(Re)Imagining Water

A Postcolonial Response to Colonial Hydrology

Shaheed Hassan Karim

2019 - 2020

Supervisor: Kees Lokman

Committee Members: Sameer Shah, Peeroj Thakre

Submitted in partial fulfillment of the Master of Landcsape Architecture, School of Architecture and Landscape Architecture, University of British Columbia

Release Form

Landscape Architecture
School of Architecture and Landscape Architecture
University of British Columbia

Name: Shaheed Hassan Karim

Student Number:

Graduate Project Title: (Re)Imagining Water: A Postcolonial Response to Colonial Hydrology

In presenting this report in partial fulfillment of the requirements for the Master of Landscape Architecture, University of British Columbia, I agree that UBC may make this work freely available for reference or study. I give permission for copying the report for educational purposes in accordance with copyright laws.

Shaheed Hassan Karim		May 11, 2020
Name	Signature	Date

ABSTRACT

(Re)Imagining Water: A Postcolonial Response to Colonial Hydrology is a case study in reappropriating architectural representation to uncover and make visible the infrastructures of power and narrative which sustain socio-economic and political inequities. Adopting a postcolonial lens this project proceeds first with an investigation of the underlying factors which have contributed to the manifestation of the systemic and paradoxical water crisis of urban India – arguing that the current water crisis affecting millions of people in Delhi, and many millions more in other large centres in India, derives from a colonial hydrology imposed upon India by the British during their colonial rule. Influenced by the role that representation played in the colonial process the final portion of the project takes the form of a hypothetical gallery exhibit containing drawings which use architectural representation to challenge what we typically draw and in some instances the way we draw - experimenting with depictions of water not just as bounding lines but as flows that respond to the social, physical and ideological infrastructures which shape India's urban water reality.

LIST OF FIGURES

Fig 1 - Photo taken at the Ardh Kumbh Mela 2019

INTRODUCTION

Every 12 years the Triveni Sangam becomes the site of "the largest assemblage of humans on the planet" – the Kumbh Mela (Alday & Gupta, 2018, p. 12). Tens of millions of Hindu pilgrims per day gather to take part in rituals and bathe at the confluence of the Ganga, the Yamuna, and the mythical Sarasvati, three of the holiest rivers in India. The event sees the raising of a temporary 'mega-city' to house over 100 million pilgrims over a period of 55 days (Baan, 2014). Its an event that, among other things, demonstrates the importance of water to India.

Religious studies scholar Diane Eck argues that there is "no place in the world that should have a higher standard of river quality than India, for there is no other culture in which rivers have such a central role in the daily ritual lives of countless millions" (2013, p. 187). Yet 600 km upstream, during the dry periods, the flow of the Yamuna river is composed entirely of sewage, industrial effluent, and urban runoff for the stretch of nearly 20 km that the river runs past the country's capital state of Delhi (Alday & Gupta, 2018). The state of Delhi's Yamuna is not unique in India, even the Ganges river, considered to be India's

holiest flow of water, is contaminated with untreated sewage, industrial pollutants, agricultural and urban runoff, and solid waste as it winds its way past some of India's largest urban centres (Colopy, 2012).

Unfortunately, in Delhi and other major Indian cities, contamination of rivers is only one component of a full-blown water crisis. In the face of rapid urbanization and climate change, the approach to water management and city planning developed during colonial rule, and continuing today, is failing nearly half of Delhi's population who live in settlements of varying levels of informality. This translates to millions of people lacking sufficient water provision, a connection to the official sewer system, and agency over their access to clean water (Cities of Delhi, 2015; Jain, Chennuri, & Karamchandani, 2016). These communities are forced to rely on a growing water black market to purchase stolen municipal water and contaminated groundwater to supplement the little they acquire from spending hours each day procuring water from municipal water tankers and unreliable community taps - tasks which primarily fall to women and girls (Alday & Gupta, 2018; Mehta, Allouche, Nicol, & Walnycki, 2014; Palat Narayanan, 2019; Truelove, 2011). The situation is worsened by the conversion of lakes, waterways, and ephemeral streams into sewage drains resulting in the severe contamination of the city's surface and groundwater which are quickly being depleted by overallocation and unsustainable withdrawals (Alday & Gupta, 2018; Colopy, 2012; Jacob, 2014). Somehow a water rich nation, blessed by the monsoon, is running out of water.

Project Statement

Adopting a postcolonial lens this project proceeds first with an investigation of the underlying factors which have contributed to the manifestation of the systemic and paradoxical water crisis of urban India – here I argue that the current water crisis affecting millions of people in Delhi, and many millions more in other large centres in India, derives from a colonial hydrology imposed upon India by the British during their colonial rule, but whose ideology took root in the earliest of Western scientific thought. Secondly, this project examines the role of representation and the designer in contributing a postcolonial response to the current water system, one which reappropriates architectural representation in order to uncover and make visible the infrastructures of power and narrative which sustain socio-economic and political inequities in water access. Situating itself in the conceptual geography of Informal Delhi this project aims to use the creation and hypothetical deployment of representation in order to generate a new narrative surrounding water in Delhi, India.

A PRIMER ON POST-COLONIAL(ISM/ THEORY)

OBSERVER
OCCIDENT
WEST
COLONIZER
SCIENCE

⟷

OTHER
ORIENT
EAST
COLONIZED
NATURE

Fig 2 - West vs East

In its most basic definition 'post-colonial' refers to "a time period after the end of formal colonial rule" (Jazeel, 2019, p. 4). It is signified by the physical retreat of colonial power, perhaps the return of its officials to their homeland. However, postcolonial theory argues that the formal withdrawal of a colonial power does not demarcate the end of colonial influence, as Jazeel writes "the legacies of colonialism and imperialism are still with us … they have indelibly shaped the world as we know and experience it" (2019, p. 1). One strand of "postcolonial scholarship has aimed at recognizing the continued and troubling presence of colonialism within the period we designate as after-the-colonial" (Jazeel, 2019, p. 5), but this forms only one avenue of the broad pursuit. Thus, to define postcolonialism is difficult.

Postcolonialism or postcolonial theory arose in the 1970's out of the work of scholars like Edward Said (Jazeel, 2019). His book *Orientalism* (1978) documents the creation of the East – West divide, a product of the colonial imagination propagated through representation of the Orient (the East) as an 'other' that existed in opposition to the Occident (the

West). An important concept emerging from Said's 1978 novel framed future explorations in postcolonial thought and serves to preface this project. This concept is the production of 'imaginative geographies' – created by the "representations of peoples and places that express the perceptions, desires, fantasies, fears, and projections of their authors, who are generally external observers" (Desbiens, 2016). 'Orientalism' is a case study of the production of an 'imaginative geography' – the Orient. Said's careful dissection of depictions of the Orient, created by Western scholars, officials, and artists, demonstrates how an accumulation of representation formed a discourse which possessed the power to naturalize its claims. Orientalism, Said argues, resulted in the idea of the East (the Orient) and the West (the Occident) as separate geographies - the former exotic, uncivilized, and tameable while the later cultured and destined to express control. His work was not simply a catalogue of Orientalist representations but a demonstration of the impacts of these representations and why they were desirable results for those who produced them. The naturalization of an imaginary Orient allowed for the colonization of real geographies - "orientalism responded more to the culture that produced it than to its putative object" (Said, 1978, p. 22), it "could prepare the way for what armies, administrations, and bureaucracies would later do on the ground" (Said, 1978, p. 123).

Returning to an attempt to define postcolonialism, Jazeel states "whatever else postcolonialism is, it is a cluster of perspectives and interventions that interrogate what we think we know, urging us to explore more carefully the historical production of that knowledge" (Jazeel, 2019, pp. 1–2). This attempt at a definition highlights the contributions of Foucault to the foundation of postcolonial theory. Foucault's analyses of the relationships between knowledge and power, and of course his notion of discourse and discursive production, were essential to the work of Edward Said and continue to be important for those who follow in the

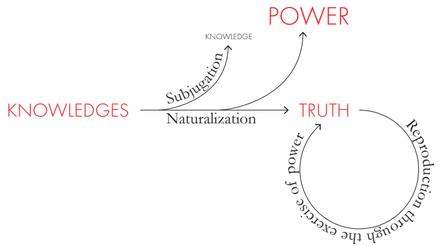

Fig 3 - Knowledge, Power, Truth

postcolonial tradition (Jazeel, 2019). Foucault's analysis of the relationship between knowledge and power demonstrates the importance of situating knowledge in the history of its production instead of trusting in the putative truth (Foucault, 1972). He offers that it is through history that some knowledge becomes truth while other knowledge is subjugated – "disqualified as inadequate to their task or insufficiently elaborated … beneath the required level of cognition or scientificity" (Foucault, 1972). Foucauldian power relies on the existence of a discursive truth, a certain knowledge that is naturalized at the expense of other knowledges (Foucault, 1972). The production and reproduction of this 'truth' enables the expression of power and the maintenance of power relations – and so the production of a discursive truth is fundamentally a pursuit of power. The mechanics of colonial systems (from representations of the other to imperial science, from infrastructure to ideologies of nature and urbanisation) all work to reproduce a discursive truth and through that truth maintain control and power. These systems remain in place today, naturalized into a post-colonial world and continue to churn as taken for granted truths. To unsettle the dominance of select truths Foucault advocates for:

> an ascending analysis of power…from its infinitesimal mechanisms, which each have their own history, their own trajectory, their own techniques and tactics, and [to] then see how these mechanisms of power, have been – and continue to be – invested, colonised, utilised, involuted, transformed, displaced, extended etc., by ever more general mechanisms. (Foucault, 1972, p.99)

As such an investigation of not only what was imposed upon the colonized by the colonizer (the other by the author) but the reasons for why those impositions were desirable as modes of maintaining the exercise of power is essential to understanding how colonization continues to shape the agency of those living in postcolonial societies today. This has formed an important path for exploration in postcolonial thought. Much of the systems, ideologies, and infrastructures which exist today are taken for granted without questioning their fundamental underpinnings. With this in mind postcolonialism seeks to investigate and challenge "epistemic certainties" (Jazeel, 2019, p. 2) brought to much of the world through imperial and colonial agendas.

