

The public space between land and sea. Quarteira's case

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Abstract

In the Portuguese coastal city of Quarteira, a case study of the research, the seafront is composed by two fixed linear infrastructure systems - the seashore streets and a dune park, *Passeio das Dunas* - succeed each other, separated by the port area.

Methodologically, drawing as a qualitative tool allowed us to decompose the layers that compose the public space, thereby enabling us to represent the formal characteristics and thus highlight the material and immaterial characteristics of the place.

Aim of the research is to describe the compositional grid of Quarteira urban public space, its formation and transformation process over time, as well as to debate the recent missed opportunities for effective adaptation to the effects of extreme weather events.

In conclusion, we consider that a critical theoretical reflection on the spatial planning and design of public space in coastal cities permits the definition of operative compositional parameters - which make it possible to overcome project theories that, in the face of the effects of climate change, have become obsolete.

Keywords

Public Space; Seashore Street; Passeio das Dunas; Quarteira; Portugal.

Introduction

Since the modern era, one of the major urban transformations that affected cities was the delimitation and channelling - in pipes, embankments and conduits - of water bodies (Marsalek et al, 2008). Water bodies were progressively demarcated by rigid infrastructures that delimited their limits and distanced them - physically and/or visually - from the city.

Nowadays, because of the necessity to cope with the effects of climate change on the urban environment, a conceptual paradigm shift is taking place, choosing to “make room for water” as opposed to the idea of delimiting it (Sijmons et al, 2017). Although water has always been a shaping and structuring element of the landscape, the contemporary necessities that have arisen with the climate crisis require a more conscious management of the element, and it is in this sense that the role of public space design in the face of extreme events is strengthened (Matos Silva in Brandão, 2019). Therefore, by integrating local wisdom with scientific and technological knowledge in a design adapted to uncertainty, public spaces can improve climate change awareness and promote vulnerability reduction (Matos Silva in Brandão, 2019).

The case study, discussed in the article, is Quarteira, a coastal city located in the Algarve region of southern Portugal. Until before the 1950s, the coastal area in front of the historic core of the fishing agglomeration of Quarteira consisted merely of a long, low, sandy seashore with dunes. From the second half of the twentieth century, due to the new socio-cultural needs related to tourism, and the economic boom, the urban limit - the seashore street - was built. Moreover, the most significant urban transformation took place in the threshold space between the city and the beach. The seashore street is a linear urban public space bounded on one side by the facade of buildings and on the other by the beach and the sea. This channel space articulates the relationships between the city and the beach, and is where the main socio-cultural activities of the city take place.



Fig. 1: Quarteira. Author's editions, 2022

Nowadays, the seashore street as an infrastructural system is the first line of defence of the urban agglomeration against erosive and flooding phenomena caused by extreme climatic events. Indeed, it is estimated that, along the 943 km of Portuguese coastline where around 70 per cent of the population lives (Bigotte et al, 2014), a percentage that rises to around 80 percent in the summer months, thanks to the phenomenon of tourism (Andrade et al, 2002), urban areas are the most vulnerable in Europe to the effects of rising mean sea level.

To cope with the effects of the rise in the average sea level, in 2019, with the aim of supporting the protection, redevelopment and valorisation of the coastal strip, the Algarve's Intermunicipal Climate Change Adaptation Plan, PIAAC-AMAL (*Plano Intermunicipal de Adaptação às Alterações Climáticas do Algarve*) was approved. The plan has as its objective the adaptation of coastal cities, and in the case of Quarteira it describes scenarios of shoreline retreat, for which it suggests the continuation of artificial beach nourishment, as well as stating the need to relocate the first line of buildings after 2040. However, the continuous urban expansion of coastal areas, to meet the needs of tourism, requires the implementation of adaptation projects that do not consider the urban relocation and thus the distancing of the city from the coastline.

Among the projects reconfiguring the space next to the sea is the *Passeio das Dunas* (sea promenade), designed by João Nunes, *PROAP: Landscape Architecture and Design Studio*, inaugurated in 2016, which connects the city of Quarteira with Vilamoura, to the west along the seashore. João Nunes' project involved the creation of conditions for the dune system to settle and develop as a natural process supported by the anthropic elements created. Aim of the project was building with nature, creating and recovering the existing dunes and vegetation in the adjacent natural area. However, during implementation it was decided, by the project's controlling entities, that the dune system would be fixed, preventing its natural movement; thus, the construction of the project was conditioned regarding its initial design assumptions.

