Inclusive Public Spaces for Water Management in Rural India

by

Tsz Wai Wong

BA (LS), University of Hong Kong, 2013

A REPORT

submitted in partial fulfillment of the requirements for the degree

MASTER OF LANDSCAPE ARCHITECTURE

Department of Landscape Architecture and Regional & Community Planning
College of Architecture, Planning and Design

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2018

Approved by:

Co-Major Professor
Alpa Nawre

Approved by:

Co-Major Professor
Stephanie Rolley

Copyright

Abstract

In underprivileged communities in developing countries, water is essential for basic survival. Particularly for rural communities, water supports irrigation for agriculture and, hence, the livelihood of villagers. Based on a forecast by the Asian Development Bank, India is expected to reach a water deficit of 50% by 2030 (Dutta, 2017). Without awareness of conservation and efforts to conserve water resources and protect them from being polluted by industries and communities, rural Indian communities will continue to suffer from water mismanagement and the loss of potential long-term environmental, social, and economic benefits that water can bring to a community.

Nonetheless, better water management is attainable in rural communities. Given the model Indian villages that have been transformed into sustainable communities by implementing and managing effective blue-green infrastructure through community participation, landscape architects are proven that they are capable of various roles in leading, initiating, and providing design and technical support for water infrastructure projects of different scales in rural India. Since stewardship and maintenance of these systems are critical for long-term effectiveness, the core idea of this design project is leveraging local efforts and community power to build and maintain functional water infrastructure as a better, more sustainable water management strategy. In this study, public space associated with water infrastructure is considered as a potential driver for local efforts to maintain the water management landscape when those public spaces are designed for inclusiveness and diversity.

Thus, the project goal is to create or transform the public space associated with existing water infrastructure into an inclusive, productive community place that can generate environmental, social, and economic benefits, as a strategy for sustainable water management in rural India. Currently, the proposed water management landscape in this study is a diverse public space shared by community members of different ages, genders, classes, castes, and religions.

The research methodology divides into three phases. The first phase addresses the general water issues and the cultural background of rural India through literature and preliminary site inventory using the GIS data provided by the Panchayat of Dhamori. The second phase presents the perceptions of villagers in Dhamori about using water and public space after collecting quantitative and qualitative data through site observation and participatory planning. By synthesizing and analyzing the knowledge generated from the participatory process on-site, the final phase interprets and addresses the emergent problems through developing a design framework for conceptual site design.

Inclusive Public Spaces for
Water Management in Rural India

Astrid Tsz Wai Wong

Inclusive Public Spaces for Water Management In Rural India

A Design Framework of the Public Spaces Associated
with Water Infrastructure in Rural India to Promote
Sustainable Water Management

by

Astrid Tsz Wai Wong

Master of Landscape Architecture
Master's Report 2018
Kansas State University

List of Figures

List of Tables

Abstract

In underprivileged communities in developing countries, water is essential for basic survival. Particularly for rural communities, water supports irrigation for agriculture and, hence, the livelihood of villagers. Based on a forecast by the Asian Development Bank, India is expected to reach a water deficit of 50% by 2030 (Dutta, 2017). Without awareness of conservation and efforts to conserve water resources and protect them from being polluted by industries and communities, rural Indian communities will continue to suffer from water mismanagement and the loss of potential long-term environmental, social, and economic benefits that water can bring to a community.

Nonetheless, better water management is attainable in rural communities. Given the model Indian villages that have been transformed into sustainable communities by implementing and managing effective blue-green infrastructure through community participation, landscape architects are proven that they are capable of various roles in leading, initiating, and providing design and technical support for water infrastructure projects of different scales in rural India. Since stewardship and maintenance of these systems are critical for long-term effectiveness, the core idea of this design project is leveraging local efforts and community power to build and maintain functional water infrastructure as a better, more sustainable water management strategy. In this study, public space associated with water infrastructure is considered as a potential driver for local efforts to maintain the water management landscape when those public spaces are designed for inclusiveness and diversity.