Colonial infrastructures, both physical and ideological, continue to live on in now independent nations like India. Their legacies range from language to legal systems, from massive irrigation projects like the Ganges Canal to educational institutions like the Indian Institute of Technology Roorkee, originally founded by the British in 1847 under a different name, where irrigation engineering was and continues to be taught in order to further the hydrological regime implemented by the British (Gilmartin, 1994). While over 70 years have passed since India's independence in 1947 there can be no doubt that the impacts of the colonization of the Indian subcontinent continue to permeate the cities and societies of modern India. During nearly 200 years of formal British colonial rule India was reconstructed to mirror systems and ideologies that were not born from its local geographies, customs and aspirations, but instead to serve objectives, often self servient, set out by a far away nation. So today as we endeavor to solve systemic problems, like the water crisis in Delhi, its important to not simply look for the cracks in the system but instead to question the entirety of the system, the reason it was designed, and the purpose it was made to serve.

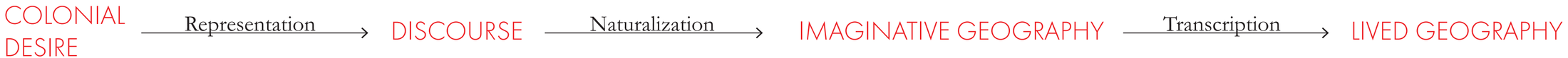

Fig 4 - Process of manifesting an Imaginary Geography

EUROPEAN COLONIALISM DID NOT JUST IMPOSE ANOTHER WAY OF SEEING AND KNOWING PLACE; IT IMPOSED ANOTHER PLACE

Dilip da Cunha, 2019, p. xi

COLONIAL HYDROLOGY BEFORE EUROPEAN COLONIALISM

D'Souza defines 'colonial hydrology' as "the varied hydraulic interventions of colonialism to simultaneously alter South Asia's fluvial and social worlds" (2006, p. 625). He argues that British colonial rule, particularly during the 19th century, shaped India's hydrologic reality through the implementation of irrigation infrastructure and its intended supersession of traditional water management (D'Souza, 2006). Indeed the British imposed upon India a hydrologic system and ideology that continues to impact water provisioning today (Sharan, 2011), but here it is argued that the seeds of colonial hydrology were sown long before the establishment of the British Raj in 1858, and even before Vasco da Gama's arrival in India in 1498. It began, da Cunha argues, with the drawing of a line (2019).

In his book *The Invention of Rivers: Alexander's Eye and Ganga's Descent* da Cunha recounts the story of the line that shaped the predominant hydrological paradigm, a Foucauldian truth, one which has had troubling consequences in India (2019). His argument stems from the separation of land from water as a human construct executed through the drawing of a line. Da Cunha traces the origin of this line back to the School of Miletus, founded by Thales (commonly known as being the first Western scientist), whose scholars are credited with the invention of the first world maps (2019). Two important consequences arose from the employment of the line that separates

land from water, both of which continue to shape India's hydrologic regime today: first, the creation of distinct entities of water, the river chief among them; and second, the prioritization of overland flows over other moments in the hydrological cycle (da Cunha, 2019).

Da Cunha builds the case for the river as a human construct through a discussion of its creation by the drawing of lines (da Cunha, 2019). In its most basic abstraction a river is created by the two lines which define its banks. They confine water as a flow in a channel and dictate where it should and should not be. These lines, as all other lines, are drawn between points and therefore define an origin and a destination – insinuating that the river and the waters that flow within it begin in specific places and end in others (da Cunha, 2019; Mathur & da Cunha, 2014). Lines shape the totality of rivers, characterising them as unique entities that can be controlled and designed, the first step towards which was drawing them in the first place. Like an imaginative geography the river is the product of representation. It exists first as an imaginative element, an oversimplification of a natural flow of water that can be drawn. Then there is a process of naturalization and transcription. Over time and through the continuous depiction of rivers in this fashion, and by physical interventions that begin to transcribe rivers in maps onto real geographic surfaces (the building of embankments, channelization, etc.) the river, in a sense, becomes real. But as Mathur and da Cunha remind us the river is "a product of visual literacy rather than a natural feature of the earth surface, an extraordinary work of art before it is a taken for granted object of science" (2014, p. 1).

While the drawing of lines that separate water from land serve to create distinct entities of water in the imaginary, even with physical intervention water often cannot, or perhaps will not, be contained. Flood serves as another reminder that the river, and the separation of water from land are human constructs which have been represented, naturalized and transcribed into a lived experience. If the drawn line creates the bounds of water it also creates flood, which can be understood as the moments when water breaches the drawn line (da

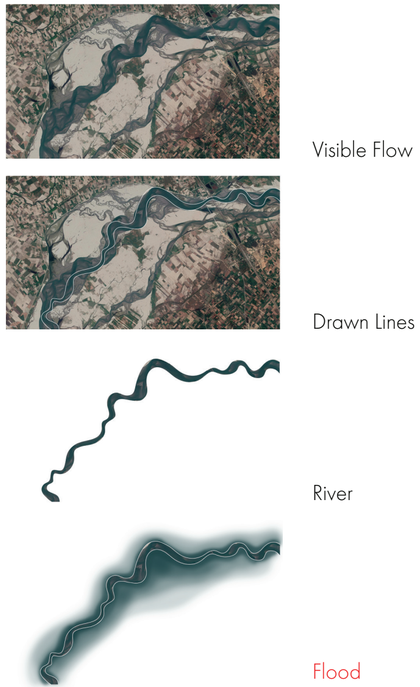

Fig 5. Creating a River

Cunha, 2019). Flood is generally conceived of as a natural event, and when it impacts human settlement it is labelled a natural disaster, however, following da Cunha's logic flood is in fact a human disaster, one born of human imagination and intervention (2019). Only by defining where water should and should not be can one define the moment of flood – without a line to cross water can never flood.

The separation of water from land has had one other particularly profound consequence which da Cunha describes as the anchoring of reality in a singular moment of the hydrological cycle, specifically the moment of overland flow (2019). The typical hydrological cycle describes water as a never-ending flow moving between precipitation, formation of flows in/over land, evaporation, and cloud formation. By drawing maps in the bird's eye view under 'fair-weather' conditions, and with lines that delineate water as static entities, we have chosen to anchor in the moment of overland flow and created a reality where rivers exist as discrete perennial entities (da Cunha, 2019; Mathur & da Cunha, 2014). The result of this "has made water in other moments in the hydrologic cycle ephemeral, so that rain, mist, snow, humidity, and so on are seen a visitors where as rivers are granted the status of residents" (da Cunha, 2019, p. 9). The permanence of rivers in this paradigm is illustrated by rivers which run dry:

> What remains is a space between lines that continues to be seen and enforced as a river or a riverbed, suggesting it is the line more than water that is essential to rivers. It 'flows' even when waters do not. (da Cunha, 2019, p. 6)

In areas that are heavily influenced by the monsoon, like South Asia, 'rivers' continually oscillate between conditions of 'flood' and 'running dry,' and as such representing these flows as consistent, and perennial was a misconception. This representational misconception was first imposed upon India's geography at the hands of one Alexander the Great (da Cunha, 2019). Alexander found immense power in the map, and "together with the surveyors who accompanied him, sought to confine water to channels on the earth's surface, name these channels, and draw them into their world map" (da Cunha, 2019, p. 12) believing, perhaps rightly so, that mapping a place would lead to conquering it. Although his journey in India was cut short, he is credited with being the first to refer to Ganga as "the Ganges, which he did not see but imagined as the greatest river on earth and the wealthiest" (emphasis added) (da Cunha, 2019, p. 12).

The river, since its inception and subsequent inclusion on the earliest of world maps, has been maintained as an essential geographical feature. Its importance is reinforced by our employment of the river for generating wealth through water provision, power generation, industrial development, real-estate, and irrigation (da Cunha, 2019). This prioritization of rivers, da Cunha argues, has marginalized the rain, the relegation of which is especially concerning for India and other places whose natural hydrologic regimes are governed by the monsoon rains (2019). The underestimation of the importance of rain, which is perhaps the flipside of the prioritization of rivers, also draws its beginnings in early Western thought (Mathur & da Cunha, 2014). As early as the 1st century AD, and through to the 16th century, many scholars, including Leonardo da Vinci, would not buy into the idea that it was rain which fed rivers, and instead hypothesized of a vast network of water circulating through the core of the earth (Mathur & da Cunha, 2014). It wasn't until the 1600's that rain was acknowledge for its importance in the hydrologic cycle, when Pierre Perrault and later Edme Mariotte put forth sufficient proof that precipitation falling in the watershed of the River Seine was more than enough to compose the flow of the river (Mathur & da Cunha, 2014). Yet in the European mind the river still took precedence over the rain and the lines that defined them continued to be employed as Europe set its eyes on South Asia.

