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# 'Exploring the impact of climate adaptation strategy on public space quality: A study of innovative urban stormwater management in Rotterdam, The Netherlands'

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Being a dissertation submitted to the faculty of The Built Environment as part of the requirements for the award of ***MSc Urban Design and City Planning*** at University College London:

I declare that this dissertation is entirely my own work and that ideas, data, and images, as well as direct quotations, drawn from elsewhere are identified and referenced.

**Acknowledgements:**
I would like to thank my supervisor, Dr. Bahar Durmaz-Drinkwater, for her support, guidance and kindness throughout this project. I would also like to thank the participants of this study for their thoughtful answers and enthusiasm for my project. Thanks to them, I thoroughly enjoyed my time researching in Rotterdam.

**Abstract:**
Public space will have to take on climate adaptive functions in the face of the global climate crisis, which is threatening increasingly dense cities with risks of stormwater and flooding. Water Sensitive Urban Design including implementation of innovative solutions can enhance public space functionality and increase resilience at the same time as producing high quality public spaces that contribute to city liveability.

To explore these claims, for which there is limited existing empirical evidence, this research uses four case studies of innovative solutions in Rotterdam, The Netherlands as a lens to reveal the overall impact of the city's Climate Adaptation Strategy (2013). Rotterdam was selected given its international reputation as a pioneering innovator in the field. Qualitative methods used include semi-structured interviews, observations, social media analysis and analysis of online reviews; to access the perspectives of public space users. Findings show positive support for the claims. The innovative solutions are generally perceived to improve public space quality. Suggestions of best practice are offered, including prioritising delivery of natural elements and ensuring careful physical and social integration with surrounding built environment context. Further empirical research from other contexts and of greater depth is needed to support findings, and contribute to the development of a body of best practice knowledge.

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## INTRODUCTION

As the global climate crisis continues to intensify, stormwater and flooding will pose a high risk to growing urban populations in increasingly dense cities (Palazzo 2019). This threat should be seen as an opportunity to pursue more resilient, adaptable, equitable cities (Matos-Silva & Costa 2016). Urban design has the potential to deal with the critical challenge of climatic risk whilst regenerating and enhancing city areas (Palazzo & Wan 2017, Fletcher et al 2015).

This opportunistic perspective is set within the context of a shift in resilience thinking, and the emergence of Water Sensitive Urban Design ideas (Wong 2006, Fletcher et al 2015, Che et al 2014, Van de Brugge & De Graaf 2010). “Radical changes” are underway in the “technical and ideological forms” of urban water management systems (Bell 2015 p23). Recent approaches are concerned with adaptability (Adger et al 2007). This involves working with stormwater, seeing it as a resource or partner in urban design; rather than trying to remove it with hard infrastructure, following more longstanding traditions (Palazzo 2019, Lennon, Scott & O’Neill 2014). Emerging under this adaptation perspective is a recognition that public space (PS) may find an “enhanced protagonism”, capable of delivering multiple benefits whilst mitigating impacts of climate change and urbanisation (Silva & Costa 2018 p1, Sharma et al 2019, White 2008) ). Researchers have identified PS as an ideal interface for action on climate change (Mato-Silva & Costa 2018, Al 2022). PSs are “uniquely positioned to be sources of both physical and social resilience”, which can prepare the urban environment for climate change while building social cohesion (Pienhardt 2021 p1).

This dissertation aims to test these claims around the potential of PS, and explore how climate adaptation is impacting public space quality (PSQ). It is motivated by a desire to understand how WSUD can enable increasingly pressurised cities to respond to multiple objectives. To do this, this dissertation explores the impact of Rotterdam’s Climate Adaptation Strategy (CAS 2013) on PS in the city. It aims to understand this impact from the perspectives of day-to day users of PS, on the basis of actual experiences, in the context of complex city dynamics and actual city liveability (Yin 1994, Carmona 2015). In this way, this research makes a new contribution to the emerging field of literature, which so far has focussed on potential – findings will show what is actually being produced. This actual human perspective is too often neglected in PS design and management (Carr et al 1992). The goal is to learn from Rotterdam as a city which innovates in the field, and to

contribute to understandings of best practice as to how innovative management, following WSUD principles, can improve PSQ.

Rotterdam's position as a low-lying port city has forced evolving innovative management of water, traditionally to deal with seawater, but increasingly now with stormwater given high probabilities of extreme rainfall. Therefore, Rotterdam is internationally recognised as a pioneer in the field: with European Peer City Status, C40 Innovation and EU I-Capital Awards, and as leaders of the Resilient Cities Network (Molenaar & Gebraad 2014). They are global front-runners in incorporating PS into their adaptation strategy, which offers a "comprehensive yet socially sensitive" "informative not prescriptive approach" (Pienhardt 2021 p1).

To briefly summarise, the overall approach behind their Climate Adaptation Strategy (CAS 2013) is 'connecting water with opportunities'. In practical terms this means spatial development and climate adaptation are "inextricably intertwined" to apply innovative solutions in PSs to enhance quality of life in the city (Molenaar & Gebraad 2014). Key goals are increasing the 'sponge-function' of the city by reducing impermeable surfaces to improve drainage, and making extra room for water with storage both below ground and at surface level. This requires "making use of the entire urban environment" through small scale innovative solutions "implemented deep in the arteries of the city" (CAS 2013 p4). These innovative solutions allow multi-functional use of limited space to create an attractive, lively, healthy city. They will produce an additional layer of adaptation and therefore resilience, to work alongside the city's existing 'robust system' of hard engineering infrastructures. The approach is illustrated in Figure 1.

**Figure 1 – summary of Rotterdam's adaptation strategy. Source: CAS (2013 p7).**

**Research aims and objectives**

The overarching research question is 'how is Rotterdam's Climate Adaptation Strategy impacting public space quality in the city?'. To investigate this, the research objectives are as follows:

1. To identify relevant innovative solutions for water management that follow WSUD principles, to use as case studies. Implementation of innovative solutions is the primary goal of the CAS, and so studying their impact on PS is used as a lens to investigate impact of the strategy as a whole.
2. To understand the strategic design aims behind the case examples – in terms of why they are needed, how they are water sensitive and how they should function as public spaces.
3. To define an analytical framework to guide exploration of dimensions of public space quality.
4. To compare case study examples, allowing exploration of how users experience and perceive quality of the public spaces produced.
5. To synthesise findings towards conclusions, presenting insights from Rotterdam to contribute to understandings of good practice.

**Structure of the dissertation**

This dissertation will first present a review of existing literature on public space quality (PSQ), Water Sensitive urban design (WSUD), and the limited yet emerging area bringing these two concepts together and studying their relationship empirically. Next, the methodology chapter explains and justifies the research approach and methods taken. Following this will be descriptions of the four case studies selected, and brief explanations of the strategic design aims behind them. Findings and discussion will be presented relating to each case, before a brief overall discussion to synthesise the main research findings. Finally, the conclusion will summarise what has been achieved, reflect on the process and offer recommendations for further research.

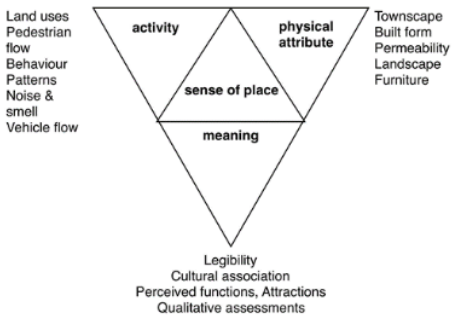
## CHAPTER 1: LITERATURE REVIEW

### Public space

PS is the "stage upon which the drama of communal life unfolds" (Carr et al 1992 p4). Multiple attempts at categorising PS are visible within literature. Research from political-economy perspectives categorise based on questions of ownership (Gulick 1998). Carmona's "new typology" (2010) presents a continuum of classifications from clearly public to clearly private space. More commonly, categorisations are based on form or function – Gehl & Gemzoe (2001) distinguish between monumental, recreational or traffic squares, and Carr et al (1992) identify public parks, waterfronts, streets, and greenways. Such categorisations prompted decisions for case study selection in this research – those chosen represent a range of PS type.

An extensive body of literature explores elements of 'good' or successful urban environments, examples of multiple terms visible to capture quality, a notion which can be allied with place value (Carmona 2018). It is essential to understand dimensions of place quality in order to improve experience of place, which is fundamental to health and wellbeing (Carmona 2014, Adams & Tiesdall 2013, Barton 2017). Canter (1977) suggests successful places are dependent on physical attributes, activities and conceptions. Punter (1991) presents a similar argument (Figure 2) in relation to sense of place – a quality of successful cities (Montgomery 1998). Referencing these authors, Montgomery (1998) develops three principles for achieving urban vitality and diversity, which for him are indicative of quality and are essential urban design goals. The first is activity, the extent to which a place feels alive. The second is image, a combination of a place's identity and perception. The third is city form, which should stimulate activity and be flexible enough to enable natural growth and a degree of disorder. Montgomery then outlines physical conditions conducive to such places – notably, the incorporation of green and blue natural elements, beneficial for recreation, health and legibility.

**Figure 2 – Components of a sense of place (Punter 1991)**



Another stream of literature investigates quality specifically in relation to PS, featuring longstanding established arguments. Gehl's (1987) framework suggest good qualities are those that make PS usable for necessary activities, or desirable for optional and social activities. Carr et al's (1992) seminal text *Public Space* reviewed existing research, and argues space should be responsive to people's primary needs, democratic, and meaningful. These criteria "explain the use of places", which is critical to success (p92). They identify five needs a PS should provide for. The first is comfort, a "prerequisite" to the second, relaxation, which describes a deeper "level of release" (p98). Third is need for passive engagement, and fourth active engagement - spaces should enable chances for indirect or "direct experiences with place and people in it", accommodating passive activities like people watching or activities and chances for interactions (p118). Discovery is the final need, representing a desire for simulation. Successful PSs should be intellectually or physically stimulating, to keep people exploring and enthused by spaces, fulfillable through distinctive purposeful design (Carr et al 1992). Specific features of PS that impact each of these needs are explained in Figure 4. A democratic space must be physically and symbolically accessible, dependent on features like permeability or certain 'cues' to suggest who/what is welcome in a space. For a space to be meaningful, it must become an important part of day to day life to allow connections to develop over time, which is again dependent on other features, further explained in Figure 4.

These ideas have been taken forward in more contemporary research. The Project for Public Spaces developed a framework for PSQ based on four categories: sociability, uses/activities, comfort/image and accessibility/linkages (2013). Each is broken down into different variables, visible in Figure 3. Carmona (2015) 're-theorises' contemporary public space, and develops a new set of normative principles to understand its nature based on empirical research in London. He suggests good PSs are capable of constantly evolving, balance the needs of pedestrians and traffic, offer diverse activities , and are social, engaging, meaningful, and comfortable. He suggests they should be distinctive and able to resist homogenisation – a link is visible back to Carr's element of discovery, both commenting on need for space to be stimulating and distinctive.

Mehta (2014) presents an index constructed of 45 variables to evaluate PSQ, based on research across US cities. The index generates quantitative data by weighting/scoring variables – this research will not utilise this given it is exploratory in nature. It is relevant as it details five dimensions of PSQ which capture people's perceptions of quality. They are:

- **Inclusiveness** – how able different groups/people can enter and use space, if their behaviours are supported or inhibited by space.
- **Meaningful activities –** how space supports socialisation, activity and resultant place attachments.
- **Safety –** whether people feel safe during day and night. Threats may be physical, e.g. traffic, or social e.g. crime.
- **Comfort –** physiological levels of comfort, determined by physical features of convenience and comfort
- **Pleasurability –** determined by a spatial quality, imageability and sensory complexity.

Within this body of literature, overlapping arguments suggest consensus on essential dimensions of PSQ, though they are often termed in different ways. Based on the prominence of certain dimensions, an analytical framework has been developed to guide this research, presented in Figure 4 below. It encapsulates and briefly explains the relevant dimensions, with the final column bringing together different specific variables that impact or underpin them – reversed or non-achievement of variables will be taken as signs of poor PSQ. This is particularly useful to clearly direct fieldwork and analysis. Often variables impact more than one dimension, but are presented where they are most relevant.

**Figure 3 – Project for Public Spaces' quality assessment mechanism (2013)**

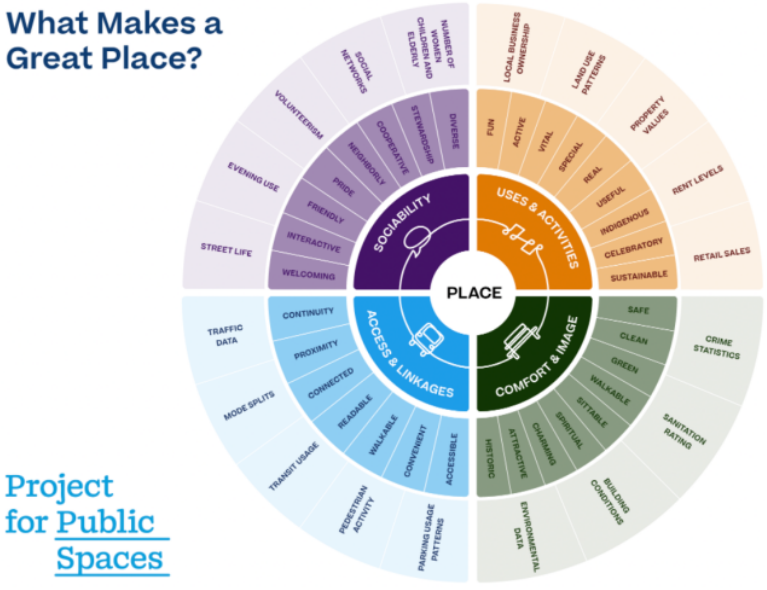


**Figure 4 – Analysis framework built from literature review**

| Dimension | Explanation – achievement indicates high PSQ | Variables |
|---|---|---|
| Activity and Uses | Ability of space to support diverse range of activities, uses + behaviours, illuminating what design enables or prohibits | -Space flexibility and suitability of layout (Mehta 2014), sub-spaces, e.g. open areas for ballgames, playgrounds, walking/cycling/running routes (Carr et al 1992)<br>-Amenities/features in space e.g. fountains (Carmona 2014)<br>-Opportunities for passive engagement – suitable places from which to view/observe (Carr et al1992) |
| Comfort | Whether a space is conducive to wellbeing, comfort, rest/relaxation. | -First impressions – cleanliness, attractiveness (PPS 2013)<br>-Climatic comfort i.e. microclimates, shade from sun, shelter from rain (Carr et al1992, Mehta 2014)<br>-Sitting spaces: frequency/arrangements of benches, walls, soft surfaces (Carr et al 1992)<br>-Natural elements, ambience/"pastoral retreat from the city" (Carr et al 1992 p318, Montgomery 1998), grass conducive to relaxation (Carmona 2014)<br>-Convenience facilities: toilets, bins, water fountains (Carr et al 1992)<br>-Noise and traffic (Carmona 2015)<br>-Spaces offering privacy (Mehta 2014) |
| Accessibility | Whether people reach space - physical access, linkages and connections with the wider urban fabric (Mehta 2014). Strong impact on inclusiveness. | -Opening hours, lockable gates, restricted access (Mehta 2014)<br>-Potential physical barriers e.g. steps, uneven surfaces, roads (Carr et al 1992)<br>-Permeability (Carr et al 1992)<br>-Visual connectivity to adjacent/surrounding spaces (Mehta 2014)<br>-Proximity to public transport connections (PPS) |
| Inclusiveness | Whether people can enter and use space based on non-physical variables, whether space be appropriated for different needs by different people. | -Symbolic cues e.g. individuals perceived as threatening or inviting (Carr 1992)<br>-Intensity of use by others (Carmona 2015) – potential for domination/alienation<br>-Presence of people of diverse age, gender, ethnicity, physical ability (Mehta 2014) |
| Meaning | Meanings develop/attach to experience of spaces as they as spaces become part of people's everyday lives, other dimensions impact this e.g. comfort, activities (Carr et al 1992, Carmona 2014). Can be positive or negative encouraging or discouraging use. | -Whether spaces can support gatherings, events, wide range of activities (Mehta 2014)<br>-Evidence of interaction, engagements and social relationships (Mehta 2014)<br>-Frequency of use (Mehta 2014)<br>-Open, friendly, welcoming, social space (Carr 1992, Carmona 2015)<br>-Whether spaces are well suited to their surroundings (Carr et al 1992) |

| | | |
|---|---|---|
| Safety | People's feelings of safety, relating to presence of physical and social threats e.g. traffic and crime. Strong impact on comfort. | -Balance between traffic and pedestrians – harmonious or invaded (Carmona 2015)<br>-Surveillance – CCTV, security operatives<br>-Physical and visual permeability<br>-Appropriate physical condition/maintenance (Praliya & Garg 2019)<br>-Sense of enclosure (above all Mehta 2014) |
| Stimulation | Whether space is engaging, interesting, enthusing and stimulating. | -Diversity of spaces/areas (Carr et al 1992)<br>-Changing vistas, views organised for mystery + surprise (Carr et al 1992)<br>-Evidence of evolution (Carmona 2015)<br>-Attractive and memorable design/landscape features (Mehta 2014)<br>-Interesting, distinct, purposeful design (Carr et al 1992)<br>-range/complexity of details, textures, features (Mehta 2014) |

**Water sensitive urban design (WSUD)**

Urban stormwater has generally been managed worldwide as a threat to control, contain and rapidly convey or channel out from cities (Che et al 2014, Wong & Brown 2009). This approach is considered unsustainable in face of climate change (Van de Brugge & de Graaf 2010, Bell 2015). Therefore, since the 1990s new design guidelines and technical frameworks have been emerging under a paradigm of 'water sensitivity' to minimise stormwater impacts (Wong 2006). The term 'WSUD' originated and gained momentum in Australia (Wong & Brown 2009). Other overlapping terms from different contexts include 'integrated urban water management' or 'sustainable urban drainage systems' – they all imply a shifting relationship between stormwater and cities, and evidence "exponential growth in societal interest" (Fletcher et al 2015 p534, Matos-Silva & Costa 2018, Wong & Brown 2009).

