neighbourhood Gungoren with 773 people per hectare, the extremity of this case can be grasped.

Differently, there are others urban-architectural settlements which are moderated and by obeying to the nature are closer to it. The Suan Mokkh temple, designated by Utaiwatananont and Aruni 'Architecture of emptiness', is such an example because it possesses only essential and inevitable structures and buildings - anything unnecessary is omitted. As for the rest, the natural elements are used as a building materials and structuring elements – earth as floor, trees as walls, sky as roofs.

In urban and architectural practices the tension between natural and manmade is present on various levels. Through his idea that "the house is a machine for living in", (Le Corbusier, 1986) brings a technological efficiency, purposefulness and accuracy into the discussion on architecture and urbanism. He sees complete usefulness of technology and praises its hegemony: "Machines will lead to a new order both of work and of leisure" (idem, p.101). Moreover, his conception of technology makes a loop back to the nature. He believes that "the creations of mechanical technique are organisms tending to a pure functioning, and obey the same evolutionary laws as those objects in nature which excite our admiration" (ibid, p.103).



*Figure 13 Built environment between natural and manufactured settings, author's drawing*



Through his work, Corbusier's understanding of nature-manmade mutual necessity and inseparability appears in rather manifold ways. In his early phase, especially in his house projects he claimed that houses should be machines in a way that they are logic realisations of their problems' statements. Nevertheless, his urban responses show sensibility either generally towards nature (his pilotis concept) or particularly towards places (morphological adaptability such as one in the Plan Obus – Algiers from 1932).

Another example of the exploration of nature-manmade closeness is visible in Cretto sculpture made by Alberto Burri in 1981 in Italian city of Gibellina (Figure 14). This large sculpture covers the Gibellina's ruins from a big earthquake which in 1968 destroyed 12 Italian cities. Cretto was designed to cover the urban tissue of streets and ruined buildings preserving them from further decomposition. Though the massive concrete structure, Burri actually recuperated the form of natural landscape, marked transience of human artefact and left sigh of lost victims.

Similar nature-manmade proximity and nature-manmade-nature loop is addressed in the works of Anselm Kieferlt, a German painter and sculptor (Figure 15). He uses industrial, rough and dirty materials, such as lead, oil, chalk, pigment, in a way that their natural properties are recovered. By bringing attention to the matter rather than to the image representation he accentuates materials' composition and decomposition thus recalls matter origination and disintegration pointing out its natural origin (see *The Secret Life of Plants* from 2002).



**Figure 14** Grande Cretto, Alberto Burri, Gibellina, 1989  
<http://goodmorningsunday.tumblr.com/post/54787087920/grande-cretto-alberto-burri-gibellina-1989> accessed 18.6.2015.

**To summarize**, Built Environment is a complex human-nature interplay in which Open Public Spaces are structured and UrbArch Emptiness is moulded. Built Environment embodies men-nature relationship, through practices such as urban, architectural, social, artistic, etc. This manmade-nature dyad reveals the opposition and tension between mechanized and Natural Environment but also manifests their proximity which is addressed in various urban, architectural and visual-art approaches. Within the manmade-nature gradation, what distinguishes the manmade from the natural extreme is the quality of built elements but also quality of its Emptiness. In a natural setting which contains no built structure, UrbArch Emptiness can be seen as complete. When structured, natural settings are being built and their Emptiness filled up. This means that when brought to the extreme, Emptiness in a built environment converges towards the Natural Environment.



**Figure 15** Anselm Kiefer, *Buch (The Secret Life of Plants)*, 2002, Mixed media on lead, Page Dimensions: 77 x 57 x 1",  
Diameter of open book: 113".  
[http://artsearch.nga.gov.au/Detail-LRG.cfm?IMG=127617\\_e&IRN=127617&vID=6](http://artsearch.nga.gov.au/Detail-LRG.cfm?IMG=127617_e&IRN=127617&vID=6), accessed 18.5.2015.



## **Built environment and Breathing emptiness**

Inspired by Taoists' Emptiness, we might interpret cities' growing and diminishing process as part of constant interplay of full-empty inseparability and permanent "breathing" process through which our Built Environments are being constructed. Constitution of Built Environment starts with choice of natural place which is unoccupied thus open for new usages and urban-architectural forms. Through interaction, appropriation and usage, a **Natural Environment** is turned into Built Environment and its Emptiness is gradually filled up by artefacts of human practises. In short, Emptiness and Fullness structure a Built Environment over canvas of natural context (Figure 13).

In the filling process of strengthening of manmade urban structure, there are places which are left natural and in urban ecology addressed as wild urban spaces (Baines, 1986). Baines sees these spaces as key for wildlife, city resilience and biodiversity because they provide ideal home for wild plants and animals. Railway sidings, canal-side bramble banks, river corridors are some of examples of wild spaces within urban landscapes which Baines claims to be important in continuity of natural habitat for plant and animal diversity. These, together with an extensive legacy of urban industrial wasteland and built natural spaces, such as parks and sweeps of grassland, are all together important for intricate mosaic of different habitants of urban ecosystems (Baines, 2012).

In the interview given to Wild City Mapping organisation, multidisciplinary artists Dominique Ferraton and Maia lotzova raised their concern about importance of wildness in urban life and its preservation (Ferraton and lotzova, 2015). Wildness have a value due to special conditions they provide but also due to memory they hold on what urban space was before it got constructed. Moreover, they are undetermined, open and free, leaving space for creativity to occur. Differently from constructed natural

spaces with cut grass, these permit observation of ecosystem in its originality and self-organising spontaneity, claims Ferraton<sup>21</sup>.

When we pass from the increasing part of city growing curve to the decreasing one, we witness phenomenon of overall shrinkage of manmade environment through obsolescence of industrial land, railway abandonment, economic fallacies and social misappropriation. Here, the relation between natural and manmade structure differs significantly. The natural places are slowly being reborn through spontaneous and uncontrolled colonization of unoccupied soil which show response of ecosystem to specific urbanized landscape. In natural history and urban ecology, these places are also termed **wildscapes** representing “complexes of spontaneous 'ruderal' (hardy or weedy pioneer) vegetation that colonize disturbed urban sites. Wildscapes as the living landscape's response to environmental conditions common in cities” (Gobster 2011).

In the process of urban growth, besides wild remaining pieces of urban landscape, we find constructed natural places or as Baines (2012) called them ‘manicured’ and ‘official green space network’ which even though less mechanized than closed facilities can be conceptualised as built passages towards them. These make part of growing and determination process of urban landscape and offer more controlled appropriation of urban landscape.

If we observe **full-empty cycles** of growing and shrinking processes of built environment we can understand them as important in places’ aging and significance. There are places that acquire their complete fullness much faster than others, and

---

<sup>21</sup> “...people really value the fact that these spaces don't have pre-determined uses – which leaves a lot of openness and freedom for creativity. I've been reading a lot about the importance of wilderness in our lives – there's a difference between a lawn with cut grass and a place where you can see an ecosystem – how this environment is building itself, and how the elements within are self-organizing spontaneously.”

those whose process of filling is slow and last several centuries. Moreover, there are places which are being emptied and built several times thus overpassed several life cycles, and those that are still at their first round. The passages from **Natural Environment** towards **built places** are parts of urban development process and growth. These, together with inverse processes of urban shrinkage, actions of renaturing and spontaneous rebirth of nature are what we can call a complete process of **Built Environment life cycle**.

In the breathing process of 'nature-to manmade built environment', Open Public Spaces are constantly being structured and defined. From uncultivated permeable land to densely built spaces, the process of city growing is reflected in diminishing of natural surfaces and their replacement with built elements. The link between uncultivated nature and built structure is reflected in etymology of term 'rossio' which is used for specific Open Public Spaces in Portuguese urbanism and as stated by Ricard (1954) widely known due to the famous Lisbon's square Rossio<sup>22</sup>.

---

<sup>22</sup> Some sources indicate origin of rossio (in Dicionário da Língua Portuguesa com Acordo Ortográfico [em linha]. Porto: Porto Editora, 2003-2016. [consult. 2016-02-19 09:05:45]. Disponível na Internet: <http://www.infopedia.pt/dicionarios/lingua-portuguesa/rossio>) in Latin residuu meaning remaining and nowadays signifying: 1.public square, 2.spacious yard, 3.ground brought to fruition, erstwhile, in common, by the inhabitants of a village. Richard claims that its meaning has rarely been questioned – often hiding the meaning and concealing the origin and the exact role of these places in Portuguese cities and towns. Lisbon's Rossio as it is known today, has changed completely its character and function becoming almost the opposite of what it used to mean (Ricard, 1954, pp.133,134). Richard suggests that rossio may have twofold origin. One possibility is derived from Latin terms rissio, resio, resio (or resium, recium in latin) that were used in parallel with rossio to be substituted by it later on. These terms are originating from Latin resīduu – vacant, that should be used with a degree of uncertainty especially because it is an adjective word. Second possibility he sees in a word roça that means cleared and cultivated land. These two significances may seem to be contradictions but Ricard claims that this seemingly contradiction is perhaps not as strong as one might think a priori - between the wasteland and cultivated land there is an intermediate stage, that of uncultivated land which is freed from its natural vegetation.

**To summarize**, the process of **Built Environment life cycle** can be traced through comprehension of its built-unbuilt dynamics - from a completely empty and undefined Natural Environment towards a fully defined and built places. In that sense, on the beginning of a life cycle of built environment, UrbArch Emptiness coincides with Natural Environment. Natural Environment is an empty, vague, undefined and unstructured. Further, as natural environment is being built; UrbArch Emptiness is being defined and diminished. Natural Environment is gradually turning into built one, reaching its climax. Further, as life cycle of built environment is heading towards its decreasing side because of a functional, economic or natural change, UrbArch Emptiness is being reintroduced through emptiness of usage, values which further lead towards collapse of form. Together with the cycle of Built Environment, the phase of UrbArch Emptiness is also completed.

## UrbArch emptiness and nature-city process

Unlike Vitruvius categories of *firmitas*, *utilitas*, *venustas*, which are permanent requirements in urban and architectural disciplines, importance of surroundings has been varying. After the World Wars and failure of rationality, the primacy of industry and technology weakened. A deeper relationship with environment emerged with phenomenological approaches as contra-balance for accelerated technological development of humanity and its nuclear scientific production when the problem of the impact of humankind on environment was posted.

Through accounts such as Heidegger's 'dwelling-being' (Heidegger, 1971a), the inseparability between environment and human was reaffirmed. Attempting to resituate the question of being within the concept of dwelling, he questioned the modern separation between place and being (Heidegger, 1971b)<sup>23</sup>. It is in the relationship with environment that he finds the essence of existence, and it is exactly through 'dwelling' that he considers being possible.

This essentialist return towards soil and nature is something that has not been a constant priority in urban and architectural practices. It arrives rather as a counterbalancing force that tries to bring certain equilibrium into the excess of progressivist standpoints. As highlighted by Frampton, the movement of Critical Regionalism appeared as an equilibration to International style and a resistance to place-detached architectural and urban productions (Frampton, 1993, p.26).

---

<sup>23</sup> "What, then, does Bauen, building, mean?... Bauen originally means to dwell. Where the word bauen still speaks in its original sense it also says how far the nature of dwelling reaches. That is, bauen, buan, bhu, beo are our word bin in the versions: ich bin, I am, du bist, you are, the imperative form bis, be. What then does ich bin mean? The old word bauen, to which the bin belongs, answers: ich bin, du bist mean: I dwell, you dwell. The way in which you are and I am, the manner in which we humans are on the earth, is Buan, dwelling." (Heidegger, 1971, pp.144-145)

The **untouched natural** and **fully manufactured** environments are seen as conceptual and complementary oppositions which structure built environment, either urban or rural. Built Environment is thus positioned in between nature and manmade settings as gradual transition from one to the other. What distinguishes these two extremes is the quality and quantity of embodied actions but also of UrbArch Emptiness like that moulded.

Theoretically, the completed **manufactured setting** would be **an extreme case** of Built Environment with no Emptiness left. A good representation of Built Environment which is, on the abstract nature-to-manmade scale, closer to a mechanist extreme is Chu Enoki's RPM-1200 city made out of highly polished metallic pieces (Figure 16). By occupation through actual action, a Natural Environment becomes built and starts losing its empty part. When Emptiness of Built Environment is diminished, dense structures are getting conceptually remote from their complement – the Natural Environment. By adding built elements, environment is getting further from nature and closer to a mechanized structure. In this dynamic process, preservation of unbuilt part can be deemed important because Emptiness permits Earth and Nature to emerge within the Built Structure thus by losing its unbuilt part our surrounding is loosening its relation with the Nature.

This **nature-to-manmade** process which is followed by disappearing of unfilled voids and by thickening of built parts, is visible in growing processes of cities. The opposite process, **manmade-to-nature** one, is found when population starts to shrink or leave, occupation diminishes or disappears thus city is abandoned or dead. Through process of turning into ruins, built structure reveals its qualities of temporality, transience and decomposition. It starts unveiling its fragile and natural materiality and allows nature to reclaim the built environment. Through this deconstruction process, a cycle of filling and emptying becomes evident and the 'breathing' circle of built environment is closed.

To summarize, within the city, both **nature-to-manufactured** and **manufactured-to-nature** processes occur permanently on smaller scales, buildings are being demolished and rebuilt, lots are being joined and densified, etc. These processes make part of common city's life thus are difficult to be spotted as rising and descending. One needs to perceive a longer period of place's life to be able to understand if the place is being densified or diluted; if it is being on towards-manmade or towards-nature path. Since city's processes are long and often longer than human's they pass unnoticed. They are nevertheless active, permitting city to renew itself and to last.

Thinking about designing a city is quite different then thinking about an architectural work. Architectural pieces are pearls which can be appreciated separated or as a part of an exciting jewellery in which they gather. When we design and plan an architectural piece it is usually defined to such a limit that it can stay the same for many years. With the urban realm this cannot be the case. A city is a permanent process which started long ago and it is difficult to estimate when or if it is going to be ended. It is a continuous artefact of many generations and many eras. When planning an Open Public Space we are entering into the complex process of city development, common usage, shared places. We step into thread of tradition, frame of context, road of progress, milieu of collective being. In such an engagement within the process of city-making, one cannot ignore what was Before, what is Around, what is To be and for Whom. By making one urban or architectural decision we pull the strings and influence the whole.



**Figure 16** RPM-1200, Chu Enoki, accessed on 23.11.2015 <http://chuenoki.com/works.html>  
[http://artsearch.nga.gov.au/Detail-LRG.cfm?IMG=127617\\_e&IRN=127617&VID=6](http://artsearch.nga.gov.au/Detail-LRG.cfm?IMG=127617_e&IRN=127617&VID=6), accessed 18.5.2015.



## Place – Landscape – Space

To understand **Open Public Spaces** and their unbuilt part one might grasp its environment. In that regard in the previous section, we defined Built Environment as passage from natural towards manufactured setting in which emptiness as part of Open Public Spaces' breathing process is explained. In this one we are aiming at explaining the notions of **Open Public Spaces** which englobe **different conceptualisation of built environments – Place, Landscape and Space** – depending on how proximate the relationship between human agency and its Built Environment is. The place, landscape and space conceptualisations are singled out because they are commonly addressed and especially focused by human geographers (Lukermann, 1961, (Tuan, 1977), 1979).

The notion of **Place** as we use it is based on Aristotelian tradition as something that originates in direct dependence between Body and Space. According to Aristotle, Place, (τόπος) as particular locations of something in space, is a constructing element of Space which is the set of all the Places (Applebaum, 2000, p.943, par.1). The Aristotelian concept of Place is an important reference for the introduction of natural continuity between Body and Space as a precondition for existence:

*“The physicist must have a knowledge of Place (sic), too, as well as of the infinite — namely, whether there is such a thing or not, and the manner of its existence and what it is — both because all suppose that things which exist are somewhere (the non-existent is nowhere — where is the goat-stag or the sphinx?)” (Aristotle, Phys, I, 4, 208a 27-29).*

For Aristotle the Place originates in direct dependence between body and space. According to him, space is an abstraction from the body and do not have its own<sup>24</sup> place is thus understood as a space apprehended through the body.

The connection and the passage between **Space** and **Place** are frequent themes and commonly addressed in geographical studies and employed in urban and architectural works (Lukermann, 1961, Tuan, 1977, 1979). A Place is defined as something that carries 'sense of place' and is 'meaningful location', a 'secure' one. Nonhuman animals are found to have an understanding of place through recognition of its value for satisfaction of biological needs, claims Tuan.

The placement, as addressed by Cresswell (2015) has deep connotation of reason and purposefulness which he illustrates with linguistics examples such as being out-of-place, to put someone in-her-place or one is supposed to-know-his-place. To be placed properly implies to be within the right borders of our corresponding habitat. Place can be delimited by **topographical occurrences**, and/or specific usages over time can generate specific sense of place. Places precede Open Public Spaces, which over time can be changed in nature and size.

The social and cultural practices, which lay behind construction of places, go much further from the formal definition. To come to existence a Place and a Landscape do not need a built form nor to be formally constructed. An act of designation makes them concrete. As Seddon highlights from the work of Paul Carter, during history explorers were sent to locate significant objects such as rivers, mountains, meadows, etc. They

---

<sup>24</sup> "Now if Being and Unity are the same, i.e. a single nature, in the sense that they are associated as principle and cause are..." (Aristotle. Met. 4.1003b, par.2)

had to make the most of what we see and to give names to habitable places, confronting whatever they found with needs and expectation (Seddon, 1998, p.24).

The process of naming is a strong act of appropriation in the sense that it combines the name-givers with what is named, searching for their mutual association and attraction. Who names inscribes his affiliation in what is been named looking at the phenomenon for its essential corresponding quality. The relation of inseparability between a Place, its context and the culture is also addressed by Relph's concept of 'spirit of place'. As he points out, the 'spirit of place' is substantiated in environmental qualities of the place and the culture that inhabits it, in its natural and social specificities which give it a distinctive identity<sup>25</sup>.

His 'spirit of place' corresponds to the idea of community, locality, its significance, name, particular environmental qualities, to its stories, shared memories, to the intensity of meanings that people give to it or derive from it. The interplay between manmade and natural setting is reflected in 'spirit of place':

*"When a settlement is abandoned, as has happened with many Canadian prairie towns, buildings collapse and spirit of place fades. Alternatively, as somewhere is built up and lived in, spirit of place grows" (Relph, 2008).*

'Spirit of place' exists primarily outside us radiating through its innate qualities, while 'sense of place' lies primarily inside us as an individual and inter-subjective attribute, connected to community, personal memory and self. It is a faculty that combines sight, hearing, smell, movement, touch, imagination, purpose, and anticipation (Relph, 2008).

---

<sup>25</sup> "Spirit of place' is a translation of the Latin *genius loci*. The Romans believed in a pantheon of gods, many associated with specific places. Each house, town, grove, and mountain was possessed by its own spirit that gave identity to that place by presence and actions." (Relph, 2008)

The intrinsic relationship between inhabitant and his habitat is also addressed by **cognitive linguistics**, which explains that the upbringing environments influence our use of spatial prepositions, and ways we conceptualise reality. When asked if we should rather say that a lake is 'on' or 'in' a mountain, people brought up in hilly and flat regions have different designations. While those from mountains tend to use 'on' preposition, people brought up in flat areas use 'in' (Toyota et al., 2012). This shows that the relationship between human and his context is reciprocal – while shaping his environment, human is also being shaped.

Next important concept to be mentioned is one of **Landscape**. Landscape usually refers to the shape of material topography as a part of the Earth that can be seen from a Place. "Landscape is an intensely visual idea. In most definitions of landscape the viewer is outside of it" (Cresswell 2015, p.17). Landscape is an out-there world. As Schulz highlights (1979) the structure of a Place is built by the relationship between the Landscape and the urban settlement grown on it, generating what he calls a Place Atmosphere or Character<sup>26</sup>. The same built assembly would gain different Characters when related to diverse Landscapes, he claims. Landscape is more than merely objective physical environment – it is a way of looking at that environment. Its notion in English speaking world is more ambiguous than in Italian or French. While Shultz's idea of 'paesaggio' is something that by definition incorporates the human point of view and his needs, the English landscape is sometimes mistakenly confused with a notion of

---

<sup>26</sup> "La nostra disamina preliminare ci ha portati alla conclusion che la struttura del luogo andrebbe descritta in termini di «paesaggio» e di «insediamento», e analizzata mediante le categorie di «spazio» e di «carattere». Mentre lo spazio indica l'organizzazione tridimensionale degli elementi che compongono il luogo, il «carattere» denota «l'atmosfera» generale, che rappresenta la proprietà più comprensiva di qualsiasi luogo. Invece di distinguere tra spazio e carattere si può naturalmente impiegare un concetto unico omnicomprensivo, come quello dello spazio «vissuto» " (Schulz, 1979, p.11, par.2)

undetermined vast territory still to be appropriated (Seddon, 1998, p.97). The notion of Landscape as we use it is closer to the prior description – it is a Space seen through a filter of human eyes as something potentially purposeful and meaningful in satisfying his survival needs<sup>27</sup>. A Landscape is understood as being between Abstract Space and Concrete Place – it is a cultivated Space on its way to become a Place. Or said differently, it is a Place before we immerse into it.

In the 19th and 20th century, Landscape has become an important field of study developed within movements for nature protection, such as the Lüneburger Heide (Germany), Fontainebleau (France) and the Lake District (United Kingdom). By the mid nineteenth century English landscape movement was the catalyst for the formation of the National Trust in 1895, initially to protect landscapes while making them available to an increasingly urbanized society. In 1992, the World Heritage Convention became the first international legal instrument to recognize and protect Cultural Landscapes taking in consideration the various expressions of the cultural interaction of people with their Natural Environment (“UNESCO World Heritage Centre - Series no.26,” 2012).

Both, Places and Landscapes are outputs of constant social practices. Depending on intensity of the human practice, they can be cultured differently and to different extents. These different gradations are all results of close human-environment relationships and are equally important for cultural self-exploring and comprehension. In 1992, the World Heritage Convention became the international legal instrument for recognition and protection of ‘Cultural Landscapes’ taking into consideration the importance of various expressions of people’s cultural interaction with their Natural Environment. The term ‘Cultural Landscape’ refers to interaction between humankind and the Natural

---

<sup>27</sup> “Even today, then, according to these theories, the best liked landscapes tend to be those which would have helped to satisfy the survival needs of primitive humans due to their special spatial characteristics” (Hunziker et al., 2007, p.49).

Environment reflecting specific techniques of sustainable land-use, considering the characteristics and limits of the Natural Environment they are established in, and a specific spiritual relation to the Nature. In this way, Cultural Landscapes become illustrations of the evolution of human society and settlement over time. They show interconnections between physical constraints, opportunities presented by their Natural Environment and successive social, economic and cultural forces (“UNESCO World Heritage Centre - Series no.26,” 2012, pp.17,18).

In human geography, differently from Place and Landscape, **Space** is seen as something broader, vaguer, more anonymous, less defined and less concrete. In his introduction into theory of place, Cresswell discusses the commonly made distinctions between conceptualisation of Place and Space:

*“(S)pace, (then), has been seen in distinction to place as a realm without meaning – as ‘fact of life’ which, like time, produces the basic coordinates for human life” (Cresswell, 2015, pp.16-17).*

This is merely one point of view, which neglects the importance of the notion of Space in defining and structuring the Place itself. There are others which point to their common nature and conceptual continuity:

*“‘Space’ is more abstract than a ‘place’... The ideas ‘space’ and ‘place’ require each other for definition... From the security and stability of place we are aware of openness, freedom, and threat of space, and vice versa” (Tuan, 1977).*

There is certain indefiniteness and vagueness in conceptualisation of Space which seems to contain quality of indeterminacy and traces of Emptiness as ultimate home of unknown. Translated to our notions, Tuan’s and Cresswell’s Spaces are deemed similar to the Absolute Space as we use it: space is the absolute and permanent background (Cresswell’s idea) that lacks stability and exhibits certain vagueness and openness (Tuan’s idea).

Based on Plato's reference, Space is understood as an absolute and permanent background on which relative and temporary things occur. It is an infinite and immutable container which receives mutability of the sensitive world. With Copernicus' discoveries, the notions of infinite, endless and limitless started being introduced in theoretical and practical discourses as continuations of Plato's spatial conceptualisation. The Copernican revolution, prompted by the Copernicus work on the replacement of geocentric model by the heliocentric one, inspired a set of debates on the Infinite Universe. In the XVII century, these discoveries introduced the concepts of Limitlessness and Indefiniteness in baroque religious pieces and gardens which started aiming at Spatial Infinity rather than focusing on its containing (Wölfflin, 1964) which opened the conceptual passage from notion of Absolute Space to Absolute Emptiness as we reason them.

**To summarize**, to better understand Open Public Space we previously reflected on **Place, Landscape and Space** conceptualisations. As constructive part of Built Environment, UrbArch Emptiness makes part of these three levels. This relationship is in more detailed addressed in the section 6.1 where it is shown the relationship between place's contextualisation and characterisation and its UrbArch Emptiness as connecting element between Place, Landscape and Space. By reinforcing unbuilt part of our environment, a relationship between Place and its Landscape can be rethought thus a possibly stronger connection to the natural setting might be established. Said differently, by diminishing the manmade part, the Natural Settings can be given predominance over built structures. Through UrbArch Emptiness Place can easier expand into Landscape and further into Space. In such a manner, the urban and architectural practices would, by giving up the imposing control of built structure, receive in return some authenticity of the Nature.

## **Emptiness and Open Public Space**

When a Specific Space, as a particular realm of apprehensible reality, exhibits lack of something, we can talk about Specific or Particular Emptiness – emptiness of built structures, emptiness of social activities, emptiness of historical layering, of behavioural cues etc. Since there are as many spaces as there are ways of observing world, there is at least the same number of corresponding Specific Emptiness.

Within theoretical and practical approaches on Built Environment there are different frameworks of observation – Specific Spaces as we designate them – such as social, ecological, political or usage with their belonging and composing specific emptiness: emptiness of social practice, justice, built structure, natural elements, etc.

The Specific emptiness of urban-architectural spaces, are designated differently due to their different focuses such as: urban void (Trienal de Arquitectura, 2007), terrain vague (Solà-Morales, 2002), open urban space (Francis, 1987, Thompson, 2002), vacant land (Bowman and Pagano, 2004). These varies notions that surround unbuilt part of our environment indicate a wide and multi-perspective interest Emptiness aroused within urban and architectural experts and imply its diverse potentials which are being recognized and argument by various authors.

In contemporary urban-architectural practice, Emptiness, commonly termed Urban Void, is used in numerous ways and given various purposes. In the case of Salto Studio, architectural office from Estonia, the diminishing of architecture led to the augmentation of Open Public Space thus opening of new possibilities for public life. In their urban-architectural solution for Baltic Film and Media School they turned the building into a public spectacle stage which in return started generated new social activities (Figure 17). Salto gave up on some built square feet to create new public space for social gathering whose size cannot be measured in terms of its size nor compared to the lost inside area. The liveliness and a social interaction that it inspires



have a resonance larger than immediate physical context it is inserted in. The augmented importance of public life and strong appropriation of urban environment, leads towards stronger dialogue between architecture and urbanism. Lately, architecture is broadening its field of influence tending to merge with urban practice and address everyday social demands. Buildings are creating public spaces, public spaces are shaping buildings.

A different treatment of the relationship between Emptiness and Open Public Space can be pointed out in the work of SANAA studio. Their 21<sup>st</sup> Century Museum of Contemporary Art Kanazawa examines transparency and opaqueness of building as a strategy of Architecture of Emptiness through the building that is translucent, permeable, open and closed at the same time. Through its minimal visual intrusion, their building enables communication with the environment praising the special atmosphere that emerges out of the interactions between the built object and its physical and social surroundings. Here, the Emptiness of Architecture is a catalyst for social interaction and enhancer of building-surrounding relationship.

In her comment of SANAA's architecture during Pritzker architectural award, historian of architecture and urban form Eve Blau describes its multi-layered transparencies as important in articulation but also revelation of SANAA's artistic and social agenda. Their spaces show the potential to be simultaneously 'open and closed', to be 'connected and separate' from the others, to offer 'solitude and society', 'rest and activity'. Through manifold glass layering they allow for visual overlapping, through the walls which reflect and refract the spaces they enclose, but also visually project them "onto, through, and beyond one another". This creates a double and contradictory spatial logic which combines the minimum distance with the maximum spatial independence (Blau, 2011).

Contradiction between the physical organisation and the visual apprehension opens up a cognitive gap between ways of knowing the architecture; between information and experience, claims Blau (2011).

*“For SANAA, the double spatial logic of independence and interconnection produces what Sejima and Nishizawa call public space. This is a space defined by human activity not by terms or ownership, access, or formal typology. Public space allows one to be alone and in company at the same time. It is a condition predicated on freedom and flexibility of use and it provides its users with both independence and connection” (Blau 2011, p.2)...Referring to this production, Koji Taki has said, “One’s body slips into, without any resistance, the abnormality of contemporary society” (Blau 2011, p.1).*



**Figure 17** Baltic Film and Media School, Salto Architects, available at: <http://www.salto.ee/baltic-film-and-media-school/> accessed on 09.02.2016

Another important usage of Emptiness in urban and architectural discipline is incorporated in work of Solà-Morales (1942-2001). He designated the term 'Terrain Vague' from the French notion that has root in Latin *vacuus*, vacant, vacuum, that in English means empty, unoccupied, but as well free, available, unengaged. His concept of Terrain Vague addresses the Specific emptiness of regular Open Public Space usage. This Emptiness of Usage can be understood as something fertile that transmits sense of liberty – Solà-Morales establishes an interesting relation between absence of activity and the sense of freedom and expectations which are the fundamental potentials that terrain vague has in the perception of nowadays cities (Solà-Morales, 2002, pp.186-187).

Terrain Vagues are residual, external places, disaffected of the activity of the city and outside of the circuits of productive structures. Apparently forgotten, in them memories seem to predominate over the present (Solà-Morales 2002, p.187,par.3). They are also vague or uncertain, imprecise or unbounded, carrying both negative and positive connotations: unused but also free to be occupied and imaginatively reinvented. Places such as brownfield sites, port land fills and hangars, abandoned railways lines and stations, interstitial spaces, disused industrial facilities, make part of vast and rich depository of unproductive areas within the current state of economic restructuring of cities. They carry the same potential as Solà-Morales recognized in terrain vague. In those places, the Emptiness of Activity opens inspirational abyss in which artistic intervention and spontaneous occupations can easily find their social and formal canvases.

Perceived as empty, these situations are often the focus of architecture's and urban design's desire for productivity, control and order. This instrumental view disregards the richness and special atmosphere of the Terrain Vagues as places colonized by nature

and people in a more uncontrolled manner, with the charm of the formless and indeterminate (Kamvasinou, 2006).

The power of the Terrain Vague lies in its freedom and openness in contrast to other public spaces in the city which tend to be heavily monitored and commercialised. It is a space where people can still access a strange slowness away from the hysteric pace of the contemporary city. The terrain vague, is a trademark of our contemporary condition, which in terms of urban politics, includes freedom and critique. To assign to these 'empty' landscapes a 'place' both **territorially** (by acknowledging their indeterminacy and un-formulation as their physical boundary) and **semantically** (by giving a value to unfinished, un-commercial and un-embellished loci) – would open a possibility for an alternative, non-formal and non-building thinking about the city.

**To summarize**, contemporary approaches on Open Public Spaces tend to operate within larger ecological systems in which urbanism and architecture are one of the layers together with social, psychological, natural, cultural realms. These are frameworks of observation that we designated as specific spaces: social space, psychological space, space of nature, cultural space which as such contain their Specific emptiness. To limit our object of observation we are going to look into Open Public Spaces focusing on the Specific emptiness of urban and architectural form (UrbArch emptiness explained in chapter 3).

|               |                                                                                                                                                                                                                       |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sofia Morgado | “Protagonismo de la <b>ausencia</b> ” in balancing contemporary city                                                                                                                                                  |
| João Rodeia   | <b>Urban emptiness</b> is never actually empty – “Urban is always <b>something</b> ”                                                                                                                                  |
| Jose Mateus   | <b>Urban voids</b> as biggest city <b>resources</b> full of memories and collective imaginary                                                                                                                         |
| Pedro Janeiro | <b>Urban voids</b> as breeding spaces that should be thought as a <b>silence in music</b>                                                                                                                             |
| Luis Pedro Sa | Spaces of <b>contemplation</b> of city                                                                                                                                                                                |
| Satlo Studio  | <b>Less</b> architecture, <b>more</b> space for urban life                                                                                                                                                            |
| SANAA         | Examines transparency and opaqueness of emptiness which is translucent, permeable, open and closed at the same time                                                                                                   |
| Solà-Morales  | <b>Terrain vague</b> refers to a place in the city that is empty and unoccupied, vague or uncertain, imprecise or unbounded. It carries both negative and positive connotations: unused but also free to be occupied. |

## **Different types of UrbArch emptiness**

The UrbArch Emptiness diverges from the Absolute one which can possibly be grasped only through intellectual and imaginative abstraction. Rather, UrbArch Emptiness is an **actual and apprehensible part** of the Built Environment accessible through spatial experience and appropriation, which participates in its construction carrying its usage and signification. It involves streets, squares, in-between spaces, and residual spaces, undefined and unconsolidated urban and industrial spaces, urban voids still to be constructed, terrain vague, etc. It encompasses a wide variety of different proportions between filled and unfilled environments, including all the urban and architectural spaces which are not filled up and as such preserve some empty parts. It accounts for an extensive and continuous network of Open Urban and Architectural Spaces that we move through and live in – both formally structured and informally created.

In our study of cases in Lisbon Riverside the first formal type belongs to the central and the western shore where Open Public Spaces such as traditional squares (Terreiro do Paço), Riverside promenades (Ribeira das Naus) and parks (Torre de Belem garden) might be found. When we talk about informally created, nonconsolidated spaces, we focus on port areas that have been gradually obsoleted from port function and recently moved to the public domain (Cais de Santos dock and Poço do Bispo dock).

Our observation of UrbArch Emptiness is thus done through the observational framework of Open Public Space within the context of Lisbon Riverside where UrbArch Emptiness is, as explained in the following chapters, recognized as important on various levels and scales.

### **2.3. Emptiness in Lisbon Riverside**

In the Portuguese urbanism, Emptiness and Voids are deemed important on various levels.

*“In the genesis and definition of Portuguese proto-urban space, significant great open spaces can be found – squares of different size – whose topological nature, expansion and informality is associated to the multi- and meta-functional praise of emptiness prevailing on the architectural image, unlike the geometrical austerity, containment and architectural domination of Spanish and French squares” (Pinto, 2010).*

Spaces which once were tilled plots and urban border line areas, between nature and city, became town centres, as for instance Rossio and the Terreiro do Paço in Lisbon before the 1755 earthquake; the subsequent additions to the city of Evora starting from empty spaces inside and outside the walls, which have conquered the plain (Pinto, 2010).

#### **Terreiro do Paço – The Representative Emptiness**

The Lisbon Riverside has been crucial area in development of the city's urban image, commerce, public and royal life. An installation of the fish market in the Riverside area, during the kingdoms of D.Dinis and D.Afonso III, marks a turning point in the life and growth of the city, hitherto relatively corseted within the limits of Moorish (Martins, 1994).

The first artificial land fills over beaches and river banks started to be made in XIV century establishing the Lisbon Riverside in between Tercenas da Porta da Cruz (now Military Museum) and Largo de Santos, including the front of the estuary of Baixa. Was formed the Terreiro do Paço that was growing as an important commercial, economic and representative city point. For its expansion into Paço Real (a new designation of Terreiro do Paço), promoted by D. Manuel I, and its further construction and

rearrangement, after the earthquake in 1755, were made important land fills during the XV and XVI century (Durão 2012, p.24).

The scope and importance of these changes emphasised the value of Riverside, which kept receiving and transcending specific ideas of spatial organisation demanded by various eras. As Carita explains, an image of city of medieval man was structured as a group of points, spaces that are autonomous and discontinued and whose relations seem to be absent. These points refer to punctual 'loci' lived and experienced by the body (Carita, 1999) as the Riverside itself was at the time.

Pinto discusses that we can find the Emptiness of Terreiro do Paço to convey an idea of Portuguese proto-urban space as a significant great open space whose topological nature, expansion and informality is associated to the multi- and meta-functional praise of Emptiness prevailing on the architectural image. According to him the Terreiro do Paço of pre-Pombalina Lisbon constitutes the paradigm of that marginal tilled territory between the natural and the built, open to the river and which informally accompanies part of its course (Pinto, 2010, pp.56-57).

With the Discoveries, port, commercial and financial activities increased and Lisbon became one of the most important commercial cities of Europe. The knowledge about other European capitals and the wealth that was arriving to the town allowed, during the reign of D. Manuel I, realisation of improvements and structural works in the city and Riverside in a more planned manner. New spaces were created, such as in Cataque-Farás (current location of Cais do Sodré) and Santos, through the land fill over beaches, where were built warehouses for commercial and port activities, as well as sites for goods disembarking from shallow draft boats that made the handling of goods from deep draft boats that were anchored in the River and could not approach the margins (Durão, 2012a).



These spaces of shipbuilding arsenal, provided by several fountains and gates were part of D. Manuel reordering of the Riverside validated by two documents, from August of 1498 and from April 1499. These documents were dealing principally with Lisbon Riverside profoundly influencing architectural and urban character of the structure and the image of the city (Carita, 1999, p.53). D.Manuel, left the Castelo and Limoeiro, ordering Paço da Ribeira to be built assuming the Terreiro do Paço as a new space of royal power. This representative function is going to be an exclusive task of Terreiro de Paço after the earthquake in 1755, pushing the industrial poles of the city to be developed further from this zone in the direction of shipbuilding arsenal of Ribeira das Naus toward west and toward Armazéns da Alfandega and Terreiro do Trigo in the eastern riverfront of Alfama.

Even though, the architecture of Terreiro do Paço (Paço Real) was once again changed during the reign of dynasty Filipina and the square itself was renewed, reorganised and renamed into Praça do Comercio after the earthquake of 1775, its relation to the River remained – it was and it stayed made by the land and the River and clearly composed by interaction of its built and empty part.

*It is like a "hemicycle of most of Greek theatres like Epidaurus, Priene or Syracuse, whose Emptiness represented by the surrounding landscape, the horizon of land and sea, virtually completes the absent half of the complete form of the circle, which missing part has been intentionally left to the invisible attending of the gods" (Pinto, 2010, p.48).*

## **Bélem and multileveled Emptiness**

In the XX century, the important moment of urban renewal of industrial riverside of Lisbon took place in 1938, together with the campaign held by Duarte Pacheco, following the proposals of the *Plano Geral de Urbanização e Expansão de Lisboa* (PGUEL). One of the structuring measures of this important planning document was the assumption that certain parts of the west and central area of the Lisbon Riverside should be seen as noble and transformed into Spaces of Representation by strengthening their physical value and symbolic weight that are linking them to the Portuguese Discoveries - a period of history that the 'politics of the spirit' of the Estado Novo sought to praise (Costa, 2008, p.13).

The reflection of this policy was the gradual release of many industrial occupations that previously took place in the central and western Riverside, as for an example the closure of the Navy Arsenal in 1938, with its relocation in Alfeite, or in 1944, the transfer Factory of Gas from the immediate neighbourhood of the Tower of Belém to Matinha. In this process of renewal of the industrial Riverside, it is important to highlight the essential moment which took place in 1940 with the completion of the *Exposição do Mundo Português* for which was chosen the area of 56 hectares of "admirable scene of Bélem in front of Jerónimos, symbol of imperial space" (Costa, 2008, p.13).

For the *Exposição do Mundo Português* as it was defined by PGUEL which recognised the zone of Bélem as a noble area, was necessary to demolish the urban nucleus that in this zone already existed. The deconstructions followed by displacement of local population occurred in the late '30s especially on the east side of Monastery breaking down the urban structure that was built over centuries. Blocks of building, whole streets, squares, gardens, factories and numerous small shops disappeared with such intensity and consequences that gained the epithet of *Ciclone Centenário* ("Belém -

Torre de Belém,” 2013). Observing the newly created UrbArch Emptiness as a basis for new Open Public Spaces around monastery of Jerónimos, we got to understand that the Emptiness which was released in this area of Lisbon Riverside, holds inside itself a dense and complicated history of numerous centuries and several different circumstances that have formed it. Over time, this place was structured and restructured, generating what we call a Multileveled Emptiness.

The first layer of Emptiness existed in pre-Discoveries time as uncontrolled and natural beach which was re-established during the time of Discoveries. The Monastery of Jerónimos, as a religious building too important to be possibly hidden by any object, had to stay visible especially for those who circulated through the River, which was the main route of the time. In this context, originates a charter of D. John III, 15 December (“A imagem ribeirinha de Lisboa,” 2001), forbidding the building of houses in front of the Monastery till the River.

Another level of Emptiness was actually added to this area through the exhibition in 1940 which was based on the construction of ephemeral architectures, not generating a permanent occupation. This phenomenon had particular expression on architectural level - not so much in the public space - that resulted in overthrow of substantial number of buildings after 1940. What left behind the exhibition in 1940 as a physical patrimony is meagre legacy that can be count on one hand such as Museu de Arte Popular, Padrão dos Descobrimentos, with some pavilions along the waterfront such as Associação Naval and few sculptural remains. In this way was made a return towards indefiniteness and Emptiness that the area already possessed before modern times.

Nowadays, what remained out of this multileveled Emptiness is its immaterial legacy kept through the memory. Formally, it is constrained by newer constructions of Centro Cultural de Belém and Museu Nacional dos Coches which disregard Monastery-River

visual relationship and neglect the Jerónimo's force of radiance by diminishing the necessary space for its irradiation. In this way, the circle of decisions made during Duarte Pacheco term of office, which unintentionally but successfully gave back to the Jerónimo the space that old Portuguese kings five centuries ago devoted to it, was interrupted.

### **Lisbon – A city of the Riverside**

Since the Roman time, the city-river relation was based mostly on the economic reasons – Lisbon always lived from the river which, directly or indirectly, has provided it by work and by goods necessary for its day-to-day life. Due to these benefits, Lisbon was a city closely linked to its riverbank, which is certified through archaeological excavations that date at least since the Roman presence (Martins, 1994).

From its beginning, Lisbon's characteristic positioning turned its Riverside into the most dynamic area of the city. Its direct exposition to the Tagus made it vulnerable toward sieges and attacks postponing its development as a city centre but accelerating its permanent fortification improvement (Carita, 1999, pp.30-31). Linked to the marine and the port commercial activities, the Riverside was an area of vital importance for Lisbon's inhabitants since the Middle Ages. It was providing them by food, work, and trade possibilities and later by colonially gained wealth. Its positive, promising and hopeful connotation made it alluring for strategic and investment decision.

Mostly flooded by the river Tagus, the territory in which Lisbon grew up, was in Ancient times quite different from its present form. The natural changes which occurred through the River's natural silting up together with the construction of the artificial land fills led to a large and significant transformation of the city area. The land fills, as open, plane and empty spaces, constructed outside of the proper urbanised area, were during the history fundamental in the continuous adaptation of the city that has been using its river according to the specific requirements and circumstances from each epoch (Durão,

2012, pp.17-19). The development of the Lisbon was always followed by progressive construction of the Riverside land fills and creation of UrbArch Emptiness whence it is possible to read the needs that city was projecting over time leaving us evidences of its reach identity, symbolic value and history.

### **Metropolis and beginning of Industrial Emptiness**

With kingdom of D.João V the wealth from Brazil started to be exploited permitting a notable urban expansion that allowed for a more intensive expansion of the city which started to be developed along the wider Riverside, from Santa Apolónia until Alcântara, extending to the north until Prazeres, Santa Isabel, Rato, Santa Marta, Campo Santana, Graça e Senhora do Monte (Museu da Cidade Lisboa n.d.). All these expansions made part of D.João V strategy of transforming Lisbon into the “head of the royal patriarchate over the ocean” – a New Rome – trying like this to regain the trust and support from Vatican after the Reinstatement of Independence from Spain (Rossa 2008, p.65).

Transformations of D.João V and his plans for the Lisbon were characterized by three main components: expansion of the city toward west, concentrating of symbols of power on the platform over the River and restructuration of the complete Riverside as its representative face. By purchasing several farms in Belém, outside of the boundary of the city near the sea, which was followed by construction of courtiers houses in area of Junqueira and Pedrouços, King has transformed this property into a "true river front palate" (Rossa, 2001, pp.1336-37). By joining his six farms, D. João V created a set of recreation palatine. This direction of expansion would, in 1733, develop into a land fill linking Lisbon to Belem which did not only allow substitution of the boat traffic by coaches, but also did give to the city a new riverside façade (Rossa, 2008, p.69).

With the industrial revolution that occurred during the XIX century, as Durão discuss it, Lisbon was developing slowly comparing it to London or Paris. The aspirations of the

Lisbon's bourgeoisie followed the European trends wanting to turn Lisbon into an internationally recognizable city able to support future expansions. This led to the holding of general urban plans that integrated the study of major infrastructure such as the roads and railway which were considered critical to fulfil their objectives. It was made the survey by Filipe Folque in 1856-1858 that helped planning a future expansion of the city. The plans from the second half of XIX century were promoting principally a modification of the main road network and construction of a riverside avenue. To realise these important infrastructures were made new land fills over the river that were until that moment the most extensive ones, both in area and depth. It was created Infante D. Henrique Avenue together new docks. On the western side of the Terreiro do Paço were realised several land fills such as Boavista where was initially implemented the street 24 de Julho that margined the river. Over these land fills were created Praça Duque de Terceira next to Cais do Sodré and the rail station linking Lisbon and Cascais. Avenue 24 de Julho became the most important route of the western matrix that got complete new port façade of warehouses and docks. The riverside avenue, storage and piers spaces disconnected the city from its river. Tagus, the main entrance to the city over centuries lost its symbolic importance (Durão, 2012, pp.24-25).

The observed part of the Riverside, located to the west of the Ribeira das Naus and occupied by historic port, developed a perpendicular relationship between port and Riverside allowing it to penetrate into the urban space. That induced a bigger functional contact in between port and this part of the city bringing closer the public and the port spaces. On the other hand, the modern port located to the East of the Ribeira das Naus, developed parallel to the water line causing a disconnection in the urban and functional relationship between city, port and river, making them difficult to be articulated (Sousa and Fernandes, 2012).

Like other major European cities, Lisbon has witnessed a decrease of its port activities in the last decades. This decreasing in harbour industry and commerce contributed to the dereliction of soil and facilities and consequently to the urban and environmental degradation in those spaces. This process raised public pressure to bring back together the city and the river which led *Administração do Porto de Lisboa* (APL) to start a movement towards the reorganisation of the port space. In this way started the identification, characterization and organisation of port areas classifying them into: ones necessary to port activities and the others that could be returned back to the public non-port usages of recreation and leisure like *Docas de Santo Amaro* (Sousa and Fernandes, 2012).

Until the mid-nineteenth century, Lisbon grew in a dynamic relation with the Tagus where most of the people found their sustention, from fishing to shipbuilding activities. Lisbon and its port were growing entwined along the Riverside without physical or visual constraints. The industrial revolution caused the functional and physical separation using Riverside as a dividing wall. The current efforts to overpass the wall, prequalify and reorganise obsolescent port areas need to take into consideration these values knowing that the Industrial Emptiness is actually full of memories of thousands of workers that in this area had made their survival during the XX century.

*This page intentionally left blank*



## 2.4. From theoretical foundations towards research's main concepts

Based on the concepts introduced in this section, we found important to define four notions as they structured and narrowed our research: **absolute emptiness, absolute space, specific space and specific emptiness** (Figure 18).

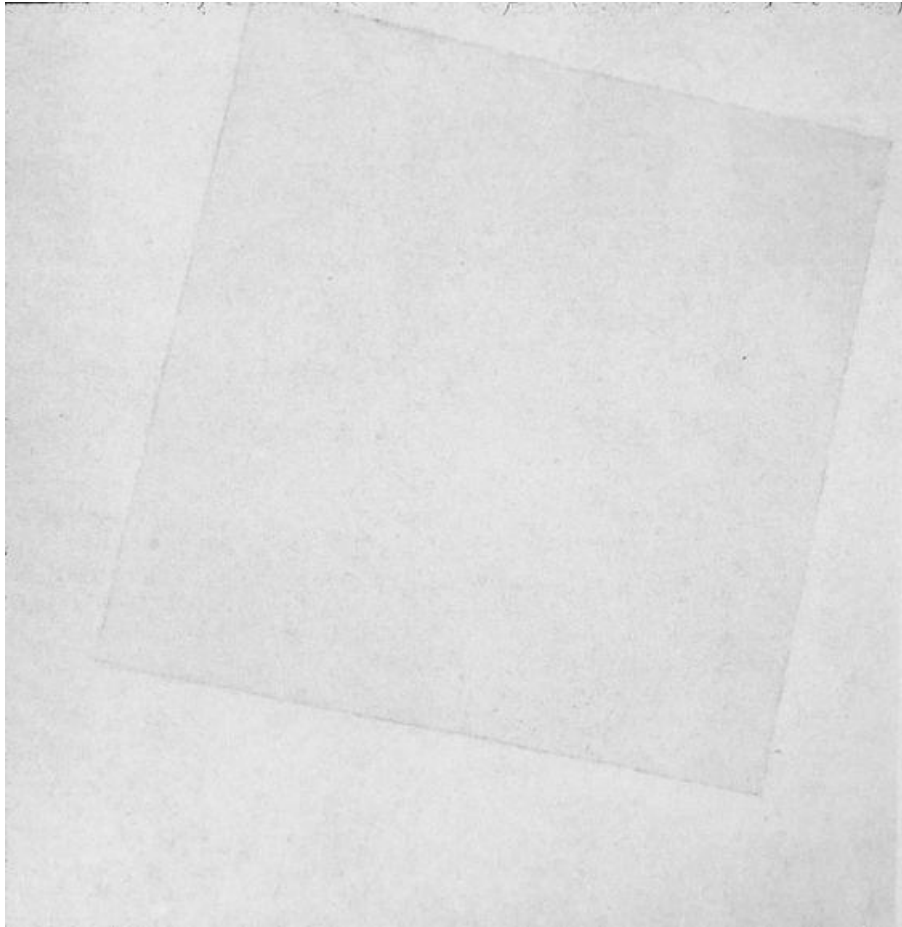


*Figure 18 Process of concretisation - from Absolute Emptiness, through Space towards Specific Emptiness*

In short:

### **Absolute emptiness**

Inspired by eastern notions, the **absolute emptiness** is conceptualised as an unreachable, undefined and fertile notion, which has a capacity to become and receive everything. It is an ultimate source and finishing line of everything that comes into being. When emptied from each and every realms, **space** tends to be undefined leading ultimately towards the **complete emptiness**.



**Figure 19** Kazimir Malevich\_1918\_Suprematist-Composition\_PLZ-161 <http://imgkid.com/white-on-white-malevich.shtml> accessed 5.6.2015.

## Absolute Space

When the **absolute emptiness**, which is understood as emptied from even its conceptual limits, starts being defined, localised, filled or somehow limited, we start talking about **space**: “The form in which space is presumed to exist is the framework of our perception of the world” (Peterson, 1980). In this way, starting from the **absolute emptiness**, such as one found in Buddhist and Taoist teachings, we get to the **absolute space** which accounts for human perspective as a way of observing reality as in Plato’s Space. Seen from the opposite direction, when emptied from each and every realms, the **space** tends to be undefined leading ultimately towards complete **emptiness** (Figure 20).



*Figure 20 Process of concretisation - From Absolute Emptiness to Absolute Space*

As we conceptualise it, the notion of **absolute space** is inspired on Plato’s concept and incorporates all the realms, which is to say **specific spaces**, that human might possibly contemplate and cognize. The **absolute space** is a vessel which involves various realms with their emerging layers such as formal, social, historic, etc., without specifically focusing on any of its composing parts. It includes built and unbuilt, human and nonhuman, spatial and temporal, formal and functional, imaginary and psychological etc. It is a positive receptacle in which things exist or come into existence - imaginary, actually or potentially.

•

As we conceptualised it, the **absolute emptiness** is the source of the nature while **absolute space** is the place where the nature becomes comprehensible to us.

•

**Absolute space** is the home of our consciousness, **absolute emptiness** is home of our home  
(what is beyond its limits).



**Figure 21** *Critical Whiteness*, from <http://www.whiteonwhite.eu/index.php?/project/whiteness/> accessed at 15.12.2016

## Specific space

**Specific space** is seen as a certain observational perspective upon reality which includes specific gaze that allows its apprehension. It is not primarily seen as a vessel for occurrences or entities to emerge, but as observational framework which filters the complexity of specific realm thus this is comprehended as isolable wholeness. Specific space is thus conceptualised as a notion which includes a **specific emptiness** and its **full antipode**— correspondingly a specific emptiness is understood as a belonging and constructive element of a **specific space** (Figure 22).



*Figure 22 Process of concretisation - From Absolute Emptiness to Specific Space*

The reality as continuum, needs particular observational frameworks to be grasped and apprehended. Seen through framework of Specific space, complementary oppositions coexist in inseparable unity. For example, a (Specific) Urban-Architectural Space includes fullness and emptiness, thus while describing it one can talk about Built Space, Unbuilt Space, Open Space, Enclosed Space. These are various composing frameworks which through their layering, overlapping and merging create what we call a Specific Space.

## Specific emptiness

When a Specific Space, as a particular realm of apprehensible reality, exhibits lack of something, we can talk about Specific or Particular Emptiness – Emptiness of built structures, Emptiness of social activities, Emptiness of historical layering, of behavioural cues etc. Since there are as many spaces as there are ways of observing world, there is at least the same number of corresponding Specific Emptiness (**Figure 23**).



*Figure 23 Specific emptiness as a part of Specific space*

The actual or Specific Emptiness is thus not seen as a part of extremely voided reality, but rather corresponding thus defining complement of its full part which in their mutual inseparability construct a Space. In each realm or Space, Full and Empty need each other for their mutual definition and dynamic unfolding. The realm in which our research is situated is Open Public Space and the Emptiness which we are focusing on is the one of urban-architectural form, here termed UrbArch Emptiness.

This notion of UrbArch Specific Emptiness belongs to the built environment but it contains genes of the Absolute Emptiness. By augmenting and deepening, a Specific Emptiness goes towards Absolute one, dissolving into Specific and Absolute Spaces. On this passage, it begins as urban-architectural conformed and structured emptiness, such as those we find in urban squares and streets, which are delimited and almost solidified. It further expands towards extensions of Specific Spaces generating their full-empty completeness.



*Figure 24* L.L. H&J from <http://yana-a-art.tumblr.com/post/105439908867> accessed at 15.12.2016

## **Between Specific and Absolute Emptiness**

There is a substantial difference between a **specific or particular emptiness** within certain spatial realm, such as those mentioned above – emptiness of built structure, emptiness of social activities, behavioural cues – and potentially Absolute one which converges towards eastern notions and Plato's Space and is conceptualised as ultimate vessel beyond or behind everything.

If we make an abstraction exercise and try to augment all the Actual Emptiness until the point where specific Spaces become completely empty of every specific notion, the specificity loses its meaning. When a full complement of Space is absent and its Specific Emptiness augment to the point where their specificity disappear, one might say that Specific Space as observational realm converges towards Absolute Space, which further possibly disperses or dissolves into the Absolute Emptiness. The possible link, which can be made from the Specific to Absolute Emptiness, is one of the research's objects of investigation. This is based on idea that both, specific and absolute emptiness share the same DNA which is reflected in their ontological continuity – by enlarging a Specific Emptiness toward infinity one might be reaching the Absolute one. The association between Specific and Absolute notions of Emptiness emerges also due to dependant origination which is to say, their relation with other system's particles such as: built limits, ground, sky, place structure. The assumption that capturing of ungraspable phenomenon might be done through comprehension of the tangible ones, is in the very foundation of our research.

Imagine that we are looking into a city which is losing its urban architectural built part thus growing its urban architectural Emptiness. There would be a point in this process where urban architectural form would disappear completely, thus structuring link between Emptiness and its built complement would be broken. One could look at the empty city and see not only the emptiness of urban-architectural form but also



emptiness of everything else. One would read specificities of Emptiness depending on the quality of his gaze. As long as one holds the specific observation frame, what he sees is Specific Space and within it specific or particular Emptiness. It is needed a loss of particular gaze thus Absolute Space can be reached. It is necessary that the Absolute Space loses any limits or definition thus it might be inclined to equal Emptiness. At that point one could say that the notion in this manner abstracted, strives towards the intangible Taoists' emptiness which has a potential to become everything, but also towards the Buddhists' one which is everything indeed.

In our theory, there is an 'infinite' distance between the Actual Emptiness and the Absolute one, in the same way there is infinite detachment between understanding process of infiniteness and infinity itself. To perceive the Actual Emptiness one would have to reach its wholeness, through perception of some limits or some otherness, which would simultaneously fulfil the Emptiness. On the other hand, because of the endlessness of the Absolute Emptiness, one cannot deem its limitlessness. The distance between Absolute and Actual Emptiness is conceived possible as a process reachable only in infinity therefore unapproachable in actuality. If we follow the ideas of Aristotle and Kant that the infinity is never actual, because limited body through limited time cannot grasp it, we can claim that the Absolute Emptiness is also unreachable. The Absolute Emptiness is thus merely an idea, the same way infiniteness is.

In our research, we employed the Aristotle's recognition of similarity between Infinity and Emptiness, finding the notion of endlessness as one of their main merging qualities. Both Infiniteness and Emptiness are endless in the way they are being conceptualised and in the ways they are being apprehended. "Endlessness is, after all, a principal component of one's concept of infinity. Other notions associated with infinity are indefinite-ness and inconceivability" (Rucker 1995).

## Between Emptiness and Void

Our research concentrate on generative and fertile qualities of Emptiness thus for a more precise identification of our object of investigation, we use the term Emptiness. Since our overall approach discourages unnecessary excess of urban-architectural production looking at no-building actions as new way of doing architecture and urbanism, the notion of Void is also comprehended as an explanatory one. There is an important difference between these two somewhat overlapped concepts. Although 'Emptiness of' can indicate both: 1) a specific lacking part and 2) wholeness which is being missing a part; 'Void of' indicates merely a part that is lacking. For example, while the 'Emptiness of Space' indicates vacantness, clearness, thus describes the quality of Space as unobstructed thus exposed in its totality (1<sup>st</sup> option); 'Emptiness of Colour' would mean that a certain object is colourless which is to say focus rather on the missing state of an element than on the object from which colour is lacking (2<sup>nd</sup> option). The 2<sup>nd</sup> signification of Emptiness is however not only focused on what is missing but also on overall realm to which the missing part belongs. 'Emptiness of Colour' indicates not only the quality of not having a colour, but through its interpretational resonance opens a gate for entering into colourless world in which other qualities come into first plan.

Void on the other hand, focuses rather on the very quality of lacking, turning it into an object itself. 'Void of' such as 'Void of Goodness', does not describe a being that is open thus can be shaped in various ways but an unattached lack of person's goodness attribute. There is an illustrative example of Void in Žižek's logic of differentially, where he highlights the importance of 'lacking' in creation of identity. Something that is absent, participates by non-existence in creation of the identity of the object from which it is missing and subject who by interpretation brings it into existence. As Žižek playfully explains, a coffee without milk differs significantly from coffee without cream, thus

missing element is an actual generative feature of the coffee. Also, a person who drinks coffee without milk differs from a person drinking coffee without cream. Here, the notion of Void is structured and solidified throughout its quality of inexistence and the recognition of the part in that way created.

In our account, whenever we talk about unbuilt part of built environment as inseparable from the totality of its surrounding realm we use the term Emptiness. Differently when focusing on a specific quality of unbuilt environment which by itself is deemed important and as such should be analysed we use the term Void, such in the Solid Voids method in which the objectivisation and solidification of the unbuilt part of built environment through reflection of its limits is reasoned explanatory and depictive.