Just as with human and cultural aspects of place, the ability to transform an existing physical geography into an imaginative geography that performs as one wishes it to, was essential to colonization. The inception of the line that can both separate an overland flow of water from the hydrologic processes that sustain it, as well as give form to the flow itself is, as I believe da Cunha would agree, the beginning of colonial hydrology. That line has enabled and encouraged the creation, engineering, and design of a paradigm of hydrology in which mankind attempts control over water, and therefore people. The line belongs to a discourse of truth that was maintained by European Colonists as they

conquered (most of) the world. To continually reproduce that discourse and to draw power from it required the imposition of infrastructural and administrative systems, and the subjugation of other knowledges – this formed the basis of British colonial hydrology in India.

COLONIAL HYDROLOGY: BRITISH COLONIALISM IN INDIA

An empire is something of a fiction to begin with, an imagined entity . . .

Raymond B. Craib, 2019, p. 17

As one would say of modern scholars, engineers, geographers, designers, etcetera, when the British arrived in India they were "already disposed to seeing a terrain marked by lines of flow." (Mathur & da Cunha, 2014, p. 4). Not only were they already possessed by an ideology which prioritized rivers over rain, they were equipped with maps, and the science to continue to produce and 'improve' on them. Upon first arrival mapping and surveying allowed for the establishment of settlements along rivers, which could serve as important means of transportation for the goods the Europeans would export to a growing world market (da Cunha, 2019; McGinn, 2009). But drawing lines on maps soon became a tool for expansion and conquest as the British East India Company looked to claim India as their own in the 18th century.

During the British conquest and subsequent rule of India, irrigation engineering became an indispensable tool. Veiled under the guise of development and famine prevention, hydrologic engineering was employed as a form 'peaceful conquest' that allowed the British Empire to "multiply its territorial holdings without having to fire a shot or invade

another state" (Acciavatti, 2015, p. 118). In his book *Canal Irrigation in British India* Stone, perhaps not intentionally, necessitates an investigation into British colonial hydrology through a postcolonial lens:

> As with any technology, canal irrigation was not 'neutral' in its effects. It was intended to serve the perceived interests of its masters, in much the same way as the earlier irrigation works were. In its design, modes of operation, and intended effects, canal irrigation was ultimately a cultural expression, representing the priorities and aspirations of its western architects, and was inextricably bound up with some of the most vital aspects of colonial rule. (Stone, 2002, pp. 7–8)

Specific colonial desires for a British India were transcribed into reality through the design and construction of embankments, canals, dams, barrages, and pipes. Exemplified by a vast network of irrigation and water provisioning projects across all of India, the British through its colonial hydrology sought to achieve three important things: to demonstrate its power through scientific prowess, to increase its revenue production, and to exercise control over the 'native' population (Acciavatti, 2015; D'Souza, 2006; Gilmartin, 1994, 2003; McGinn, 2009; Mollinga & Veldwisch, 2016). Hydrologic infrastructure in Colonial India came to exemplify the term 'technology of rule' (Mollinga & Veldwisch, 2016). The imposition of such infrastructures "provided the perfect alibi in order to incorporate a population into a colonial government and international market" (Acciavatti, 2015, p. 118) while "technical innovation vindicated the social and political changes produced by colonial rule" (Acciavatti, 2015, p. 120).

The description of colonial territories as conceived of as laboratories, by colonial powers, is common in literature tracing the impacts of 'imperial science,' a term which Gilmartin describes as suggesting "a colonized world that became, in many respects, a great laboratory in which the natural world was not only catalogued, studied, and observed, but also technologically manipulated in the name of commercial transformations on a great scale" (Gilmartin, 1994, p. 1128). The extreme lengths to which the British Empire went in order to prove the superiority of their scientific and technological advances is illustrated no better than in Acciavatti's *Ganges Water Machine*. His book documents the transformation of the Ganges River Basin into one of the worlds largest engineered spaces, crowned by the construction of the Ganges Canal (Acciavatti, 2015). He describes it as follows:

> Since the middle of the nineteenth century, this watercourse has functioned as a laboratory to test and build a new civilization around the culture of water management. Jointly authored by human actors and their shifting natural heritage, the Ganges River Basin today is a machine in which the entire basin functions as a highly engineered hydrological super-surface. (Acciavatti, 2015, p. 7)

The British Empire demonstrated their self proclaimed superiority, maintaining their discursive truth, not only through the domination of people, but through the domination of nature – water chief among it (Gilmartin, 2003). Lines originally used to suggest the course of overland flows became used first for its confinement and later for its redirection. Eventually, large areas of the Indian sub-continent had been transformed into machines that commanded nature, with varying success, to do the bidding of the colonizer. The rhetoric of imperial domination over nature was embedded into the scientific jargon (Gilmartin, 2003). Water was described as having the sole purpose of increasing production. The term 'duty,' in relation to water, was used as a measurement of the area of land that was irrigated by a unit of water, while the term waste became used to describe water that wasn't performing productive work to serve the purposes of the state as directed by the engineer (Gilmartin, 2003). In an effort to propagate their ideology, of the superiority of their science over nature, and to produce a larger body of engineering professionals to carry out the will of the British Empire, various educational institutions were established in India beginning with the College of Civil Engineering at Roorkee in 1847 (Gilmartin, 2003). These schools pursued:

> the scientific control over nature . . . the aim of the education was not just skill in engineering, but also the 'moral training' and 'discipline' that would prepare them for 'victorious success' – success, in this case, in 'subduing nature,' and turning its products into 'resources' that could be used for the purposes of production. (Gilmartin, 2003, p. 5058)

Through these educational institutions the British were not only able to continue to colonize the land at an increasingly rapid pace, but also to colonize the mind – "cultivating the native to see the separation of land and water and to appreciate the economy, governance, ecology, aesthetics, hydraulics, and engineering that resulted from the river and landscape that followed" (da Cunha, 2019, p. 277). Educational institutions became a mechanism through which European truth could be reproduced and power relations between colonizer and colonized were maintained.

British colleges were not the only institutions whose legacies were engineered to cultivate a new ideology within the peoples of India. The British, in many cases, also pursued an agenda of destroying traditional water management systems and eroding 'local knowledge,' which within a framework of 'imperial science' "had no formal place" (Gilmartin, 1994, p. 1128). As a display of 'technical dominance,' colonial infrastructures were intended to surpass and supersede the technologies of previous empires (Acciavatti, 2015). The "traditional water management in India was a sophisticated, decentralized system" relying in large part on harvesting and managing monsoon rains (Colopy, 2012). This was at odds with British aims of centralization of water command through canal systems, which would grant them greater control (Acciavatti, 2015; Colopy, 2012). The British in order to maintain power and the dominance of their truth needed to subjugate local knowledge. As such the orientation and implementation of colonial infrastructure and administrative systems was "sharply aimed at eliminating" pre-existing systems (D'Souza, 2006, p. 624). Land settlement enacted by the British created private property which undermined traditional land management as well as the communal systems that were in place. Changes to the agricultural rent structure coupled with the introduction of perennial irrigation encouraged traditional rain fed water systems to fall into disuse and disrepair (D'Souza, 2006; Mollinga & Veldwisch, 2016). At the same time "colonial canal lines were deliberately situated in ways that supplanted other prevailing irrigation structures" (D'Souza, 2006, p. 624). In short:

> instituting private property, commodifying land, commercialisation, pursuing highly extractive revenue agendas and dismantling community control over natural resources caused the impoverishment of the rural populace at large and led to the decay and destruction of indigenous water harvesting systems. (D'Souza, 2006, p. 623)

Colonizers saw control of rivers and water systems as a way of controlling local communities, instituting state power, and, perhaps most importantly, increasing the revenue that could be extracted from the land and people of India (D'Souza, 2006; Gilmartin, 1994, 2003; McGinn, 2009). McGinn details the devious and convoluted methods surrounding canal irrigation implemented by the British in order to capture revenue. He states firmly that "canals and railways were not built to modernise India's economy. Development was merely rhetoric to legitimise actions taken purely in the interests of capital" (McGinn, 2009, p. 6). The British Raj, the name given to the rule of India after the crown officially took over control from the East India Company in 1858, was highly invested in maintaining India as an agricultural state and an exporter of raw goods (McGinn, 2009). To this end canal and irrigation projects were deemed vital, as a perennial water supply was assumed to result in higher yields and thus higher revenues from heavy taxation (McGinn, 2009). The imposed system did not, however, endeavour to irrigate lands evenly:

> Dry zones in need of irrigation were left untouched whilst productive land already irrigated by wells became the target of canal development . . . areas not in need of additional irrigation were developed for the production of water-demanding crops like sugarcane, indigo and rice. (McGinn, 2009, pp. 13–14)

Simultaneously public works like canals became opportunities for British

investment. The British Raj became “an institution that functioned almost exclusively to generate markets for British capital and deliver the necessary security for these investments” (McGinn, 2009, p. 8). Canals were being built on capital invested by the rich in Britain, and returns were being generated by taxation and export revenue in India (McGinn, 2009).