Quarteira therefore becomes a case study in which it is possible to decode the embryonic paradigm shift underway, albeit with its weaknesses and paradoxes. Indeed, along the same coastline coexist both the conventional idea of a limit defined by a fixed layout, the seashore street, and an initial attempt to create a space composed of non-linear forms/layouts related to living and evolving ecological systems such as green and blue infrastructure. Although the *Passeio das Dunas* (seafront promenade) was not constructed as designed, we consider that it remains an initial starting point for a long theoretical discussion and one of the possible paths on the future formal definition of the space between the city and the sea.

If the urban public space adjacent to the sea is the area most vulnerable to climate risks, it is simultaneously the most favourable urban space for transformation and adaptation to cope with erosion and flooding phenomena due to the effects of extreme events associated with the rise in mean sea level. A threshold space that can accommodate externalities from the effects of mean sea level rise; and thus protect the coastal agglomeration. Purpose of the article is to describe, by comparing, two possible design approaches, constituted through rigid limits or through the implementation of green and blue systems, articulating dual theories in the landscape design debate. In conclusion, we consider that the reading of the formal characteristics of the space between the city and the sea provides an opportunity to rethink the design processes of urban adaptation.

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The Time of water in the city

The duality between the desire to dwell near the water body - the riverbanks and coastal locations - has become more ambiguous and paradoxical nowadays caused by the high exposure to climate hazards (Hunt et al, 2011).

Nowadays, World Cities Report 2020 by United Nations Human Settlements Programme (UN-Habitat) estimates that by 2050, approximately 6.4 billion people will live in cities and that demand for water will increase by 55% compared to current estimates. Moreover, given that half of the world's population lives within three kilometres of a surface freshwater body, and over 40 per cent reside in coastal areas, these populations would be at risk from sea level rise and extreme weather events associated with climate change (Barragan and De Andrés, 2015; Voskamp et al. 2021). It is estimated that the combined threat of rising sea levels and storm surge in coastal cities could result in the loss of more than one trillion dollars each year by 2050 (Hallegatte, et al, 2013).

Over time, water in the territory has shaped the landscape, directing the choice of a city's foundation site and the development processes that followed. Indeed, throughout the city's history, different evolutionary phases have followed, characterised by different relationships between the urban system and the water body. Matos Silva in 2016 mentioned both Saraiva's text (*O rio como paisagem: gestão de corredores fluviais no quadro do ordenamento do território*) from 1999, in which the author identifies four main evolutionary phases; and Brown et al.'s text (*Transitioning to Water Sensitive Cities: Historical, Current and Future Transition States*) from 2008 in which the author, similarly, identifies six different phases of water management over time. The first phase, coinciding for both authors, defined by Saraiva as 'harmony' and by Brown as 'water supply city,' corresponds to pre-industrialisation in which human activities were adapted to the natural water cycle. From 1800, with the beginning of the modern age, until the second half of the 1900s, Saraiva (1999) identifies the beginning of a period defined as 'domination' in which the water body was transformed and adapted to human needs. Brown et al (2008), more precisely, identify within the same period two phases, the 'sewer city' and the 'drained city.' A period in which urban transformations were guided by theories that favoured a strict separation between the city and water, whereby the first large water containment and channelling infrastructures were built: dirty water was channelled outside the city limits, large areas were reclaimed, canals, pipelines and river and sea embankments were built (Matos Silva, 2016). The third period, defined by Saraiva as a phase of 'degradation', coincides with the economic boom after the end of the Second World War and was characterised by massive exploitation of the water resource, in which the ecological damage caused in favour of economic progress became evident. The fourth period beginning in the 1980s is defined by the increased awareness of the environmental, ecological, cultural, social, economic and symbolic value of water. Brown et al (2008) identify the 'waterways city' phase from the late 1960s, with the beginning of heightened environmental awareness. During this period, legislative plans and programmes for the regulation of water as a resource and for its protection began to be drawn up. The last period theorised by Brown et al (2008) coinciding with the beginning of the 21st century is defined as 'water cycle city' and by Saraiva in 1999, as 'sustainability.' For the authors, the concept of 'water cycle city' encompasses a multifunctional, integrated and adaptive management of the entire water cycle, taking into account the precautionary principle instigated by the ongoing climate change projections (Matos Silva, 2016).