## **2.5. Conclusions on Theoretical Foundation of Research**

In short, we systematised two notions of Emptiness: Particular and Absolute ones as inseparable from two notions of Particular and Absolute Space. The absolute notion of Emptiness is deemed as existent in potentiality but not directly apprehensible phenomenon which could be grasped either by mystical experiences, as in oriental culture, or intellectual conceptualisations, as in western thought. It is an undefined and fertile notion, which has a capacity to become and receive everything. It is an ultimate source and finish line of everything that come into being.

When, into comprehension of the Absolute Emptiness, is introduced an observational framework what is approached is not empty any longer. It becomes Space, the

Absolute Space which by mirroring the observer's way of looking into reality incorporates the observer. When observation becomes anyhow particular, we are entering into realm of Specific Space. Entering into Specific Space one realises its full-empty structure based on full-empty inseparability and notions of necessity of oppositions in construction of wholeness. Here, a Specific Emptiness is seen as a part of a Specific Space. The presented research **is inspired** by the enormity of Absolute Emptiness but it focuses on a **specific one – urban-architectural**. It nevertheless addresses the possible link between these two phenomena, established through their ontological continuity and dependence.

To summarize, the specific and the absolute emptiness are conceptualised as substantially different – Absolute is possible, Particular is tangible. The **Absolute Emptiness** is beyond **Absolute Space**, the **Specific** one is within a **Specific space**. Although conceptualised as different, **Absolute and Specific Emptiness** are due to their ontological affinity acknowledged as being of the same nature – the empty palm shares something similar to the empty horizon – a DNA.



*Figure 25* Nicolas Alan Cope photography, available at <http://cargocollective.com/cope1> accessed at 18.12.2016

*This page intentionally left blank*

### 3. Definition of UrbArch Emptiness

The following chapter is the output of **Theoretical Objective 2 TO.2**.

After having introduced the concept of **emptiness in general**, its application **in urban-architectural practise** in particular and its relation towards its **context and Lisbon Riverside**, we more precisely defined the focus of our observation: **Urban-Architectural emptiness of built form - UrbArch Emptiness** and based on it explained methods for Open Public Space representation (next chapter).

The specific emptiness depends on the observational stance one adopts while approaching the reality. Since there are as many spaces as there are ways of observing world, there is at least the same number of corresponding specific emptiness. Since urban-architectural places are multidimensional realms, the UrbArch emptiness is also manifold – we can talk about emptiness of built structures, emptiness of social activities, emptiness of historical layering, of behavioural cues etc. As inseparable part of Open Public Space and built environment and their complexity, UrbArch Emptiness can be observed as a cultural, social, urban but also political and economic artefact, as well as artistic and poetic generator – the one we focused on is the **urban-architectural emptiness of the built form**.

The lack of urban-architectural form does not always coincide with lack of other elements in Open Public Space system. Absence of urban-architectural forms might inspire appearance of uncontrolled and unmonitored usages, growth of artistic reflections, emergence of economic and social incubators.

We explained **process of specification** of absolute emptiness into its specific manifestation – UrbArch emptiness. This is done through the **concretisation of conceptual emptiness** into its **formal and manifested artefact – UrbArch Emptiness** which is 'objectified' and 'solidified' to be further grasped and approached.

### 3.0. UrbArch emptiness as Manifested artefact

UrbArch Emptiness which we are approaching on different scales and levels, manifests its belonging to the wholeness of reality and its dependence on that wholeness. Employing the Buddhists' concept of **dependent origination** we conceptualised UrbArch Emptiness not as something that is endlessly voided but rather full of relationships with other elements. In that regard, we considered a possibility to grasp the phenomenon of UrbArch Emptiness through observation of its full antipode namely: **built limits, topography limits and horizon.**

Gestalt theory adopts a stance that: "Space perception occurs only in the presence of perceivable things" (Arnheim, 1977, p.10, par.2) which therefore can be used for the capturing of the phenomenon of unbuilt part of Open Public Spaces. UrbArch Emptiness can be thus deemed graspable through **comprehension of qualities** of its **built and topographic moulding elements** – while fullness is being built, emptiness is being moulded. To **conceptualise** and **capture** UrbArch emptiness it was needed to reflect a possibility for **manifestation** and **definition of its limits.**

Emptiness is seen as a **consequence of the fullness** and as such reflects the **quality of its form.** If we analyse concepts such as Meiss' **radiance** (1990) we comprehend empty as a dynamic element which **receives influence** from surrounding or belonging objects. It is an extension and the context of architectural piece – its prolongation and its source. Moreover, empty can be seen as an **interspace** that possesses certain **field of forces** which reflects the relation of the surrounding built elements (Arnheim, 1977).

**To summarize,** the assumption that capturing of ungraspable phenomenon might be done through comprehension of the tangible ones, is in the very foundation of our research. Through observation of the relating elements, our **specific emptiness,** termed UrbArch Emptiness is **concretised,** made **tangible and actual.** In this way, the absolute abstract emptiness is turned into graspable one. Our intention is therefore to



observe the manifested emptiness and its dependence with urban-architectural form as **building blocks** of living space that can even prevail over built form.

### 3.1. UrbArch emptiness as reflection of its full antipode

As Meiss argues, architectural space is defined by **relationships between objects or boundaries** which do not themselves have the character of object, but which through definition of limits gain objecthood. UrbArch emptiness, as we deem it, gains objecthood due to either strong interrelation between its limits which generates what Arnheim refers to as **density (1)**, or Fried's experience of **endlessness, objectlessness (2)** whose experience is similar to experience of an object of art. In that sense, UrbArch Emptiness is further approached twofold, as either **Solidified Object** or **Field**:

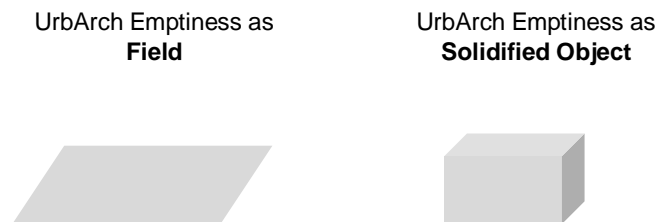
- 1) *"A good way to demonstrate that interspaces are not empty is referring to what may be called their density. If one makes small models of our two buildings and moves them back and forth, closer together and farther apart, one observes that the interspace looks looser and thinner as the distance between the buildings increases. Conversely, the interspace becomes denser as the distance diminishes. The observer experiences perceptual compression or decompression in the interval" (Arnheim, 1977, p.18, par.3).*

Fried (1998) explores the minimalists' experience of a place (situation) through **endlessness** and **objectlessness** which turns it similar to the experience of an object. A subject before the situation experiences something similar to the objecthood which distances and isolates him as a beholder:

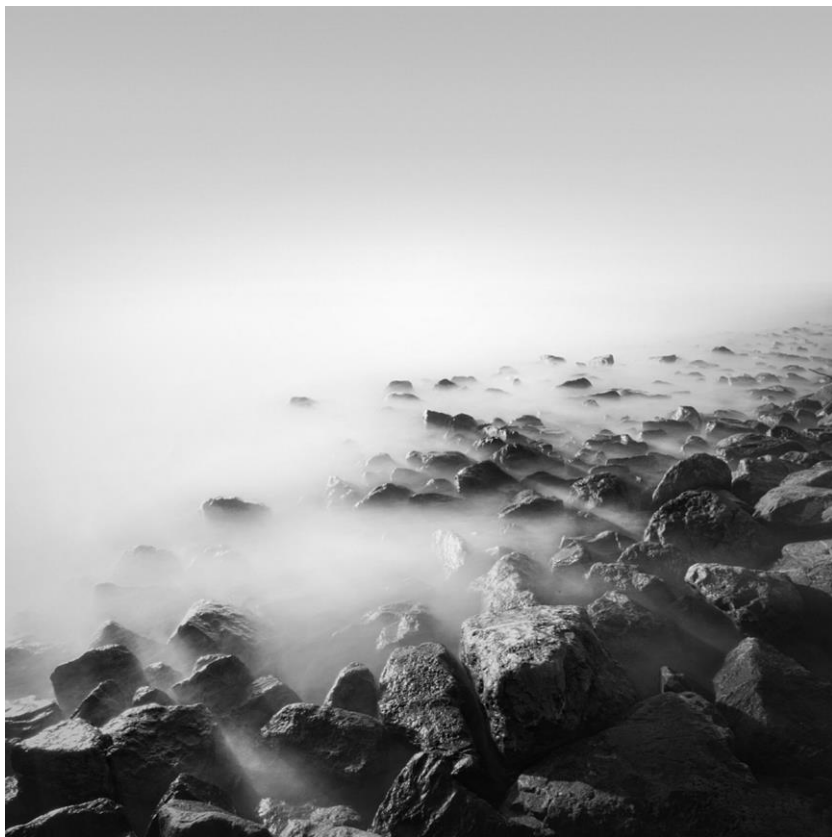
- 2) *"What replaces the object—what does the same job of distancing or isolating the beholder, of making him a subject, that the object did in the closed room—is above all the endlessness, or objectlessness, of the approach or on-rush or perspective. It*

*is the explicitness, that is to say, the sheer persistence, with which the experience presents itself as directed at him from outside (on the turnpike from outside the car) that simultaneously makes him a subject— makes him subject—and establishes the experience itself as something like that of an object, or rather, of objecthood. [.. . ]” (Fried, 1998, p.159, par.2)*

**To summarize**, in our research we adopted the possibility of UrbArch emptiness to be grasped either as a **Solidified Object** with well-defined and structured limits, or as a **Fields** characterised by **endless objecthood of situation** (Figure 26). On one side we find the well-structured, limited and composed UrbArch Emptiness which is dense and almost tangible. On the other, we will see disperse and limitless places, which leakage into the landscapes tending towards vast spaces. We therefore argue that the second ones, even though not clearly bounded by urban-architectural limits, obtain the quality of objecthood through their completeness and wholeness as defined by far perceptual limits such as topography and/or earth curvature.



*Figure 26 UrbArch Emptiness grasped as Field or Solidified Object*



**Figure 27** *Light*, Wills, available from <https://www.flickr.com/photos/willsun/5148550136/in/photostream/> accessed at 20.12.2016

## 3.2. Limits

### Conceptual limits

To be listened to and distinguished as a note, sound needs a pause. In order something to be defined as an authentic unity, it is necessary that it has limits towards something else, obtaining like that a distance, pause, silence, intervals, in-between emptiness. Linguistic categories, spatial units, body forms need defined boundaries, either conceptual or actual, to be seen as distinct units. In his Space-Limit, Pinto (2007a) explores ontological inseparability between space and its boundaries but also quality of limits as origin and precondition for existence of any identity. As Pinto explains, limits are indissociable from what they limit since only through that act limits themselves can exist.

*“The limit is therefore comprehensible in its complete cycle as the beginning and the end, the boundary where things begin, start being apprehensible and where they finish”<sup>28</sup> (Pinto, 2007a, p.23, par. 1)*

Definition of conceptual categories starts with delineation of their **borders**. Boundaries of **categories** are spatially based cognitive constructs that further limit and separate distinctive entities. In Saussure's (1959) discussions on meaning-making, he highlights the importance of relationship that an element establishes with its proximate elements in definition of the identity. The way in which the proximate elements differ or resemble is important in generation of both, their signification and value.

Conceptualisation of surrounding world is also based on capturing limited figures which are placed in certain localisation and over specific background. “When we

---

<sup>28</sup> “O limite é assim entendido no seu ciclo completo como princípio e fim, o contorno onde a coisa começa e se percebe e onde ela própria termina...” (Pinto, 2007a, p.23, par.1, translated by author)

conceptualise the world, we tend to view it in a binary pair of a certain object in focus and a background in which this focused object is located” (Toyota et al., 2012).

Linguistic necessity for definition of concepts as process of attribution of common meaning to a sign might find its substantiation and evolution premise in the way brain searches for limits to allow navigation and object recognition (Ramachandran and Hirstein, 1999). In spatial disciplines, limits are explored as something with multidimensional capacity to define and separate objects and spaces but also to blend them<sup>29</sup>. On one side limits might delineate objects, direct behaviours, control usages but also permit inside-outside continuity and spatial leakage. Limits as the **shaping** elements of Open Public Space are the same elements of its **shapelessness**.

**To summarize**, need for definition of limits is an intrinsic process of human cognition, which is in the basis of conceptualisation and grasping of environment through understanding of primal objects-background binary systems. The logic of limits and object-background definition, as the key for search for gestalts, is present in human relating towards environment thus important for structuring of our theory on UrbArch Emptiness and the possible method for its capturing, describing and operating.

---

<sup>29</sup> The notion of limits, even on conceptual level, is something not fixed and permanent, but rather elastic and diffuse that is being redefined and remodelled by development of the usage and change of the context.



**Figure 28** *Emptiness*, Wills, available from <https://www.flickr.com/photos/willsun/5469022465/in/photostream/> accessed at 20.12.2016

## Urban-architectural Limits

In urban-architectural spaces, qualities of **limits** between empty and built are widely examined and their comprehension is intensely employed in spatial creations.

The unbuilt part of our environment – UrbArch Emptiness depends on its **moulding borders** which chunk a naturally continuous emptiness into **smaller separable units** and definability of those borders. The process of division is almost **straightforward in traditional cities** (Peterson, 1980) whose well-defined urban structure clearly distinguishes streets from squares. A **continuous Open Public Space** of a traditional city is obviously **divided** into streets, squares, gardens. In cases of non-traditional tissues, definability of borders decreases thus clear definition of separated Open Public Space becomes challenging.

The importance of **definability of Open Public Spaces and UrbArch emptiness** manifested through well demarcated boundaries are also reflected in the **notions such as place and loci**, as defined and limited portion of built environment which presupposes in-situ interaction, apprehension and appropriation. In the time of globalisation, mobility, virtual reality, uncertainty, impermanency, place is still found crucial for urban life: “(A)and yet place, even relatively **fixed and bounded kinds of place, remains important**” (Cresswell, 2004, p.82, par.1).

The importance of encoding and mental representations of limits in cognition of loci and place finds its support in cognitive neuroscience and studies on perception of surroundings. Importance of limits is proven intrinsic for cognition of environment through discovery of border cells within the hippocampus “which fire when the animal is close to a border within its environment” (Banich and Compton, 2011). These studies prove that human brain operates with limits as one of its inherent invariables. Brain creates mental maps due to the relationship we have with spatial boundaries.

The possibility of chunking the continuous architectural and urban spaces into a set of experiential units Foucault (2004) recognises as crucial in the development of spatial notions in the mediaeval times. For the medieval man the image of the city was discontinued and constructed as a set of autonomous and independent Places whose spatial relations seemed to be absent. These places could have been open spaces with specific activity of significant sacred or secular buildings (Foucault, 2004).

**To summarize**, notion of limits is deemed intrinsic in human perception and cognition of surrounding leading to discretisation of Open Public Space experiential continuity thus to constitution of place and loci. In that sense, in our theoretical and representation approaches, UrbArch Emptiness is deemed inseparable from its built antipode and boundaries which as limits of Open Public Spaces' definability allow for its grasping.



## Depth of limits

Emptiness and fullness share the same limits which as mutual skin receive their tension, permit their separation, and allow their penetration. The **urban-architectural membranes** exhibit formal ambiguity because they belong to both, built and unbuilt spatial elements. They limit and structure built parts but also reflect upon their unbuilt antipode. Through thickening of limits, both built and unbuilt become well separated and delimited. On contrary, through limits' weakening built structures turns to be rather transparent and porous thus the UrbArch emptiness starts leaking.

Limits depth can be addressed as either formal or material phenomena. When talking about formal depth of limits we enter into realm of urban and architectural typologies where depth of urban-architectural limits diverges from very shallow and planar to deep and volumetrically unfolded ones. While shallow limits, as a blade, sharply define full-empty distinction, deep and volumetric ones because of their terraces and balconies, get profoundness and transitional spaces. Deepness of façades influence the quality of element they limit but also quality of emptiness they mould. On one side buildings gain transitory spaces that permit shading and in-between passages, on the other unbuilt UrbArch emptiness get various sheltering and sojourning spaces. The facades are thus contact surfaces which receive tension of inside-outside relationship and built-unbuilt distinction.

Depth of limits also depends on their materiality. Two equally plane walls would be more or less inviting for a proximate usage, such as leaning or touching due to their tactile appealing revealed thorough the materials' thermal touch, which refers to the perception of temperature of objects in contact with the skin, and its naturalness. Due to the quality of surfaces uninviting for bodily touches, materials such as glass or metal grow their cognitive depth, repealing any very proximate and long-lasting contacts.

Glass, which is commonly used as formally and visually shallow material, generates reflections and tactile coldness that due to lack of porosity and thermal comfort from formally and visually shallow material is turned into a deep limit (Figure 29).



*Figure 29* Offices in Zamora, Alberto Campo Baeza, available from <http://www.campobaeza.com/offices-for-the-junta-de-castilla-y-leon/> accessed at 20.12.2016

## **Semantic and structural level of limits**

Thickness and sturdiness of certain spatial limits do not solely depend on material qualities of façade as boundary but also on its symbolic charge which makes it thinner or thicker, by diluting it or intensifying it. Even though, a fence that separates military area for example, can be transparent and thin, its limiting power is increased by the symbolic weight it is been attached. There are ethics and consciousness layers which depending on our interpretation thicken spatial limits not through materiality but through their capacity to be interpreted impenetrable. Places that are privately owned and run are often found to be publicly unattractive. They generate strong semantic limitations and can direct public usage without thickening actual physical boundary. These socio-cultural codes, as Pinto designates them, behind interpretative collective charge, can have personal and psychological function, which on individual level delimit and shape spatial behaviours.

This difference between formal and symbolic qualities is what Oliva (2011) distinguishes as structural and semantic level of environment. While structural level refers to **geometric context** of surrounding world, of semantic level rely on understanding **meaning of the space** person is embedded in. Encoding first level means to: “describe the shape, size, boundary and content of the space in view” while second accounts for “meaning of the physical or pictorial world and are modulated by the knowledge of the observer” (Oliva et al., 2011, p.109, par.1-2).

## Explicit vs implicit limits

As Meiss argues, architectural space is defined by **relationships between objects or boundaries** which do not themselves have the character of object, but which through definition of limits gain objecthood. Architectural compositions put buildings or buildings' parts into inseparable unity by relationships that are established due to their proximity or boundaries continuity. Elements are thus used as cues for structuring wider compositional wholeness.

*“These limits may be more or less explicit, constitute continuous surfaces forming an uninterrupted boundary, or on the contrary, constitute only a few cues between which the observer establishes relationships, enabling him to interpret an implicit limit... As a human being we do not consciously need to register in a linear fashion all the fragments present in order to obtain an overall idea of the space which we are visiting or in which we are living... The resulting overall idea is not the objective fact of space as it is, but space experienced, passed through the subjective filter of perception conditioned by our previous experiences, our language and our culture” (Meiss, 1990).*

The question of limitation is inherent to our object recognition as part of human evolutionary surviving apparatus. The necessity to recognize objects has been developed into a capacity to spot possible treats usually projected by moving feature. In that regard, our brain also developed an ability to reconstruct implicit limits which objects are lacking. This part of our evolutionary apparatus makes us able to spot consistent objects which surround us either because they move together as whole or because they stay united as we move around them. In that regard we look for objects even if there are no explicit ones. Our brain reconstructs objects looking for their inner affinity hold themselves as unified isolated elements.

The implicit borders, revealed through continuations of explicit ones are strongly present and extensively used in urban and architectural disciplines. Modernist

architects such as Mies, Loos, Johnson, Eames, Frank Lloyd Wright, Neutra, etc extensively used implicit force of spatial limits which generated clear spatial organisations within the continuous and uninterrupted field of emptiness. Without being explicitly separated, their spaces are clearly divided (Figure 30).

The possible structuring qualities of emptiness have been addressed by Arnheim (1977), Hall (1990), Gehl (2011), Pinto (2010). Arnheim discusses its perceptual density and importance in bringing together apparently separated entities "...Space between the buildings is an inseparable part of the image. Far from being empty, that interstitial space is pervaded by gradients" (Arnheim, 1977, p.17, par.4). This quality of seemingly empty space to hold together perceptual reality as unified wholeness is what Arnheim calls density and illustrates on examples of two buildings whose distance increases gradually diminishing their in-between solidity. When distance between objects enlarges, the intensity of their interspace changes and becomes "looser and thinner" (ibid.p.18, par.3).

Urban-architectural spaces are never completely bounded; outdoor spaces are interconnected through streets, porches, gates, entrances. Indoor spaces are linked by doors, openings. Nevertheless, the perception of urban-architectural space is chunked into smaller episodes which are somewhat definable by limits – either explicit or implicit. These limits allow for definition of locus, place, and specific location within the city.

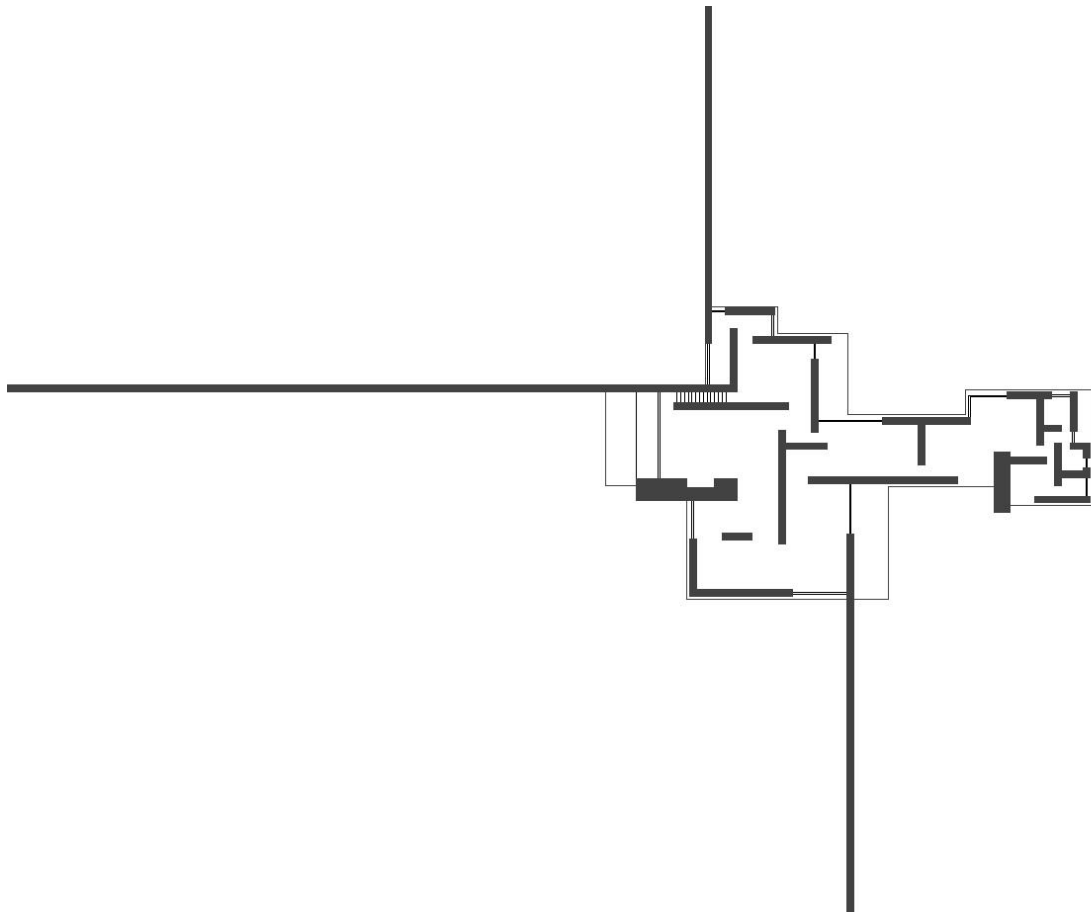
**To summarize**, while the explicit limits belong to urban and architectural form, the implicit ones need interpretation to become part of continuous and uninterrupted boundaries. When the implicit boundaries make clear continuation of explicit ones, they are together easily interpreted as part of the same experiential unity, as in traditional urban tissue. There, the explicit and the implicit limits permit clear understanding of smaller units which are unmistakably chopped out of continuous UrbArch Emptiness.

When implicit boundaries are not strong enough, spatial unities are ambiguous leading to several possible interpretation of their wholeness as found in non-traditional urban tissues. This ability of human to discretise continuous unbuilt urban space is introduced in construction of proposed Open Public Space representation model whence convex spaces, as portions of urban tissue were defined.

### **Limits of UrbArch Emptiness and Open Public Space Types**

As unbuilt part of built environment, the UrbArch Emptiness is structured by both natural and built limits. Apart from the manufactured urban-architectural limits there are naturally inscribed borders which are as important in constitution of Open Public Spaces: shape of topography, curvature of earth and water surfaces. While the first type of limits defines open public spaces through **Solidified** UrbArch emptiness, the second ones delineate it as **Field** through natural limits or landscape borders. The first one operates on urban-architectural level, the second one on natural-geographical level.

Both of these delimitation manners, either **Solidification** delineated by urban-architectural limits or unbuilt **Field** defined by limits of surrounding landscape; strongly delineate **open public spaces**. The first gives priority to immediately embodied urban-architectural scenography, the second to visually approachable immensity of surrounding. UrbArch Emptiness therefore promotes open public spaces on different levels of built environment: from place through landscape towards space. These two types of open public spaces, which are based on structuring of UrbArch Emptiness as either **solidified object** or **field**, are in more details addressed in the section 6.2 and analysed through the attributes of spaciousness and openness.



*Figure 30* Brick country house, Mies Van der Rohe, from "Mies van der Rohe: European works" 1986

### 3.3. Conclusions on UrbArch emptiness

The definition of UrbArch Emptiness is grounded in the process of conceptual specification of notion of Emptiness based on conclusions previously drawn from the theoretical analysis used as inspirational and analogical triggers.

- UrbArch emptiness is a **manifested artefact** of built environment of Open Public Space (see discussion on Buddhists' emptiness)
- As such it **reflects its built antipode** and its perception occurs due to the **presence of perceivable things** (see discussion on Atomists' emptiness)
- UrbArch emptiness can be **'objectivized' and 'solidified'** (see discussion on Objecthood of emptiness and Fullness of emptiness)
- UrbArch emptiness and form share **common boundaries** (see discussion on Objecthood of emptiness)
- UrbArch emptiness influences various levels of **built environment** (see discussion on Place-Level-Space)
- As part of urban-architectural space UrbArch emptiness is **multidimensional** (see discussion on Different types of UrbArch Emptiness)

Starting from these presented theoretical bases we introduced a concrete observational standpoint, urban-architectural, and used it for further specification and concretisation of UrbArch emptiness. UrbArch Emptiness is therefore 'objectified' and 'solidified' as manifested artefact which reflects its built antipode and as such can be grasped and approached.



*This page intentionally left blank*

*This page intentionally left blank*

## 4. The Materialisation of Theory - Representation Models for Open Public Spaces based on UrbArch Emptiness

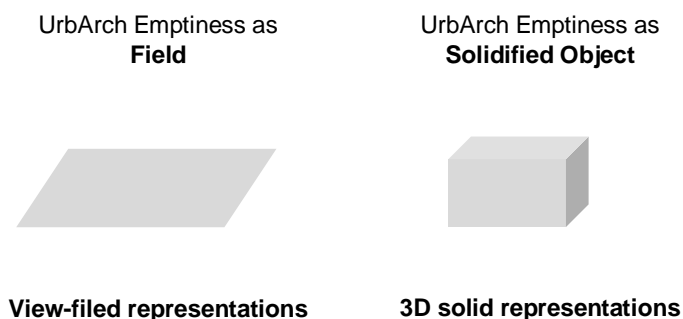
The following chapter is the output of **Application Objective 1 AO.1**.

As goal, this chapter has the development of representation models that can be used for assessment of Open Public Space attributes from the perspective of UrbArch Emptiness. The definition of the proposed representation models is therefore grounded on two previously introduced notions: UrbArch emptiness as possibly **solidified object** (1) and as **solidified field** (2). These two concepts led to definition of **two Open Public Space representation models** which focus on unbuilt part of urban environment respecting its nature as either **solidified Object or Field**. The proposed representations were further used for different observational approximations towards Open Public Spaces.

- **3D Solid representation of Open Public Space**, is inspired by UrbArch Emptiness as possibly **solidified object**. It accounts for direct Open Public Spaces' limits (such as urban, architectural, equipment) and for three levels of granularity which resulted into three models of **Solid, Convex and Fragmented Voids** (section 4.1)
- **View Field representation of Open Public Space** is inspired by characteristic of UrbArch Emptiness to be conceptualised as **unbuilt field** which allows for place-landscape-space continuous apprehension. In that regard, we proposed usage of representations models of Open Public Space which account for the field characteristic of its unbuilt part - **Isovist and Viewshed analysis** (section 4.2). Differently from Convex, Solid and Fragmented Voids which are primary limited to constructed spatial limits, the representation models of Isovist and Viewsheds account for further place, landscape and space borders (such as earth curvature, topography, water surfaces).

While the representation tools for capturing Open Public Space focusing on UrbArch emptiness as a **View field** already exist and as such are going to be applied, the

representation models of Open Public Spaces based on notions of **Solidified UrbArch** emptiness and corresponding tools are developed within the research (Figure 31).



*Figure 31 UrbArch Emptiness and Representation Models*

#### **4.0. Representation of Solidified UrbArch emptiness**

##### **Abstract**

As constructs which mediate the reality and human capacity to conceive it, representation models are made and used as simplified reflections necessary for structuring and discretising the continuum of reality. Based on the necessity for representation that could be applied for observation of Open Public Spaces from the angle of its unbuilt construct, the general idea of this chapter was to construct models which would account for UrbArch Emptiness as solidified object. These representation models were further used for addressing attributes deemed important by user of Open Public Spaces. The models addressed important Open Public Space properties, as measurable aspect of spatial attributes which ultimately gave us an insight into spatial qualities.

To capture, describe and operate with an unbuilt part of Open Public Spaces we proposed automated, user-regulated, 3D representation models of Convex, Solid and Fragmented Voids. These were inspired by solidified nature of UrbArch Emptiness and based on compartmentalisation of Open Public Spaces grounded on theoretical basis on visual perception drawn from Gestalt and neuroscience on discretised apprehension

of built environment. The choice to ground discretised spatial representation on theories on visual spatial apprehension is inspired by idea that 'seeing' is an important tool for spatial experiences, walking, navigation, orientation, sojourning, social and leisure practices; but also that visual and spatial experience shapes other aspects of cognition and plays a major role in structuring of other domains (Langacker, 2000, p.203).

Therefore, the models propose discretization and solidification of unbuilt part of Open Public Spaces, as a possible method for construction of 3D representation and data-visualisation model. We started by reflecting a possibility and necessity for discretization and partitioning Open Public Space into smaller apprehensible particles through employment of convex spaces as defined by Space Syntax. These are further introduced 3D information deemed relevant in apprehension of built environment which led to the development of 3D-informed Convex Map. Based on the Convex Map, we structured object-based models of Convex, Solid and Fragmented Voids, which are applied on study of cases of Lisbon and used for visualisation and analysis of Open Public Spaces and further for data visualisation and presentation.

## **Introduction**

The current state of the art regarding representation models of Open Public Spaces is vast and takes into account several spatial, social and behavioural aspects such as publicness (Németh & Schmidt 2011, Varna 2014), appearance and behaviour (Vanegas et al., 2010), visual properties of space (Oliva and Torralba, 2001), pedestrian movements (Blue et al., 1997; Hillier et al., 1993), etc. They usually address built parts of Open Public Spaces neglecting the impact these have on unbuilt stage of urban life. Since our research focuses on unbuilt part of Open Public Spaces and its relationship towards built antipode the idea was to develop representation model which would incorporate the theory.

*“On the one hand, a model can be a representation of a selected part of the world (the ‘target system’). Depending on the nature of the target, such models are either models of phenomena or models of data. On the other hand, a model can represent a theory in the sense that it interprets the laws and axioms of that theory.” (Frigg and Hartmann, 2012).*

As possible idealised or conceptual representations of phenomena and data, models are important instruments in conducting scientific observations thus imply several epistemological and philosophical questions such as: how do we infer from models, what is the relationship between model and reality, model and theory, how knowledge about model as a simplification can be used for learning about what model stands for, etc (Frigg and Hartmann, 2012).

Representation models that were developed for capturing **Open Public Spaces attributes** are **solidified models** of Convex, Solid and Fragmented Voids. Their conceptualisation and development is inspired by unbuilt parts of Open Public Spaces (UrbArch Emptiness) which are deemed as **graspable objects** whose limits and boundaries allow for their apprehension making them **definable and separable** from the surroundings. Based on that, these representation models look into Open Public Spaces discontinuity and boundaries, which delimit it from the surrounding and chunk it into **apprehensible portions**.

#### **4.1. Definition of 3D Solid representation Models**

The construction of 3D Solid representation models of Open Public Spaces – **Convex, Solid and Fragmented Voids** – is based on several theoretical pillars extracted from findings of: **gestalt theory, neuroscience on visual perception and space syntax** such as: (1) possibility for manifestation of unbuilt part of Open Public Space, (2) discontinuity of seemingly continuous Open Public Space, (3) importance of 3D qualities of spatial limits, (4) necessity for diverse model granulation due to various analytical and spatial approximations.

**The first** theoretical pillar accounts for **gestalt's postulate** (Arnheim) on possibility of perception of invisible parts of surroundings through grasping the visible ones. In that regard we raised the possibility of solidification of the empty part thus it reflects its **full complement**. Based on that, the construction of representation models accounted for the built part of environment aiming at **solidification** of its unbuilt antipode, so this can be further captured, described and operated with.

**The second pillar** addresses the possibility and necessity of compartmentalising continuity of urban-architectural spaces into smaller discrete episodes<sup>30</sup> which are to some extents defined by their either explicit or implicit limits. This is already addressed by representation model of Convex Spaces as defined by **Space Syntax**, which differently from axial lines which are focused on linear movements, tend to capture spaces of interaction and sojourning within Open Public Spaces. In that regard, the notion of Convex Spaces, in which all the points are visible from one another, was used as a robust representation of **spatial particles** as catchable from various Open Public Spaces' locations.

**The third pillar** accounts for the importance of 3D qualities of spatial limits in convex spaces' structuring. Therefore, we discuss several Open Public Spaces' limits that might influence structuring of the convex **spatial particles** such as explicit topographic and other natural, urban and architectural boundaries, or one that are non-built but are implicitly present in Open Public Space apprehension. Therefrom, **3D-informed** Convex Spaces arose.

---

<sup>30</sup> These episodes can be well-described by Peterson's notion of 'space' which is easily distinguishable as separable portion of experiential environment. This lead to the possibility of dividing the continues field of Open Public Spaces as represented in Giovanni Battista Nolli's maps into apprehensible objects which by limit definition obtain certain objecthood.

**The fourth pillar** uses **neuroscience’s findings** on the way **spatial envelope** is being apprehended which depends on the users’ intentions but also on spatial approximations. In that sense, we distinguished structural versus semantic limits, but also urban-architectural versus equipment limits. Based on that, we propose three observational approximations which resulted in three models granulations: Convex, Solid and Fragmented Voids that each account for different types of environmental limit and are intended for different analytical and spatial approximation.

To summarize, the theoretical basis are formulated through following postulates which led towards specific outcomes:

*Table 4 Defining 3D solid representation models*

| <b>Theoretical postulates</b>                                                                                            | <b>Explanation</b>                                                                                                                                                                                                                                                                                  | <b>Practical Outcome</b>                                                 |
|--------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| Unbuilt part of Open Public Spaces (UrbArch emptiness) is a manifested phenomenon                                        | The space in-between is infused by the influence of surrounding object thus <b>not empty at all</b> : “Space perception occurs only in the presence of perceivable things” (Arnheim, 1977, p.10, par.2)                                                                                             | <b>I Solidification of UrbArch emptiness</b>                             |
| Seemingly continuous Open Public Spaces are apprehended as chopped into smaller spatial units                            | The experience of Open Public Spaces is a continuous but nevertheless divided into smaller <b>experiential episode</b> addressed by space syntax convex spaces method.                                                                                                                              | <b>II Convex Spaces</b>                                                  |
| 3D qualities of spatial limits are important for spatial apprehension and usage                                          | UrbArch emptiness is <b>inseparable</b> from its 3D built antipode and limits which as such must be the basis for the model development                                                                                                                                                             | <b>III 3D-informed Convex Spaces</b>                                     |
| Different research intentions should lead towards different observational approximation thus diverse models granulations | Different researches and observation approximation take into consideration different types and granulations of <b>limits</b> (such as semantic and structural; explicit and implicit, natural and manufactured) have different weight in surrounding apprehension thus might be differently treated | <b>IV Research approximations - Convex, Solid and Fragmented Voids</b>   |
|                                                                                                                          |                                                                                                                                                                                                                                                                                                     | <b>I + II + III + IV<br/>3D Analytical and Data Visualisation Models</b> |



## I Solidification of UrbArch emptiness

As part of a specific urban-architectural space, UrbArch Emptiness coexists with the built structure by which it is moulded and intrinsically influenced. In that regard we discuss a possibility of modelling the unbuilt part of Open Public Spaces through Solidification of their empty part thus it reflects its **full complement**. This process is grounded in the concept of fullness of emptiness as defined by both Meiss' radiance<sup>31</sup> and Arnheim's density<sup>32</sup> and represented in Nolli's map of Rome<sup>33</sup> (Figure 32).

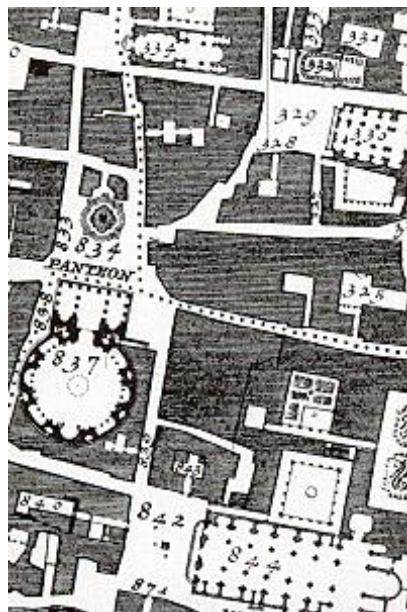


Figure 32 Rome map by Giambattista Nolli, detail, [https://commons.wikimedia.org/wiki/File:Nolli\\_detail\\_pantheon.jpg](https://commons.wikimedia.org/wiki/File:Nolli_detail_pantheon.jpg) accessed on 10.5.2017

---

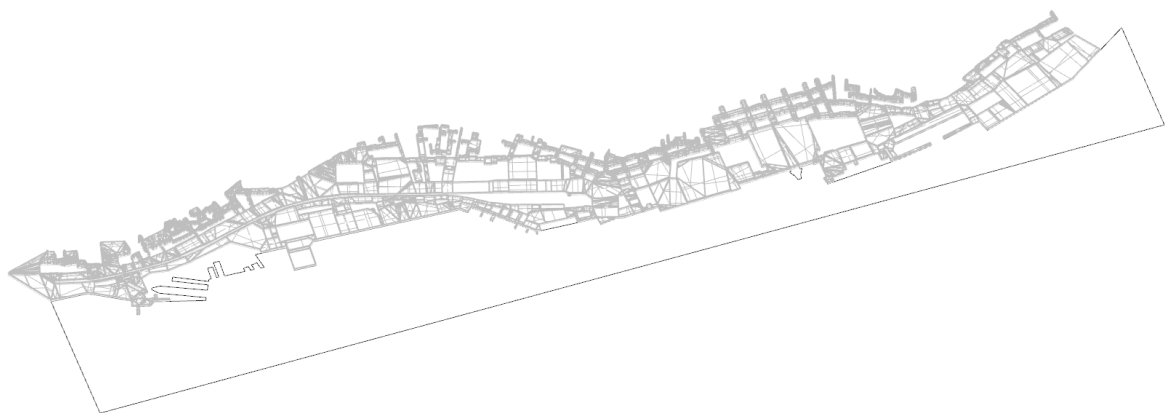
<sup>31</sup> Empty is as a dynamic element which **receives influence** from surrounding or belonging objects.

<sup>32</sup> "A good way to demonstrate that interspaces are not empty is referring to what may be called their density. If one makes small models of our two buildings and moves them back and forth, closer together and farther apart, one observes that the interspace looks looser and thinner as the distance between the buildings increases. Conversely, the interspace becomes denser as the distance diminishes. The observer experiences perceptual compression or decompression in the interval" (Arnheim, 1977, p.18, par.3).

<sup>33</sup> Nolli's map of Rome from 1748 depicts, in two-dimensional way, the unbuilt part of the city as a continuous framework where the urban life occurs. It represents interior and exterior, covered and uncovered as continuous Open Public Spaces as long as they are publicly accessible. It includes Open Public Spaces showing possibility to read a city as a collective framework for public life.

Following the Arnheim's analogy, we deem that the **solidification of UrbArch** emptiness depends on **definability** of its limits. Based on this, one can say that UrbArch Emptiness of traditional Open Public Space tends to be dense, almost tangible, built as consecutive sequence of smaller units which are as parts of overall city's emptiness easily distinguishable. In his analogy traditional interspaces look **confine and thick** thus can be designated as **consolidated**. Differently from the traditional, well-defined spatial envelope which limits Open Public Spaces in rather strict manner making them confined and thick, there are others which have less defined spatial limits thus turn to be dispersed such as modern spaces tending urban sprawl. Coming back to Arnheim analogy these spaces are, due to their lack of limits, rather **looser or thinner**, thus can be designated as **unconsolidated**.

The proposed process of **solidification** (Figure 33) based on definability of Open Public Spaces' limits is also important because it converts unbuilt Open Public Spaces into object, making them easier to be grasped. Gestalt discusses a distinction between things and their surrounding frameworks which is to say between figure and ground because: "it is a figure we are 'concerned with', the figure we are remembering, and not the ground" (Koffka, 1955).



*Figure 33 Central Lisbon 3D Solid Representation Model*

## II Convex Spaces

In urban environment, Open Public Spaces **are continuous channels** that accommodate **urban life**. Streets, squares, informal and residual open spaces are **leaking** one into the other creating the **conditions for experiential continuity** of a city apprehension.

The experience of Open Public Spaces is a continuous process, which is nevertheless **divided** into **places** as **experiential episodes**<sup>34</sup> which one can recognize while wandering around city. Changes of spatial scale, passages through urban arches, visual discovery of hitherto hidden areas are examples of **phenomenological thresholds** which divide the endless Open Public Space into smaller episodes. These changes facilitate spatial legibility turning it into smaller pieces easier to be grasped, cognized and remembered. The idea of chunking Open Public Space into smaller units is already applied in **convex maps** used in **space syntax** methodology. There, **convex spaces map** are drawn by capturing consecutively convex spaces starting from the biggest and fattest ones (Hillier and Hanson, 1984) until a complete representation of space is **filled**. These are further used for comprehension of grid convexity, grid articulation and axial integration of convex spaces (ibid. pp.99-100) showing the configurational relationship between open spaces and built environments.

---

<sup>34</sup> In neuroscience based researches on nature of scene perception, Park and Chun (2014), look into bottom-up constitution of perception of environment. A place is being surmised through smaller particles of views are disparate but finally must be linked together. They discuss three structuring levels of perception of environment: view, scene and place claiming that views are the smallest perceivable units (ex. a view of the kitchen island counter when standing in front of the refrigerator). Further, multiple views are being grouped into scenes that are understood as “part of the same broader environment or ‘place’... which is a location or landmark in the environment and often carries semantic meaning (e.g., the Yale campus, my kitchen).”

Even though they account for spatial compartmentalisation, these maps (Figure 34) ignore 3D spatial occurrences which participate in the very process of spatial chunking. In that regard an additional layer of information is added to our representation model as presented in the next section wherefrom the notion of 3D-informed Convex Spaces arose.

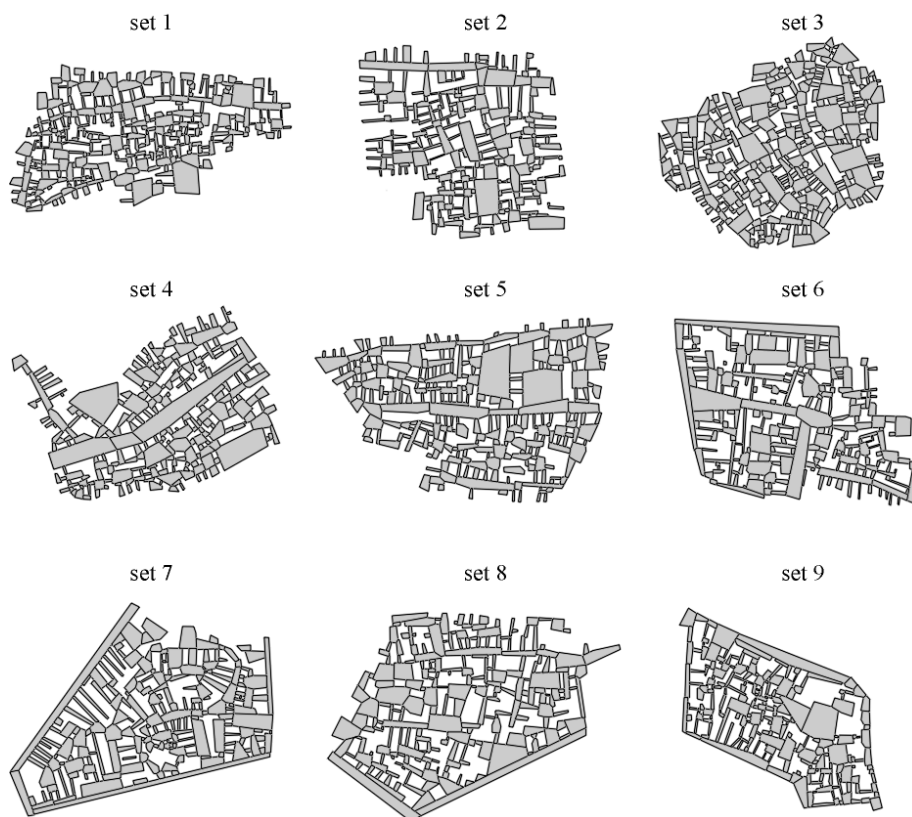


Figure 34 Convex Spaces examples, available from <http://www.favelas.20m.com/paper.htm> accessed at 20.12.2016

### III 3D-informed Convex Spaces

Looking into Open Public Spaces from the Space Syntax point of view, we infer that 3D spatial occurrences, such as height alterations, openings in crossroads, and accentuated changes in topography are disregarded. This means that smaller spatial episodes, such as those when we find ourselves in the middle of bidirectional crossroads, are ignored.

Apart from neglecting more subtle Open Public Spaces' changes, the lack of sufficient number of particles would disable a later possibility for more versatile particles agglomerations in which elements such as crossroads could belong to more than one convex space.

Differently from the Space Syntax, we proposed convex spaces that would account for 3D information leading towards **spatial particles** which consider important topography and height alterations. This means that a street which is a unique convex space in space syntax convex map would be, in our 3D-informed convex map, chunked into smaller portions distinguishing street crossings from built streets particles. This quality of 3D-informed convex map is proven useful in more complex spatial agglomerations, such as Solid Voids (see next sections), where street crossings allow for several aggregation possibilities in terms of spatial continuity and can belong to more than one spatial unit.

The explicit changes in height of built environment, such as those that occur in crossroads, clearly partition continues UrbArch emptiness into smaller elements. However there are situations in which changes occur only on one side of the space thus the threshold between spaces is not as explicit as in crossroads' examples. These limits, even though implicitly induced, are found important in chunking space and as such addressed in proposed methodology. Using Meiss' theory on limits, implicit ones can be explained as visual cues that do not constitute continuous and uninterrupted

boundary, but due to proximity allow for establishing visual relationships which further lead towards unified interpretation. In that regard certain interpretation of 3D spatial limits was needed wherefrom apart from limits which are obviously and explicitly graspable, the implicit ones which must have been interpreted as such are introduced (for more details see the following section).

Differently from the space syntax method, where convex spaces are drawn thus the smallest number of fattest spaces is provided, our subdivision aims at **minimum number of elements that allow the maximum number of possibilities for aggregation**: “Subdivide the minimum number of elements that allow the maximum number of possibilities for aggregation” (Beirão, Chazar, Covic, 2014, 2015).

Once defined, our **3D-informed convex map** provides a basis for further development of 3D representation models Convex, Solid and Fragmented voids.

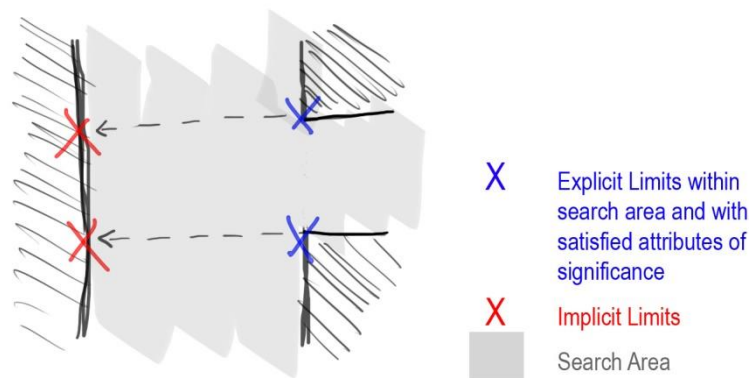


*Figure 35 Solid Representation Model of Terreiro do Paço, Ribeira das Naus 3D*

### **Construction of 3D-Informed Convex Map**

Construction of 3D informed Convex Map takes as input Urban Limits of Open Public Spaces which are divided into three major groups:

- **Horizontal limits (ground and overhang limits)** are constant horizontal boundaries that include elements such as topography, streets, pavements, but also bridges, shadings, publicly accessible roofs, etc.
- **Vertical limits (planar and volumetric limits)** are elements either planar such as fences and walls or volumetric such as buildings and water surfaces
- **Implicit limits** are visual cues which participate in spatial compartmentalisation due to proximity to other explicit limit. They are defined by rectangular projecting over nearby explicit edge regarding the distance between them (searching space) but also other attributes of significance of explicit limits (bearing angle, vertices' height difference and vertices minimum horizontal distance). These parameters are adjustable by users thus adaptable to deferent contexts and research necessities (Figure 36).

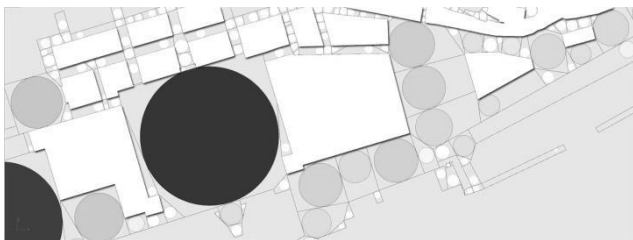


*Figure 36 Projection of Explicit Limits into Implicit Ones*

The computation of 3D-informed convex map therefore starts by encoding Urban Limits (horizontal urban limits, vertical and implicit) into the main spatial taxonomies (location, spatial vertex, spatial edge) from which a Delaunay's triangulation is processed and robust spatial units – triangles are produced. These are further joined into unique non-overlapping compartments - convex spaces using region growing

algorithm based on the convexity thresholds and the function of superiority<sup>35</sup> (such as fatness<sup>36</sup>, compactness<sup>37</sup>, squareness<sup>38</sup>, or their combinations fatness\*compactness, fatness\*squareness) (Cavic et al., forthcoming). For purpose of the research we applied fatness\*squareness superiority (Table 5) which corresponds well to intuitive convex space drawing according to the Gestalt theory especially for the regular urban grid (fatness\*compactness does so for an irregular grid).

Table 5 Applied convexity type

| Convexity Type                         | 3D-Convex Spaces Output                                                             | Observations                                                                                                                                                                                                                                                               |
|----------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Fattest</b><br>+<br><b>Squarest</b> |  | <p>The representation is the most similar to a manually drawn convex map in regular urban tissues.</p> <p>It produces the biggest number of convex spaces thus improve the compartmentalisation of an urban void regarding criteria of further junction possibilities.</p> |

#### IV Research approximations – Convex, Solid and Fragmented Voids

Depending on research intentions the continuous fields of Open Public Spaces can be represented and analysed as networks, as continuous spatial fields, as compartmentalised units or fragments within a single spatial continuity. These spatial conceptualisations are grounded in the ways human experiences and conceive

<sup>35</sup> The value of superiority indicates how much a certain convex space is likely to dominate above the others to be perceived as a separate one. Hillier and Hanson (1984) have suggested that superiority should be measured as a value of fatness, however, that does not account for the shape of a space, while two rectangles of the same width and different length have the same value of fatness.

<sup>36</sup> Fatness is a radius of the biggest circle inscribed in a 2D polygon.

<sup>37</sup> Compactness is a ratio between perimeter of a polygon and perimeter of a circle of the same area.

<sup>38</sup> Squareness is a ratio between area of a polygon and area of its smallest bounding square.



environment – from networks as cognitive correlations established between physically remote places towards more proximate out-place or in-place spatial appropriations when we directly embody them (Harvey, 2006). Therefore, they require separate analytical procedures and rely on different representation models. Since the above presented 3D-informed Convex Spaces preserve information about urban limits, but also account for topographical and topological specificities, they can be used for development of 5 types of Open Public Space representations and data organisations based on core concepts of GIS as suggested by Kuhn (2012): Location, Network, Field, Object and Events (Sileryte, Cavic, Beirão, forthcoming).

From these Open Public Spaces representations, one that is practically employed in the research is based on the concept **of compartmentalised objects** which starts from 3D-inform convex spaces and further encodes 3D information of Open Public Spaces limits. It therefore represents the extrusion of unbuilt space taking into consideration properties of its built limits. By doing so, model joins built and unbuilt structures respecting the focus of the research – UrbArch Emptiness which is an integrated notion of urban space and its surrounding architectural scenography. Model encodes simplified and coarse data of Open Public Spaces spatial structure which is by neuroscience theories deemed important in grasping early environmental comprehension. In that regard a process of encoding 3D data of Open Public Spaces into solidified and simplified 3D models is developed on three scales or approximations: **Convex, Solid and Fragmented Voids**. They primarily encode 3D structural data of built environment (Figure 37) allowing for further introduction of semantic descriptors. Horizontal and vertical model surfaces can be thus attached diverse nonphysical attributes such as ownership, price, usages, construction date, symbolic values, permitting multilevel data organisation intended for multidimensional spatial analysis.

These are applied as bearing models for spatial analysis that can be used twofold, either as representations of Open Public Space phenomena or data models for visualisation of findings already extracted from spatial analyses. In the first case they are solidified and simplified idealisations of reality due to different possible theoretical bases. In the second case, they are used for visualisation of data already extracted from reality or the very representation models.



Figure 37 Process of encoding of 3D Information

### Levels of abstraction

To demonstrate a possibility for multi-scale representations of Open Public Space we proposed three models structured through different levels of approximation: Convex, Solid and Fragmented Voids. The idea to propose three different modelling scales, Convex, Solid and Fragmented, follows the necessity for different scientific approximations thus diverse models' granulation which are outputs of variability of observed phenomena of Open Public Spaces (Table 6).

Table 6 Representation Models description

| Representation Model       |                                                                                       |                                               |                                        |                                                                                                        |                                                                                         |                                                                                         |                                                                                      |                                                                                            |
|----------------------------|---------------------------------------------------------------------------------------|-----------------------------------------------|----------------------------------------|--------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| Model                      | 3D-informed Convex Spaces                                                             |                                               | Convex Voids                           |                                                                                                        | Solid Voids                                                                             |                                                                                         | Fragmented Voids                                                                     |                                                                                            |
| <b>Level of Analysis</b>   | Geographic and Natural Level                                                          |                                               | Urban-architectural Level              |                                                                                                        | Urban Level                                                                             |                                                                                         | Urban-design Level                                                                   |                                                                                            |
| <b>Data Level</b>          | Topographic data                                                                      |                                               | Limits data                            |                                                                                                        | Place data                                                                              |                                                                                         | In-place data                                                                        |                                                                                            |
| <b>Construction Method</b> | Introduction of implicit limits, topographic and 3D occurrences into convex space map |                                               | Extrusion of 3D-informed convex spaces |                                                                                                        | Joining Convex Voids                                                                    |                                                                                         | Fragmentation of Solid Voids                                                         |                                                                                            |
| <b>Data Type</b>           | Structural                                                                            | Semantic                                      | Structural                             | Semantic                                                                                               | Structural                                                                              | Semantic                                                                                | Structural                                                                           | Semantic                                                                                   |
|                            | Geometric form                                                                        | Description                                   | Geometric form                         | Description                                                                                            | Geometric form                                                                          | Description                                                                             | Geometric form                                                                       | Description                                                                                |
| <b>Encoded Data</b>        | Natural limits<br>Orientation                                                         | Types of natural limits<br>Other descriptions | Urban and architectural limits         | Types of limits<br>Other descriptions<br>(Significance<br>Year of construction<br>Usages<br>Condition) | Aggregation of urban and architectural limits into Places, sites or buildings assembles | Types of limits<br>Significance of place<br>Year of construction<br>Usages<br>Condition | In-place Pavement limits<br>Greenness limits<br>Equipment limits<br>Behavioural data | Types of limits<br>Significance of elements<br>Year of construction<br>Usages<br>Condition |

The choice of urban limits, which should be taken into consideration while modelling representation of Open Public Space, depends on the various criteria such as research objectives, analytical approximation, available data, and expected information. The level of abstraction of representation model is linked to the analytical zoom required by certain analyses.

As structured, these 3D representations of urban void should ideally account for as much detailed data as available that would further be selected depending of intention and approximation of scientific observation (Figure 38). Different levels of analysis demand different levels of detailing which reduces scale of modelling target leading towards the appropriate simplification and idealisation:

- **Convex Voids** are made as extrusion of 3D-informed convex spaces and account for natural, urban and architectural spatial limits. They solidify small spatial episodes and as such permit different types of further spatial agglomerations.
- **Solid Voids**, account for human tendency to join similar or visually continuous particles into larger agglomerations. Therefrom Solid Voids are built as spatial clusters that might correspond to different spatial agglomerations composed by several smaller spatial units of Convex Spaces due to their affinities: either visual continuity, belonging to the place unity, constancy in qualities of surrounding built environment.
- Moreover, taking into consideration other detailed information on urban architectural limits together with equipment one might find within the space, **Fragmented Voids** representation was introduced. They are more detailed spatial representations made by partitioning Solid Voids, which capture in depth spatial characteristics accounting for secondary structural properties of built environment. Depending on objectives of analysis Fragmented Voids might take into consideration elements invisible on larger urban space such as urban furniture, elements of inclusiveness, temporary services, advertising elements, artistry etc.

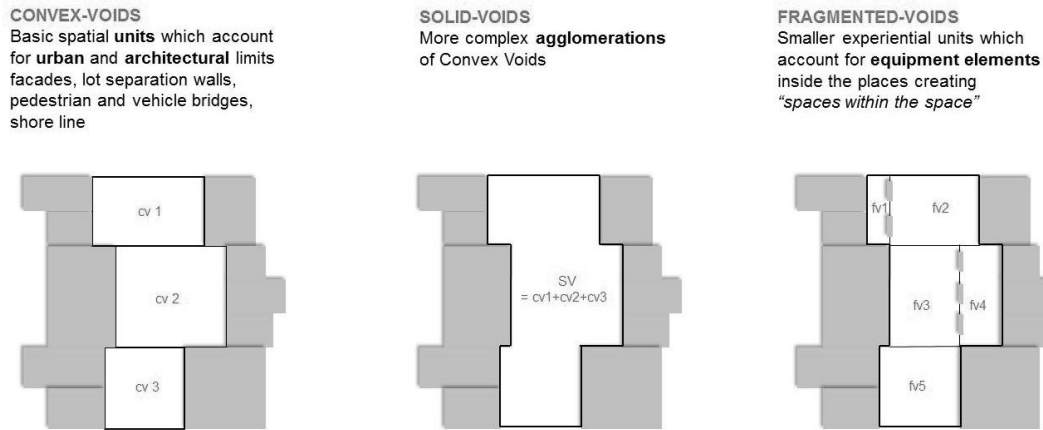


Figure 38 Convex Voids, Solid Voids and Fragmented Voids

To test 3D solid model capacity, we generated Convex and Solid Voids representation of open urban spaces of central Lisbon riverside and captured three attributes: **spaciousness, openness and diversity** chosen from an extensive list developed in chapter 6.2.