While the British no longer profit directly from the colonial hydrology they pursued between the 18th and 20th centuries, the ideologies and infrastructural pursuits continue to shape India today. The continuation of colonial hydrology is epitomized by the sustained pursuit of the interlinking of India’s rivers. This would see the linking of almost 60 of the nation’s rivers in an attempt to further wean Indian farmers off of the Monsoon rains (Reuters, 2017). The contemporary name for the project is the Interlinking of Rivers Programme and is being instituted by the current Indian government, but the origin of this scheme dates back to Colonial India when the prominent British irrigation engineer Arthur Cotton was a great proponent of the idea (Acciavatti, 2015).

Investigating the intent behind the reshaping of India’s hydrologic reality, the desire that inspired the lines drawn in maps and engineering plans, provides a unique understanding as to why continuing to work within the system created by the British is not likely to serve India and its people. The colonial system was not designed to work within the natural paradigm but instead to control it and impose upon it a new reality. Neither was the colonial agenda a pursuit of development for the Indian people, but instead a plan to generate revenue. Holistically the system was created to continuously affirm the discursive truth that has maintained relations of power that marginalize not only certain knowledges but also certain people, primarily the poor. People who whether by choice but most often by circumstance cannot live within the framework created by colonialism that has manifested itself in legal and economic systems, urban development plans, service provisioning infrastructures, and conceptions of modernisation. This is undeniably obvious in Indian cities and perhaps in Delhi more than anywhere else.

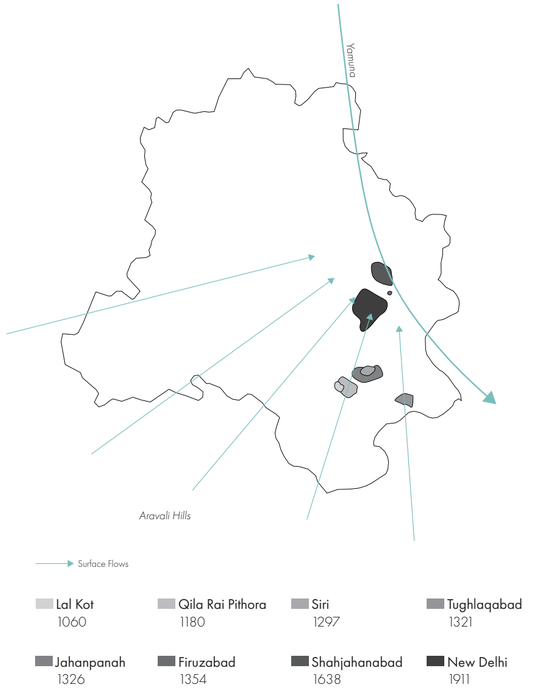

Fig 6 - Delhi through time

URBAN MANIFESTATIONS OF COLONIAL HYDROLOGY: DELHI

Delhi is commonly known as a city of cities. This pays homage to the numerous historical cities that were built through successive empires, each still visible in part within the city’s urban fabric. But the phrase has also come to connote the immense divisions amongst the city, divisions which have been accentuated since the British arrived in 1803.

Early urban settlements in what is now Delhi, from Qila Rai Pithora in the 12th century to Shahjahanabad in the 17th century, shared a deep connection to the Yamuna. Buildings were never erected in the floodplains, instead they borrowed the rivers view incorporating its majesty into gardens and palaces built on high ground along the river’s banks (Alday & Gupta, 2018). During the Mughal Empire the city was built “to look sensuously out on the river, and the waterfront was a pleasure zone of palaces and gardens” (Dasgupta, 2018). For these settlements the main source of their water was not the Yamuna but the rain, which was collected as it ran off the Aravalli hills (Dasgupta, 2018). Built in harmony with the seasonal rains “the Mughal city was thick with wells, and also with their necessary corollary: man-made lakes and tanks which replenished what was drawn out by capturing rain and letting it seep down into the earth” (Dasgupta, 2018, p. 158).

Living within and facilitating the natural cycle of water between its different flows and states maintained a high groundwater level enabling shallow wells and storage tanks to sustain the peoples' thirst even during the dry period (Colopy, 2012; Sharan, 2011). The system employed complemented the characteristics of the place, a "relatively arid but paradoxically water – and monsoon – rich land" (Colopy, 2012, p. 63).

Very little of the water harvesting infrastructure constructed prior to British Colonialism still exists today and what does is generally in a state of major disrepair (Jacob, 2014). In Delhi a few examples remain – the man-made lakes Hauz Khas, and Hauz-i-Shamsi and the Agrasen ki Baoli (stepwell) are prime examples but they no longer serve the same purpose. Once frequented as places of rest and rejuvenation where clean water could be harvested, the lakes are now pools of filth choked by sewage and garbage while the stepwell's connection to the aquifer has been cut so that its only water is derived from urban runoff (Colopy, 2012; Jacob, 2014). The same can be said of the Yamuna at Delhi. Once majestic and revered as a goddess, marvelous in its capricious tendencies, it served as a space of daily and spiritual ritual – but today it is a mostly forgotten space and to many an embarrassment (Alday & Gupta, 2018; Baviskar, 2017; Dasgupta, 2018; Jacob, 2014). Almost the entire flow of the Yamuna is diverted north of Delhi at the Wazirabad Barrage (Alday & Gupta, 2018). Less than half a kilometer downstream the Najafgarh Drain empties into the dry riverbed, its flow made up entirely of sewage, industrial effluents, and urban runoff (Alday & Gupta, 2018, Baviskar, 2017). During the dry season the flow of the Yamuna is composed completely of the sewage and waste water the city dumps into it, the repercussions of which are felt all the way to the Bay of Bengal (Alday & Gupta, 2018). The loss of traditional water systems and the desecration of the Yamuna have forced a reliance on an inefficient water provisioning system which continues to reproduce spatial injustices imposed during colonialism. An examination of the history which produced Delhi's current water system also alludes to the beginnings of the current water crisis, one which seems to have been inevitable since the early 1900's.

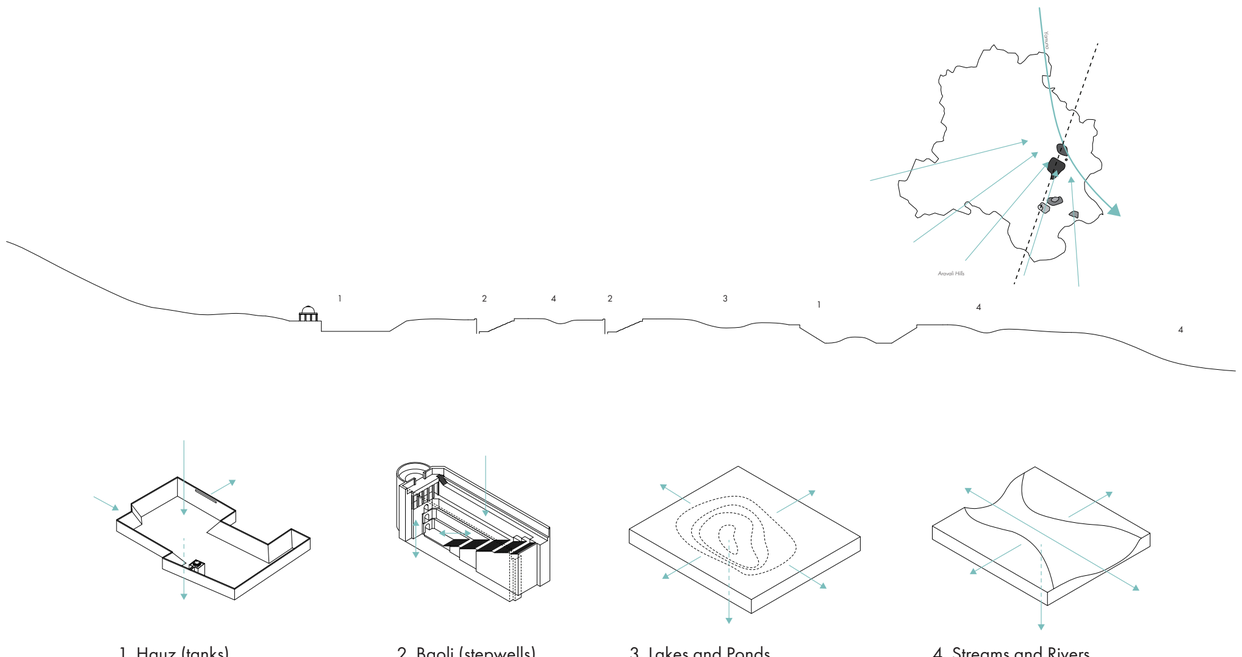

Fig 7 - Holding water, diagramatic section through Delhi

The British declared Delhi the capital of British India in 1911 and shortly after began the implementation of Luytens' designs for New Delhi, which drew heavily on major Western centres like "Paris, Rome, and Washington D.C." (Alday & Gupta, 2018). The design, in opposition to the earlier Mughal settlements in Old Delhi, turned its back to the Yamuna (Alday & Gupta, 2018; Dasgupta, 2018). Unlike European rivers, the Yamuna did not maintain a continuous and constant flow, it could not "be walled in and enjoyed from riverside cafés and walkways" (Dasgupta, 2018, p. 159). Put simply "the British did not find the Yamuna beautiful" (Dasgupta, 2018, p. 159) and so they did away with it. The colonial desire to impose their 'European-style water system' resulted in the abandonment of rain and groundwater fed systems, which were replaced with diversions, dams, canals, and pipes that drew from the river upstream of Delhi and directed wastewater back into the Yamuna further downstream (Dasgupta, 2018). Viewing "piped water and drainage as an integral component of urban modernisation" (Sharan, 2011, p. 426) the British began the construction of a piped water provisioning system in the late 1800s. The system primarily fed the areas where the majority of residents were European, and thus began the spatial inequity of water provisioning that continues today. Alongside the unjust provisioning of water, the use of water ways to carry away waste is a legacy of colonization that continues to plague Delhi today. During the 19th and early 20th centuries the colonists were determined that rivers (more so those in India than in England) had the capacity to "absorb, dilute and disperse wastes" (Sharan, 2011, p. 447) which formally led to the use of waterways as entities to receive waste water and carry it away.