Thus, the project goal is to create or transform the public space associated with existing water infrastructure into an inclusive, productive community place that can generate environmental, social, and economic benefits, as a strategy for sustainable water management in rural India. Currently, the proposed water management landscape in this study is a diverse public space shared by community members of different ages, genders, classes, castes, and religions.

The research methodology divides into three phases. The first phase addresses the general water issues and the cultural background of rural India through literature and preliminary site inventory using the GIS data provided by the Panchayat of Dhamori. The second phase presents the perceptions of villagers in Dhamori about using water and public space after collecting quantitative and qualitative data through site observation and participatory planning. By synthesizing and analyzing the knowledge generated from the participatory process on-site, the final phase interprets and addresses the emergent problems through developing a design framework for conceptual site design.

Acknowledgements

It has been the toughest semester among all the others in this three years. Therefore, I am very grateful that both this project and my academic study in the Master's degree in Landscape Architecture at K-State are finally coming to an end.

I have to start by thanking my co-major professor, Assistant Professor Alpa Nawre for her guid-ance, support, and encouragement since the beginning of this project in 2017. Working with mar-ginal communities in developing countries has always been my interested area to explore even before coming to K-State. Considering the lack of resources and feasibility to visiting unfamiliar marginal communities in new countries all alone, I hesitated to pursue the topic that I was the most interested. By the time I started to think about other new possibilities, Alpa had suggested me this exciting opportunity in the summer of 2017 to work along with her LAF research project in India. This unexpected opportunity changed my life (or at least my whole final year)! Without Alpa's resources and connections, I would not be able to pursue such kind of project on my own and earn this memorable experience.

In addition, Alpa always has confidence and high expectation on me, which meant a lot to me. I have also learned a lot from her dedicated attitude to work for marginal communities and from her personality. The field trip I joined with Alpa in December 2017 led me to meet with new friends who had similar research and design interests. The amazing people I traveled with during the trip to Dhamori included Monu, Skandha, Leslie, and Kabir. Monu and Skandha helped me a lot to integrate into the Indian culture since that was my first time to travel to India. They also played a critical role during the participatory research process and helped translate the Hindi conversation they had with the villagers for me. It was also an enjoyable experience to discuss ideas and collect site data like flying the drone together with Leslie, who was also a graduate landscape architecture student in the University of Minnesota. It was also an interesting experience to travel with Kabir, who is Alpa's two-year-old son that has always brought so much fun (as well as some unexpected challenges for me to learn) in this trip. I also want to thank Alpa's friends and relatives in India who showed their hospitality by making meals for us and sharing their shower when our guest house was out of water.

I also sincerely thank the residents in Dhamori that we interviewed and those who have invited us to their house for a chai break after our several hours of walking through the village. I would not have been able to develop the participatory part of this project without their collaboration and input.

On the other hand, I would like to express my special gratitude to my other co-major professor, Stephanie Rolley for her understanding and flexibility to approve Alpa to be my major professor regardless of the unconventional situation. Otherwise, all these would not have happened in the first place. My other LARCP committee members, Associate Professor Katie Kingery-Page and Howard Hahn also gave me thoughtful comments during each design reviews which have helped me to proceed and reflect on the project.

Also, thanks to Marcella Reekie for her high-quality work in proofreading my written document. Her editing advice improved the quality of this document a lot to be more readable.

Last but not least, thanks Mom and Dad for their unwavering supports and love throughout these three years.

Preface

Traditionally, landscape architecture has had an inseparable link with private, luxurious garden design for the wealthy minority. Regardless of the expanding field in the public realm and large-scale development, such imagery has still been widely perceived by the public such that the profession of landscape architecture is only relevant in providing services for the wealthy. However, nowadays, we are facing more and more unprecedented local and global challenges with various emerging environmental and social problems such as climate change, decaying infrastructure, depleting water resources and quality, emerging issues in public health, and inequity in accessing natural resources. In the face of these complex socio-environmental problems, there is and should be a shifting paradigm in the role of contemporary landscape architecture and the design process for designing a sustainable, resilient, and inclusive landscape for the public majority.