**Convex Voids as 3D coarse representation of Open Public Spaces**

The representation model of Convex Voids is based on the encoding of 3D **information** extracted from the **Open Public Spaces** in urban and architectural environment. Convex Voids are modelled as **extrusion of 3D-informed Convex Spaces** which encodes 3D limits information and whose **visualisation** might permit new perspective for Open Public Space observation thus novel modes for its analysis.

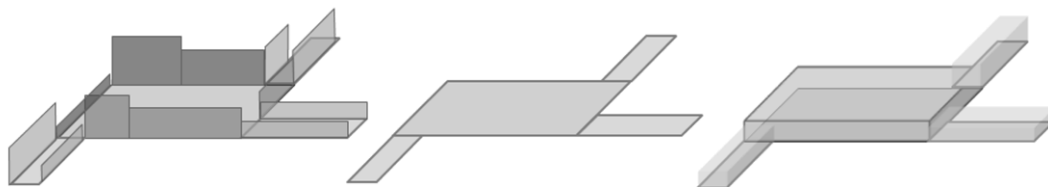


Figure 39 Constriction of 3D solid representation model

Convex Voids can be extruded according to various data thus can represent diverse properties such as **size, shape and limits height** of the unbuilt and built environment or their averaged and combined values that can have a certain theoretical or empirical correspondence to attributes. For example, we can average the height of built

surrounding in multiple ways, the average can be weighted or not, height of built facades can include or not the total perimeter of convex space or merely its built part (Figure 39).

As conceptualised, Convex Voids primarily account for urban and architectural limits, especially their formal and structural part disregarding the semantic values that can be later, as descriptive tag, added to the formal model. The decision to concentrate on structural properties of Open Public Spaces before semantic ones is grounded in experimental studies which have suggested that “recognition of real world scenes may be initiated from the encoding of the global configuration, ignoring most of the details and object information” (Oliva and Torralba, 2001, p.143, par 1)<sup>39</sup>. The decision is also supported by **economy of our perceptual apparatus**, as termed in perceptual psychology, which describes simplifications which occur in early spatial conceptions:

*“The economical choice of the shortest connection is an elementary application of gestalt psychology’s principle of simplicity: any pattern created, adopted, or selected by the nervous system will be as simple as the given conditions permits” (Arnheim, 1977, p,11, par.1).*

This is also grounded on findings of visual cognition which highlights that in scene perception, more abstract spatial information of **general spatial relationship** (LSF low-spatial-frequency) are processed separately from more detailed ones (HSF high-

---

<sup>39</sup> Oliva and Torralba came with holistic spatial model termed ‘Spatial envelope’ which accounts for set of perceptual dimensions and spatial envelope properties which are proven specifically dedicated to describe spatial properties of the scene. Using spectral and coarsely localised information spatial envelope scenes’ representation, characterized by the set of spatial envelope properties, succeeded to provide a meaningful description of the scene picture and its semantic category ool.

spatial- frequency) (Malcolm and Schyns, 2014) and occur in early spatial schema before detailed one<sup>40</sup>.

### ***Solid Voids as 3D agglomeration of Convex Spaces***

Solid Voids (SV), as agglomeration or groups of Convex Voids tend to group **separated spatial units** into more **complex agglomerations**. While **CV account for 360°** experiential but coarse reality they can be further grouped into **SV** due to their formal and visual continuity. Solid Voids can find their correspondence in notion of 'scene' which comprises from various 'views' (CV) that one might take from the same experiential point. Following the same analogy, several Solid Voids might be further turned joint into more complex notions of spatial unities that, beyond spatial, carry semantic meaning of a **Place**.

The relationship between CV particles and the SV agglomerations, such as how many CV units participates in each SV, explains the twofold character of experiencing Open Public Space. On one side there is a tendency for partitioning and compartmentalisation, on the other for affinity for continuity and unification.

*"While convex-voids can be thought of as the "atomic particles" of space—the basic units—solid-voids are more complex agglomerations of space, analogous in some sense to molecules" (see Figure 40, Beirão, Chazar, Cavic, 2015).*

The agglomeration of smaller **convex voids** into **solid voids** can occur due to their affinity – if convex spaces are continuous they might be perceived and designated as **unified**. Unification can be done in multiple ways depending on aggregation criteria

---

<sup>40</sup> Malcolm and Schyns highlight the difference between two levels of surrounding perceptual apprehension. "Critically, from a scene perception standpoint, different channels provide the viewer with different properties of a scene image: low-spatial-frequency (LSF) information indicates size, lightness, and spatial layout of blobs, revealing the general spatial relationship within the image; high-spatial-frequency information (HSF) provides detailed information about edges and boundaries, often relating to object and texture processing" (Malcolm and Schyns, 2014, p.29, p.2).

which themselves depend on research objectives. The unification can be linked to formal and visual, but also to functional, ecologic, economic or social idea.

One of possible aggregation procedures explored in the research is one based on visual and locomotive continuity of Open Public Space. It follows two basic rules of convex voids' interrelations which allow for their unification:

- Continuity of visual field between convex voids which is to say small angular deviation between CV them both in horizontal and vertical directions
- Sufficiently large overlapped edges producing a gradual transition between spaces and thus a continuous spatial experience with no sudden breaks in spatial continuity.

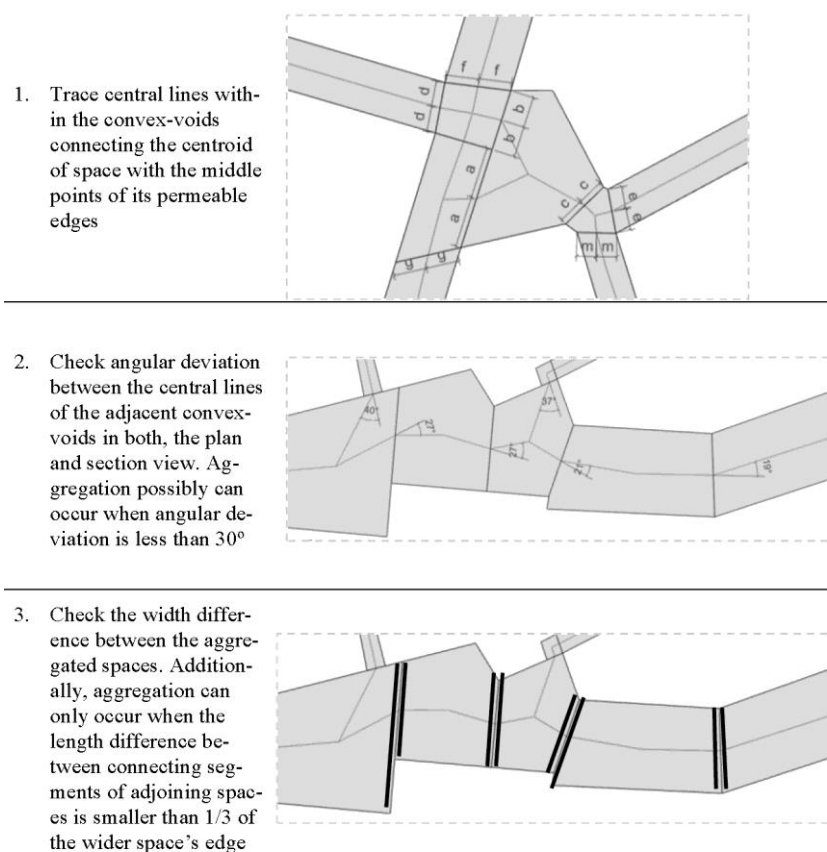


Figure 40 Possible construction of Solid Voids, from (Beirão et al., 2015)

Agglomerating Convex Voids into more complex urban unbuilt space structures of Solid Voids can lead to: 1) recognition of formal Open Public Spaces such as streets and squares but also to 2) other spatial unities which are not yet designated as urban

typologies. Solid Voids agglomeration process can be thus employed as both: **top-down** (formal Open Public Spaces) and **bottom-up** (informal Open Public Spaces) procedure. On one side it allows for analysis of known urban typologies, on the other emergence of unexpected results that might lead towards new classifications. Solid Voids construction is not a deterministic process that ends up only in a finite number of previously known categories. It is rather a representation method for the visualisation of open space that by its formal rigorous approach may produce some unexpected results that open new perspectives in understanding urban open space, its behaviour and qualities.

### ***Fragmented Voids***

Fragmented Voids, as a more in-place approximation take into account detailed qualities of Open Public Spaces such as specific qualities of boundaries, pavement, object and equipment found within it. These elements are often linked to materiality and significance within the spaces, to atmospheric qualities, to colours, or to secondary in-place elements of overall diversity. As Pinto claims (2007a) these subtle cues, such as change of texture or levelling, differentiation between shaded and sunny area, separations by curtains and overhang elements, divide the space into ambits within ambits. These poetically charged elements which determine liveability and character of space are in empirical researches deemed crucial for perception of structural spatial properties such as spaciousness (Stamps, 2010).

Since the FVs' objective is to approach Open Public Space taking into consideration higher level of details, it was necessary to establish modelling principles additional to ones previously established for the more global CV and SV scales. In that regard, we divided added detailed elements into: 1) **linear bordering ones** which chunk Solid Voids into smaller 'open rooms' one find within Open Public Spaces and 2) **punctual isolated ones** that do not slice space into smaller particles but do occupy its surface



making it less permeable and more diversified. These two categories (Table 7) of detailed in-place elements are modelled in two distinct ways.

- 1) **Linear-bordering elements** introduce spatial limits thus repartition Solid Voids into convex particles that represent smaller open rooms such as:
  - a. Equipment which has a significant volume and obstruct perception of spatial limits thus become limits themselves (height over ~2,0m)
  - b. Changes in pavement which divide space into smaller spaces
  - c. Equipment which are punctual but aligned in a way that form border or transition between two spaces
  
- 2) **Punctual-isolated elements** are introduced either as tags or posteriorly added objects:
  - a. Other punctual equipment which do not influence nether perceptual nor locomotive spatial limits.

*Table 7 Equipment Elements Types*

|                                            | <b>Linear-bordering<br/>elements</b> | <b>Punctual-isolated<br/>elements</b> |
|--------------------------------------------|--------------------------------------|---------------------------------------|
| <b>Equipment elements</b>                  |                                      |                                       |
| Urban Furnishing (ex. benches)             | √*                                   | √                                     |
| Walkability equipment (ex. paved surfaces) | √                                    | -                                     |
| Sojourning equipment (ex. esplanades)      | √                                    | -                                     |
| Elements of Inclusiveness (ex. ramps)      | √                                    | -                                     |
| Leisure equipment (ex. sport fields)       | √                                    | -                                     |
| Protectiveness (ex. covered passages)      | √                                    | -                                     |
| Artistic equipment (ex. stages)            | -                                    | √                                     |
| Services (ex. kiosks)                      | √                                    | -                                     |
| Greenery (ex. trees)                       | √*                                   | √                                     |

\*Elements which if aligned become linear-bordering elements of space

Apart from permanent equipment mention in the previous table, there are other elements which are **ephemeral and temporary** but also participate in generating spatial properties of Open Public Spaces. In his work on urban design methods and techniques, Moughtin (2003) argues that visual analysis should contain studies of three main parts: three-dimensional public space, two-dimensional surfaces which enclose

public space and architectural details that generate **area's special character**<sup>41</sup>. These 'characterisation details' can be permanent but also ephemeral elements which appear repeatedly in Open Public Space and in that way tend to become a permanent imageability generator.

Here, the tactic is to evaluate the importance and imageability of the temporary elements and to understand how deeply they intervene with an Open Public Spaces' characterisation. In the case of Lisbon Riverside, such examples are ships, which can be found within the informal Open Public Space situated in POCO do Bispo in the eastern Lisbon shore. Some of these are anchored at the same place for a longer time while others are entering and exiting the maritime space (Figure 41). We would therefore argue that the ephemeral elements which are characteristic for Lisbon's port landscape, such as ships, port container and industrial machinery, through their permanency actually turned into recognizable features of Lisbon's east coast imageability. They strongly participate in generating special spatial character.



*Figure 41 Poço do Bispo Dock*

There are various worldwide examples of important ephemeral elements such as well-known food-stalls, whose imageability, but also spatial containment greatly influence perception of Djemaa el Fna Square in Marrakech. In the similar way the recognisability of Zocalo square in Mexico City, is also linked to the huge Mexican flag put in the very centre of the square.

---

<sup>41</sup> "the visual analysis had three main parts: a study of three-dimensional public space, a study of the two dimensional surfaces which enclose public space and a study of the architectural details which give to an area much of its special character" \*Moughtin, 2003)

## V Open Public Space Properties

Since they can preserve all embedded information about open public spaces, either structural such as form of facades or positioning of entrances, or semantic such as usage, occupation, signification, the proposed 3D solid representations can be used for different data visualisation and analysis. Convex, Solid and Fragmented Voids models once can be therefore used for addressing spatial properties on various levels, 2D, 3D, 3D+ (3D with embedded Semantic information), or network (Figure 42).

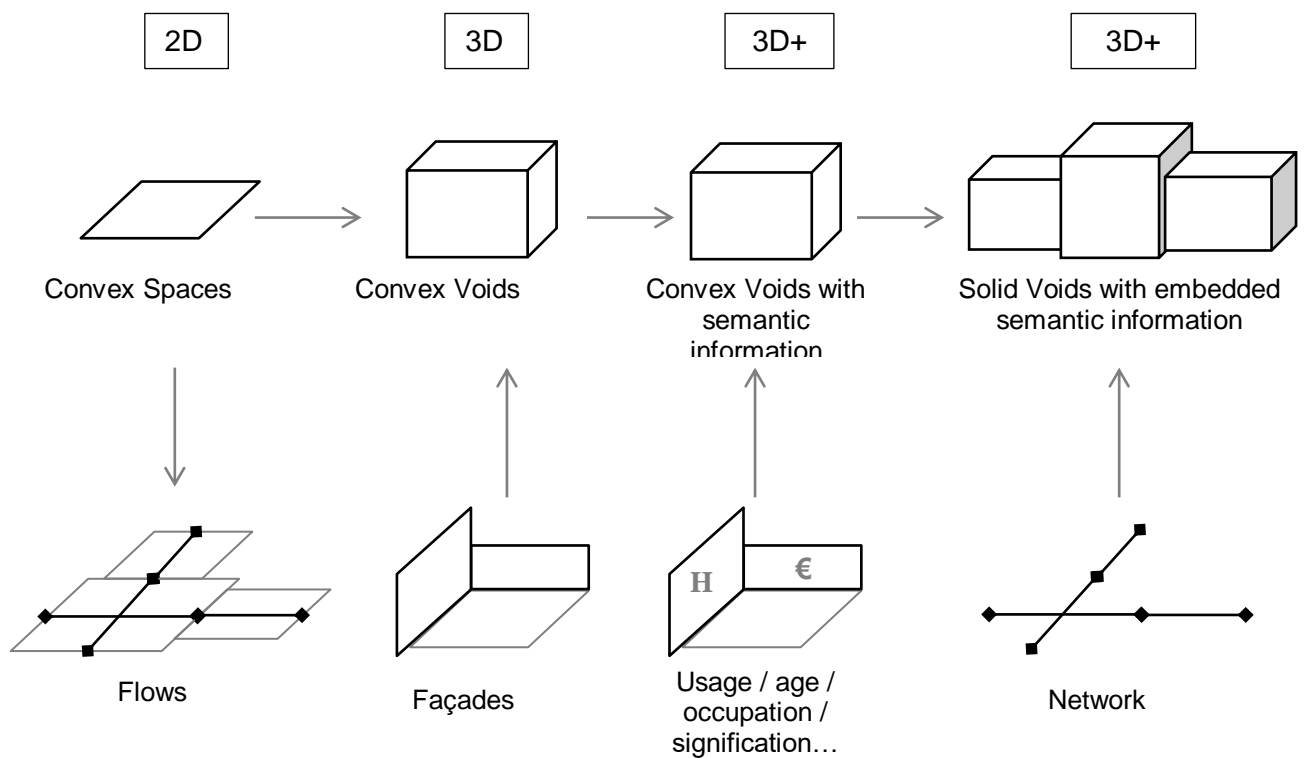
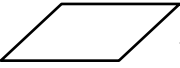
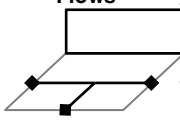
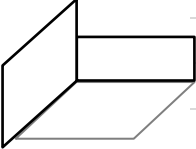
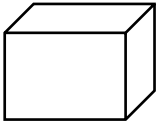
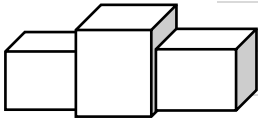


Figure 42 Content of Convex, Solid and Fragmented Voids Models

The next table (Table 8) presents the list of some formal spatial properties already extracted from CV and SV 3D solid representations. Fragmented Voids model even though previously theoretically developed was not practically applied. The specific choice of the properties to be approached is extracted from the theoretical findings already done by other researchers on attributes that are intended to be approached.

Table 8 Some of possible properties extracted from CS, CV and SV models

| Model Approximation                                                                 | Short Name                          | Long Name                                           | Properties                                                                                                                                                                                                     |
|-------------------------------------------------------------------------------------|-------------------------------------|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <b>CS_Id</b>                        | Convex Space ID                                     | ID attributed to Convex Space                                                                                                                                                                                  |
|                                                                                     | <b>CS_Thresh</b>                    | Convex Space Threshold                              | Convexity Thresholds defined by user for unification of triangles into CS                                                                                                                                      |
|                                                                                     | <b>CS_Option</b>                    | Convex Space Option                                 | Type of Convexity chosen by user for unification of triangles into CS due to function of superiority (such as fatness, compactness, squareness, or their combinations fatness*compactness, fatness*squareness) |
|                                                                                     | <b>CS_Area</b>                      | Convex Space Area                                   | CS Area calculated from the area of all belonging triangles                                                                                                                                                    |
|                                                                                     | <b>CS_Per</b>                       | Convex Space Perimeter                              | CS Perimeter calculated as length of 3D circumferential polyline                                                                                                                                               |
|                                                                                     | <b>CS_Circ_Diam</b>                 | Convex Space Circle Diameter                        | Diameter of the biggest circle inscribed inside CS                                                                                                                                                             |
|                                                                                     | <b>CS_F_Cast</b>                    | Convex Space Flow Cast                              | ID of Flows which belong to CS                                                                                                                                                                                 |
|                                                                                     | <b>CS_Fac_Cast</b>                  | Convex Space Façade Cast                            | ID of Facades which belong to CS                                                                                                                                                                               |
| <b>CS_SV_Cast</b>                                                                   | Convex Space Solid Voids Cast       | ID of Solid Voids to which the CS belongs           |                                                                                                                                                                                                                |
|    | <b>F_ID</b>                         | Flow IDs                                            | ID attributed to Flows (lines which link permeable CS edges to CS centroid)                                                                                                                                    |
|                                                                                     | <b>F_Length</b>                     | Flow Length                                         | Flow Length calculated in 3D                                                                                                                                                                                   |
|                                                                                     | <b>F_Inclin</b>                     | Flow Inclination                                    | Flow inclination calculated in XZ plane                                                                                                                                                                        |
|                                                                                     | <b>F_CS/CV/SV_Cast</b>              | Flow Convex Space / Convex Void / Solid Void Cast   | ID of CS / CV / SV to which the Flow belongs                                                                                                                                                                   |
|  | <b>Fac_ID</b>                       | Facade IDs                                          | ID attributed to Facades                                                                                                                                                                                       |
|                                                                                     | <b>Fac_Height</b>                   | Façade Height                                       | Façade Height calculated from front orthographic projection                                                                                                                                                    |
|                                                                                     | <b>Fac_Area</b>                     | Façade Area                                         | Façade Area above the topography mesh                                                                                                                                                                          |
|                                                                                     | <b>Fac_Width</b>                    | Façade Width                                        | Façade Width calculated from top orthographic projection                                                                                                                                                       |
|                                                                                     | <b>Fac_Proportion</b>               | Façade Proportion                                   | Façade Width / Length ratio                                                                                                                                                                                    |
|                                                                                     | <b>Fac_CS/CV/SV_Cast</b>            | Façade Convex Space / Convex Void / Solid Void Cast | ID of CS / CV / SV to which the Façade belongs                                                                                                                                                                 |
|  | <b>CV_Id</b>                        | Convex Void ID                                      | ID attributed to Convex Voids                                                                                                                                                                                  |
|                                                                                     | <b>CV_Avg_Height</b>                | Convex Voids Average Height                         | CV Extrusion Height calculated from the heights of belonging facades (averaged, weighted average, minimum, maximum)                                                                                            |
|                                                                                     | <b>CV_SkyVF</b>                     | Convex Void Sky View Factor                         | CV Sky View Factor calculated for number and length of shots defined by user                                                                                                                                   |
|                                                                                     | <b>CV_Compactn</b>                  | Convex Void Compactness                             | CV Compactness is ratio between the horizontal area of CV and the area of a circle with the same perimeter.                                                                                                    |
|                                                                                     | <b>CV_Openness</b>                  | Convex Void Openness                                | CV Openness is percentage of open spatial boundaries                                                                                                                                                           |
|                                                                                     | <b>CV_Fac_Per</b>                   | Convex Void Façade Perimeter                        | Perimeter of all Facades that belong to CV                                                                                                                                                                     |
|                                                                                     | <b>CV_Fac_Area</b>                  | Convex Void Façade Area                             | Area of all Facades that belong to CV                                                                                                                                                                          |
|                                                                                     | <b>CV_Fac_Number</b>                | Convex Void Façade Number                           | Number of all Facades that belong to CV                                                                                                                                                                        |
|                                                                                     | <b>CV_SV_Cast</b>                   | Convex Voids Solid Voids Cast                       | ID of SV to which the CV belongs                                                                                                                                                                               |
| <b>CV_Fac/F_Cast</b>                                                                | Convex Voids Facades and Flows Cast | ID of Fac / F which belong to Convex Voids          |                                                                                                                                                                                                                |
|  | <b>SV_Openness</b>                  | Solid Void Openness                                 | SV Openness is percentage of open spatial boundaries                                                                                                                                                           |
|                                                                                     | <b>SV_Entrances</b>                 | Solid Voids Entrances                               | Number of locomotive links entrances leading towards SV                                                                                                                                                        |
|                                                                                     | <b>SV_Fac_Per</b>                   | Solid Void Façade Perimeter                         | Perimeter of all Facades that belong to SV                                                                                                                                                                     |
|                                                                                     | <b>SV_Fac_Number</b>                | Solid Void Façade Number                            | Number of all Facades that belong to SV                                                                                                                                                                        |

## 4.2. Field-based Representation of UrbArch emptiness

Open Public Spaces overcome their urban and architectural limits, through their UrbArch Emptiness which allows for the further spatial apprehension providing basis for cognition, movement, reactions, etc.<sup>42</sup> As an unobstructed field of built environment, it allows for visual perception, thus opens a channel for place, landscape and space comprehension. Through the field of unbuilt cities' areas, Open Public Spaces go beyond their direct urban and architectural limits. This means that apart from grounding Open Public Spaces representation on UrbArch emptiness as possibly **solidified Object**, we approached it taking into consideration its quality of **unbuilt Field** essential for enabling **visual and experiential appropriation of Open Public Space**.

In our conceptualisation, thanks to UrbArch emptiness which provides visual continuity, **Open Public Spaces** incorporate three notions of **place, landscape and space** commonly separated by human geographers:

- The first moulding element of an Open Public Space is defined by quality of the **place** in which that space is inscribed. Different topographies render different preconditions for place development. In that sense, apart from urban and architectural limits, **topography** also starts playing the important limitation role<sup>43</sup>.
- The second moulding limit of an Open Public Space is the landscape, which is defined as environment seed from a place. It accounts for broader topographical conditions,

---

<sup>42</sup> If we use Epicurus' analogy, we can deem that the essential quality of UrbArch Emptiness is its necessity as an interval. He says in his Letter to Herodotus: "If there was not what we call emptiness, intangible space and nature, the bodies would not have where to be or where to move" (Ribas i Massana, 2008, p.5.).

<sup>43</sup> "In the hemicycle of most of Greek theatres like Epidaurus, Priene or Syracuse...the emptiness represented by the surrounding landscape the horizon, constituted by land or sea, virtually completes the absent half of the complete form of the circle, which missing part has been intentionally left to the invisible attending of the gods" (Pinto, 2010, p.48).

which do not directly define an Open Public Space but mould its **UrbArch emptiness'** **field** and in that way shape visual, cognitive and experiential reading of Open Public Space. UrbArch Emptiness and its capacity to visually convey perception towards landscape reveals its importance in the phenomenological dimension of urban and architectural places whose experience is inseparable from the **landscape** they are inserted in.

- The third limit of an Open Public Space relates to the notion of **space** which is the furthest limiting boarder. This boarder is linked to the possible perception of horizon due to the earth curvature. This outermost reachable perceptual limit depends on shape of landscape which allows or not for reaching the horizon.

**To summarize**, apart from being completing element of experience of urban-architectural **place**, UrbArch emptiness through provided expansion of visual field and extension; becomes the very core of **landscape** experience which by reaching the horizon leakage towards the **space** grasping. It accounts for urban-architectural, but also for the landscape limits. Moreover it englobes the notion of abstract space through apprehension of horizon as the furthest outmost limit one might reach.

Apart from the novel methodology on Convex, Solid and Fragmented Voids there are other types of analyses that can explain us how shape and form of UrbArch Emptiness as Field (visual) is influencing the formation of Lisbon's image, from inside and outside the Riverside area – isovist and viewsheds. Here we made a general introduction to these methodologies which are further applied to capturing Natural Advantages of case studies of Lisbon Riverside.

**Isovist** as a method explain us what we can see from different spatial points and how far our sight can go. Defined as a field of view, isovists are showing what enclosure of space is and what the obstacles are interfering our views (Morello and Ratti, 2009).

Similar to isovist, in field of landscape architecture and planning, the concept of **viewshed** has been developed. While isovist represents the space that can be 'overviewed', viewshed show the objects and parts of the objects that are visible from specific spatial point (Weitkamp, 2011a).

## **Isovists**

Based on analyses of visual fields spread from a particular point, the method which is usually used to capture visual qualities of a place are *isovists* (Benedikt, 1979). Defined as a field of view, isovists show how places are enclosed and how obstacles are interfering with our sights (Morello and Ratti, 2009). These fields of view are sometimes round and convex showing the compact visual amplitude. Sometimes, the isovist field is very concave indicating various openings which rip the homogeneity of place's view field. That is why we have 'star-like' isovist. Regarding qualities of views from a single point, the investigations on isovists usually account for several first-order measures such as: isovist area, perimeter, number of vertices, isovist openness (length of open and closed edges) but also for integrative characteristics such as jaggedness (Wiener), roundness (Meilinger), vertex density (Franz, 2005). The method is also shown to be suitable for description of spatial properties which emotionally affect spatial experience (Franz, 2005).

In *isovist* theories, the qualities which address existence of interchangeably shallow and profound views are addressed by measures of spikiness and jaggedness. Jaggedness is proposed by Franz to capture the quality of spikiness of the view and it accounts for *isovist* perimeter and *isovist* area ( $isovist\ perimeter^2/area$ ) which he finds important "since both a jagged spatial profile and large visual areas were tendentially rated to be more pleasing" (Franz, 2005). *Spikiness* is a mean length of all of *isovist* radials measured at specified intervals (for example every one-degree)(Conroy Dalton and Dalton, 2001a). The other measure proposed by a theory exploring *isovist's*

profundness is occlusivity or “length of occluding boundaries within the *isovist*” (Batty, 2001). There are also properties called maximum and minimum radial lengths which account for the biggest and smallest profundness of the *isovist* from the standing point and account for the experiential contrast of profundness of views that a certain place provides.

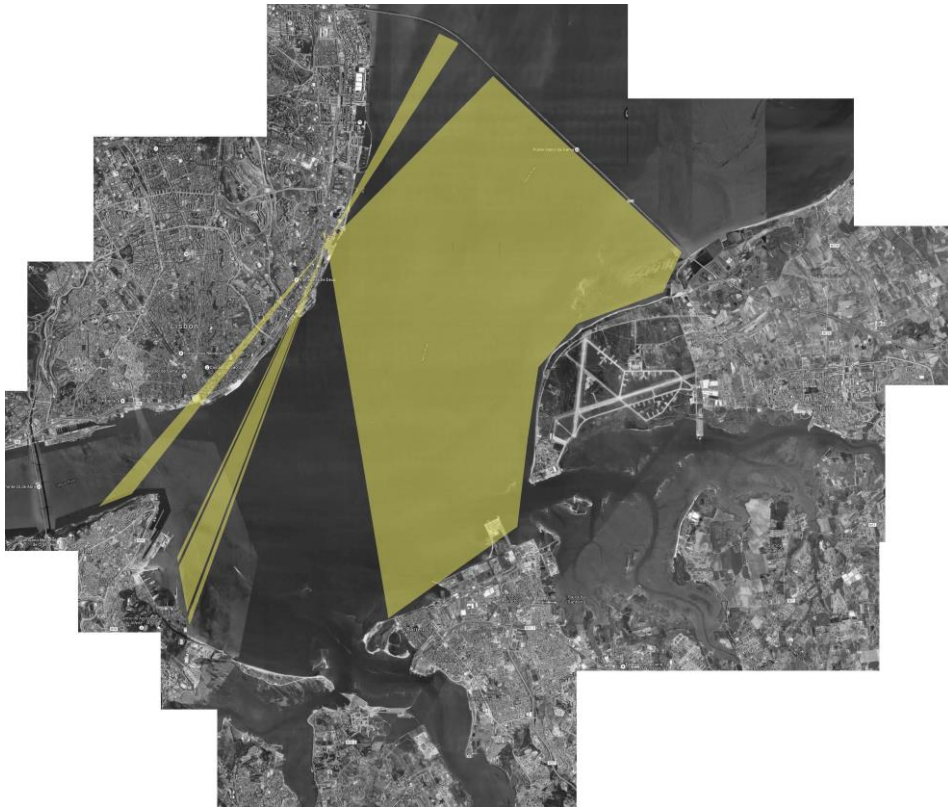


Figure 43 Isovist from Poço do Bispo



## Viewshed

*For the viewshed: "(T)he visible area is determined by defining one location as the viewing point and then calculating the line-of-sight to every other point within the area of interest (target points). If the land surface rises above the line-of-sight, then the target is out-of-sight, and otherwise it is in-sight" (Fisher, 1996, p.1297, par.3)*

This analysis gives us together with the isovist methodology gives us an overall idea about the size of the view field a certain place offers (Figure 44). While the isovist show the size and shape of the body of view, viewshed explains the size and shape of ending surface in which a view lands on the landscape. For application of these two methodologies see **section 6.1** in which we applied them to grasp properties of Natural Advantages of Open Public Spaces deemed important from users in the next chapter.

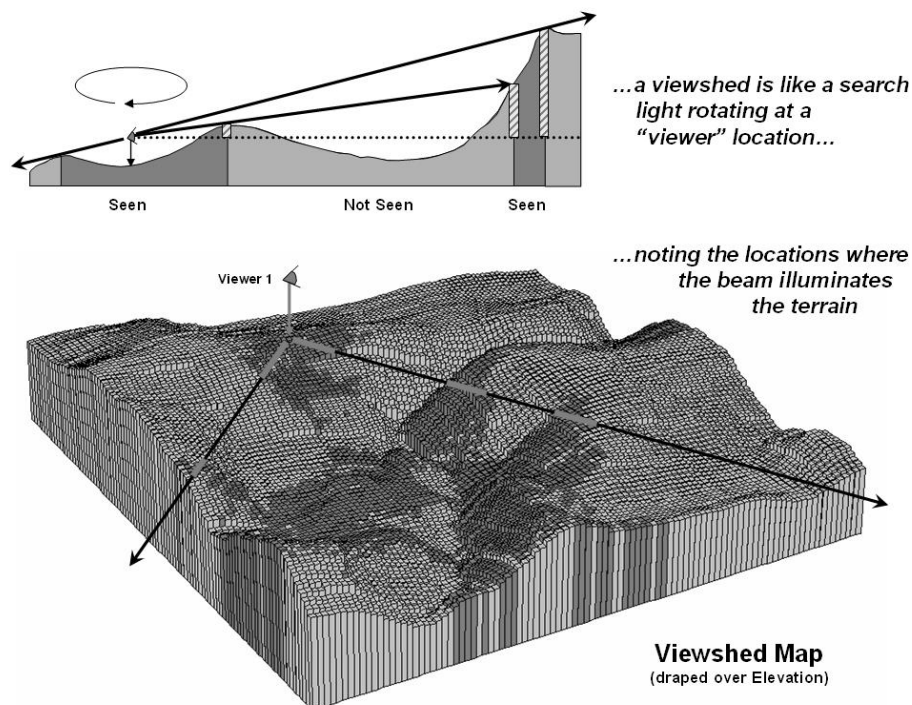


Figure 44 "Calculating a viewshed" from <http://www.innovativegis.com/basis/mapanalysis/topic15/topic15.htm> accessed on 22.12.2016

### 4.3. Conclusions on Representation Models

As presented in the previous sections, the two main models types adopted for representation of open public spaces unbuilt part are **3D solid representation** (Convex, Solid and Fragmented Voids) and **view-field based representations** (Isovist and Viewsheds). These two representation types are intended for addressing different levels of open public spaces analysis. As demonstrated in the **chapter 6, 3D solid representations** are proved useful for observation of structuring of open public spaces on urban-architectural level, while **view-field** based ones are shown advantageous for comprehension of natural and geographic level. Moreover, due to continuity between urban-architectural and natural-geographic level, the view-field based representations when developed with more detailed can also be applied on urban-architectural scale.

Apart from usage presented in the study, there are other possible applications of 3D Solid representations. The capacity of the Convex, Solid and Fragmented preserve data about belonging facades, flows, topography but also to receive additional semantic and descriptive data can be useful for information comparison and overlaying allowing for diverse multidimensional analyses. These representations, as compartmentalised thus optimised carriers of different data, can be embedded in other data systems allowing for faster data search, storage and management.

At this stage of the research, the presented and applied representation models are used only for capturing few open public space attributes and qualities. Some further investigation ought to be done on analysis of UrbArch Emptiness in various urban and architectural layouts which were outputs of different historical, cultural and ideological contexts. In that manner, a more extensive analysis would be done, thus more general conclusions could be drawn. Moreover, it would be interesting to approach UrbArch Emptiness in additional urban and architectural contexts, wherefrom other specificities would emerge, thus different attributes and qualities would be framed.

*This page intentionally left blank*

*This page intentionally left blank*

## 5. Open Public Space Attributes

The following chapter is the output of **Application Objective 2 AO.2**.

The chapter is partially published in international peer-reviewed scientific journal AR journal under the title: *“Open Public Space Attributes and Categories - complexity and measurability”* (for more information see Annex)

As a goal, this chapter has definition of object of research - Spatial attributes relevant in generating qualities of nowadays Open Public Space. Since the successful usage of public space is an overall goal of thesis we used a survey directed to users for completing the imperatives' list pre-defined through literature review giving like that a social fidelity to our point of view (Figure 45). We conducted a survey directed to users where from we gathered attributes of Open Public Space that are deemed important by users. These were confronted with attributes of Open Public Space extracted from literature review producing a holistic list. Further, Open Public Space properties were categorized and used as directional inputs for development of the research.



Figure 45 Chapter main objective

Humans and space are the primal focus of architectural and urban practices. Spatial attributes and categories are their substantial elements - both in an analytic and synthetic sense. Our discussion about open public space as understood by its users

has two main aims. The first is to inform about important concepts that permit a better understanding, reasoning and discussion on the phenomenon of public space. The second is to systematise its attributes and categories and discuss their measurability in order to inform and support further spatial planning, design and assessment.

We employed a user-based approach to gather that information so we could conjoin imperatives important to experts and to users (Figure 46). We used a survey-based methodology (section 5.6) that helped us to better understand what users are looking for in public space. From the users' responses, we collected 500 spatial imperatives (section 5.7) that we systematised in 30 attributes (section 5.9). Through data coding, we discussed attributes' categories and their disciplinary levels (section 5.10) useful for understanding the nature of spatial attributes and their measurability (section 5.11, 5.12). In this way we constructed an analytical matrix intended to be the basis for spatial analysis and assessment (Table 14). Finally, we present considerations together with some important findings (section 5.13).

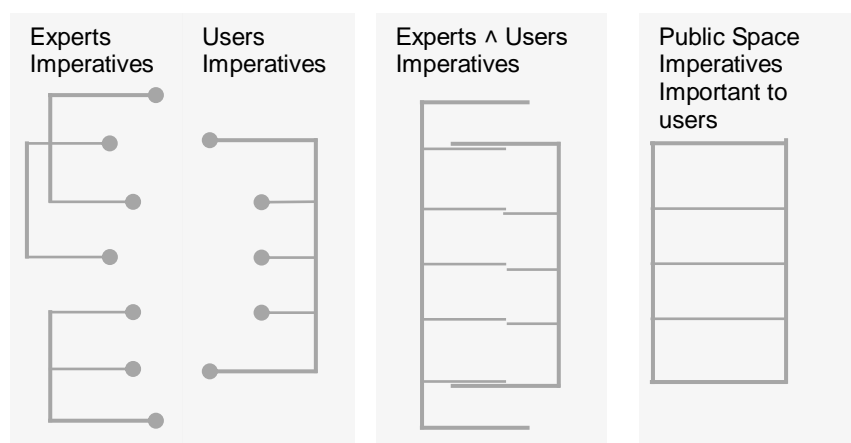


Figure 46 Completing Experts imperatives with Users'

We defined *attributes* as public space characteristics that emerge on various levels: from formal, through emotional to usage. *Categories* are approached as sets of attributes dependent on epistemological stances necessary for its comprehension. At

this moment we are not questioning any qualitative weight of proposed attributes, but preparing the theoretical bases for qualitative weighing to happen.

Since we wanted to grasp attributes and categories of public space, this gave us a chance to discuss their importance in urban and architectural reasoning (section 5.3). Moreover, we addressed the complexity and ambiguities of both: public space (section 5.4) and contemporary user (section 5.5) seeing them as opportunity for widening the focus of architectural and urban research.

We took the multileveled complexity and ambiguity within architectural and urban disciplines as an opportunity for rethinking their focus and as a challenge for adapting their practices. Contemporary users, their postmodern experiential heterogeneity (Jameson, 1985, p.8) and sensibility to problematise what is already known (Aylesworth, 2012) are understood to be a good source of information as well. Since the ultimate goal of our research is to improve usage of public space the decision to run a survey directed to users ensured that our perspective is socially informed. In this context, we took advantage of the uncertainty of spatial paradigms and complexity and heterogeneity of postmodern human. They become the starting point for our research on Open Public Space attributes and their categories.

## **5.0. Abstract**

Within the field of architectural and urban research, this work addresses the complexity of contemporary public space, both in a conceptual and concrete sense. It aims at systematizing spatial attributes and their categories and discussing spatial complexity and measurability, all this in order to reach a more comprehensive understanding, description and analysis of public space.

Our aim is to improve everyday usage of Open Public Space and we acknowledged users as its crucial factor. There are numerous investigations on the complex urban

and architectural reality of public space that recognise importance of users. However, we did not find any that would holistically account for what users find essential in public space.

Based on the incompleteness of existing approaches on Open Public Space and the importance of users for their success, this paper proposes a user-orientated approach. Through an initial survey directed to users, we collected the most important aspects of public spaces in the way that contemporary humans see them. The gathered data is analysed and coded into spatial attributes from which their role in the complexity of Open Public Space and measurability are discussed.

The work results in an inventory of attributes that users find salient in public spaces. It does not discuss their qualitative values or contribution in generating spatial realities. It aims to define them clearly so that any further logical argumentation on open space concerning users may be solidly constructed. Finally, through categorisation of attributes it proposes the disciplinary levels necessary for the analysis of complex urban-architectural reality.

**Key words:** Open Public Space, spatial attributes, spatial categories, contemporary user, user-based approach

List of countries mentioned in the paper:

Serbia, Austria, Germany, France, Portugal, England, Poland, Italy, Belgium, Slovenia, and Ireland



## 5.1. Introduction



Figure 47 Emerging public space in Lisbon Riverside

Historically inherited concepts such as squares, gardens, courtyards or streets are not enough to cover the variety of places acquired by urban development today and gradually appropriated (or neglected) by urban habitants. There are several notions that describe the complexity of contemporary city circumstances such as invaded space, incidental space, consumption space, public-private space. Spatial attributes such as scale or proportion that were focused by urban theories over centuries are losing their importance. Other things matter.

Strategies that are being used in architectural research have employed various epistemological stances, from objective positivism through realism to interpretivism because “architecture – as well as most design and professional fields – entails such broad multidisciplinary qualities” (Groat and Wang, 2013, p.27, par.1). A literature review concerning the question of open urban and architectural space attributes shows that different authors have been focusing on different spatial aspects. They analyse reality on various levels of conceptualisation such as objective, phenomenological or cognitive, and on various levels of abstraction, such as concrete-formal or abstract-cultural. On the cognitive individual level we can find Lynch’s: *legibility* as the easiness with which the parts can be recognized and organised into a coherent pattern, *imageability* as a quality of space in evoking a strong image to observer (Lynch, 1960). There are collective ones, namely Untaru’s cultural planning imperatives: *local identity*, *sense of place*, *place identity* and *perceptual unity* (Untaru, 2002, p.172). Differently, on

a more formal level we find Oliveira's urbanity revealed through *high accessibility, high density, high diversity* and *high continuity* (Oliveira, 2013, p.22). On the practical and usage concerned level authors found that *liveability, comfort, security* and *safety, shelter* and *protection* are crucial for Open Public Spaces' success (Francis, 1987). Thompson argues that 21st century open space should respond to new lifestyles, values, attitudes to nature and sustainability such as *green networking* linking urban with recreational area, better *accessibility* responding to ageing demographic trends (Thompson, 2002, p.60).

This register of spatial demands emphasises a wide spectrum of aspects focused by the contemporary urban and architectural agenda. Nevertheless, when we started the research and defined our intentions, we needed to recognize within existing theoretical frameworks, one that is valuable, satisfactory and suitable. If that happened, the central categories and attributes would have been defined accordingly. However, it is different when we do not recognize within the existing theoretical body, the satisfactory framework or when we try to observe an unknown phenomenon or the known one but from a different standpoint. Since this was the case we needed a more proactive recognition of categories. It was the very lack of the comprehensive understanding of users' imperatives which prompted our research to be user-based.

## **5.2. Problem statement**

Due to the diversity, complexity and schizophrenic use of public space it is challenging to identify spatial and usage qualities and their relationships from simple observation. In the postmodern world of stylistic diversity and heterogeneity (Jameson, 1985) it is difficult for urban and architectural practices to rely on any previously determined direction. There are no known styles that could normatively ensure the *success* of urban and architectural projects.

Here presented analysis finds its motivation in three main issues: the importance of understanding space, its attributes and categories (section 5.3), the complexity and ambiguity of Open Public Space (section 5.4) and the opportunity for urban and architectural practices to focus more intensively on their users (section 5.5).

### **5.3. Importance of Spatial Attributes and Categories**

The notion of space is widely discussed both in contemporaneity and over history by philosophers, scientists, sociologists, geographers, psychologists, and neuroscientists. Each of them found that space is an important factor of human reality, inseparable from his nature. All philosophical doctrines and physician's theories have questioned it, revealed and refined it. In its disclosure they were searching a possibility for approximation towards human nature itself. Acknowledging its importance in various disciplines, it is rather redundant to emphasise its weight in urban and architectural practices.

Despite being permanent and ever-present, conceptualisation and analysis of space are far from being stable and finished. They are constantly being moulded. Looking for attributes and categories of open urban spaces is in a way similar to defining the first principles in logical argumentation. They should be clearly derived avoiding a "muddled reasoning" (Groat and Wang, 2013). In that sense, conceptual building blocks should tend to be irreducible, clearly demarked and not overlapped with each other (ibis.p.380, par.7.). To have clear concepts means not only that they do not overlap but also that there is no need for additional ones (ibid.p.383, par.1). The importance of spatial attributes and categories is their construction capacity and they should be seen as "building blocks by which, or upon which, broad explanatory theories can be constructed" (Groat and Wang, 2013, p.379.,par.2).

We can see attributes and categories as temporary snapshots of human mental representations that are in permanent evolution as well. For example, attributes of

*colour and light* are dependent on other qualities, such as *material* or *atmosphere*, and thus could be seen within the boundaries of these categories. Similarly, the presence of *electrical vehicles* can be seen as belonging to either a category of *accessibility* or *sustainability*. All these concepts are part of the complexity of our surrounding reality. Each attempt to organise or systematise reality is a process of simplification which neglects some aspects emphasizing some others. In fact, the goal of science is to find the simplest explanation for the observing phenomenon by eliminating the superfluous data – notice. Codifications are thus processes that tend to abstract reality in a meaningful way so the same can be reasoned, discussed and explained. Depending on our point of view attributes can belong to one or to some other complementary sets. Since our approach emphasises users as factor of open space success it is within user-based methods and user-substantiated data that we looked for rules for data organisation and systematisation.

#### **5.4. Ambiguity of Public Spaces**



*Figure 48 Emerging public usages in Lisbon Riverside*

Apart from conceptual issues, there are essential changes in the way urban spaces are being generated and used. As Giulia Setti claims, nowadays public spaces are losing firm boundaries of formal and functional definition. Fragmentation and disintegration of urban fabric leads to the emergence of new public spaces and to the need for the reformulation of their existing concepts (Figure 48). Classical notions such as gardens, squares and streets are no longer enough to describe open urban spaces. A new semantic order is needed (Setti, 2013). Due to deindustrialisation, urban dispersion and unclearness about land ownership, new possible spaces for new possible usages have been gained.

Mitchell claims that *public space* which has been crucial in the city development over centuries faces the rising sense of fear and mistrust. Not only regarding formal appearance but also regarding content, utility and social practices, contemporary public spaces are being widely discussed. Commercial centres, designated as pseudo-public spaces, hidden behind an idealised image of *agora*, are actually promoting interactions that are carefully planned and performances designed only to sell. Shaped as theatres, corporate plazas, library grounds and festive marketplaces, they are narrowing the list of the users of the public spaces. In doing so they are filtering the social heterogeneity, and producing the unreal image of middle class homogeneity protecting it from the homeless people and poverty that can be found in traditional public spaces (Mitchell, 1995, pp.116-120).

Optionally, trying to avoid the ambiguous notion of *public space* some authors suggest the notion of *open space* which has non-political and non-civic function, but that serve to separate functions, open up distance between buildings, allow penetration of sunlight and greenery, as one where we can find all kinds of actors and social interaction (Mitchell, 1995). Not trying to literally provide places for extensive social contact, their usage differs from the functionally and ideologically predefined political

public spaces allowing to different actors to meet on a *common live stage* (ibid.). Other authors have extended the notion of public spaces by using terms such as *relational spaces* and *shared places* (Setti, 2013). To define our disciplinary framework and define our standpoint more precisely we will use *Open Public Space* which covers all the spaces that are possible to be commonly used and not always formally or functionally planned or predefined.

### **5.5. Opportunity for refocusing urban and architectural practices on users**



*Figure 49 Santa Apolónia, Lisbon*

In “The use of pleasure”, Foucault argues that “subjectivation is a formative power of the self, surpassing the structures of knowledge”. He defends the postmodern sensibility as a condition of human to problematise the conditions of life, which allows

him to think differently instead of accepting what is already known. Without the subjective sensibility that surpasses reason, thought would be inert (Aylesworth, 2012). Jameson describes that postmodernist experience of space and time within the emergent social order of late capitalism has some new specificities. Defining nowadays subject Jameson emphasizes two of its features: “pastiche and schizophrenia”, where “pastiche” concerns the way space is being produced and “schizophrenia” the way it is being received. For a schizophrenic contemporary person there is no temporal continuity, human time, past, present, memory. What it is lived today is perpetual present as an isolated, disconnected, with temporal continuity that breaks down, “the experience of the present becomes powerfully, overwhelmingly vivid and material” (Jameson, 1985, p.8).

Facing the mentioned changes of built environment and way it is being experienced and used, architectural and urban professions are given an opportunity for rethinking their focus and a challenge for adapting their practices. This richness of emerging spaces and personal experiences are valuable layers of contemporaneity which should be captured, analysed and used.

## **5.6. Methodology**

As mentioned above, our analysis recognises the need for a redefinition of Open Public Spaces. We use it as an opportunity for widening the focus on urban and architectural practices by considering users as their most important factor. We based our methodology on two poles: the lack of comprehensive urban and architectural approaches on Open Public Space regarding users and the importance of users for public space success. In that regard, we conducted qualitative questionnaire-based survey with three-levelled coding that enabled a certain generalisation of findings. The survey was directed to users of public space and focused on both eastern and western European cultural contexts. We chose to run the initial survey for various reasons:

1.the importance that we believe that user has, 2.spatial dynamics and time compressing that are constantly influencing urban and architectural paradigms, 3.the belief that humans share important ideas which are as valuable as ones that experts are pointing out.

Our goal was to understand what and how people talk about public space. What do they look for in physical, social and emotional senses. The employed qualitative questionnaire-based methodology was directed to the users of public space and had two principal phases: data gathering and data analysis (Table 9). Data was collected through two main open-ended questions that gave us complex data and allowed us to carry out in-depth analysis. From all the answers we collected 500 public space imperatives that users found most salient (section 5.7). After systematizing them into attributes (section 5.9), we analysed and coded them into spatial categories (section 5.10). Finally, we observed and discussed the measurability of the obtained attributes (section 5.12).

*Table 9 Research phases, methods and outputs*

| Research Phase | Method                        | Output                        |
|----------------|-------------------------------|-------------------------------|
| Data gathering | Inquiry-based survey          | 500 imperatives from 51 users |
|                | Coding by systematisation     | 30 public space attributes    |
| Data analysis  | Coding by disciplinary levels | 6 space categories            |
|                | Coding by word types          | Possible measuring approaches |

Our qualitative approach, rather than trying to make generalisations, favours the understanding of complexities (Marshall, 1996, p.524). As Marshall points out an appropriate sample size should be established dependent on what would best answer the research. Our sample size was defined through data saturation – “recognition of the moment when during the development of study “new categories, themes, or explanations stop emerging from the data” (ibid.p.523, par.3). We suspected that open-ended questions would gather too many data which would be difficultly in-depth



analysed and decoded. However, this doubt was overcome when necessary data saturation was reached when we got 300 answers, from the reasonably small sample size, around 30 participants. However, some age groups were reinforced so the final number of respondents increased. In total, the initial survey was conducted to 51 persons. Our respondents came from mostly European context. They came from various cities and usually lived in more than one. We got responses from inhabitants from Serbia, Austria, Germany, France, Portugal, England, Poland, Italy, Belgium, Slovenia, and Ireland. Survey's open questions allowed to the users to choose whichever word or words' group in their explanation of expectations regarding open urban and architectural spaces. From those we got 500 responses that were further analysed, coded and presented further ahead.

### **5.7. Data gathering**

The decision to conduct the initial survey online came along with the intention to collect general users' ideas and ideals without pointing to any specific object of analysis. They were asked to reflect on their interiorised cognitive and emotional images and mental schemas. Users had to recall memories and re-experience them again dragging to the surface their idealised categories and values. Rationalist social anthropologist Edmund Leach highlighted the importance of these inner ideas as a *structure behind* what happens in reality. By understanding verbal and not verbal communication one could reach what is beneath the obvious. The relationship between inner ideas and visible reality is similar to musical score and its interpretation. Score is the *cause* of what happens and it is within this *cause* level that the social reality *exists* (E. R. Leach 1976). Leach discusses that if we are willing to get to the musical score it is necessary to overlap several interpretations of it. Our survey was a method of *listening* to the individuals' thoughts about open spaces. By using it, we wanted to make an

approximation towards underpinning truth about what people think in open urban and architectural spaces matters.

The proposed survey captured general imperatives that people ascribe to open spaces. It was exploratory, aiming to understand the spectrum of themes that contemporary users find essential for the usage of public space. It did not point the importance of any specific spatial quality or aspect. The principle was not to limit or direct answers. Questions were open allowing users to answer freely without an imposed direction. Apart from respondents' identification questions that were of multiple choice type, the survey used an open-ended question type. However, we suggested that a *maximum of 10 expectations* should be indicated. The survey was based on two key questions:

1. What should an outdoor public space be like and what should it offer?
2. What sensations and experiences do you seek when you go to an outdoor public space?

Our intention was to make an overall collection of spatial attributes not tending to compare their relative importance meaning that attribute of *heritage*, for example, even though chosen by only two respondents was incorporated in our inventory. Similarly, the attributes of *crowding*, *centrality* and *publicness* were also mentioned by only 2 persons and *openness* and *social diversity* by 3. The importance which experts are giving to these attributes made us believe that they anyhow should be incorporated into our matrix.

## **5.8. Data analysis - From data coding to spatial attributes and categories**

In order to analyse obtained data it was necessary to construct a coding frame. We had the notion that in choosing our codification framework we would neglect some information from our rich data. Oppenheim argues that by "imposing set of classificatory categories ... on a very much larger and probably very varied set of

responses, we are inevitably going to lose information” (Oppenheim, 1992, p.267, par.3). Thus, the coding frame was constructed in a way that preserves everything we initially deemed as important and valuable to extract.

Going back to the main goal of the analysis - to systematise spatial attributes, find their categories and understand their measurability and role in the complexity of space – we defined that the coding frame should:

1. Separate responses that are at different levels of abstraction / epistemological levels (See section 5.9)
2. Emphasise disciplinary levels that are concerned with particular attributes (See section 5.10)
3. Inform us about nature of data and possible way for its analysis (See section 5.11)

The process of codification was therefore done in three stages. Each of them allowed us step forward towards a better understanding of the data and phenomenon of Open Public Space itself. The three stages were:

1. Systematisation of 500 imperatives into 30 attributes taking into consideration their levels of abstraction (5.9)
2. Coding by disciplinary level allowing the categorisation of discovered attributes (Section 5.10)
3. Coding by types of words unveiling the attributes and possible approaches for its measurability (Section 5.11)

## **5.9. Coding by systematisation of data – towards attributes**

We started the codification by putting together the related survey responses. While doing so we were careful to preserve their distinct level of abstraction. This could be explained through the example of *leisureliness of space*. The *leisureliness* could be observed from different epistemological stances. One tends to be objective and it

concerns formal *equipment* intended to support *leisure*. The other one is *leisure* seen as human *behaviour*. This distinction is important because it informs us that these two attributes should be analysed differently. Moreover, once we separate them it is possible to observe their interrelation. We could analyse for example if the *equipment* is a real affordance of *leisureliness* or, if there are other factors more influential in generating this spatial usage. Affordance here is used as latent possibility of environment to embrace a certain action and it is also dependent on the capacity of the actor himself. We can speculate that for instance *publicness of space* might be more influential in inspiring *leisure* behaviour than existence of *equipment* itself. This process of grouping similar responses led to the 30 attributes (See Table 14). We could have reduced this number, but it would have removed some nuances of space that we regarded as important. The labelling of attributes took into consideration the literature review. We tried to use terminology that already exists in science. After having discovered the attributes, we proceeded with their categorisation.

## 5.10. Coding by disciplinary level – towards categorisation



Figure 50 Disciplinary frameworks and levels of research

The initial data simplification and discovering 30 important spatial attributes led to the second codification phase. The aim was to organise attributes in categories according to their different *disciplinary frameworks*. We proposed this coding frame which accounts for disciplinary levels in order to understand where urban and architectural

practices should broaden their focus. This finding can also be useful for starting interdisciplinary research.

*Table 10 Disciplinary levels and corresponding users' responses*

| Geographical and Nature Level<br>- Contextual Predispositions- | Urban and Architectural Level<br>-Building Actions- | Social and Personal Level<br>-Human Behaviours- |
|----------------------------------------------------------------|-----------------------------------------------------|-------------------------------------------------|
| 'Good View'                                                    | 'Built with natural materials'                      | 'Comfortable and Pleasant'                      |
| 'Within Urban Area'                                            | 'Good information and directions'                   | 'Multiple uses'                                 |
| 'Natural Viewpoint'                                            | 'Broad/Large /Spacious'                             | 'Interesting, intense and unique experience'    |

In that regard, we observed how imperatives of open space pointed out by users could be either within the a) wider geographical and nature level, b) urban and architectural level or c) social and personal (Table 10, Table 11). The first level (geographical and nature) is seen as a contextual background where the second level (urban and architectural) is inscribed so that the third one (social and personal) could emerge. Said differently, ecological and nature predispositions together with suitable urban-architectural actions are receiving, shaping and inspiring social and personal behaviour.

*Table 11 People - in - place complexity*

|                               |                       |
|-------------------------------|-----------------------|
| Geographical Level            | Geographical ensemble |
| Urban and Architectural level |                       |
| Individual level              | Human dimension       |
| Behavioural level             |                       |
| People – in –place            |                       |

Users did not make a distinction between a naturally pre-inscribed level and an architecturally created one. Rather, in users' responses these two levels are mingled together in what Seamon calls *geographical ensemble* (Table 11) and includes both natural and human-made dimensions (Seamon, 2012). The same author groups social

and individual behaviour into *human dimension* that together with the notion of *geographical ensemble* he calls *people-in-place* (Figure 50). This way he expands the notion of separated human agency towards a notion of humans as they are “unfolding in the geographical ensemble” (Seamon, 2012, p.12, par.1). Using the mentioned disciplinary distinctions we organised attributes in 6 categories that emphasise the disciplinary levels (Figure 51).

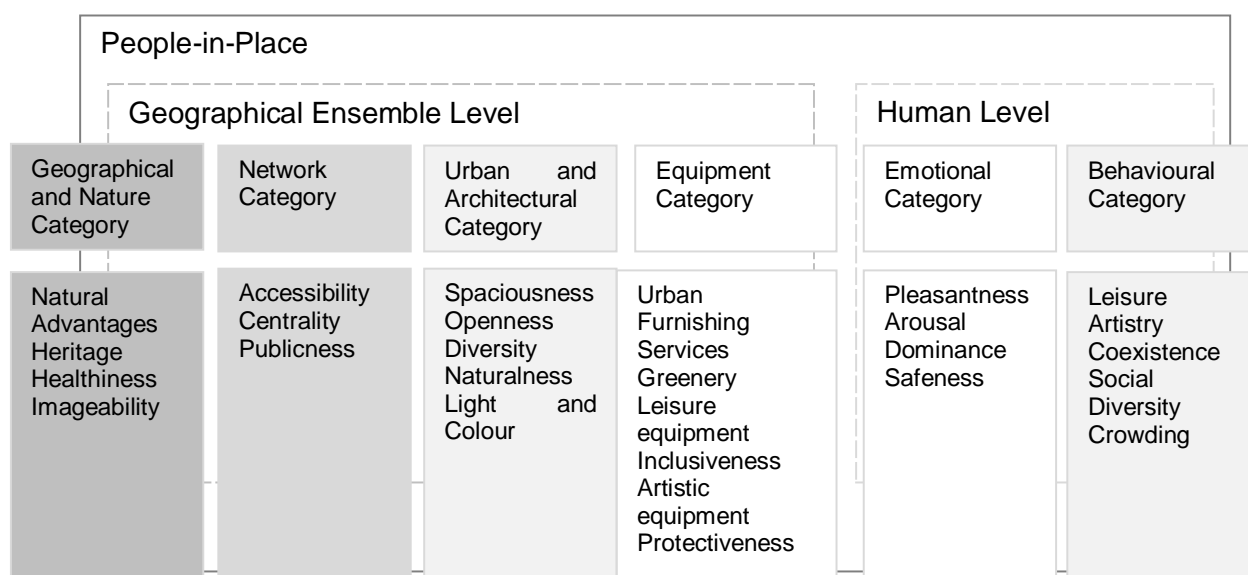


Figure 51 Spatial categories and attributes

### 5.11. Coding by types of words – towards measurability

The open questions that we used, allowed us to recognize subtle differences in word choice for specific spatial attributes. These nuances helped us understand how attributes participate in forming the complexity of places and gave us some hints about their measurability.