Today the city of Delhi, like numerous other cities in India, is in the midst of a water crisis, the burden of which is inequitably borne by the poor (Mehta et al., 2014; Truelove, 2011). As summarized by Roy – "water is produced and commodified, struggled over, contested and transformed into an indictor for power, urbanisation and modernity, which renders water access as dependent on economic, social and cultural processes" (Roy, 2013, p. 98). The equally unsuitable

approaches to water management and city planning developed during colonial rule has continued today and remains unable to cope with rapid urbanization and a natural hydrologic system which does not resemble that of Western Europe. An estimate of "77% of Delhi's urban fabric has been constructed in the last 40 years" (Alday & Gupta, 2018, p. 67), making it "one of the fastest growing metropolises in the world" (Mehta et al., 2014, p. 163). The city's most current municipal Master Plan 'Delhi 2021' depicts zoning that has long been surpassed through the growth of informal settlement and a continued lack of planning and affordable housing provision for the rapidly growing population (Alday & Gupta, 2018; Jain et al., 2016). As a result, "less than one quarter of Delhi's population lives in 'planned colonies' " (Alday & Gupta, 2018, p. 69) – areas zoned for residential development, and which comply with the necessary norms and bylaws (Cities of Delhi, 2015). These planned colonies include those set out in the original plans for New Delhi, and following the colonial legacy are the only colonies which are fully serviced with water, sewerage, paved roads and other basic infrastructure (Cities of Delhi, 2015). The remainder of the population lives in settlements expressing some degree of informality. Depending on their socio-economic and political status the majority suffer insufficient and indirect water provision, a lack of connection to the official sewer system, and little agency over their access to clean water (Mehta et al., 2014; Truelove, 2011, 2018).

The official piped water system continues its colonial legacy of inefficiency with a reported 40-60% of water lost to leaks and illegal water tapping resulting in even those who are fortunate enough to be hooked up to the system to search for supplementary water sources on either a continuous or intermittent basis (Mongabay-India, 2019; Sharan, 2011; Truelove, 2018). The Delhi Jal Board, the government agency in charge of water provisioning, has moved to supplement the system with a fleet of water tankers to service poor areas where the pipeline network does not reach or where the pipes run dry, but the service is limited and sporadic (Roy, 2013; Truelove, 2011). While middle and upper-class residents can leverage their financial power and political connections to guarantee a 24/7 supply of water, for the poor the cost of accessing a sufficient supply of water for daily needs is significantly higher (Mehta et al., 2014). The insufficient and inequitable water provisioning has resulted in the growth of a large water black market where the poor purchase water at high costs from purveyors who obtain the water from illegal connections to the official system or private and unregistered tubewells that draw up contaminated groundwater (Alday & Gupta, 2018; Mehta et al., 2014; Truelove, 2011). In addition to the monetary and health costs of relying on illegal water provision there is also the cost of time. For the poor the task of 'fetching water', whether through official or illegal means, also requires a significant investment of time, an investment most often made by women and girls, who "are often kept out of school to stay home and help with either procuring tanker water or watching the youngest children while older women leave on water outings"(Truelove, 2011, p. 148).

While "national and local authorities are reluctant to extend water and sanitation services to people living in slums, claiming that connecting these communities will 'legitimise' their presence" (Roy, 2013, p. 97), the crisis continues to worsen. The lack of sewerage is leading to severe contamination of both overland and ground-water in the region (Colopy, 2012; Jacob, 2014). An estimated 45% of the population of Delhi is not connected to the official sewer and as a result direct their waste into ephemeral streams and small rivers, once used to capture rain water, now officially labeled drains (Colopy, 2012; Jacob, 2014). The drains lead to the contamination of the Yamuna, into which the majority eventually flow; the official piped water system, which since its founding by the British has suffered from the interaction of sewage and drinking water; and groundwater into which the contaminated water percolates (Alday & Gupta, 2018; Colopy, 2012; Jacob, 2014; Sharan, 2011). Still groundwater remains an important source of water for Delhi (Alday & Gupta, 2018).

The proliferation of unregulated tubewells, a technology introduced by the British in the early 1900s after recognizing the insufficiency of their centralized irrigation and water provisioning systems (Acciavatti, 2015), has resulted in the overdraft of groundwater (Alday & Gupta, 2018; Mehta et al., 2014). This, coupled with the development and encroachment on critical areas of groundwater recharge (not to mention the repression of traditional water management practices pursued by the British), is causing the groundwater table to drop quickly (Alday & Gupta, 2018; Baviskar, 2017; Jacob, 2014). Out of the nine districts of Delhi only two are extracting water at sustainable rates, in the other seven the rate of groundwater withdrawal is outpacing that of recharge by 1.7 times (Alday & Gupta, 2018). With contamination, groundwater depletion, and an infrastructural system rife with inequities and inefficiencies there is great need to look outside of the current system for an answer to Delhi's water crisis. While the paradigm of urbanisation and modernity touted by European colonists may have mandated piped water and the conversion of water courses into controlled infrastructure, it may be time for the "re-emergence of [what the colonists deemed to be] . . . low-ranking knowledges, these unqualified, even directly disqualified knowledges" (Foucault, 1972) and the production of a new discourse which brings power to those subjugated by the colonial truth.

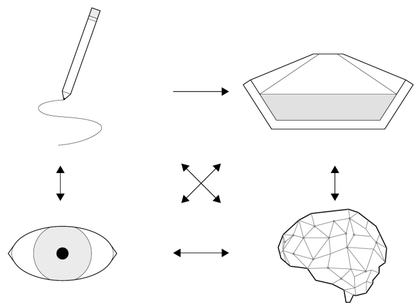

Fig 8 - Role of representation

THE POWER OF REPRESENTATION: PAINTING, DRAWING, MAPPING AND LANDSCAPE ARCHITECTURE

Representation has played a fundamental role in colonisation. Colonial representation, of both textual and visual mediums, created imaginative geographies and narratives that became realities of conquest and domination (see Edward Said's Orientalism, 2019). The analysis of these representations and their effects gave rise to postcolonial theory (Jazeel, 2019).

Landscape Architecture too was born from representation, mostly that of landscape drawing and painting, but later also of mapping. All three of these mediums have played their own parts in colonialism. Colonial maps, paintings and drawings all contributed to the discursive formation of imaginative geographies and were used by colonists as templates to be transcribed onto real geographies.

The planimetric and sectional drawings created by engineers of canals and embankments depicted the systems of control that would be constructed to dominate nature and people (Acciavatti, 2015). Maps too have long been instruments of control (Craib, 2000; Kalpagam,

1995). For many European nations "the recording of a place on a map became a critical sign of possession" (Craib, 2000, p. 16) and as such mapping most often prefaced colonisation. Barrow notes that "during the British colonial period in India, maps were among the most effective resources the British could turn to when they looked for their legitimacy as a colonial power" (2003, p. 2). The nature of the modern map reinforced the European notion of land as a space to be owned and controlled "by assuming an ontological separation between subject and object and by ordering space in a uniform, infinitely repeatable fashion" (Craib, 2000, p. 20). It was not simply the type of representation but the method of constructing it that was critical to its colonial nature. The use of a grid for example can serve to blanket terrain in uniformity – "when overlaid with an abstract grid, land became a socially and historically flat surface for possession and control, a surface that was static and ahistorical" (Craib, 2000, p. 20). While the addition of various cartographic elements, symbols, illustrations, and dedications to maps served to convince the viewer that the lands depicted in the map were a natural part of the colonial empire (Barrow, 2003).

Mitchell's seminal book in the field of Landscape Studies draws deep connections between the act of creating and representing landscape and the pursuits of imperialism. Mirroring the scientific conquest of nature attempted by imperial powers, landscape painting and drawing have always been about two things: control over nature and the superiority of the modern European man (Mitchell, 2002). This takes root in the claims that modern European landscape painting was born from the idea that landscape was first seen for what it truly is when the modern man gazed upon it solely for his own purpose, and that therefore modern landscape painting was the first natural representation of nature (Mitchell, 2002). Mitchell finds that "on the one hand, the goal [of landscape painting] is nonrepresentational painting, freed of reference, language, and subject matter; on the other hand, pure hyperrepresentational painting, a superlikeness that produces 'natural representations of nature' " (Mitchell, 2002, p. 13). It is a conscious method then, of deciding what nature is and then convincing the audience that a decision was never made. There is an attempt "to erase the signs of our own constructive activity in the formation of landscape as meaning or value, to produce an art that conceals its own artifice, to imagine a representation that ' breaks through' representation into the realm of the nonhuman" (Mitchell, 2002, p. 16-17). In this way there occurs the construction of a reality and the construction of an illusion convincing the viewer that the reality is true – a process that draws parallels to the formation of imaginative geographies.

