
A Performative Approach to Geodesign: Conceiving Open Space in a Highly Polluted Beijing

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Abstract

Geo-design aims to expand GIS driven planning methodologies by offering new opportunity for creative solutions within geographic frameworks. How design fits within this ‘new’ framework however remains unclear. This paper argues that adopting a more performative approach to geo-design offers a valuable conceptual framing for engaging these diverse perspectives. Guided by a performative framing, design is no longer conceived as subjective or intuitive but instead as an engagement with creative forces and pragmatic criteria. Similarly GIS methodologies shift from a focus on optimization and ‘best fit’ to be instead shaped by a more explicit intent expressed at the beginning of the process. Further a performative approach offers a useful lens for engaging with the challenging dilemmas of the urban environment.

This paper will demonstrate the opportunities offered by a performative approach to urban space through a speculative project that engages with the planning and design of open space in highly polluted Beijing. Within this project, pollution minimization forms the major performance criteria, operating as the lens for engaging with analysis and form generation. Through the interrogation of a range of 2 and 3-dimensional data, crossing multiple geographic and temporal scales, the project reveals new scenarios for the siting and configuration of open space (including relationships to surrounding built form), together with generative design concepts for the park.

1 From Optimisation to Performance

Current proposals for the integration of design practice with geographic sciences focus predominantly on the development of ‘sketching’ capabilities, either as the application of hand drawings or the ability to sketch within specific software (DANGERMOND 2010). Whilst integrated sketching may provide a further representational technique, it does not address more pressing conceptual questions concerning the relationship between planning methodologies and design processes; namely how to reconcile the rational and the non-rational, the quantitative and qualitative perspectives, method and form. In order to bridge this divide, we argue a more fundamental critique of the methodological framings inherent within geo-design is necessary, beginning with the enduring influence of optimisation and regional focus.

GIS planning methodologies have been heavily influenced by processes that privilege optimization. Through a highly linear process, the designer / planner seeks out the optimal

solution through a systematic sifting of existing and past site conditions. This process assumes that the best outcome or most suitable intervention, or as stated by MCHARG (1969) 'the form of fitting which is most fitting', is to be discovered from within the site survey. Operating as a form of 'physiographic determinism,' this process assumes a strategy of avoidance premised on the nomination of the best and worst areas of development based on a set of physical and environmental attributes (SPIRN 2000). Although technology is present, the questions being asked of technology are limited due to the dominance of a highly objective and linear method. Within this structure, design is conceived as problem-solving weighted towards certainty and absolutes rather than experimentation, speculation and testing. It renders the role of both designer and technology as passive.

Design however is inherently about the creation of something new, the intent to develop an innovative outcome. Emphasis lies not in the solution, but instead on the value of the exploratory process that led to the solution (HILL 2012). To engage explicitly with design thereby requires the articulation of an explicit intent in which to guide exploration. This is currently missing within an understanding of geo-design. WITHERSPOON (2012), for example, identifies the absence of a 'concept of design' within a geo-design framework, claiming that without a concept, decisions are limited to 'optimizing solutions based on a rule set.' He warns against geo-design becoming a tool of avoidance through optimising rather than designing with concept and ethic. The necessity for the designer / planner to contribute more to the process beyond site driven information, is further advocated by MOORE (2010) who states:

The parochial sorting of physical information and the separation of technical knowledge from ideas as well as wider theoretical and interpretive issues, discourages important cultural exchanges that should be an integral part of the design process.

C. Dana TOMLIN (2011) suggests that the defining difference between design practice and decision making is that design allows for emergent criteria, and this quality of emergence should be taken advantage of within a geo-design framework. He proposes that emergent properties are likely to limit the role of formal optimization techniques as geo-design becomes more engaged with the theory and practice of design.

The incorporation of a clearly defined intent, concept or research question, combined with a more exploratory process therefore offers valuable means for strengthening design within the technological advancements offered by geo-design. We argue that these framings are also useful in expanding the scope of geo-design beyond its dominant use within environmental and regional scale planning, to engage with the urban. The rapid urban expansion that has characterized the twenty-first century has shifted the forefront of environmental issues to the urban environment. Government are no longer focused on achieving general concepts of sustainability, but now target particular agendas such as extreme weather events, pollution or water quality.

These spaces of rapid change and huge environmental and social influence provide challenging and urgent problems for the design and planning professions. ERVIN (2012) points to the increasing need for geo-design to engage with urban conditions, specifically places of large populations. We suggest that adopting a more performative approach to geo-design provides a valuable means for bridging the conceptual divide of design and

planning, as well as offering a useful lens for engaging with the challenging dilemmas of the urban environment.