Our respondents used various lexical types for explaining their preferences, from nouns, through adverbs and adjectives, to verbs. We observed these linguistic distinctions trying to identify any patterns. We understood that the usage of nouns mostly indicates the demands for specific objects such as equipment, urban furniture, protection from extreme weather situations, even green areas and vegetation, etc. By

using verbs or verbal nouns, participants pointed out different services and activities which are needed in public spaces. The range of activities diverged from very generally designated ones such as social or leisure activities to very specific ones, e.g. street exhibitions, theatre, concerts, cinema, and so on. Adjectives or adverbs were usually used as qualitative imperatives e.g. clean, broad, large, quiet, safe, maintained, illuminated, etc. While adjectives and adverbs indicated the intrinsic qualities of spaces or actions themselves, propositions suggested the relationship between spaces or actions e.g. close, remote.

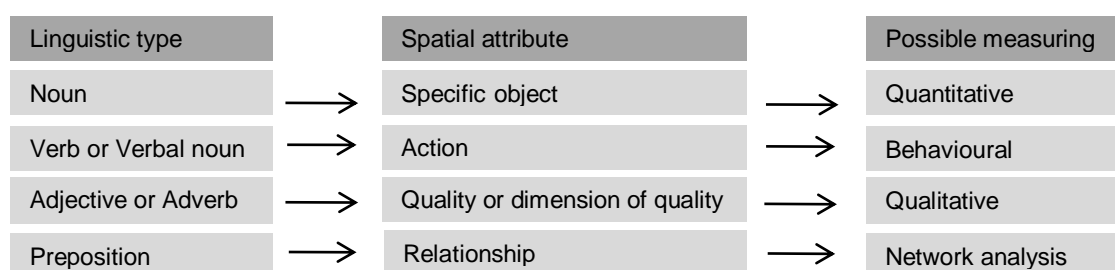


Figure 52 Linguistic types and related spatial attributes

The coding based on word type uncovered the nature of spatial attributes and how we could possibly approach them. For example we understood that the attribute of accessibility consists of a formal precondition for being accessed, expressed through nouns such as public transportation or subway, but also as the relative or topological position of the space in a network. The first part is formal and easily measurable by a simple Boolean true/false (exist / doesn't exist) expression. The second requires a network and morphological analysis.

There are attributes, mostly indicated by adjectives and adverbs, which are much more complex and thus much more difficult to understand. They are more intangible but not less important or appealing to be understood. By expressing a certain quality they reflect a personal judgment and subjectivity. Spatial attributes such as *imageability* or *pleasingness* would vary from person to person, their intellectual and bodily state. Our perception is shaped by our belief, goals, cultural background.

Table 12 Linguistic types and related spatial qualities – examples

| Type of Word                | Indication                                    | Example                                |
|-----------------------------|-----------------------------------------------|----------------------------------------|
| <b>Noun</b>                 | Specifics objects, Equipment, urban furniture | ‘Benches, drinking fountains... ‘      |
| <b>Verb or Verbal nouns</b> | Action, service or function                   | ‘Recreation, reading, photography...’  |
| <b>Adjective or Adverb</b>  | Quality of space or Dimension of that quality | ‘Quiet, amusing, relaxing, dynamic...’ |
| <b>Proposition</b>          | Relation to other spaces and spatial network  | ‘Within urban area...’                 |

An interesting and more addressed spatial attribute is *naturalness*. From a completely built manmade setting, on one side to an untouched natural environment on the other we can distinguish various *levels of naturalness*. In our conceptualisation this notion represents the relationship or proportion between human-made impact and our natural environments. As presented in Table 14 we separated *naturalness* from the attribute of *greenery*. We did so because they are on different levels of abstraction and complexity, thus they should be measured differently. While *greenery*, as trees or shrubs, can be easily counted *naturalness* cannot. The other reason for this separation is the fact that *greenery* in a city context is usually artificially planted as equipment (e.g. to shade, divide) or decoration.

Further, attributes of *protectiveness* and *safeness* are separated for the same reason. *Protectiveness* from the sun, rain or wind can be more objectively addressed than *safeness*. Even though different they are both an intrinsic parts of architectural and urban spaces - we built in order to be sheltered. In environment we can recognize various grades of *protectiveness*. From the total exposure that one feels while being in nature to the complete artificial protection one finds in shopping malls. Francis discusses that together with liveability, comfort, qualities of security; *safety*, *shelter* and *protection* are crucial for Open Public Spaces’ success (Francis, 1987). When we talk about *shelter* and *protectiveness* these qualities are linked to the basic human need for bodily protection from bad weather, rain or other extreme climatic conditions.



Differently, sense of *safety* and *security* relate towards not physical but social issues. While problems of *protectiveness* could be directly addressed by designers, the question of *safeness* is more complex and involves higher levels of spatial organisation – from government legislation and municipal policies to the decisions of condominium administrations.

### **5.12. Measurability of attributes**

We showed through our examples of *protectiveness* and *safeness* that spatial attributes are spread across different levels of conceptualisation. There are some that can be precisely defined and others that are more vague. How general or specific our observation is, will depend on how generally or specially we want and need to talk about space. As Groat and Wang claim, a logical argumentation in architectural and urban research covers the whole spectrum of ways of “making sense” (Groat and Wang, 2013, p.385, par.2). Studies based on use of computer programs require pure formal-mathematical frameworks. Differently, there are logical argumentations such as design-polemical theory that are cultural-discursive. They tend to capture “large cultural worldview distilled into a ‘logical’ argument with both theoretical clarity and rhetorical power”. There are still those, named mathematical-cultural, that are in between these two poles. They tend to combine qualitative and quantitative dimensions of environmental design and to “shed light upon social-cultural values” (ibid., p.386, par.1).

If we want to analyse for instance the attribute of *spaciousness*, we would probably use mathematical-cultural argumentation. We inferred this when we asked users to point out the most important spatial characteristics of open urban spaces. We did not expect them to mention *openness*, *broadness* or *spaciousness*, it seemed redundant to us. This drew our attention to the possibility that open spaces might not be perceived and experienced as such. We understood that the human factor and being in place are

important factors in defining *spaciousness*. A human along with his embodiment and cognition is necessary to help us define how this attribute should and could be meaningfully measured.

When we talk about the emotional spatial attributes that users asked of open space they went from pleasant, charming, comfortable, beautiful, to interesting, relaxing, amusing, etc. We organised them according to the PAD framework developed by Mehrabian and named after its three essential emotions: Pleasure, Arousal and Dominance. These emotions as affective responses can be triggered by architectural and urban *stimuli* which Franz (2005) calls *affective qualities*. He explains that affective response to specific stimuli can be for example 'pleasure' while the affective quality responsible for such a response is '*pleasingness*'. When we have a response such as arousal, the quality behind it is '*arousingness*' (ibid.). These spatial attributes of *pleasingness, arousingness and dominance* that Franz developed from PAD model succeeded to include all the *emotional* responses from our survey. Since they are subjective and personal their measurability should be based on individual experience which is challenging to capture.

Differently, the behavioural category that includes the attributes of *leisure, artistry, coexistence, social diversity and crowding* instead of focusing on first person experience should analyse individual and collective behaviour through behavioural mapping or physical trace analysis.

### 5.13. Conclusion on Open Public Space Attributes

Here presented user-based approach led to the construction of an analytical matrix for spatial description, analysis and assessment by means of a categorization of attributes describing properties of public open space. It was done through: 1. the systematisation of spatial attributes important to users, 2. their categorisation that led to 3. a better understanding of their measurability and their role in the complex reality. The main concept was to capture from user based statements the attributes that complete a description of requirements for public open space. The questionnaire based approach allowed the identification of 30 attributes organised in 6 categories defined at two levels of abstraction – geographical ensemble level and human level – which together describe the experience of people in place.

Apart from significance of *separate attributes* extracted through our codifying framework, we find important to emphasise possibility to *interrelate* them. Once we succeed to abstract from complex reality its parts we have a possibility to observe how those parts are linked together. It would be interesting to understand how physical backgrounds, geographical, urban-architectural, network and equipment, are generating *active affordances* for public space behaviours and emotional responses. Based on such a framework we can relate the physical and morphological aspects of public spaces with their qualitative expressions by recognizing how certain components of space afford particular expressions of usage. In that way, we could understand what attributes or set of attributes are important in creating appealing and intensively used spaces. The neutral analytical matrix presented in Table 14 would be the basis for qualitative inferences.

Furthermore, it is important to understand that our matrix is a temporary snapshot of reality that for some other time or cultural context should be verified and adjusted.

Rather than arguing the possibility for generalisation of findings we suggest that a *transferability* of our user-based method would be possible. The transferability would depend on research contexts and goals. For some other cultural context we would expect other attributes to emerge. For another research goal different categorisation would then be possible.

The *generality/particularity* of our theoretical framework and the *number* of obtained attributes are the result of a certain balancing between acceptable simplification and possible measurability. If our theoretical framework was more fragmented we would risk losing natural connections between concepts extracted from unified reality. On the contrary if our framework was more general it would keep us on theoretical distance impeding us from any practical and concrete approach. Between wide and holistic categorization and neat attribute systematisation one should be able to grasp our underlying investigation goals.

Categorisation of obtained attributes is done according to their disciplinary level and epistemological stances necessary for their observation leading to their possible measurability. Different categories have diverse challenges for their capturing. *Geographical and nature, architectural and urban* and *equipment* ones could be observed more objectively and within a shorter period of time. Differently, *emotional* category implies subjective or subject-orientated analysis for which reliability is difficult to test because of personal factors. Analysis of *behavioural* category is possible through objective recordings and behavioural mappings. The issue of reliability of the measuring *behaviours* lies in the importance of the day, week, and season during which the data was collected (Table 13).

Table 13 Measurability of Attributes

| Category                       | Possible measuring                          | Issues of reliability |
|--------------------------------|---------------------------------------------|-----------------------|
| <b>Geographical and Nature</b> |                                             |                       |
| <b>Network</b>                 | Tend to be objective or object-orientated   | No issues             |
| <b>Architectural and Urban</b> |                                             |                       |
| <b>Equipment</b>               |                                             |                       |
| <b>Emotional</b>               | Tend to be subjective or subject-orientated | Personal factors      |
| <b>Behavioural</b>             | Tend to be objective and subjective         | Time factors          |

Apart from more general conclusions we believe to have made a step forward in understanding the spatial needs of contemporary users. Within all their heterogeneity, humans possess a uniformed notion about public space. In all their personal and cultural complexity, people are much more similar than they might originally seem. Or want to be. Differently from experts' view, that is focused and specific, nonprofessional users have no preferable level of preoccupations. They are equally concerned with social, ecological or phenomenological dimensions and on various scales such as geographical, urban or personal. While gathering our data we suspected that people would mostly choose self-orientated spatial aspects, such as pleasure, amusement and comfort. This was not the case. Responses were distributed within all realms such as personal and subjective well-being (27%); social, behavioural and activity (34,6%); geographical and global issues (19%); furnishing (11,2%) and architectural and urban objects (8,2%). By thinking abstractly the human thinks both individually and socially. This broadness of users' opinions showed us that architectural and urban practices cannot be focused merely on their disciplinary level. They should rely on interdisciplinary and ecologic approaches.

As understood from the surveys, humans have a very trustful sense for social ethics and an elevated preoccupation about global issues. We compared aspects important to experts with ones important to users. While the first are usually concerned with a narrow niche of specific problems or an aspect of urban and architectural space, the latter cover all the gammas of the issues. This suggests that a user-orientated approach is not necessarily focused only on personal comfort and security but also on ecological footprint and social justice. Such broadness of answers on one side and their matching with experts' point of view on the other proved not only that humans have an accurate notion of crucial environmental issues but also spatial appreciation on various levels and scales. Thus, we should respectively acknowledge their credibility in recognizing important issues of urban and architectural reality.

Future steps will focus on establishing a closer relation between the attributes, the ways they could be measured and the qualities they afford.

**Table 14** Public space attributes and categories

|                           |                                   | Attribute             | Used type of word         | Examples of users' responses that built the proposed attribute                                         | Number of users talking about it                                      |
|---------------------------|-----------------------------------|-----------------------|---------------------------|--------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| Geographic ensemble Level | Geographical and Natural Category | Natural Advantages    | n                         | Good view, Nice landscape environment, green or blue views                                             | 6                                                                     |
|                           |                                   | Heritage              | n,a                       | Heritage, Beautiful old architecture                                                                   | 2                                                                     |
|                           |                                   | Healthiness           | a                         | Healthy, Not too noisy, Clean, Isolated from noise, Hygienic                                           | 17                                                                    |
|                           |                                   | Imageability          | n,a                       | Unique atmosphere, Different from everyday, unusual and original ideas in shapes and orders            | 3                                                                     |
|                           | Network Category                  | Accessibility         | n,a                       | Metro, Accessible, Well connected with other city areas, Public transportation, Easily accessible      | 7                                                                     |
|                           |                                   | Centrality            | p,a                       | Within urban area, A bit isolated                                                                      | 2                                                                     |
|                           |                                   | Publicness            | a                         | Free, Free and open access to anyone                                                                   | 2                                                                     |
|                           | Architectural and Urban Category  | Spaciousness          | a                         | Board, wide, open, spacious, open space sensation, emptiness                                           | 18                                                                    |
|                           |                                   | Openness              | n                         | Infinity, limitlessness, distance                                                                      | 3                                                                     |
|                           |                                   | Diversity             | n                         | Without details, Built / Unbuilt alternation, Diversity                                                | 6                                                                     |
|                           |                                   | Naturalness           | n,a                       | Reduced size of built environment, Nature friendly, Not overbuilt, Low buildings, Contact with nature  | 12                                                                    |
|                           |                                   | Light and Colour      | n,a                       | Well illuminated, Luminous, Warm light, Appropriate illumination, Colourful                            | 8                                                                     |
|                           | Equipment Category                | Urban Furnishing      | n                         | Drinking fountains, Toilets, benches, Equipment for baby change                                        | 25                                                                    |
|                           |                                   | Services              | n                         | Souvenir Shop, Tourist info, Press kiosk, Cafe, Restaurant, ITM, Multiple uses                         | 21                                                                    |
|                           |                                   | Greenery              | n                         | Green areas, Trees, Gardens, With plants and flowers, Park                                             | 32                                                                    |
|                           |                                   | Leisure equipment     | n                         | Sport areas, Bicycle areas, Amusement park, Sport equipment                                            | 11                                                                    |
|                           |                                   | Inclusiveness         | a                         | Inclusive design, Disabled people friendly, Children friendly, Children playground                     | 17                                                                    |
|                           |                                   | Artistic equipment    | n                         | Prepared for expositions, Prepared for concerts, Stage for shows/spectacles,                           | 5                                                                     |
|                           |                                   | Protectiveness        | n                         | Shadow, Rain protection, Sun protection, Shade                                                         | 10                                                                    |
|                           |                                   | Walkability equipment | n,a                       | Paving on walking areas, limited car speed, Separated walking and car areas, Reduced vehicular traffic | 11                                                                    |
| Sojourning equipment      |                                   | n                     | Places to chat, sit, rest | 18                                                                                                     |                                                                       |
| Human Level               |                                   | Emotional Category    | Pleasigness               | a                                                                                                      | Pleasant, charming, comfortable, beautiful, enjoyable, gourmand, etc. |
|                           | Arousingness                      |                       | n,a                       | Interesting, intensive experience, relaxing, amusing, calmness, dynamism, silence, etc.                | 32                                                                    |
|                           | Dominance                         |                       | n,a                       | Freedom, welcome, Acceptance                                                                           | 9                                                                     |
|                           | Safeness                          |                       | a                         | Safe, Security                                                                                         | 6                                                                     |
|                           | Behavioural Category              | Leisure               | v                         | Recreation, photography, reading, physical exercise, meditation, picnic, wandering, walking            | 15                                                                    |
|                           |                                   | Artistry              | v,n                       | Artistic fountain, Sculpture, Street exhibition, Music                                                 | 10                                                                    |
|                           |                                   | Coexistence           | v                         | Social interaction and activities, Sociability but also privacy, Empathy with others, Coexistence      | 13                                                                    |
|                           |                                   | Social diversity      | n                         | Multiple/different users                                                                               | 3                                                                     |
|                           |                                   | Crowding              | a,n                       | Not overcrowded, Optimized flux of people                                                              | 2                                                                     |
|                           |                                   |                       | <b>n</b> – noun           | <b>a</b> – adverb or adjective                                                                         | <b>v</b> – verb or verbal noun                                        |

*This page intentionally left blank*



#### **5.14. From complexity towards feasibility – Narrowing object of research**

The following section is output of **Application Objective 3 AO.3**.

Based on the surveys directed to users we systematised the complex tissue of reality into 30 attributes organised in 6 categories (Chapter 5). These represent the Open Public Spaces reality which is possible yet vast and extensive field of observation. Even though each and every of these attributes could have served as directional and orientation guideline for the further study, some narrowing of the object of the research was necessary.

As elements of any system, the particles of urban environment make part of unbreakable unity whose specificity depends on its composing parts and their relationships. The recognition of wholeness of a system and limitations for its complete capturing introduce into realm of scientific observation necessity for reductionism. The need to reduce complexity of observational reality of certain phenomena brings the question of what is prior or before something else thus it can stand for it. In that sense, the 30 resulting spatial attributes and 6 categories were interpreted from the perspective of UrbArch Emptiness, aiming at understanding which from those are essential for grasping its **Structural** and **Behavioural** qualities. The reduction of object of observation similarly to the construction of representation model accounted for the nature of UrbArch Emptiness and reflected the theory which drives the research.

Within the complexity of reality we searched for the categories which are closely linked to spatial boundaries thus participate more directly in moulding UrbArch Emptiness. Therefrom, the **Geographical and Natural category** together with **Architectural and Urban category** (with Equipment Category) were singled out. Since the research aimed at understanding impact of UrbArch Emptiness on spatial usages, the **Behavioural Category** was also tackled.

From the 6 previously inferred categories, 3 were recognised as especially important. The **Geographical and Natural category** was chosen because it represents the initiation trigger for any urban-architectural space. Moreover, the **Architectural and urban category** was picked as the main disciplinary framework of our research and the eventual background for further theory application. It is within the **Architectural and Urban category** and **Geographical and Natural** that the research was intended to bring the most important contribution. Finally, the **Behavioural Category** is seen as an important indicator of spatial quality because it informs about active human-space relation and place appropriation.

In short, to **narrow down** the categories and multiplicity of possible attributes to be observed we focused on those which account for moulding structure of UrbArch Emptiness on **contextual (natural and geographic) and urban-architectural and equipment scale**. The choice of the categories reflected the multi-scale approach that the research aimed at attaining: **global scale** – Natural and Geographic Scale, **local scale** – Urban-architectural Scale, **human scale** – Behavioural Scale (Figure 53).

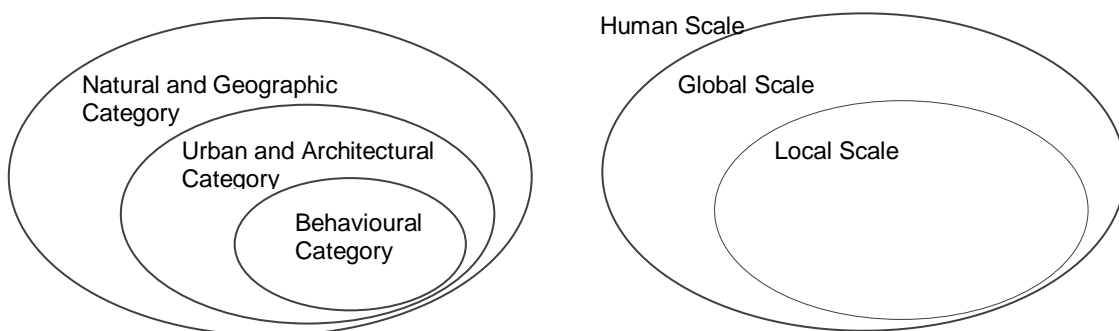


Figure 53 Approached Categories and Scales

After we narrowed down the **categories**, we looked into **attributes** they are composed by and made a selection of those that would be practically addressed. From the **Geographical and Natural Category**, the **attribute of Natural Advantages** expresses open public space initiation context and its constitutional trigger, the **Heritage** addresses its temporal context and layers of its spatial instability. Differently,

230

**Healthiness** expresses the care certain space is given and **Imageability** the strength of the image a space evokes. Even though each of these attributes could have been addressed, we would argue that the attribute of **Natural Advantages** shapes and structures UrbArch Emptiness in the most significant way – it reflects the origination quality of space and as such is singled out to be practically addressed (see section 6.1).

**Chosen Category: Geographical and Natural Category**

**Chosen Attribute:** Natural Advantages

**Omitted attributes:** Heritage, Healthiness, Imageability

From the **Architectural and Urban Category** that includes **Spaciousness, Openness, Diversity, Naturalness** and **Light and colour**, we chose the three firstly mentioned which are **structural** and give the **formal** definition to UrbArch Emptiness. It is important to highlight that the attributes of Naturalness and Light and colour influence significantly urban-architectural place providing it with atmosphere and transfigurative irradiance that penetrates UrbArch Emptiness. However these are not practically addressed because the structural ones were given presendence (see section 6.2).

**Chosen Category: Architectural and Urban Category**

**Chosen Attribute:** Spaciousness, Openness, Diversity

**Omitted attributes:** Naturalness, Light and Colour

Regarding the **Equipment Category** this one was addressed together with Architectural and urban one. Equipments are observed as general influencers of spatial structruing and usages – none of the equipment type was especially singled out. Regarding the **Behavioural Category** the Gelh's theory of spatial usage was used as a filter thus from various attributes the **Necessary, Optional and Social activities** were chosen to be observed (see section 6.3).

*This page intentionally left blank*

## 6. Capturing Open Public Spaces Attributes by approaching UrbArch Emptiness

The following chapter is output of **Practical Objective 1 PO.1**.

To make a multi-scale observation of Open Public Spaces **attributes** defined in the previous section, we analysed several measurable **properties** on **Natural and geographic** (section 6.1), **Urban-architectural** and **equipment level** (section 6.2) and **Behavioural level** (see section 6.3). We did that focusing on UrbArch Emptiness aiming at discovering how this phenomenon influences Open Public Space generation and structuring.

After capturing Open Public Spaces attributes, we searched for the **relationship between attributes and specific spatial qualities** expressed through usages they provide (section 6.3) which showed how UrbArch Emptiness influences Open Public Spaces qualities.

---

*Table 15 Usage of terms Attribute, Properties and Qualities*

---

### **Open Public Space Attributes**

Characteristics of Open Public Spaces without attributed qualitative expression. They become expression of qualities only when their specific value is linked to a certain positive spatial occurrence.

Ex. Spaciousness is an Open Public Space attribute which might be deemed as either positive or negative spatial occurrences depending on its signification and contextual purposefulness.

---

### **Open Public Space Properties**

Measurable quantitative features of Open Public Spaces which give an insight into specific value of Open Public Space attribute.

Ex. Attribute of spaciousness is deemed correlated to measurable properties of Open Public Spaces such as Area and surrounding building Height. Spaces with big area and low surrounding building have higher value of Spaciousness Attribute and vice versa.

---

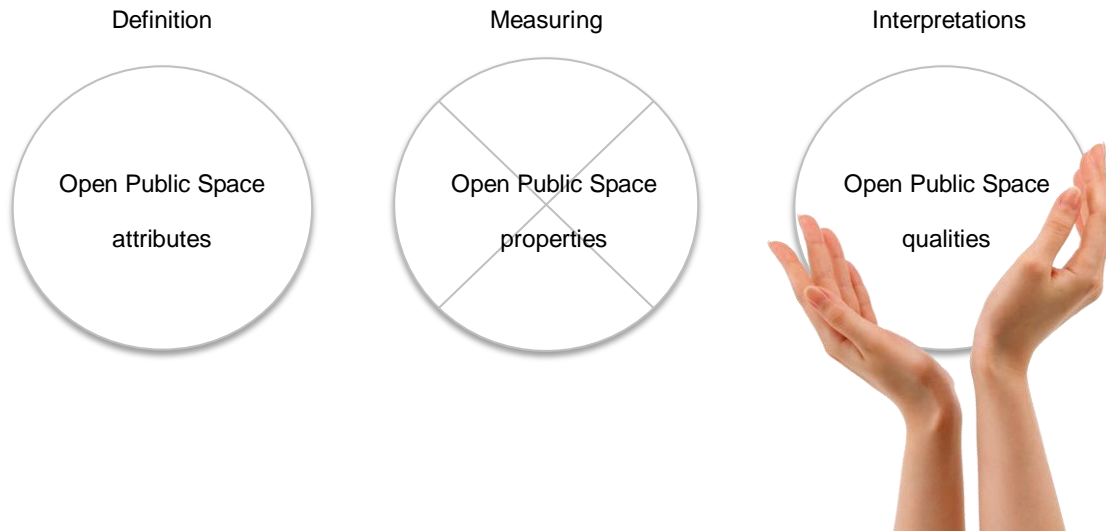
---

### Open Public Space Qualities

Attributes with specific values inferred from properties' measurements which can be tied to a certain spatial occurrence.

Ex. High value of spaciousness attribute is deemed linked to good recreational usages.

---



- **Attributes** were defined and narrowed down in the previous section.
- **Measurable properties** were inferred based on theoretical and methodological analysis.
- **Specific spatial qualities** were inferred by correlating measured attributes with three types of behaviour inspired by Gehl theory of usage of public space:

**Space for Necessary Activities** – do not require any special spatial conditions because necessary activities are more or less compulsory such as walking towards school, work, etc.

**Space for Optional Activities** – requires favourable exterior conditions for activities such as walking to get fresh air, recreation, enjoying, sitting, sunbathing, etc.

**Space for Social Activities – requires certain spatial containment that allows for more proximate observation of others in public space:** children playing, greetings, conversation, passive contact etc. through seeing and hearing other people.

The study approached Open Public Spaces' attributes of central Lisbon Riverside aiming at illuminating the phenomenon of UrbArch Emptiness as its constructive element. It therefore aimed at exploring attributes of Open Public Spaces through the prism of UrbArch emptiness. This approach is nested in the idea that both, full and empty constitute a place and that it is possible to observe the space from either of those two sides: its emptiness and fullness.

## 6.0. Case Studies Choice

To limit the vastness of our object of study we restricted our object of investigation to the area of **Lisbon Riverside** where we especially focusing its **central part** which we are going to approach in more details hereafter. The following Open Public Spaces are chosen to be more closely observed:

*Table 16 Primary and Secondary Case Studies*

| <b>Primary Case Studies</b>            | <b>Secondary Case Studies</b> |
|----------------------------------------|-------------------------------|
| Terreiro do Paço with Cais das Colunas | Terreiro do Trigo             |
| Ribeira das Naus                       | Rua da Alfândega              |
| Praça do Município                     | Rua dos Bacalhoeiros          |
| Campo das Cebolas                      | Jardim de Belém               |
| Cais do Sodré                          | Poço do Bispo                 |
| Santos                                 |                               |
| Jardim Dom Luis                        |                               |

While the **primary case studies** were chosen within the **central Lisbon Riverside** as **formal** and **informal Open Public Spaces** suitable for either optional and/or social activities; the secondary ones were chosen as their complementary examples added due to their differences (exp. morphological: such as streets Rua da Alfândega and Rua dos Bacalhoeiros; implantation: such as Jardim de Belém) wherefrom some important conclusions were rendered.



## 6.1. Capturing Geographical and Natural Category

The following section is the output of **Practical Objective 1.1 PO.1.1.**

This section is presented at National Conference "*A Imagem de Lisboa: O Tejo e as Leis Zenonianas da Vista do Mar*". Lisbon, 13-14 October 2016, Portugal, under the title "**Urban-Architectural Emptiness in Lisbon Riverside - UrbArch Emptiness as a Qualifier of Open Public Space Characterisation and Contextualisation**" (in press).

It aims at capturing UrbArch Emptiness by analysing Open Public Space **attributes and properties** on natural and geographic level. As inferred in the previous section, the attributes of Open Public Space which belong to and Geographical and natural category are: **natural advantages, heritage, healthiness and imageability**. While attributes of natural advantages focus on relationship between Open Public Spaces and natural environment; the attributes of heritage reflect Open Public Space temporal and historical context. Imageability accounts for quality of Open Public Space of evoking a strong image or memory in observer and Healthiness for diverse kinds of pollution one might find in urban space. Due to our narrowing criteria, we are going to address **natural advantages**, because they are in the closest relation with urban and architectural disciplines.

### **Abstract**

Within disciplinary areas or architecture, urban-design and human geography, the work aims at grasping spatial qualities of **characterisation** and **contextualisation** of Open Public Spaces in Lisbon Riverside. To do so, it approaches attribute of **natural advantages** as outputs of specific interplay between built and natural environment. It focuses on Open Public Space in relation to place, landscape and space, through examination of its unbuilt yet constructive and descriptive part, referred to as UrbArch Emptiness.

Investigating the relationship between built and natural environment in Portuguese and Lisbon's urban planning tradition, the particular natural advantages of **specific topography** and **visual amplitude** are inferred to be essential for Open Public Space characterisation and contextualisation. These **natural advantages** are observed on case studies of Open Public Spaces of Lisbon Riverside through the prism of UrbArch Emptiness, using topography analysis together with isovist and viewshed methodologies. Finally some conclusions on how UrbArch emptiness influences natural advantages of built environment and gives insight into Open Public Spaces' **characterisation** and **contextualisation** are shown.

**Key words:** Open Public Space, UrbArch Emptiness, Place-Landscape-Space, Characterisation, Contextualisation

## **Introduction**

The relationship between Open Public Space and its context is intrinsic, complex and permanent – it starts with human recognition of naturally advantageous landscapes, which leads towards making places and their further developed through occupation. The choice of landscape and topography that satisfy inhabitants' needs plays a crucial role in constitution of built environment. Therefore, to grasp any human settlement involves comprehension of specificities and potentials of its natural environment and the way these are taken advantage of or neglected.

In his theory on topology of landscape, Christophe Girot (2016) calls attention to the necessity to look into natural environment through the framework of human needs, culture and values.

*“Topology is meant to weave meaningful symbolism back into a particular place by understanding its terrain and surface condition, and by modifying the*

*inherent significance of natural features as they interact with the purpose of man, his daily life and destiny.”*

From a similar position, we focus on **natural advantages** as expressions of value human attributes to natural environment through the way he builds his settlements. In short, natural advantages are conceptualised as materialised artefacts of environmental values.

During history, the choice of a *locus* for establishment of urban settlements was linked to recognition of places that would satisfy human needs of that period. Within a particular place and time, choice of the most beneficial points was also related to recognition of locality that was naturally the most advantageous. The requirements for selection of building sites have been altering over time – different eras got different preoccupations that privileged certain parts of environments over others. Elevated palatines, which were useful for defensive overviews during middle ages, were exchanged for wide and flat places during renaissance and baroque periods where popular revolts were easily controlled and formal squares could appeared in their representative magnitude.

In Portuguese urbanism in general and in case of Lisbon Riverside in particular, natural advantages of 1) particular topography which would allow for certain places **exposure** and 2) big visual amplitude are recognized as especially important. On one level, the advantage of specific topography enhances Open Public Spaces' **character** allowing their good visibility and participation in construction of wider city panorama. On another, big visual amplitude reinforces Open Public Spaces' **contextualisation** by strengthening place-landscape-space visual connections. In the context of our research, the characterisation and contextualisation of built environment are examined on the cases of Open Public Spaces located on Lisbon Riverside whose natural advantages are shown to strongly influence the constitution of places there situated.

- 1) **Specific topography** is observed in the way places are being 'implanted' in sites wherefrom their characterisation arises. Topography is therefore deemed a rudimentary precondition for place formation, primal moulding element of its UrbArch Emptiness and important anchoring point for further development of Open Public Spaces. This relationship between built and natural environment established through specific place-site interaction is what we conceptualise as part of Open Public Spaces' **characterisation**.
  
- 2) In Portuguese and Lisbon's urbanism, the advantages of ample visual field linked to visual control over territory, was essential in pre-medieval and medieval times when visual domination over surroundings was crucial for spotting enemies from distance. Nowadays, the natural advantages of good and extensive views are recognized as important qualities of Lisbon's imageability revealed through existence of various viewpoints and their touristic attractiveness. The first attribute of specific topography –is informative about **characterisation** of Open Public Space addressing its rudimentary aspect of place 'implantation'. The second attribute of visual amplitude allows comprehension of the interrelationship between Open Public Space and its context, its place-landscape-space connection established through their visual continuity. The advantage of visual amplitude is thus seen as a depicter of place-landscape-space permeation wherefrom the quality of place **contextualisation** was approached.

## **Methodology**

The analysis is based on the premise that we can observe the unbuilt part of our environment as important as its built antipode – while fullness is being built, emptiness is being moulded. The moulded empty output is deemed, together with the built mass, a constructive element of our environments and as such informative for its comprehension.

Based on this premise and to grasp natural advantages of Open Public Spaces of Lisbon Riverside, the research proposes a novel perspective for its observation. Rather than on qualities of built structure, it focuses on place and its context, landscape and space, through examination of its unbuilt part, referred to as UrbArch Emptiness.

Firstly, it examines how empty part of our built environments can give us an insight into place **characterisation** through comprehension of its topography. By observing UrbArch emptiness, we analysed form and **slope of topography** as the primary moulding element of place which establishes potentials for Open Public Space development.

Further, it addresses Open Public Spaces' **contextualisation** through analysis of UrbArch Emptiness and its capacity to potentiate views from Open Public Spaces. Therefrom, the natural advantage of **visual amplitude** of place towards landscape and space, as foundation for further interweaving between Open Public Space and its context, is grasped. This **contextualisation** capacity of UrbArch emptiness to strengthen and depict place-landscape-space permeation is observed by analysis of views that certain unbuilt parts of place provide on two levels. On the first level, we observed **potential contextualisation**, which is to say views shaped merely by obstructions of natural environment. On the second level, taking into consideration natural but also built urban-architectural obstacles, the **actual contextualisation** is addressed (Table 17). To conclude, the potential visual amplitude is compared with the actual one which explained how place potentials are being taken advantage of in actuality.

To analyse Open Public Spaces' topography and visual amplitude we observed **form of topography**, together with **viewshed** and **isovists** representations and studied them on seven cases of central Lisbon Riverside. As output, we made a step towards a

better understanding of UrbArch emptiness as depicter of characterisation and contextualisation of Open Public Spaces within Lisbon Riverside.

*Table 17 Characterisation and Contextualisation of Open Public Spaces*

|                                               |                                                                                                                                                            |                                                                                                                                                                                                             |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Characterisation</b> of Open Public Space  | 1. Quality <b>of Open Public Space</b> manifested as specific relationship between built and natural environment potentiated by <b>specific topography</b> |                                                                                                                                                                                                             |
| <b>Contextualisation</b> of Open Public Space | 2a. Potential contextualisation                                                                                                                            | 2a. Potential quality <b>of Open Public Space</b> to establish an intertwining relationship with its environment through <b>ample visual field</b> which allows for <b>place-landscape-space permeation</b> |
|                                               | 2b. Actual contextualisation                                                                                                                               | 2b. Quality of <b>Open Public Space</b> to <b>make use</b> of place's potentially ample visual field                                                                                                        |

### Natural environment in Portuguese urbanism

The decision to closely look into natural advantages of specific topography and visual amplitude was made due to specificities of Portuguese and Lisbon urban tradition. To define which natural advantages should be closely observed, we made a historic overview of Portuguese urbanism searching for consistencies in place definition that could reflect permanencies in landscape valuing.

Teixeira claims that particular landscape choice is a characteristic of Portuguese urbanism leading towards specific morphological responses which distinguish Portuguese cities from the settlements of other cultures. He stresses several invariants in dealing with location such as: modes of adaptation to the site, logic of localization of important buildings, the layout of the roads, the positioning of squares and their role in organisation of urban spaces as specific answers that Portuguese gave to natural environment creating a particular urban morphology easy to be identified (Teixeira, 2009).

Location of open urban spaces in Portuguese urbanism, according to the same author, was never occasional but intrinsically linked to specific qualities of natural environment. Positioning of both squares and important buildings was dependent on specificities of site – for squares were chosen locations of convergence or turning of natural lines; and

for main buildings' placement the most elevated points. In the design of urban space, sun exposure together with wind regime was taken into consideration (Teixeira, 2009, p.4). Open Public Spaces were also indication of some built-environment occurrences – solutions for articulation or break in urban structure. Until XV century<sup>44</sup> squares were used for reconciling of distinct urban layouts and different morphologies, thus were positioned on points of intersections or inflection of roads (Teixeira, 2009, pp.10-11).

The existence of water in choosing places for establishment of cities, Teixeira also finds essential for Portuguese urbanism. The first street used to be constructed parallel to bay, followed by others roads adapted to natural ridge and valley lines of topography. It used to be picked an enclosed bay, with deep and well protected waters – from the sea, enemies and wind, taking advantage of landforms such as promontories, capes or islands. Urban settlements were initiated twofold: on the highest plain areas were established defensible administrative and religious nuclei while lowest points next to rivers were chosen for port and commercial functions (Teixeira, 2009, pp.2-3).

### **Natural advantages and Lisbon's Riverside**

As described in the XVII century by Simão Vaz Barbosa, Lisbon was a city which comprised a great deal of natural goodness. Its topography endowed it with numerous viewpoints, Tagus breeze and eternal spring weather (Castelo-Branco, 1969, pp.35-38). During several eras, this abundance of intrinsic place qualities has been reflected in Lisbon's capacity to respond to various eras' demands. Claimed to be a place with exceptional natural advantages, the riverside allowed gradual development of Lisbon's

---

<sup>44</sup> From the XV century squares formation began to reflect more formal preoccupations. In urban layout they started to be inserted with a formal logic playing an important role in the structure of city that would culminate with Enlightenment in XVIII century when squares gained generative force in formation of urban matrix with important buildings built within them (Teixeira, 2009, p.11).

recognizable image. Several hills with multiple plain areas provided good observation positions and viewpoints wherefrom extensive Lisbon's landscape could have been appreciated in its full greatness. Therefrom, views from the city expanded outwards throughout Tagus estuaries aiming towards large distances. In the XVII century, these qualities led to a high appreciation of city's image as something that was praised by various authors. Italian Magalotti and Swiss Conde de Oxenstierna were seduced by Lisbon's view contemplated from the river. Looking from distance, ignoring details, this 'amphitheatre' situated over large delta of Tagus was claimed to look more magnificent than in reality was.

### **Constructed Topography of Contemporary Lisbon**

Dynamic cultural and social needs are foundations for people's interaction with their natural environment and basis for existence of places as such. Humans' needs are reflected in surroundings and landscapes' selection, ways of occupation and place-making. In the Lisbon's case of places' choice, the pre-medieval period required a defensive and good visual overview which led to elevated sites to be selected. Later, with the development of port industries, different locations such as large riverside areas were valorised.

Nowadays Lisbon Riverside is in its totality situated on artificially constructed land fills. This is the output of a long process which over centuries has been changing the nature of Lisbon's shore and the relation city has with Tagus<sup>45</sup>. Artificial expansion of Riverside through land fills led to extension and the flattening of the riverbank. A rich,

---

<sup>45</sup> Baixa Chiado land fill was partially naturally, partially artificially created. What started as a natural process of River sedimentation leading to diminishing of Tagus flow was finished by human intervention. A continuous construction of land fills on low and muddy terrain lifted significantly the ground level of Baixa for ~3m turning this place in what we know today (Durão, 2012, p.18, par.1).



direct and intense interplay which city used to have with its river has been continuously changed over centuries by shoreline regulation and straightening.

The benefits of natural elevation and diversity of water-land relation were over time exchanged for different, artificial and 'clean' contact with Tagus. The area which used to be the riverfront gained the distance from the river. Even though pushed back from the initial shoreline, due to its low construction density, city preserved visual connection with Tagus and kept cherishing its network of elevated viewpoints – a strong visual connection of the city with Tagus remained. This visual connection is however diminished by latter urban-architectural decisions, such as building of the new EDP headquarters at Aterro da Boavista, which by high and massive built structure cuts previously clean visual connection between city and river invading contextualisation quality and spoiling authenticity of cities viewpoints (ex. Adamastor viewpoint).

### **Choice of Natural Advantages in Lisbon Riverside**

Looking at the distinctive relationship between natural and built environment in Portuguese urbanism in general and Lisbon Riverside in particular, we inferred as especially important properties linked to topography, its shape, elevation, scale, inclination, orientation, which participate in attributes such as specific topography, insolation, wind protection, breeze, amplitude of visual field. From these natural advantages, we concentrated on those which are constant characteristics of Open Public Spaces. While insolation, wind and breeze are seen as important for open public space daily usage and atmosphere, these qualities vary with seasons and throughout days. In that regard, we focused and more closely observed the natural advantages of **specific topography** and **visual field** as permanent attributes of Open Public Spaces.

The attribute of **specific topography** was deemed important for **characterisation** of place-topography relationship and it was addressed through **topography and landscape analysis**. Visual field was deemed intrinsic to specific **place**

**contextualisation** and acknowledged potential for providing place-landscape-space unification. These potentials are grasped through analysis of places' visual amplitude and addressed by **viewshed and isovist methodologies**. While the mentioned natural advantage linked to **topography** characterises Open Public Space as unit, the **visual amplitude**, was rather seen as informative for Open Public Space contextualisation. The places' contextual potentials as preconditions for Open Public Space contextualisation might or not exist in actuality. In that regard we observed contextualisation on two levels:

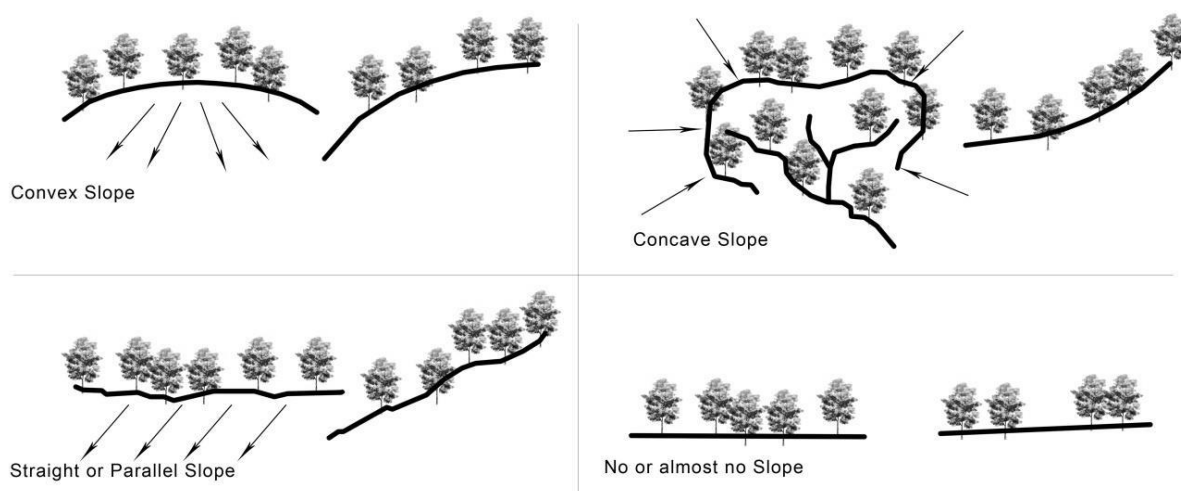
1. The first level addresses **potential contextualisation** which is to say takes into account the amplitude of visual field over natural form of landscape and place.
2. The second level, addresses **actual contextualisation** accounting for natural but also built form as they permit visual fields to reach great amplitude or extension.

### **Topography and Open Public Space Characterisation**

We cannot talk about any urban and architectural place without mentioning the land where it had grown from. This rudimentary aspect of shape of site and topography has manifold influence on attributes and qualities of built environment. It conditions site-settlement relationship making site more or less exposed thus more or less insolated, windy and visible. This deep-seated relation is primary established by choice of a place and revealed through property such as shape of topographic surfaces.

In the following section, we observed various shapes of topography through analyses of several forms that site-settlement interaction takes aiming at comprehension of ways in which places are 'implanted' on a landscape, or 'grown' from it. The term **implanted** has an interesting association with the way both places and plants are being grown and cultivated or cultured by society. It originates from Late Latin notion of 'implantare' which actually means 'to engraft' or 'plant into' (in- 'into' + plantare 'to plant').

The relation with ground can therefore be deemed as one of the primal preconditions for generation of a place. It influences several constants of surroundings such as accessibility, linkage, visibility, wind regime, skyline and position of horizon which are important in experiencing and appreciation of the environment<sup>46</sup>. To reveal the attribute of topography we start by understanding types of slopes and shapes of topography as a basis upon which places are situated or 'implanted'. Firstly, we concentrate on form of slopes and we single out four types: convex slope, concave slope, straight or parallel slope and no slope (**Figure 54**) that differently influence a place by preconditioning the relation it establishes with its landscape.



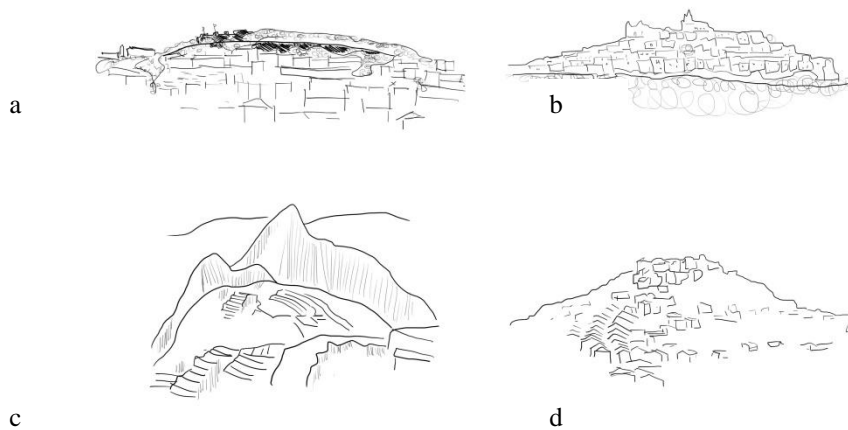
**Figure 54** Slope shape adapted from (Sheng, 1990)

The places situated over convex slopes (**Figure 55**) are fairly exposed towards their surrounding generating wide-open UrbArch Emptiness as predisposition for profound

---

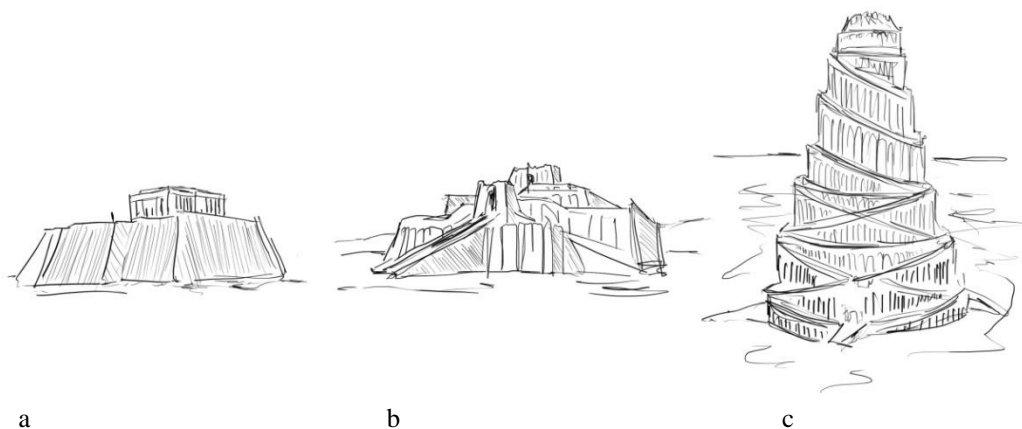
<sup>46</sup> There is a well-known anecdote within the movie art told by Steven Spielberg about his first meeting with John Ford, when he was around 15 years old and got his first important lecture in "picture making". Ford made him to walk around his office and to look into paintings he had hanged on the walls asking repeatedly the same question: "Where is the horizon?" Spielberg had to reflect about substantial differences between pictures which had either low or high horizon line. He was asked to acknowledge substantial differences which various horizon's positioning prompted.

views towards landscape and good place overview. This kind of slope is often found in historical parts of cities such as Lisbon (Portugal), Ostuni (Italy), Macchu Picchu (Peru), Cordes sur Ciel (France), as a prerequisite for visual control and 'ritual elevation' over territory.



**Figure 55** Places implanted at convex slope – a) Lisbon (Portugal), b) Ostuni (Italy), c) Macchu Picchu (Peru), d) Cordes sur Ciel (France), author's drawing

In history, there are various examples of structures that artificially provided a similar spatial experience of convex slope overcoming flatness of landscape. The structures such as Warka, 'the White Temple' in Uruq (Iraq), Ur ziggurat of Ur-Nammu or Tower of Babel, illustrate the necessity of elevating settlement for both ritual and protection purposes (Figure 56).



*Figure 56 a) Warka, 'the White Temple' in Uruq (Iraq), b) Ur ziggurat (Iraq) and c) Tower of Babel, author's drawing*

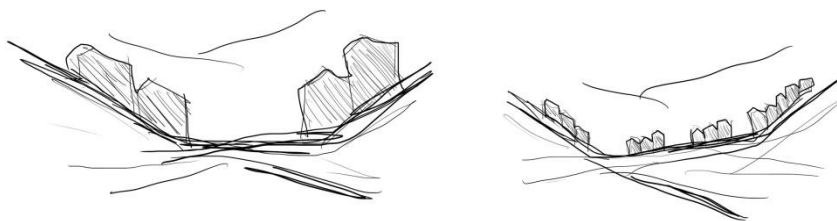
Historically, as explained in theological discussions on topography, meaning of hills was inspired by and associated with Jerusalem's Mount Sion as metonym for the sacred city (Christie et al., 2016, p.107). Notion of 'cities in the high' were thus linked to the sacred topography materialised in 'Seven Hills' claimed later to be found in various cities (ex. Belgrade, Lisbon, Istanbul, Jerusalem, Macau, Mecca, Rome, San Francisco, Brussels, Budapest, etc.). Apart from its symbolic weight, the convex slope has its strong repercussion on the phenomenological level of environment apprehension. Together with place elevation, it allows for an ample visual field from a place which is otherwise limited to the maximum possible distance that our vision can reach, due to the Earth's curvature, or to the landscape's obstacles.

On the contrary, when implanted on a **concave slope**, places tend to be embedded in their environment and turned towards themselves rather than exposed outwards. There is a third kind of places that are located on a sloped terrain that are exposed towards lower side of landscape and sheltered from the higher one. This occurs on inclined terrain on **straight or parallel slopes**. The last type of place implantation linked to a **flat** terrain is not commonly found in traditional settlements, since a designation of place in history, as explained by Seddon (1998), requires certain conditions such as specific limits and elements of interest. In abstract terms, a neutral exposure gets closer to a limitless, undefined or 'smooth' space as Deleuze and Guattari (1988) define it. It does not possess any natural boundaries within which one would establish his territoriality. The acceptance of these limitless places whose tendency towards immenseness leans towards infiniteness, is one of the important theme in modernist urbanism and architecture. Instead of looking for limits, modern movement erased place-landscape boundaries looking at the landscape as the most intimate home of contemporary human. The natural environment was not any longer seen as something

out-there but as a human direct home. Landscapes with their limitlessness replaced previously well-defined places, clearly striated by topographies occurrences.

The mentioned specificities of topography influence the place-topography relationship and define place-landscape rudimentary condition. By characterizing the initial place-landscape juncture topography moulds its visual field – it provides a potential for places' extensive view and good overview. The first type of slope, the convex one, allows for elevation of place thus offers a potential for ample views towards the landscape. Differently, the concave slopes, demonstrates a limited potential for view spreading – when situated within a valley our view is limited to its natural borders. A parallel slope is characterized with an ample, but directed and orientated view. Differently from a convex slope which might permit 360° of place-landscape-space connection, the inclined one prioritises certain direction.

Apart from the differences linked to the shape of topography, there are other parameters that should be taken into consideration. If we use 'planting' analogy again, we cannot talk about places without talking about their scales, inclinations and orientations. Places that have similar 'implantation' but different scales, inclinations and orientations provide different natural advantages. Comparing to smaller scale places that are embedded in their landscapes and as such perceived as unified, bigger ones are rather perceived as chunked into smaller pieces – inclined slopes and in-between natural flat area (Figure 57).



*Figure 57 Importance of scale in place implantation, author's drawing*

### ***Capturing Characterization – Topography in Lisbon Riverside***

In experiential reality, places usually occupy situations which combine different topography shapes– isolated and ideal examples are rare. There are places situated over inclined slopes ending in neutral valleys, or the same slopes with the plateaus on their higher end. These combined ‘implantations’ also occur in our case studies of Lisbon Riverside where we usually find a combination of convex, parallel and no slope (**Figure 58**) as a result of a long process of human-nature relationship<sup>47</sup> which created Lisbon Riverside as it is today.

The chosen case studies belong to the central Lisbon Riverside and include following Open Public Spaces:

**Table 18** *Type of Slope in Case Studies of central riverside*

|   | <b>Open Public Space</b>               | <b>Type of Slope</b> |   | <b>Open Public Space</b>                | <b>Type of Slope</b> |
|---|----------------------------------------|----------------------|---|-----------------------------------------|----------------------|
| 1 | Terreiro do Paço, square               | Concave+Neutral      | 5 | Cais do Sodré, Public space with garden | Convex+Neutral       |
| 2 | Ribeira das Naus, waterfront promenade | Convex+Neutral       | 6 | Santos, waterfront promenade            | Concave+Neutral      |
| 3 | Praça do Município, square             | Convex+Neutral       | 7 | Jardim Dom Luis, garden                 | Concave+Neutral      |
| 4 | Campo das Cebolas, Square              | Convex+Neutral       |   |                                         |                      |

---

<sup>47</sup> Initially, Lisbon was growing on a sloppy terrain leaning towards the Tagus river. It was overexposed taking advantages of great expansion and extension of its visual field. As city was expanding and getting closer to the water, its representative façade during the Portuguese Discoveries’ times was structured. Through punctual construction of various important buildings, Lisbon was developing its representative image and anchors for further Riverside development. This led to a gradual conquest of river basin ending in large industrial interventions – artificial land fills. The city conquered the river’s basin gaining its flat part which provided a regular, but due to new industrial functions, very distant junction between city and its river. This process simplified the relationship between Lisbon and its landscape opening a possibility for neutral and levelled relation with the Tagus but at the same time hitherto functionally proximate city tissue and the river were separated by the port.



**Figure 58** Place-landscape relationships in Lisbon Riverside: 1. Terreiro do Paço, 2. Ribeira das Naus, 3. Praça do Município 4. Campo das Cebolas 5. Cais do Sodré 6. Santos 7. Jardim Dom Luis, author's illustration

Almost all of our case studies are situated over artificially constructed land fills which have very little or no slope at all. These places however differ significantly from completely neutral *loci* without any boundaries as designed by modernism. They are embraced by natural margins of distinctive Lisbon's topography perceivable from the places. Therefore, even though placed on flat land fills, these Open Public Spaces are somewhat enclosed by surrounding landscape. Terreiro do Paço is narrowed down by two hills which funnel the place embedding it in background city tissue. Ribeira das Naus, Praça do Município, Campo das Cebolas and Cais do Sodré are positioned at more exposed topographical points which allow for greater visual fields. Santos and Jardim Dom Luis are similarly to Terreiro do Paço, slightly embedded from the northern side.

Due to the distance between spaces and the influential topographical occurrences, the difference between Open Public Spaces on concave and convex topography is rather subtle but it should not be neglected. When we are in the exposed places on convex topography, such as Ribeira das Naus, Praça do Município, Campo das Cebolas and Cais do Sodré, we find ourselves at the 'prow' of natural environment. This defers from experience of embedded places such as Terreiro do Paço, Santos and Jardim Dom Luis in which one is not pushed forward the front of shoreline but rather protected from several sides. In these cases it becomes evident how topography, as rudimentary condition for place and Open Public Spaces' generation, moulds UrbArch Emptiness



which further provides channel for urban life and place-landscape-space unification (see following sections). Said differently, UrbArch Emptiness depicts the shape of topography illustrating the characterisation quality of Open Public Spaces within it.

### **Visual Amplitude and Open Public Space Contextualisation**

Having explained **place characterisation** through analysis of topographic specificities, in this section we addressed **place's contextualisation** as quality of place-landscape-space permeation, provided by UrbArch Emptiness in Lisbon Riverside. We looked at the relationships between place, landscape and space established through **visual field** which relies on **topography** but also depends on UrbArch Emptiness which is to say on density of Open Public Spaces' construction and openness of its limits.

When one finds himself in Open Public Space, due to its UrbArch Emptiness he experiences visual continuity which unifies physically separated sites. UrbArch Emptiness here refers to the parts of places which lack construction thus open views outwards places. One's apprehension of place, in which Open Public Space is situated, expands towards its landscape by visual field which extends throughout the unbuilt part. Similarly to a bridge which links two shores, UrbArch Emptiness provides a connection between territorially separated places together with their landscapes and spaces. UrbArch Emptiness can be thus seen as a tunnel for visual connection and appropriation which overpasses legal and proprietary limits, place boundaries and states' borders. The view from a place can be therefore deemed to belong to public domain – UrbArch Emptiness belongs to no one or to everyone.



*Figure 59 Place-Landscape-Space Visual Amplitude and Experiential Wholeness, author's illustration*

While human geographers commonly separate notion of place, landscape and space, we deem that they might be unified into ontological wholeness which is reflected in their experiential continuity. An Open Public Space exists due to specific place to which it belongs and landscape in which it is inscribed. In that regard, we found important to shortly introduce notions of place, landscape and space and discuss possibility for their unification (Figure 59) established through place-landscape-space visual continuity and experiential wholeness enabled by UrbArch emptiness.

A notion of **place** is defined as something that presupposes in-situ interaction, apprehension and appropriation thus carries 'sense of place' (Relph, 2008) and represents 'meaningful location' (Cresswell, 2015), a 'secure' one (Tuan, 1979). It is a way human makes world meaningful by chunking it into recognizable units that he knows and is attached to. For Aristotle place is a precondition for being to occur<sup>48</sup>.

When relationship between human and environment occurs as ex-situ, we talk about **landscape**. Landscape can be thus designated as a part of the Earth that can be seen from a place: "Landscape is an intensely visual idea. In most definitions of landscape the viewer is outside of it" (Cresswell, 2015, p.17).

Differently from notions of place and landscape, **space** is conceptualised as something even broader, vaguer, more anonymous, less defined and less concrete. " 'Space' is more abstract than a 'place'...The ideas 'space' and 'place' require each other for definition...From the security and stability of place we are aware of openness, freedom, and threat of space, and vice versa' " (Tuan, 1979). Moreover, space can be conceptualised as out-there notion which goes behind landscape and can be linked to

---

<sup>48</sup> "things which exist are somewhere (the non-existent is nowhere — where is the goat-stag or the sphinx?)"  
(Aristotle, *Phys*, I, 4, 208a 27-29).

idea of infinity, uncertainty and absolute space through perception of visual limits, such as horizon.