The water sensitive city is an ideal in which cities successfully sustainably deliver "safe and reliable water services to all now and in the future" (Bichai & Cabrera-Flamini 2015 p2). Brown, Keith & Wong (2009) identify six transitional stages towards the water sensitive city. They represent a shift away from rigid hard engineering features of traditional linear approaches e.g. underground piping channels; towards flexible approaches involving provision of smaller integrated innovative solutions (Brown et al 2009, Mitchell 2006). Development of these innovative solutions is guided by WSUD principles, explained by a key stream of literature. WSUD focuses on detention rather than conveyance of water, and use vegetation for permeability and capturing/filtering purposes (Wong 2006). Palazzo (2019) outlines the principle of multifunctionality, meaning solutions should be holistic with socio-ecological benefits. Another idea is that solutions should be 'safe to fail' - for example, submersible public spaces for storing water capable of flooding

and recovering without modification of their intrinsic state, or compromise of wider systems (Al 2022). Matos-Silva & Costa (2018) identify and categorise management strategies and corresponding physical solution forms – for example harvesting and conveying water through urban greening, or storing and tolerating water with retention basins (for example Watersquare Benthemplein, Rotterdam). These guidelines for novel stormwater management approaches mean water is making a visible comeback in the urban fabric of many cities (Buurman & Padawangi 2018).

WSUD principles are being embraced by the global water management community to tackle increasing water stress, experienced as higher intensity rainfall/run off exacerbated by climate change and population growth (Bichai & Cabrera-Flamini 2017, Buurman & Padawangi 2018). WSUD practices are practices of climate adaptation. They represent changes in a wide '"decision environment" and "actual adjustments" to design approaches to "ultimately enhance resilience" and reduce vulnerability to observed and expected climate change; after critical reflection and reshaping of management goals within the global urban water management community (Adger et al 2007 p720).

**WSUD and public space**

In addition to mitigating climate change, mainstreaming WSUD will deliver multiple societal benefits (Sharma et al 2019, Fletcher et al 2015). WSUD brings water to the heart of planning, viewing it as a fundamental city element and "a partner in urban design" (Bell 2015 p35). It is widely argued that WSUD will contribute to city attractiveness, comfort capacity, ecological health, PSQ and overall quality of life or city 'liveability' (Marlow et al 2013, Bichai & Cabrera-Flamini 2017, Johnstone et al 2012). WSUD guidelines for working with nature will "ultimately result in an aesthetically and functionally enhanced urban public realm" (Lennon et al 2014 p756). Creating a more permeable landscape with green/blue features will provide for water absorption and storage, habitat connectivity, recreational access and aesthetic improvement (Lennon et al 2014). Innovative WSUD solutions will create new "socio-spatial arrangements" bringing people and nature closer together (Buurman & Padawangi 2018). WSUD will particularly impact public spaces, ideal interfaces for climate action given they combine physical and social components (Matos-Silva & Costa 2018). This area of literature presents an overwhelmingly positive perspective on the potential impact of WSUD on PSQ. This research develops a more critical approach.

Empirical research on this relationship is limited. Matos-Silva & Costa (2016) systemise flood adaptation measurers pertinent to PS design but retain a technical focus

on infrastructure. In contrast, studies into benefits of water for PS tend not to focus on climate adaptive measures but standard features like fountains (Rosenberg 2015). Existing research that links WSUD and PSQ mostly investigates the Netherlands and Singapore, given few cases of multifunctional stormwater management approaches in other contexts (Al 2022). Singapore's marina barrage represents "unique application of technologies" working to achieve multiple benefits, offering a bold model of what is achievable when crisis is considered an opportunity (Harley 2012 p150). The barrage is a tidal barrier, storage/supply reservoir, and lifestyle attraction. Bedok Reservoir Singapore combines water storage with a marsh habitat park with floating boardwalks (Buurman & Padawangi 2018). These are elements of Singapore's WSUD approach which views water as a medium for social cohesion (Buurman & Padawangi 2018 p9). Integrated urban water management took hold in the Netherlands in the 1990s (Al 2022). Strong private sector/governance interest means the Netherlands is internationally recognised for pioneering approaches using climate change as a catalyst for innovative urban design (Jacobs 2012, de Graaf and van de Ven 2012). Van Loon-Steensma & Vellinga (2014) studied possible functions of dikes, using interviews to assess professional stakeholder opinions on different combinations of function. They generally found support for multifunctionality and shared ambition to improve spatial quality, but concern around potential for 'over-dimensioned' defences.

This research will contribute to this emerging area of literature. It offers a more critical, bottom-up perspective on the impact of WSUD on PSQ based on interviews with day-to-day users of case study spaces, rather than experts or designers. It gives insight into how space quality is actually perceived, and whether quality is compromised in pursuit of climate adaptation through WSUD.

## CHAPTER 2: METHODOLOGY

### Multiple case study approach

This dissertation applies a multiple-case study approach (Yin 1994). It explores four climate adaptive PSs in Rotterdam in their real-life contexts to illuminate features that impact how users perceive their quality. This chapter explains the approach, justifying selected case studies and methods used to research them, before detailing the data analysis process and reflecting on important ethical considerations. Limitations are considered throughout.

By studying few units intensively over a short time period, case study research aims to "elucidate features" of a similar "broader class" of units (Gerring & McDermott 2007 p688, Hays 2003). Here, Rotterdam's innovative adaptation projects are used as a "creative laboratory" to elucidate impacts of different solutions on public space quality; generating insights to inform future practice (Matos-Silva & Costa 2018 p4). The nature of this research is therefore exploratory (Yin 1994, Groat 2013). Some consider case study research limited, arguing findings cannot be generalised for knowledge building (Flyvbjerg 2006). However, others argue instrumental case research is ideal, as in-depth analysis allows development of ideas testable with further research (Yin 1994, Stake 1998). This research does not directly generalise context-specific findings or make claims as to what will produce high quality climate adaptive public spaces universally.

### Case study selection

Rotterdam was selected as the overarching study location for reasons previously explained – briefly, its leading position on innovative urban water management and climate adaptation. Diverse case studies to represent the city were purposively selected to achieve useful variation along two relevant dimensions of interest (Seawright & Gerring 2008): firstly, Rotterdam's overall CAS (2013) and secondly PS. To do this, the four case studies originally chosen represented different PS classifications – a public square, riverfront, street and park (Carmona 2010). They represent different guiding ideas for dealing with urban water in the CAS (2013): optimising storm surge barriers by creating multifunctional dikes, and restoring 'sponge function' of the city through green-blue adaptation measures to capture/store then delay drainage of rainwater, both underground and at surface level. Notably, Water Square Benthemplein was chosen given its prominence within literature and broader media (Seawright & Gerring 2008). This strategy enhances study

representativeness, and ensures data collection addresses the research question with robust multiple case evidence (Seawright & Gerring 2008, Yin 1994).

Upon arrival in Rotterdam, a location visits showed the IUWM solution had not materialised as expected at the case study street selected. The initial research plan was not "tightly prescribed" given literature calls to remain adaptive, so other potential cases had been identified in advance – the street was not used for fieldwork (Becker 1998, Cresswell 2007 p39). This switch means the final four case studies include two parks, representing fewer PS classifications – a study limitation.

**Data collection**

Multiple qualitative methods have been used to enable holistic exploration of the case studies (Groat & Wang 2002) and possibilities for data triangulation/finding corroboration (Patton 2015, Yin 2018). Qualitative methods are effective for answering questions relating to "experience, meaning and perspective" from the standpoint of respondents, therefore being more suitable to meet the exploratory objectives of this research than factual quantitative data (Hammarberg 2016 p499).

**Phase 1 – desk-based secondary research**

The research process began with background investigation into Rotterdam's approach to WSUD and creating innovative multi-functional public spaces. Key documents are Rotterdam's CAS (2013), Waterplan (2013) and 'Connecting Water With Opportunities' Adaptation Programme (2014), official policy documents. Subsequent research identified potential case study examples, meeting research objective one. Further research met objective two, producing rich descriptions of each case study recognising uniqueness (Hays 2003). These will be presented in the next chapter, briefly covering the previous state of cases and explaining strategic design aims – how they should function as innovative urban water management solutions and as public spaces.

**Phase 2 – fieldwork**

Data collection took place during a two-week trip to Rotterdam in July 2022. Duration was determined by feasibility in terms of money and time (Hays 2003). This short period is acknowledged as a limitation, constraining scope of research and data collected – further research encompassing more variation on time and larger samples would be beneficial. Data had to be collected intensively daily to complete the study - more opportunity for breaks/reflection often allows more effective research (Yin 1994, Hays 2003). However,

this set research boundaries, preventing never-ending thinking additional visits will produce more data, hindering research progression (Yin 1994). Data collection methods are as follows:

**Observations**

Carr et al (1992 p87) argue "any good analysis of public space must begin by spending time there" watching how it is used and "recording how it feels". Observations produce initial impressions and act as a lens revealing activities and uses (Ciesielska et al 2018). They exposed physical elements that impact other quality elements like comfort, safety and accessibility, for example greenery, sitting spaces, traffic or permeability. An observation schedule was developed to ensure coverage of each case throughout different hour periods of the week/day. Actually, more time was spent in each place and observation notes continued throughout, guided by the idea of data saturation – recording stopped when no additional insights were emerging (Hennink et al 2017).

**Semi-structured interviews**

Interviews are critical sources of case study evidence (Yin 1994). Semi-structured interviews allow participants to explore issues they felt were important (Longhurst 2010), useful for illuminating insights into the subjective issue of PSQ. Guiding questions were formulated to reflect the analysis framework, to gather relevant data whilst aiming to not lead responses (appendix 1). The interviews more resembled 'guided conversations' with a fluid stream of evolving questions to explore emerging insights whilst pursuing a persistent line of enquiry (Rubin & Rubin 2011). Carmona (2015 p381) used interviews as part of conducting 'user assessments', to "gauge the success of each space from a user perspective" – this research uses interviews in a similar way to collect data on less easily observable elements of place quality, including perceptions of meaning/purpose and inclusiveness.

Interviews were conducted with a random sample of people in each PS. The aim was to reflect a typical cross-section of everyday users – notes on age, gender and whether they were residents help to understand this profile, presented in the table of interviewees (appendix 2). The flexible nature of interviews was emphasised to potential participants, reflecting the need to collect a sufficient base of data without being too demanding, thereby discouraging participation (Albaum & Smith 2012). Respondents often said they had little time but could chat quickly, opportunities I adapted to, whilst others were free. This is reflected by interview lengths, ranging from brief two minute interactions

to 28 minutes. The majority were between 10-15 minutes. Most were conducted with single participants. In some cases groups of friends/couples answered together for comfort and convenience – 35 interviews were conducted with 46 respondents.

Difficulties were faced during the interview process which constitute research limitations. Primarily, during fieldwork I tested positive for Covid-19 and had to cease interviewing. Prior to this, approximately 50% of people approached were unwilling to take part – this rejection rate was tiring/discouraging. This was exacerbated by unexpected absences of people – particularly at Watersquare Benthemplein, where one interview occurred. Only 7 people were seen at the square, and they were unwilling/too young to participate. 15 interviews were conducted at Museumpark, 10 at Dakpark and 9 at Westersingel. This can be treated as a research finding in itself - analysis will aim to understand the aspects of quality explaining this.

Interviews as social interactions are inherently shaped by identity and positionality (Beebeejuan 2022). Of 46 interviewees, 28 were female, who generally gave longer responses. Beebejuan (2017 p324) argues inclusivity, access and safety are “dynamically produced” and “negotiated in tandem with other people” in space. These constitute elements of the analysis framework and also underpin this slight imbalance – I felt more able to approach other females and found they were more likely to engage, due to feeling more comfortable with each other given similar experiences of existing in PS. Furthermore, after initial attempts I felt unsafe conducting research after dark, and so cannot offer related insights, another research limitation, This tendency and my own notes on how I felt and experienced the spaces are revealing of PSQ and can be considered data. This follows the idea that understanding positionality doesn’t weaken research but can lead writers to insightful analyses (Moser 2008).

**Social media and online review platforms**

The aim of interviews was to understand quality from the user’s perspective. To compensate for Covid limiting interviews, I needed to find data sources produced by users themselves to further access their perspective. The first source is social media. Instagram location-tagged posts are rich visual and textual objects (Moore & Rodgers 2020, Zeller 2017). The app structures, contains and archives posts meaning contributions are visible and readily searchable (Moore & Rodgers 2020). 50 ‘top posts’ are automatically displayed for each location, defining a data boundary. The second source is online Google and TripAdvisor reviews, again readily accessible and sorted/contained by location. The quantity of reviews with textual descriptions was manageable without setting further

boundaries. There were more reviews for some cases than others, reflecting earlier research.

**Figure 5– sample social media post**

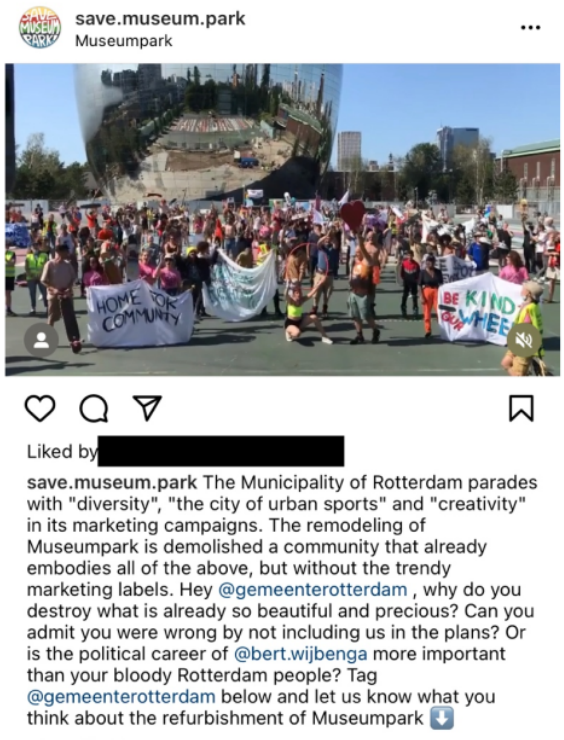
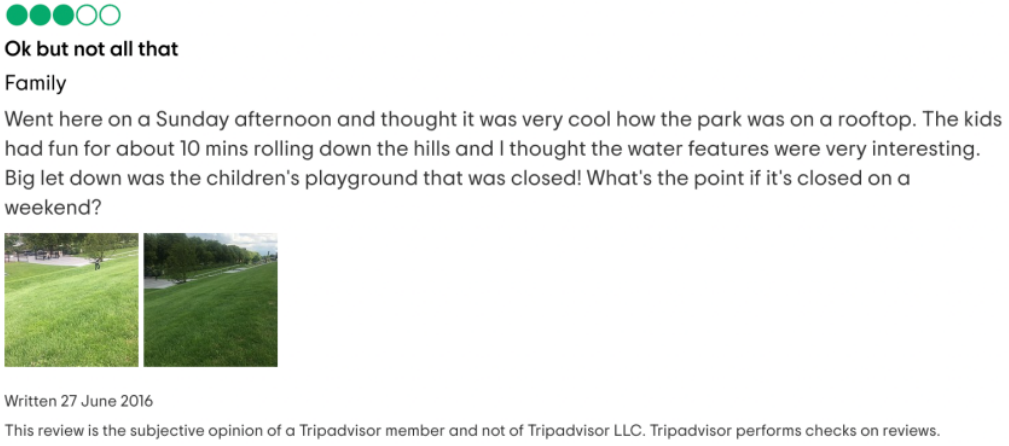



**Figure 6 - Sample TripAdvisor review**



**Data analysis**

This involved ‘drilling in’, taking raw data, organising and reducing it before ‘abstracting out’ meaningful understandings (O’Leary 2010). A coding system based on the analytical framework was developed to guide this process and ensure focus on research questions (Hays 2003). Each dimension of analytical framework was colour coded, then relevant findings from the presented observation data and interview transcripts were highlighted. The approach to social media analysis broadly resembled this – applying the same codes to captions and visual content (Moore & Rodgers 2020). The framework of pre-determined codes was extended to direct review content analysis (Hsui-Fang & Shannon 2005, Bowen 2009).

**Ethical considerations**

The research process avoided personal data collection and sensitive questions. When approaching interviewees, I verbally delivered the study information sheet (appendix) ensuring they were fully informed before verbally obtaining consent. This included requesting use of a recording device – if respondents refused or seemed uncomfortable with this, often citing concerns around their English ability, it was not used (Yin 1994). More detail is available in the ethics assessment (appendix). Public accessibility of social media and online review content does not mean it was meant to be consumed for research (Boyd & Crawford 2012). Possible risk to subjects was perceived as low given the non-sensitive nature of the topic, however the common protective measure of preserving anonymity by removing usernames has been adopted (Moore & Rodgers 2020).

## CHAPTER 3: CASE STUDY DESCRIPTIONS

This chapter introduces the four climate adaptive case studies of this research, detailing strategic design aims behind them in terms of how they function as innovative urban water management solutions and PSs.