While the two authors mentioned above dealt in their study with the paradigm shift, which occurred over time, in the relationship between the urban system and the water body from a river perspective, Miriam García García (2019) outlines similar, and temporally coinciding,

processes in the approach to the marine limit. As the author highlights the progressive increase in population, and consequently economic development, along the coastline has over time brought the construction of massive defence infrastructures and the artificiality of the margins (García García, 2019).

Since the late 1990s, with the first report of the International Panel Climate Change (IPCC), the concept of adaptation to climate change has been introduced into the scientific debate (Matos Silva, 2016). Therefore, the political and social models and techniques we have been working with need to be reformulated, for as García García (2019) states, the reinvention of the coast requires a dynamic vision based on detailed observation of the natural phenomena occurring on it. Therefore, nowadays aware that disturbances of the natural water cycle within the urban environment (such as soil sealing, channelling of watercourses, delimitation of sea banks, among others) significantly increase the negative externalities of extreme events (Ciupa et al, 2020) nature-based projects are beginning to be considered alongside hard infrastructure.

The form of the Portuguese coastline

The form of water in the city is particularly evident in the multiple relationships, spatial and temporal, that occur in the shore space, a zone of transition and tension between the anthropic system, the city, and the natural system, the sea. The reconfiguration of the interface, of the space between land and sea, through the introduction of the rigid infrastructure, the seashore street, throughout the 20th century in the Portuguese coastal landscape, changed the relationship between the city and the water (fig. 2).



Fig. 2: Portugal Coastline. Author's editions, 2022

Along the Portuguese coastline, urban settlements, located near the water line, are characterised by the presence of a linear public urban space in which the city's social and economic activities take place. Urban space that is defined on one side by the buildings' façade, mainly designated for tourist use, and on the other by the natural element, the beach. Indeed, the rise of the tourism sector and the demand for seasonal tourism, which arose after the end of World War II, and the development of the automobile as a mass commodity in the 1960-70s, induced major transformations in the urban development of coastal cities. In cases where the construction of the seashore street is older, the old fishing buildings, built adjacent to the seashore street, were demolished and replaced by tourist structures, positioned parallel to the water line to obtain a

larger built-up area facing the seascape. In more recent cases, the seashore street has served as a driver of the urban agglomeration development, to which tourist-oriented buildings have been built alongside the urban layout (fig. 3).