### ***Capturing Contextualisation – Visual Amplitude in Lisbon Riverside***

The importance of quality of a view which is established from a place, Stamps (2005a) links to the issue of safety – open and extensive views do not only show the possible ways out of a danger but also expose a potential enemy. In Portuguese urbanism, this aspect was important precondition for place establishment. To be chosen, sites had to possess an ample view over surroundings as a perceptual shield against potential enemies. Lisbon's Castle is an example of such a concern. Nowadays, places and apartments with ample and extensive views are more valued, and in dense city tissues natural views which frame river, park, forest, lakes or vast urban panorama augment significantly real estate value.

To acquire an ample visual field over its surroundings, place needs (1) to be situated on convex topography (to be fairly 'exposed') and (2) to have a porous limiting membrane which is to say to lack bordering buildings. The primal qualities of visual field linked to the shape of topography, which precede urban and architectural structure, are seen as **potential contextualisation** of Open Public Space. The way place is being 'implanted' in its topography moulds UrbArch Emptiness and its potential to provide a bridge for place-landscape-space permeation and visual appropriation.

Whether the potential contextualisation is going to be taken advantage of or neglected further depends on the secondary qualities of their built structure, which might allow or disallow potentials of contextualisation to become **actual** ones. In that regard, to comprehend potential of Open Public Spaces to establish a strong contextualisation relationship with its landscape and space, we observed its unbuilt part without taking into consideration any built structure. Further, we accounted for urban and architectural

boundaries looking at the way the potentials are being turned into actual ones through specific urban and architectural structure of Open Public Space.

The methods usually used to capture visual attributes of a place are **viewshed and isovists**. While viewshed (Fisher, 1996) is visible area from a viewing point towards landscape; isovist (Benedikt, 1979) are based on analyses of visual fields spread from a particular point. An overall comprehension of visual field, both in potentiality and actuality, was addressed by **viewshed methodology**; more detailed information and in-depth comprehension were acquired through **isovist methodology**.

### ***Place contextualisation in potentiality and actuality***

As previously explained, the **potential contextualisation** is conceptualised as overall amplitude of **visual field** possible to be established from a certain place. In viewshed representation this **visual amplitude** can be grasped through **angle and coverage** of surroundings from certain place. It can be addressed through observation of viewsheds of merely natural environment without accounting for any urban and architectural structure. In our application, viewsheds are visualised from a matrix of observational points within Open Public Spaces, with approximately 50m between them, using the viewshed software available at Google Earth. In the first and third row of

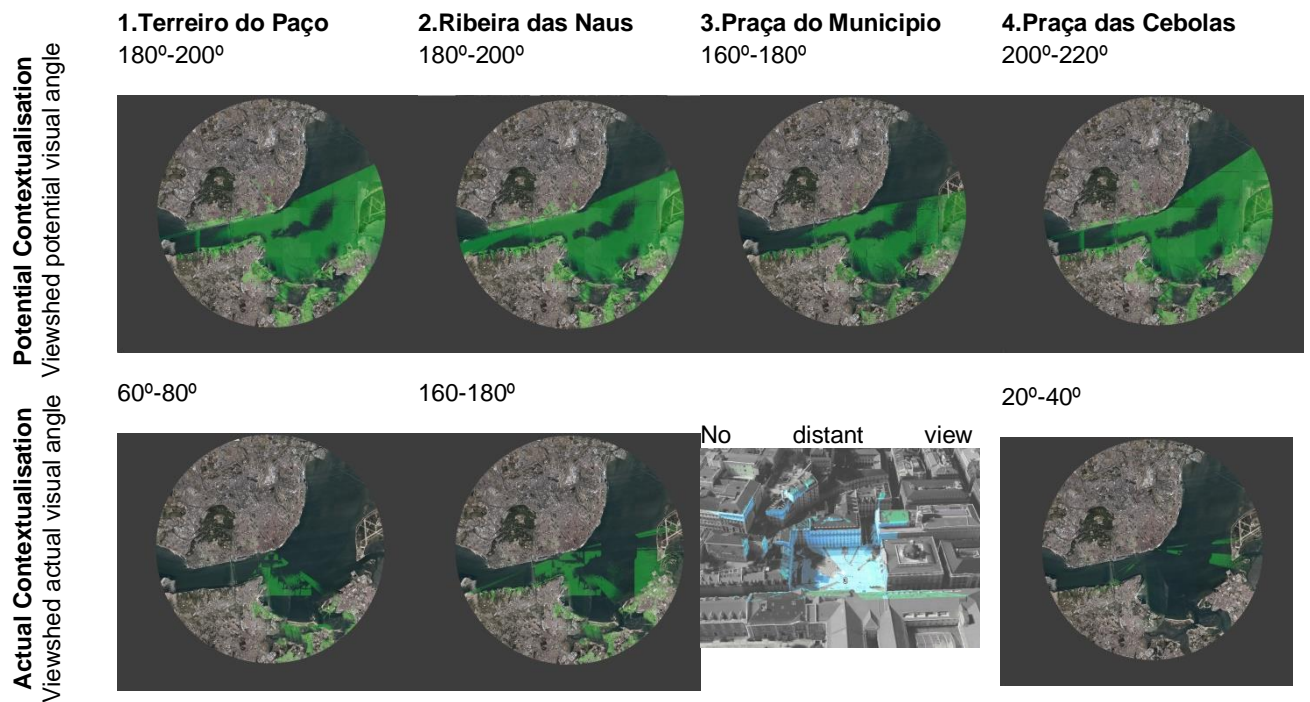
**Table 19** we show viewsheds of 7 case studies when freed of any built structure allowing comprehension of areas which would be visible from places if no built structure was added. These are output of overlapping viewsheds from points' matrix (50x50m) within Open Public Spaces on the height of 2m.

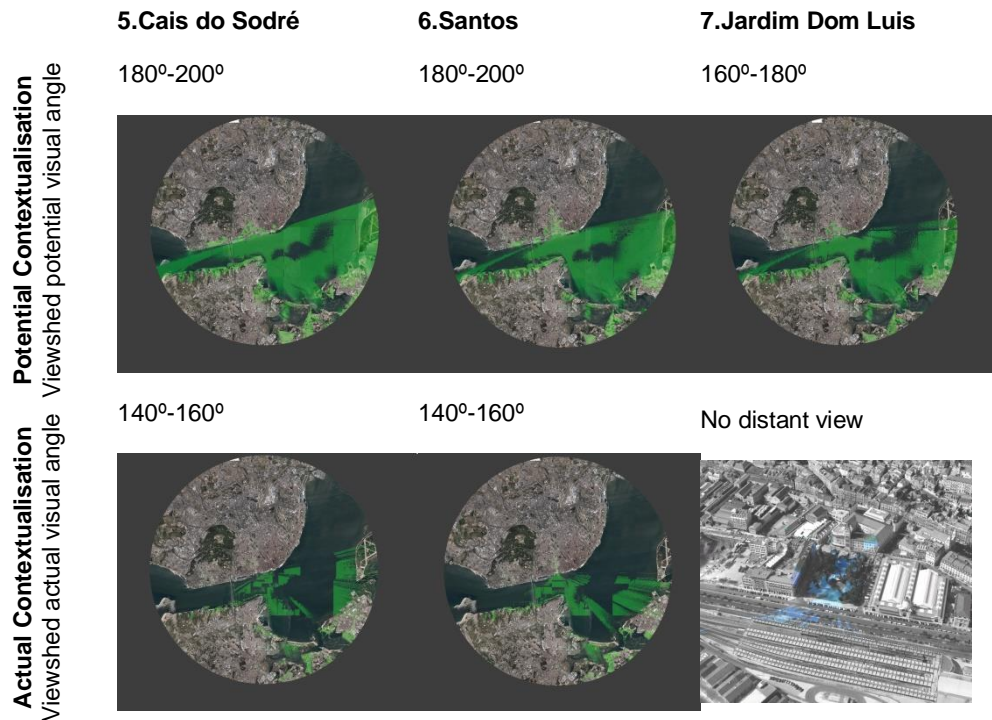
The green regions, which are visualised viewsheds, represent a possible visible coverage towards landscape from a certain point. In the second and fourth row of the

same table, we can see actual viewsheds of the same Open Public Spaces which include urban and architectural elements in their calculations. Comparing the first and the second row, we can infer how the potential **amplitudes of visual fields** of Open Public Spaces are actually being taken advantage of.

If we conceptualise UrbArch Emptiness as a channel that unifies place, landscape and space, viewshed represents the limiting surface of that channel at the moment when it reaches landscape. In the same representation, the circle signifies the set of furthest viewshed's points one can observe from starting point due to Earth curvature. The circle depicts distance to the horizon which is about 4,8 km away from observer at the sea elevation and it increases as we climb a hill or mountain augmenting the amplitude of our vision thus growing our invisible shield. The higher a place is, the bigger its **visual field amplitude** tends to be.

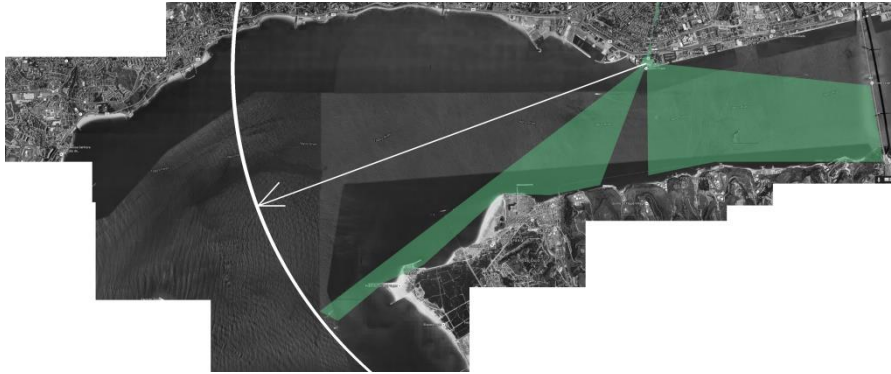
**Table 19** Viewshed analysis - Place contextualisation in potentiality and actuality / from Google Earth





All of our case studies are positioned in the Tagus Riverside area, close to its large mouth to the Atlantic Ocean, thus they are situated on low elevation facing great Tagus profoundness. Nevertheless, they are somewhat delimited by southern shore of Tagus' estuary meaning that viewsheds do not reach the circle of horizon and maximum possible distance but are actually limited to the landscape surrounding. The example of Open Public Space, out of our study area, which does reach the line of horizon, is situated closer to the end of the estuary of Tagus – Jardim de Belém (Figure 60). There, the visual appropriation is not limited to the landscape boundaries but to the perception of horizon which by depicting the end of visible limits is usually linked to perception of absolute space and infiniteness. Apart from landscape and buildings that limit places' visual amplitude, two Lisbon's bridges also serve as enclosure boundaries

of Lisbon Riverside. Between two bridges, 25<sup>th</sup> of April and Vasco de Gama bridge, and southern Tagus shore, 15km long Lisbon's Riverside is delimited and defined as unity.



*Figure 60 Jardim de Belém - Visual amplitude reaches horizon*

If we compare **potential** and **actual visual field** we observe a significant diminishing of visual angle in cases of Open Public Spaces that are not in direct relation with the River (3, 4 and 7). In other case studies (2, 5 and 6) wide visual amplitudes are somewhat diminished, for 20° to 40°, while in the case of Terreiro do Paço (1) it is diminished more expressively, for 120°. In short, due to the built structures which enclose them, some of these places lost the amplitude of their visual field and possibility for more direct landscape and space apprehension.

### ***Visual amplitude***

Apart from overall size and angle of visual field – visual amplitude – captured with **viewshed methodology** by overall visual angle and coverage from certain place, we found important to address, in more detail **shape of that visual field** as a significant property “since both a jagged spatial profile and large visual areas were rated to be more pleasing” in affective response towards surroundings (Franz, 2005, p.146, par.2).

In that regard we employed isovist which represent the field of views itself, showing how places are enclosed and how obstacles are interfering with our sights (Morello and Ratti, 2009). These fields of view are sometimes round and convex representing compact and spacious visual fields of great amplitude. Sometimes, the isovist field is

very extensive and concave indicating various openings which rip the homogeneity of place's view field, making what is known as a 'star-like' isovist.

Regarding our interest in Open Public Space contextualisation and place-landscape-space visual appropriation, we are especially interested in the properties of **compactness** and **area** of visual fields which show their overall **amplitude** depicting how strong and direct place-landscape-space relationship is. It is a maximum possible size to which we can expand our sight as an invisible shield we put on when we look from a place towards landscape or stretch our body in schizophrenic terms<sup>49</sup>. It is the size of the round view that Open Public Spaces provide.

### ***Capturing Contextualisation – Visual Amplitude in Lisbon Riverside***

Discussions within the isovists theory, address the issue of **size of view field** as correlated to **experience of spaciousness** (Benedikt 2008, Franz, 2005). Their works tried to reveal attribute of spaciousness through area or isovists together with some other measures such as perimeter and openness of spatial boundaries. In addition we would argue that **amplitude of visual field** could be measured through area of isovist (visual field) and its compactness since the size of visual field alone does not inform about quality of compactness or oneness of that field which we find important in understanding *place-landscape* relationship. The quality of compactness is important because it informs about how 'round' a visual field of certain place is. Even though both a square and a street might be convex spaces and have significant size of visual field that could in their totality be experienced at once, their spaciousness depends on how linear or rounded their visual fields are (Stamps, 2010, 2008). Compactness thus should inform notion of amplitude of visual field meaning that there is a need for an

---

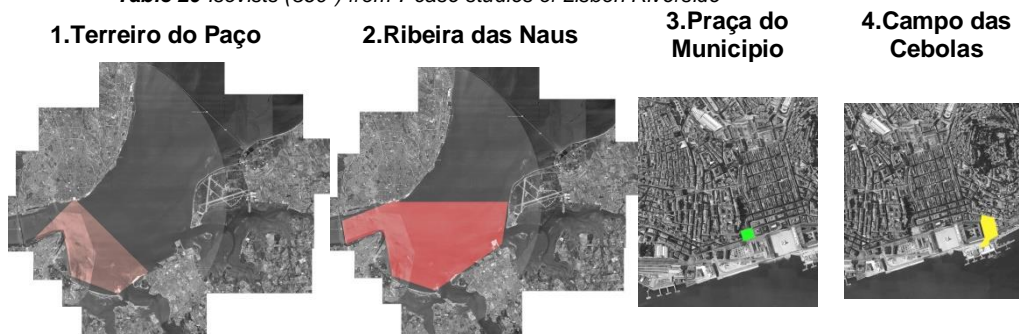
<sup>49</sup> In cases of schizophrenic disorder, patients actually switch their bodies' boundaries for spatial ones (Low, 2003).



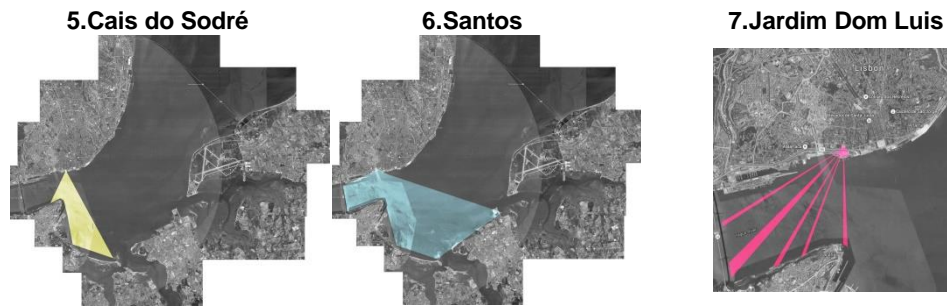
additional indicator which would convey the idea of how ‘round’ a visual field is because it would diverges significantly from the ‘linear’ one of the same size. In that regard, we would highlight the roundness ratio already present in isovist theory. This ratio shows how closely the shape of an isovist approaches the shape of a circle and it is based on compactness measure of a shapes. Measure of compactness is seen as ratio (from 0 to 1) between area of a shape and area of a circle with the same perimeter.

Taking this into consideration we started from isovists’ notion of spaciousness and conceptualised the notion of **amplitude of visual field** taking into consideration both, the **area of isovist** and the **aspect of its compactness**. In that regard we propose codification of the attribute of amplitude of visual field as **Area x Compactness** of isovist – a compact area of circle which has the same perimeter as isovist itself. In that way it quantifies not only size of the view we have from the place, but also the size of that view which is round, convex and unified. If we compare **Area x Compactness** of isovist with an existing measure of ‘area to perimeter ratio’ discussed by (Conroy Dalton and Dalton, 2001b) we infer that **Area x Compactness** preserves the information about an overall size of the place’s view. This is informative for studies concerned with actual relationship between human and place in which size and scale should not be neglected.

**Table 20** Isovists (360°) from 7 case studies of Lisbon Riverside



|                                   | 1. Terreiro do Paço | 2. Ribeira das Naus | 3. Praça do Municipio | 4. Campo das Cebolas |
|-----------------------------------|---------------------|---------------------|-----------------------|----------------------|
| <b>Isovist area m<sup>2</sup></b> | 20,963,928          | 46,737,755          | 5,582                 | 19,111               |
| <b>Compactness</b>                | 0.51                | 0.59                | 0.65                  | 0.54                 |
| <b>Area x Comp.</b>               | 10,615,757          | 27,533,328          | 3,616                 | 10,280               |



|                                   |           |            |           |
|-----------------------------------|-----------|------------|-----------|
| <b>Isovist area m<sup>2</sup></b> | 9,539,821 | 33,776,080 | 1,125,689 |
| <b>Compactness</b>                | 0.38      | 0.51       | 0.01      |
| <b>Area x Comp.</b>               | 3,644,458 | 17,142,806 | 16,282    |

As demonstrated in Table 20, isovists representations of seven Open Public Spaces of Lisbon Riverside differ in their form which can be verified both visually and numerically. Four of them (1.Terreiro do Paço, 2.Ribeira das Naus, 5.Cais do Sodré, 6.Santos) are situated in the direct proximity of the river, two (4.Praça das Cebolas and 7.Jardim Dom Luis) are very proximate but due to industrial facilities visually separated from the Lisbon's Riverside – the existence of buildings diminishes amplitude of visual field. Buildings slice the view from the place and chunk the quality of unobstructed singular visibility augmenting extension but diminishing amplitude of visual field by introducing new vertices in isovist shape. The last case (3) Praça do Município is in the second line of urban quarters thus, even though quite close in distance, visually far away from the river.

### **Conclusions on Capturing Geographical and Natural Category**

As previously explained, the potential of UrbArch Emptiness to depict and give an insight into Open Public Space **characterisation** and **contextualisation** is manifold. It is an element whose form is moulded and implied by topography type defining the character of places. Moreover, UrbArch Emptiness allows for expansion of Open Public Spaces' experience throughout place into landscape and space, contributing in their mutual permeation, interweaving and relating. In that regard, it is a depicter of place-topography relationship and an important phenomenon in place-landscape-space

unification, thus an informative qualifier of Open Public Space characterisation and contextualisation.

Besides being an explanatory part of our surrounding, UrbArch Emptiness is proven to be a qualitative, positive and generative part of our built environment. It influences open public spaces' relationship towards site and topography, permitting their visual continuity and experiential wholeness. It deflects focus away from the constructed part, opening a new world of presences. It brings into the first plane other qualities which structure our urban surrounding, such as place and landscape character or amplitude and magnitude of visual field. It renders importance of spatial background allowing it to become an important figure in Open Public Space experience. Its capacity to act as a visual channel, through which an Open Public Space establishes connection with its contexts, permits a unified apprehension of a place, landscape and space.

Regarding qualities of **place characterisation** and **contextualisation**, expressed in particular through attributes of topography and visual amplitude, we inferred that they are likely to perform as synchronised – ex. places which are situated on convex slopes are likely to have an ample view. In actuality, the relationship between place implantation and quality of place's view depends on the built structure that together with the empty part constitutes the place. As shown in our case studies, the natural advantages and synchronicity of topography type and visual amplitude are not always taken advantage of. The way places are built can neglect the intrinsic qualities those places offer, weakening the potential relation between topography and possible visual amplitude. In that regard, comprehension and awareness of UrbArch Emptiness as a qualitative, strengthening, positive and explanatory element of Open Public Spaces' characterisation and contextualisation should be introduced as important qualifier in project development and decisions making. The presented study shows the theoretical basis and a possible practical application of such an intention.

*This page intentionally left blank*

## 6.2. Capturing Architectural and Urban Category

The following section is the output of **Practical Objective 1.2 PO.1.2.**

On the **geographical and natural level** addressed in the previous section, we did not limit our object of observation on boundaries of observed case studies as possible to be directly embodied. To approach the **contextual scale** we focused on the UrbArch Emptiness as shaped by broader limits of **topography, landscape and horizon**. The limits of our object of observation accounted for a larger **place-landscape-space** scale and wider surroundings' elements which overpassed the **limits of places**. UrbArch Emptiness was conceptualised as a linking element, which allows experience and apprehension of place to leakage towards its landscape, and further towards space and was proven **to promote background** observation and to establish **place-landscape-space triad** through the visual connectivity it allows.

Differently, for the purpose of analysis of Open Public Spaces attributes **at urban-architectural level**, we made an analytical approximation, thus increased observational scale towards a **place level** and UrbArch Emptiness at this level moulded. From this perspective, more proximate urban and architectural limits and boundaries start participating in generation of **Open Public Spaces** and the way these are being **structured and classified**. These findings from urban and architectural level were joined to results from geographic and natural one and finally interpreted regarding their capacity to provide framework for social interaction and recreational activities (chapter 6.3).

Natural Geographic Context + **Urban-architectural structure** > Specific Behaviour

In that regard we reintroduced urban-architectural attributes of **spaciousness, openness, diversity, naturalness, light and colour**, deemed important by users in

the previous section, and specifically focused on structural ones (spaciousness, openness and diversity) which are in more detailed observed and explained at case studies of Lisbon Riverside. While for Natural and Geography Category (chapter 6.1), we recognized within existing methodologies, isovists and viewshed as suitable for proposed investigation, for this section we used **theoretical and representation 3D solid models** of Convex, Solid and Fragmented Voids. These were developed by author (chapter 4.0) and applied, together with isovist, on analysis of Urban-Architectural **attributes** inferred important by users (chapter 5).

## **Abstract**

To address how UrbArch Emptiness influences attributes of Open Public Spaces on urban and architectural level, we tested models of Convex, Solid and Fragmented Voids (see chapter 4.0). They are developed as abstracted representation of Open Public Spaces intended to address various spatial attributes. Here, the models are used for analysis of attributes of spaciousness, openness and diversity and applied in several case studies of Lisbon Riverside. The representation models are applied on both traditional and non-traditional cases of Open Public Spaces wherefrom some important findings on **Open Public Spaces structuring** and **classification** are extracted. In short, while attribute of spaciousness is found important for structuring of places through their solid **objecthood**, the attributes of openness and diversity are found important for structuring of places as **unbuilt fields**.

## **Urban-Architectural Open Public Space Attributes**

On the Urban and Architectural level, attributes of Open Public Space such as **spaciousness, openness, naturalness, diversity and materiality** (light and colour) were singled out as especially important (Cavic and Beirão, 2014). Regarding specific spatial characteristic they address, these urban-architectural attributes can be clustered in two groups: **structural** and **semantic**. While spaciousness, openness and

diversity are structural which is to say **formal attributes**, the naturalness and light and colour are **semantic** or descriptive ones.

**Table 21** *Structural and Semantic Urban-Architectural Attributes*

|                                       |                              |                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------------|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Urban-architectural Attributes</b> | <b>Structural Attributes</b> | Spaciousness (vs containment) is a structural attribute of Open Public Space which corresponds to size of Open Public Spaces' unfilled intervals. Spaciousness / containment are attributes of unbuilt part of Open Public Space which is moulded by its built structure.                                                                         |
|                                       |                              | Openness (vs enclosure) is a structural attribute of Open Public Space which corresponds to visual and locomotive permeability of spatial limits. Openness and its inverse enclosure are attributes of built limits of Open Public Space which account for how permeable, visually or physically, the limits of a specific Open Public Space are. |
|                                       | <b>Semantic Attributes</b>   | Diversity (vs uniformity) is a structural attribute of Open Public Space which corresponds to condition of having or being composed of different either unbuilt or built elements.                                                                                                                                                                |
|                                       |                              | Naturalness (vs artificialness) is a semantic attribute of Open Public Space which corresponds to natural attribute of its limits                                                                                                                                                                                                                 |
|                                       |                              | Light and colour (eq. materiality) is a semantic attribute of Open Public Space which corresponds to material attribute of its limits.                                                                                                                                                                                                            |

Out of these we specifically addressed the **structural ones**: Spaciousness, Openness and Diversity (Table 21). The results are finally correlated with qualitative spatial capacities to provide space for social interaction and recreational usages inferred by first person phenomenological analysis and natural observation of study of cases in Lisbon Riverside.

**Table 22** *Application of Convex, Solid and Fragmented Voids*

|                                   |                                                                                                            | Convex Voids | Solid Voids | Fragmented Voids |
|-----------------------------------|------------------------------------------------------------------------------------------------------------|--------------|-------------|------------------|
| <b>Urban-architectural Limits</b> | Lot separation walls, Pedestrian and vehicle bridges, Shore Line, Facades                                  | +            | +           | +                |
| <b>Equipment Limits</b>           | Linear-bordering equipment elements (ex. paved surfaces, ramps, sport fields, covered passages, kiosks...) | -            | -           | +                |

## Spaciousness

An extensive body of work developed by Stamp collects various experimental findings on notion of spaciousness and correlated spatial properties and qualities. He deems spaciousness as a significant attribute due to its importance to qualities of safety and utility because it allows for enough space for satisfaction of human needs<sup>50</sup> (Stamps, 2008, p.526, par.1) giving them enough room not to feel threatened<sup>51</sup> (Stamps, 2010, p.253, par.1). Spaciousness is also linked to the security because it provides ability to move (locomotive permeability) and ability to see (visual permeability)<sup>52</sup> (Stamps, 2009, p.865, par.1). In architectural theory authors such as Joedicke (1985) claim that even though very basic, the attribute of spaciousness is very important in spatial experience. 'Spaciousness' or 'containment' depend on properties of spatial area and height of facades adjacent to it – when spaces is small with high surrounding buildings it is perceived as less spaciousness comparing to bigger one with lower built environment (Beirão, Chazar, Cavic, 2014).

In their analysis of Open Public Spaces Viljoen and Howe, (2012) introduced notion of Continuous Productive Urban Landscapes (CPUL) which provide cities with continuous network of planted spaces, that patches city by urban and peri-urban agriculture, propose spaciousness as one of three major CPUL's attributes.

---

<sup>50</sup> "Theory suggests that having enough space is a fundamental human need and so research on how environments can be modified to increase perceived spaciousness is important"

<sup>51</sup> "animals, including people, feel threatened if they do not have sufficient space"

<sup>52</sup> "The gist of the argument is as follows: Safety is the most important function an organism can have in an environment; safety is intimately entwined with abilities to see (visual permeability) or move (locomotive permeability); impressions of enclosure or spaciousness are proxies for judgments of potential safety or danger, and permeability, either perceptual or locomotive, is mediated by features of the physical environment such as boundaries or properties of horizontal regions within boundaries"



*“Spaciousness describes the space itself, its extent, its width and breath. It means more than size, but size is its basic element, its starting point. There is no qualitative judgement connected to size: small open space is not bad open space, neither is big open space. Size is considered as influencing the space’s designation and its ability to accommodate certain programmes and occupants.” (Viljoen and Howe, 2012, p.109, par.8)*

*“Examples can be found where smaller spaces are more desirable than larger spaces. This is reflected in natural language by terms such as ‘cozy’, which connotes both small and desirable, just as ‘claustrophobic’ connotes both small and undesirable, or terms such as ‘agoraphobic’, which connotes both large and undesirable and ‘spacious’...” (Stamps, 2007)*

### **Capturing Spaciousness**

In the Space Matrix theory spaciousness is expressed through variable of Open Space Ratio OSR, which measures the amount of non-built space at ground level per square metre of gross floor area. This figure provides an indication of the ‘pressure on non-built space’. If more floor area is developed in an area (with the same footprint), the OSR decreases and the number of people who would potentially use the non-built space increases. The unit of OSR is  $m^2/m^2$  (<http://www.urban-knowledge.nl/3/spacemate-spacematrix>).

Another method commonly used for capturing attribute of spaciousness is isovists. Benedikt (2008) explains judgment of spaciousness through isovists analysis and their specific measures – **A**rea of isovist, **P**erimeter of isovist excluding the horizon and excluding **Q**, **Q** measure of the length of the radial, **M2** which is a statistical measure of the variability of the boundary’s distance from observing point; and **M3** which is a measure of the asymmetry of M2. Our impression of spaciousness is evoked by **high A, low P, low Q, and high M3** claims Benedikt, while M2 seemed to make little difference.

Some researchers approach attribute of spaciousness in relation how human perceive it finding it highly correlated with horizontal spatial area which is thus deemed as the most important property in judged spaciousness (Stamps, 2008, 2010). Moreover, other properties are also proven somewhat important for perception of spaciousness: a) shape (elongation) of space, b) permeability and height of boundaries, c) light, d) boundary roughness, e) crowding, c) colour.

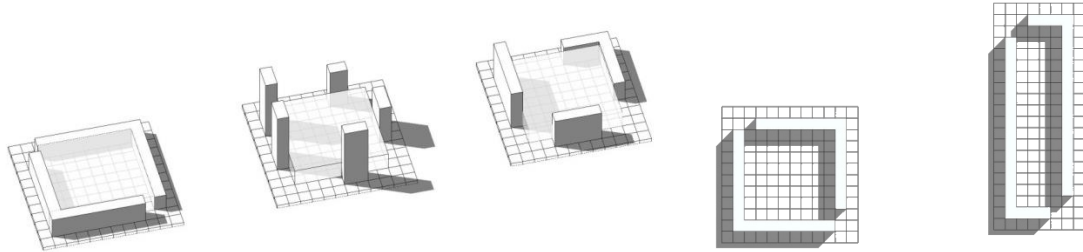
In various studies Stamps establishes and measures correlation between perceived spaciousness and other physical properties of space. He finds the notion of perceived spaciousness as highly correlated with openness of its boundaries ( $r=0.64$ ), horizontal spatial area ( $r=0.56$ ) and overall lightness ( $r=0.39$ ) (Stamps, 2009). Moreover, in his studies other properties, such as shape (elongation) of space, permeability (openness) and height of boundaries, boundary roughness, are also proven somewhat important for perception of spaciousness.

To capture attribute of spaciousness of Open Public Space, we propose usage of **Convex, Solid and Fragmented Voids** representation taking into consideration **physical properties** that Stamp claims to be the most influential to the perceived spaciousness. We especially focus on those that are structural and in that regard accounted for:

- 1) Horizontal spatial area,
- 2) Average height of built boundaries and
- 3) Shape (elongation) of space

Property of **horizontal spatial area** is linked to the attribute of spaciousness providing enough space and area to be used, seen and walked through. **Average height** of built boundaries influences the notion of spaciousness since higher spatial boundaries increase notion of containment thus diminish spaciousness. **Elongation / compactness** influences Open Public Space spaciousness – two spaces that have the

same area and the same average height of built boundaries would have different spaciousness depending on their compactness (Figure 61).



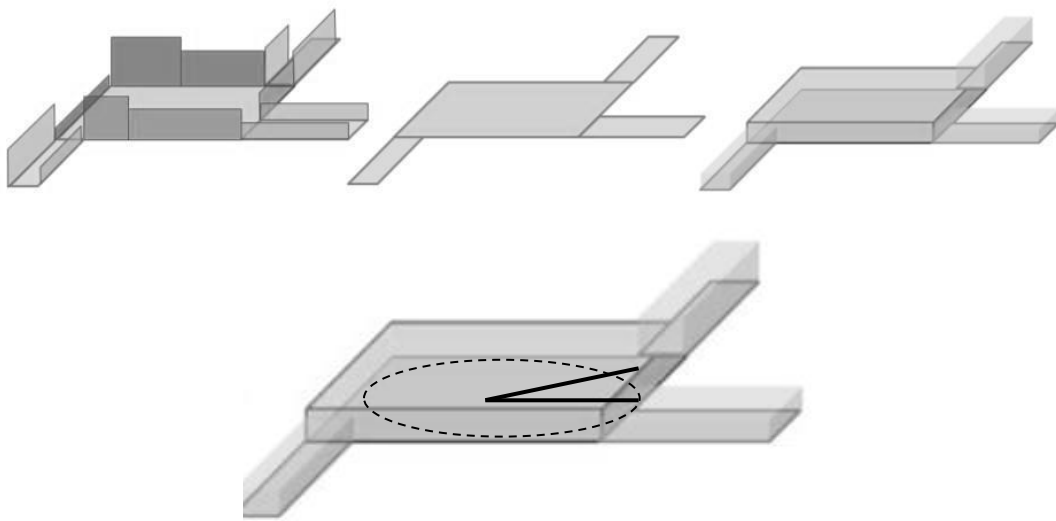
**Figure 61.** Spaciousness /Openness and Spaciousness/Compactness Relationship

**Table 23** Attribute of Spaciousness captured by Convex, Solid and Fragmented Voids

|                            | <b>Convex Voids</b>                                            | <b>Solid Voids</b>                                             | <b>Fragmented Voids</b>                                                                     |
|----------------------------|----------------------------------------------------------------|----------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| Containment / Spaciousness | Horizontal area of CV<br>Compactness<br>Average facades height | Horizontal area of SV<br>Compactness<br>Average facades height | Horizontal area of FV<br>Compactness<br>Uncovered horizontal area<br>Average facades height |

The attribute of spaciousness is thus expressed through the three measurable properties: **horizontal area**, **compactness** and **average facades height** (Table 23). As space is bigger and its built environment is lower the sensation of spaciousness tends to be higher. On the contrary, as area of space decreases and buildings are higher feeling of containment is getting stronger and its numerical value bigger. Bigger the space and lower its built environment is, the higher Open Public Space spaciousness tends to be. On contrary, with increasing of buildings' height spaciousness tends to diminish and containment tends to increase. Finally, more elongated spaces with the same area and the same boundaries' surface tend to be perceived as less spaciousness.

To comprise the properties of **horizontal area, compactness and average façade height**<sup>53</sup>, we proposed usage of Convex Spaces as representation model of facades' average height (**Figure 62s**). We further calculated the **Angle** between the circle diameter and facades' average height wherefrom the measure which comprise the properties of horizontal area, compactness and façade height was made. This comprised measure converges towards **spaciousness** as theoretically deemed by Stamps.



**Figure 62** Convex Spaces as Representation of Facades' Average Height and Angle

To verify the findings we compared the results with another measure that is deemed a qualitative standard to evaluate the spaciousness of open air - **Sky View Factor**

---

<sup>53</sup>As defined, the average facade height overpasses the notion of simple measurable property because it accounts for more than dimension of heights of built boundaries. It takes into consideration area of convex space and average heights of build boundaries of neighbourhoods' spaces since they influence the overall perception of spaciousness or containment. If neighbourhood average boundaries are higher they are going to augment the height of the CV itself. How strongly this augmentation is going to be depends on area of space itself. In smaller spaces the perception of neighbourhood façades is due to proximity more present thus smaller spaces are more strongly influenced by neighbours ones. On contrary, big space receive small influence of surrounding spaces thus correction fraction diminishes. The exact equation can be found in Beirão et al., (2015)

(Brown et al., 2001). The correlation found between **Sky View Factor (SVF)** and **Angle** which comprise properties of horizontal area, compactness and façade height is very high  $r=0.8474$  showing high correspondence (Figure 63). Therefore we verified that the attribute of spaciousness, already captured by SVF, can also be adequately expressed through measure of the presented **angle**.

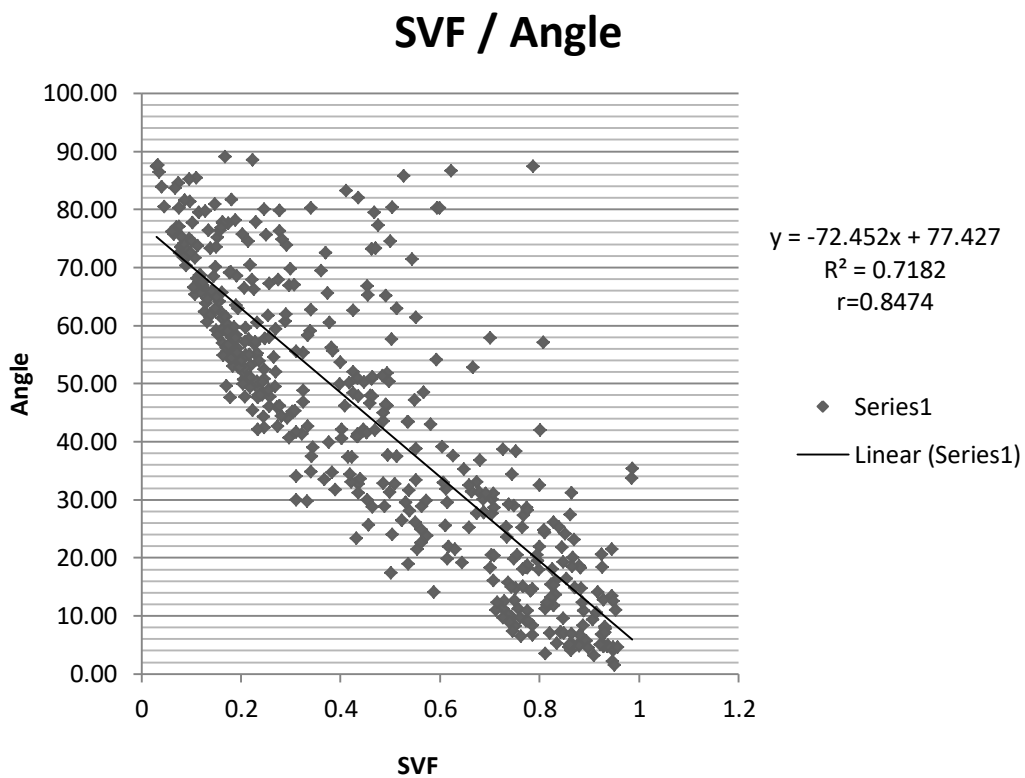


Figure 63 SVF / Angle correlation

## Spaciousness in Lisbon Riverside

|                            | CV_ID     | CV_Avg_Height<br>m | CS_Area<br>m <sup>2</sup> | CS_Circ_Diam<br>m | CV_Compactn   | Angle<br>degree |
|----------------------------|-----------|--------------------|---------------------------|-------------------|---------------|-----------------|
| Terreiro do Paço           | CV_R_0000 | 11.6               | 35967                     | 191               | 0.83          | 6.97            |
|                            | CV_R_0287 | 8.9                | 521                       | 17                | 0.51          | 46.97           |
|                            | CV_R_0413 | 16.5               | 969                       | 13                | 0.16          | 68.09           |
|                            | CV_R_0393 | 15.8               | 559                       | 13                | 0.27          | 67.79           |
|                            | CV_R_0158 | 4.0                | 314                       | 14                | 0.65          | 28.94           |
| Terreiro do Paço           |           | <b>Wg Avr</b>      | <b>Tot</b>                | <b>Wg Avr</b>     | <b>Wg Avr</b> | <b>Wg Avr</b>   |
|                            |           | <b>11.7</b>        | <b>38,330.4</b>           | <b>179.8</b>      | <b>0.8</b>    | <b>10.1</b>     |
| Cais das Colunas           | CV_R_0044 | 2.3                | 891                       | 30                | 0.84          | 8.85            |
|                            | CV_R_0114 | 1.9                | 269                       | 16                | 0.76          | 13.42           |
|                            | CV_R_0431 | 1.9                | 43                        | 5                 | 0.52          | 36.99           |
|                            | CV_R_0414 | 1.7                | 59                        | 5                 | 0.35          | 33.59           |
|                            |           | <b>Wg Avr</b>      | <b>Tot</b>                | <b>Wg Avr</b>     | <b>Wg Avr</b> | <b>Wg Avr</b>   |
|                            |           | <b>2.2</b>         | <b>1,262.5</b>            | <b>25.0</b>       | <b>0.8</b>    | <b>11.9</b>     |
| Ribeira das Naus           | CV_R_0113 | 10.4               | 436                       | 17                | 0.75          | 50.70           |
|                            | CV_R_0060 | 11.0               | 661                       | 23                | 0.78          | 43.32           |
|                            | CV_R_0012 | 13.5               | 5015                      | 68                | 0.77          | 21.61           |
|                            | CV_R_0214 | 3.6                | 1728                      | 30                | 0.45          | 13.70           |
|                            | CV_R_0001 | 13.5               | 27192                     | 168               | 0.82          | 9.14            |
|                            | CV_R_0005 | 5.4                | 11195                     | 97                | 0.80          | 6.32            |
|                            | CV_R_0006 | 11.6               | 7712                      | 89                | 0.83          | 14.56           |
|                            | CV_R_0231 | 14.0               | 659                       | 21                | 0.60          | 53.82           |
|                            |           | <b>Wg Avr</b>      | <b>Tot</b>                | <b>Wg Avr</b>     | <b>Wg Avr</b> | <b>Wg Avr</b>   |
|                            |           | <b>11.2</b>        | <b>54,598.6</b>           | <b>124.0</b>      | <b>0.8</b>    | <b>11.9</b>     |
| Praça do Município         | CV_R_0010 | 22.3               | 4986                      | 71                | 0.84          | 32.15           |
|                            | CV_R_0236 | 17.9               | 243                       | 12                | 0.58          | 70.94           |
|                            | CV_R_0268 | 12.3               | 227                       | 12                | 0.56          | 64.36           |
|                            |           | <b>Wg Avr</b>      | <b>Tot</b>                | <b>Wg Avr</b>     | <b>Wg Avr</b> | <b>Wg Avr</b>   |
|                            |           | <b>21.7</b>        | <b>5,455.6</b>            | <b>66.0</b>       | <b>0.8</b>    | <b>35.2</b>     |
| Campo das Cebolas          | CV_R_0028 | 15.9               | 5419                      | 63                | 0.73          | 26.61           |
|                            | CV_R_0377 | 11.8               | 351                       | 11                | 0.40          | 64.51           |
|                            | CV_R_0029 | 10.2               | 5938                      | 60                | 0.73          | 18.88           |
|                            | CV_R_0049 | 6.3                | 4586                      | 51                | 0.72          | 13.87           |
|                            |           | <b>Wg Avr</b>      | <b>Tot</b>                | <b>Wg Avr</b>     | <b>Wg Avr</b> | <b>Wg Avr</b>   |
|                            |           | <b>11.0</b>        | <b>16,295.5</b>           | <b>57.6</b>       | <b>0.7</b>    | <b>21.0</b>     |
| Cais do Sodré              | CV_R_0008 | 10.4               | 8450                      | 89                | 0.82          | 13.16           |
|                            | CV_R_0246 | 7.0                | 178                       | 11                | 0.63          | 52.10           |
|                            | CV_R_0009 | 6.0                | 7301                      | 84                | 0.80          | 8.05            |
|                            | CV_R_0205 | 2.8                | 846                       | 23                | 0.48          | 14.01           |
|                            | CV_R_0443 | 6.4                | 763                       | 20                | 0.42          | 33.17           |
|                            |           | <b>Wg Avr</b>      | <b>Tot</b>                | <b>Wg Avr</b>     | <b>Wg Avr</b> | <b>Wg Avr</b>   |
|                            |           | <b>8.0</b>         | <b>17,538.1</b>           | <b>80.2</b>       | <b>0.8</b>    | <b>12.3</b>     |
| Jardim Dom Luis            | CV_R_0004 | 13.7               | 9503.1                    | 94.0              | 0.8           | 16.2            |
|                            | CV_R_0050 | 12.3               | 970                       | 28                | 0.78          | 40.83           |
| Largo do Corpo Santo       | CV_R_0448 | 15.3               | 73                        | 6                 | 0.46          | 79.56           |
|                            | CV_R_0446 | 15.5               | 80                        | 7                 | 0.48          | 78.03           |
|                            | CV_R_0447 | 12.5               | 120                       | 8                 | 0.40          | 72.81           |
|                            |           | <b>Wg Avr</b>      | <b>Tot</b>                | <b>Wg Avr</b>     | <b>Wg Avr</b> | <b>Wg Avr</b>   |
|                            |           | <b>12.7</b>        | <b>1,242.9</b>            | <b>23.7</b>       | <b>0.70</b>   | <b>48.59</b>    |
| Largo do Terreiro do Trigo | CV_R_0035 | 13.8               | 1921.4                    | 40.2              | 0.8           | 34.4            |
| Rua da Alfândega           | CV_R_0345 | 12.0               | 54                        | 6                 | 0.61          | 75.78           |
|                            | CV_R_0286 | 19.2               | 397                       | 11                | 0.60          | 73.50           |
|                            | CV_R_0135 | 10.9               | 125                       | 10                | 0.78          | 64.27           |
|                            | CV_R_0372 | 13.0               | 139                       | 9                 | 0.46          | 70.92           |
|                            | CV_R_0394 | 18.3               | 674                       | 12                | 0.32          | 71.31           |
|                            | CV_R_0347 | 13.0               | 159                       | 9                 | 0.46          | 69.96           |
|                            | CV_R_0275 | 16.2               | 524                       | 13                | 0.59          | 67.58           |
|                            | CV_R_0217 | 9.3                | 113                       | 10                | 0.73          | 62.63           |
|                            |           | <b>Wg Avr</b>      | <b>Tot</b>                | <b>Wg Avr</b>     | <b>Wg Avr</b> | <b>Wg Avr</b>   |
|                            |           | <b>16.2</b>        | <b>2184.4</b>             | <b>11.6</b>       | <b>0.5</b>    | <b>69.9</b>     |
| Rua dos Bacalhoeiros       | CV_R_0130 | 12.8               | 199                       | 14                | 0.82          | 61.07           |
|                            | CV_R_0151 | 14.6               | 191                       | 12                | 0.76          | 66.96           |
|                            | CV_R_0273 | 11.5               | 87                        | 8                 | 0.73          | 71.44           |
|                            | CV_R_0134 | 15.0               | 113                       | 10                | 0.76          | 71.08           |
|                            | CV_R_0234 | 18.1               | 166                       | 10                | 0.72          | 74.65           |
|                            | CV_R_0327 | 20.8               | 169                       | 8                 | 0.61          | 78.93           |
| CV_R_0360                  | 23.3      | 118                | 7                         | 0.58              | 81.71         |                 |
|                            |           | <b>Wg Avr</b>      | <b>Tot</b>                | <b>Wg Avr</b>     | <b>Wg Avr</b> | <b>Wg Avr</b>   |
|                            |           | <b>16.6</b>        | <b>1042.2</b>             | <b>10.4</b>       | <b>0.7</b>    | <b>71.5</b>     |

### Classification by Spaciousness

As shown in the previously presented analysis of case studies of Lisbon Riverside, it is possible to correlate values of angles between radiuses of biggest circles inscribed in space and average height of built environment with Sky View Factor. Moreover, when we tried to jointly present properties deemed important for attribute of spaciousness (ex. CV\_Avg\_Height, CS\_Area, CS\_Circ\_Diam, CV\_Compactn, Angle) we found certain correlation between these measures and Portuguese nomenclature given to some spatial typologies.

By observing UrbArch Emptiness of several cases of Lisbon Riverside, we inferred that attribute of **spaciousness** can be explicative for Open Public Spaces' typology as designated in Portuguese urbanism. Different linguistic notions reveal specific qualities of spaciousness – they are more or less **solidified**. Open public spaces such as 'terreiro' and 'ribeira' show highest measures linked to attribute of spaciousness. Differently, 'praça', 'largo', 'rua' manifest lowest spaciousness (see following tables).

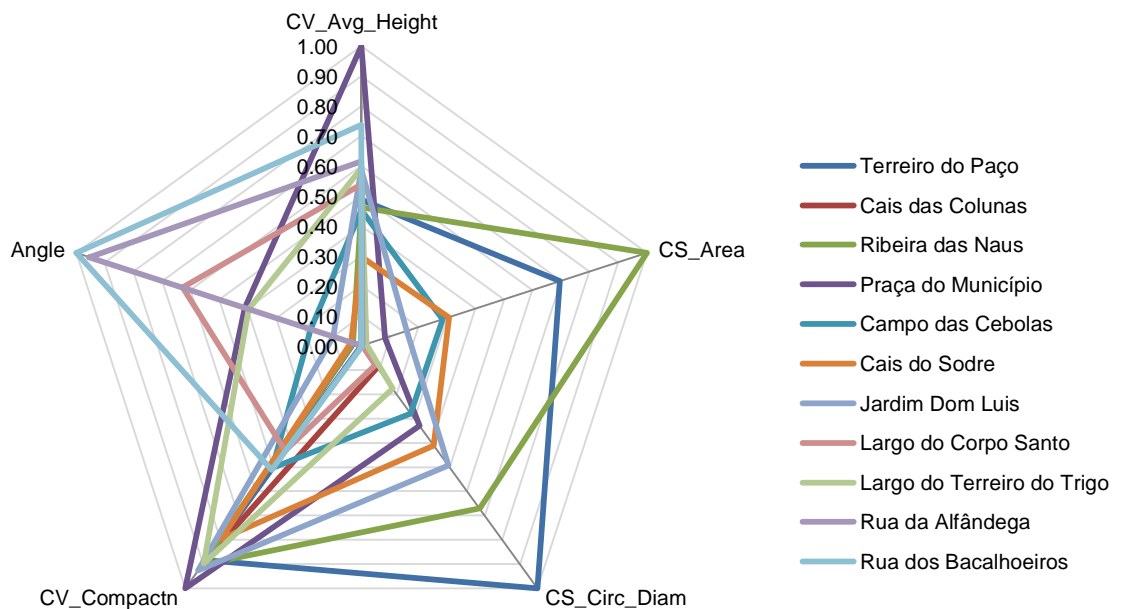


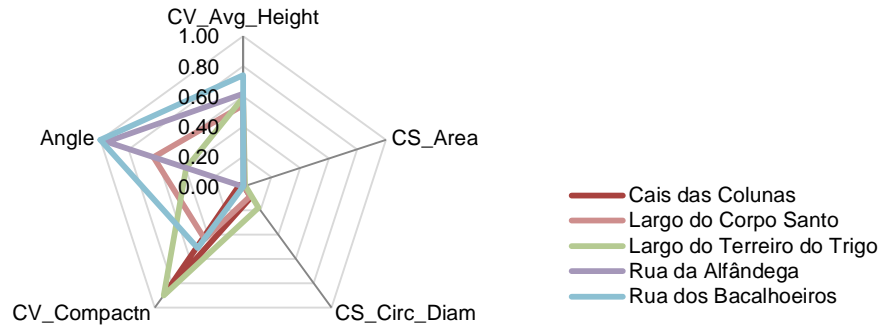
Figure 64 Spaciousness captured through several Properties

## Possible Classification by Area and Angle properties

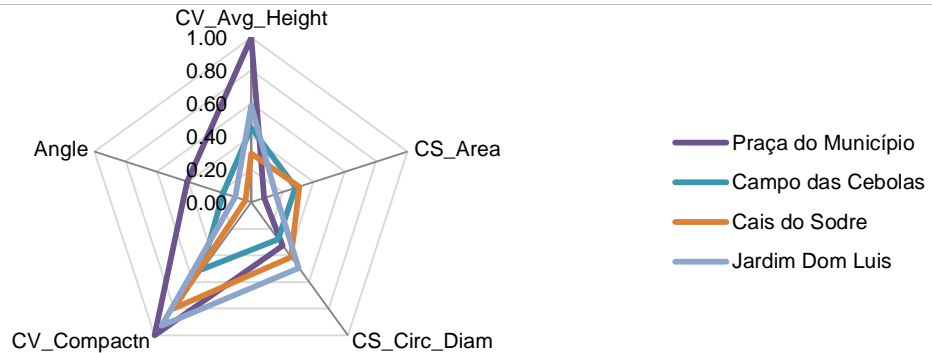
Table 24 Classification of Open Public Spaces by Area and Angle properties

### Classification of Open Public Spaces by Area and Angle properties (Small, Medium, Big) and Angle due to Height of Surrounding buildings (Big, Mid and Small)

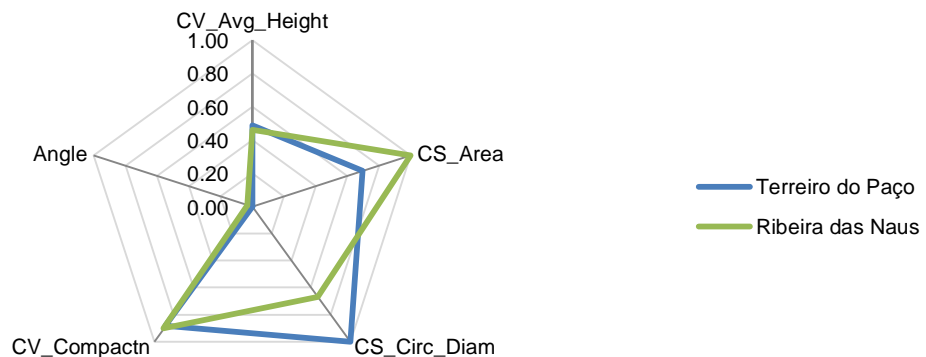
Small-Area + Big-Angle Open Public Spaces: "Ruas" - Ex: Rua da Alfândega, Rua dos Bacalhoiros  
 Small-Area + Mid-Angle Open Public Spaces: "Largos" - Ex: Largo do Corpo Santo, Largo do Terreiro do Trigo  
 Small-Area + Small-Angle Open Public Spaces: "Cais" - Ex: Cais das Colunas



Mid-Area + Mid-Angle Open Public Spaces: "Praças" - Ex: Praça do Município  
 Mid-Area + Small-Angle Open Public Spaces: "Campo" "Cais" "Jardim" - Ex: Campo das Cebolas, Cais do Sodré, Jardim Dom Luis



Big-Area + Small-Angle Open Public Spaces: "Terreiros" "Rossios" Ex: Terreiro do Paço, Ribeira das Naus





## Possible Classification by Angle properties

Table 25 Classification of Open Public Spaces by Angle

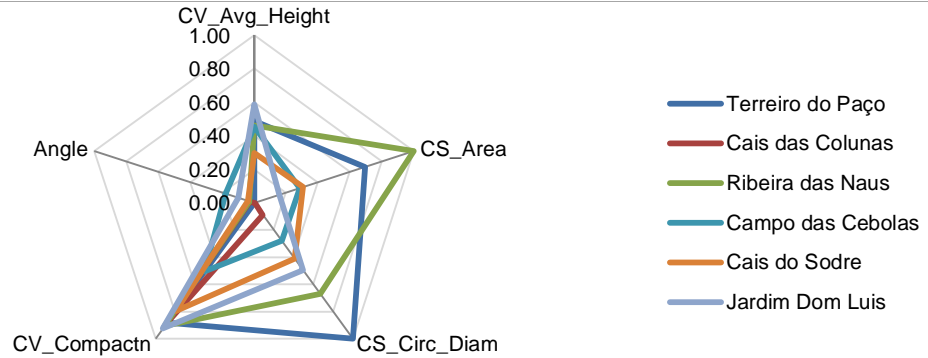
### Classification of Open Public Spaces by Angle (Small, Mid, Big)

#### Small – Angle Open Public Spaces

Small-Area Open Public Spaces, ex: Cais das Colunas

Mid-Area Open Public Spaces, ex: Campo das Cebolas, Cais do Sodré, Jardim Dom Luis

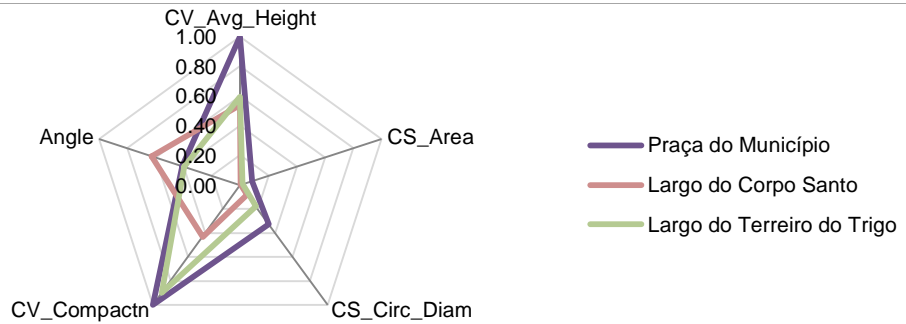
Big-Area Open Public Spaces, ex: Terreiro do Paço, Ribeira das Naus



#### Mid – Angle Open Public Spaces

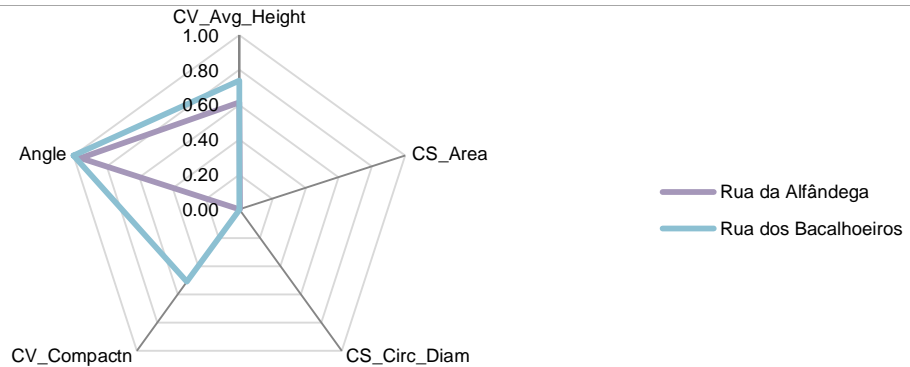
Small-Area Open Public Spaces, ex: Largo do Terreiro do Trigo, Largo do Corpo Santo

Mid-Area Open Public Spaces, ex: Praça do Município



#### Big – Angle Open Public Spaces

Small-Area Open Public Spaces, ex: Rua da Alfândega, Rua dos Bacalhoiros



## Openness

Neurophysiology has identified spatial boundaries as strongly linked to the intrinsic brain functioning through the PPA brain region (the parahippocampal place area) which responds to enclosed spaces rather than to objects, highlights (Stamps, 2005b). Moreover, the importance of **enclosure** is linked to survival mechanism described through the Appelon's **prospect** and **refuge** theories in which **openness** of limits allows one to spot enemies from distance (prospect) without being seen by them (refuge). In urban and architectural analysis, boundaries play an essential role. Due to the porosity of the limits Open Public Spaces establish visual and locomotive relationships with the surrounding thus, instead of being limited to the perimeter, unenclosed places "bleed out" towards landscape and space.

Attribute of Openness deals with how **permeable, visually or physically**, boundaries of specific Open Public Space are (Stamps, 2009). It therefore accounts for properties such as **permeability of spatial perimeter**, both **locomotive** and **visual**. Locomotive openness or linkage can be expressed through measurable properties such as **number of links** certain space has and visual through the **percentage** of spatial perimeter **preamble to view** (Table 26).

*Table 26 Attribute of Openness captured by Convex and Solid Voids*

|                            | <b>Definition</b>                                                                                     | <b>Measurable Properties</b>                                                                                                            | <b>Measuring Method</b>                                    |
|----------------------------|-------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| <b>Visual Openness</b>     | <ul style="list-style-type: none"> <li>• Visual porosity of Open Public Spaces limits</li> </ul>      | <ul style="list-style-type: none"> <li>• Number of visual openings</li> <li>• Openness percentage</li> <li>• Openness Angles</li> </ul> | <ul style="list-style-type: none"> <li>• SV</li> </ul>     |
| <b>Locomotive Openness</b> | <ul style="list-style-type: none"> <li>• Locomotive porosity of Open Public Spaces limits.</li> </ul> | <ul style="list-style-type: none"> <li>• Number of locomotive links</li> </ul>                                                          | <ul style="list-style-type: none"> <li>• CV, SV</li> </ul> |

## ***Openness and Spaciousness***

The notion of **openness** is frequently interchangeably used with **spaciousness** which often leads towards their confusion. To clearly distinct these two attributes we used them together with their conceptual opposites as descriptor – spaciousness-containment and openness-enclosure. **Spaciousness-containment** are attributes of overall spatial vastness which is to say spatial size also accounting for height of spatial boundaries. They give an insight into the space itself linking it to spatial boundaries as they are reflected over the space. This means that attribute of spaciousness contains information on openness and as such is correlated with it. Differently, **openness-enclosure** concentrate primary on boundaries describing how much of the spatial two-dimensional or three-dimensional perimeter is enclosed or open towards its background. Even though the notion of **spaciousness** is commonly used interchangeably with **openness** it is possible to draw a clear categorization line between these. Spaciousness is an attribute of unbuilt part of Open Public Space as it is been moulded by its built structure. It accounts for spatial properties such as **area, shape and height** of open space. An attribute which accounts for notion inverse to **spaciousness** is **containment**. Differently, **openness** and its inverse **enclosure** are attributes of built limits of Open Public Space.