**Figure 7 – Indication of case locations and area**

**Watersquare Benthemplein**
Location: Agniesebuurt, Rotterdam
North – outer city centre/residential area fringe
Area: 9000m$^2$

**Dakpark**
**Location:** Bospolder-Tussendijken, Rotterdam West – residential district bordering industrial port district
Area: 80,000m2

**Westersingel**
Location: Rotterdam Centrum – city centre
Area: approx. 18,000m2

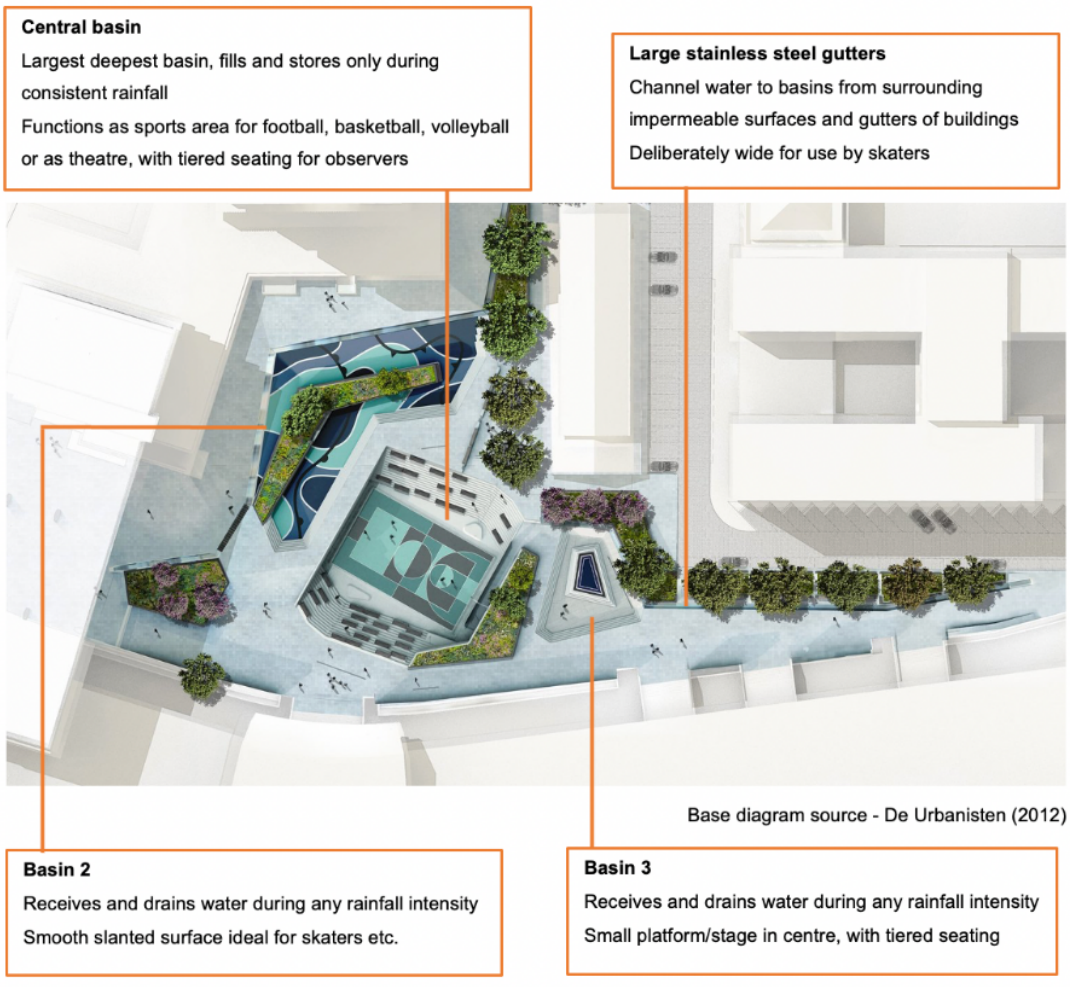
**Museumpark**
Location: Rotterdam Centrum – city centre
Area: approx. 64,000m2

All aerial images source – Google Earth

**Watersquare Benthemplein**

Watersquares combine water storage with improvement of PSQ (De Urbanisten); exemplary small-scale water management solutions implementable deep in city arteries (CAP 2013). The idea was developed by design bureau De Urbanisten, collaboratively designed with stakeholders including local residents and members of the church, theatre and colleges around its perimeter. They explain a two-fold strategy: to make water management visible and enjoyable whilst generating opportunities to improve space quality and identity. Completed in 2013, Benthemplein is an early example of the innovative solution – similar squares are now in development across Rotterdam and other city contexts. This is the most renowned of the case studies (Al 2022).

**Figure 8 – Explanation of functions**




Base diagram source - De Urbanisten (2012)

The basins are usually dry, available for recreational purposes, but have capacity to store 1.7million litres (Stormwater.org 2014). Water collected in two shallower basins gradually seeps back into groundwater through underground infiltration devices. The deep central basin stores water, buffering and delaying flows into the city's water system to alleviate pressure during heavy rainfall. It is pumped back in after 36 hours maximum. The planting plan retains existing trees and introduces high grasses and wild flowers to support biodiversity.

It is a "felicitous example" of potential benefits when PSs are explicit in their utility", and how water management solutions can free spaces from being limited to one function (Bravo 2020). Images below show transformation from "uninteresting and unused" "excessive interstitial space" (Bravo 2020).

Image source – Public Space.org 2020

Source – Ossip van Duivenbode for De Urbanisten

Image source – Public Space.org 2020

**Dakpark**

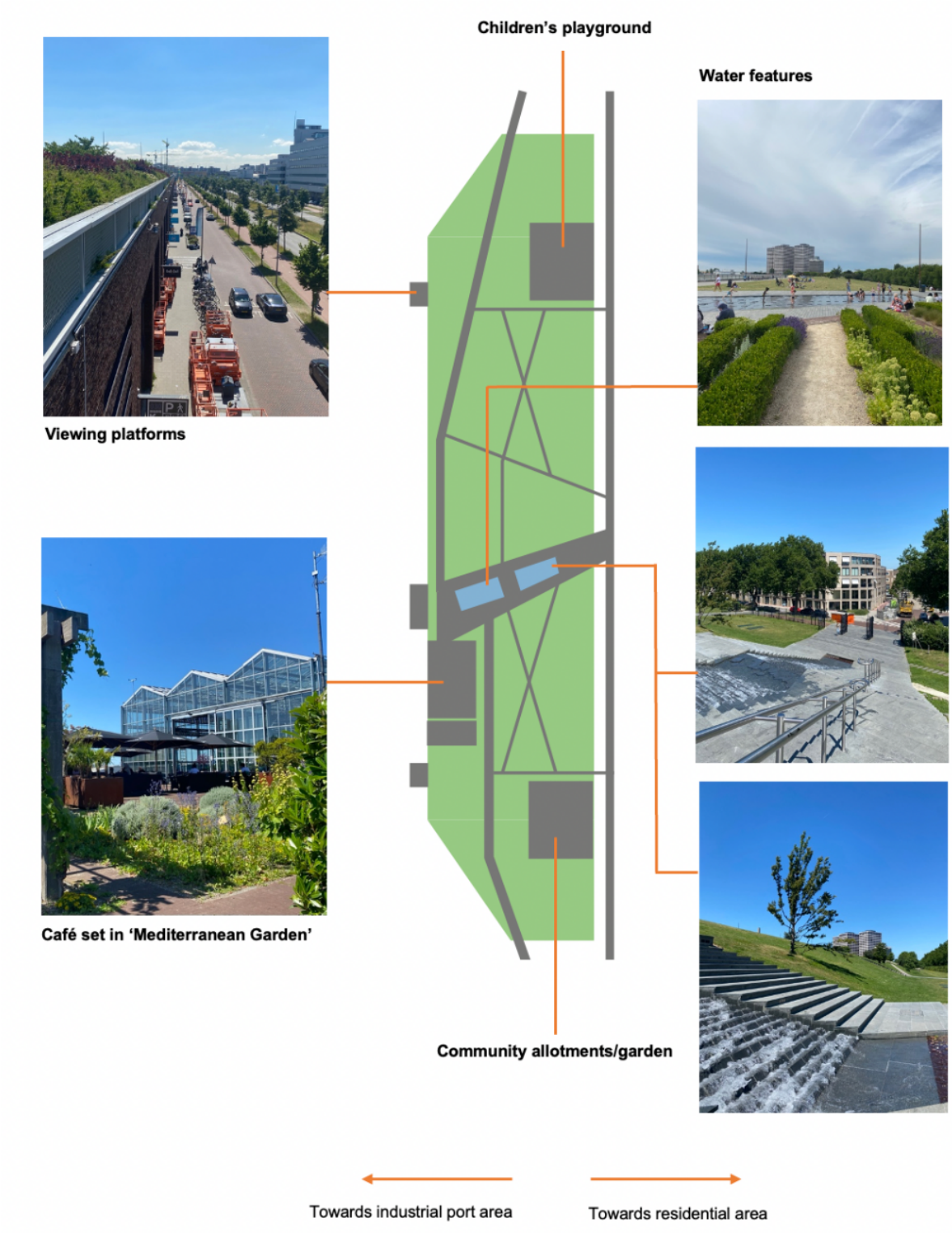
Dakpark is a multi-purpose inland levee with parking garage, shops, and water storage tanks topped by a park (Al 2022). The landscape architect, Buro Sant en Co, describe it as "an ingenious construction" bringing together "what seems incompatible", proving the "integrative power of spatial design".

This renewal project responds to climate change with intensive space use. At 80,000$m^2$ it is Europe's largest roof park, a huge previously concrete 'green lung', increasing permeable surface sand cooling the city. Dakpark encompasses 'Delflandse Dijk', part of major sea barrier dike ring 14 (van Veelen 2017). An additional layer of underground water storage below car parking provides capacity of 100-200 litres per $m^2$, delaying returns of water to the city system (Buro Sant en Co 2015).

Dakpark sits on a former railway yard vacated in 1998, land owned by Rotterdam Port Authority who intended to expand the industrial zone – the park project was realised after pressure from the Municipality and Water Authority, supporting residents of Bospolder-Tussendijken neighbourhood. As a PS the park should improve social cohesion and provide space to improve quality of life, supporting renewal of the area (van Veelen 2017).

Under construction. Source – Buro Sant en Co

**Figure 9 – Illustrative diagram of park features**



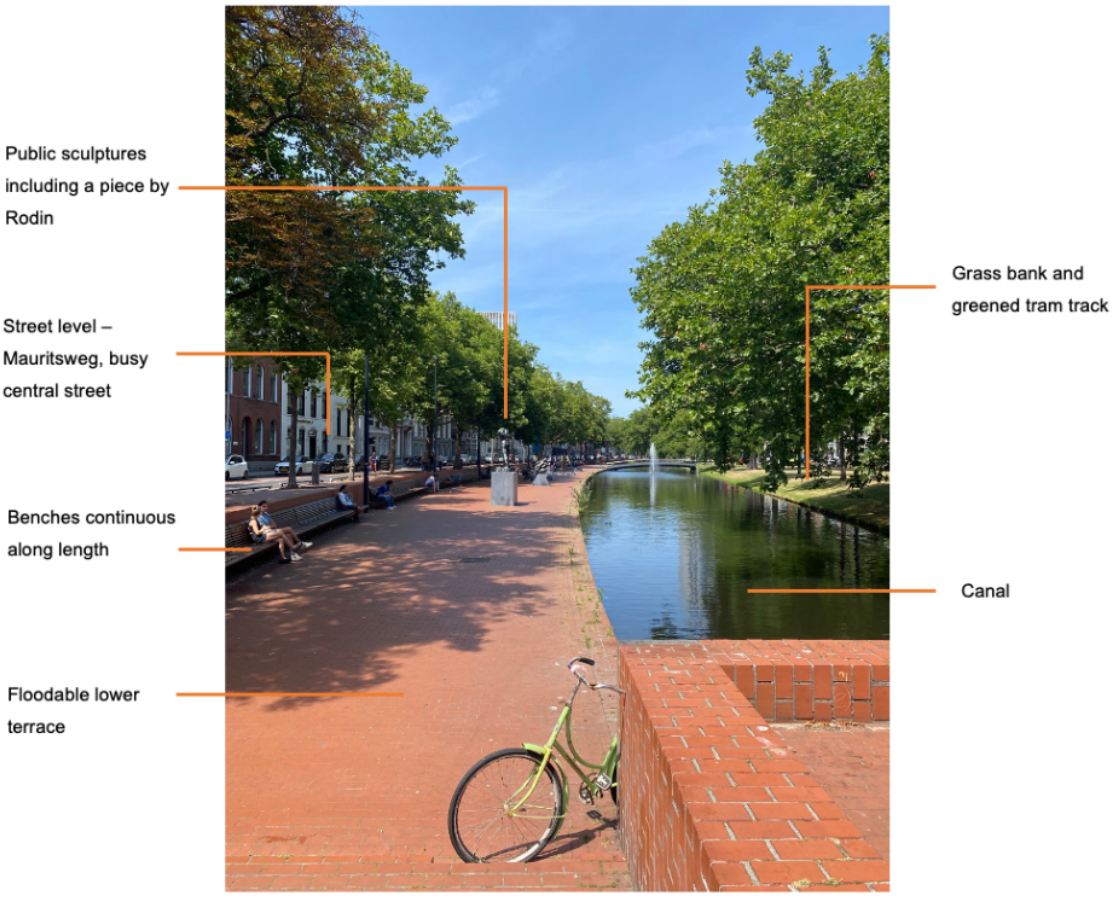
**Westersingel urban floodplain**

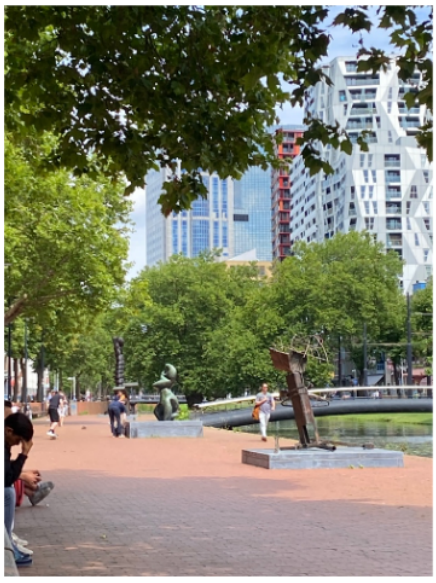
The Westersingel is a 'waterproof public area' capable of temporarily storing water, delaying drainage without causing damage during extreme weather events (CAS 2013, Musmanni 2021). Previously the canal had been sunken – it was re-exposed and a lower-lying terrace was added (Matos-Silva & Costa 2018). This brings natural elements to the street and functions as a 175m long 'sculpture terrace' displaying public art. The combination of water and sculptures 'invites people to stay' (Dirk Van Piejpe, project leader). It provides a pedestrian link between city centre, Centraal Station and Museumpark areas, space where Rotterdam "can catch its breath", where people "most automatically come to experience peace and quiet" (Waterplan 2013 p15).

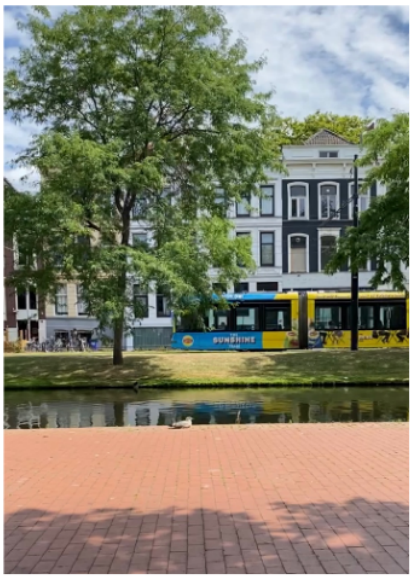
Completed in 2001 this is an earlier case of innovative urban water management in Rotterdam. The design principle of increasing storage capacity at surface level is a major CAS aspect being implemented across the city. The Westersingel features hard surface whereas more recent efforts are less structured and natural – analysis comments on how people feel this difference impacts space quality.

Source – Jannes Lioders on BKOR

**Figure 10 – Westersingel features**





**Museumpark**

Museumpark is a large 'cultural heart' civic space in the city centre combining green space with three museums – PS of high economic and cultural value popular with tourists and locals. The area became a park in 1927, redesigned in 1993 by Rem Koolhaas.

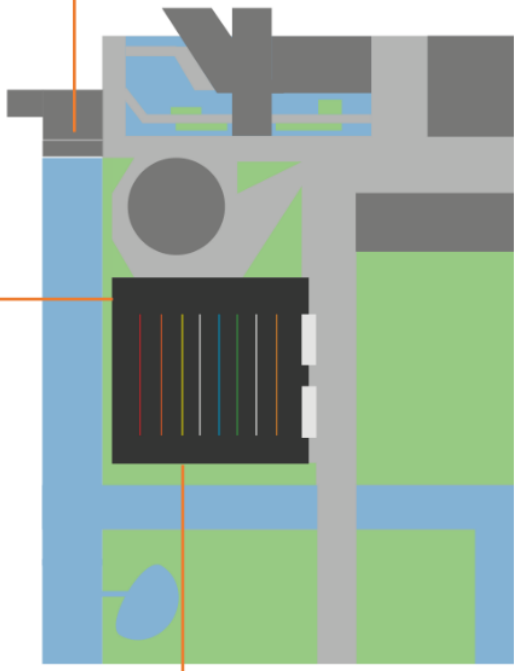
In 2013 a large parking garage was completed to address city congestion, parking issues and keep PS intact – for efficient land use, parking is co-located with belowground water storage tanks, topped with public space (AI 2022). Underground is a 60x35m reservoir which opens in extreme rainfall with potential for sewage overflows. Within 30 minutes it can fill with 10million litres, reducing pressure on the city drainage system by ¼ (Paul de Ruiter, Architect). Directly above is a large asphalt surface, called 'Event Deck' or 'Skateplein' by interviewees and the Bojimans Van Beuningen art depot.

Between 2020-2023 Museumpark is undergoing further transformation masterplanned by Gustafson Porter + Bowman, to create a 'city living room' with a strong focus on climate adaptation through greening and increasing surface water storage. Notably, the plan involves "the entire rectification" of the asphalt deck with planting and sculpted grass mounds" to create a green accessible events space, found to be controversial – discussion reveals issues with this loss of PSQ in pursuit of climate adaptation. Figure 11 explains park layout and relevant masterplan changes.