My motivation for landscape architecture stems from my first-hand experience in developing countries and my belief in the power of agency in the profession. I believe that the profession should be as influential as architecture or engineering in improving living conditions of marginal communities in developing countries, especially where basic survival is the priority. I am driven to investigate how landscape architecture and public space design can connect through bottom-up grassroots agency to influence and empower less fortunate communities to create a just, sustainable living environment.

In the 2017-18 school year, my co-major professor of this master's project, Professor Alpa Nawre received support from the Landscape Architecture Foundation Fellowship to further her research efforts on the design of resilient water management infrastructure in rural India. The project, which proposes a feasible landscape infrastructure plan for rural India, will be a pioneering design that can help rural communities to harvest water sustainably to improve the livelihood of villagers. Professor Nawre's project inspired my research interest and formed the basis for this Master's research project.

Table of Contents

1
Introduction

"Today 663 million people globally are without clean water and the vast majority of them – 522 million – live in rural areas. These communities face particular challenges in gaining access to water due to isolated locations, inadequate infrastructure and a continued lack of funding" (Thapliyal, 2017)

1.1 Background & Motivation

In developing countries like India, water is about basic survival and plays a major role in sustaining rural livelihoods. Specifically, significant water scarcity and poor water management in rural India have caused low productivity in agriculture and hence insufficient food and resulting poverty for many rural families. The difficult living conditions in these communities usually disrupt social harmony, which always leads to other socio-cultural issues. It turns out that the management of water is tied to different aspects of socio-cultural problems in rural villages, such as issues of gender and class inequities. The past and current unsustainable and inequitable practices in manageing water resources in rural India aroused my interest in investigating appropriate design and research methods to address the water crisis in rural India and the role of landscape architects in underprivileged communities.

In 2017, Professor Nawre started working under an Indian governmental initiative, The Member of Parliament's Model Village Scheme, to address resilient water management in an existing Indian village, Dhamori, in the Amravati District in Maharashtra State. A Member of Parliament, Dr.Vikas Mahatme who is undertaking the rural development program known as Sansad Adarsh Gram Yojna (SAGY), and the villagers in Dhamori village are the stakeholders of this project. With this opportunity, I am interested in understanding the deep-rooted cultural conflicts such as gender and class segregation in India, and their influence on the design and management of water infrastructure and the associated public space. By studying the relationship

between water infrastructure and the associated public space, I aim to find out whether physical design intervention in the landscape of water infrastructure can inform sustainable water management, and hence, lead to opportunities to address bigger socio-cutlural issues in rural Indian communities.

Apart from my interests in water management landscape, my other major research focus is participatory planning methods that can facilitate an inclusive design process for designers to work with and empower communities. Through engaging with the stakeholders in the selected village, Dhamori, I can experiment participatory action research methods that are applicable for rural communities in developing countries.

I visited Dhamori village with Professor Nawre in December 2017 for two and a half weeks. I collaboratively worked with Professor Nawre and another graduate student from the University of Minnesota to understand the site problems, collect data regarding the stakeholders' perspectives of problems and usage in water resources and public space in Dhamori. During and after the site visit, I made observations, documented the villagers' opinions and ideas on how to improve the physical and social environment of Dhamori village, reflected on the participatory process. The findings and lessons learned from the site visit informed a conceptual design proposal to address the critical problems found in Dhamori. The conceptual design enables abstraction and generalization into a typology as for applying to other rural Indian communities.

[1]   Part of the research team photographed at Dhamori signage.