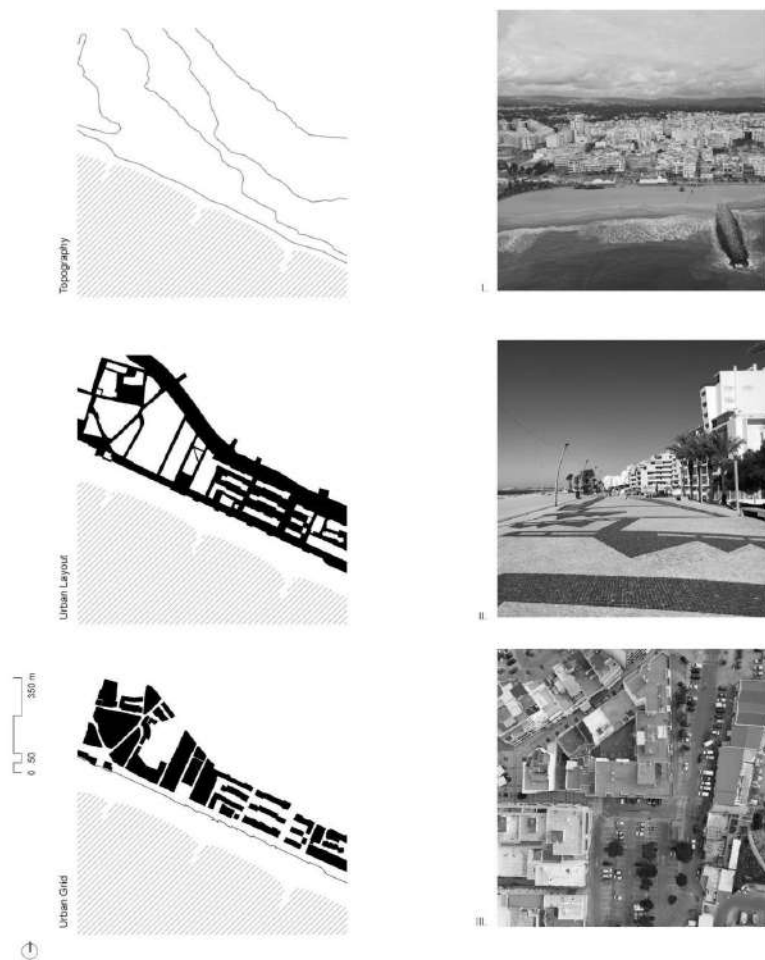


Fig. 3: Quarteira: Topography, Urban Layout, Built-up area. Author's editions, 2022.

Quarteira's seashore street case

On the 943 km of coastline, it is estimated that the areas affected by extreme tidal flooding and SLR will be 903.1 km² in 2050, impacting 59.530 buildings and 145.550 residents; this value will increase to 1146 km² (river delta areas are included in the estimate), with 82.000 buildings and 224.830 residents in 2100 (regarding the relative contemporary mean sea level on the Portuguese coast, reference is made to Cascais tide gauge data) (Antunes et al, 2019) (fig. 4).

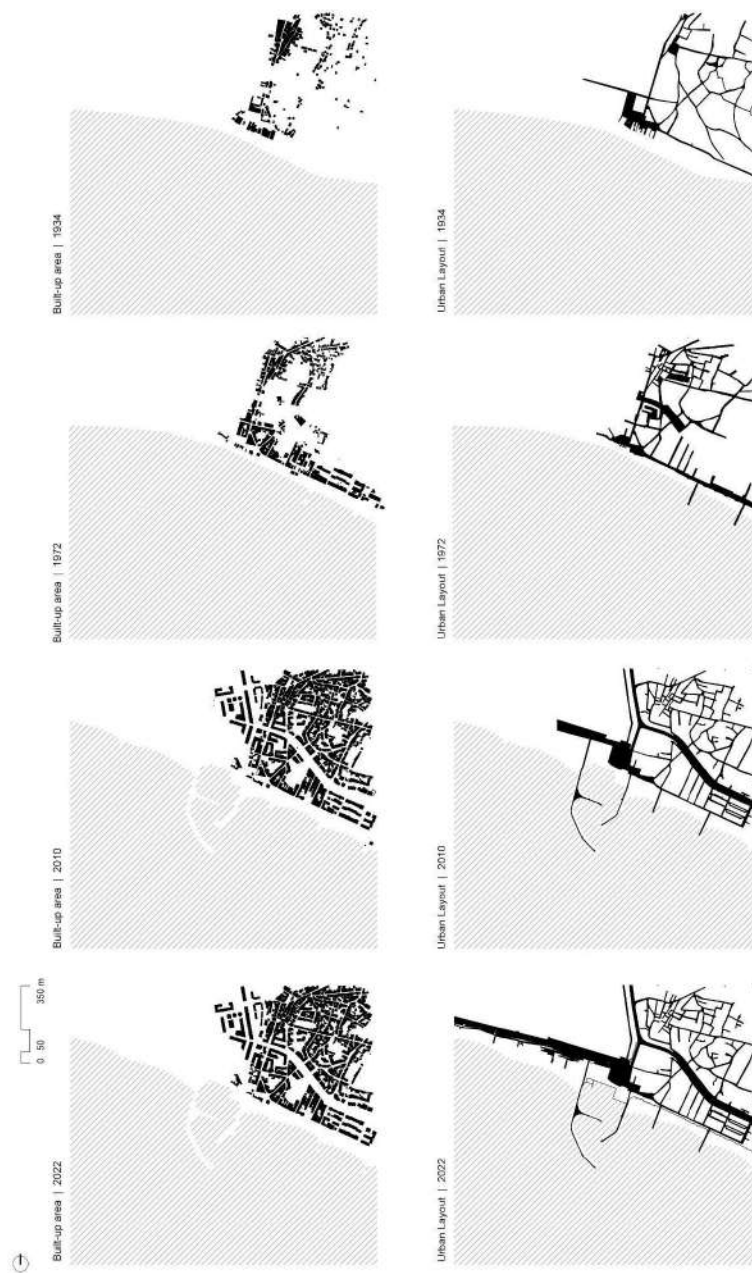


Fig. 4: Quarteira: Urban Evolution. Author's editions, 2022.