**Figure 11 – Illustrative Museumpark diagram**

**Parking garage** - subtle entrance at area periphery
Source – Paul De Ruiter Architects

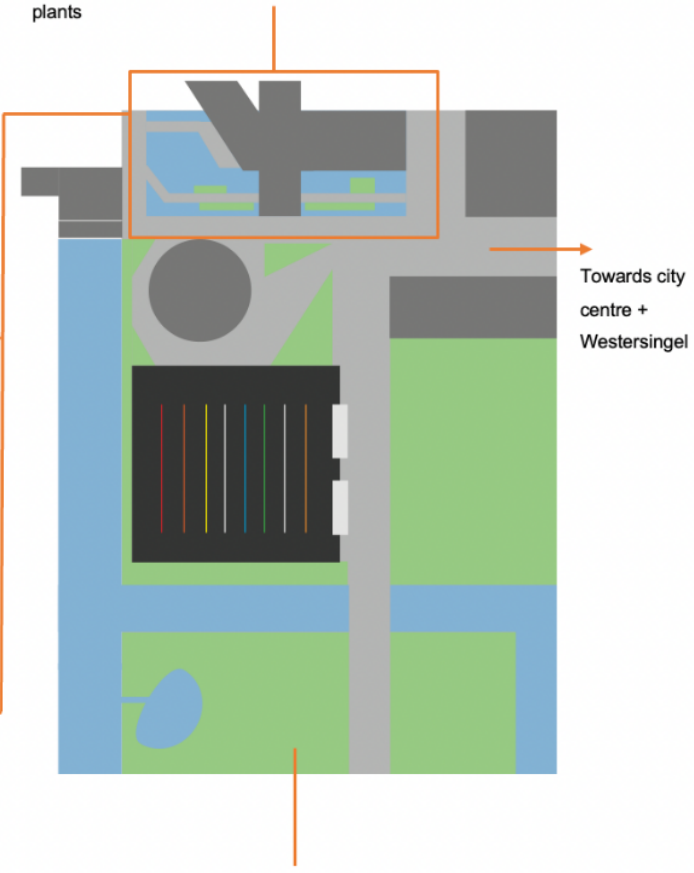
Source – Paul De Ruiter Architects



**Event deck/Skateplein**
Closed off and under construction at time of fieldwork
Masterplan changes: new surface, adding planting and sculpted grass mounds

**Figure 11 continued**

Source – Johannes Schwartz




**Het Nieuwe Instituut area**

Masterplan changes: rainwater system installed under expanded water ponds, new boardwalks, purifying aquatic plants

**Established park area continues**

Masterplan changes: diversify space with tree avenues, woodland habitats, additional water elements and aquatic habitats

## CHAPTER 4: FINDINGS AND DISCUSSION

This chapter presents research findings by case study, before an integrated discussion synthesising the four cases to argue WSUD innovative solutions are positively impacting overall PSQ in Rotterdam.

### Watersquare Benthemplein

Key PSQ dimensions: accessibility, comfort, safety

For the vast majority of fieldwork period, Watersquare Benthemplein was empty and devoid of activity. Being in close proximity to fieldwork accommodation, visits were highly frequent – yet only one interview was possible. This section argues this can be explained by the dimension of accessibility, and how it impacts comfort, safety and overall PSQ.

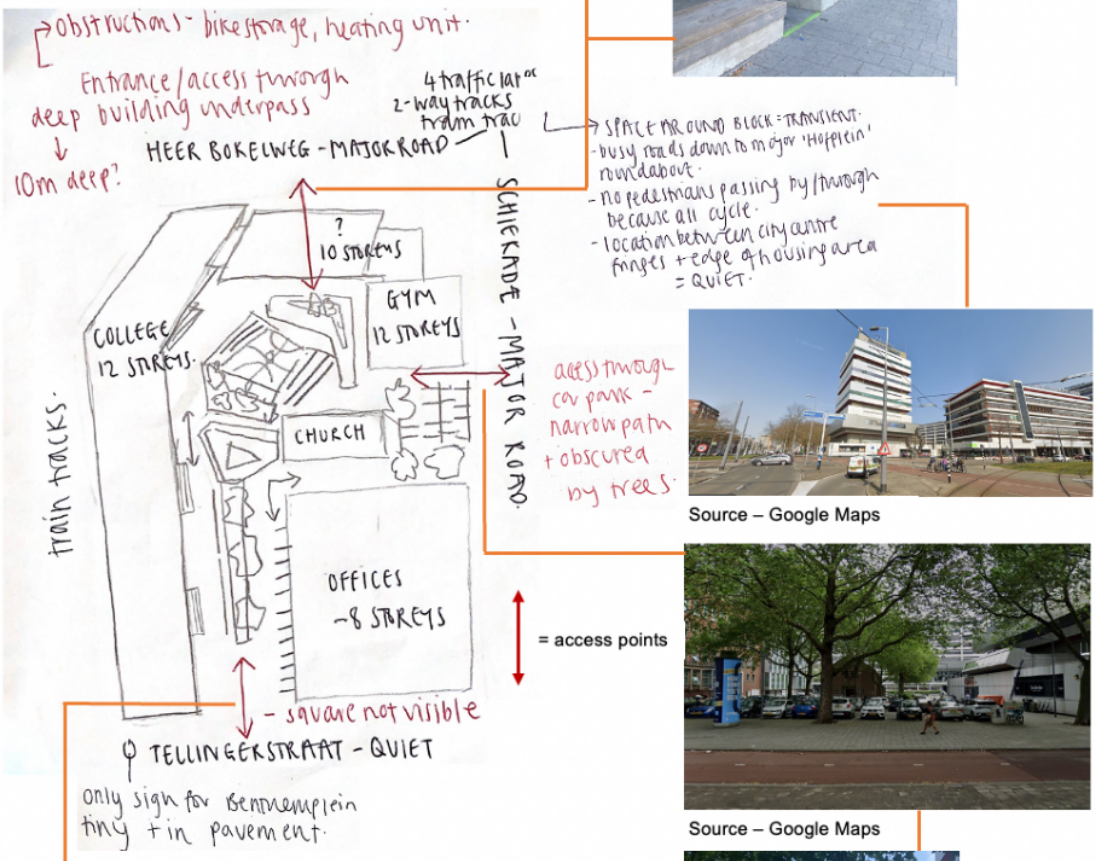
Watersquare's multifunctional basins are designed to support a range of uses. Visible activity was concentrated at space peripheries. Few people were seen smoking, eating and chatting on benches along gutters leading up to the basins outside of the offices/colleges surrounding the square. The only direct use observed was for skateboarding – four boys were practicing together on Friday afternoon, and later around eight other older boys entered the square. They stopped, filled water bottles at the main basin's fountain, then left. Actual observed engagement with the innovative solution was minimal – it was frequently deserted. The design includes physical variables that should contribute to high comfort capacity. Abundant seating of different arrangements allows users to benefit from microclimates, whilst large planting beds of wild grasses and flowers enhance the square's green natural element (Carr et al 1992). However, comfort capacity was reduced by significant litter and accumulated dirt in the basins, including evidence of drug use and smashed glass (Figure 12). The caption of one of few Instagram posts simply reads "water square or dirt pit?"; whilst one reviewer described it as "worn down even though it's new". Jacobs (1961) identifies activity and cleanliness or good maintenance of a space as essential determinants of sense of safety – somewhat explaining the hostile atmosphere.

Sense of safety is also dependent on space being overlooked, or clearly visible from outside (Jacobs 1961, Mehta 2014). Visual permeability was poor, illustrated in Figure 13. The interior basins are essentially invisible from outside. This correlates with poor physical accessibility, through two narrow long openings and one obstructed building underpass without any signage for legibility. Limited access routes combined with high

building heights creates a threatening sense of enclosure. At 8pm one evening, Police were stopping and searching cars that pulled into the square (Figure ?). Based on these observations, it seems Watersquare is physically neglected and a potentially exclusionary, scary space where signs of physical disorder, poor permeability, and “social incivilities” could dominate perceptions (Carmona 2015, Maruthaveeran  & Konijnendijk 2015 p704) This shows how variables of accessibility affect comfort and safety, thereby overall perceptions of PSQ.

**Figure 12 - collage of images illustrating state**

**Figure 13 – fieldnotes on accessibility, supplemented with images**






Source – Google Maps



Source – Google Maps

Source – Google Maps

From an alternative perspective, these signs of disorder including alcohol/drug use and graffiti are evidence of activity – for example, more drinks cans emerged overnight. They indicate use and therefore meaning, potentially as an evening hangout spot supporting social groups of skaters and young people – as De Urbanisten intended. In this case, the enclosed location is suitable to minimise conflict between skaters and other groups (Carmona 2019). This is in line with the idea that PSs should offer something for everyone in the right locations, supporting diverse lifestyles, and should not aim to appeal to all – highlighting the subjectivity of the issue of PSQ (Carmona 2015).

In any case, Watersquare's design is carefully considered and very impressive. Online reviewers appreciate the storage concept, and seeing water being transferred to basins from nearby buildings, calling it a "beautifully designed" "chill spot". Interviewee WB1 said "it is clever…this is a drain, it fills with water". Users find the purposeful design stimulating – it brings identity, colour, greenery and interest to the space, another design aim (Figure 15). Most social media posts are by visitors who have specifically come to study it (Figure 14). Whilst it is not dynamic, Watersquare contributes to climate adaptation and generally improves PSQ – as WB1 says, "before it was just a plain street, so this is better, I like it being here". The main issues are not produced by design of the solution itself, but are a result of issues of accessibility and integration with wider urban fabric undermining it. The Watersquare concept is highly transferrable. As PSs accrue meaning when they are well suited to their surroundings (Carr et al 1992); it is easy to imagine Watersquares inclusive of different groups depending on space context and who collaborative design involves – like Watersquare Tiel, completed in 2016 next to a primary school (directly below). Overall, Benthemplein shows theoretically high quality innovative design alone cannot guarantee production of a high quality PS. Design must contend with issues relating to wider urban context.

Source – De Urbanisten

**Figure 14 – Instagram posts**

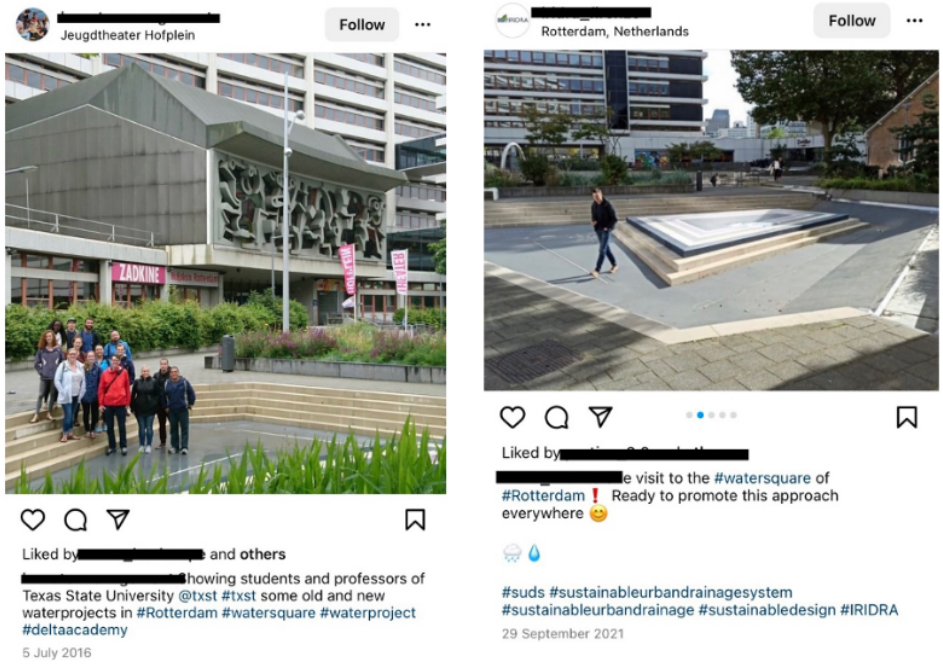



**Figure 15 – Design bringing colour and nature**

**Dakpark**

Key PSQ dimensions: activity and use, inclusiveness, meaning

Dakpark was striking as a vibrant PS capable of supporting residents of the growing nearby residential area, by enabling diverse activities. Of the case studies, this is the space analysis has shown to be most integrated with people's day-to-day lives. People feel able to appropriate the space almost as an extension of their homes (Taylor et al 2020). An online review describes it as "a nice park in a dull district. Especially for locals. My advice for tourists – go to other parks", reflecting Dakpark's apparent role as a functional neighbourhood park.

To fill a space with activity, use opportunities must be "carefully designed in" (Carmona 2019). The water fountain/steps are a critical feature that animate Dakpark and encourage lingering, illustrated by Figure 16 (Carmona 2014). They are the physical and social focal point for planned and spontaneous interactions inclusive of diverse people. Most interviewees cited children as their 'motivator' for visiting the PS (Irvine et al 2013). Babysitter DP1 comes "every day, twice a day. For like four hours. His mum likes him to be outside with other kids". Other parents said they came most days during school breaks. People were laying out blankets, picnics and umbrellas, or as DP6 said, "we are getting ourselves set up here to stay for the day". Children playing together visibly prompted parents to socialise. The feature also has indirect or shared social value through passive engagement – DP3 said he likes to take his lunchbreak nearby, finding the "very happy scene" relaxing (Worpole & Knox 2008). DP6 raised concern, saying "for younger children these water steps are not so good…it's scary when you see them running towards them", showing how design impacts capacity for comfort and relaxation. She then explained "all the parents are watching for all the children", a quote which encapsulates the inclusive sense of community there.

Further along in a large open zone a campsite was set up, a 'DeBuurtCamping' event (Figure 17). Social media analysis revealed Dakpark to be a venue for multiple community events (Figure 17). Dakpark is also appropriated more informally. DP9, DP10 and DP10 were observed bringing furniture from their homes, setting up a balloon arch for a birthday party as they did not have space at home - "we've picked this place in the corner…so hopefully no one random will join". Instagram posts show Dakpark is often used for 'private' celebrations.

**Figure 16 – water feature animating space**

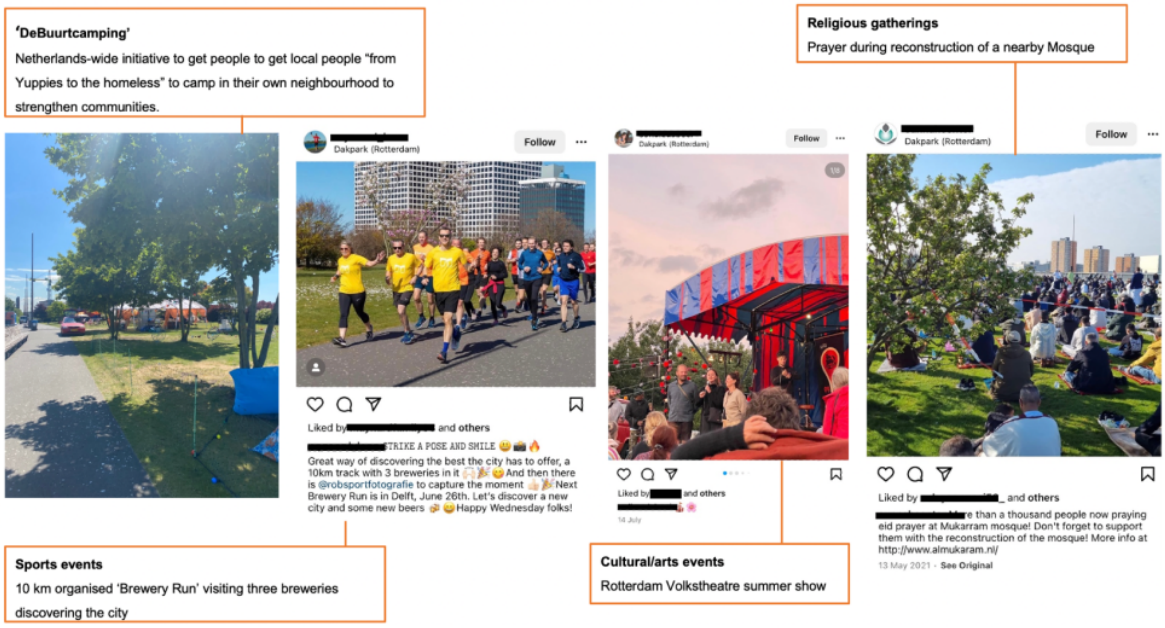

Image 1 captured on weekday, Images 2 + 3 on a Saturday.
All 30°+ weather.

Images captured on a Sunday afternoon.
30°+ weather.

Other interviewees echoed the sentiment of using Dakpark to make up for space they don't have at home. DP7 & 8 were a couple having dinner in the permitted BBQ zone. They appreciated being able to relax and eat outdoors where "down here it kind of feels like we have our own garden anyway". DP4 and 5 had laptops to study outdoors as their apartment was too hot. They said "these small trees are nice… everyone can get their own patch in the shadow". These responses, combined with observed tendencies of sitting in less exposed space peripheries, indicate a preference for more private/intimate comfortable spaces distant from others (Whyte 1980) – termed 'the edge effect' (De Jonge

1967). Overall, the park is large-scale enough to work successfully as a series of "distinct and separate" subspaces (Carmona 2019 p53). As a result, Dakpark facilitates a activities from community events to more mundane daily uses, therefore supporting a spectrum of social relationships and levels of contact (Hall 1992, Gehl 1987). Evidence suggests it is inclusive meaningful space. More detail of use/layout is presented in Appendix 3, a summary of observation data relating to each PSQ dimension.