In short, while **spaciousness-containment** pair primarily explains the **quality of unbuilt spatial intervals**, **openness-enclosure** address quality of **spatial built membrane**. Openness-enclosure can therefore address either visual permeability of spatial limits or locomotive one, which some authors termed linkage.

The spaciousness-openness conceptual proximity is present in various approaches on spatial apprehension. In their research on modelling spatial envelope Oliva and Torralba joint notions of spaciousness and openness as we used them in single term

'openness': "The notion of openness was mainly described as open vs. closed-enclosed environment, scenes with horizon vs. no horizon, a vast or empty space vs. a full, filled-in" (Oliva and Torralba, 2001, p.148, par.1). In his analysis on spaciousness and openness of inside spaces Franz (2005) finds, similarly to Stamps, a high correlation between spaciousness and area of a space but also between spaciousness and openness of space towards exterior (area of windows). Other **openness** analyses are done on landscape visual openness (Weitkamp, 2011b) which emphasizes the visual aspect of openness as important for perceived visual quality and landscape preference.

## **Diversity**

Another important structural attribute of Open Public Spaces is **diversity** which can adopt various meanings and can be addressed on various levels of observation. As Franz claims (2005), diversity is a **collative characteristic**, which is to say characteristic of comparison such as order or complexity that do not relate only to particular physical features but to environment as a whole<sup>54</sup>. Diversity, therefore can address wholeness of structure of Open Public Spaces on various levels: the structure of '**open rooms**' (their overall areas, compactness, spaciousness), but also structure of '**built boundaries**' (chunkiness and irregularity). It can also account for **equipment** and their diversity or diversity of inner spaces they create, etc (Table 27).

*Table 27 Attribute of Diversity captured by Convex and Solid Voids*

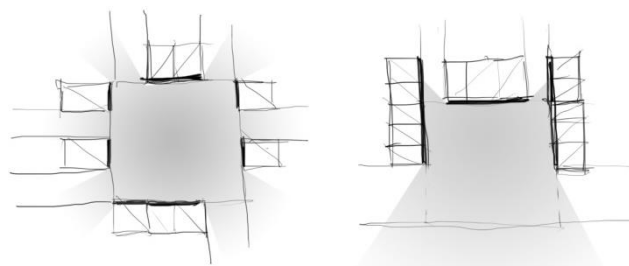
---

<sup>54</sup> "Besides denotative adjectives that can be more or less concisely ascribed to particular physical features, there is a second discriminable group of words intuitively related to physics that characterize environments as a whole" (Franz, 2005)

|                                       | Definition                                                                                                                   | Measurable Properties                                                                                                                              | Measuring Method                                           |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| <b>Diversity of Unbuilt structure</b> | <ul style="list-style-type: none"> <li>• Diversity of 'open rooms'</li> </ul>                                                | <ul style="list-style-type: none"> <li>• Diversity of horizontal area</li> <li>• Diversity of compactness</li> <li>• Diversity of angle</li> </ul> | <ul style="list-style-type: none"> <li>• SV</li> </ul>     |
| <b>Diversity of Built structure</b>   | <ul style="list-style-type: none"> <li>• Structure of built boundaries, such as chunkiness and irregularity, etc.</li> </ul> | <ul style="list-style-type: none"> <li>• Number of facades per 100m</li> <li>• Height differences</li> </ul>                                       | <ul style="list-style-type: none"> <li>• CV, SV</li> </ul> |
| <b>Diversity of openness</b>          | <ul style="list-style-type: none"> <li>• Diversity of open boundaries' intervals size</li> </ul>                             | <ul style="list-style-type: none"> <li>• Number of open boundaries' intervals</li> <li>• Maximum and minimum open boundaries' intervals</li> </ul> | <ul style="list-style-type: none"> <li>• SV</li> </ul>     |
| <b>Diversity of Equipment</b>         | <ul style="list-style-type: none"> <li>• Diversity of equipment</li> <li>• Diversity of equipment distribution</li> </ul>    | <ul style="list-style-type: none"> <li>• Number and types of equipment</li> <li>• Equipment orientation</li> </ul>                                 | <ul style="list-style-type: none"> <li>• FV</li> </ul>     |

### ***Openness and Diversity***

As discussed in the previous section on capturing attributes of Natural Advantages, due to the **openness** of their limits, places can establish ample and generous visual relationships with their surroundings which then allow for stronger places' **contextualisation**. Depending on **opening type**, continuous facades which open big chunks of views allow for round and convex **fields of views** which produce **compact and wide magnitude of visual field**. The relationship between external-internal, which is the primary aspect of concrete space, implies that the space has an extension and a closure<sup>55</sup> (Schulz, 1979. p.7).

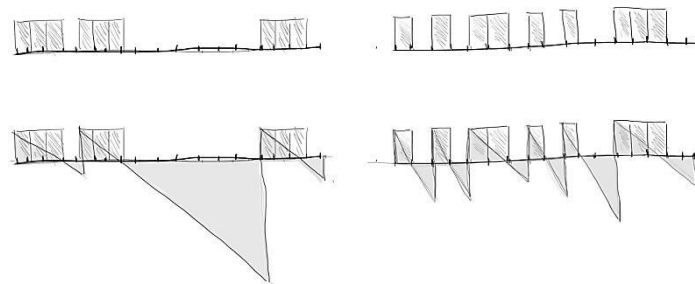


**Figure 65** Same openness percentage with different view type

<sup>55</sup> "Il rapporto esterno-interno, aspetto primario dello spazio concreto, sottintende che lo spazio possiede una varietà di estensione e di chiusura." (Schulz, 1979, p.7).

Differently, smaller openings **rip the homogeneity of place's view field** making **concave and profound** extension of visual field. This means that Open Public Spaces which have the same percentage of unbuilt perimeter might produce different visual fields depending on distribution and diversity of built-unbuilt intervals (Figure 65). In that regard we simultaneously observed **openness** and **diversity** of Open Public Spaces' limits addressing them as part of a joint **rhythmic structure of a city**.

The open-enclosed interplay creates **Open Public Spaces' rhythm** which is in the basis for **urban-architectural compositions** – places where open and enclosed boundaries are significantly altering differ from places with uniformly distributed open and enclosed boundaries portions (Figure 66).



**Figure 66** Wave analogy applied to Open Public Spaces rhythm

To perceive better the full-empty interplay we can use 'wave' analogy and observe effects that full-to-empty alterations produce in spatial apprehension. Different **openness-diversity** as relationship between full-empty heights and distances create different 'waves' that are more or less regular with lower or higher 'frequencies', and larger or smaller 'amplitudes'.

### **Capturing Openness**

To capture attribute of **openness** of Lisbon Riverside we observed it jointly with the attribute of **diversity** using method of **Solid Voids** and **Isovists** especially focusing on measuring of the following properties:

| <b>Attribute</b>             | <b>Properties</b>                | <b>Description</b>                                                                                                                                               | <b>Method</b> |
|------------------------------|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>Openness</b>              | Openness Percentage              | Percentage of open spatial boundaries which gives us an overall idea of boundaries' permeability                                                                 | Solid Voids   |
|                              | Openness Angles                  | Total angle of openings through which view can reach certain visual radius (ex. 250m)                                                                            | Isovist       |
|                              | Maximum Opening Angle            | The biggest opening through which view can reach certain visual radius (ex. 250m)                                                                                | Isovist       |
| <b>Diversity of Openings</b> | Number of openings               | Number of openings through which view can reach certain visual radius (ex. 250m) giving a notion of envelope discontinuity                                       | Solid Voids   |
|                              | Number of links towards Exterior | Number of locomotive links which leads towards exterior of the Open Public Spaces giving a notion walking continuity. This property is sometimes termed linkage. | Solid Voids   |

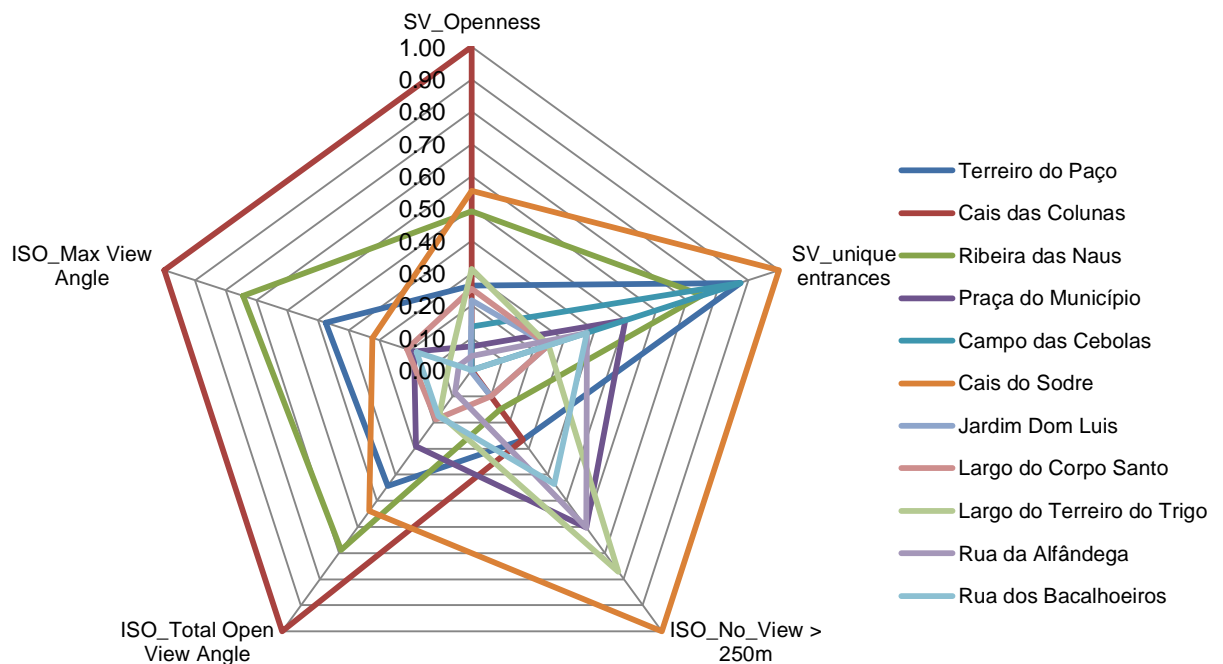
## Openness in Lisbon Riverside

|                            | SV_Openness   | SV_unique entrances | ISO_No_View > 250m | ISO_Total Open View Angle | ISO_Max View Angle |
|----------------------------|---------------|---------------------|--------------------|---------------------------|--------------------|
| Terreiro do Paço           | 0.365         | 8                   | 2                  | 78.00                     | 75.60              |
| Terreiro do Paço           | <b>Wg Avr</b> | <b>Total</b>        | <b>Wg Avr</b>      | <b>Wg Avr</b>             | <b>Wg Avr</b>      |
|                            | 0.365         | 8                   | 2                  | 78.00                     | 75.60              |
| Cais das Colunas           | 1             | 1                   | 2                  | 175.17                    | 158.40             |
|                            | <b>Wg Avr</b> | <b>Total</b>        | <b>Wg Avr</b>      | <b>Wg Avr</b>             | <b>Wg Avr</b>      |
|                            | 1             | 1                   | 2                  | 175.17                    | 158.40             |
|                            | 0.6136        | 1                   | 1                  | 202.34                    | 202.34             |
|                            | 0.6427        | 0                   | 1                  | 186.00                    | 186.00             |
| Ribeira das Naus           | 0.5431        | 1                   | 1                  | 132.00                    | 132.00             |
|                            | 0.5709        | 5                   | 2                  | 70.80                     | 62.40              |
|                            | <b>Wg Avr</b> | <b>Total</b>        | <b>Wg Avr</b>      | <b>Wg Avr</b>             | <b>Wg Avr</b>      |
|                            | 0.56          | 7                   | 1.30               | 120.51                    | 118.01             |
|                            | 0.2043        | 5                   | 4.00               | 51.60                     | 30.00              |
| Praça do Município         | <b>Wg Avr</b> | <b>Total</b>        | <b>Wg Avr</b>      | <b>Wg Avr</b>             | <b>Wg Avr</b>      |
|                            | 0.20          | 5                   | 4                  | 51.60                     | 30.00              |
|                            | 0.1476        | 2                   | 0                  | 0.00                      | 0.00               |
|                            | 0.4203        | 6                   | 1                  | 1.20                      | 1.20               |
| Campo das Cebolas          | <b>Wg Avr</b> | <b>Total</b>        | <b>Wg Avr</b>      | <b>Wg Avr</b>             | <b>Wg Avr</b>      |
|                            | 0.26          | 8                   | 0.40               | 0.48                      | 0.48               |
|                            | 0.6232        | 2                   | 6                  | 98.85                     | 61.20              |
|                            | 0.6079        | 7                   | 7                  | 87.60                     | 34.80              |
| Cais do Sodre              | <b>Wg Avr</b> | <b>Total</b>        | <b>Wg Avr</b>      | <b>Wg Avr</b>             | <b>Wg Avr</b>      |
|                            | 0.62          | 9                   | 6.36               | 94.79                     | 51.66              |
|                            | 0.3261        | 3                   | 1                  | 1.20                      | 1.20               |
| Jardim Dom Luis            | <b>Wg Avr</b> | <b>Total</b>        | <b>Wg Avr</b>      | <b>Wg Avr</b>             | <b>Wg Avr</b>      |
|                            | 0.33          | 3                   | 1.00               | 1.20                      | 1.20               |
|                            | 0.3574        | 3                   | 1                  | 33.60                     | 33.60              |
| Largo do Corpo Santo       | <b>Wg Avr</b> | <b>Total</b>        | <b>Wg Avr</b>      | <b>Wg Avr</b>             | <b>Wg Avr</b>      |
|                            | 0.3574        | 3                   | 1                  | 33.60                     | 33.60              |
|                            | 0.4102        | 3                   | 5                  | 30.00                     | 12.00              |
| Largo do Terreiro do Trigo | <b>Wg Avr</b> | <b>Total</b>        | <b>Wg Avr</b>      | <b>Wg Avr</b>             | <b>Wg Avr</b>      |
|                            | 0.4102        | 3                   | 5                  | 30.00                     | 12.00              |
|                            | 0.1778        | 4                   | 4                  | 15.60                     | 7.20               |
| Rua da Alfândega           | <b>Wg Avr</b> | <b>Total</b>        | <b>Wg Avr</b>      | <b>Wg Avr</b>             | <b>Wg Avr</b>      |
|                            | 0.1778        | 4                   | 4                  | 15.60                     | 7.20               |
|                            | 0.1408        | 4                   | 3                  | 31.20                     | 28.80              |
| Rua dos Bacalhoeiros       | <b>Wg Avr</b> | <b>Total</b>        | <b>Wg Avr</b>      | <b>Wg Avr</b>             | <b>Wg Avr</b>      |
|                            | 0.1408        | 4                   | 3                  | 31.20                     | 28.80              |

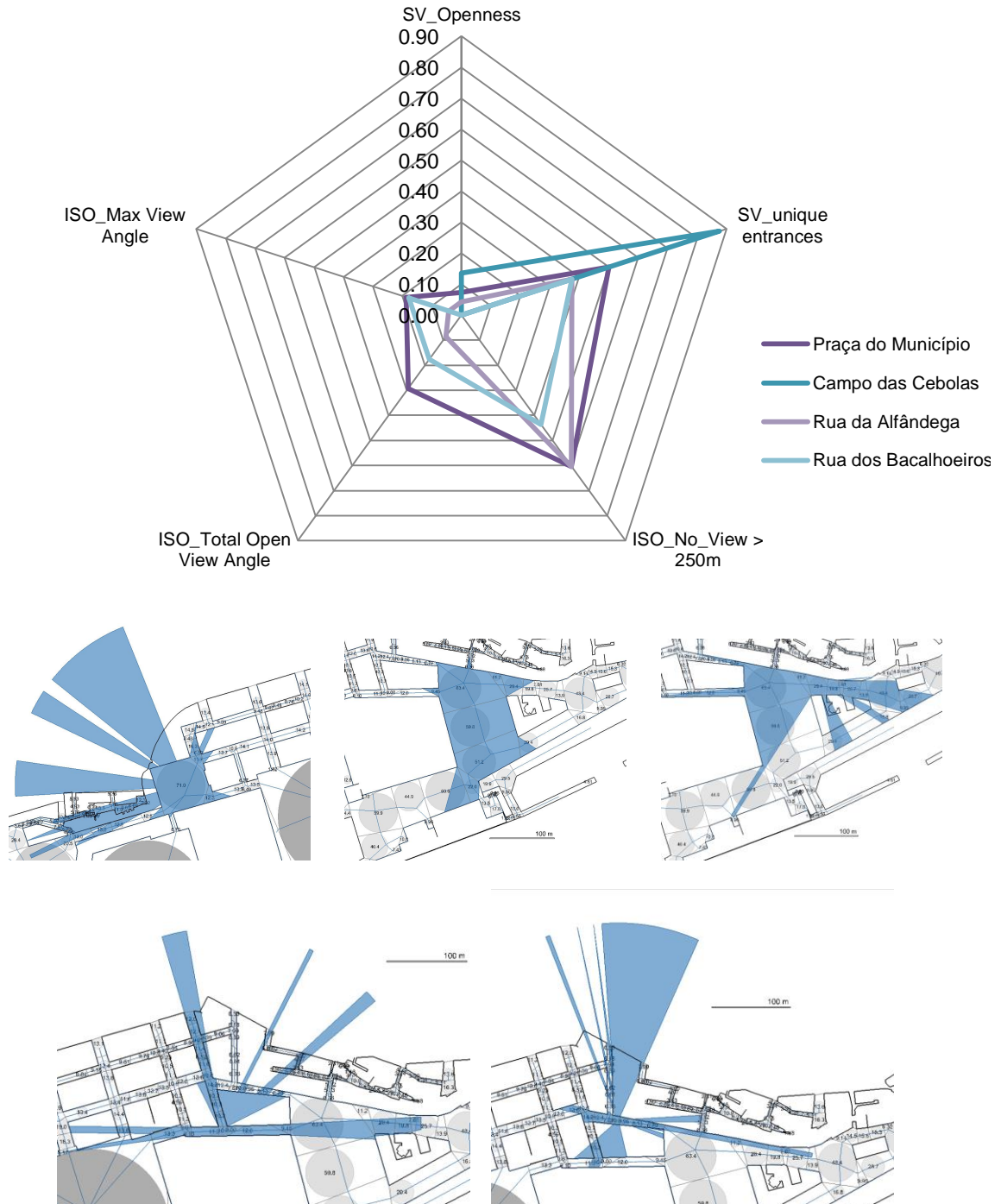


## Classification by Openness

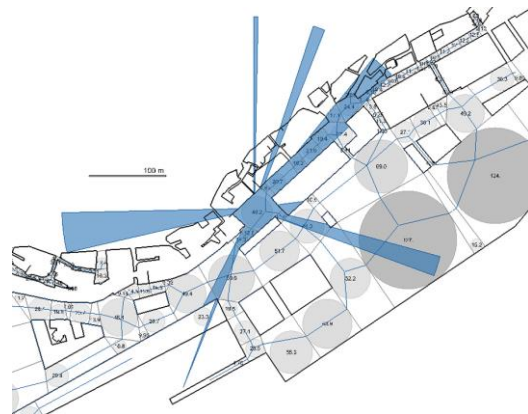
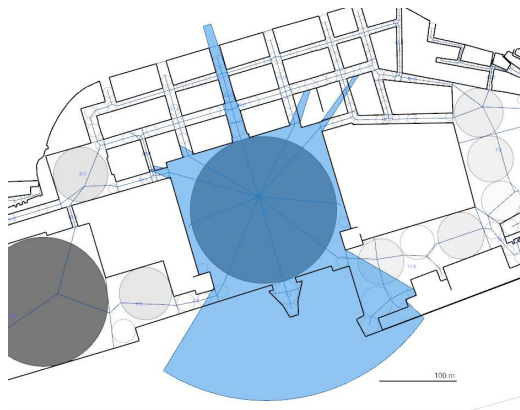
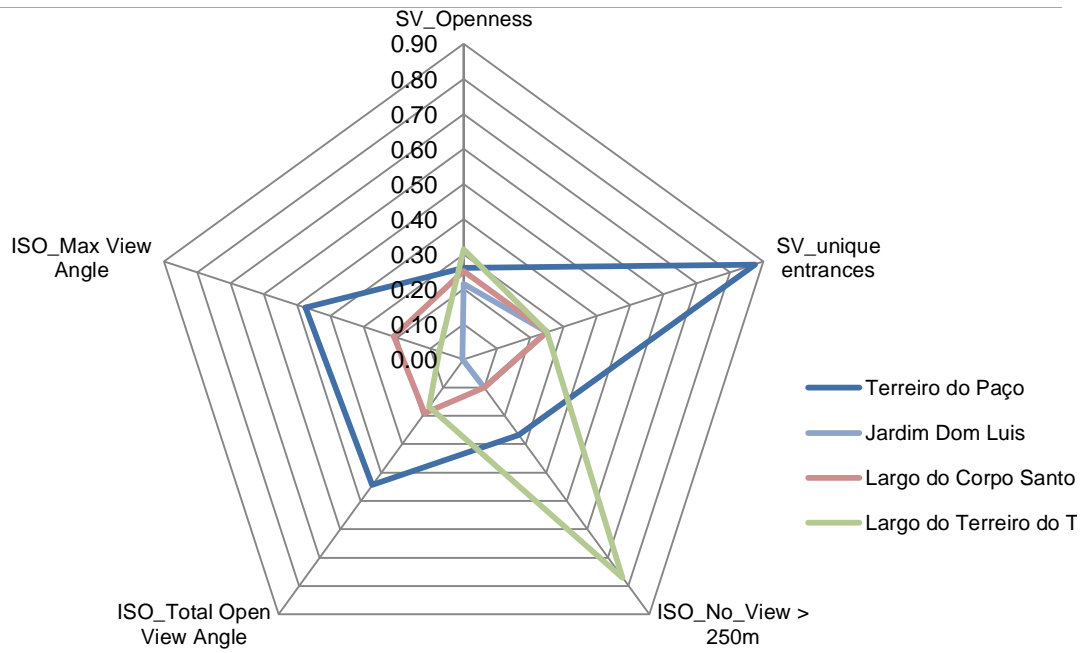
Differently from **spaciousness**, which accounts for how **solidified** UrbArch Emptiness is, the attribute of **Openness** give us another insight into open public spaces membrane structure by defining it as a **field**. On one size, the open public spaces with small openness, such as Praça do Município, exhibit more continuous spatial boundaries thus present stronger **solid objecthood**. On the other side, there are open public spaces with bigger openness, such as Ribeira das Naus, which present strong notion of place due to **field** they provide and not continuity of spatial boundaries (see following tables).



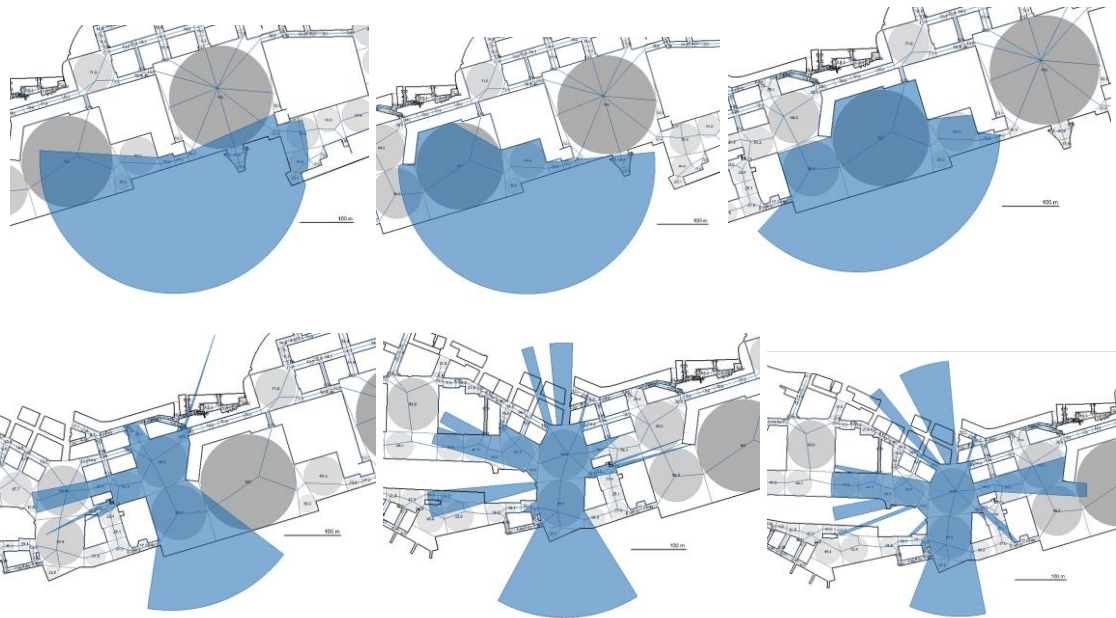
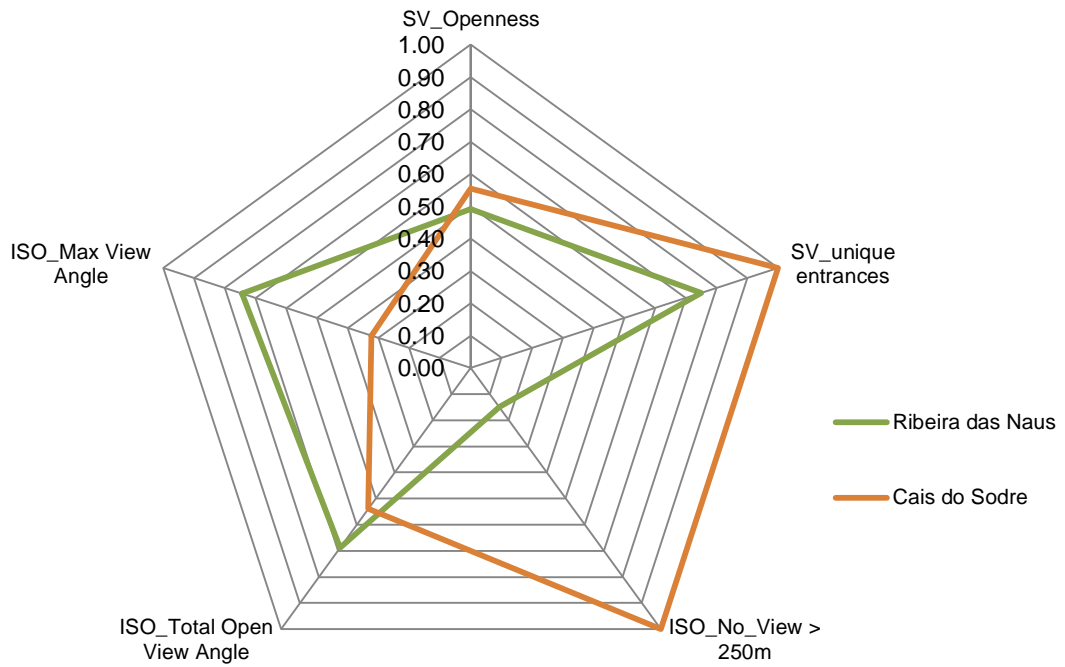
## Classification of Open Public Spaces by Openness Percentage (Low)



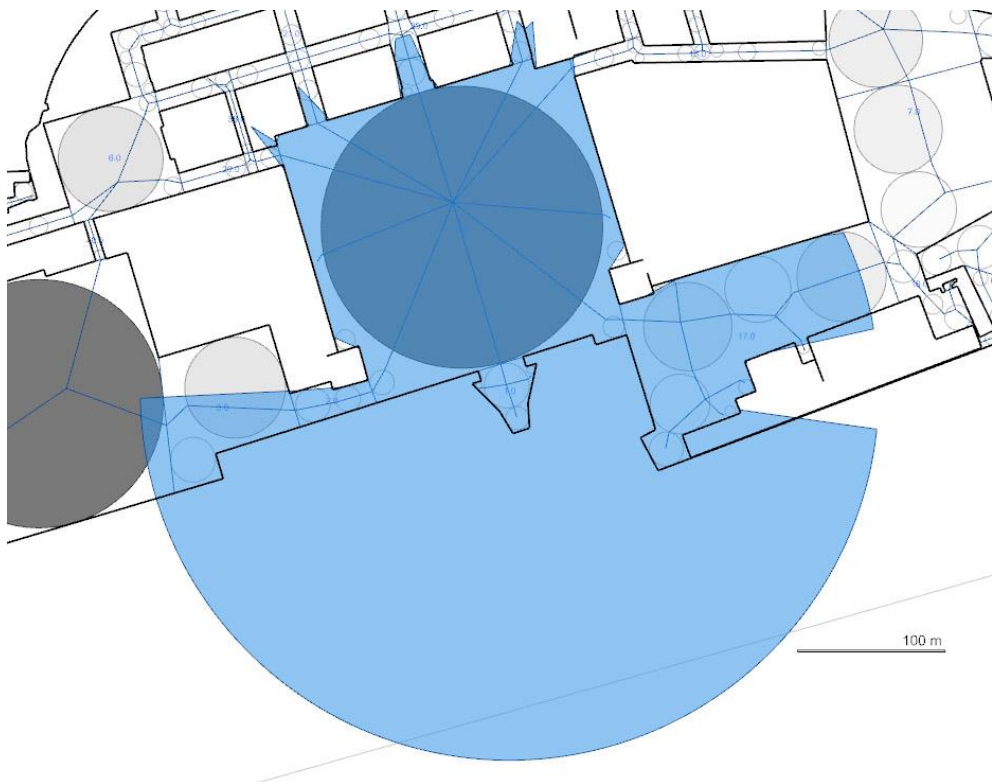
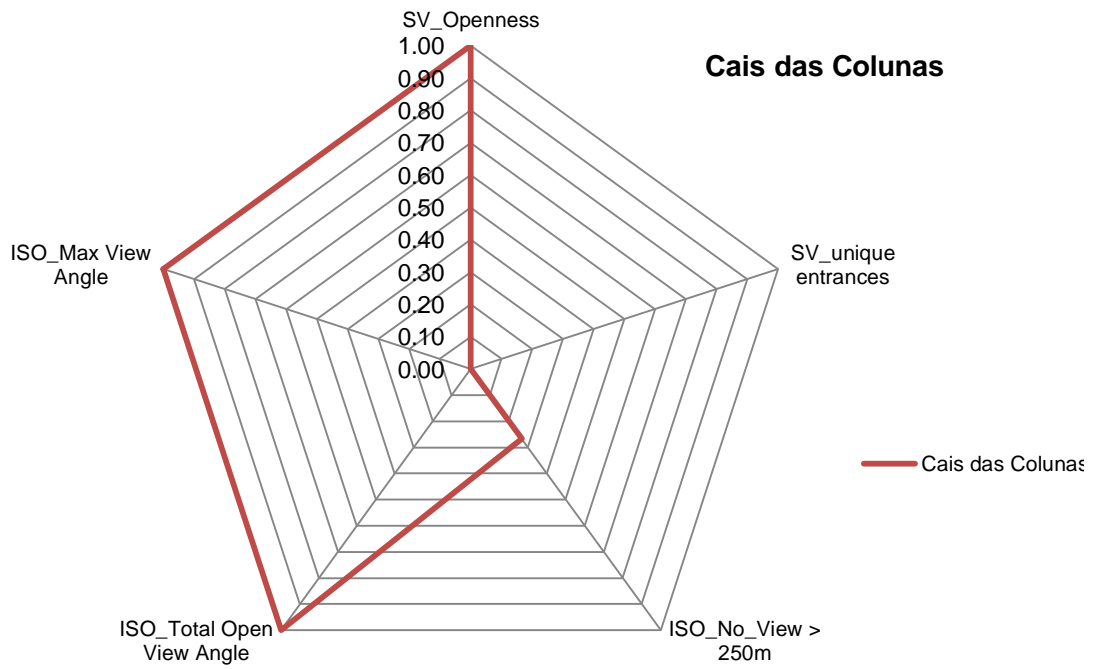
### Classification of Open Public Spaces by Openness Percentage (Medium)



### Classification of Open Public Spaces by Openness Percentage (High)



### Classification of Open Public Spaces by Openness Percentage (Large)



## Conclusions on Capturing Architectural and Urban Category

Once we changed our perspective of observation and made an approximation towards Open Public Spaces on directly embodied place level, the UrbArch Emptiness became more than a passage towards the landscape and place experience. From being a relational link in place-landscape-space triad, UrbArch Emptiness became, together with built components, a structuring and constructive element of a place itself.

As shown, the attribute of **spaciousness** focuses on important shape aspect of unbuilt part of Open Public Spaces on urban-architectural level. It accounts for intrinsic place notions linked to its UrbArch Emptiness as compartmentalised and apprehensible object described through its size, form, compactness, etc. Lower spaciousness (higher containment) can be associated to more solidified UrbArch Emptiness which due to its **conformed objecthood** gives a clearer idea of 'open public room'.

Differently, more spacious open public spaces are defined by 'looser' UrbArch Emptiness which due to open public spaces area, distance towards limits and overall weak presence of boundaries loses its **solidification as objectified 'room'**. It can be therefore inferred that attribute of spaciousness can express the notion of **Solidification of UrbArch Emptiness** as one of basic shape depictees of Open Public Spaces. Or said differently, UrbArch Emptiness, due to its solidification as object, might show how spacious, conformed or room-like a certain open public space is (Figure 67).

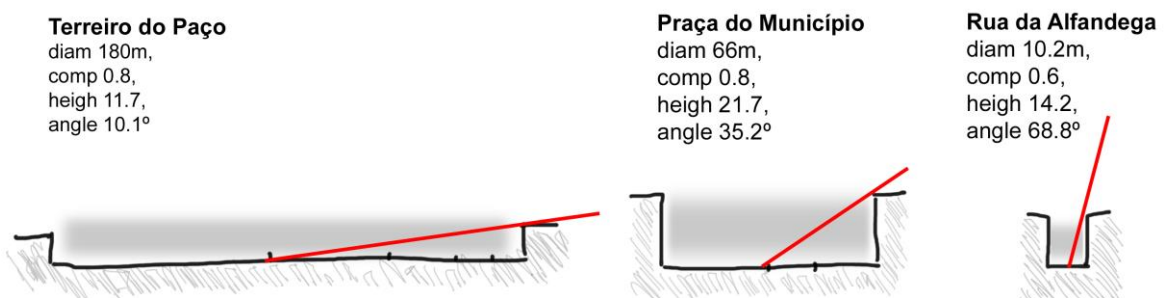
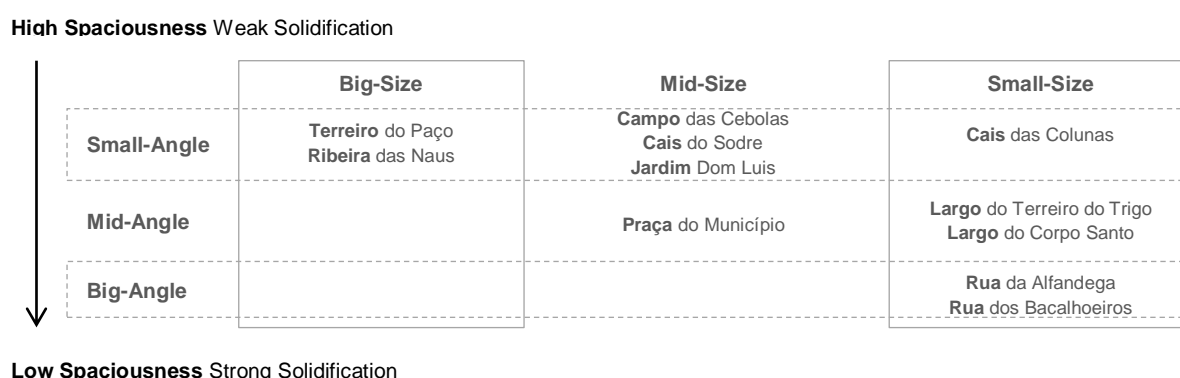


Figure 67 High, Mid and Low-Spaciousness



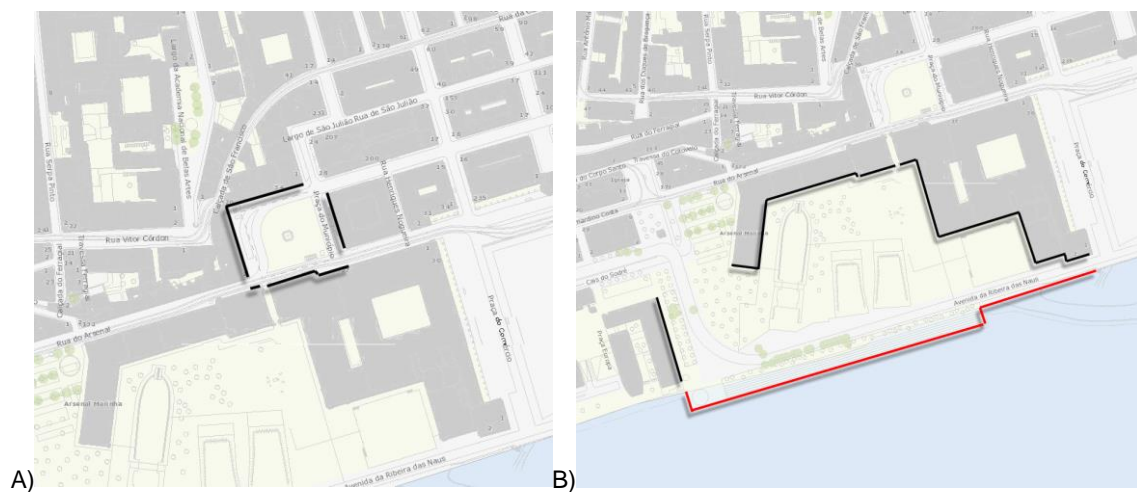
By observing UrbArch Emptiness of several cases of Lisbon Riverside, we inferred that attribute of **spaciousness** can be explicative for Open Public Spaces' typology as designated in Portuguese urbanism. Notions such as 'terreiro', 'ribeira', 'campo', 'cais', 'praça', 'largo', 'rua' manifest specific **Solidification** differences when described by two specific properties of spaciousness attributes such as **Area** and **Angle** (measured between Circle Diameter and Average Facades Height). In that sense one can observe how attribute of spaciousness can be explicative for differentiation between various linguistic notions of open public spaces in Portuguese urbanism (Figure 68).



*Figure 68 Spaciousness, Solidification and Portuguese Linguistic notions*

Differently from **spaciousness**, which accounts for how solidified as an **Object** an UrbArch Emptiness is, the attribute of **Openness** defines it as a **Field**. Therefore the attribute of **openness**, expressed through percentage of visually permeable spatial boundary together with number of views each open public space provides, give us another insight into open public spaces structuring. Small visual openness doesn't allow for strong field definition of UrbArch Emptiness and Open Public Spaces defining rather ruptured and discontinuous views. Differently, bigger openness with small number of ample views defines potential for stronger field definition which due to absence of limits allow for ample views thus generate a strong notion of objecthood.

On one size, the open public spaces with small openness, such as Praça do Município, exhibit more continuous spatial boundaries thus present stronger **Solid Objecthood** as notion of unity in terms of Gestalt edge reconstruction (Figure 69, example A). On the other side, there are open public spaces with bigger openness which are concentrated in smaller number of views. These open public spaces, such as Ribeira das Naus or Cais das Cebolas, present strong notion of place which is structured around strong notion of **Field** they provide and not continuity of spatial boundaries (Figure 69, example B). The open public spaces with mid- and high-openness and small number of Views demonstrate constancy trough strength of non-boundaries and continuity of view they offer. In these cases notion of place is built by lack of buildings (red line in B example).



**Figure 69** A) Praça do Município - Low Openness (weak field) B) Ribeira das Naus - High Openness (strong field)



Can be therefore said, that UrbArch Emptiness depicts open public spaces openness through its potential to expand into **Field** structuring places based not on their solidified objectness but potential to gain objecthood by providing a situation or experience which isolates a beholder as deemed by Fried (1998).

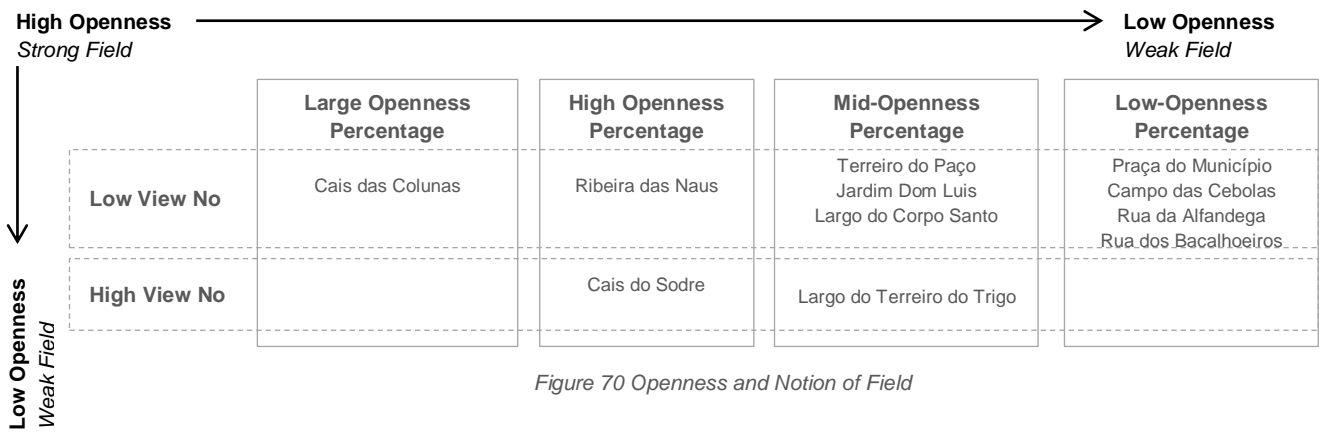


Figure 70 Openness and Notion of Field

*This page intentionally left blank*

### 6.3. Capturing Behavioural Category - From Open Public Space Attributes to Qualities

The following section is output of **Practical Objective 1.3 PO.1.3**.

In the previous sections we introduced, developed and applied the **field-based** and **3D 3D Solid representation models** as analytical tools for analysis of Open Public Spaces natural-geographic and urban-architectural attributes deemed relevant by users and experts. We specifically addressed the attributes of natural advantages, spaciousness, openness and diversity focusing on UrbArch Emptiness and the way this phenomenon contributes to them.

In that fashion, we addressed the first part of research question, namely: “How UrbArch Emptiness influences Open Public Space Attributes”. To approach the second part of the question “How UrbArch Emptiness can give as an insight into Open Public Spaces Qualities” we observed the relation between spatial **attributes and properties** as **expression of qualities** linked to a certain positive spatial occurrence. We searched for the correlation between spatial attributes and properties to **specific spatial qualities** expressed through usages they provide. To do so, we correlated the measurements of properties of specific attributes with findings from first person **phenomenological analysis and natural observation** of study of cases in Lisbon Riverside.

Natural Geographic Context + Urban-architectural structure > **Specific Behaviour**

The possible link between specific spatial attributes and qualities was inferred from Gehl's theory on **behaviour and usage of public space** wherefrom three types of spaces based on the essential spatial attributes necessary for emergence of different activities were distinguished:

- **Space for Necessary Activities** – do not require any special spatial conditions because necessary activities are more or less compulsory such as walking towards school, work, etc.
- **Space for Optional Activities** – requires favourable exterior conditions for activities such as walking to get fresh air, recreation, enjoying, sitting, sunbathing, etc.
- **Space for Social Activities** – requires certain spatial containment that would presence of others in public space children playing, greetings, conversation, passive contact etc. through seeing and hearing other people.

Jan Gehl explains correlation between spatial qualities (expressed through certain activities e.g. necessary, optional or social) and several spatial attributes. He starts by size of fields of human senses giving them significance due to human ability to see and hear, ex. up to 7 meters distance one can hold a conversation and up to 35 meters still hear a lecturer. Regarding sight, he highlights the 100 meters interval as **'the social field of vision'** as it enables human to be distinguished from other moving figures. From 70 to 100 meters, one can determine persons' sex, age, behaviour, and recognise someone familiar because of behavioural and clothing patterns. When distance is reduced to 20 to 25 meters, ones expressions can be clearly perceived thus theatres' maximum distance of 30 to 35 meters are somewhat compensated with actors' makeup and exaggerated 'theatrical' expressions. At distance of 1 to 3 meters a common conversation takes place. This distance-proximity relationship is what Gehl

explains through notion of intensity which makes cities more “intimate, warm, personal” (Gehl, 2011).

These distances, especially the ones around 100 and 30 meters, are important thresholds that distinguish places which either promote solitude and optional activities (over 100m) or social interaction due to their ability to join people together and allow them to mingle by meeting, passing by one another and seeing each other (under 30m). Open Public Spaces between these two extreme thresholds (from 30m to 100m) allow for both: perception of other humans and enough space for relaxation, isolation and nature appreciation.

Apart from Gehl’s theory, for understanding of Behavioural Category, the first person phenomenological study and natural observation were conducted.

- The **Phenomenological Study** implied author’s repetitive not guided usage of open public spaces chosen as case studies. Therefrom an extensive **photographic dossier** was made – from **12/12/2012 to 9/6/2017** around 3800 photos were taken some of which presented in the thesis. This analysis also led to necessity of recording spatial impression by **drawings and sketches** some of which are presented in the thesis. Here it is important to highlight the importance of repetitive spatial experiences in the phenomenologically orientated scientific observations. Through experiential repetition, our phenomenological observation thus understanding of space became layered and multileveled in a sense that it permitted a generation of a more accurate overall phenomenological insight.
- The **Natural Observation** of spatial usages was conducted during the spring time which we deem to be the most explicative for successful usages in Lisbon because of its proximity to seacoast which drives spatial usages towards beaches in the warmer months of a year. Each space was visited at least three times, during the morning, afternoon and lunchtime. The main outputs of the observation were diagrams of spatial usages. Even though the observation was done systematically the incapacity of

rigorous capturing of activities by one person, especially in open public spaces with high occupation such as Terreio do Paço, invalidated the precise counting of the users. However, the more precise and grounded notion of the overall spatial usages was obtained.

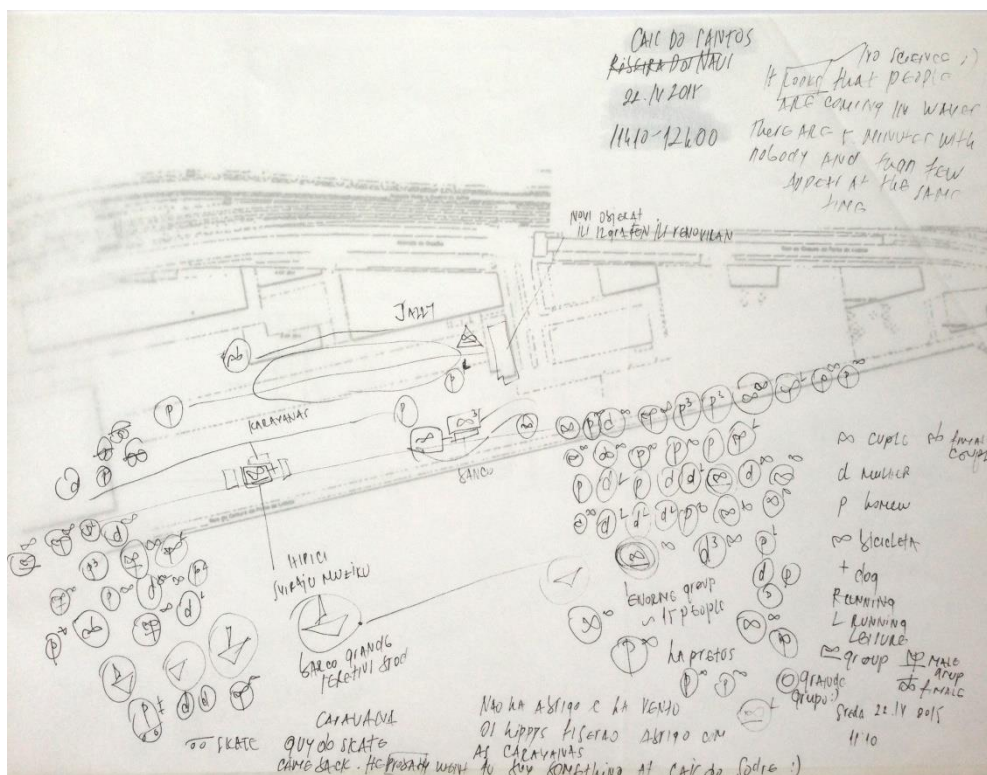


Figure 71 Examples of authors' diagrams made during Natural Observation, above Ribeira das Naus, below Cais dos Santos

Table 28 Capturing Spatial Qualities Expressed through Usages they provide

| SPACE FOR NECESSARY ACTIVITIES                | SPACE FOR OPTIONAL ACTIVITIES                                                                                                                                   | SPACE FOR SOCIAL ACTIVITIES                                                                                                                                                                                                                                                           |                                                                                                                                                     |
|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Do not require any special spatial conditions | Require favourable exterior conditions                                                                                                                          | Require presence of others in public space                                                                                                                                                                                                                                            |                                                                                                                                                     |
| <b>Specific Spatial Attributes</b>            |                                                                                                                                                                 |                                                                                                                                                                                                                                                                                       |                                                                                                                                                     |
| NATURAL ADVANTAGES                            | NATURAL ADVANTAGES                                                                                                                                              | NATURAL ADVANTAGES                                                                                                                                                                                                                                                                    | MEASURED PROPERTIES                                                                                                                                 |
| No specific spatial attributes necessary      | <b>Natural Advantages</b> of specific place implantation which promote <b>high magnitude of visual field</b> thus good place-landscape-place unification        | No special <b>Natural Advantages</b> necessary                                                                                                                                                                                                                                        | Isovist Area<br>Compactness<br>Area x Comp<br><br>Method: ISOVIST                                                                                   |
| SPACIOUSNESS                                  | SPACIOUSNESS                                                                                                                                                    | SPACIOUSNESS                                                                                                                                                                                                                                                                          | MEASURED PROPERTIES                                                                                                                                 |
| No specific spatial attributes necessary      | <b>Higher Spaciousness</b> that by providing space between people allows for insolation and relation                                                            | <b>Lower Spaciousness</b> that by diminishing space between people would enable their interaction                                                                                                                                                                                     | CV_Avg_Height<br>CS_Area<br>CS_Circ_Diam<br>CV_Compactn<br>CV_Angle<br><br>Methods: CONVEX SPACES AND CONVEX VOIDS                                  |
| OPENNESS                                      | OPENNESS                                                                                                                                                        | OPENNESS                                                                                                                                                                                                                                                                              | MEASURED PROPERTIES                                                                                                                                 |
| No specific spatial attributes necessary      | <b>Higher Openness Percentage and Angle</b> that enables good and ample overview of surrounding                                                                 | <b>Lower Openness Percentage and Angle</b> that by conform the space would defining it as a possible place                                                                                                                                                                            | SV_Openness<br>SV_unique entrances<br>ISO_No_View > 250m<br>ISO_Total Open View Angle<br>ISO_Max View Angle<br><br>Methods: ISOVIST and SOLID VOIDS |
| EQUIPMENT                                     | EQUIPMENT                                                                                                                                                       | EQUIPMENT                                                                                                                                                                                                                                                                             | MEASURED PROPERTIES                                                                                                                                 |
| No specific spatial attributes necessary      | <b>Urban Furnishing and Recreational Equipment</b> whose orientation would allow for peoples' contemplation of surrounding, leisure and recreational activities | <b>Urban Furnishing and Sojourning Equipment</b> whose orientation would allow for peoples' visual and audio interaction and as such support sociopetal space<br><br><b>Linear Equipment</b> distribution that would divide spaces in smaller portion (providing spaces within space) | Type of equipment<br>Equipment orientation<br><br>Method: FIRST PERSON PHENOMENOLOGICAL ANALYSIS and NATURAL OBSERVATION                            |

*This page intentionally left blank*



## Case Study - Quantitative Comparison and Qualitative Reflection on Lisbon

### Riverside

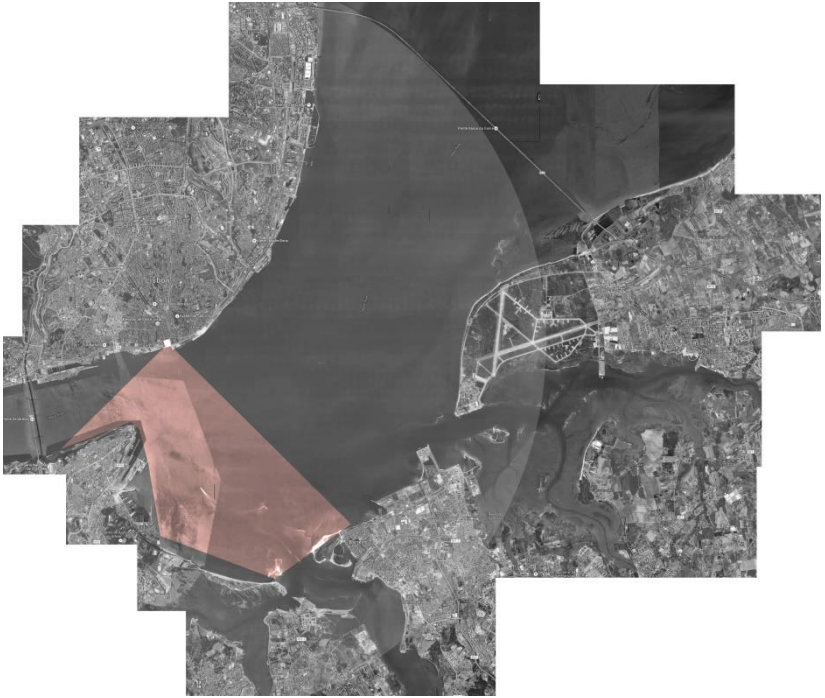
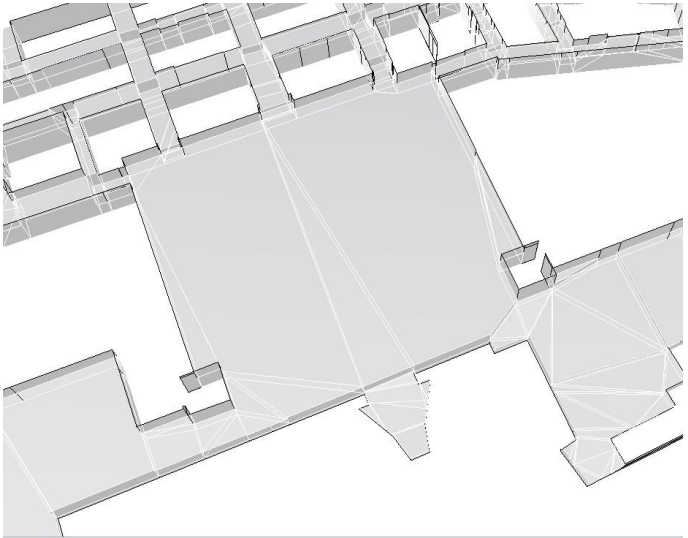
*Note: all the drawings, photos and diagrams used in Case Study Analysis are made by author if not stated differently*

### Terreiro do Paço



Figure 72 Terreiro do Paço - Author's drawing

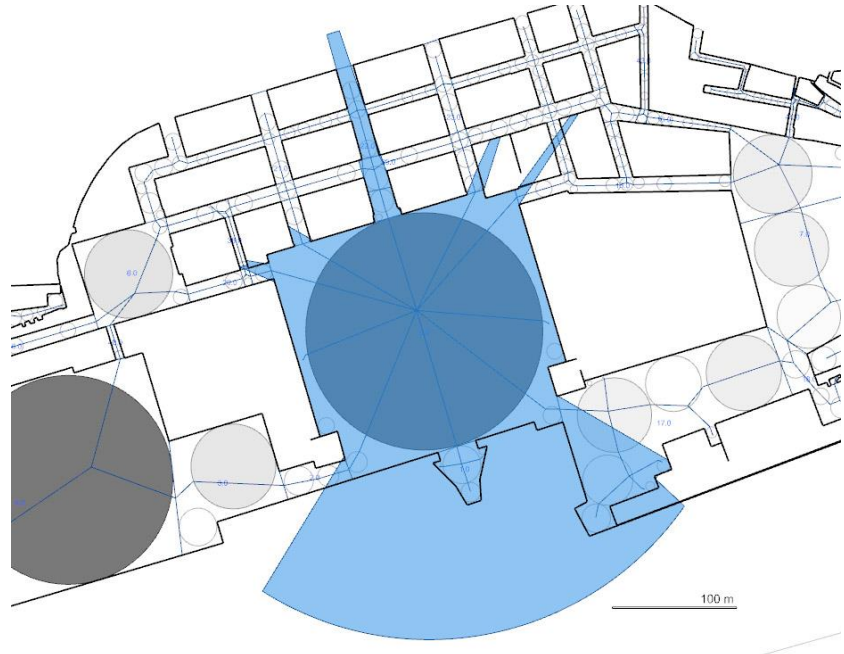
*Table 29 Capturing Spatial Qualities of Terreiro do Paço*

|                                                                          | Space for Necessary Activities                                                                                                                                                                                                                                                                                            | Space for Optional Activities | Space for Social Activities |
|--------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------------------|
|                                                                          | ---                                                                                                                                                                                                                                                                                                                       | √                             | √                           |
| <p><b>NATURAL ADVANTAGES</b></p> <p>Method: ISOVIST</p>                  | <p>Isovist area m2 <b>20,963,928</b><br/>                     Compactness <b>0.51</b><br/>                     Area x Comp. <b>10,615,757</b></p>                                                                                      |                               |                             |
| <p><b>SPACIOUSESS</b></p> <p>Methods: CONVEX SPACES AND CONVEX VOIDS</p> | <p>CV_Avg_Height <b>11.7m</b><br/>                     CS_Area <b>38,330.4m</b><br/>                     CS_Circ_Diam <b>179.8</b><br/>                     CV_Compactn <b>0.8</b><br/>                     CV_Angle <b>10.1</b></p>  |                               |                             |

**OPENNESS**

Methods: ISOVIST and SOLID VOIDS

SV\_Openness **0.365**  
SV\_unique entrances **8**  
ISO\_Total Open View Angle **78**  
ISO\_Max View Angle **75.60**



**EQUIPMENT**

Method: FIRST PERSON PHENOMENOLOGICAL ANALYSIS and NATURAL OBSERVATION

**Type of equipment:** All equipment concentrated within cafes' terraces

**Specific Affordances:** Pedestal of statue of D. José I serves for sitting

**Equipment orientation:** Equipment in cafes' terraces orientated towards the centre of the square. Pedestal of the statue permits sitting with orientation towards edges of the square.