1.2 Dilemma & Research question

Water is life, and naturally, access to clean water is believed to be a basic human right. As one of the most valuable natural resources on earth, water is not distributed equally in the world, as is true in many regions of India. Some regions suffer from receiving too much water that causes flooding, while in other regions, water is so scarce that it leads to recurrent droughts. Climate change, rapid urbanization and lack of planning in water management exacerbate the situation, augmenting the risks of natural disasters and lowering resiliency of the living environment. Therefore, strategic management of water resources is a major consideration in sustainable landscape architectural design for every site and scale of project. From artful green infrastructures to regional watershed planning, contemporary landscape architecture contributes to resilient water management through innovative and effective solutions to mitigate the detrimental change in water patterns that emerge due to site developments.

In underprivileged rural communities in developing countries, water is never considered as a mere aesthetic design component but viewed as essential for agricutlure to produce food and income, and, hence, the livelihood of villagers. On the contrary, insufficient water for irrigation can lead to fatal issues. For instance, farmers without hopes to harvest enough crops for supporting their family are subject to committing suicide (Snyder, n.d.). Unlike in developed countries, most Indian villages cannot afford to construct large-scale, high-cost, highly-engineered infrastructure projects to reserve, pump, or convey water effectively. Also, failure to properly manage water resources exacerbate the situation, leading to devastated environmental, social, and economic dilemmas.

Nonetheless, some villages have managed to invest in traditional low-cost water harvesting systems and develop their community as a whole without financial assistance from NGOs or the government. Those successful villages usually implement better water management scheme through active participation by the whole community. Participation in water management and governance has helped many impoverished villagers sustaining themselves. Still, these successful precedents are minority cases. Finding solutions, gaining necessary resources, and generating community dedication do not happen overnight. It requires more than the construction of water infrastructure systems alone to transform and address the social, environmental, and economic problems of Indian villages. The participatory planning process and action such as leadership, community participation, education, and so forth, plays a crucial role to facilitate and sustain long-term management, which will be discussed in Chapter 2- Literature Review, more in detail.

[2]   Indian farmers frequently reported to commit suicide due to lack of irrigation water for crops.

According to a non-profit organization that is concerned with public space, Project for Public Spaces, incorporating public spaces in designing policies and programs is even more important to developing countries like India. While infrastructure needs like clean drinking water and sanitation are still lacking, solving them alone would not address the other problems. Instead, public spaces can be common ground to address multi-sectoral problems through adding or enhancing social, environmental, and economic values to a community [3], and perhaps serving as a catalyst of change (Project for Public Spaces, 2014). Moreover, failure to value what public space can potentially provide could hamper economic activities, aggravate environmental degradation, and reduce social stability and security (Kim, 2015).

According to UN-Habitat, public spaces should be places that contribute to individual and social well-being, collective lives, and cultural richness of a community. Public space, in theory, is open and accessible to all community members (Mackenzie, 2015). This sense of equity and public ownership should be the core value of a public space. And so should this be true for water infrastructure. Effective water infrastructure should be designed with participatory management strategies that encourage every individual in the community to steward the natural resources for the sake of the whole. In this regard, it is critical for water infrastructure to be associated with public space, so that the value of openness, accessibility, equity, and a sense of ownership and stewardship can be incorporated to best manage the water infrastructure.