**Figure 17 – sample of community uses revealed through Instagram**




However, for some scale produced issues undermining overall PSQ, often relating to exposure and therefore comfort. Multiple reviews comment on a lack of trees, or "obviously very new not very high trees" – DP2. Reviews relate this to inadequate shade provision shade, or the roof being "very cold in the wind". Another review calls Dakpark "barren" (Figure 19). DP9, a counsellor for the Dutch Green Party, said:

> **"I feel like there's something missing. I really love the idea, I think it's a very good use of space. We need more green roofs. I still think it could be a lot better. There's so much space…so much grass, they could do a lot more for biodiversity. We have a tendency to put up a park and put up 26 of the same trees, then you only get one type of bird. That's what's missing. Just bits of it should grow a bit wilder."**

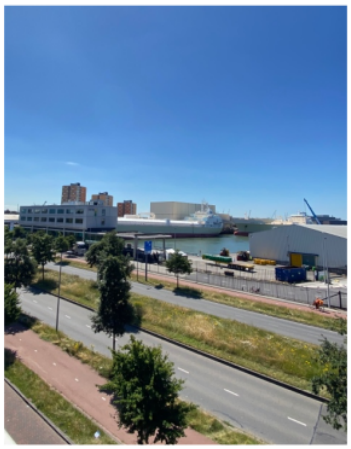
She felt a lot of the space was “kind of exposed”. Wilding as suggested would enhance climate adaptive PS function, create more sub-spaces, and generate more desired edge experiences (Gehl 1987). This may also help make Dakpark more stimulating with different character habitats – a lacking dimension. Many interviewees and reviewers liked the cool idea behind the innovative solution, but in terms of what is actually physically produced, identified water features as the only notable engaging landscape feature. The other positively mentioned recurring variable were “unique” elevated views. A reviewer describes walking in a new rooftop park with a “huge ship docked about 100m away surrounded by buildings” as a distinctive “cool Rotterdam experience” (Figure 20).

Scale also seems to produce issues of space availability –the children’s playground and community garden were constantly locked, as reviews suggest happens frequently (Figure 18). Many users raised frustration, particularly around the playground given how important a space this is for children. DP explained responsibility for unlocking sub-spaces is with volunteers, to let residents participate in management (Buro Sant en Co) – it seems nobody is committed. Accessibility is otherwise assessed positively (Figure 21). As the park and surrounding community continue to establish, these issues may resolve.

**Figure 18– locked playground**

**Figure 19 - barren space**

**Figure 20 – views to Port**



Overall, Dakpark exemplifies the importance of designing to accommodate activities, and creating a space physically and socially well-suited to its context (Carmona 2019). It’s layout and proximity to a growing pressured neighbourhood ensures vitality. Activity such as children playing has been shown as foundational to development of positive meanings, and people appropriating space freely shows it is inclusive. The overall

impression is of an innovative solution that produces a fairly standard yet high quality neighbourhood park.

**Figure 21 – Summary of accessibility**

Integrates well physically with existing urban fabric – e.g. direct links to nearby sports court, and access points aligning with routes into the neighbourhood. Linkages are also strong to nearby Marconiplein public transport hub – bus, tram, Metro.

Steep gradient of from ground up to roof level means there are lots of steps throughout the park – however they are balanced with alternative step-free routes supporting those with mobility needs/cyclists/pushchairs.

**Westersingel**

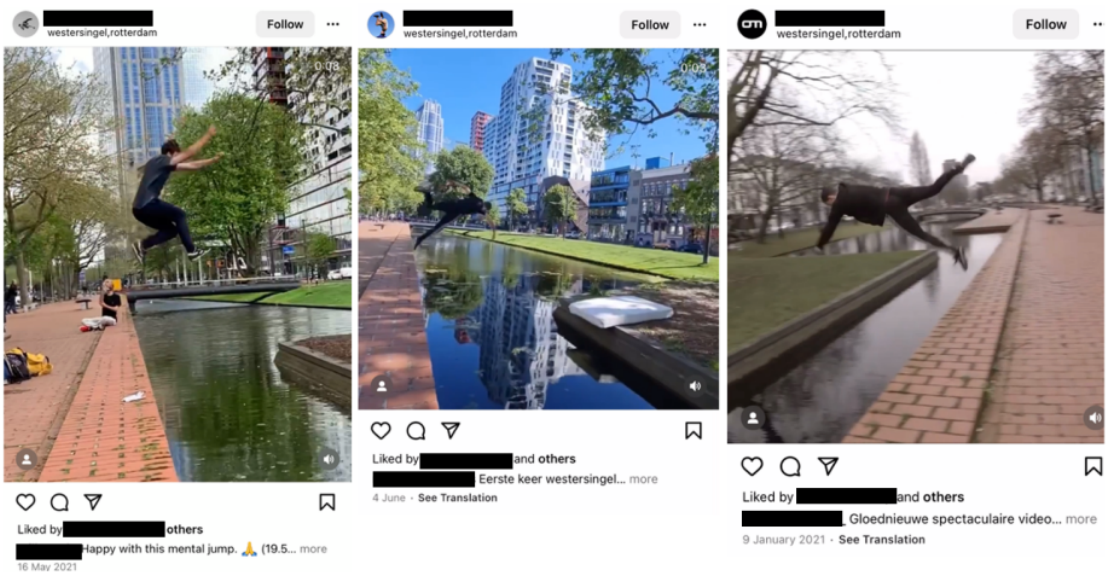
Key dimensions: stimulating, comfort

Westersingel is the smallest case example in terms of usable surface, and an early solution representing the adaptation 'deep in the arteries of the city' approach called for in the CAS. The built terrace brings public art and greenery to a bustling central city street. It is generally considered to positively impact PSQ, but analysis revealed clear opinions on how it could be improved. More specific data relating to the full range of PSQ dimensions is presented in appendix 3.

Interviewees appreciated Westersingel as "a rare little bit of water and green in the middle of the city" – WS9, where it is "nice to take a break and relax" as design intended. MP21 described it as a place where "you can really relax and just be". She had just arrived from Austria, saying "walking out of big stations is usually stressy, but this is relaxing", "it's very generous to use the street in this way". Online reviews echoed this, finding a "great surprise" when walking between popular tourist areas. Positive perceptions are related to calming natural elements and public art: "it is wonderful to have these statues just standing in the city". People were visibly stimulated through discovery of sculptures, sharing opinions with strangers, taking photos, and climbing on them. In these ways, art displays enrich environments and animate PS (Memarovic et al 2012, Montgomery 1998). Offering criticism, WS9 argued "all cities love this kind of industrial art", which could be "better for the settlement" and "more useful". Later, when we discussed climate adaptation, she suggested artwork could be an opportunity for learning about the city's distinctive climate adaptation approach. Given scale and arrangement of sculptures, Westersingel is limited in range of activities offered. People try to use it for urban sport (Figure 22), but skateboarders were observed being told to move on by 'Handhavering' security operatives. Most people used it briefly, for a rest or to have lunch, or were waiting with luggage, presumably before heading to nearby Centraal Station.

The terrace seems to have become an essential, meaningful space of daily existence for multiple homeless people through repeated use (Doherty et al 2002). WS7, who volunteers at the Pauluskerk church nearby, said "it's nice to have a comfortable area for them to go". Visible homelessness can be unsettling (Koprowska et al 2020). Other interviewees gave responses indicating "intensity and decorum" of use by homeless people dominates the space and impacts their comfort (Carmona 2015 p401). WS10 usually sits away from the terrace – "you know the guys will be down there, which is ok…but it gets super dirty". One man was observed urinating on a sculpture. The terrace

**Figure 22 – Instagram revealing popular use for**

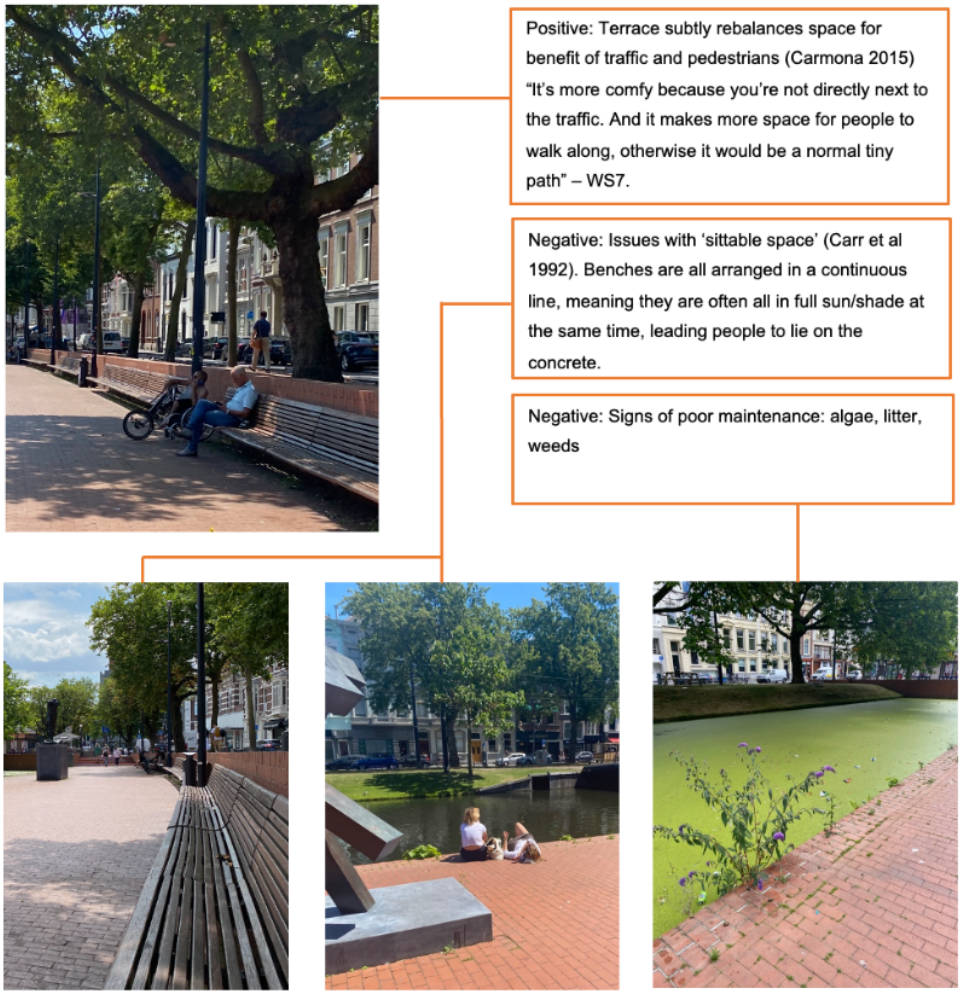



seemed to be a popular spot for marijuana users, often male, another dominant group. WS1, a young female, said "it feels like people are really watching you. You get interrupted a lot. People come and ask for money or lighters, so you can't relax properly relax". This was echoed by SW9, another young female – "he just kept offering me beers. I put my headphones on so he went away, but it makes you feel on edge afterwards". More factors impacting comfort are shown in Figure 23.

These negatives can explain why many locals did not seem to attach much positive meaning to the Westersingel. WS7 said "I never sit here actually…if I'm here I'm usually on the way to somewhere else". WS1 added "it's a good place to wait [for friends, trains], but we would never hang out here". She explained "when you know the city more, there are better places to be", drawing comparison to Heemradsingel (Figure 24), another storage pond with "grass on both sides so people lie down and chill there more". WS9 said she prefers to sit at other end of the Westersingel, where it is more green and natural (Figure 24). These preferences reflect suggestions as to how Westersingel PSQ could be improved:

> **"I wouldn't leave this so concrete. It's easier or cheaper to put concrete, but it destroys the environment. If you have water, it's amazing to use it and put greenery closer to it, it looks better, and it's better for insects and animals and heat" – WS9.**

**Figure 23 – variables of comfort**




WS7 added "grass would be comfier and better for the water situation", and would help reinforce terrace/street separation. WS3 said they should add more plants to "plain floor". Interviewees strongly recognised potential of greenery for comfort and climate adaptation, and how it affects the city:

> **"we have these [storage] singels all over the city. Actually, this one is not the prettiest…and when it's flooding it's more obvious. At others the water just rises up slowly, and you only notice when the grass [edges] gets small" – WS6.**

These findings reflect research showing soft WSUD design initiatives to reduce impervious surfaces improve environmental appearance and experience (Lennon et al 2014), and how storage swales specifically can enhance streetscape experience and biodiversity (Hoyer, Dickhaut & Weber 2011). This is a positive finding. Although it indicates people feel Westersingel PSQ could be improved, and that the solution design feels “a bit…past it’s best” – WS4, it aligns with more current approaches in the overall CAS. Recently implemented solutions are more natural and unstructured. Innovative water management solutions are changing in ways aligning with user opinions on how PSQ could be improved.

Nevertheless, it “definitely makes the street better, no question” - WS9. It seems to be a place that visitors perceive as being of higher PSQ than locals, who seem to use it out of necessity and prefer other greener, peaceful spaces. It plays different roles for different user groups.

**Figure 24– Preferred solutions**

Further down the Westersingel

Heemradsingel. Source – Geemente Rotterdam.

**Museumpark**

Key dimensions: meaningful, stimulating

Museumpark is an important cultural space in central Rotterdam. This section explores the impact of two WSUD solutions, firstly focussing on the underground water storage reservoir/parking garage and how it created space for Bojimans Van Beuningen (BVB) art depot, completed in 2021. It will turn to explore how an ongoing greening project is changing the area, leading to loss of a highly valued sub-space. Again, more supplementary information is presented in Appendix 3.

Evidence suggests that for many, the focal point of the PS is BVB, an architecturally impressive distinctive building surrounded by a dynamic landscaped space. Its mirrored exterior design plays a major role in animating PS and stimulating visitors – people play in reflections, take selfies, and it visibly prompted spontaneous interactions (Figure 25). It was uplifting to observe, as "you can really see a lot of joy" – MP11. MP11 was at Museumpark with her grandson, they come often and stay for hours:

> **"I can sit on the bench and still watch him everywhere. The best thing is to watch him learning in the mirror…he dances, runs towards it, and he plays with other kids too…it's so fun to watch, lots of other people do and they're laughing too" – MP11.**

This quote reflects Worpole & Knox's (2008) arguments about shared social value of PSs: busy scenes generate a 'feel-good buzz', conveying therapeutic benefits. MP9 said "I'm finding it to be a really calming space". When asked why, she pointed out the soothing, considerate planting scheme and absence of traffic (Figure 26). Similarly, MP12 said "there's no traffic noise. It's so peaceful…it's like a secret garden in the city". Ample seating means "you can just sit, relax and contemplate what you've seen [in the museums]" – MP21.

It is busy yet peaceful. The innovative solution concealed underground "doesn't disrupt this area at all" – MP21. It gives Museumpark a climate adaptive function and removes problematic traffic, clearing a surface for the BVB and surrounding space; considered "really smart design" – MP4. The result is a place perceived as "inviting" or welcoming, pleasant and comfortable, despite construction works going on nearby -MP4. Based on this evidence, Museumpark is a "really special place…it's so important in the city" – MP10, clearly perceived as high quality.

**Figure 25 – visitors enjoying BVB**

**Figure 26 – planting scheme**


The construction works were part of the ongoing greening project. A large sub-space called 'eventdeck' or 'skateplein' was completely closed off, ready for renovation (figure 27). MP10, by chance a Project Engineer there, said "it will be great. The new surface will pick up more water and take it to those ponds [outside Het Nieuwe Insituut]". These storage ponds are popular completed aspects of the new masterplan (figure 28). Interviewees see the added water as "a big plus", "so far, it looks really well done" – MP21. MP21 and MP7 loved the boardwalks over aquatic plants, allowing close proximity to nature.

**Figure 27 – surface closure**


**Figure 28 – new storage ponds**

In contrast, local interviewees were less positive about the new surface. It was an important space accommodating various activities, “really good things like the open air cinema” – MP3. MP16 identified it as popular hangout for skateboarders. Instagram posts and reviews suggest this is an incredibly popular space function (figure 29 ) MP10 explained new design will leave space for events like festivals and the cinema, “but skates not so much…it was one flat asphalt, which was good for them”, but will be lost. This decision seems very unpopular with Skateplein users, who feel they are being excluded from what was a meaningful space for them, explained in Figure 29. This solution has a negative impact on two dimensions: activities/uses and meaning.

Museumpark highlights the potential for loss of important existing PS functions in pursuit of climate adaptation through innovative WSUD solutions. In many contexts, solutions that leave space intact may be most appropriate. The multifunctional garage, for example, enabled creation of high PSQ around the BVB without having a direct visible impact. Innovative solutions can be implemented across different built environment layers, underground or at surface level, to either preserve existing spaces or create new ones. Museumpark exemplifies the importance of understanding and respecting existing PS meaning and functions before altering them, in order to preserve quality.

**Figure 29 – response to Skateplein resurfacing**

★★★★★ 11 months ago

I went there with my inline skates and it is a skating paradise!!!
It is a huge flat smooth square where you can train (or show off) your skills. All around there are gardens where you can drink or eat, and I also saw the entrance of a parking garage but I am not sure.. it was a sunny day and finding yourself in that enormous glass building is also a funny challenge!!!!

★★★★★ a year ago

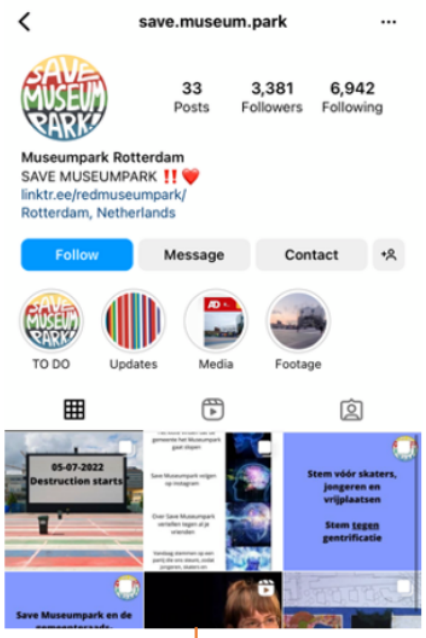
Unique, exciting, splendid, only few of the words that can try to describe how great this park is. Not only the park allows for calm picnics protected by the wind, it also attracts many people on skates, roller blades, bikes etc. The "ground braking" piece of, ground, is place where the youth can in a relatively safe place practice various sports. This place is definitely a destination to visit.

★★★★★ a year ago

So sad to hear that the city have plans to get rid of this magnificant skating place which really gives great vibes to this touristic area

1

Instagram posts and online reviews showing popularity and use of the Skateplein.





Campaign in response to proposed Masterplan changes aiming to preserve Skateplein – high number of followers and protest attendees indicate widespread place attachment and meaning.