The power of representation is an important piece of the architectural disciplines. Some might argue that architecture is embodied more in its representation than its physical manifestations. Representation is both an imaginative and practical tool – its used to convince public and private stakeholders of the efficacy of a design and at the same time to communicate information from designers to craftsman, to translate design into construction. It is also employed as a creative endeavour to explore possibilities and tell stories of what may or not be.

TOWARDS A MODUS OF POSTCOLONIAL DESIGN: METHODOLOGY

Fig 9 - Photo taken of the ruins at Hauz Khas, Delhi

Through the earlier discussion of colonial hydrology, both during and prior to European colonisation, what is most striking, at a fundamental level, is the ability that colonial interventions had to recharacterize the relationship between the Indian people and water. From drawing lines to separate water from land and the imposition of massive canal projects, to the destruction of traditional water management practices and the reorienting of the city of Delhi, colonial hydrology has shaped the very way that Indian people view, live within, and interact with water.

Traditionally Indian societies have been stewards of water, aware of the cyclical nature of its flows. Water infrastructure was deployed not to reconfigure water systems and short circuit natural cycles but to mimic its patterns in moments of holding, overflowing, and seeping (da Cunha, 2019; Jacob, 2014; Mathur & da Cunha, 2009). da Cunha recounts how prior to colonization, and before the marginalization of rain in preference of the river, settlements in India were less fixated on the specific position of overland flows in horizontal space and instead focused on the rise and fall of water (2019). Rain that fell from the sky,

"the celestial Ganga", soaked the earth creating an "ocean of rain" and encouraging movement to higher ground (da Cunha, 2019, p. 232). Care was also taken to refrain from soiling water. Hymns within "the most ancient Hindu texts, the Vedas . . . forbid any pollution of water bodies, noting places where defecation and urination are permitted" (Colopy, 2012, p. 32). In Muslim thought water "is considered a blessing from God that gives and sustains life" (Faruqui, Biswas, & Bino, 2001, p. 1) and as such the Mughal Empire sought to ensure equitable and sustainable water provision (Dasgupta, 2018; Jacob, 2014). Both Hindu and Muslim people hold water as an agent of purification (R. P. B. Singh, 1994), a belief demonstrated by the Hindu performance of puja on the banks of rivers (including splashing water on the head and immersing ones body) (Colopy, 2012); and Muslim practices of wudu and ghusl (washing before prayer and ritual bathing respectively) (Faruqui et al., 2001). While religious beliefs and practices continue to hold, the people of India's relationship to water has changed. This is illustrated with the relationship between Delhi and the Yamuna. As referenced earlier, Dasgupta describes the Mughal city in what is now Old Delhi as one that was built "to look sensuously out on the river . . . the waterfront was a pleasure zone of palaces and gardens" (2018, p. 158), while today "many people spend years in Delhi without ever laying eyes on the Yamuna" (2018, p. 159). "For the citizens of Delhi, the Yamuna is a non-place. If history, identity, and social relations are the hallmarks of an 'anthropological place', the Yamuna is perceived as being devoid of all these . . . the river is a watery nothingness" (Baviskar, 2017, p. 4).

In comparing to earlier descriptions India today is very different place – "European colonialism did not just impose another way of seeing and knowing place; it imposed another place" (da Cunha, 2019, p. xi). Colonial hydrology, first through modes of representation and later through infrastructural and administrative acts on the ground has changed the narrative of India's relationship to water. There are many who still rely on the Yamuna and on natural and man-made water spaces for social and productive use, including the procurment of water. This is the realm of subalternity. Its people are the subaltern, a term used within the discourse of Subaltern Studies and postcolonial theory to describe those people or voices which are dominated by the ruling class (Jazeel, 2019). They are those who have been forced to live in a system which was not designed to serve them, whose voices and lives are marginalized in pursuit of continued colonial hydrology – people who today are persecuted by 'bourgeoisie environmentalism', perpetuated by governmental agencies along with the middle and upper-class, as the cause of a deteriorating natural environment hindering the pursuit of Delhi's dream of becoming a world class city (Baviskar, 2018; Palat Narayanan, 2019). How does a designer proceed?

In his book, appropriately titled *Postcolonialism*, Jazeel argues that "postcolonialism is best conceived not as a theory per se, but instead as methodology" (Jazeel, 2019, p. 3). While his book speaks primarily to the pursuit of postcolonial geography, I find his sentiments applicable to postcolonialism in any field, including the field(s) of design in which little seems to have been published on the topic. After all, the end goal is the same – not simply to document the impacts of colonialism but to "conceptually transcend the primacy of colonization" (Jazeel, 2019, p. 5). In this way Jazeel states that "postcolonial texts and interventions may consciously seek to push past and beyond the condition of coloniality in its widest sense" (2019, p. 5). The author's use of the term 'interventions' here is comforting, as it is a term we 'designers' often use to describe our work, this places the pursuit of postcolonial design within our sights.

This project, as I believe no project operating under the lens of postcolonialism should, does not intend to put forth one specific, overarching methodology for postcolonial landscape architecture or design at large – put concisely "the very idiosyncratic context of each of our own research endeavors should promulgate a just as unique call" (Jazeel, 2019, p. 200). Following that logic my own methodology is less the employment of an existing methodology and more a creative pursuit in itself, in which I borrow and attempt to expand upon ideas, frameworks, ambitions, and modes of narration and representation in order to contribute a design response conceived of through a postcolonial lens.

As for a modus of working this project turns to Edward Said and Michel Foucault who have stressed the importance of representation as a form of discursive production that has the power to preference certain knowledges, craft truths and imagine narratives (Foucault, 1972; Said, 1978). Representation and narrative are of course two tools commonly employed in Landscape Architecture.

In the case of colonialism and imperialism, representation was used in the production of discourse that justified the dominance of the colonial entity, the superiority of their way of life, and the power of imperial science. It did so by silencing the voices of the other, the colonized. The work of the Subaltern Studies Collective aimed to retell Indian history through the voices of the dominated (subaltern) and attempted to counter issues of the hegemony over historical narrative with representation (Jazeel, 2019). Similarly this project attempts to reimagine the water system through architectural representation in a way that presents more clearly the often invisible infrastructures that maintain socio-economic and political inequities in access to water and water related services in urban India. This project will exist solely as representations and persuasions, not with any claims to directly produce changes in the real world but to reorient the viewers perception of the current water reality. Representation is employed to challenge what we typically draw and in some instances the way we draw - experimenting with depictions of water not just as bounding lines but as flows which respond to the social, physical and ideological infrastructures which shape India's urban water reality.

On Matters of Site

While many of the ideas introduced here are applicable to a number of urban centres in India, this project will focus geographically on Delhi, formally known as the National Capital Territory of Delhi which includes India's capital city New Delhi. Specifically, this project will site itself in Informal Delhi, a conceptual rather than a physical geography. It is composed of the spaces, places, and interactions of those who are considered to inhabit unauthorized space and engage in unauthorized activity. This does not imply criminality but instead a condition of marginalization. In Delhi the formal and informal live side by side, intertwined and superimposed. Thus using Informal Delhi as a site allows for the investigation of and intervention within a network of spaces constituted of a myriad of actors.

(RE)IMAGINING WATER: A POSTCOLONIAL RESPONSE TO COLONIAL HYDROLOGY

In its final form *(Re)Imagining Water: A Postcolonial Response to Colonial Hydrology* is commuicated as a virtual gallery containing a series of drawings and descriptions. The exhibit exists hypothetically in the National Gallery of Modern Art in New Delhi where it may be frequented by the upper and middle class and designers alike. To follow is the contents which would have comprised the gallery exhibit and were once (perhaps still are) hosted on the website *reimaginingwater.com* .

(Re)Imagining Water

A Postcolonial Response to Colonial Hydrology

For nearly two centuries the British imposed their imperial agenda on India through the pursuit of Colonial Hydrology - physical and ideological infrastructures which sought to express the power of the empire through the control of nature, of water and thus the control of people. Implementation of a colonial imaginary conveyed in seemingly impartial drawings created by cartographers, surveyors, planners, and engineers were actualized as physical infrastructures which further fragmented India - widening divisions along lines of economic, social and political class while at the same time disconnecting people from the natural hydrologic system.

Today the impacts of Colonial Hydrology continue to reproduce socio-spatial inequalities seeded in the design and conceptualization of the water system. Approaches to water management and urban planning passed down by colonial predecessors have been unable to cope with rapid urbanization, climate change, and the self induced deterioration of the surrounding environment. As overallocation and unsustainable withdrawals of water for agricultural, industrial, and urban use spurs increasing rates of rural to urban migration, cities like Delhi find themselves in the midst of a water crisis, the burden and blame for which is inequitably borne by the poor. The conversion of rivers, lakes, and ephemeral streams into sewage drains has resulted in severe contamination of surface and groundwater flows which are simultaneously being deprived of recharge by urban development. Disadvantaged communities are forced to rely on a growing water black market to purchase stolen municipal water and contaminated groundwater to supplement the little they acquire from spending hours each day procuring water from municipal tankers and unreliable community taps - tasks which primarily fall to women and girls. While the water crisis increasingly affects the whole of India's population, the cost of coping is exponentially higher for the socio-economic and politically disadvantaged who pay with their labor, time, health, and opportunities at future upward mobility.