So how might we define performative design and how does this differ from more orthodox analysis and planning?

The concept of the performative is not new, having first emerged in the humanities in the 1940s and 1950s, and arguably evident in the functionalist driven doctrine of modernism. However it is possible to define a more contemporary approach to performative design which emerges within architecture following post modernism. A renewed focus on performance surfaces as part of a larger theoretical repositioning that aims to reconcile the two competing ideologies of Postmodernism; the pursuit of Contextualism, order and composition and Deconstructivism's alternative focus on opposition, fragmentation and disjunction (LYNN 1998).

Two theorists were particularly influential: French philosopher Gilles Deleuze who offered the concepts of complexity and contradiction, and Manuel De Landa who extended Deleuze's ideas into the theoretical paradigm of "New Materialism." DE LANDA (1997) advocated for an understanding of the cultural production of design not for what it symbolizes (post-modern concern for interpretation and meaning) but instead for what it expresses and how it works. Approaches to performance in architecture have focused on systems, complexity and the notion of event. These have been aided by new technologically driven techniques such as scripting, modeling and measuring that allow a more definitive understanding of outcome. These approaches are underpinned by concepts of 'active agency', response and adaptation where architectural affect is produced through continual interaction between subjects and objects (PICON 2010). Architecture can be understood 'as the locus of performances (not functional solutions), it can be seen as both a preparation and a response; an ensemble of conditions that not only anticipates occurrences but reacts to them' (LEATHERBARROW 2013).

A performance-oriented design process therefore shifts emphasis from the purely formal or functional to the processes and behaviour of the designed space. Critical to this definition is the conceptualization of design as the greater process of research, testing and generation. Working across multiple platforms and digital techniques, it is now possible to understand how a design works or performs. These techniques do not offer a definitive outcome, but rather offer the designer parameters and valuable feedback loops in which to frame speculation and decision making. The ability to respond to and design complex dynamics and processes becomes possible with new digital and computational powers. As such, GIS programs offer a suite of complimentary and varied techniques that can be applied within a performative framework.

However in order to engage with a performative approach, a clear articulation of which phenomena or factor is the focus of the design research is a critical starting point. As will be discussed in the second part of the paper, this specific focus offers designers and planners the potential to operate with greater political agency in the development of innovative environments and design, merging aspects of design exploration with data analysis, performance with outcome.

2 Atmospheric Performance

Phillipe RAHM and Catherine MOSBACH's winning scheme for Taichung Gateway Park (2011) offers one of the earliest examples of a performative approach in the design of open space. Building on Rahm's decade long exploration of 'atmospheric' architecture, the design focuses on the climatic performance of the park. Rahm's ambition is not to apply the functional rules of sustainability but instead embrace climate within the domain of design. This desire to engage with atmospheric and climatic phenomena is shared by the numerous data labs emerging in cities across the world. Many governments now offer open access to data sets allowing designers and the community to engage with an unprecedented amount of information for free. For example the Visualizar research project at MEDIALAB-PRADO in Madrid has developed the data driven collaborative work 'In the Air' (Figure 1) which maps Madrid's air quality as a real time visualization (CALVILLO 2008).



Fig. 1: In the Air. Web-based dynamic model of Madrid's air quality.

Increased access to data, together with the ability to test environmental phenomena within software, offers landscape architects new techniques for working across planning and design. These potentials were tested in a speculative project that engaged with design of open space in the highly polluted context of Beijing. This Masters design thesis by Yixiao Lin was initially framed within a more general intent; namely the insertion of contemporary open space within a new residential suburb in Beijing. Research quickly identified that extreme levels of pollution reached in the summer of 2012 had pushed the city to a tipping point (recognised for example in the phenomena of the Beijing cough).

Nominating pollution as the driving factor establishes a very different analytical and generative process than conventional planning methodologies premised on optimisation. Within these methodologies, all factors considered relevant to open space are sifted through in a reductive process. However as the remainder of the paper will demonstrate, the intent to achieve a particular level of air quality (performative) within open space, offers scope for speculation and innovation (as distinct from purely problem solving).

Data was easily accessible to the designer located in Australia (and also fluent in Mandarin). This open access to pollution levels demonstrates the priority that the Chinese government is placing on addressing the problem. Real time data readings, visual diaries of residents and scientific research papers discussing built form, environmental phenomena and pollution offered the designer detailed understandings of the particular qualities of pollution within Beijing. Working outside broader policy questions such as addressing coal

stations, the designer set out to explore the potential of design to minimise pollution through techniques of siting, configuration and the design of open space.