Unlike with urban sites where there is always competition between private development and public open space, a village usually has plenty of open spaces, but most of which are perceived as inaccessible due to years or generations of negligence. In turn, such ignored public spaces in a village are usually the most unsafe and undesirable spaces where people dump garbage or defecate, making the space itself culturally inaccessible. "Where open public space already exists, its thoughtful design and maintenance is vital for the health—cultural, social, economic, and physical—of any community" (Mackenzie, 2015). After all, a public space can only become a place when it has meaning and can generate benefits for its community.
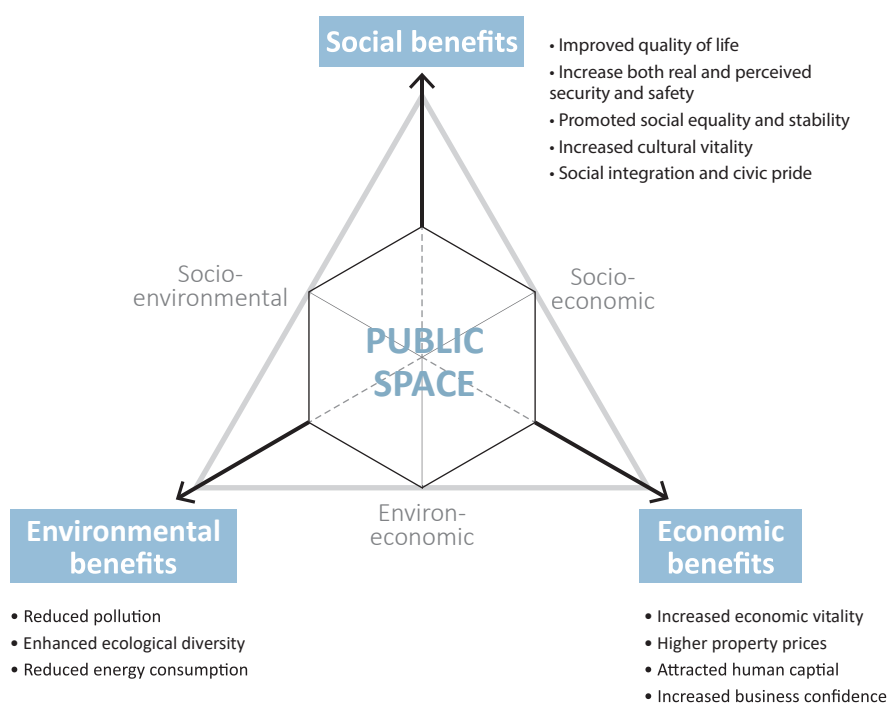
[3]   The benefits of public spaces in the poorest parts of the world.

Given that the landscape architecture profession has expertise in designing the outdoor physical realm with respect to the existing natural and cultural relationships of a site, is there a role for landscape architects to intervene and facilitate the process of improving village development by bridging the gap between systematic functions of water infrastructure and active community input in water management?

These issues and design opportunities lead to the following research question:

How can critical **water infrastructure** be designed as a **placemaking** tool to generate **social, environmental, and economic benefits** for rural India?

1.3 Theoretical framework & Approach

In this research question, three keywords or phrases guide the investigation and design of this project: water infrastructure, placemaking, and social-environmental-economic benefits. They are discussed from the perspective of the landscape architecture profession.

First, water infrastructure is designed to manage water systematically. Since the target groups to focus on in this project are the marginal, economically-deprived, rural communities in India, the ideal critical water infrastructure should be low cost and multi-purpose systems that can harvest rainwater and treat greywater and blackwater.

Second, placemaking is a human-led process by which a physical environment is made meaningful, or becomes a place (Mackenzie, 2015). In this case, placemaking is a tool to create or develop a community by adding the layer of social components to the water management system. Through strengthening the meaning of the landscape towards the community, the emphasis in designing the water infrastructure as a community place could be a strategy to to achieve sustainable water management practice, which helps organize the community to govern, operate, and maintain its own water infrastructure.

Finally, through this place-based approach, the design of water infrastructure as a diverse public space aims to foster collective governance and maintenance as a water management strategy, yielding social, environmental, and economic benefits relevant to rural Indian communities. Regarding this aim, physical design without the act of placemaking would be insufficient to nurture a sense of ownership and stewardship of the water infrastructure and the associated community space. "The degree of investment in one's physical community, or neighborhood, is largely dependent on its quality, and particularly the characteristics of the collective public realm. The public spaces where people interact provide a shared sense of ownership, and the qualities of these spaces influence how the communities operate and evolve" (North, 2012).