The power dynamics sown into the infrastructure of Colonial India continue to play out today. The narratives are controlled by those with the capital to decide what is visible and invisible, what is authorized and illegal, formal and informal. Recognizing the role that visual representation has and continues to play in India's water system this exhibit seeks to reappropriate architectural representation to uncover and make visible the infrastructures of power, and narrative which sustains the socioeconomic inequities of access to water and water related services. Drawing is used to reimagine/reframe narratives for the socioeconomically disadvantaged and their interactions with water. Perhaps India's future success actually lies in the development of what can and is already taking place in settlements of the subaltern.

Whose Lines Are These?

On the surface India's water crisis is a paradox. How could a country renowned for its rivers and monsoon rains be 'running out of water'? It's not. Holistically India's water crisis is not a case of water scarcity or shortage. Instead it's a machine driven by mismanagement, inequity, and disconnection. The water crisis is a story of lines drawn on maps, plans and sections. Lines that turned water into rivers, and rivers into canals and sewers. Since the arrival of the British East India Company in the early 1600's India's hydrologic system has become increasingly disconnected from the natural hydrologic cycle. Redirecting water through canals and pipes has given a select few the power to choose who and what receive water and for what purpose. A system devised by the British to generate more tax revenue from water intensive cash crops and to provide investment opportunities for the British elite through the construction of unnecessary hydrologic infrastructure has continued to shape India's water.

This isometric drawing uses serial sections to convey the porosity of the land which in reality does not separate the water in the sky, from the surface and the subterranean but instead mediates its flow.

Pipes corral a free flowing Yamuna - pumping it to the city of Delhi. The city's waste fills ephemeral streams and cascades down into a forgotten river where it seeps through the porous ground and continues downstream. Upstream cotton farms and bottling plants continue to deprive rural villages of water, driving people into the city where water is reserved for the elite.

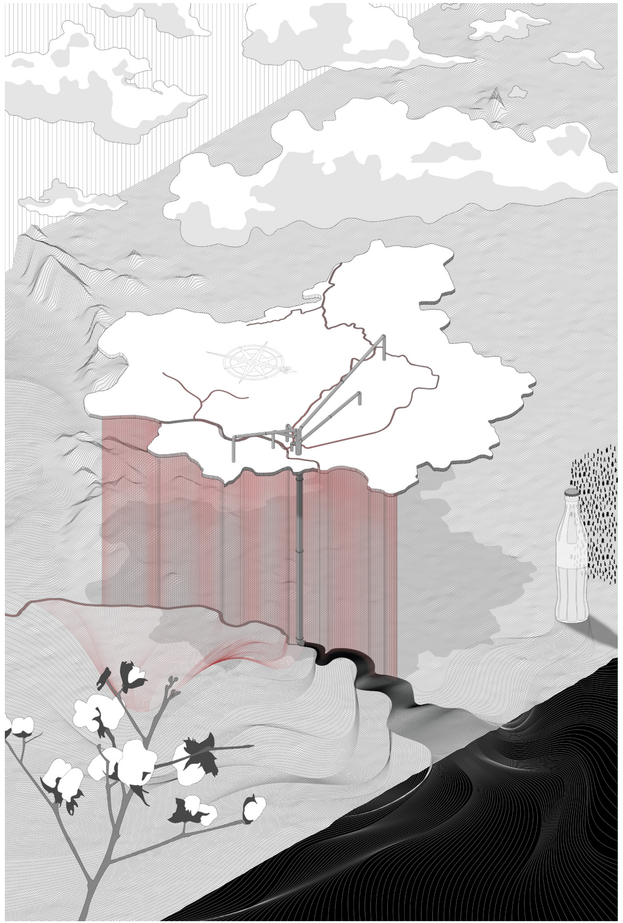

Fig 10 - Whose Lines Are These?

Marigolds

In India one's access to water, both in terms of quantity and quality, is based largely on socio-economic and political capital. The unlimited access to clean water enjoyed by the elite few comes at the expense of the many who are excluded – this exclusion maintains the system. The socio-economic and politically disadvantaged face high costs for any access to water at all. They effectively subsidize the elite's water access with the time, labour, health, and monetary capital that is spent on procuring water from unreliable and often unsanitary sources.

This drawing collapses and reorganizes horizontal space into a vertical arrangement making visible the power relation between those who can spend water leisurely and those who struggle to meet their basic water needs.

A marigold is watered in a private domestic garden. Excess fertilizer is mobilized and drains downward. The bodies of women and young girls have become receptacles for the contamination that finds its way into the water that they struggle for access to. Their labour reproduces the current system of inequitable water access, pumping water back to the domestic garden. In the background a new system emerges leveraging flowering plants to remove contamination. The filtrate dilutes the polluted groundwater which will eventually find its way into human and non-human bodies.

Fig 11 - Marigolds

Pools, Pipes, Participation

Upwards of 40% of the water that flows through the municipal system in Delhi is reported as 'lost'. Likewise more than 50% of the sewage finds its way into the environment untreated. The invisibility of underground infrastructure hides the unmaintained and unmetered water lines which drop half their contents along the way, and the sewage pipes that never make it to a treatment plant. The majority of Delhi's population discharges their waste into rivers, streams, lakes, ancient tanks, and stepwells. However, only some can afford to keep it a secret. Their proximity and reliance on public bodies of water forces residents of informal settlements to bear the burden of the entire population's waste, yet they are refused equal access to the municipal water system. Branded as the problem by bourgeois environmentalists, informal communities are eventually displaced. The degradation of their neighboring water spaces makes them easy prey for developers looking to purchase land for cheap. Skimping out on sewage connections allows developers to ensure future projects as they promise to clean up the messes they've often secretly created.

This drawing can be read as simultaneously flipping a typically horizontal adjacency into a vertical one or the depiction of the same space at two different points in time. In this way infrastructure is revealed as connecting the informal and the less informal through inequities in participation across both space and time.

Water and sewage lines fill the liminal space between an informal settlement and a new development. After trading their votes for unrealized and temporary water connections the settlers begin to construct an honest and visible water system by tapping into the water mains that they are denied access to.

Fig 12 - Pools, Pipes, Participation

Sanivation X Delhi

Unfortunately safety and privacy during sanitary acts is not a right but a privilege in India. While the act of defecation and the resulting waste are invisible for the privileged, a large portion of the population in rural and urban environments are forced to defecate in the open. This is especially dangerous for women and gids whose health and safety are constantly jeopardized. The issue of open defecation is the result of insufficient and inequitable access to toilets combined with cultural beliefs, including the association of human waste with the lowest caste - the 'untouchables'.

Sanivation is an organization that operates in East Africa using a container based sanitation system that turns human waste into a usable household product - cooking coals. This transforms defecation into a component of an economic system, eliminates the need for sewerage, and reduces the environmental impacts of open defecation while providing a cleaner source of cooking fuel.

This set of drawings along with the gallery space (a container based sanitation washroom) imagine a partnership between Sanivation and the city of Delhi. Making acts of defecation invisible while making the waste product more visible is an attempt to find a place for design in the solution to open defecation.

Panel 1 - women make their way to the bank of a canal/drain under the cover of night
Panel 2, 3 - squat toilets, and decorated waste containers kickstart a process of converting human waste into an economically viable system.

Fig 13, 14, 15 - Sanivation X Delhi Panels 1, 2, 3

A Goddess

Residents and visitors alike are often unaware that the same river which winds past the Taj Mahal passes through Delhi upstream. Regarded as the second most holy river in India, the Yamuna is the physical manifestation of a Goddess. Along with the Ganges it has been declared a living entity, afforded the same rights as a human being. Yet over the 20km stretch in which it passes through Delhi the Yamuna is transformed into one of the most polluted rivers in the world. The British design for New Delhi turned the city's back to the sacred river, converting the holy entity into a source of water and a receptacle for waste. A nonplace for some, many still depend heavily on the Yamuna. While its waters are contaminated with industrial effluents, raw sewage, and solid waste, it's banks are still home to those who can't afford to live anywhere else. Its floodplains are still farmed, and its ghats (steps) still frequented by religious pilgrims who come to cleanse themselves in her holy waters. It's only during spiritual practice that all become equal before the Yamuna, in that moment and only that moment is exposure to the physical pollution and the metaphysical purity experienced equally across socio-economic and political class.

The Signature Bridge looms over the Yamuna, foreshadowing the generic riverfront developments of a future Delhi. A pipe aerates the dead river - simultaneously oxygenating its waters and forcing solid waste to bubble to the surface. Fishermen sweep across the Yamuna with their fishing nets, guiding garbage towards the ghats which have been repurposed as temporary receptacles for waste. Coupling waste collection with religious infrastructure subverts a typical caste power relation. 'Scavenging' - the practice of collecting and sorting through garbage is seen as the duty of the lowest castes, but maintaining religious spaces like the steps of a holy river is a righteous duty.