2.1 Siting and Configuration of Open Space

A focus on pollution instantly challenges the 2-dimensional mapping practice which dominates conventional planning studies. To understand pollution, space must be understood as atmospheric and volumetric (rather than a flat plane). The first exploration focused on the location (inclusive of volume) of open space in relation to the existing condition (shown in Figure 2). Adopting the ambition of achieving a moderate level of pollution [80 $\mu\text{g}/\text{m}^3$], this study revealed that under the current conditions within Beijing, open space would need to be sited 1500 metres above ground.

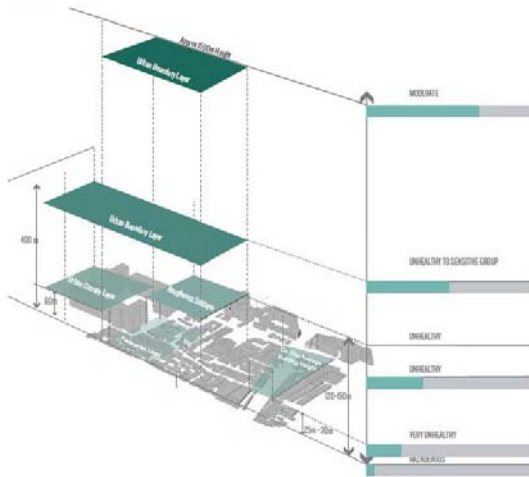


Fig. 2: Siting as Volumetric. To access a moderate level of air (without any change in urban form or use of technology) requires open space to be sited 1500 m above the ground (Image: Y. LIN).

A second study informed by research on the pollution reducing potential of urban forest (Beijing's Olympic Forestry Park) and an analysis of exiting open space typologies examined the size of open space required to achieve a moderate level of pollution if the open space was 'grounded.' These studies (Figure 3) revealed that open space designed entirely as urban forest would need to be five times larger than open space within a non-polluted zone to have any impact.

This study also highlighted the poor performance of linear park systems in addressing pollution. Together these explorations of volumetric space, configuration and size offered relational parameters to which the designer could respond. To address pollution through the potentials of urban forestry was not feasible within a new residential environment, requiring far too much space and limiting the use of the park. Instead a combined approach engaging urban form and technology was required. The next series of explorations focused on understanding in more detail how built form and wind speed influences pollution.

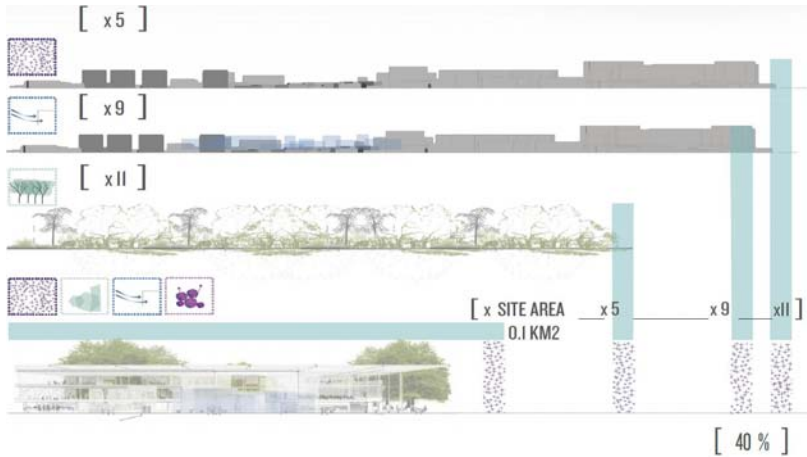


Fig. 3: Testing size and configuration of urban parks at ground level (Image: Y. LIN)

2.2 Designing for Performance

Coal combustion, automobile and industrial emission and dust from urban construction are considered the major sources of pollution. These factors are impossible to address at the level of the site. However phenomena (wind, humidity and temperature combined with climatic seasonal patterns) which heighten the effects of pollution can be addressed. In this case wind dispersion patterns (combined with humidity control) were considered the most significant drivers in manipulating pollution within the urban environment. A wind speed of between 8-12 m/s was determined to achieve the best outcome for dispersing pollution.