Research case study is the coastal city of Quarteira, situated in the Algarve region of southern Portugal, where approximately 24.421 people live during the year, a number that triples during

the summer period (INE, Instituto Nacional de Estatística) due to the tourism. Until before the emergence of mass tourism, Quarteira was a fishing town built far from the shoreline. The urban transformation of the coastal town of Quarteira began in the early 1950s, the construction of the street parallel to the sea, on the edge of the sandy beach, and the construction of the marina at the mouth of the Ribeira de Quarteira (Lobo, 2018); introduced a change in the relationship between the urban agglomeration and the sea. The seashore street stretches for about 3 kilometres with an average width of about 60 metres, and is situated at a height of between 4 and 5 metres above mean sea level, and is today, due to the effects of the rise in mean sea level, vulnerable to flooding and erosion. According to Teixeira, coastal erosion, caused by the prevailing wave motion from west to east, has increased with the construction of the breakwaters of the Vilamoura marina and also with the more recent construction of the defence infrastructure of the fishing harbour in 1999. Indeed, over the past three decades, several coastal protection structures have been built along the Quarteira coastline (Braz Teixeira, 2004) (fig. 5).

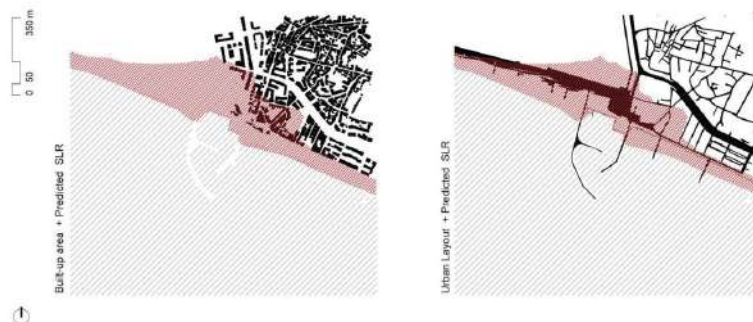


Fig. 5: Quarteira: Built-up area and Urban Layout + SLR. Author's editions, 2022.

Portugal's coastal protection policy, as of 2013, is no longer based on the construction of rigid protection structures. Indeed, since 2013, the majority of interventions are allocated to the maintenance of existing hard structures (Pranzini et al, 2013). In 2019, the Algarve Intermunicipal Climate Change Adaptation Plan, PIAAC-AMAL (*Plano Intermunicipal de Adaptação às Alterações Climáticas do Algarve*), was drafted, framed within the main objectives of the European Climate Change Adaptation Strategy (EEA) and the National Climate Change Adaptation Strategy (*Estratégia Nacional de Adaptação às Alterações Climáticas 2020*) (ENAAAC 2020; PIAAC-AMAL, 2019), with the aim of supporting the protection, redevelopment and enhancement of the coastal strip. For Quarteira's urban waterfront, the PIAAC-AMAL, provides scenarios of shoreline retreat in the urban coastal front and suggests continuing to artificially feed the beach over the next decade, and subsequently proposes the construction of a dike-in-dune, while addressing the need to remove and relocate the first built line of the waterfront from 2040 (Dias and Santos, 2019). Moreover, the Algarve PROT (*Plano Regional de Ordenamento do Território*) territorial management regional plan establishes a ban on urban occupation in protected areas to ensure the continuity of ecological corridors connecting the coast and the interior (fig. 6).