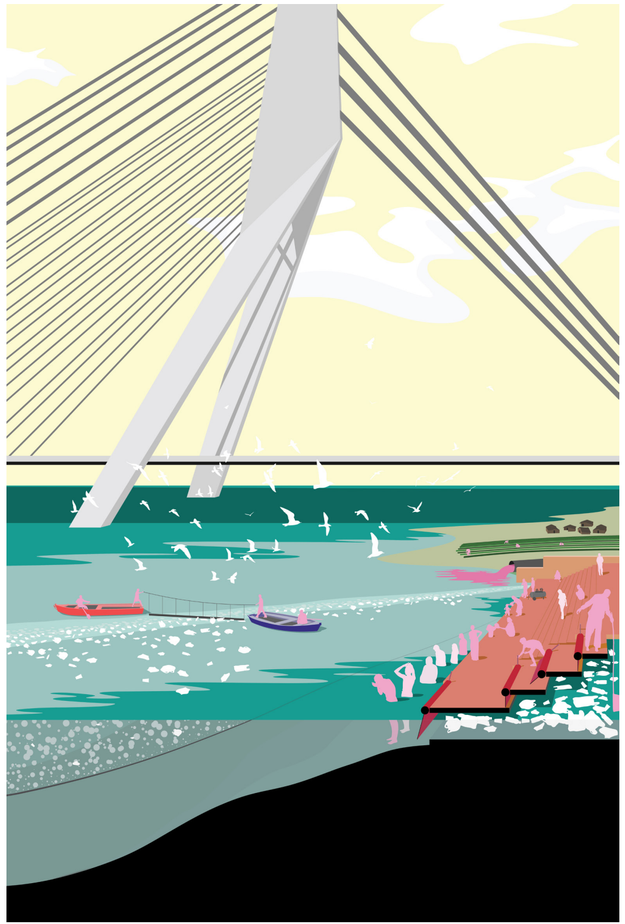

Fig 16 - A Goddess

IN CONCLUSION

While this project did not conclude with the design of a physical space, it became an important process in examining how representation has been previously used to further colonial intent and how it can be used to reflect on the systemic inequities that representation has helped to create. During the colonization of India, and many other geographies, the seemingly impartial drawings made by cartographers, engineers, planners, and designers were in fact tools in shaping preexisting places into the geophgraphies of the colonial imaginary and simultaneously expressing colonial power over nature and the other. As we continue to design physical spaces in the professional and academic pursuits of Landscape Architecture and other design fields this project advocates for the use of drawing to showcase invisible power relations and to reframe the narratives that are so often written by those in power. Doing so can be an important initial step in any kind of design intervention where there are socio-economic imbalances, and it is likely that those exist everywhere. In hindsight, this has been an exploration and development of a new layer of site analysis which will hopefully find a place in future projects and practices.

REFERENCES

Acciavatti, A. (2015). *Ganges Water Machine: Designing New India's Ancient River*. Applied Research + Design Publishing.

Alday, I., & Gupta, P. V. (2018). *Yamuna River Project: New Delhi Urban Ecology*. Actar.

Baan, I. (2014). Kumbh Mela. *Harvard Design Magazine*, (37), 7.

Barrow, I. J. (2003). *Making History, Drawing Territory: British Mapping in India, C.1756-1905*. Oxford University Press.

Baviskar, A. (2018). Between Violence and Desire: Space, Power, and Identity in the Making of Metropolitan Delhi. *International Social Science Journal*, 68(227–228), 199–208. https://doi.org/10.1111/issj.12184

Baviskar, A. (2017). What the Eye Does Not See: The Yamuna in the Imagination of Delhi. In *The SAGE Handbook of the 21st Century City*, 298-313. Newbury Park, CA. SAGE Publications Ltd.

Cities of Delhi. (2015). Categorisation of Settlement

in Delhi. Centre for Policy Research India.

Colopy, C. (2012). *Dirty, Sacred Rivers: Confronting South Asia's Water Crisis*. Oxford University Press.

Craib, R. B. (2000). Cartography and Power in the Conquest and Creation of New Spain. *Latin American Research Review*, 35(1), 7-36.

da Cunha, D. (2019). *The Invention of Rivers: Alexander's Eye and Ganga's Descent*. University of Pennsylvania Press.

Dasgupta, R. (2018). A Map of the World That Does Not Contain Utopia. I*n Yamuna River Project: New Delhi Urban Ecology*. Actar.

Desbiens, C. (2016). Imaginative Geographies. In *Encyclopedia of Geography: People, the Earth, Environment, and Technology*. Hoboken, NJ: John Wiley & Sons.

D'Souza, R. (2006). Water in British India: The Making of a "Colonial Hydrology." *History Compass*, 4(4), 621–628. https://doi.org/10.1111/j.1478-0542.2006.00336.x

Eck, D. L. (2013). India: A Sacred Geography. Three Rivers Press.

Faruqui, N. I., Biswas, A. K., & Bino, M. J. (2001). *Water Management in Islam*. New York, NY: United Nations University Press.

Foucault, M. (1972). Two Lectures. In *Power/Knowledge: Selected Interviews and Other Writings*. New York, NY: Panthon Books.

Gattegno, N. (2014). Aqueous Territories. In *Design in the Terrain of Water*. Applied Research + Design Publishing.

Gilmartin, D. (1994). Scientific Empire and Imperial Science: Colonialism and Irrigation Technology in the Indus Basin. *The Journal of Asian Studies*, 53(4), 1127–1149. https://doi.org/10.2307/2059236

Gilmartin, D. (2003). Water and Waste: Nature, Productivity and Colonialism in the Indus Basin. *Economic and Political Weekly*, 38, 5057-5065.

Jacob, N. (2014). *Jalyatra, A Journey Through India's Water Wisdom*. CreateSpace Independent Publishing Platform.

Jain, V., Chennuri, S., & Karamchandani, A. (2016). *Informal Housing, Inadequate Property Rights*. FSG Mumbai.

Jazeel, T. (2019). *Postcolonialism* (First Edition). London ; New York: Routledge, Taylor & Francis Group.

Kalpagam, U. (1995). Cartography in Colonial India. *Economic and Political Weekly*, 30(30), PE87-PE98.

Khan, N. (2015). Urban Vernacular: Informal Architecture of the Unauthorised Colonies of Delhi. *Spandrel Journal of School of Planning and Architecture*, 10, 30-40.

Mathur, A., & Cunha, D. da. (2001). *Mississippi Floods: Designing a Shifting Landscape*. Yale University Press.

Mathur, A., & da Cunha, D. (2009). *Soak: Mumbai in an Estuary*. Rupa & Company.

Mathur, A., & da Cunha, D. (2014). *Design in the Terrain of Water*. Applied Research + Design Publishing.

McGinn, P. (2009). Capital, 'Development' and Canal Irrigation in Colonial India. *Institute for Social and Economic Change*, 29.

Mehta, L., Allouche, J., Nicol, A., & Walnycki, A. (2014). Global environmental justice and the right to water: The case of peri-urban Cochabamba and Delhi. *Geoforum*, 54, 158–166. https://doi.org/10.1016/j.geoforum.2013.05.014

Mitchell, W. J. T., (2002). *Landscape and Power*. University of Chicago Press.

Mollinga, P. P., & Veldwisch, G. J. (2016). Ruling by Canal: Governance and System-Level Design Characteristics of Large-Scale Irrigation Infrastructure in India and Uzbekistan. *Water Alternatives*. 9(2), 222-249.

Mongabay-India. (2019, June 24). Delhi is running out of water, and it is everybody's problem. Retrieved December 16, 2019, from Mongabay-India website: https://india.mongabay.com/2019/06/delhi-is-running-out-of-water-and-it-is-everybodys-problem/

Palat Narayanan, N. (2019). The Production of Informality and Everyday Politics: Drinking Water and Solid Waste Management in Jagdamba Camp, Delhi. *City*, 23(1), 83–96. https://doi.org/10.1080/13604813.2019.1575118

Reuters. (2017, September 1). Modi's $87 Billion River-Linking Gamble Set To Take Off As Floods Hit India. Retrieved December 15, 2019, from Reuters website: https://www.reuters.com/article/us-india-rivers-idUSKCN1BC3HD

Roy, D. (2013). Negotiating marginalities: Right to water in Delhi. *Urban Water Journal*, 10(2), 97–104. https://doi.org/10.1080/1573062X.2012.709254

Said, E. W. (1978). *Orientalism*. Pantheon Books.

Sharan, A. (2011). From Source to Sink: 'Official' and 'Improved' Water in Delhi, 1868–1956. *The Indian Economic & Social History Review*, 48(3), 425–462. https://doi.org/10.1177/001946461104800305

Singh, R. P. B. (1994). Water symbolism and sacred landscape in Hinduism: A study of Benares (Varanasi). *ERDKUNDE*, 48(3). https://doi.org/10.3112/erdkunde.1994.03.05

Stone, I. (2002). *Canal Irrigation in British India: Perspectives on Technological Change in a Peasant Economy*. Cambridge University Press.

Truelove, Y. (2011). (Re-)Conceptualizing Water Inequality in Delhi, India Through a Feminist Political Ecology Framework. *Geoforum*, 42(2), 143–152. https://doi.org/10.1016/j.geoforum.2011.01.004

Truelove, Y. (2018). Negotiating States of Water: Producing Illegibility, Bureaucratic Arbitrariness, and Distributive Injustices in Delhi. *Environment and Planning D: Society and Space*, 36(5), 949–967. https://doi.org/10.1177/0263775818759967