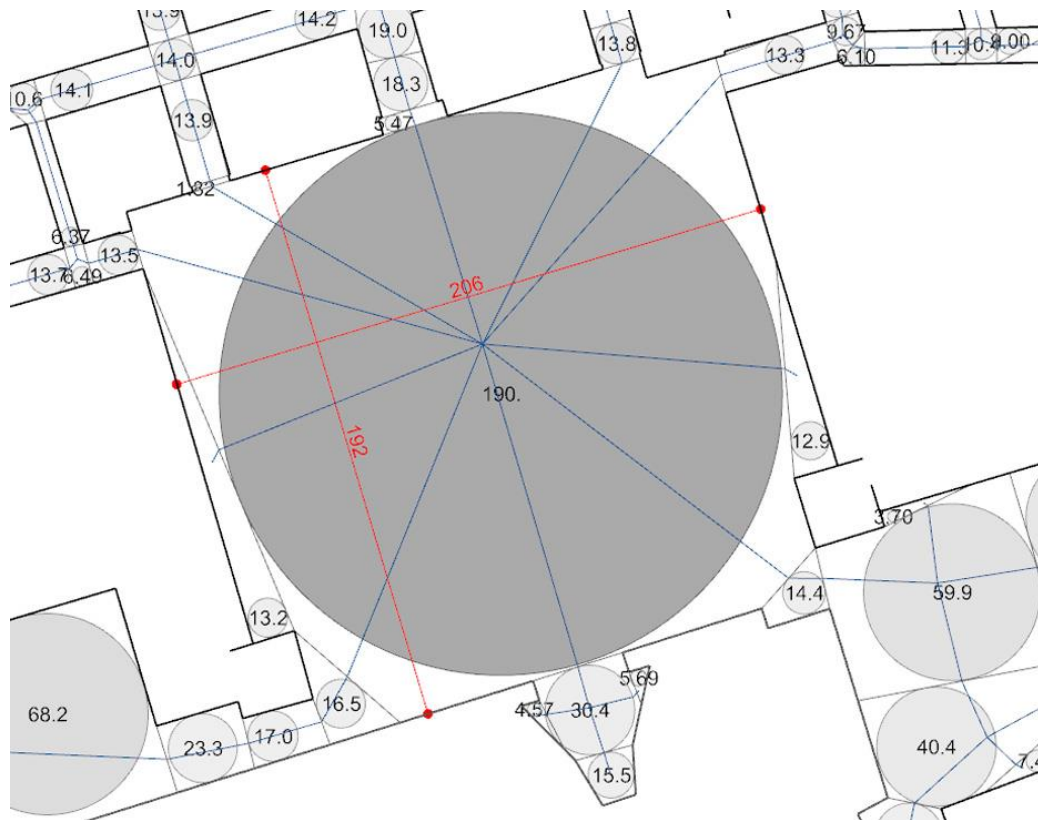
### ***Terreiro do Paço – On the limit between Optional and Social activities***



Terreiro de Paço, also known as Praça do Comércio, has been representing an important space in generating urban life and representation image of Lisbon. From being a natural beach and a river lagoon through which Tagus used to penetrate the city almost until Rossio, Terreiro de Paço was by gradual natural and human conquest created both formally and functionally. It became the point wherefrom “history of country is going to be constructed, towards Africa, East and Discoveries” (Dias, 1987, p.47 ).

Today, this formal, representation square is characterised by its imposing dimension which is a result of enlargement (completed after earthquake) of the previous open public space there established. Its size, regularity, together with quality of architectural assembly, as representation qualities inspire what is, in PAD model (focused on pleisigness, arousingness and dominance) developed by Mehrabian and Russell in 1974, defined as affective response of dominance. “As regards objects, places, or architectural spaces, one could conceive dominance as their presence, their potential to draw attention upon them and thereby induce specific behaviour” (Franz, 2005, p.37). In the case of this space, its dominance can be reviled through strong symmetry,

explicit orthogonal form together with high spaciousness and mostly enclosed still frontally orientated openings.



The size of square (**cc. 206m x 192m**) when we observe its merely urban and architectural elements is **twice the maximum size of social field of vision (100m)** which would permit human to be recognized as such (Gehl, 2011, p.65). This means that social interaction is rather challenging in Terreiro do Paço turning this square into field in which, relation towards dominant urban-architectural assembly and wide view of Tagus has prevalence over possible social interactions.

However, the position of statue of D. José divides the square in two poles which are cc.100m wide. As one can observe being at the square, the statue as spatial division oblige people to walk in either one or another side of Terreiro do Paço in that way diminishing the distance for vision turning the square more sociable. Moreover, the square's centrality and its historical importance have turned it into an important touristic

site of Lisbon attracting significant number of visitors whose density diminishes their mutual distancing thus augments social perception within square.

**To conclude**, when we combined the measured attributes of Terreiro do Paço, medium-openness, medium-spaciousness and ambiguous social field of vision (~200m divided by monument in two corridors of ~100m) we inferred duality of nature of this open public space. On one side, it is a formal square whose continuous boundaries keep it in objectified unity. On the other, due to its open river façade it establishes field-like relation towards natural context. In that regard one could say that it is open public space on the limit between Optional and Social activities. This dual nature suggests that if it had a more natural and recreation orientated equipment and finishing, this square would offer a good framework for recreational and leisure activities. Differently if divided, by usage of more sojourning equipment and cafes, its social capacity would prevail. However, we would claim that its particularity lies in its ambiguity.



## Cais das Colunas

Table 30 Capturing Spatial Qualities of Cais das Colunas

|                                                                          | Space for Necessary Activities                                                                                                                                                                                                                                                  | Space for Optional Activities | Space for Social Activities |
|--------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------------------|
|                                                                          | ---                                                                                                                                                                                                                                                                             | √                             | √                           |
| <p><b>NATURAL ADVANTAGES</b></p> <p>Method: ISOVIST</p>                  | <p>Isovist area m2 <b>32,674,323</b><br/>           Compactness <b>0.50</b><br/>           Area x Comp. <b>16,184,041</b></p>                                                                |                               |                             |
| <p><b>SPACIOUSESS</b></p> <p>Methods: CONVEX SPACES AND CONVEX VOIDS</p> | <p>CV_Avg_Height <b>2.2m</b><br/>           CS_Area <b>1,262.5m</b><br/>           CS_Circ_Diam <b>25.4m</b><br/>           CV_Compactn <b>0.8</b><br/>           CV_Angle <b>11.8</b></p>  |                               |                             |

**OPENNESS**

Methods: ISOVIST and SOLID VOIDS

SV\_Openness 1  
SV\_unique entrances 1  
ISO\_Total Open View Angle 175.17  
ISO\_Max View Angle 158.40



**EQUIPMENT**

Method: FIRST PERSON PHENOMENOLOGICAL ANALYSIS and NATURAL OBSERVATION

**Type of equipment:** The equipment that can be found in this Open Public Space are traditional Portuguese “namoradeiras” – benches embedded into the wall which limits the “cais” towards the river.

**Specific Affordances:** As conceived, the “namoradeiras” strongly employ the notion of affordance using the height and the thickness of traditional walls exploring their capacity to provide alternative usages.

**Equipment orientation:** The equipment of “namoradeiras” permits visual overview of Tagus.

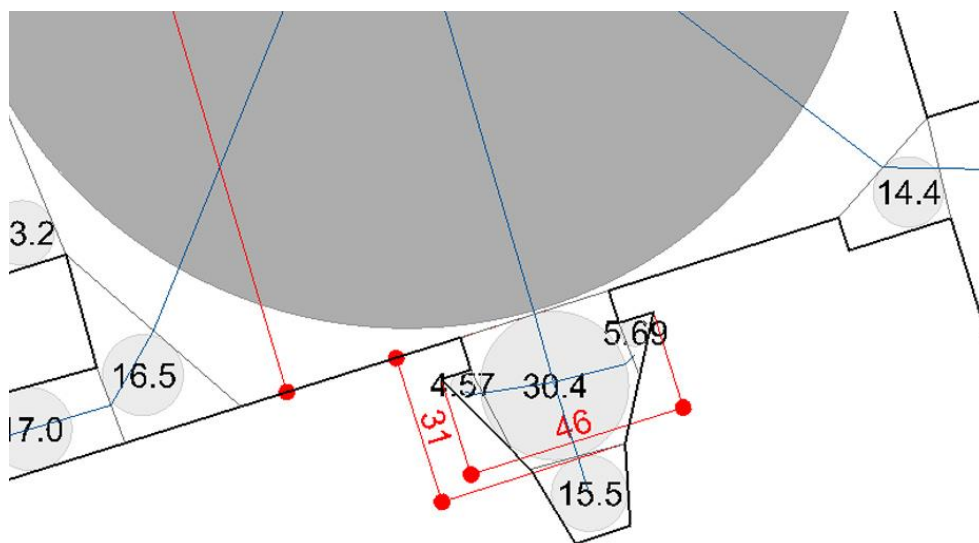




### ***Cais das Colunas for Social appreciation of Nature***

Cais das Colunas is the only monumental pier in Lisbon, built as part of the project of city reconstruction undertaken after the earthquake of 1755. During more than a century this dock was the only arriving and departing point for important visits of Lisbon gaining its significance and monumentality not only through the formal junction it provides between city and its river but through its functional importance in embarkation and disembarkation of countless important personalities. As part of dock construction of Praça do Comércio (current name of Terreiro do Paço) which presupposed 200-meter-long wall that integrated two small side piers, this monument had to be partially dismantled in 1997 and restored back in September 2008 due to expansion of the Lisbon subway (Antunes et al., n.d.).

Because of its particularly small size Cais das Colunas (max. inscribed diameter 30.4m), provides kind of social mingling which is, in case of Lisbon's Open Public Spaces, usually found in old neighbourhoods of Alfama and Mouraria, with very tight urban tissue.



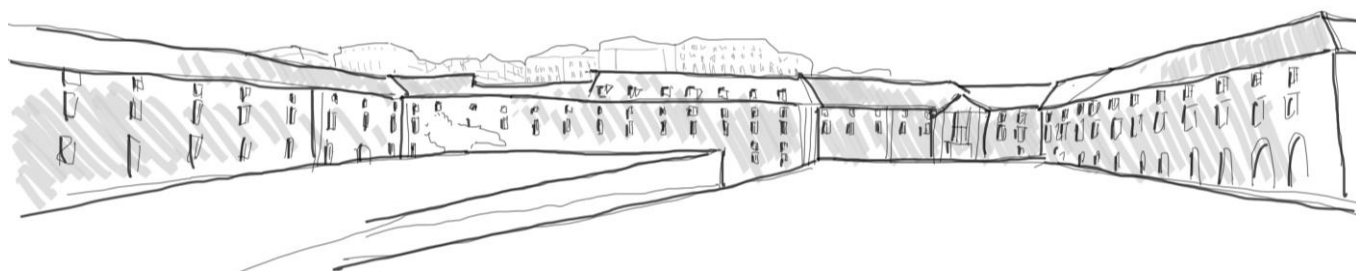
On the other side, expended visual field permits a strong relationship with environment offering a powerful counterbalance to tight urban and architectural limitations. In that

sense Cais das Colunas can be described as a place which is of a twofold nature - at the same time small and big. Its small locomotive boundaries are bridged with hollowness of enormous visual field providing at the same time close interaction with others, and distant contemplation of landscape.

These place specificities when combined with its centrality and historical significance generates a unique Open Public Space in which UrbArch Emptiness plays important and multiple roles. Its formal compactness combined with visual looseness glorifies UrbArch Emptiness doubly, as framework for urban synergies and channel for surroundings appreciation.

**To conclude**, the particularity of this open public space lies in its high-spaciousness, high-openness and extremely small size of social field of vision (~30m). This mean that space which otherwise would be exclusively preferable for optional activities and nature appreciation, offers an extremely 'tight' background for mingling and social interaction intertwined with a possibility for nature appreciation.

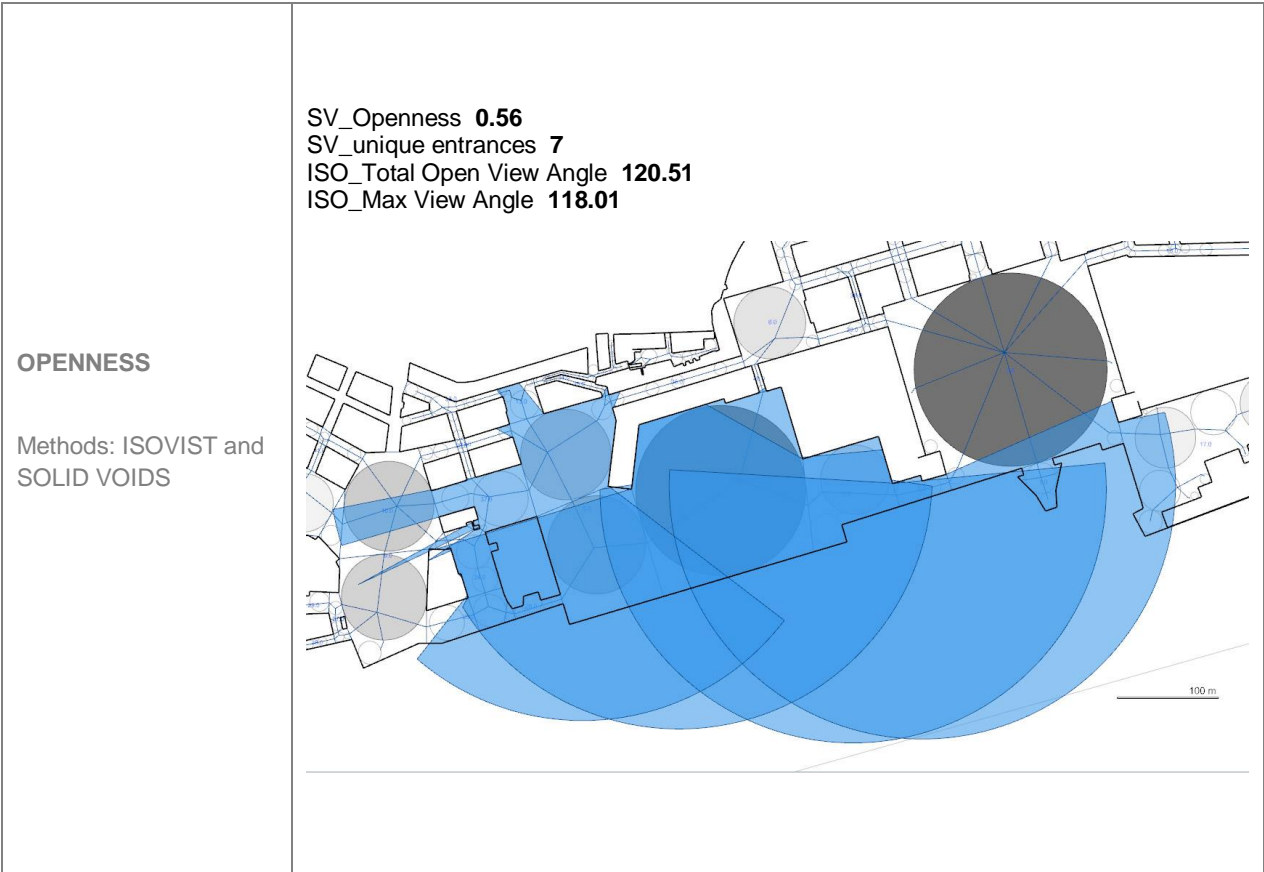
**Ribeira das Naus**



**Figure 73** Ribeira das Naus - Author's drawing

Table 31 Capturing Spatial Qualities of Ribeira das Naus

|                                                                          | Space for Necessary Activities                                                                                                                                                                                                                                                                                            | Space for Optional Activities | Space for Social Activities |
|--------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------------------|
|                                                                          | ---                                                                                                                                                                                                                                                                                                                       | √                             | ---                         |
| <p><b>NATURAL ADVANTAGES</b></p> <p>Method: ISOVIST</p>                  | <p>Isovist area m2 <b>46,737,755</b><br/>                     Compactness <b>0.59</b><br/>                     Area x Comp. <b>27,533,328</b></p>                                                                                      |                               |                             |
| <p><b>SPACIOUSESS</b></p> <p>Methods: CONVEX SPACES AND CONVEX VOIDS</p> | <p>CV_Avg_Height <b>11.2m</b><br/>                     CS_Area <b>54,598.6m</b><br/>                     CS_Circ_Diam <b>124.0</b><br/>                     CV_Compactn <b>0.8</b><br/>                     CV_Angle <b>11.9</b></p>  |                               |                             |



**EQUIPMENT**

Method: FIRST PERSON PHENOMENOLOGICAL ANALYSIS and NATURAL OBSERVATION

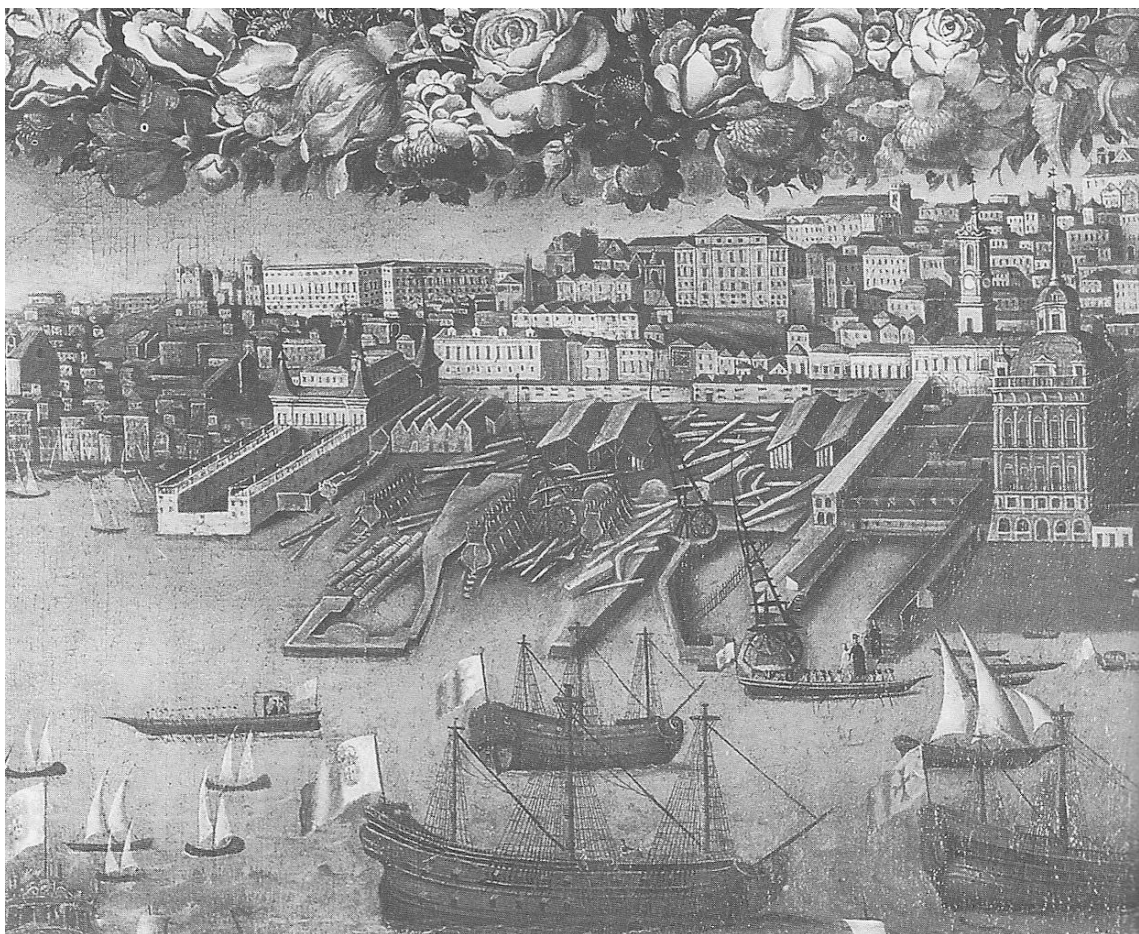
**Type of equipment:** There is not any specific urban furniture that serves this Open Public Space.

**Specific Affordances:** However, the finishing, such as stairs and inclined grassy ramps serve as urban furniture for sitting, laying, relaxing, reading, etc.

**Equipment orientation:** All the elements that serve as urban furniture are orientated towards the main Open Public Space view.

### ***Ribeira das Naus as space for Optional Activities***

Ribeira das Naus, in XVIII century also designated as Arsenal Real da Marinha, was before its consolidation through land fill and construction of Av. Ribeira das Naus in early XX century, an important infrastructure for shipbuilding. It was an organisational backstage which throughout centuries supported the growth of power and development of representation image of the neighbourhood Praça do Comércio (Terreiro do Paço).



*Figure 74* Lisbon panorama with the departure of S. Francisco de Xavier to India, beginning of the 18th century, source: Lisboa Manuelina - Helder Carita

Nowadays, after requalification which started in 2012 based on the project developed by PROAP landscape studio, Ribeira das Naus is an important Open Public Space of central Lisbon riverside. It is composed from several smaller spaces which are joined



together into what is nowadays experienced as a unique place for leisure and relaxation. The multiplicity of spatial compartments is defined by buildings on one side and straight dock line on another providing different depths thus several levels of interaction both with others and with nature.



Even though there are several levels of spaciousness within the 'open rooms' compartments, this set of urban voids has accentuated linearity due to existence of Av. Ribeira das Naus. The street divides the Open Public Space into longer less compact portions which due to great overview over landscape provide good framework for optional activities. This spatial quality is supported by most of surfaces being inclined towards the river and the choice of natural material, such as grass, used in their finishing. On the other side, the avenue together with compartments defined by pavement design diminishes the overall distance of 'social vision' allowing for a more proximate interaction between users.



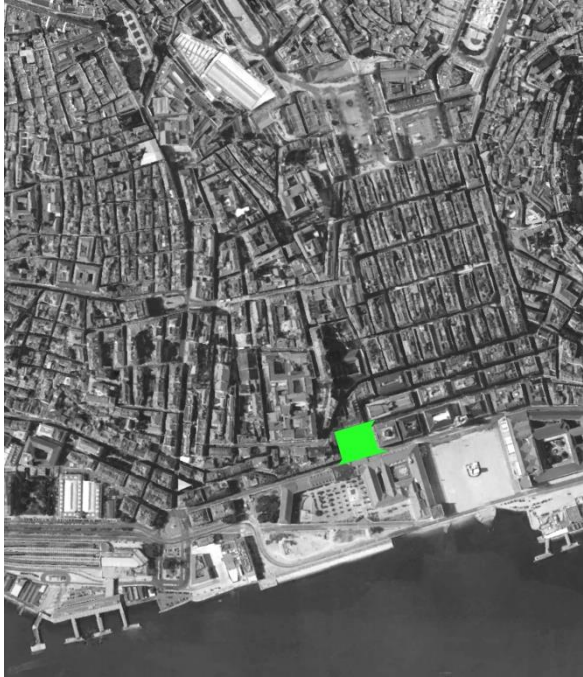
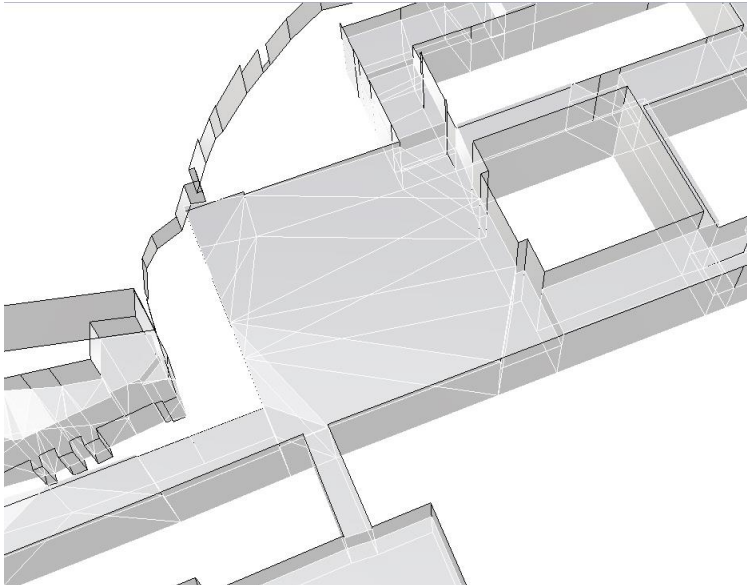


***Praça de Municipio***



*Figure 75 Praça de Municipio - Author's drawing*

**Table 32** Capturing Spatial Qualities of Praça de Município

|                                                                          | Space for Necessary Activities                                                                                                                                                                                                                                                                                           | Space for Optional Activities | Space for Social Activities |
|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------------------|
|                                                                          | ---                                                                                                                                                                                                                                                                                                                      | √                             | ---                         |
| <p><b>NATURAL ADVANTAGES</b></p> <p>Method: ISOVIST</p>                  | <p>Isovist area m2 <b>5,582</b><br/>                     Compactness <b>0.65</b><br/>                     Area x Comp. <b>3,616</b></p>                                                                                               |                               |                             |
| <p><b>SPACIOUSESS</b></p> <p>Methods: CONVEX SPACES AND CONVEX VOIDS</p> | <p>CV_Avg_Height <b>21.7m</b><br/>                     CS_Area <b>5,455.6m</b><br/>                     CS_Circ_Diam <b>66.0m</b><br/>                     CV_Compactn <b>0.8</b><br/>                     CV_Angle <b>35.2</b></p>  |                               |                             |

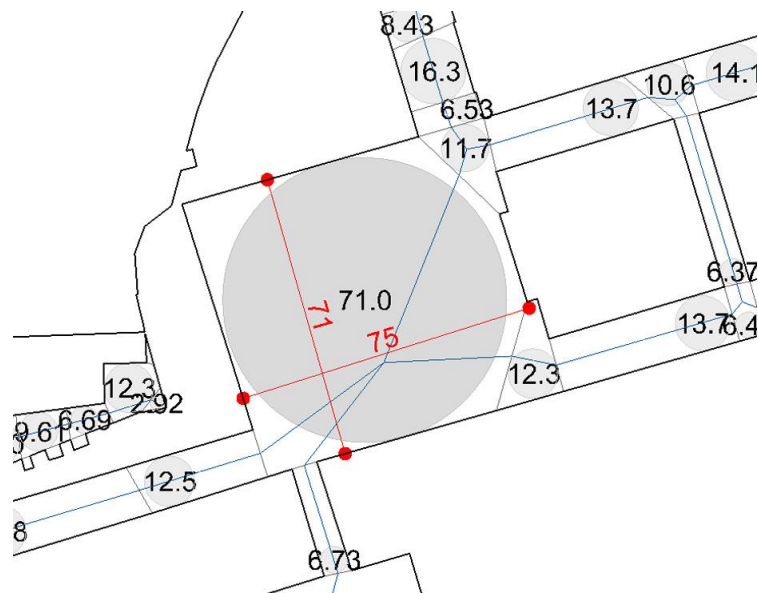


## ***Praça do Município as space for Social Activities***



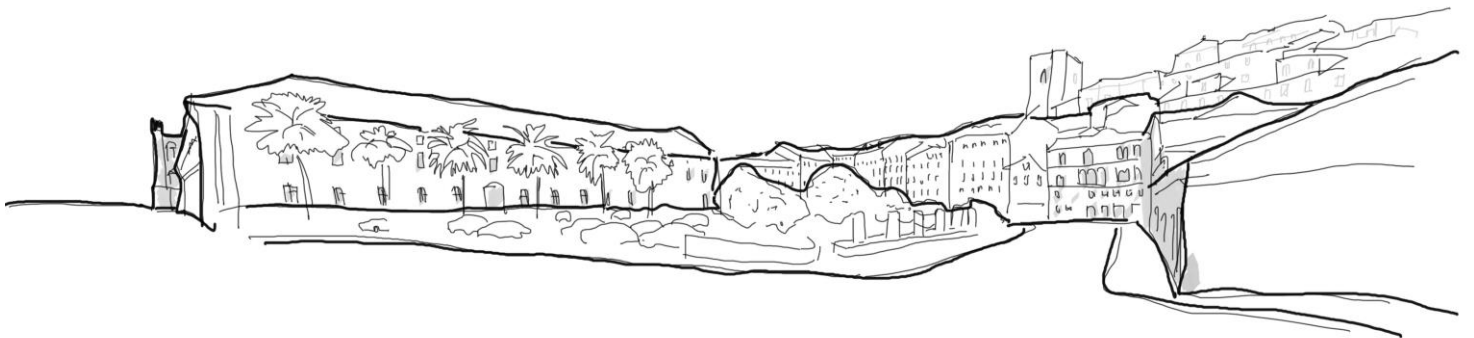
This square, situated in the vicinity of both Terreiro do Paço and Ribeira das Naus, reveals characteristics not common to Open Public Spaces of Lisbon riverside. Its high enclosure and low spaciousness define clearly a well-conformed open urban room. In the middle of the square is Lisbon's Pelourinho built after the earthquake whose pedestal is nowadays used for sitting and relaxation.

Its central plan with axis of nearly identical length (71m x 75m), where none is dominant, reinforces the sense of specific location rather than of direction or passage. The punctuality of the place is accentuated by uniform height of spatial skin and dominance of building of Lisbon Municipality.



**To conclude**, low-spaciousness and low-openness of this open public space, define it clearly as preferable for social activities. This is supported by both, smaller social field of vision (~75m) and existence of central monument which additionally partitions space into smaller ambits.


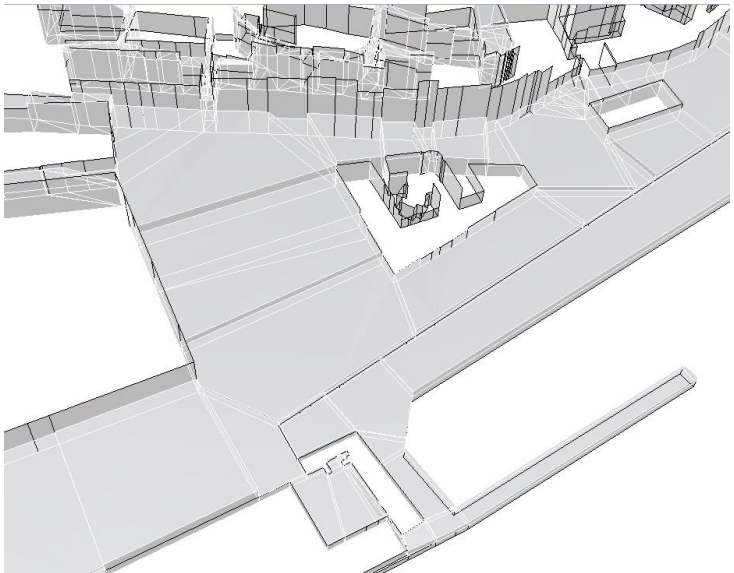
**Campo das Cebolas**



*Figure 76 Campo das Cebolas - Author's drawing*



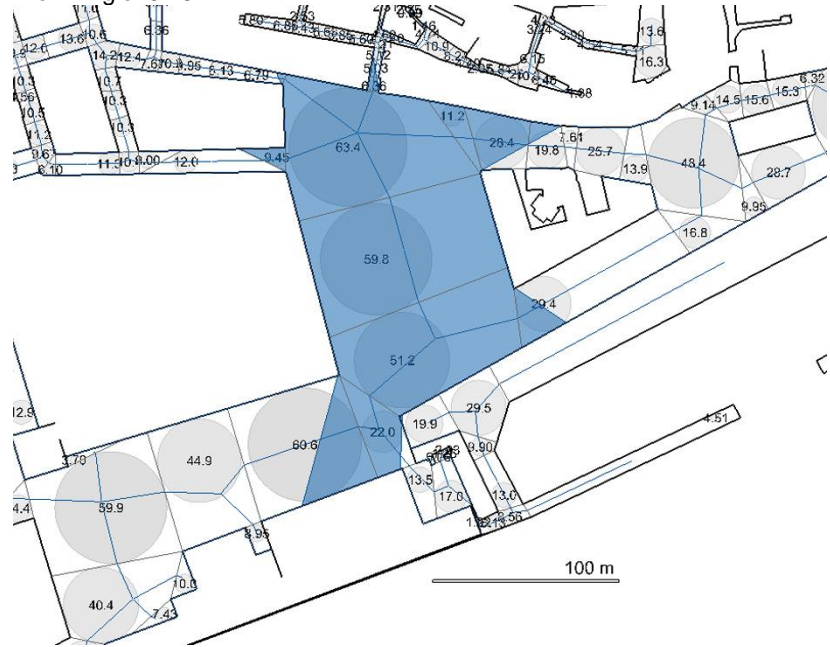
**Table 33** Capturing Spatial Qualities of Campo das Cebolas

|                                                                          | Space for Necessary Activities                                                                                                                                                                                                                                                                                           | Space for Optional Activities | Space for Social Activities |
|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------------------|
|                                                                          | ---                                                                                                                                                                                                                                                                                                                      | √                             | ---                         |
| <p><b>NATURAL ADVANTAGES</b></p> <p>Method: ISOVIST</p>                  | <p>Isovist area m2 <b>19,111</b><br/>                     Compactness <b>0.54</b><br/>                     Area x Comp. <b>10,280</b></p>                                                                                             |                               |                             |
| <p><b>SPACIOUSESS</b></p> <p>Methods: CONVEX SPACES AND CONVEX VOIDS</p> | <p>CV_Avg_Height <b>11.0m</b><br/>                     CS_Area <b>16,295.5 m</b><br/>                     CS_Circ_Diam <b>57.6m</b><br/>                     CV_Compactn <b>0.7</b><br/>                     CV_Angle <b>21</b></p>  |                               |                             |

**OPENNESS**

Methods: ISOVIST and SOLID VOIDS

SV\_Openness **0.26**  
SV\_unique entrances **8**  
ISO\_Total Open View Angle **59.64**  
ISO\_Max View Angle **51.91**



**EQUIPMENT**

Method: FIRST PERSON PHENOMENOLOGICAL ANALYSIS and NATURAL OBSERVATION

**Type of equipment:** There is not any specific urban furniture that serves this Open Public Space.

**Specific Affordances:** Its current usage is mostly parking which leaves no possibility for any additional or creative usage.

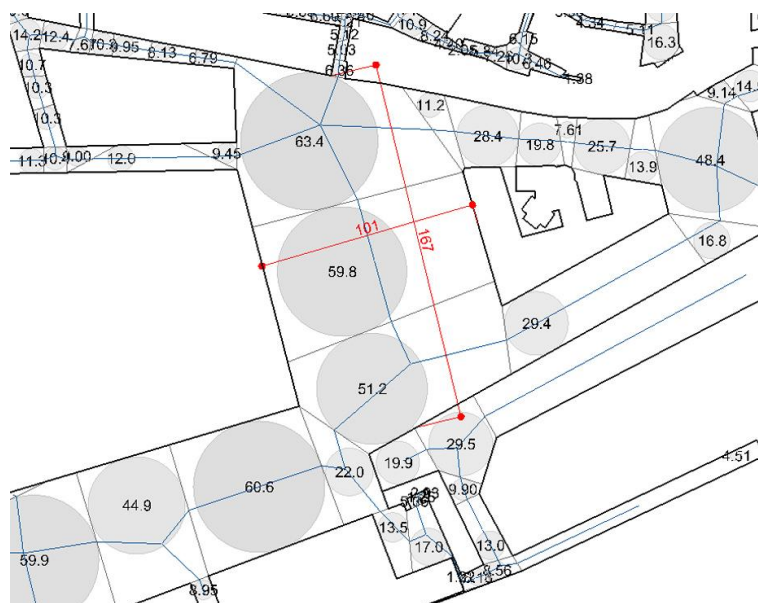
**Equipment orientation:** No equipment



## Campo das Cebolas as space for Necessary Activities



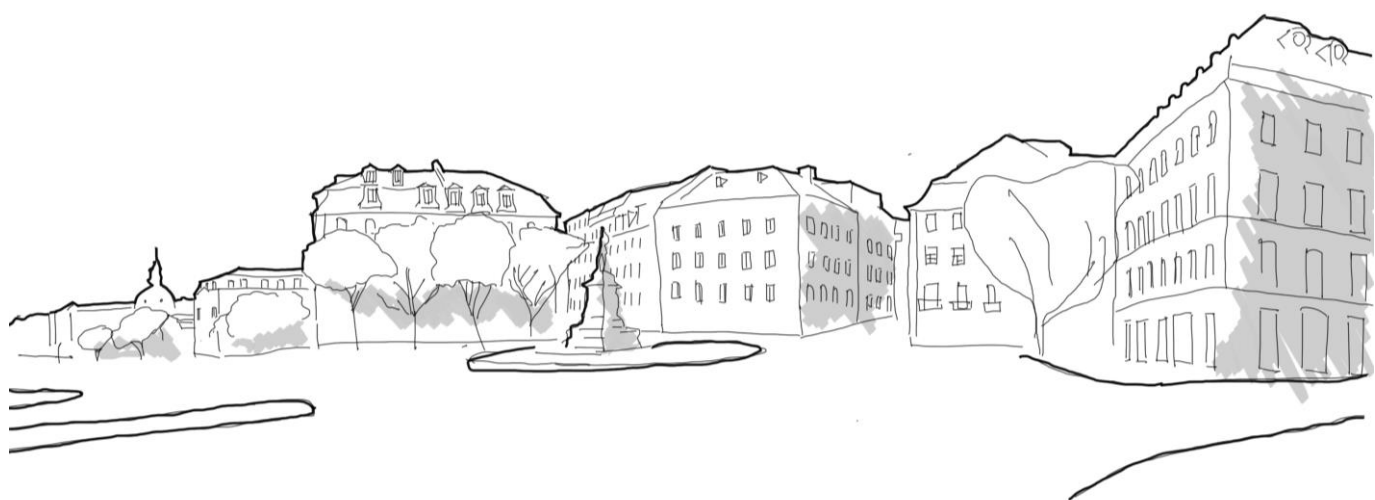
Cais de Cebolas, similarly to Ribeira das Naus used to be infrastructural area situated on the lateral side of Terreiro do Paço. On the northern side, this space is delimited by a set of buildings aligned with the old Moorish wall.



Nowadays, this open public space is characterised by low-openness and lower-spaciousness combined with middle-sized social field of vision (~60m). As it is conformed in natural and urban-architectural terms, it could be used as a social place but this potential is fairly reduced due to its function as parking lots. In this way it is mainly used for necessary activities.




**Cais do Sodré**



*Figure 77 Cais do Sodré - Author's drawing*

**Table 34** Capturing Spatial Qualities of Cais do Sodré

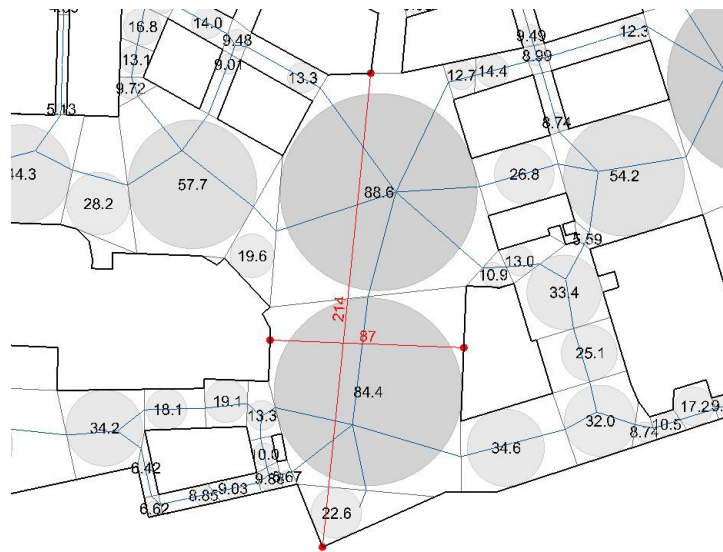
|                                                                          | Space for Necessary Activities                                                                                                                                                                                                                                                                                           | Space for Optional Activities | Space for Social Activities |
|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------------------|
|                                                                          | ---                                                                                                                                                                                                                                                                                                                      | √                             | ---                         |
| <p><b>NATURAL ADVANTAGES</b></p> <p>Method: ISOVIST</p>                  | <p>Isovist area m2 <b>9,539,821</b><br/>                     Compactness <b>0.38</b><br/>                     Area x Comp. <b>3,644,458</b></p>                                                                                       |                               |                             |
| <p><b>SPACIOUSESS</b></p> <p>Methods: CONVEX SPACES AND CONVEX VOIDS</p> | <p>CV_Avg_Height <b>8.0m</b><br/>                     CS_Area <b>17,538.1m</b><br/>                     CS_Circ_Diam <b>80.2m</b><br/>                     CV_Compactn <b>0.8</b><br/>                     CV_Angle <b>12.3</b></p>  |                               |                             |



## Cais de Sodr  as space for Necessary Activities

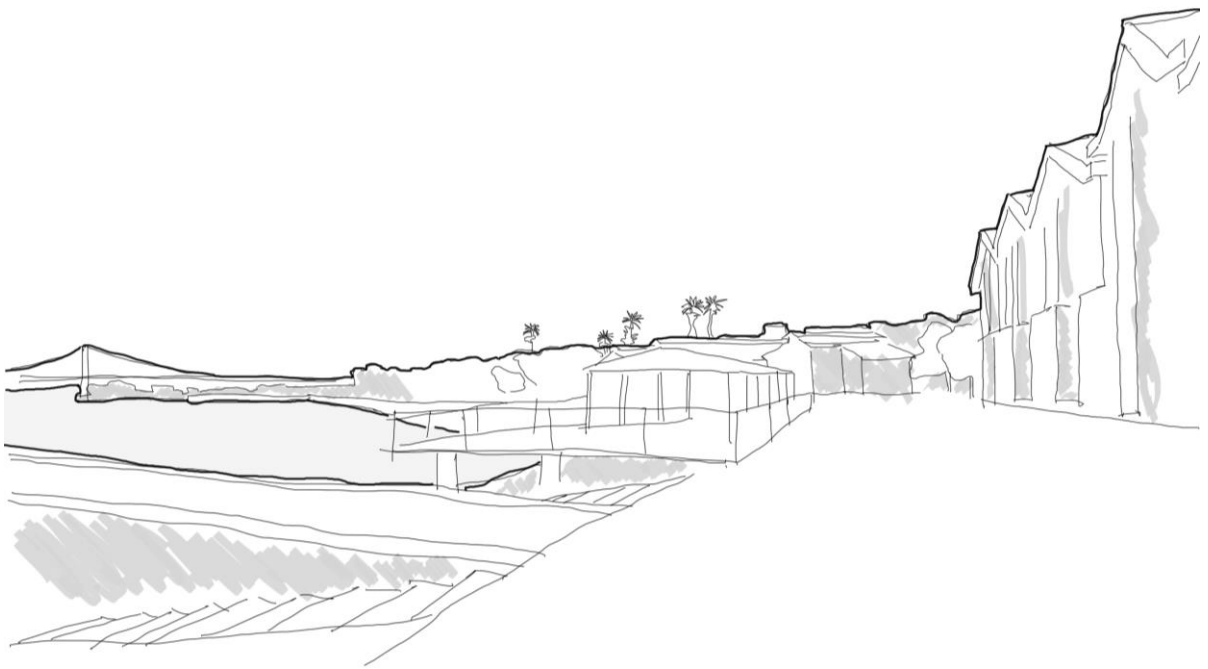


This area designated as Cais do Sodr  is composed by Pra a Duque da Terceira on the North and Jardim de Roque Gameiro on the southern side. Historically, its positioning is linked to the direction of Rua de Alecrim which follows Fernandin wall and used to lead towards the river and Pra a dos Remolares (nowadays Pra a Duque da Terceira).



**In sum**, this open public space is characterised by middle-openness, middle-spaciousness and middle-sized social field of vision (~85m). However, discontinuity of its spatial boundaries does not allow for structuring of open public space as neither object nor field. Ripped facades' scenography and multiplicity of views, together with high traffic usage, downgrade its notion of place as unified oneness leaving it mostly used as space for necessary activities.

**Cais de Santos**



**Figure 78** Cais de Santos - Author's drawing



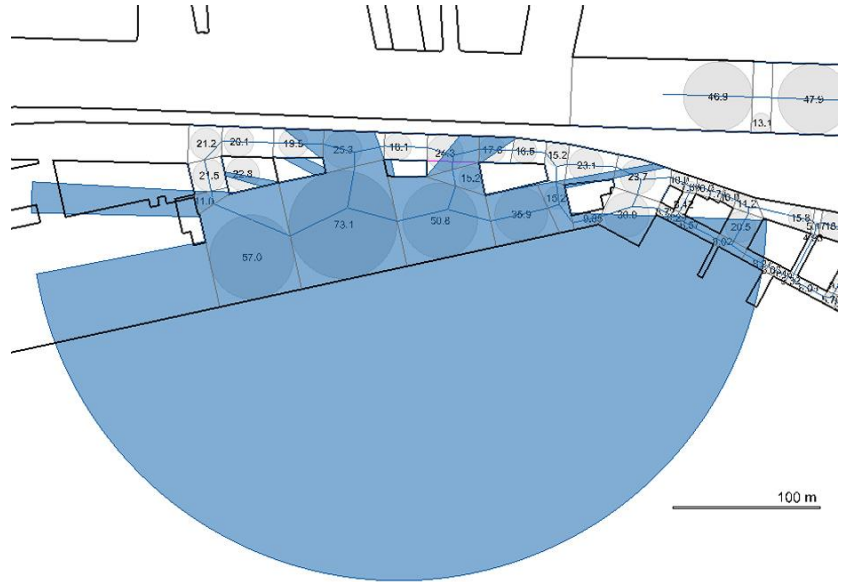
Table 35 Capturing Spatial Qualities of Cais de Santos

|                                                                          | Space for Necessary Activities                                                                                                                                                                                                                                                                                          | Space for Optional Activities | Space for Social Activities |
|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------------------|
|                                                                          | ---                                                                                                                                                                                                                                                                                                                     | √                             | ---                         |
| <p><b>NATURAL ADVANTAGES</b></p> <p>Method: ISOVIST</p>                  | <p>Isovist area m2 <b>33,776,080</b><br/>                     Compactness <b>0.51</b><br/>                     Area x Comp. <b>17,142,806</b></p>                                                                                    |                               |                             |
| <p><b>SPACIOUSESS</b></p> <p>Methods: CONVEX SPACES AND CONVEX VOIDS</p> | <p>CV_Avg_Height <b>4.9m</b><br/>                     CS_Area <b>14,671.1m</b><br/>                     CS_Circ_Diam <b>58.2</b><br/>                     CV_Compactn <b>0.8</b><br/>                     CV_Angle <b>10.5</b></p>  |                               |                             |

**OPENNESS**

Methods: ISOVIST and SOLID VOIDS

SV\_Openness **0.66**  
SV\_unique entrances **6**  
ISO\_Total Open View Angle **174**  
ISO\_Max View Angle **169.20**



**EQUIPMENT**

Method: FIRST PERSON PHENOMENOLOGICAL ANALYSIS and NATURAL OBSERVATION

**Type of equipment:** There is not any specific urban furniture that serves this Open Public Space.

**Specific Affordances:** However, the finishing, such as stairs and inclined grassy ramps serve as urban furniture for sitting, laying, relaxing, reading, etc.

**Equipment orientation:** All the elements that serve as urban furniture are orientated towards the main Open Public Space view.



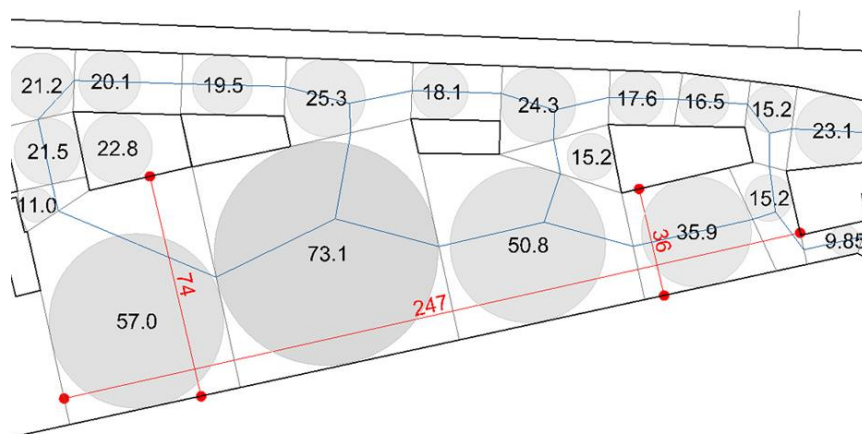
### ***Cais de Santos as space for Optional Activities***



Area that we designated as Cais dos Santos is in its totality situated over the artificial land fill of Boa Vista whose construction began in the late XIX century as part of the largest public works of the time. It consisted of the connection of Cais do Sodré to Alcântara through Av. 24 de Julho, conquering, for this purpose, lands from the river. . Until that time this area was a series of muddy beaches where garbage and city filth were dumped, similarly to the western industrial area of *Bom Sucesso* near Belém where various factories were situated. The construction of this central land fill (Boa Vista until Santos), together with construction of longitudinal axis (Avenida 24 de Julho), was a most important object of municipality attention during the whole 1860 decade (Barata, 2011). At that moment, Avenida 24 de Julho became the important route of the west which got complete new port façade of warehouses and docks. This riverside avenue with storages and piers spaces, detached the city from its river Tagus, thus the main entrance to the city over centuries, according to Durão, lost its symbolic importance (Durão 2012, pp.24,25).



This big new empty area did essentially change the city-river relationship. The undetermined nature or deep land fills worked as invitation and inspiration for various project and proposal to emerge. Lisbon Riverside, in 19<sup>th</sup> and early 20<sup>th</sup> century, was a designing polygon for various generations of Portuguese and foreign polytechnics' engineers<sup>56</sup>. While some projects were concerned mostly with housing and living qualities such as Júlio de Oliveira Pimentel's (1860) other were merely theoretical such as Pierre Pézerat's writings (1852 and 1865), or principally concerned with the aggrandizement of Lisbon such as Thomé de Gamond's (1870).



Nowadays, this area is due to decline of industrial functions mostly occupied with artistic and architectural studios, restaurants and clubs. Its specific image, industrial

---

<sup>56</sup> The improvement of Lisbon's port started being the discussion issue long before anything about it was realistically approached. The first work originates from *Marquez de Pombal* (1750-1777) time and was made by *Carlos Mardel*. There is a unique drawing made on the cardboard, it was a plan that proposed marginal dock and big arsenal. The marginal dock should have started at *Terreiro do Paço* and finished at *Belém* where these two places had the same docks as they have in actuality. After *Mardel*, many years have passed without any questioning about port. Only in 1854 the discussion restarted and during next decades various authors presented their projects, such as: *Conde de Clarange Lucote*, *Conde de Farrobo*, *João Evangelista de Abreu*, *Thomé de Gamond*, etc. All these projects had similar goals: to make along the right Tagus margin a long and slightly sinuous line of docks. This dock line should have been long and separated from the shore to ensure sufficient area for port functioning and water depth for safe boats' traffic. (Mesquita 2006, pp.100-102).











architecture and proximate relationship with Tagus, generate an alternative sense of place which is still to be fully explored. While open public places previously approached, such as Terreiro do Paço or Ribeira das Naus, are clearly defined as places, Cais de Santos lacks its more precise definition to be successfully utilized.

In sum, this open public space is characterised by high-spaciousness, high-openness and middle-sized social field of vision (~60-70m). Its main spatial structure together with its longitudinally, resamples slightly Ribeira das Naus. However, the lack of equipment or any user-orientated finishing demotes significantly its contextual value. However, due to latter increase in utilisation of surrounding buildings, place security and liveability increased. These facts, combined with possibility for isolation and recreational activities that Cais de Santos offers, this open public space is somewhat used for optional activities.

## Conclusions on Capturing Behavioural Category - From Open Public Space Attributes to Qualities

As demonstrated in this chapter, UrbArch Emptiness influences attributes on both **natural-geographic** and **urban-architectural level**. Besides its geographical capacity to depict shape of topography and to provide ample visual channel towards surroundings, UrbArch emptiness significantly influences configuring open public places on urban-architectural scale. Due to its relationship with natural surrounding but also its size, scale, compactness, but also relationship towards topographic and built limits, it structures open public spaces twofold: as **solidified object**<sup>57</sup> and **field**<sup>58</sup> which both in a different way allow for perception of their spatial oneness.

Table 36 Solidification Type of Open Public Spaces

|                            | Natural Geographic Level       | Urban-Architectural Level |                   |                    | Behavioural Level  | Solidification Type                                                                   |
|----------------------------|--------------------------------|---------------------------|-------------------|--------------------|--------------------|---------------------------------------------------------------------------------------|
|                            |                                | Magnitude of Visual Field | CV_Angle          | SV_Openness        |                    |                                                                                       |
|                            | Low<br>< 1,000,000             | Low<br>< 30°              | Low<br>< 33%      | Low<br>< 60°       | Low<br>< 50m       |                                                                                       |
|                            | Middle<br>1,000,000<10,000,000 | Middle<br>30°<60°         | Middle<br>33%<66% | Middle<br>60°<120° | Middle<br>50m<150m |                                                                                       |
|                            | High<br>>10,000,000            | High<br>>90               | High<br>>100%     | High<br>>120°      | High<br>>150m      |                                                                                       |
| Terreiro do Paço           | 10,615,757                     | 10.1                      | 0.365             | 75.60              | 179.8              |  |
| Cais das Colunas           | 16,184,041                     | 11.8                      | 1                 | 158.40             | 25.4m              |  |
| Ribeira das Naus           | 27,533,328                     | 11.9                      | 0.56              | 118.01             | 124.0              |  |
| Praça de Município         | 3,616                          | 35.2                      | 0.20              | 16.8               | 124.0              |  |
| Campo das Cebolas          | 10,280                         | 21                        | 0.26              | 51.91              | 57.6m              |  |
| Cais do Sodre              | 3,644,458                      | 12.3                      | 0.62              | 16.8               | 80.2m              |  |
| Cais de Santos             | 17,142,806                     | 10.5                      | 0.66              | 169.20             | 58.2               |  |
| Jardim Dom Luís            | 16,282                         | 16.2                      | 0.33              | 1.2                | 94.0               |  |
| Largo do Corpo Santo       | < 1,000,000                    | 48.59                     | 0.35              | 33.6               | 23.7               |  |
| Largo do Terreiro do Trigo | < 1,000,000                    | 34.4                      | 0.41              | 12                 | 40.2               |  |

There are situations such as Cais das Colunas, Ribeira das Naus and Cais das Santos, which are due to high openness, high spaciousness and big view angle

<sup>57</sup> possibly represented through Convex, Solid and Fragmented Voids representation









































<sup>58</sup> capturable through Isovist and Viewshed representations

noticeably **solidified as field** thus allow for great appreciation of surrounding providing great framework for leisure and recreational activities. Differently, due to lower openness and spaciousness, Praça de Município, Campo das Cebolas or Jardim Dom Luís are more inclined towards **solidification as object**. Within these examples, Campo das Cebolas is still not defined enough to bring users closed together into what is known as social distance allowing for their approximation and social mingling. With even lower openness and spaciousness, we find other, even more solidified, open public spaces, such as **'largos' and 'rua'** which due to their size work as rooms in urban fabric providing also mingling spaces.

Moreover, there as situation in which place reveal characteristics from **both solid and field solidification** such as Terreiro do Paço or Cais do Sodre which are further enhanced or weakened due to secondary equipment elements. On the positive side we find Terreiro do Paço with several cafés and statue of D. José I which improve place liveability and divide it into smaller thus more 'social friendly' open public space. Moreover, the double characterisation of Terreiro do Paço demonstrates that this place could possibly also be used for other optional activities such as leisure, relaxation, reading, playing. However, for these activities different, more natural and comfort orientated equipment, shade and additional furnishing would be needed. On the contrary, as it is today, the public spaces of Cais do Sodre is regardless its structural potential weakened due to excessive traffic and lack of meaningful place-in organisation. From the above analysed cases, we inferred the most important properties in depicting **structuring type of open public spaces** and their UrbArch Emptiness – **Angle** and **Openness percentage**. However, only when combined with property of **Maximum View Angle** it is possible to grasp if highly-open places succeed to establish strong field structuration. Moreover, beside these properties, **size of social field of vision** is also found important for better comprehension of in-place activities.

When we observed open public spaces from the perspective of usage, on the behavioural scale, the unbuilt part starts providing framework for **in-place movements, leisure, relaxation, sojourning, and social interaction** through **perception, cognition and apprehension** of others and of surrounding. At this level of approximation, apart from important natural-geographic and urban-architectural features, smaller elements such as changing in pavements and urban furniture slice bigger spatial chunks into smaller units. The smaller empty rooms inside the rooms are proven relevant to human approximation and interaction thus crucial for spatial liveability and social usage of open public spaces.

Table 37 Open Public Space Type and Activity Types

|                            | Open Public Space Type                                                              | Additional Equipment                                                                | Size of social field of vision                                                        | Activity Type                                                                         |
|----------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|                            | Field / Object                                                                      | Enhancing / No equipment                                                            | Social / Social + Optional / Optional<br><30m / 30-100m / >100m                       | Necessary / Social / Optional Activities                                              |
| Terreiro do Paço           |  |  |  |   |
| Cais das Colunas           |  |  |    |  |
| Ribeira das Naus           |  |  |  |  |
| Praça de Município         |  |  |  |  |
| Campo das Cebolas          |  |  |  |  |
| Cais do Sodre              |  |  |  |  |
| Cais de Santos             |  |  |  |  |
| Jardim Dom Luís            |  |  |  |  |
| Largo do Corpo Santo       |  |  |    |  |
| Largo do Terreiro do Trigo |  |  |  |  |

Solidification Type  
Field / Object



Additional Equipment



Field  
Open Public Spaces

Solidified Object  
Open Public Spaces

Equipment -  
Enhanced  
Open Public

No equipment or  
inappropriately used  
Open Public Spaces

Activity Type



Necessary  
Activities

Social Activities

Optional Activities

When we analyse the Table 37 and compare the type of open public space with the usage which is usually observed<sup>59</sup> within the space, we can infer that open public spaces with whose UrbArch emptiness is structured as field are more often used for leisure and recreational activities. Differently, Object like open public spaces provide more often the framework for social activities. Moreover, when speaking about Object-like open public spaces we understood that social activities do not occur when space is completely unprepared and unequipped.

---

<sup>59</sup> The observation is done during several day and year periods wherefrom some pattern of usage are inferred.

*This page intentionally left blank*

*This page intentionally left blank*



## 7. Conclusions and Final Considerations

The following chapter presents the conclusions from the research drawn from theoretical, application and practical levels. Conclusions are organised regarding research aims and objectives and the way these were addressed and responded throughout the research.

### 7.0. From theoretical foundation towards Practical application - From Emptiness to UrbArch Emptiness



*Figure 79 Gradual process of conceptual narrowing of Emptiness into UrbArch Emptiness*

Regarding the general theoretical foundations, the presented study did not approach the absolute and abstract notion of Emptiness as addressed in Buddhists' and Taoist philosophies nor its ultimate generative quality supposed by quantum physics (Watson 2014). However, used as analogies, these concepts did inspire the definition of UrbArch Emptiness as we conceptualised it (Figure 79).

For example, the Buddhist's concept of fullness of Emptiness, contained in its dependence on other elements was one of research's main triggers which allowed for conceptualisation of Emptiness as potentially manifested through perceivable things and as such potentially graspable. Moreover, the analogy with Atomists idea of discontinuity between atom and void supported the possibility for conformation of UrbArch Emptiness as distinct thus graspable notion of built environment. Finally, the processes of concretisation of emptiness into space, which occurred during Middle Age, allowed for systematisation of numerous historical notions into research's main

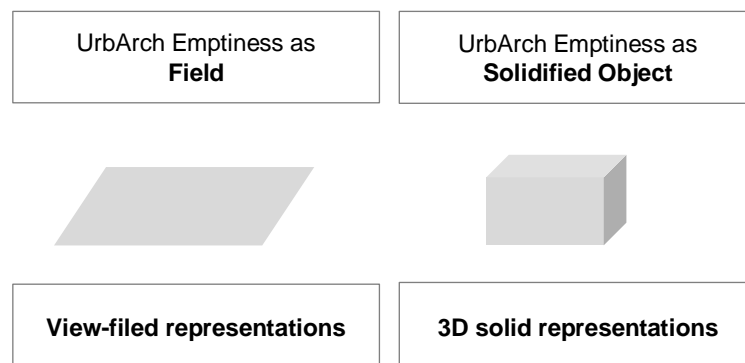
concepts: **absolute emptiness**, **absolute space**, **specific space** and its **specific emptiness** (Figure 80). This systematisation allowed for definition of the UrbArch Emptiness which is based on the mentioned systematisation and defined as specific emptiness.