**Overall discussion**

This research offers strong evidence showing that innovative WSUD solutions generally improve PSQ in Rotterdam. It has shown different ways that solutions for stormwater drainage and temporary storage can be combined with functional and recreational uses, to maximise multifunctional potential of PS (White 2008).

Across all four case studies, users identified natural elements as essential variables for high PSQ, especially for the comfort and relaxation dimension. This contributes to significant literature showing a strong positive association between urban greenness and place quality (Carmona 2018). Presence of nature, particularly water, has high restorative potential good for wellbeing (Ulrich 1981, White et al 2010). All of the innovative solutions bring extra water into the city, suggesting that the CAS will continue to improve PSQ in Rotterdam. They are already having noticeable impact:

> **"I can imagine myself here for a longer time than my hometown [Milan] because it is more green, and there's more water. It absolutely 100% makes a huge difference to life in the city.**
>
> **"You can see it, you can feel it, it's like a completely different way of living the public space. It's more relaxing. Milan is beautiful, but it is not liveable like here at all." – WS9.**

WS9's statements reflect wider research findings, and clearly indicate that following WSUD principles is leading to a greater appreciation of nature and better wellbeing through higher PSQ (Liao, Le & Van Nguyen 2016). Innovative solutions should prioritise visibly incorporating natural elements, bringing people and nature closer together.

The case studies show how innovative solutions can be applied at different scales, across different types of PSs. They can be applied very flexibly through layers of the city: above ground or at surface level, deep within dense city centres like Westersingel or in redeveloping outer neighbourhoods, like Dakpark. They have potential for application to and improvement of PSs fulfilling different requirements of urban life – special cultural places, everyday functional neighbourhood parks, secluded hangout spots or spaces for breaks from busy central areas.

A key research finding is that carefully considered design which fully integrates both physically and socially with existing urban fabric is essential to ensure high PSQ. Solutions must be appropriate to their surroundings. The impressive design of Benthemplein, for

example, is not so attractive that it creates a vibrant space within a concealed square on city centre fringes. Designers must think about what is already existing or risk losing valuable high-quality space in pursuit of climate adaptation – shown by Museumpark, where established meaningful space is being lost. Solutions without a direct surface level impact at could have been more appropriate here, utilising rooftops or underground layers – designers must continue to innovate. Perhaps solutions can be more experimental in quiet, disused space, where any improvement to climate adaptive function can be considered to generally improve PSQ. Dimensions have been shown to essentially produce each other, and so must be considered holistically. For example, strong accessibility enables activity, activity contributes to a comfortable inclusive space, and a more comfortable space can be better used therefore accruing meaning over time.

PSQ is subjective, and a balanced view must be taken "that recognises the multiple complex types, roles and audiences for public spaces in cities today". This research has found evidence to suggest climate adaptation strategy can have a positive impact across this spectrum (Carmona 2015).

## CONCLUSION

Overall, research has shown that innovative solutions generally improve overall PSQ across a spectrum of PS type and function in Rotterdam, based on the perspectives of their different audiences or users. It therefore finds support for claims that PS is an ideal interface for climate adaptation (Matos-Silva & Costa 2018, Peinhardt 2021).

It has shown that innovative solutions can be scaled and applied across different PS contexts, and that critically they must be socially and physically well-integrated with the surrounding built environment and appropriate to their context. General dimensions and important variables have been highlighted as key elements of high quality PSs, notably green and natural elements and capacity to support a range of activities, around which meanings develop.

The outcomes of this Rotterdam-based research clearly show a synergistic relationship - climate adaptation strategies can enhance PSQ and city liveability, and that PSQ in return enhances climate adaptive capacity, a very positive outlook for the future potential of WSUD. An early set of best practice ideas have been offered. However, this is based on limited research with a relatively small scope based a short time period and only one urban context. Further empirical research should continue to test more solutions across different contexts, to best develop best practice ideas and facilitate knowledge sharing. This will be increasingly useful and critical as more cities inevitably have to adapt to climate change.

**REFERENCES**


Adams, D. & S. Tiesdell (2013) *Shaping Places: Urban Planning, Design and Development* Abingdon Oxon: Routledge.

Adger, W. N. (2007) 'Assessment of Adaptation Practices, Options, Constraints and Capacity' in Parry, M. L., Canziani, O.F., Palutikof, J., van der Linden, P. J. & Hanson, C. E. (eds.) *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* Cambridge: Cambridge University Press pp.717-743.

Al, S. (2022) 'Multi-functional urban design approaches to manage floods: examples from Dutch cities' *Journal of Urban Design* 27(2) pp.270 278.

Albaum, G. & Smith, S. M. (2012) 'Chapter: Why People Agree to Participate in Surveys' in Gideon, L. (ed.) *Handbook of Survey* Methodology *for the Social Sciences* New York: Springer pp.179-193.

Barton, H. (2017) *City of Well-Being, a Radical Guide to Planning*. Abingdon Oxon.: Routledge.

Becker, H. S. (1998) Tricks of the Trade: How to Think About Your Research While You're Doing it Chicago: University of Chicago Press

Beebeejaun, Y. (2017) 'Gender, urban space, and the right to everyday life' *Journal of Urban Affairs* 39:3 pp.323-334.

Beebeejuan, Y. (2022) 'Race, Gender and Positionality in Urban Planning Research' *International Journal of Qualitative* Methods 21 pp.1-10.

Bell, S. (2015) 'Renegotiating urban water' *Progress in Planning* 96 pp.1-28.

Bichai, F. & Cabrera Flamini, A. (2017) 'The Water-Sensitive City: Implications of an urbanwater management paradigm and its globalization' *WIREs Water* 5(3) pp.1-9.

Bowen, G. (2009) 'Document Analysis as a Qualitative Research Method' *Qualitative Research Journal* 9 (2) pp.27-40.

Boyd, D. & Crawford, K. (2012) 'Critical questions for big data' *Information, Communication & Society* 15.pp/662–79.

Bravo, D. (2020) 'Water Square in Benthemplein, Rotterdam' Public Space.Org [online]. Available at: < https://www.publicspace.org/en/web/guest/works/-/project/h034-water-square-in-benthemplein>. [Accessed August 2022].

Brown, R. R., Keith, N. & Wong, T. (2009) 'Urban Water Management in Cities: Historical, Current and Future Regimes' *Water Science & Technology* 59(5) pp.847–855.

Buro Sant En Co (2015) 'Dakpark Rotterdam'. Available at: < https://www.santenco.nl/portfolio_page/dakpark/>. [Accessed June 2022].

Buurman, J. & Padawangi, R. (2018) 'Bringing people closer to water: integrating water management and urban infrastructure' *Journal of Environmental Planning and Management* 61(14) pp.2531-2548.

CABE (2006) *The Value Handbook, Getting the Most from Your Buildings and Spaces*. London: Commission for Architecture and the Built Environment.

Canter, D. (1977) *The Psychology of Place* London: Palgrave Macmillan.

Carmona, M. (2010) 'Contemporary Public Space, Part Two: Classification' *Journal of Urban Design* 15(2) pp.157-173.

Carmona, M. (2010) 'Contemporary Public Space: Critique and Classification, Part One: Critique' *Journal of Urban Design* 15(1) pp.123-148.
Carmona, M. (2014) 'The Place-shaping Continuum: A Theory of Urban Design Process' *Journal of Urban Design* 19(1) pp.2-36.

Carmona, M. (2015) ‘Re-theorising contemporary public space: a new narrative and a new normative’ *Journal of Urbanism: International Research on Placemaking and Urban Sustainability* 8(4) pp.373-405

Carmona, M. (2015) ‘Re-theorising contemporary public space: a new narrative and a new normative’ *Journal of Urbanism: International Research on Placemaking and Urban Sustainability* 8(4) pp.373-405.

Carmona, M. (2018) ‘Place value: place quality and its impact on heath, social, economic and environmental outcomes’ *Journal of Urban Design* 24(1) pp.1-48.

Carmona, M. (2019) ‘Principles for public space design, planning to do better’ Urban Design International 24 pp.47-59.

Carr, S., Francis, M., Rivlin, L. G. & Stone, A. M. (1992) *Public Space* Cambridge: Cambridge University Press pp.1-187.

Che, W., Zhao, Y., Yang, Y., Li, J. & Shi, M. (2014) ‘Integral Stormwater Management Master Plan and Design in an Ecological Community’ *Journal of Environmental Sciences* 26(9) pp.1818–1823.

Ciesielska, M., Boström, K. W. & Öhlander, M. (2018) ‘Chapter 2: Observation Methods’ in Ciesielska, M. & Jemielnak, D. (eds.) *Qualitative Methodologies in Organization Studies* London: Palgrave Macmillan pp.33-52.

Creswell, J. W. (2007). *Qualitative inquiry and research design: Choosing among five approaches* Thousand Oaks, CA: Sage.

De Graaf, R. & Van de Ven, F. (2012) ‘Chapter 15: Keys to Successful Transitioning: Lessons from the Netherlands and Japanese Water Delta Cities’ in Howe, C. & Mitchell, C. (eds.) *Water Sensitive Cities* London, New York: IWA Publishing pp.209-231.

De Jonge, D. (1967) ;Applied hodology’ *Landscape* 17(2) pp.10–11.

De Urbanisten (2013) 'Watersquare Benthemplein'. Available at: < https://www.urbanisten.nl/work/benthemplein>. [Accessed June 2022].

Doherty, J., Busch-Geertsma, V., Karpuskiene, V. & O'Sullivan, E. (2002) 'Homelessness and Exclusion: Regulating Public Space in European Cities' Surveillance & Society 5(3) pp.290-314.

Fletcher, T. D., Shuster, W., Hunt, W. F., Ashley, R., Butler, D., Arthur, D., Trowsdale, S., Barraud, S., Semadeni-Davies, A., Bertrand-Krajewski, A., Steen Mikkelsen, P., Rivard, G., Uhl, M., Dagenais, D. & Viklander, M. (2015) 'SUDS, LID, BMPs, WSUD and more – The evolution and application of terminology surrounding urban drainage' *Urban Water Journal* 12(7) pp.525-542.

Flyvbjerg, B. 'Five Misunderstandings About Case-Study Research' *Qualitative Inquiry* 12(2) pp.219-245.

Gehl, J. (1987) *Life Between Buildings: Using Public Space* New York: Van Nostrand Reinhold.

Gehl, J. & Gemzoe, L. (2001) *New City Spaces* Copenhagen: The Danish Architectural Press.

Gerring, J. & McDermott, R. (2007) 'An Experimental Template for Case Study Research' American Journal of Political Science 51(3) pp.688-701.

Groat, L. (2013) 'Chapter 7: Qualitative Research' & 'Chapter 12: Case Studies & Combined Strategies' in Groat, L. & Wang, D. *Architectural Research Methods* 2nd Edition New York: Wiley pp.215-263, 415-453.

Groat, L. & Wang, D. (2013) *Architectural Research Methods* New York: Wiley.

Gulick, J. (1998) 'The disappearance of public space: an ecological Marxist and Lefebvrian approach' in A. Light & J. Smith (eds.) *The Production of Public Space* Oxford: Rowan and Littlefield.

Gustafson, Porter + Bowman (2015) 'Museumpark, Rotterdam'. Available at: < http://www.gp-b.com/museumpark-rotterdam>. [Accessed July 2022].

Hall, E. (1992) *The hidden dimension* Gloucester, MA: Peter Smith Publishing

Hammarberg, K., Kirkman, M. & de Lacey, S. (2016) 'Qualitative research methods: when to use them and how to judge them' Human Reproduction 31(3) pp.498-501.

Harley, B. (2012) 'Chapter 11: Singapore's marina barrage and reservoir – changing mindsets in urban solutions' in Howe, C. & Mitchell, C. (eds.) *Water Sensitive Cities* London, New York: IWA Publishing pp.147-155.

Hays, P. A. (2003) 'Chapter 13: Case Study Research' in deMarrais, K. & Lapan, S. D. *Foundations for Research: Methods of Inquiry in Education and the Social Sciences* London, New Jersey: Lawrence Erlbaum Associates Publishers pp.217-235.

Hennink, M. M., Kaiser, B. N. & Marconi, V. C. (2017) 'Code Saturation Versus Meaning Saturation: How Many Interviews Are Enough?' *Qualitative Health Research* 27(4) pp.591-608.

Hoyer, J., Dickhaut, W. & Weber, B. (2011) *Water Sensitive Urban Design- Principles and Inspiration for Sustainable Stormwater Management in the City of the Future* Hamburg: Hafen City Universitat Publishers.

Hsiu-Fang, H. & Shannon, S. (2005) 'Three Approaches to Qualitative Content Analysis' *Qualitative Health Research* 15 pp.127-188.

Jacobs, J. 1961, 1984 edition. *The Death and Life of Great American Cities: The Failure of Modern Town Planning*. London: Peregrine Books.

Jacobs, J. C. J. (2012) 'Chapter 17: The Rotterdam Approach: connecting water with opportunities' in Howe, C. & Mitchell, C. (eds.) *Water Sensitive Cities* London, New York: IWA Publishing pp.251-265.

Johnstone, P., Adamowicz, R., de Haan, F. J., Ferguson, B. & Wong, T. (2012) 'Liveability and the Water Sensitive City - Science-Policy Partnership for Water Sensitive Cities' Melbourne, Australia: Cooperative Research Centre for Water Sensitive Cities.

Koprowska, K., Kronenberg, J., Kuzma, I. B. & Laszkiewicz, E. (2020) 'Condemned to green? Accessibility and attractiveness of urban green spaces to people experiencing homelessness' *Geoforum* 113 pp.1-13.

Lennon, M., Scott, M. & O'Neill, E. (2014) 'Urban Design and Adapting to Flood Risk: The Role of Green Infrastructure' Journal of Urban Design 19:5 pp.745-758.

Liao, K. H., Le, T. A. & Van Nguyen, K. (2016) 'Urban Design Principles for Flood Resilience: Learning from the Ecological Wisdom of Living with Floods in the Vietnamese Mekong Delta' *Landscape and Urban Planning* 155 pp.69–78.

Longhurst, R. (2010) 'Semi-Structured Interviews and Focus Groups' in Clifford, N., French, S. & Valentine, G. *Key Methods in Geography* London: SAGE pp.103-116.

Marlow, D. R., Moglia, M., Cook, S. & Beale, D. J. (2013) 'Towards Sustainable Urban Water Management: A Critical Reassessment' *Water Research* 47 (20) pp.7150–7161.

Maruthaveeran, S. & Konijnendijk van den Bosh, C. (2015) 'Fear of crime in urban parks – What the residents of Kuala Lumpur have to say" *Urban Forestry & Urban Greening* 14 pp.702-713.

Matos-Silva, M. & Costa J. P. (2018) 'Urban Floods and Climate Change Adaptation: The Potential of Public Space Design When Accommodating Natural Processes' *Water* 10 (2) pp.1-24.

Matos-Silva, M. & Costa, J. P. (2016) 'Flood Adaptation Measures Applicable in the Design of Urban Public Spaces: Proposal for a Conceptual Framework' *Water* 8(284) pp.1-26.

Mehta, V. (2014) 'Evaluating Public Space' *Journal of Urban Design* 19(1) pp.53-88.

Memarovic, N., Lagenheinrich, M., Alt, F., Elhart, I., Hosio, S., Rubgeni, E. (2012) 'Using public displays to stimulate passive engagement, active engagement, and discovery in public' *MAB '12: Proceedings of the 4th Media Architecture Biennale Conference: Participation* pp.55-64.

Molenaar, A. & Gebraad, C. (2014) 'Casestudy: Rotterdam resilient delta city connecting water and adaptation with opportunities' *International Journal of Water Governance* 1 pp.43-47.

Montgomery, J. (1998) 'Making a city: Urbanity, vitality and urban design' *Journal of Urban Design* 3(1) pp.93-116.

Moore, S. & Rodgers, S. (2020) 'Researching Urban Life Through Social Media' in Ward, K. (ed.) (2013) *Researching the City: A Guide for Students* Sage: Thousand Oaks, CA, USA.

Moser, S. (2008) 'Personality: A new positionality?' Area 40(3) pp.383–392.

O'Leary, Z. (2010) *The Essential Guide to Doing Your Research Project* Thousand Oaks, CA: SAGE Publications pp.263.

Palazzo, E. (2019) 'From water sensitive to floodable: defining adaptive urban design for water resilient cities' *Journal of Urban Design* 24(1) pp.137-157.
Paul De Ruiter Architects (2010) 'Museumpark: Climate proof parking'. Available at: <https://paulderuiter.nl/en/projects/museumpark/>. [Accessed June 2022].

Peinhardt, K. (2021) 'Resilience through placemaking: Public spaces in Rotterdam's climate adaptation approach: Discussion Paper, No. 1/2021' *Deutsches Institut für Entwicklungspolitik (DIE),* Bonn.
Praliya, S. & Garg, P. (2019) 'Public space quality evaluation: prerequisite for public space management' *The Journal of Public Space* 4(1) pp.93-126.

Project for Public Spaces (2013) 'What Makes a Successful Place?' Project for Public Spaces.Org [online]. Available at: < https://www.pps.org/article/grplacefeat#:~:text=In%20evaluating%20thousands%20of%20public,one%20where%20people%20meet%20each> [accessed June 2022].

Punter, J. (1991) 'Participation in the design of urban space' *Landscape Design* 200 pp.24-27.

Rosenberg, E. (2015) 'Water Infrastructure and Community Building: The Case of Marvin Gaye Park' Journal of Urban Design 20(2) pp.193-211.

Rotterdam Climate Adaptation Strategy (CAP) (2013). 'Rotterdam Climate Adaptation Strategy: Climate Proof' Rotterdam Climate Initiative, Geemente Rotterdam. Available at: < https://static1.squarespace.com/static/5f082078d610926644d22e00/t/621e3a61f6c1665ece53bf4d/1646148232693/UB_RAS_EN_lr.pdf.>. [Accessed June 2022].