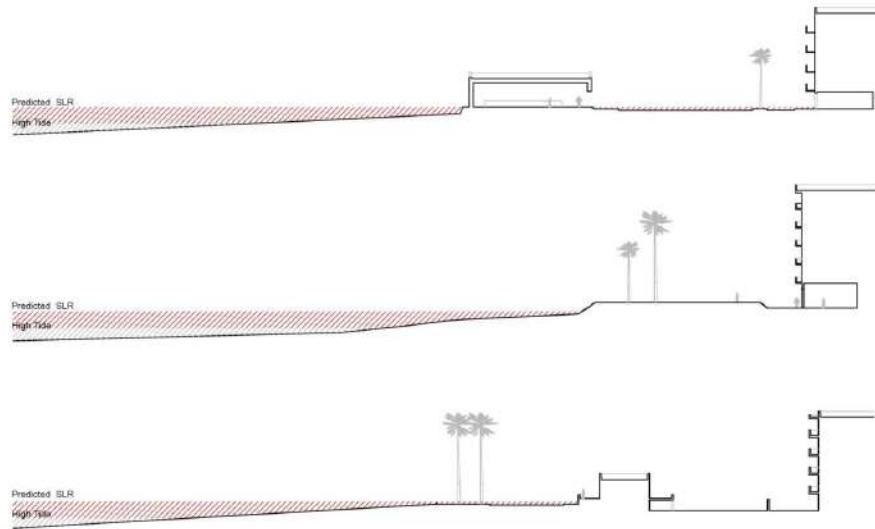


Fig. 6: Quarteira: Urban Sections + Sea Level Rise Scenario. Data estimated by IDL.Instituto Dom Luiz, Faculdade de Ciências da Universidade de Lisboa. Sea level rise scenarios available at: <https://smart.campus.ciencias.ulisboa.pt/portal/apps/MapSeries/index.html?appid=ebee609293804c49abd52ccfb07f4762>. Author's editions, 2022.

In 2016, the *Passeio das Dunas*, designed by João Nunes, *PROAP: Landscape Architecture and Design Studio*, was inaugurated, an urban public space designed with the intention of connecting Quarteira with Vilamoura and with the objective of protecting the urban agglomeration from the effects of the rise in the average sea level.

Passeio das Dunas, (seafront promenade), extends for approximately 675 m occupying an area of 52.329,54 square metres (fig. 7).



Fig. 7: Quarteira: Plan, Section and Image of *Proap: Landscape Architecture and Design Studio Project*. Author's editions, 2022.

João Nunes' project was based on the possibility of artificially creating natural conditions for the dune system to settle and develop, as in the natural process, recovering the existing dunes and vegetation. The project planned to work with natural dynamics, such as the movement of the dunes, through the creation of a thickness with blurred boundaries, allowing the continuous transformation of the space over time.

If in the competition phase the *Passeio das Dunas* was conceived as non-linear forms and paths related to working with living and evolving ecological systems such as green and blue

infrastructure, in the realisation phase the same forms were realised through rigid systems that delimited the space with rigid elements that prevented its continuous transformation. Results are sand dunes within which there is a rigid structure that holds the vegetation firm, bordered by a concrete walking surface as in the case of the seashore street to the east of the port.

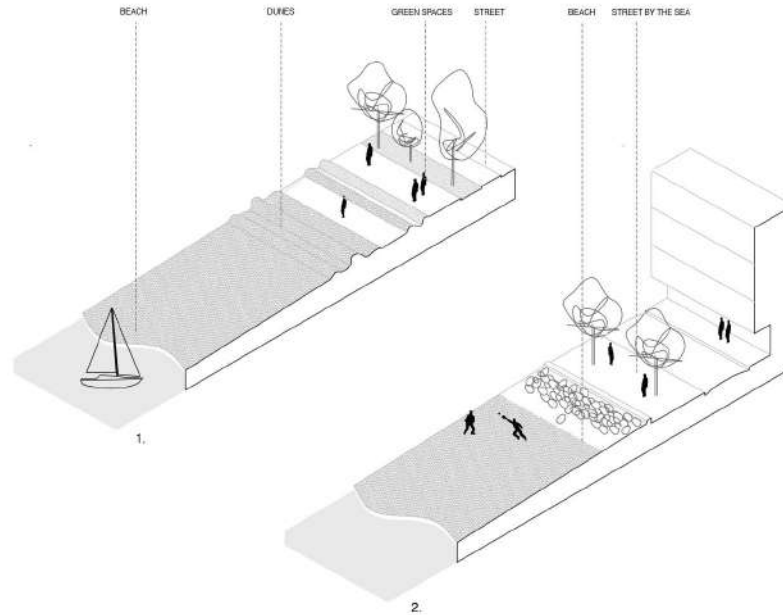


Fig. 8: Quarteira. Author's editions, 2022.

We observe in *Passeio das Dunas* project, João Nunes's design purpose to recognise the transformative process that the marine environment entails and thus propose in the project a dune landscape in continuous transformation.

The alteration of Joao Nunes' project has resulted in the construction of an infrastructure that will have the same problems over time as the fixed infrastructure, indeed, like the seashore streets, it will become a ruin over time due to the effects of extreme weather phenomena: such as erosion and floodings phenomenon.