*Figure 80 Process of concretisation of Absolute Emptiness, through Space towards Specific Emptiness*

Regarding employment of urban and architectural theoretical foundations, there were two conceptualisations (Figure 81) especially important for the presented research because they informed about the ways in which UrbArch Emptiness could have been objectivised, represented and grasped:

1. **Fried’s experience of objectlessness** which elevates the notion of **UrbArch Emptiness** as **Unbuilt Field** to the level of **object** which through its endlessness isolates a beholder and like that establishes its own objecthood.
2. **Arnheim’s Density** which point out to fullness of Emptiness in-between objects as pervaded by influence of surrounding elements thus not empty at all. This reflection of built limits towards in-between spaces was crucial for conceptualisation of UrbArch Emptiness as **solidified object**.

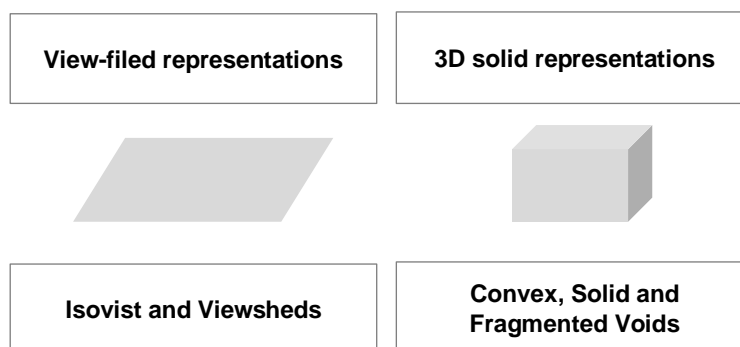


*Figure 81 UrbArch Emptiness as Field and Solidified Object and corresponding representations*

These two notions were further applied on definition of representation models (view-field and 3D solid representations) which would account for these two specific natures of UrbArch Emptiness. While on the broader theoretical level, the notion of Emptiness was applied through analogies and used as merely inspirational and conceptual trigger of the research, on the application and practical level, the ideas of **Unbuilt Field** and **Solidified Object** were used for definition of UrbArch Emptiness as an actual, tangible and graspable manifestation of its absolute extreme. The research therefore addressed a specific notion of UrbArch Emptiness as an unbuilt part of Open Public Spaces which coexists with form and it is announced through lack of it.

### 7.1. On Representation Models

Regarding representation models applied in the research, their choice is based on the very nature of UrbArch Emptiness and its two possible manifestations (field and object). These manifestations led to definition of **two Open Public Space representation models** (Figure 82) which we used to focus and analyse unbuilt part of urban environment respecting its nature as either solidified object or unbuilt field. The proposed representations were further applied on different observational approximations towards Open Public Spaces.



*Figure 82 UrbArch Emptiness as Field and Solidified Object and corresponding methods*

- **View Field representation of Open Public Space** is inspired by characteristic of UrbArch Emptiness to be deemed as **unbuilt field** which allows for place-landscape-space continuous visual apprehension. In that regard, the representations models of Open Public Space which account for the field characteristic of its unbuilt part - **Isovist and Viewshed analysis** were used (section 4.2). Differently from Convex, Solid and Fragmented Voids which are primary limited to constructed spatial limits, the representation models of Isovist and Viewsheds accounted for further place, landscape and space borders (such as earth curvature, topography, water surfaces).
- **3D Solid representations of Open Public Space** (Convex, Solid and Fragmented Voids), were structured around the notion of UrbArch Emptiness as possibly **solidified object**. These representations accounted for direct Open Public Spaces' limits (such as urban, architectural, equipment) on three levels of granularity which resulted into three models of **Solid, Convex and Fragmented Voids** (section 4.1)

As demonstrated in the **chapter 6 Capturing Open Public Spaces Attributes by approaching UrbArch Emptiness**, these two representation types are useful for addressing different levels of open public spaces analysis. **3D solid representations** are proved advantageous for observation of attributes on **urban-architectural level**, while view-field based ones are shown more beneficial for comprehension of view and topography related attributes **natural and geographic level**. Moreover, due to continuity between urban-architectural and natural-geographic level, the view-field based representations, when applied with more details, are also proven informative on urban-architectural scale.

## 7.2. On 3D Solid Representations as Research Output

One of important Research Outputs are **3D solid representations** which were conceptualised, developed and applied throughout the research. The 3D solid representations are based on the idea that continuous urban void can be apprehended as series of separated spatial units due to potential of UrbArch Emptiness to be manifested and grasped as set of discontinuous solidified units.

Therefore, the construction of the models was initiated from spatial compartmentalisation which allowed for chunking of continuous urban void into smaller meaningful spatial divisions. Starting from 3D-informed Convex Spaces, representation models of Convex, Solid and Fragmented voids were developed and to some extent shown useful for visualisation and analysis of open public spaces in relationship to their urban-architectural boundaries (Figure 83).

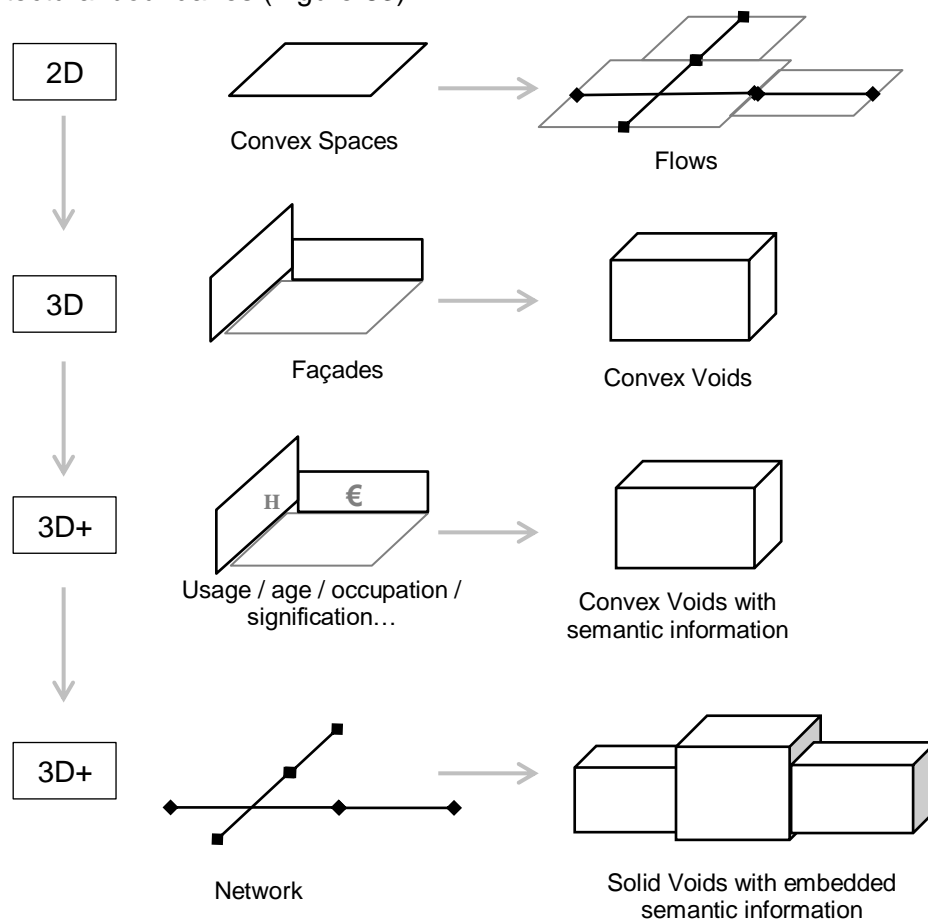


Figure 83 Convex, Solid and Fragmented Voids Models

By preserving diverse information about compartments' location, boundaries, usage, occupation type, shape, etc., the 3D solid representations were shown to be a structural part of a broader model (Sileryte, Cavic, Beirão, forthcoming) which allows for different representations and data organisations based on 5 core content concepts of GIS as suggested by Kuhn (2012): location, field, object, network and event.

Moreover, due to the convex compartmentalisation, the models permits delimitation for targeted data examination and more prompt analysis, by avoiding redundant processes. This means that the 3D solid representation allows for more efficient data organisation and manipulation. The mentioned usages of the 3D solid representations, (see section 6) were only to some extent demonstrated in this research, allowing for an important body of work to be further developed as a novel research line.

### 7.3. On UrbArch Emptiness and Open Public Spaces Analysis

The conducted research approached **UrbArch Emptiness** and the way this phenomenon contributes to attributes of **Open Public Spaces** and as such gave us insight into spatial qualities on three levels of approximation. We therefore analysed several **properties**, as **measurable** manifestations of certain **attributes** which are further linked to **specific qualities** as their **approachable expressions** (Figure 84).

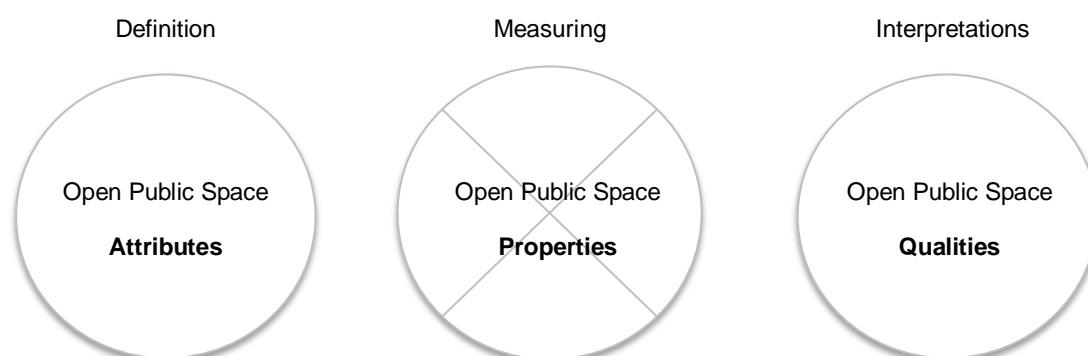
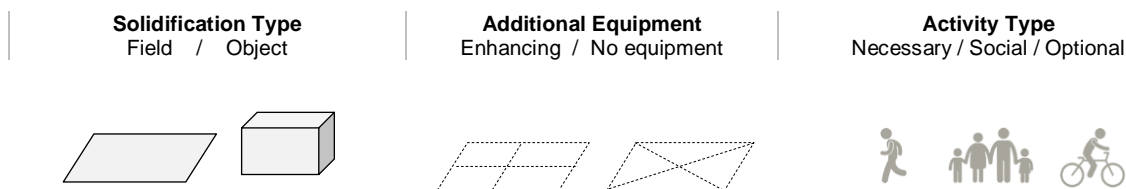


Figure 84 Attributes, Properties and Qualities of Open Public Spaces

On the **natural and geographic level** we observed attributes of **natural advantages**, specifically **topography** and **visual field**, which were tighten to Open Public Space

qualities of **characterisation** and **contextualisation**. We inferred that on this level UrbArch Emptiness helps in depicting open public space **characterisation** (based on specific relationship towards site and topography) and in preserving its **contextualisation** (based on place-landscape-space visual continuity).

On the **urban and architectural level**, we observed attributes of **spaciousness, openness and diversity** and we proposed that they can be useful for understanding of typology of Open Public Spaces of Portuguese urbanism. Moreover, on this level UrbArch Emptiness is, regarding the way it can be solidified thus apprehended as unit, shown important for understanding how **places are formally structured**. Through observation of urban-architectural definability and solidification places' oneness as either **field** or **object** is revealed. On the **equipment level**, UrbArch Emptiness of different granularity ('rooms within room') demonstrates potential to enhance Open Public Space behavioural utility.



These attributes were finally correlated on **Behavioural level** to necessary, optional and social activities wherefrom the correlation between these three levels of approximation was demonstrated. In short, **Field-like** Open public spaces are shown more favourable for Optional activities due to stronger relationship they establish with surroundings, ex. Cais de Santos. When introduced secondary partitions due to finishing and equipment elements, the field-like open public spaces are added additional barriers which diminish overall spatial size allowing for more approximate interaction with others. When they are partitioned into smaller 'rooms within room', field-like open public space start also providing framework for social activities, ex. Cais das Colunas or Ribeira das Naus.

Differently, **Object-like** Open public spaces, as Praça do Município, are more suitable for Social activities. When these spaces lack equipment or are inappropriately used, ex. Largo do Corpo Santo and Largo do Terreiro do Trigo used as parking places, social activities are diminished significantly. The equipment category stronger influences, both positively and negatively object-like open public spaces and their social activities than field-like, ones with optional activities these support.

#### **7.4. On Open Public Spaces Typology**

As demonstrated through the research, UrbArch Emptiness can be **solidified** into 'open rooms' of open public spaces through its either **object** or **field** qualities which reveal place capacity to be structured into apprehensible unit. It is also demonstrated how, on behavioural level, these two types provide conditions for diverse activities: **necessary, social and optional**. On one side we found the well-structured, limited and composed UrbArch Emptiness which is dense and almost tangible. On the other, we will see disperse and limitless places, which leakage into the landscapes tending towards vast spaces and obtaining quality of objecthood through far perceptual limits such as topography and/or earth curvature.

While field-like open public spaces provide visual channel towards landscape and space promoting conditions for optional activities, object-like open public spaces are proven to provide a more suitable framework for human gathering and interaction, which by approximating people generate what is known as space for social activities.

In short, **field-like** open public spaces with mid- and high-openness and small number of views demonstrate constancy through strength of non-boundaries and continuity of view they offer. **In these cases notion of place is built by lack of buildings**. Differently, the attribute of spaciousness express the notion of **solidification of**



**UrbArch Emptiness** as one of basic shape depicthers of Open Public Spaces, showing how **spacious, conformed or room-like a certain open public space is.**

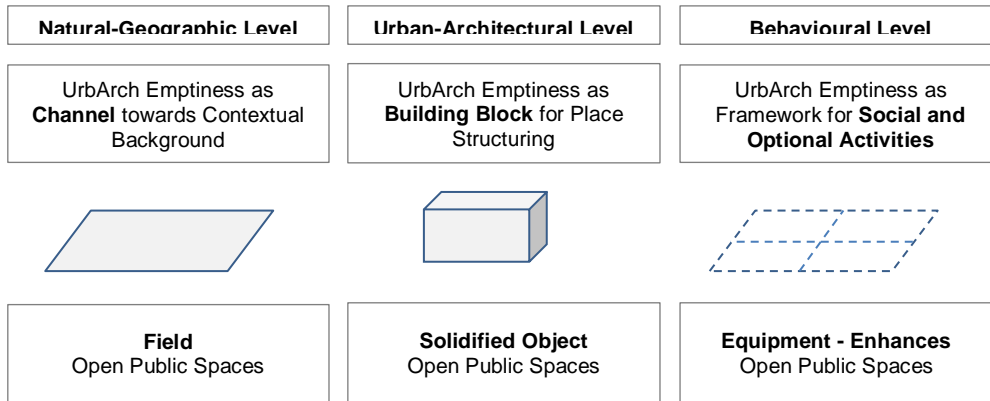


Figure 86 UrbArch Emptiness and Open Public Space Types

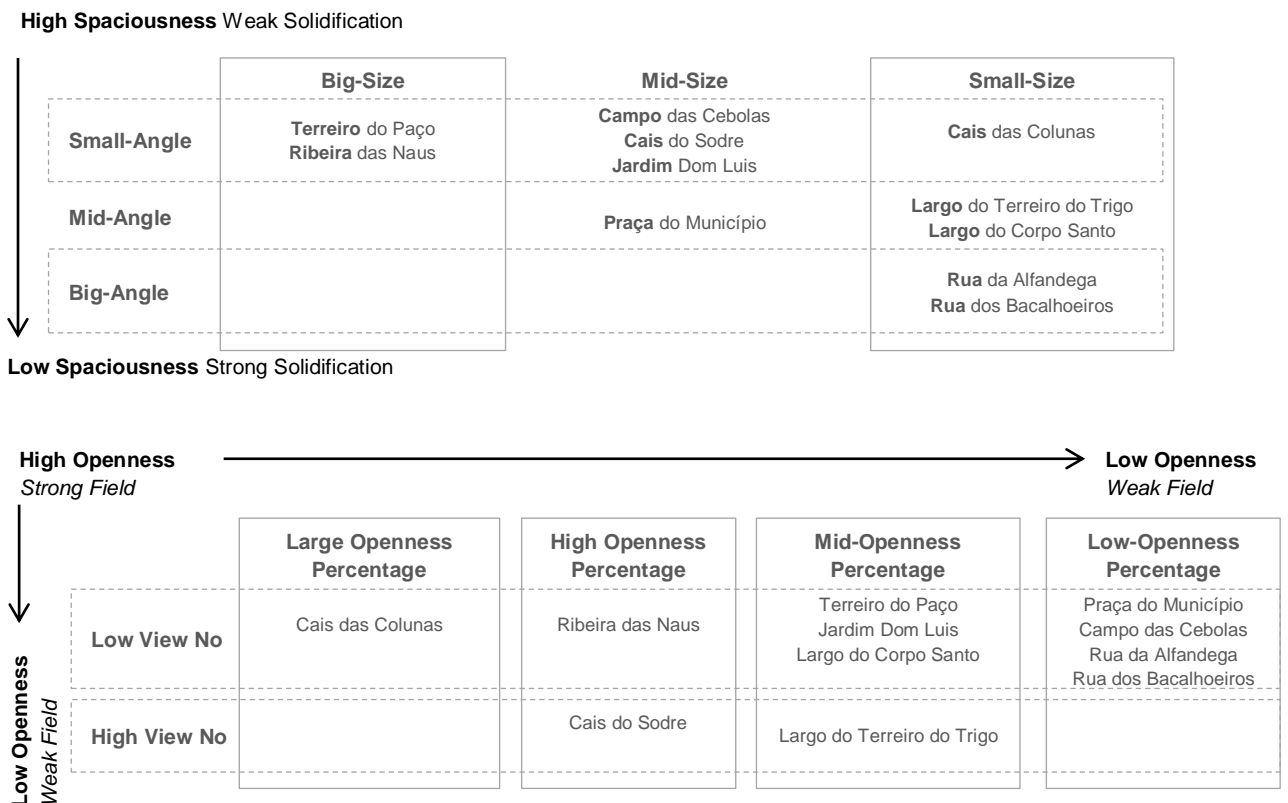


Figure 85 Spaciousness and Openness in Central Lisbon riverside

Some characteristics of field- and object-like open public spaces

**Field-like open public space:**

- Strong natural-geographic characterisation and contextualisation
- Higher Spaciousness and Openness
- Good potential to be successful framework for Optional Activities

**Object-like open public space:**

- Lower Spaciousness and Openness
- Good potential to be successful framework for Social Activities

## 7.5. On Future Works

The presented research traces various directions for future urban-architectural investigations. Namely:

1. The list of **open public space attributes** defined in chapter 5, Table 14, can be as a holistic basis, further used for investigation of relationship between open public spaces and other phenomena. The analysis could be organised around specific attributes or categories, wherefrom the relationships between different parts of system could be established.

It would be interesting to understand how physical backgrounds, geographical, urban-architectural, network and equipment, are generating *active affordances* for public space behaviours and emotional responses. Based on this framework one could relate the physical and morphological aspects of public spaces with their qualitative expressions by recognizing how certain components of space afford particular expressions of usage. In that way, it could be understood what attributes or set of attributes are important in creating appealing and intensively used spaces.

2. The **3D solid representation models** developed in chapter 4.0 are only to some extent shown useful for open public spaces analysis. Levels of Solid and Fragmented Voids demand more extensive application and validation.

At this stage of the research, the developed 3D solid representation models are used only for capturing few open public space attributes and qualities. Some further investigation ought to be done taking into consideration a wider list of attributes and qualities. Moreover, it would be interesting to approach UrbArch Emptiness in different urban and architectural contexts, wherefrom other specificities would emerge, thus diverse attributes and qualities would be framed.

UrbArch Emptiness should also be addressed in various urban and architectural layouts as outputs of different historical, cultural and ideological contexts. In that manner, a more extensive analysis would be done, thus more general conclusions could be drawn.

3. Further inclusion of the developed **compartmentalised 3D solid representation** model into broader (location, field, object, network and event) representation model and its usage in other type of data organisation and manipulation is already initiated in this research (see Cavic, Sileryte, Beirão, 2017, Sileryte, Cavic, Beirão, forthcoming). However, this research direction is in its totality open for further development.
4. Apart from analytical potential of notion of UrbArch Emptiness presented in the thesis, this concept can be used for **project and decision making**. After being correlated with spatial, emotional and behavioural qualities UrbArch Emptiness could be used reversely, as a **constructive block** of built environment whose specific morphologic attributes would guarantee certain emotional and behavioural responses. In that regard a broader investigation on additional spatial indicators is needed.
5. There is another possible usage of UrbArch Emptiness in **project development and decision making**. Comprehension of UrbArch Emptiness can help in understanding **potential of open public spaces** to be further developed into **more structured places** (either field- or object-based) and improved throughout specific **equipment**. Said differently, UrbArch Emptiness implies possible **ways for future places' generation**.

In short, UrbArch Emptiness demonstrates places potentials to be structured - its urban-architectural indefinability and multiplicity of possible solidifications, reveals potential paths for places constitution.

6. The presented work does not approach the **UrbArch Emptiness** as output of urban layouts or specific urban plans that traced them. It would be useful to understand what specific qualities of unbuilt environment are generated by certain urban plans and layout types. A research on qualities of UrbArch Emptiness within several layout types such as those defined by Dias Coelho (2002) based on addition, overlapping, sedimentation would be an interesting research continuation.

## 7.6. On Research Limitations

The presented findings show how UrbArch Emptiness influences structuring Open Public Space attributes and qualities of central Lisbon riverside. Due to time and resources limitation, the research presents the following limitations:

- The number of case studies is rather insufficient for more **deductive** conclusions. The observation of additional attributes and open public spaces is therefore projected for the future works. In that regard, rather than arguing the possibility for **generalisation** of findings we suggest that a **transferability** of our methods would be possible. The transferability would depend on research contexts and goals. For some other cultural context we would expect other attributes to emerge and for another research goals different categorisation would be possible.
- The addressed spatial context is limited to **Lisbon area**. The validity of proposed measures should be tested **on wider range** of case studies within different Portuguese and foreigner design settings, both from contemporary and historic contexts.

- The correlation between attributes, properties and qualities are descriptively explained (low, middle, high), a more precise numerical analysis of results is needed for in-depth understanding of the obtained values. The research proposes certain balancing between acceptable simplification and possible measurability.

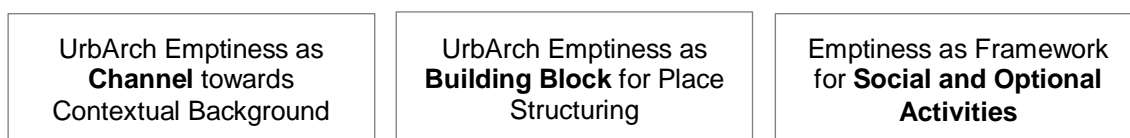
### 7.7. On UrbArch Emptiness – towards Architecture of Emptiness

The inspirational capacity of emptiness in Urban-architectural disciplines in general and participation of UrbArch Emptiness in development of Open Public Spaces in particular, are seen as a basis for paradigm change regarding **importance of unbuilt part** within built environment.

In that sense, UrbArch Emptiness is demonstrated to be a positive, fraught and generative element of built environment whose capacity goes from its **behavioural potential** to promote interaction thus generate **social activities**, through its **channel potential** to provide **place-landscape-space unification** and inspire **optional activities** by praising surrounding and triggering notions of **infiniteness**. Moreover, its **structural qualities** are shown crucial for shaping built environment, its place consistency and overall **morphology**. The UrbArch Emptiness should be therefore added to common elements of **urban morphology** such as those proposed by Lamas (1992) which account for pavement, buildings, lot, quarter, façade, patio, street, square, urban equipment, monument and vegetation, neglecting the great variety of undefined and unstructured open public spaces.

In this research, UrbArch Emptiness is shown to be a multi-scale phenomenon which influences structuring Open Public Spaces on various levels such as: **natural and geographic, urban and architectural, behavioural**. In that regard, notion of

Emptiness in general and UrbArch Emptiness in particular are demonstrated to be unbuilt but structured part of our surrounding which intensely determine and characterize open public spaces and Lisbon Riverside and binds together the place-landscape-space permitting their unification. It does so, on three levels.



On the **contextual, natural and geographic level**, UrbArch Emptiness is a depicter of relationship between place and topography and an important phenomenon in place-landscape-space permeation, thus an informative qualifier of Open Public Space **characterisation** and **contextualisation** qualities. On the **urban-architectural level**, UrbArch Emptiness gives us an insight into open public spaces structuring depicting open public spaces oneness through its solidification as either **Object of Field**.

The presented research aimed at holistic and systemic introduction of notion of UrbArch Emptiness into scientific and design urban-architectural agenda, opening a direction towards urban-architectural practices which would not use a built form as a primal tool for spatial structuring. It aimed at introducing a possibility for urban-architectural practices which would focus **on the empty part of our built environments** in a more consciousness manner, giving precedence to the strength of its unbuilt part, natural environment, place significance, atmospheres, usages, etc.

Based on this, the research demonstrated UrbArch Emptiness to be a constructive element of our environments, thus informative in its comprehension and useful for its designing and planning. As a **qualitative, strengthening, positive and explanatory element** of Open Public Spaces' attributes and qualities, UrbArch Emptiness ought to be introduced as important qualifier in **urban-architectural analysis, project development** and **decisions making**.

Employment of **UrbArch Emptiness** thought comprehension of non-building as a possible construction tactic, leads to what can be called **Architecture of Emptiness** which would explore capacity of unbuilt to embrace potential usages and **afford** stages for diverse dwellings. By not directing usages, UrbArch Emptiness provides background for multiple possibilities. It expresses **affordance** through lack of constraints which makes it capable of triggering and inspiring diverse usages. The comprehension of UrbArch Emptiness opens to urban designers and architects the whole new field of constructing built environment – **build without building**. In that regard the architects and urbanism should be trained to build by ‘not building’. The presented study elaborates the initial theoretical basis and some analytical application of that intention.

*This page intentionally left blank*



## 8. Glossary of Concepts Used

|                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Emptiness</b>                 | <p>The concept of Emptiness is used as the inspiration and conceptual basis of the research, which is as broad, reach and vague strongly present in various discourses from oriental mysticism to western philosophy (section 2.0). It is seen as the ultimate vessel from which reality emerges, as part of full-empty breathing process and mutual divisibility, ect.</p>                                                                                                                                                                                                             |
| <b>Buddhist's Full Emptiness</b> | <p>Buddhist's Emptiness (section 2.0) is based on the notion of dependent origination which points at the potential of emptiness to encompass and become everything whence we adopted Emptiness' capacity of being potentially manifested through perceivable things and as such potentially graspable. The quality of dependent origination of Emptiness inspired search for observation of this apparently non-graspable phenomenon.</p>                                                                                                                                              |
| <b>Taoist's emptiness</b>        | <p>Taoist's Emptiness (section 2.0) makes part of empty-full 'breathing process' and as a vessel for its occurrence. In our research, it is used to explain emptiness as a part of empty-full process which is in permanent change from one of these extremes towards other.</p>                                                                                                                                                                                                                                                                                                        |
| <b>Atomists' emptiness</b>       | <p>In our systematisation (section 2.4) the Atomists' Emptiness (section 2.0) is defined as a sort of Specific emptiness based on full-empty divisibility which is an important postulate of our research because it support definability of full and empty opposites allowing emptiness to be grasped. Without Atomists conceptualisation which permits observation of reality through discontinuity, any scientific observation of separated phenomenon would be challenged.</p>                                                                                                      |
| <b>Plato's Space</b>             | <p>In Timeous, Plato's space is considered an intermediate between 1) the absolute-that is not subject to change, and 2) the relative - the sensible world of generation. This quality of Plato's space to be a background and to participate in unfolding of sensitive world resembles the idea of Tao's emptiness from which everything graspable arises. Although Plato's conception of space (section 2.0) has various overlapping points with the eastern idea of Emptiness their differentiation led towards defining of Absolute Space and Absolute Emptiness (section 2.4).</p> |

---

**Aristotle's Void**

The conception of Void based on Aristotelian tradition (section 2.0), accounts for lack of something which due to its strong state of lacking gains qualities and starts defining itself, ex. absence of matter which creates vacuum or absence of desirable object which generates life's drive as in Lacanian *object petit a* from his psychoanalytic theory.

---

**Stoic's  
Extracosmic  
Empty Space**

The Stoics' spatial concept consists not only of what is reachable from reality but what is conceivable through our interpretation. Stoics argued about Aristotelian idea of limited world claiming that if there is an imaginable limit there must be something beyond it. In this way emerges an important issue of *imaginary space* – a space that is conceivable by reason but still beyond it, ideal but not real (Ribas i Massana 2008 pp.16,17).

---

**Absolute  
emptiness**

Inspired by Buddhist's emptiness we established one of the research main propositions: 1.Absolute Emptiness as the ultimate vessel of everything. This absolute notion of emptiness is seen as existent in potentiality but not directly apprehensible phenomenon which could be grasped either by mystical experiences, as in oriental culture, or intellectual conceptualisations in western thought. It is an undefined nevertheless fertile notion, which has a capacity to become and receive everything. It is an ultimate source and finish line of everything that come into being (section 2.4).

---

**Absolute Space**

When the Absolute Emptiness, which is understood as emptied from even its conceptual limits, starts being defined, localised, filled or somehow limited, we start talking about Absolute Space. From the Absolute notion of emptiness, we come to absolute space as its specified snapshot which by mirroring observer's way of looking incorporates human into reality (see section 2.4). "The form in which space is presumed to exist is the framework of our perception of the world" (Peterson, 1980).

When we introduce the observational framework into apprehension of absolute emptiness what we approach is not empty any longer.

As we conceptualised it, the absolute emptiness is the unreachable source of the nature while absolute space is the place where the nature becomes apprehensible to us. This process of absolute-to-specific definition or specific-to-absolute undefining is what links emptiness and space into ontological continuity separated by human capacity to cognize.

---

---

Absolute space is the home of our consciousness, absolute emptiness is what is beyond its limits. Seen from the opposite direction, when emptied from each and every realms, the space tends to be undefined leading ultimately towards complete emptiness (section 2.4).

---

**Specific Space**

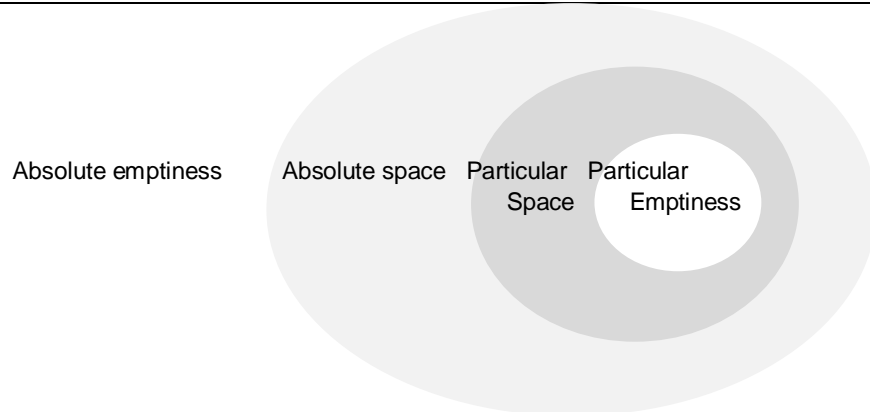
When specified, the space is not any longer seen as a vessel for occurrences of consciousness or emergences of entities, but as observational framework, which filters the complexity of specific realm to enable its comprehension as analogue wholeness. The reality as continuum, needs particular observational frameworks to be grasped and apprehended.

Seen through framework of **specific space**, complementary oppositions coexist in inseparable unity. For example, a particular urban-architectural space includes fullness and emptiness, thus while describing it one can talk about built space, unbuilt space, open space, enclosed space (section 2.4).

**Specific  
Emptiness**

When a specific space, as a particular realm of apprehensible reality, exhibits lack of something, we can talk about **specific or particular emptiness** – emptiness of built structures, emptiness of social activities, emptiness of historical layering, of behavioural cues etc. Since there are as many spaces as there are ways of observing world, there is at least the same number of corresponding specific emptiness.

---



**UrbArch  
Emptiness**

UrbArch Emptiness as a kind of Specific Emptiness diverges from absolute one which can possible be grasped only through abstraction by intellect or imagination. Rather, it is an actual and apprehensible part of built environment which influences its construction, influences its perception and shapes its usage and signification. UrbArch Emptiness as an unbuilt part of Open Public Spaces, coexists with form and it is announced through lack of it.

---

|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Open Public Space</b>                     | Open Public Space is a particular observational framework which is in the centre of our research and focuses on publicly used formally unoccupied urban and architectural spaces. It belongs to certain <b>place and landscape</b> within a wider contextual network inserted in specific built environment that is made through human interaction with its natural environment.                                                                                        |
| <b>Natural vs Mechanized Environment</b>     | Natural environment is a conceptual extreme which is not any longer present in our surroundings. Together with its conceptual opposition – fully mechanized environment it allows for what we call built environment, either urban and rural. Built environment is thus positioned in between nature and manmade setting as gradual transition from one to the other.                                                                                                   |
| <b>Built environment</b>                     | Built environment, as we use it, includes all kinds of realised human actions made to allow inhabiting and usage of natural environment. Built environment, as contextual framework of the work, is seen as dynamic interplay between empty-full, built-unbuilt, which define its position on the scale between abstract extremes of untouched natural environment and one which is fully occupied by objectivized human action, such as cities, manmade settings, art. |
| <b>Place</b>                                 | The notion of place, as we use it, is based on Aristotelian tradition as something that originates in direct <b>dependence between body and space</b> . A notion of <b>place</b> is defined as something that presupposes in-situ interaction, apprehension and appropriation thus carries 'sense of place' (Relph 2008) it is a 'meaningful location' (Cresswell 2015), a 'secure' one (Tuan 1979) 'relatively fixed and bounded' (Cresswell 2004).                    |
| <b>Landscape</b>                             | Landscape refers to the shape of material topography as a part of the Earth that can be seen from a place. "Landscape is an intensely visual idea. In most definitions of landscape the viewer is outside of it" (Cresswell 2015, p.17). Landscape is an <b>out-there</b> world.                                                                                                                                                                                        |
| <b>Natural advantages</b>                    | Natural advantages are conceptualised as outputs of specific relation between built and natural environment wherefrom their specificities and mode of contextualisation arise.                                                                                                                                                                                                                                                                                          |
| <b>Characterisation of Open Public Space</b> | Characterisation of Open Public Space is a quality manifested as relationship between built and natural environment established through specific topography and the way place is situated over it.                                                                                                                                                                                                                                                                      |

|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Contextualisation of Open Public Space</b> | Contextualisation of Open Public Space is a quality manifested as intertwining relationship between built and natural environment established through place-landscape-space permeation. Quality of Open Public Space to make use of potentiality of place's natural advantages.                                                                                                                                           |
| <b>Object-Like Open Public Space</b>          | Object-Like Open Public Spaces are spatial units whose UrbArch Emptiness is due to low spaciousness and low openness solidified into 'open room'.                                                                                                                                                                                                                                                                         |
| <b>Field-Like Open Public Space</b>           | Field-Like Open Public Spaces are spatial units whose UrbArch Emptiness is due to high spaciousness and high openness perceived as field and channel which through visual continuity allows for place-landscape-space unification.                                                                                                                                                                                        |
| <b>Open Public Space Attributes</b>           | Open Public Space Attributes are characteristics of Open Public Spaces without attributed qualitative weight. They become expression of qualities when their specific value is linked to a certain positive spatial occurrence. Ex. Spaciousness is an Open Public Space attribute which might be deemed as either positive or negative spatial occurrences depending on its signification and contextual purposefulness. |
| <b>Open Public Space Properties</b>           | Open Public Space Properties are measurable features of Open Public Spaces which give an insight into specific value of Open Public Space attribute. Ex. Attribute of spaciousness is found correlated to measurable properties of Open Public Spaces such as Area and surrounding building Height. Spaces with big area and low surrounding building have higher value of Spaciousness Attribute and vice versa.         |
| <b>Open Public Space Qualities</b>            | Open Public Space Qualities are attributes with specific values inferred from properties' measurements which can be tied to a certain spatial occurrence. Ex. High value of spaciousness attribute is deemed linked to good recreational usages.                                                                                                                                                                          |
| <b>3D Solid Representations</b>               | 3D Solid Representations are 3D spatial representations of unbuilt part of urban and architectural space that encode information of built environment associating it to unbuilt space to which they belong. Based on inseparability between built environment and the in-between urban void they solidify the unbuilt part of environment by taking into consideration diverse attributes of urban limits.                |
| <b>3D Informed Convex Spaces</b>              | 3D Informed Convex Spaces are convex space representation which preserves data about belonging facades, flows, topography thus facilitate their comparison and information overlaying allowing for multidimensional analyses of open public spaces.                                                                                                                                                                       |

---

**Convex Voids**

Convex Voids are basic units of 3D solid representation made as extrusion of 3D-informed convex spaces, which encode characteristics of urban and architectural limits. They solidify small spatial episodes and as such permit different types of further spatial agglomerations.

---

**Solid Voids**

Solid Voids are aggregations of Convex Voids based on their vicinity properties - small difference (in length) between the connecting edges and angular deviation of the connection graph below a specified value. Solid Voids, account for human tendency to join similar or visually continuous particles into larger agglomerations due to their affinities: either visual continuity, belonging to the place unity, constancy in qualities of surrounding built environment.

---

**Fragmented Voids**

Fragmented Voids consider the fragmentation of a Solid Void by taking into account the model details of the public space that change their perceived chunks of space like trees, areas with different pavements, small barriers like flower beds, benches, sculptures, etc. They are more detailed spatial representations made by partitioning Solid Voids, which capture in depth spatial characteristics accounting for secondary structural properties of built environment. Depending on objectives of analysis Fragmented Voids might take into consideration elements invisible on larger urban space such as urban furniture, elements of inclusiveness, temporary services, advertising elements, artistry etc

---

## 9. Bibliography

- Alba, A.F., 1990. Material culture and quality of urban life. *Temas de disseny* 193–194.
- Antunes, A.C., Coroado, J., Silva, A.S., Veiga, M.R., n.d. *Estudo das argamassas do Cais das Colunas (Séc. XVIII)*, Lisboa, Portugal.
- Applebaum, W., 2000. *Encyclopedia of the scientific revolution: from Copernicus to Newton*. Garland Pub., New York.
- Arnheim, R., 1977. *The Dynamics of Architectural Form: Based on the 1975 Mary Duke Biddle Lectures at The Cooper Union*. University of California Press.
- Attlee, J., 2007. *Towards Anarchitecture: Gordon Matta-Clark and Le Corbusier*. *Tate Papers* 7.
- Aylesworth, G., 2012. Postmodernism [WWW Document]. *Stanford Encyclopedia of Philosophy*. URL <http://plato.stanford.edu/entries/postmodernism/> (accessed 6.5.13).
- Baek, J., 2007. Between material sensuousness and thingness: the significance of the structural glass in Kengo Kuma's Water/ Glass Residence from the perspective of phenomenology. Presented at the *Tectonics: Making Meaning*, Eindhoven University of Technology, Eindhoven, Netherlands.
- Baines, C., 2012. *Forward - The wild side of town*, in: *Urban Wildscapes*.
- Baines, C., 1986. *The wild side of town*. BBC.
- Banich, M.T., Compton, R.J., 2011. *Cognitive neuroscience*, 3rd ed. ed. Wadsworth, Cengage Learning, Belmont, CA.
- Barata, A.M., 2011. A ordenação do espaço litoral de Lisboa, 1860-1940. *Scripta Nova. Revista Electrónica de Geografía y Ciencias Sociales* 13.
- Batty, M., 2001. Exploring isovist fields: space and shape in architectural and urban morphology. *Environment and Planning B* 28, 123–150.
- Beirão, J., Chaszar, A., Cavic, L., 2014. Convex - and Solid-Void Models for Analysis and Classification of Public Spaces, in: Gu, N., Watanabe, S., Erhan, H., Hank Haeusler, M. (Eds.), . Presented at the *CAADRIA 2014, 19th International Conference on Computer-Aided Architectural Design Research in Asia*, Kyoto institute of technology, Kyoto, Japan.
- Beirão, J.N., Chaszar, A., Čavić, L., 2015. Analysis and Classification of Public Spaces Using Convex and Solid-Void Models, in: *Rassia, S.T., Pardalos, P.M. (Eds.), Future City Architecture for Optimal Living*. Springer International Publishing, pp. 241–270.
- Belém - Torre de Belém [WWW Document], 2013. URL <http://www.torrebelem.pt/pt/index.php?s=white&pid=207> (accessed 1.21.13).
- Benedikt, M.L., 2008. Cityspace, cyberspace, and the spatiology of information. *Journal For Virtual Worlds Research* 1.
- Benedikt, M.L., 1979. To take hold of space: isovists and isovist fields. *Environment and planning B* 6, 47–65.
- Blau, E., 2011. *Inventing New Hierarchies*, Pritzker Architecture Prize Essay on Kasuyo Sejima and Ryue Nishizawa, 2010 Laureates.
- Blue, V.J., Embrechts, M.J., Adler, J.L., 1997. Cellular automata modeling of pedestrian movements, in: , 1997 IEEE International Conference on Systems, Man, and Cybernetics, 1997. *Computational Cybernetics and Simulation*. Presented at the , 1997 IEEE International Conference on Systems, Man, and Cybernetics, 1997. *Computational Cybernetics and Simulation*, pp. 2320–2323 vol.3. <https://doi.org/10.1109/ICSMC.1997.635272>
- Bognar, B., 2005. *Kengo Kuma: selected works*. Princeton Architectural Press.
- Bouman, O., Van Toorn, R., 1994. *The invisible in architecture*. Academy Editions.
- Bowman, A.O., Pagano, M.A., 2004. *Terra incognita: Vacant land and urban strategies*. Georgetown University Press.

- Brown, M.J., Grimmond, S., Ratti, C., 2001. Comparison of methodologies for computing sky view factor in urban environments, in: International Society of Environmental Hydraulics Conference, Tempe, AZ.
- Capra, F., 1975. *The Tao of physics: an exploration of the parallels between modern physics and eastern mysticism*. Shambhala; distributed in the U.S. by Random House, Berkeley : [New York].
- Carita, H., 1999. *Lisboa manuelina e a formação de modelos urbanísticos da época moderna (1495 1521)*. Livros Horizonte, Lisboa.
- Castelo-Branco, F., 1969. *Lisboa seiscentista*. Camera Municipal.
- Cavic, L., Beirão, J., 2014. Open Public Space Attributes and Categories - Complexity and Measurability. *Magazine AR Architecture*, Research 2014/2 Volume XV, 15–24.
- Cavic, L., Sileryte, R., Beirão, J.N., forthcoming. 3D-INFORMED CONVEX SPACES The Automated Generation of Convex Representation for Open Public Space Analysis. Presented at the 11th International Space Syntax Symposium, Lisbon, Portugal.
- Christie, J.J., Bogdanovic, J., Guzmán, E., 2016. *Political Landscapes of Capital Cities*. University Press of Colorado.
- Conroy Dalton, R., Dalton, N., 2001a. Omnivista: An application for isovist field and path analysis.
- Conroy Dalton, R., Dalton, N., 2001b. Omnivista: An application for isovist field and path analysis.
- Costa, J.P., 2008. *Cinco Gerações de Renovação Urbana na Ribeira de Lisboa*. ML Estuarium, edição do 1º semestre de 2008.
- Costa, J.P.T. de A., 2007. *La ribera entre proyectos. Formación y Transformación del Territorio Portuario, a Partir Del Caso De Lisboa* [WWW Document]. TDX (Tesis Doctorals en Xarxa). URL <http://www.tesisenred.net/handle/10803/6960> (accessed 5.8.13).
- Cresswell, T., 2015. *Place: an introduction*, Second edition. ed. J. Wiley & Sons, Chichester, West Sussex ; Malden, MA.
- Cresswell, T., 2004. *Place: a short introduction*, Short introductions to geography. Blackwell Pub, Malden, MA.
- Deleuze, G., Guattari, F., 1988. *A thousand plateaus: Capitalism and schizophrenia*. Bloomsbury Publishing.
- Dias Coelho, C., 2002. *A Complexidade dos Traçados*. Faculdade da Arquitectura - Universidade Tecnica de Lisboa, Lisboa.
- Dias, M.T., 1987. *Lisboa desaparecida*. Quimera, Lisboa.
- Durão, V.C.M., 2012a. Análise Urbana de Territórios Construídos Os Aterros na Baixa e na Frente Ribeirinha de Lisboa, Portugal. *Revista da Gestão Costeira Integrada* 12, 17–30. <https://doi.org/10.5894/rgci288>
- Durão, V.C.M., 2012b. Análise Urbana de Territórios Construídos Os Aterros na Baixa e na Frente Ribeirinha de Lisboa, Portugal. *Revista da Gestão Costeira Integrada* 12, 17–30. <https://doi.org/10.5894/rgci288>
- Ferraton, D., Iotzova, M., 2015. Changing our narratives of wild spaces in the city: An interview with Dominique Ferraton and Maia Iotzova.
- Fisher, P.F., 1996. Extending the applicability of viewsheds in landscape planning. *Photogrammetric Engineering and Remote Sensing* 62, 1297–1302.
- Foucault, M., 2004. *Des espaces autres*. *Empan* 12–19.
- Frampton, K., 1993. Toward a Critical Regionalism: Six points for an architecture of resistance, in: Foster, H. (Ed.), *Postmodern Culture*. p. 268.
- Francis, M., 1987. Urban open spaces. *Advances in environment, behavior, and design* 1, 7.
- Franz, G., 2005. *An empirical approach to the experience of architectural space*. Logos-Verlag.
- Fried, M., 1998. *Art and objecthood: essays and reviews*. University of Chicago Press, Chicago.



- Frigg, R., Hartmann, S., 2012. Models in Science, in: Zalta, E.N. (Ed.), *The Stanford Encyclopedia of Philosophy*.
- Garcia, P.R., 2004. Life and death of Lisbon waterfront, in: 11th Conference of the International Planning and History Society—Planning Models and the Culture of Cities, Barcelona, Escola Tècnica Superior d'Arquitectura Del Vallès.
- Gehl, J., 2011. *Life between buildings: using public space*. Island Press.
- Gibson, J.J., 1986. *The Ecological Approach to Visual Perception*. Psychology Press Taylor & Francis Group.
- Giroto, C., 2016. Topology - A new measure of quality in landscape architecture | Chair of landscape architecture | Swiss Federal Institute of Technology Zurich | ETHZ. Christophe Giroto | Chair of landscape architecture | Swiss Federal Institute of Technology Zurich | ETHZ.
- Grant, E., 2008. *Much ado about nothing: theories of space and vacuum from the Middle Ages to the scientific revolution*. Cambridge University Press, Cambridge [England]; New York.
- Groat, L.N., Wang, D., 2013. *Architectural research methods, Second Edition*. ed. Wiley, Hoboken.
- Hall, E.T., 1990. *The silent language*. Anchor Books, New York.
- Hall, P.H., 1991. *Waterfronts: a new urban frontier*. Institute of Urban and Regional Development, University of California, Berkeley.
- Hardie, Gaye (Trans.), 2015. *Aristotle Physics* [WWW Document]. URL <http://ebooks.adelaide.edu.au/a/aristotle/physics/> (accessed 6.8.15).
- Harvey, D., 2006. Space as a Keyword. *David Harvey: A Critical Reader*, Oxford: Blackwell 270–294.
- Heidegger, M., 1971a. *Poetry, language, thought*, 20. print. ed. Perennial Classics, New York.
- Heidegger, M., 1971b. *Building, Dwelling, Thinking*, in: Hofstadter, A. (Tran.), *Poetry, Language, Thought*. Harper and Row, London, p. In: “Rethinking architecture a reader in cultural theory,” Leach, Neil, London; New York, Routledge, 1997.
- Hill, J., 2006. *Immaterial architecture*. Routledge.
- Hillier, B., Hanson, J., 1984. *The social logic of space*. Cambridge University Press Cambridge.
- Hillier, B., Penn, A., Hanson, J., Grajewski, T., Xu, J., 1993. Natural Movement-or, configuration and attraction in urban pedestrian movement. *Environ Plann B* 20, 29–66.
- Hunziker, M., Buchecker, M., Hartig, T., 2007. Space and place—Two aspects of the human-landscape relationship, in: *A Changing World*. Springer, pp. 47–62.
- Hwang, J.-E., Koile, K., 2005. Heuristic Noll map: a preliminary study in representing the public domain in urban space, in: *Proc. 9th Int. Conf. Computers in Urban Planning and Urban Management*.
- Jameson, F., 1985. Postmodernism and consumer society. *Postmodern culture* 111–125.
- Joedicke, J., 1985. *Space and Form in Architecture: A Circumspect Approach to the Past*. Kraemer.
- Kamvasinou, K., 2006. Vague parks: the politics of late twentieth-century urban landscapes. *Architectural Research Quarterly* 10, 255–262.
- Karandinou, A., 2007. *Invisible tectonics*. Presented at the Proceedings of the Tectonics Making Meaning, Eindhoven: University of Technology.
- Koffka, K., 1955. *Principles of Gestalt psychology*, 1999th ed. Routledge, London.
- Kuhn, W., 2012. Core concepts of spatial information for transdisciplinary research. *International Journal of Geographical Information Science* 26, 2267–2276.
- Lamas, J.M., 1992. *Ressano Garcia. Morfologia urbana e desenho da cidade* 3.
- Langacker, R.W., 2000. *Grammar and conceptualization, Cognitive linguistics research*. Mouton de Gruyter, Berlin/Boston.
- Le Corbusier, 1986. *Towards a new architecture*. Dover Publications, New York.

- Low, S.M., 2003. Embodied space (s) anthropological theories of body, space, and culture. *Space and Culture* 6, 9–18.
- Lukermann, F., 1961. The concept of location in classical geography. *Annals of the Association of American Geographers* 51, 194–210.
- Lynch, K., 1960. *The image of the city*. MIT Press, Cambridge.
- Malcolm, G.L., Schyns, P.G., 2014. More Than Meets the Eye: The Active Selection of Diagnostic Information across Spatial Locations and Scales during Scene Categorization, in: *Scene Vision: Making Sense of What We See*. p. 27.
- Marchsteiner, U., 2008. The utility of emptiness, in: *The Utility of Emptiness*. Museu de les Arts Decoratives, pp. 12–20.
- Marshall, M.N., 1996. Sampling for qualitative research. *Family Practice* 13, 522–526. <https://doi.org/10.1093/fampra/13.6.522>
- Martins, M.G., 1994. *Lisboa ribeirinha*. Livros Horizonte, Lisbon.
- Meiss, P. von, 1990. *Elements of architecture: from form to place*. Van Nostrand Reinhold, London/New York.
- Mesquita, A., 2006. *Lisboa*. Arquimedes Livros, Lisboa.
- Mitchell, D., 1995. The end of public space? People's Park, definitions of the public, and democracy. *Annals of the association of american geographers* 85, 108–133.
- Morello, E., Ratti, C., 2009. A digital image of the city: 3D isovists in Lynch's urban analysis.
- Morgado, S., 2005. *Protagonismo de la ausencia. Interpretación urbanística de la formación metropolitana de Lisboa desde lo desocupado*, Departament d'Urbanisme i Ordenació del Territori-Universidade Politècnica da Catalunya, Barcelona.
- Moughtin, C., 2003. *Urban design: method and techniques*. Architectural Press, Oxford; Boston.
- Németh, J., Schmidt, S., 2011. The privatization of public space: modeling and measuring publicness. *Environment and Planning B: Planning and Design* 38, 5–23.
- O Mosteiro dos Jerónimos [WWW Document], 2001. URL <http://www.geocities.ws/atoleiros/JeronimosB.htm> (accessed 12.19.12).
- Oliva, A., Park, S., Konkle, T., 2011. Representing, perceiving and remembering the shape of visual space. *Vision in 3D environments*.
- Oliva, A., Torralba, A., 2001. Modeling the shape of the scene: A holistic representation of the spatial envelope. *International journal of computer vision* 42, 145–175.
- Oliveira, V., 2013. *Morpho: a methodology for assessing urban form*. Presented at the International Seminar on Urban Form.
- Oppenheim, A.N., 1992. *Questionnaire design, interviewing, and attitude measurement*. Continuum, London; New York.
- Park, S., Chun, M.M., 2014. The Constructive Nature of Scene Perception, in: *Scene Vision: Making Sense of What We See*. p. 45.
- Peterson, S.K., 1980. Space and anti-space. *The Harvard Architecture Review* 1, 101–102.
- Pinto, J.C., 2010. Praise of Emptiness - Reduction, Production and Reception in Architecture. *Le Carré Bleu* 2, 44–63.
- Pinto, J.C., 2007. *O espaço-limite: produção e recepção em arquitectura: volume II, 1a ed. ed*, Coleção Arquitectura e urbanismo. Antonio Coelho Dias, Lisboa.
- Portas, N., 1968. *A cidade como Aquitetura*. Gráfica Santelmo, Ida., Lisboa, Portugal.
- Ramachandran, V.S., Hirstein, W., 1999. The science of art: A neurological theory of aesthetic experience. *Journal of consciousness Studies* 6, 6–7.
- Relph, E., 2008. A pragmatic sense of place. *Making Sense of Place* 311–324.
- Ribas i Massana, A., 2008. *Biografía del vacío su historia filosófica y científica desde la Antigüedad a la Edad Moderna*. Sunya, Barcelona.
- Ricard, R., 1954. *Recherches sur la toponymie urbaine du Portugal et de l'Espagne*. Bulletin Hispanique 56, 133–166.
- Ross, W.D. (Ed.), 2005. *Aristotle Metaphysics*. NuVision Publications, [Sioux Falls, SD].

- Rossa, W., 2008. Lisboa e o Rio, paradigmas de cidades atlânticas, catálogo da exposição.
- Rossa, W., 2001. A imagem ribeirinha de Lisboa. Alegoria de uma estética urbana barroca e instrumento para o Império [WWW Document]. URL <http://www.upo.es/depa/webdhuma/areas/arte/3cb/documentos/104f.pdf> (accessed 12.19.12).
- Rucker, R. v B., 1995. Infinity and the mind: the science and philosophy of the infinite, Princeton science library. Princeton University Press, Princeton, N.J.
- Saussure, F. de, 1959. Course in General Linguistics. Philosophical Library, New York.
- Schulz, C.N., 1979. Genius loci: paesaggio, ambiente, architettura. Electa.
- Seamon, D., 2012. Place, Place Identity, and Phenomenology: A Triadic Interpretation Based on J. G. Bennett's Systematics, in: Hernan, C., Fatima, B. (Eds.), The Role of Place Identity in the Perception, Understanding, and Design of Built Environments. Bentham Science Publishers, Sharjah.
- Seddon, G., 1998. Landprints: reflections on place and landscape, 1. paperback ed. ed. Cambridge Univ. Press, New York, NY.
- Setti, G., 2013. Beyond Public Spaces: Shared Spaces in the Contemporary City. Journal of Civil Engineering and Architecture 7, 833–840.
- Sheng, T.C., 1990. Watershed management field manual. FAO conservation guide 13.
- Sileryte, R., Cavic, L., Beirão, J.N., forthcoming. Automated Generation of Versatile Data Model for Analysing Urban Architectural Void (Manuscript in preparation).
- Solà-Morales, I. de, 2002. Territorios. Gustavo Gili, Barcelona.
- Sousa, J.F. de, Fernandes, A., 2012. Metamorfoses da cidade portuária: transformações da relação entre o porto e a cidade de Lisboa. Confins. Revue franco-brésilienne de géographie/Revista franco-brasileira de geografia.
- Stamps, A.E., 2010. Effects of area, height, elongation, and color on perceived spaciousness. Environment and Behavior 252–273.
- Stamps, A.E., 2009. Effects of permeability on perceived enclosure and spaciousness. Environment and Behavior 864–886.
- Stamps, A.E., 2008. On shape and spaciousness. Environment and Behavior.
- Stamps, A.E., 2007. Evaluating spaciousness in static and dynamic media. Design Studies 28, 535–557.
- Stamps, A.E., 2005a. Isovists, enclosure, and permeability theory. Environment and planning B 32, 735.
- Stamps, A.E., 2005b. Enclosure and safety in urbanscapes. Environment and Behavior 37, 102–133.
- Stephenson, D., 2005. Visions of heaven: the dome in European architecture. Princeton Architectural Press, New York.
- Teixeira, M.C., 2009. O Património Urbano dos Países de Língua Portuguesa. Raízes e Manifestações de um Património Comum. Presented at the Passado e presente para o futuro - III Simpósio Luso-Brasileiro de Cartografia Histórica, Ouro Preto, Brazil.
- Thomas, K.L., 2006. Material matters: Architecture and material practice. Routledge.
- Thompson, C.W., 2002. Urban open space in the 21st century. Landscape and Urban Planning 60, 59–72. [https://doi.org/10.1016/S0169-2046\(02\)00059-2](https://doi.org/10.1016/S0169-2046(02)00059-2)
- Toyota, J., Hallonsten, P., Shchepetunina, M. (Eds.), 2012. Sense of emptiness: an interdisciplinary approach. Cambridge Scholars, Newcastle upon Tyne.
- Trienal de Arquitectura, D.L., 2007. Vazios Urbanos / Urban Voids. Caleidoscópico, Lisboa.
- Tuan, Y., 1977. Space and place: the perspective of experience. University of Minnesota Press, Minneapolis.
- Tuan, Y.-F., 1979. Space and Place: Humanistic Perspective, in: Gale, S., Olsson, G. (Eds.), Philosophy in Geography. Springer Netherlands, pp. 387–427.

- UNESCO World Heritage Centre - Series no.26 [WWW Document], 2012. URL <http://whc.unesco.org/en/series/26/> (accessed 12.12.12).
- Untaru, S., 2002. Regulatory Frameworks for Place-based Planning. *Urban Policy and Research* 20, 169–186. <https://doi.org/10.1080/08111140220144470>
- Utaiwatananont, A., Aruni, N., 2009. Suan Mokkh: The Architecture of Emptiness. *Design Principles and Practices: An International Journal—Annual Review* 3.
- Vanegas, C.A., Aliaga, D.G., Wonka, P., Müller, P., Waddell, P., Watson, B., 2010. Modelling the appearance and behaviour of urban spaces, in: *Computer Graphics Forum*. Wiley Online Library, pp. 25–42.
- Varna, G., 2014. *Measuring public space: the star model*. Ashgate Publishing, Ltd.
- Viljoen, A., Howe, J., 2012. *Continuous productive urban landscapes*. Routledge.
- Von Meiss, P., 1990. *Elements of Architecture*. Spon Press.
- Walker, S., 2009. *Gordon Matta-Clark: art, architecture and the attack on modernism*. Tauris, London.
- Watson, G., 2014. *A philosophy of emptiness*.
- Weitkamp, G., 2011a. Mapping landscape openness with isovists. *Research in Urbanism Series* 2, 205–223.
- Weitkamp, G., 2011b. Mapping landscape openness with isovists. *Research in Urbanism Series* 2, 205–223.
- Wölfflin, H., 1964. *Renaissance and Baroque*. Kathrin Simon. London: Collins.
- Zevi, B., 1974. *Architecture as space: how to look at architecture*, Rev. ed. ed. Horizon Press, New York.