Rotterdam Climate Proof Adaptation Programme (2014) 'Connecting Water With Opportunities' Rotterdam Climate Initiative, Geemente Rotterdam. Available at: < https://sdr.gdos.gov.pl/Documents/Wizyty/Belgia%20i%20Holandia/Program%20adaptacji%20do%20zmian%20klimatu%20w%20Rotterdamie.pdf>. [Accessed June 2022].

Rubin, I. S. & Rubin, H. J. (2011) *Qualitative Interviewing: The Art of Hearing Data* 3rd Edition Thousand Oaks, CA: SAGE Publications.

Seawright, J. & Gerring, J. (2008) 'Case Selection Techniques in Case Study Research: A Menu of Qualitative and Quantitative Options' Political Research Quarterly 61(2) pp.294-308.

Sharma, A., Begbie, D. & Gardner, T. (2019) *Approaches to Water Sensitive Urban Design: Potential, Design, Ecological Health, Urban Greening, Economics, Policies, and Community Perceptions* London: Elsevier Science.

Stake, R.E. (1998) 'Chapter 4: Qualitative Case Studies' in Denzin, N. & Lincoln, Y. *Strategies of Qualitative Inquiry* Thousands Oaks, CA: Sage pp.86-109.

Taylor, L., Leckey, E. H., Lead, P. J. & Hochuli, D. F. (2020) 'What visitors want from urban parks: diversity, utility, serendipity' *Frontiers in Environmental Science* 14 pp.1-12.

Taylor, L., Leckey, E.H., Lead, P.J. & Hochuli, D. F. (2020) 'What Visitors Want From Urban Parks: Diversity, Utility, Serendipity' *Frontiers in Environmental Science* 14 pp.1-12.

Ulrich, R. S., Simons, R. F., Losito, B. D., Fiorito, E., Miles, M. A., & Zelson, M. (1981) 'Stress recovery during exposure to natural and urban environments' Journal of Environmental Psychology 11 pp.201–230.

Van de Brugge, R. & De Graaf, R. (2010) 'Linking water policy innovation and urban renewal: the case of Rotterdam, The Netherlands' Water Policy 12(10) pp.21-66.

Van Loon-Steensma, J. M. & P. Vellinga (2014) 'Robust, Multifunctional Flood Defences in the Dutch Rural Riverine Area' *Natural Hazards and Earth System Sciences* 14(5) pp.1085–1098.

White, I. (2008) 'The Absorbent City: Urban form and Flood Risk Management' *Proceedings of the ICE— Urban Design Planning* 161(4) pp.151–161.

White, M., Smith, A., Humphryes, K., Pahl ,S., Snelling, D. & Depledge, M. (2010) 'Blue Space: The Importance of Water for Preference, Affect, and Restorative Ratings of Natural and Built Scenes' *Journal of Environmental Psychology* 30(4) pp.482–493.

Wong, T. (2006) 'Water Sensitive Urban Design - The Journey Thus Far' *Australian Journal of Water Resources* 10(3) pp.213–222.

Wong, T. & Brown, R. (2009) The Water Sensitive City: Principles for Practice' Water Science and Technology 60(3) pp.673-682.

Worpole, K. & Knox, K. (2007) *The Social Value of Public Spaces* York: Joseph Rowntree Foundation.

Worpole, K. & Knox, K. (2008) *The Social Value of Public Spaces* New York: Joseph Rowntree Foundation Publishers.

Yin, R. K. (1994) *Case Study Research Design and Methods: Applied Social Research and Methods Series* 2nd Edition Thousand Oaks, CA: Sage Publications Inc.

Yin, R. K. (2018) *Case Study Research and Applications: Design and Methods 6th Edition* Thousand Oaks, CA: Sage Publication Inc.

Zeller, F. (2017) ‘Analysing social media data and other data sources: a methodological overview’ in Sloan, L. & Quan-Haase, A. (eds) *The SAGE Handbook of Social Media Research* Methods London: Sage. pp.386–404.

# APPENDICES

**Appendix 1 - INTERVIEW GUIDE QUESTIONS + EXPLANATION OF FORMATION**
Questions were formed to access user perspectives/insights of dimensions of PSQ which are not easy to observe. Forming a list of observable data for each dimension revealed gaps in ability to collect information included in the analysis framework, which interview questions could then be designed to fill in – they roughly guided conversations, more questions were asked to follow up on relevant issues raised by each interviewee/to test insights emerging at each PS. Corresponding PSQ dimension is shown under each question.

**OBSERVABLE DATA** – physical evidence

**ACTIVITY AND USES**
-range/types of activity through different times of day
-empty spaces – as whole or parts more used/not
-sub-spaces – choice and diversity of space for different uses
-different features/amenities e.g. sports courts, benches for passive engagement.

**COMFORT**
-good first impression – clean, attractive, atmosphere
-arrangement/availability of benches/sitting spaces – microclimates, arrangements, type
-are there green, water + natural elements
-noise levels
-separation/balance with traffic

**ACCESSIBILITY**
-locked/blocked off areas
-is interior visible from exterior – blocked by buildings, or connected well to buildings and wider urban fabric
-is space easy to find – clear routes + signage into place, multiple access points - permeability
-close to transport links to reach it
-potential physical barriers e.g. steps, uneven surfaces – think of mobility needs

**INCLUSIVENESS AND MEANING**
-balance of people seen using space – men/women, elderly and children, mix of ethnicities, groups of people vs people alone
-if people seem to know each other/are greeting each other
-conversations, interactions evidencing social relationships

**SAFETY**
-presence of security operatives or surveillance
-maintenance – evidence of physical condition e.g. broken elements
-visual and physical permeability

**STIMULATION**
-are people enjoying the space or passing through without really engaging – are they stopping to look at things, using features, taking photos etc., watching others

**INTERVIEW QUESTIONS:**

- Do you live nearby?
  -meaning, typical user profile, activities
- How often do you come here?
  -meaning, activities/use
- What do you come here for?
  -activities and uses, meaning
- What do you like about the space?
  -comfort, activities + uses, stimulating
- How do you feel here?
  -comfort, inclusiveness, safety, stimulating
- Are there any problems here? How do you think it could be improved, or what is missing?
  -safety, meaning, comfort

**Appendix 2 – TABLE OF INTERVIEWEES**

| Code | Location | Description |
|---|---|---|
| WB1 | Watersquare Benthemplein | Male, white, 60+, local resident vising square for 30+ years |
| MP1 | Museumpark | Female, white, 70+, local, visiting Museum |
| MP2 | | Male, white, 40-50, local, on day off work |
| MP3 | | Female, white, 50-60, local, musician performing at the art depot |
| MP4 | | Female, black, 20-30, from Berlin living in Rotterdam, meeting friends |
| MP5 | | Male, black, 20-30, local, meeting friends |
| MP6 | | Male, mixed, 20-30, from The Hague, meeting friends |
| MP7 | | Female, Asian, 18-25, visiting from US |
| MP8 | | Female, white, 40-50, visiting from Amsterdam – housesitting for brother |
| MP9 | | Female, white, 20-30, visiting from UK |
| MP10 | | Male, white, 60+, Construction Engineer involved with planning and delivery of Bojimans Art Depot building |
| MP11 | | Female, white, 60+, looking after grandchild |
| MP12 | | Male, white, 18-25, student having picnic |
| MP13 | | Female, Asian,18-25, student having picnic |
| MP14 | | Female, mixed, 18-25, meeting friend for takeaway dinner |
| MP15 | | Female, white, 18-25, meeting friend for takeaway dinner |
| MP16 | | Female, black, 18-25, local, out with friend |
| MP17 | | Female, white, 18-25, visiting friend from Paris |
| MP18 | | Female, white, 50-60, local |
| MP19 | | Male, white, 18-25, visiting from London |
| MP20 | | Male, white, 18-25, visiting from London |
| MP21 | | Female, 50-60, visiting from Austria |
| DP1 | Dakpark | Female, white, 18-25, local, babysitting |
| DP2 | | Male, white, 40-50, local, photographer |
| DP3 | | Male, white, 50-60, local |
| DP4 | | Male, white, 18-25, student in park studying with housemate |
| DP5 | | Male, black, 18-25, student in park studying with housemate |
| DP6 | | Female, white, 30-40, mother at fountain with two children |
| DP7 | | Male, white, 25-30, having BBQ with girlfriend |
| DP8 | | Female, white, 25-30, having BBQ with girlfriend |
| DP9 | | Female, white, 30-40, Green Party member of Schiedam government |
| DP10 | | Female, black, 18-25, local, setting up birthday party |
| DP11 | | Female, black, 18-25 local, setting up birthday party |
| DP12 | | Female, black, 30-40 local, setting up birthday party |
| DP13 | | Male, white, 40-50, visiting, at water feature with son |
| DP14 | | Female, white, 30-40, mother at water feature with son |
| WS1 | Westersingel | Female, white, 18-35, local, reading/waiting for friend |
| WS2 | | Male, white 25-30, local, skating |
| WS3 | | Male, white, 60+, visiting from elsewhere in Netherlands, looking at sculptures |
| WS4 | | Female, white, 60+, visiting from elsewhere in Netherlands, looking at sculptures |
| WS5 | | Female, white, 18-25, travelling Europe |
| WS6 | Westersingel | Male, mixed, 30-40, local on lunch break, office nearby |

| | | |
|---|---|---|
| WS7 | | Female, white, 30-40, local, volunteers/attends church on Westersingel |
| WS8 | | Male, Asian, 40-50, local, walking dog |
| WS9 | | Female, white, 25-30, recently moved to Rotterdam from Milan |
| WS10 | | Male, white, 18-25, local, eating on bench before work nearby |

**APPENDIX 3 – SUMMARY OBSERVATION TABLES**

| Dimension | Observed variable comments |
|---|---|
| **Activities and uses** | |
| Observed activities | -exercise: group yoga class, running/walking, cyclists, boxers, people using steps for training, ball games<br>-'De Buurtcamp' Dutch urban community camping event<br>-outdoor eating – picnics, BBQ. Families, individuals, group of Muslim women with large cool boxes and friends who kept arriving to join them.<br>-day care/summer camp groups of supervised children<br>-play<br>-photography |
| Suitability of layout | -people walking through with supermarket bags, wearing work uniforms etc.<br>-sunbathing/lounging<br>-reading<br>-all enabled by large surface size of park + sub-spaces formed by planting and pathways:<br>-large central path sees main flow of activity<br>-busy water features part of this main path in active area<br>-open grass plains in central area<br>-smaller, criss-crossing paths create smaller quieter spaces around peripheries with more trees etc. more conducive for relaxation |
| **Comfort** | |
| Physical indicators | -variety of sitting spaces – picnic benches, walls, standard benches, grass<br>-most benches in middle of wide path – good for observing from, however in full sun, no benches around water feature for passive engagement<br>-excessive provision of litter bins – standard bins then lots of wheelie bins<br>-no public toilet/drinking water outlet – inside café<br>-design creates more secluded intimate spaces where people were lounging/relaxing<br>-high noise levels – from port, nearby police station sirens, children<br>-café, local Surinamese drinks/snacks portable stand being pushed around |
| **Accessibility** | |
| Availability | -entire park is closed at 9pm, all gates locked<br>-sub-spaces including community garden and children's playground remained locked for duration of fieldwork period |
| Physical access | -multiple access points evenly distributed along length of park, intersecting with existing routes into residential area<br>-lots of steps but provide ramps/sloping pathways alongside them, main entrance/exit at ends of park ramps<br>-wide even smooth paths |
| Linkages/connections | -good visual permeability from/to residential area and within park itself<br>-less than two minute walk to Marconiplein tram/tube/bus stop<br>-people who come to use the shops/parking garage underneath move through park |
| **Inclusiveness** | -ethnically diverse users<br>-multiple users on mobility scooters, with prams, blind woman<br>-groups of men particularly at edges + evidence of homelessness, drug and alcohol use – threatening to some<br>-high presence of women and children<br>-children dominate water features through play – off-putting to some |

| | |
|---|---|
| **Meaning** | -supportive of community/family/friend gatherings<br>-water feature as strong centre for both seemingly spontaneous social interactions and planned gatherings, people arriving to meet friends and sitting together<br>-people walking/cycling through greeting each other, bumping into people they know |
| **Safety** | -lively atmosphere and passive surveillance due to activity<br>-entirely separated from traffic, above major road<br>-well maintained – gardeners, bin people<br>-police circling on bicycles – seen twice |
| **Stimulation** | -diversity of spaces e.g. Mediterranean Garden<br>-only notable/interesting landscape feature = water fountain/steps<br>-boring planting scheme – neatly arranged/evenly distributed monoculture of trees, vast majority of park covered in grass<br>-good views + viewing platforms to accommodate them – over to port, rooftop location cool |

**WESTERSINGEL:**

| **Dimension** | **Observed variable comments** |
|---|---|
| **Activities and uses** | |
| Observed activities | -very popular spot for smoking weed – people alone/in small groups<br>-people taking breaks – eating, on phones, reading, listening to music<br>-dog walking – same people on different days/times, must live nearby<br>-people looking at sculptures – families, couples, 4 x walking tours of 20+ people<br>-lots of people just walking through, particularly noticeable = groups of people perhaps colleagues going to lunch<br>-homeless people sleeping<br>-lots of people waiting with luggage – very close to Centraal Station and tram stops<br>-skating |
| Suitability of layout | -small inflexible space – doesn't support any activities really other than resting/breaks<br>-no sub-spaces |
| **Comfort** | |
| Physical indicators | -benches all of the same type and arranged in one long line – all facing same way, not ideal for socialising/people in groups, under line of trees, means all in sun/shade at same time<br>-pleasant/relaxing to be near water. Quite a lot of birds to watch – ducks, swans, cygnets.<br>-noise of traffic but cannot really see it/feel threatened by it – can see trams passing but that is quite interesting<br>-people approaching others to ask for lighters money etc. cannot relax<br>-litter including drug paraphernalia, algae, dog poo. |
| **Accessibility** | |
| Availability | -always available – |
| Physical access | -only accessible via steps at each end or over a bridge, does not connect to another bridge to allow use as a route, but to access bridge have to cross tram tracks and grass – watched one lady in wheelchair try and give up |
| Linkages/connections | -good visual permeability – busy active space |

| | |
|---|---|
| **Inclusiveness** | -more men than women, not many children, few old people<br>-young people smoking and playing music, others avoided sitting near them<br>-strong presence of homeless people may be perceived as threatening |
| **Meaning** | -see spontaneous social interactions – might develop /<br>-most people alone, groups are passing through/past rather than stopping |
| **Safety** | -separates people from traffic<br>-high passive surveillance given busy location + visual permeability<br>-threat – homeless people/drug users?<br>-security enforcement team – telling skaters to move on |
| **Stimulation** | -sculptures – all very similar to each other?<br>-busy street scene good for passive engagement<br>-can see all of terrace all at once, no sub-spaces<br>-no range of planting, textures – quite a big space but all looks the same – boring |

**MUSEUMPARK:**

| **Dimension** | **Observed variable comments** |
|---|---|
| **Activities and uses** | |
| Observed activities | -mainly people taking breaks in before going in/out of museums – eating, drinking, waiting for or meeting friends<br>-reading, phone calls<br>-playing with reflections/taking selfies in exterior mirrors of BVB<br>-loads of tours: cycling tours, Segway, walking<br>-skate area locked off – under construction<br>-passive engagement opps high<br>-dog walkers |
| Suitability of layout | -no sub-spaces really – Skateplein closed |
| **Comfort** | |
| Physical indicators | -mix of grass, ample benches and low walls for sitting on, across sun and shade<br>-very green car free space, lots of water around<br>-lots of people smoking marijuana – dominating? Playing loud music<br>-peaceful<br>-can use toilets/café in museums<br>-private spaces further down/away in park |
| **Accessibility** | |
| Availability | -always available |
| Physical access | -always ramps where there are steps, but construction creating lots of obstacles and uneven surfaces |
| Linkages/connections | |

| | |
|---|---|
| | -city centre location – walkable, has own tram stop, good bike storage |
| **Inclusiveness** | -great balance of people – young and old, men and women, friends, families, locals and tourists<br>-friendly welcoming atmosphere<br>-people in wheelchairs, mobility scooters |
| **Meaning** | -so many types of social relationship visible<br>-loads of spontaneous interactions e.g. taking pictures for each other |
| **Safety** | -no traffic<br>-very active dynamic visually permeable space<br>-safety hazards due to construction e.g. machinery – not closed off? |
| **Stimulation** | -different sub-spaces e.g. Het Nieuwe Instituut and surrounding aquatic environment, greenery around Bojimans<br>-amazing views – loads of features, textures, cool planting, mirror<br>-Bojimans like artwork in itself – everyone stopping to interact with it |

**APPRVED RISK ASSESSMENT + ETHICS FORM**

Supervisor sign-off for Ethical Clearance Forms and Risk Assessment Forms

*(For supervisor completion only BEFORE submission via Moodle)*

Are you satisfied with the **ethical clearance form** (*yes/no*)? YES

| Please provide any additional comments about the form that may help the student.<br>***(If the form is missing, the proposal must be given a mark of 0, and the student will have 48hours to resubmit the complete proposal. If the form is unsatisfactory, the student must amend their ethical questionnaire to your satisfaction before they can proceed with their research)*** |
|---|

Are you satisfied with the **risk assessment form** (*yes/no*)? YES

| Please provide any additional comments about the form that may help the student.<br>***(If the form is missing, the proposal must be given a mark of 0, and the student will have 48hours to resubmit the complete proposal. If the form is unsatisfactory, the student must amend their ethical questionnaire to your satisfaction before they can proceed with their research)*** |
|---|

**Note: this is a copy of the proforma that each student MUST complete and submit directly on Moodle. Please reproduce your submission here for the purpose of your supervisor signing off on its review and approval.**

# Ethical Clearance Pro Forma

It is important for you to include all relevant information about your research in this form, so that your supervisor can give you the best advice on how to proceed with your research.

You are advised to read though the relevant sections of UCL's Research Integrity guidance to learn more about your ethical obligations.