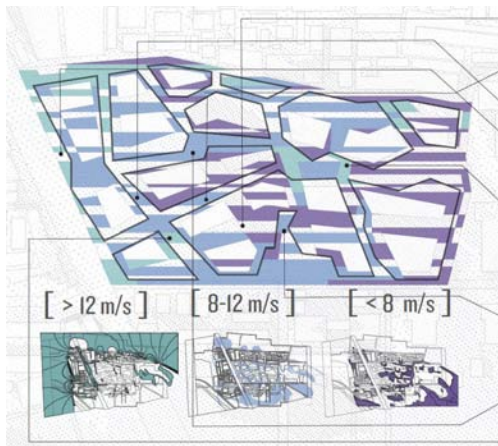


Fig. 4: Understanding the relationship between built form and wind speed (Image: Y. LIN)

Through wind modelling software (Vasari) the existing urban fabric was analysed for performance, with only 5% of the area achieving the desired wind speed. A series of form explorations, and further testing resulted in a massing model that optimised orientation and provided over 40 percent of the public domain with sufficient air movement to stop pollution being trapped at the ground level (Figure 4). Working with this scenario, a tool

box of devices and techniques were devised as further modes for manipulating pollution (Figure 5). These included techniques for:

- slowing down and speeding up wind (where appropriate) through vegetation and physical screens, giant Dyson fans and coarse and smooth materiality on facades;
- decreasing humidity through rainwater collection and air condensers (lowering the chance of smog formation);
- extracting pollution through the use of copper coil electrostatic fields, vertical green walls and algae filters; and real time data reading of site conditions through LED air quality sensors (kites) and mobile devices.

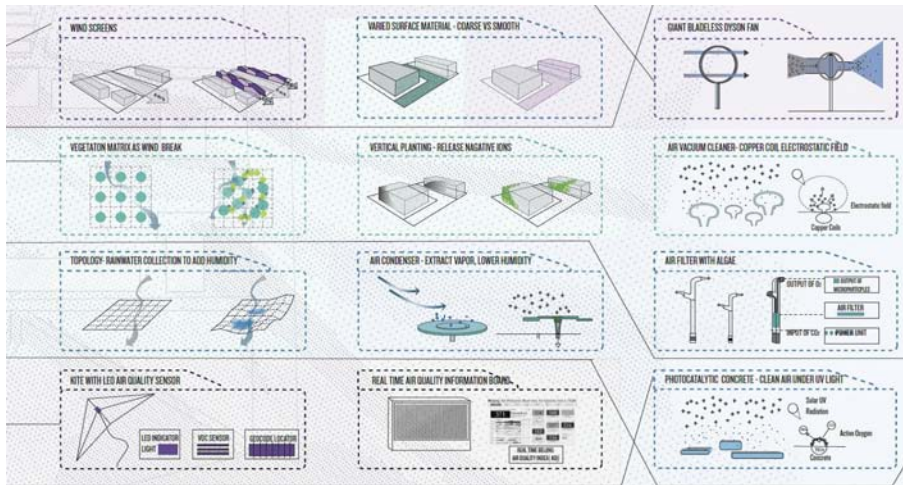


Fig. 5: Tool kit of design techniques for modifying wind speed, decreasing humidity, and extracting pollution (Image: Y. LIN)



Fig. 6: Speculation for a new urban park (Image: Y. LIN)

Through these explorations and testing of built form, volumetric space and phenomena, the designer/planner builds an understanding of the parameters and possibilities in which to design open space in response to pollution. As such these processes do not dictate an out-

come in a prescriptive manner. Instead they develop relational understandings linking process and form, performance with planning.

3 Conclusion

In 2013 Beijing's mayor committed funds to test Dutch artist Roosegarde's SMOG system (a copper coil system positioned underground that attracts airborne particles) within a public park (KAIMAN 2013). While affirming China's commitment to improving pollution, this response is technologically driven, problematically using brown coal generated energy to address pollution which has been generated from coal combustion. In contrast, this paper has demonstrated how landscape architecture through the adoption of a more performative approach to design and planning has the capability to significantly contribute to these contemporary urban issues such as pollution. Operating between planning and design, performative design can offer more relational understandings of issues crossing scale, form and phenomena.

Adopting defined performative ambitions such as the achievement of specific winds speeds and pollution levels (as distinct from generalities of sustainability) provides landscape architects with more authority for engaging with politicians and governments who desire clear outcomes. This exploration of pollution in Beijing while speculative, demonstrates how the shift from processes of generalisation and optimisation to more focused outcomes reconcile the rational and the non-rational, the quantitative and qualitative perspectives, method and form. Such an approach is equally applicable to other critical urban issues including water, ecology and food production. Fore mostly it brings planning, design and new technological advancements together in a practice which geo-design aspires to.

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