Water: a territorial project

Water, as a structuring element of places, may guide the design of the form of the city (Proença et al, 2021). As Conceição (1997) affirms, water can structure places through functional, conceptual, symbolic, and geometric relations. Although water is an element with no intrinsic form, it forces us to question and discuss its presence in architectural and urban projects. Examples where the design of public space has taken into account the natural element of water include the Living Breakwaters project, which envisages risk reduction by improving physical resilience along Staten Island's south shore through the use of hard infrastructure, the

breakwaters, and green and blue infrastructure. As is the Climate Ready Boston project, to make the East Boston and Charlestown coastal area resilient through the use of green infrastructure - vegetation - as a protective and adaptive system that accommodates rising mean sea level. As Figueira (2020) argues, the river and the sea are primordial elements in determining urban design, whether during a flood or a high tide, in both cases water is the regulating element (Figueira, 2020, p.33).

Drawing the transformation of the Landscape: a constructed nature

Nowadays, due to the increasing effects of sea level rise, such as erosion and flooding phenomena, there is a political and administrative demand to establish urban adaptation plans and projects for vulnerable areas. As with all environmental frontiers, the shore is an ecosystem with a dynamic and fragile equilibrium, therefore water-related challenges - such as storm surge protection - are often addressed in a separate way through limited procedures and plans. Landscape plans, of European character and national implementation, also identify lines of urban vulnerability, for example, the lack of resilience and doubtful reliability of water defence, collection and transmission systems in the face of extreme climatic events.

To wonder nowadays, to discuss, which is the construction with nature and which is the constructed nature becomes not only an academic exercise but a political act of recognition of the elements that exist in the Landscape and with which to operate compositionally in the architectural and urban process. World Cities Report 2020 by United Nations Human Settlements Programme (UN-Habitat), indeed reports that when nature-based solutions are incorporated into design and management, urban areas can benefit from multiple ecosystem services, including carbon sequestration, local climate regulation, stormwater capture and water and air purification. Landscape architecture, urban design, spatial planning and architecture, must be concerned with consciously shaping the environment (Oudes et al, 2020).

Conclusion

In conclusion, we consider it essential to highlight how the theme of water, in its different conjugations, allows the exercise of recognising the physical characteristics of the territory. Therefore, we can state that climate change, specifically the effects of extreme weather phenomena and rising mean sea level, becomes a pretext, a *conditio sine qua non*, to rethink the elements on the territory, not as belonging to different systems, but as subjects of transformation. We believe that recognising the role of water not only as an integral and constituent part of the landscape, but as a subject enables the drafting of adaptation plans and projects coherent with the the form of the place.

We feel it is important to summarise the main theoretical outcomes derived from the formal comparison of the two projects and the debate on the design choices undertaken, knowing that they are the first step in the development of new research on urban design transformation and adaptation paradigms:

1. Designing under uncertainty, resulting nowadays for the effects of climate change on the urban fabric, to decrease urban vulnerability requires a deep and precise knowledge of the urban landscape, from the macroscale of the territorial planning to the microscale of urban drawing;
2. Comparing different project, design and planning, visions and scales of spatial approach enables the understanding of contemporary criticalities that can be observed in the spaces, object of study, at the margins between the city and the sea;

3. Understanding that in the space between the city and the sea, the implementation of blue-green infrastructural solutions, achieved through working with nature, provides a greater palette of solutions for urban adaptation.

In conclusion, we consider that only by understanding the physical characteristics of two different approaches to public space by the coastline, - one based on the design of rigid layouts with fixed linear infrastructure systems and the other (on non-linear forms and layouts related to the use of living and evolving ecological systems such as green and blue infrastructure - can efficient designs be outlined.

The theoretical reflection carried out so far about the case of Quarteira, composed of two fixed linear infrastructure systems - the seashore streets - and a dune park, the *Passeio das Dunas* (which, as mentioned, was planned to be constituted through ecological system), demonstrates the need for a paradigm shift in the design approach to the transformation and adaptation of coastal cities. Although the *Passeio das Dunas* was not constructed as designed, we consider that it remains an initial starting point for a long theoretical discussion and one of the possible paths on the future formal definition of the vulnerable public space, between the city and the sea, of the effects of climate change.

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