## Submission Details

1. **Name of programme of study:**
   Urban Design & City Planning

2. **Please indicate the type of research work you are doing (Delete that which do not apply):**
   - Dissertation in Planning (MSc)

3. **Please provide the current working title of your research:**
   Improving urban public space quality whilst enhancing urban flood resilience and adaptability: A study of innovative urban water management in Rotterdam

4. **Please indicate your supervisor's name:**
   Dr Babar Durmaz-Drinkwater

## Research Details

5. **Please indicate here which data collection methods you expect to use. (Tick all that apply/or delete those which do not apply.)**

- Interviews
- Questionnaires (including oral questions)
- Observation / participant observation
- Audio-visual recordings (including photographs)
- Secondary data analysis

6. **Please indicate where your research will take place (delete that which does not apply):**
   - UK and Overseas

7. **Does your project involve the recruitment of participants?**
   'Participants' means human participants and their data (including sensor/locational data and observational notes/images.)

   Yes

## Appropriate Safeguard, Data Storage and Security

8. **Will your research involve the collection and/or use of personal data?**

Personal data is data which relates to a living individual who can be identified from that data or from the data and other information that is either currently held, or will be held by the data controller (you, as the researcher).

This includes:

- Any expression of opinion about the individual and any intentions of the data controller or any other person toward the individual.
- Sensor, location or visual data which may reveal information that enables the identification of a face, address etc. (some post codes cover only one property).
- Combinations of data which may reveal identifiable data, such as names, email/postal addresses, date of birth, ethnicity, descriptions of health diagnosis or conditions, computer IP address (of relating to a device with a single user).

No

**9. Is your research using or collecting:**

- special category data as defined by the General Data Protection Regulation*, and/or
- data which might be considered sensitive in some countries, cultures or contexts?

*Examples of special category data are data:

- which reveals racial or ethnic origin, political opinions, religious or philosophical beliefs, trade union membership;
- concerning health (the physical or mental health of a person, including the provision of health care services);
- concerning sex life or sexual orientation;
- genetic or biometric data processed to uniquely identify a natural person.

No

**10. Do you confirm that all personal data will be stored and processed in compliance with the General Data Protection Regulation (GDPR 2018)? (Choose one only, delete that which does not apply)**

- I will not be working with any personal data

**11. I confirm that:**

- The information in this form is accurate to the best of my knowledge.
- I will continue to reflect on and update these ethical considerations in consultation with my supervisor.

Yes

# RISK ASSESSMENT FORM
# FIELD / LOCATION WORK

**DEPARTMENT/SECTION: BARTLETT SCHOOL OF PLANNING**

**LOCATION(S):** Rotterdam, Netherlands

**PERSONS COVERED BY THE RISK ASSESSMENT:** Amy Jones

**BRIEF DESCRIPTION OF FIELDWORK (including geographic location):** Collecting primary data using methods to be confirmed – likely interviews, surveys, observations, visual recordings. These will be carried out across multiple public open locations in city of Rotterdam.

**COVID-19 RELATED GENERIC RISK ASSESSMENT STATEMENT**:

Coronavirus disease (COVID-19) is an infectious disease caused by coronavirus SARS-CoV-2. The virus spreads primarily through droplets of saliva or discharge from the nose when an infected person coughs or sneezes. Droplets fall on people in the vicinity and can be directly inhaled or picked up on the hands and transferred when someone touches their face. This risk assessment documents key risks associated fieldwork during a pandemic, but it is not exhaustive and will not be able to cover all known risks, globally. This assessment outlines principles adopted by UCL at an institutional level and it is necessarily general. Please use the open text box 'Other' to indicate any contingent risk factors and control measures you might encounter during the course of your dissertation research and writing.

Please refer to the Dissertation in Planning Guidance Document (available on Moodle) to help you complete this form.

**Hazard 1: Risk of Covid -19 infection during research related travel and research related interactions with others (when face-to-face is possible and/or unavoidable)**

**Risk Level - Medium /Moderate**

**Existing Advisable Control Measures**: Do not travel if you are unwell, particularly if you have COVID-19 symptoms. Self-isolate in line with NHS (or country-specific) guidance.

Avoid travelling and face-to-face interactions; if you need to travel and meet with others:

- If possible, avoid using public transport and cycle or walk instead.
- If you need to use public transport travel in off-peak times and follow transport provider's and governmental guidelines.
- Maintain (2 metre) social distancing where possible and where 2 metre social distancing is not achievable, wear face covering.
- Wear face covering at all times in enclosed or indoor spaces.
- Use hand sanitiser prior to and after journey.
- Avoid consuming food or drinks, if possible, during journey.
- Avoid, if possible, interchanges when travelling - choose direct route.
- Face away from other persons. If you have to face a person ensure that the duration is as short as possible.
- Do not share any items i.e. stationary, tablets, laptops etc. If items need to be shared use disinfectant wipes to disinfect items prior to and after sharing.

- If meeting in a group for research purposes ensure you are following current country specific guidance on face-to-face meetings (i.e rule of 6 etc.)
- If and when possible meet outside and when not possible meet in venues with good ventilation (e.g. open a window)
- If you feel unwell during or after a meeting with others, inform others you have interacted with, self-isolate and get tested for Covid-19
- Avoid high noise areas as this mean the need to shout which increases risk of aerosol transmission

of the virus.

- Follow one way circulation systems, if in place. Make sure to check before you visit a building.
- Always read and follow the visitors policy for the organisation you will be visiting.
- Flush toilets with toilet lid closed.
-'Other' Control Measures you will take (specify): three doses of Covid-19 vaccine

**NOTE: The hazards and existing control measures above pertain to Covid-19 infection risks only. More generalised health and safety risk may exist due to remote field work activities and these are outlined in your Dissertation in Planning Guidance document. Please consider these as possible 'risk' factors in completing the remainder of this standard form. For more information also see: Guidance Framework for Fieldwork in Taught and MRes Programmes, 2021-22**

Consider, in turn, each hazard (white on black). If **NO** hazard exists select **NO** and move to next hazard section.
If a hazard does exist select **YES** and assess the risks that could arise from that hazard in the risk assessment box.
**Where risks are identified that are not adequately controlled they must be brought to the attention of your Departmental Management who should put temporary control measures in place or stop the work. Detail such risks in the final section.**

| **ENVIRONMENT** | **The environment always represents a safety hazard. Use space below to identify and assess any risks associated with this hazard** |
|---|---|
| *e.g. location, climate, terrain, neighbourhood, in outside organizations, pollution, animals.* | Adverse weather – low<br>Getting lost – low<br>Assault – low<br>Dangers of working in busy city e.g. injury through crossing roads – low |

| **CONTROL MEASURES** | **Indicate which procedures are in place to control the identified risk** |
|---|---|
| X | work abroad incorporates Foreign Office advice |
| | only accredited centres are used for rural field work |
| X | participants will wear appropriate clothing and footwear for the specified environment |
| X | refuge is available |
| | work in outside organisations is subject to their having satisfactory H&S procedures in place |
| X | OTHER CONTROL MEASURES: please specify any other control measures you have implemented:<br>-Carrying appropriate weather protection and whistle |

| | |
|---|---|
| | -live sharing location and carrying GPS connected device<br>-studying/familiarising self with case study environments and locations, planning routes and secondary routes<br>-conducting research in public, safe, accessible, non-secluded central locations during daylight hours<br>-researching and avoiding 'unpleasant' areas<br>-following local safety guidelines and measures e.g. using road/cycle path crossings |

| **EMERGENCIES** | **Where emergencies may arise use space below to identify and assess any risks** |
|---|---|
| *e.g. fire, accidents* | Loss of valuable property – low risk<br>Severe injury, fire, accidents, loss of life – low risk |

| **CONTROL MEASURES** | **Indicate which procedures are in place to control the identified risk** |
|---|---|
| X | participants have registered with LOCATE at http://www.fco.gov.uk/en/travel-and-living-abroad/ |
| X | contact numbers for emergency services are known to all participants |
| X | participants have means of contacting emergency services |
| | a plan for rescue has been formulated, all parties understand the procedure |
| | the plan for rescue /emergency has a reciprocal element |
| X | OTHER CONTROL MEASURES: please specify any other control measures you have implemented:<br>-leaving valuable property in safe rather than carrying it<br>-storing emergency contact numbers including hotel/accommodation in phone and on paper<br>-live sharing location<br>-travel insurance |

**FIELDWORK 1** March 2022

| **EQUIPMENT** | **Is equipment used?** | **YES** | **If 'No' move to next hazard**<br>**If 'Yes' use space below to identify and assess any risks** |
|---|---|---|---|
| *e.g. clothing, outboard motors.* | Mobile phone – for recording audio and visual data – potential for failures or loss - low risk<br>Paper copies containing collected data being damaged or lost – low risk | | |

| **CONTROL MEASURES** | **Indicate which procedures are in place to control the identified risk** |
|---|---|
| | the departmental written Arrangement for equipment is followed |
| | participants have been provided with any necessary equipment appropriate for the work |
| X | all equipment has been inspected, before issue, by a competent person |
| X | all users have been advised of correct use |

| | |
|---|---|
| | special equipment is only issued to persons trained in its use by a competent person |
| X | OTHER CONTROL MEASURES: please specify any other control measures you have implemented:<br>-Carrying appropriate bag to safely contain all necessary equipment, food and water and keep it dry<br>-carrying umbrella, portable phone charger, and a back-up recording device in case of phone issues<br>-making online back-ups<br>-printing back-up paper copies in advance |

| **LONE WORKING** | **Is lone working a possibility?** | **YES** | **If 'No' move to next hazard**<br>**If 'Yes' use space below to identify and assess any risks** |
|---|---|---|---|
| *e.g. alone or in isolation*<br>*lone interviews.* | Difficult to summon help – low<br>Risk of abuse or attack – low<br>Risks to personal safety at hotel/accomodation – low | | |

| **CONTROL MEASURES** | **Indicate which procedures are in place to control the identified risk** |
|---|---|
| | the departmental written Arrangement for lone/out of hours working for field work is followed |
| | lone or isolated working is not allowed |
| X | location, route and expected time of return of lone workers is logged daily before work commences |
| X | all workers have the means of raising an alarm in the event of an emergency, e.g. phone, flare, whistle |
| X | all workers are fully familiar with emergency procedures |
| X | OTHER CONTROL MEASURES: please specify any other control measures you have implemented:<br>-carrying UCL ID and UK driving license for identification<br>-low language barrier<br>-carrying mobile phone and a personal alarm e.g. whistle<br>-saving and storing emergency contact numbers<br>-instigating a 'check in' system making regular contact with a key person<br>-sharing location and timing plans with contacts including hotel/accommodation and people at home, specifying dates/times of departure and return<br>-leave details of field site and a work plan<br>-being accompanied by family member<br>-working in public non-secluded places, keeping to well-lit busy routes, planning journeys in advance, dressing appropriately<br>-selectively approaching individuals perceived as low risk and trusting intuition, removing self from places/situations where I feel uneasy<br>-not sharing details of room/accommodation, not allowing other people into room/going to others' rooms |

| **ILL HEALTH** | **The possibility of ill health always represents a safety hazard. Use space below to identify and assess any risks associated with this Hazard.** |
|---|---|
| *e.g. accident, illness, personal attack, special personal considerations or vulnerabilities.* | Illness – low<br>Fatigue leading to lack of concentration/accidents – low<br>Personal attack - low |

| **CONTROL MEASURES** | **Indicate which procedures are in place to control the identified risk** |
|---|---|
| X | all participants have had the necessary inoculations/ carry appropriate prophylactics |
| X | participants have been advised of the physical demands of the research and are deemed to be physically suited |
| | participants have been adequate advice on harmful plants, animals and substances they may encounter |
| | participants who require medication should carry sufficient medication for their needs |
| X | OTHER CONTROL MEASURES: please specify any other control measures you have implemented:<br>-working in a country with low language barrier to help communication and avoid scenarios that may provoke personal attack<br>-carrying a whistle to attract attention in case of attack<br>-working in a city with a low crime rate generally recognised as safe<br>-taking rests and ensuring sufficient sleep to avoid fatigue |

| **TRANSPORT** | **Will transport be required** | **NO** | | **Move to next hazard** |
|---|---|---|---|---|
| | | **YES** | **X** | **Use space below to identify and assess any risks** |
| *e.g. hired vehicles* | Accidents arising from lack of maintenance or poor operation - low | | | |

| **CONTROL MEASURES** | **Indicate which procedures are in place to control the identified risk** |
|---|---|
| X | only public transport will be used |
| | the vehicle will be hired from a reputable supplier |
| | transport must be properly maintained in compliance with relevant national regulations |
| | drivers comply with UCL Policy on Drivers<br>http://www.ucl.ac.uk/hr/docs/college_drivers.php |
| | drivers have been trained and hold the appropriate licence |
| | there will be more than one driver to prevent driver/operator fatigue, and there will be adequate rest periods |
| | sufficient spare parts carried to meet foreseeable emergencies |
| | OTHER CONTROL MEASURES: please specify any other control measures you have implemented: |

| DEALING WITH THE PUBLIC | Will people be dealing with public | YES | If 'No' move to next hazard<br>If 'Yes' use space below to identify and assess any risks |
|---|---|---|---|
| *e.g. interviews, observing* | Personal attack – medium<br>Causing offence and being misinterpreted leading to unexpected behaviour - low | | |

| CONTROL MEASURES | Indicate which procedures are in place to control the identified risk |
|---|---|
| X | all participants are trained in interviewing techniques |
| | advice and support from local groups has been sought |
| X | participants do not wear clothes that might cause offence or attract unwanted attention |
| X | interviews are conducted at neutral locations or where neither party could be at risk |
| | OTHER CONTROL MEASURES: please specify any other control measures you have implemented:<br>-carry UCL ID card and personal alarm e.g. whistle<br>-Seeking consent and approaching members of the public carefully, informing them how much of their time questions will take<br>-not asking personal or controversial/provocative questions, dressing appropriately, not reacting negatively to surroundings or response<br>-if unexpected behaviours emerge, remain calm, speak gently, do not react with aggression/argument verbally or through body language<br>-low language barrier location<br>-conducting research in neutral outdoor public places where there will be other people<br>-prepare reasons/routes to leave in case of feeling uneasy/threatened |



| WORKING ON OR NEAR WATER | Will people work on or near water? | YES | If 'No' move to next hazard<br>If 'Yes' use space below to identify and assess any risks |
|---|---|---|---|
| *e.g. rivers, marshland, sea.* | Water borne/spread diseases – low<br>Drowning - low | | |

| CONTROL MEASURES | Indicate which procedures are in place to control the identified risk |
|---|---|
| | lone working on or near water will not be allowed |
| | coastguard information is understood; all work takes place outside those times when tides could prove a threat |
| X | all participants are competent swimmers |

| | |
|---|---|
| | participants always wear adequate protective equipment, e.g. buoyancy aids, wellingtons |
| | boat is operated by a competent person |
| | all boats are equipped with an alternative means of propulsion e.g. oars |
| X | participants have received any appropriate inoculations |
| X | OTHER CONTROL MEASURES: please specify any other control measures you have implemented: -working only near small, shallow, clean bodies of water in public spaces |

| **MANUAL HANDLING (MH)** | **Do MH activities take place?** | **NO** | **If 'No' move to next hazard**<br>**If 'Yes' use space below to identify and assess any risks** |
|---|---|---|---|
| *e.g. lifting, carrying, moving large or heavy equipment, physical unsuitability for the task.* | | | |

| **CONTROL MEASURES** | **Indicate which procedures are in place to control the identified risk** |
|---|---|

| | |
|---|---|
| | the departmental written Arrangement for MH is followed |
| | the supervisor has attended a MH risk assessment course |
| | all tasks are within reasonable limits, persons physically unsuited to the MH task are prohibited from such activities |
| | all persons performing MH tasks are adequately trained |
| | equipment components will be assembled on site |
| | any MH task outside the competence of staff will be done by contractors |
| | OTHER CONTROL MEASURES: please specify any other control measures you have implemented: |



| **SUBSTANCES** | **Will participants work with substances** | **NO** | **If 'No' move to next hazard**<br>**If 'Yes' use space below to identify and assess any risks** |
|---|---|---|---|
| *e.g. plants, chemical, biohazard, waste* | | | |

| **CONTROL MEASURES** | **Indicate which procedures are in place to control the identified risk** |
|---|---|

| | |
|---|---|
| | the departmental written Arrangements for dealing with hazardous substances and waste are followed |
| | all participants are given information, training and protective equipment for hazardous substances they may encounter |

| | |
|---|---|
| | participants who have allergies have advised the leader of this and carry sufficient medication for their needs |
| | waste is disposed of in a responsible manner |
| | suitable containers are provided for hazardous waste |
| | OTHER CONTROL MEASURES: please specify any other control measures you have implemented: |

| **OTHER HAZARDS** | **Have you identified any other hazards?** | **NO** | **If 'No' move to next section**<br>**If 'Yes' use space below to identify and assess any risks** |
|---|---|---|---|
| *i.e. any other hazards must be noted and assessed here.* | Hazard:<br>Risk: | | |

| **CONTROL MEASURES** | **Give details of control measures in place to control the identified risks** |
|---|---|
| | |

| | | | |
|---|---|---|---|
| **Have you identified any risks that are not adequately controlled?** | **NO** | **X** | **Move to Declaration** |
| | **YES** | | **Use space below to identify the risk and what action was taken** |

| **DECLARATION** | The work will be reassessed whenever there is a significant change and at least annually. Those participating in the work have read the assessment. |
|---|---|

Select the appropriate statement:

| | |
|---|---|
| x | I the undersigned have assessed the activity and associated risks and declare that there is no significant residual risk |
| **X** | I the undersigned have assessed the activity and associated risks and declare that the risk will be controlled by the method(s) listed above |

NAME OF SUPERVISOR **S.BAHAR DURMAZ DRINKWATER**

# BPLN0039_SBKR3

GRADEMARK REPORT

FINAL GRADE

/100

GENERAL COMMENTS

**Instructor**

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