Therefore, this research investigates what characteristics of the physical environment, what spatial qualities, and what processes can evoke the awareness of the performance of water infrastructure and management among rural Indian communities, as well as promote diverse social interaction. The infrastructural systems, process, and programs proposed that are aimed at co-creating community places for advancing water management should be replicable to many Indian villages.
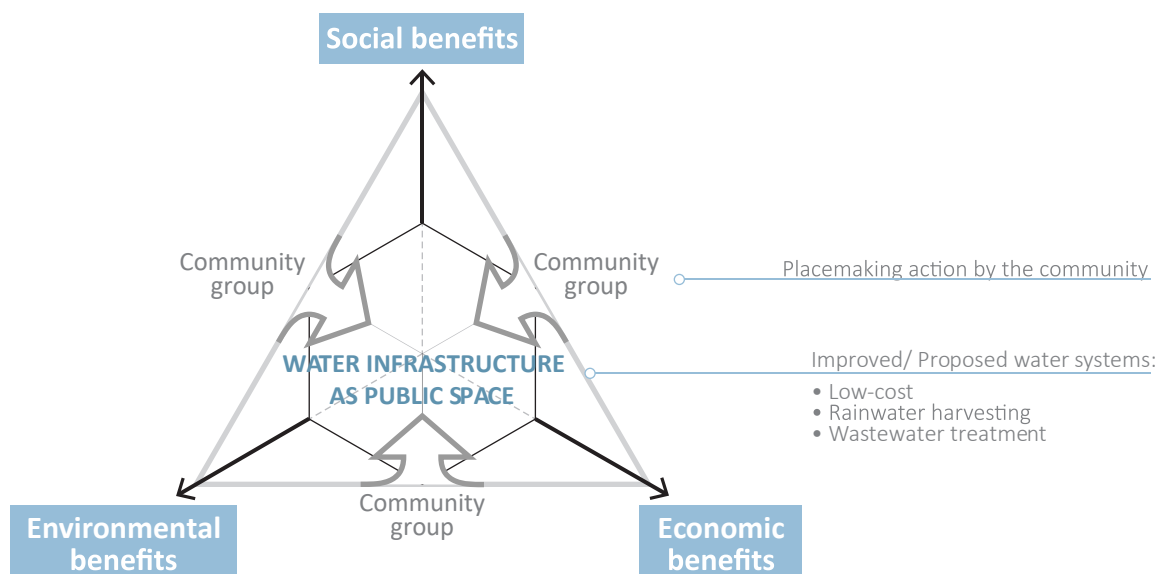
[4]   Theoretical project framework diagram.

1.4 Relevance to contemporary landscape architecture

In recent decades, the landscape architecture profession has been shifting its focus to a more urban environment (Branam, 2012). Advanced technologies also enable the profession to work on large-scale design and planning projects such as region- or city-wide infrastructure. Moreover, successful revitalization projects in water infrastructure always involve efforts from landscape architects to design the adjoining spaces of the infrastructure as community public spaces to provide human experience through social and recreational programs. Although the profession also sees its social responsibility to expand its influence in developing countries, there are not as many rural planning and design projects led by landscape architects, as compared to those by architects and engineers, resulting in insufficient academic discourses and real-life projects that provide similar socio-cultural functions as are added to our urban projects for the rural communities in developing countries.

Landscape design principles for designing quality public space are always changing and evolving to respond to contemporary values of formal cities. Other than adopting and adapting current models to the formal practice, we designers also need to be proactive in pushing our role and looking at what we can offer within the informal and rural context. This research project proposes the effective use of a localized, low-cost landscape approach to holistic water management systems in conserved, resource-deficient rural communities in developing countries. The major focus is the social impact and social-environmental-economic benefits such infrastructure brings to the public realm. To achieve sustainability of water resources, the water infrastructure proposed has to be more than a mere technically-functioning device to provide or treat water. As shown by landscape projects in developed countries, a close relationship between water infrastructure and public space design allows cultivation of a sense of community toward and stewardship of the design environment. Similarly, social cohesion and environmental awareness are especially essential in rural communities to enhance and safeguard the common good.

706

468

345

22

Urban

Rural

LANDSCAPE
ARCHITECTURE
MAGAZINE
THE MAGAZINE OF THE AMERICAN
SOCIETY OF LANDSCAPE ARCHITECTS
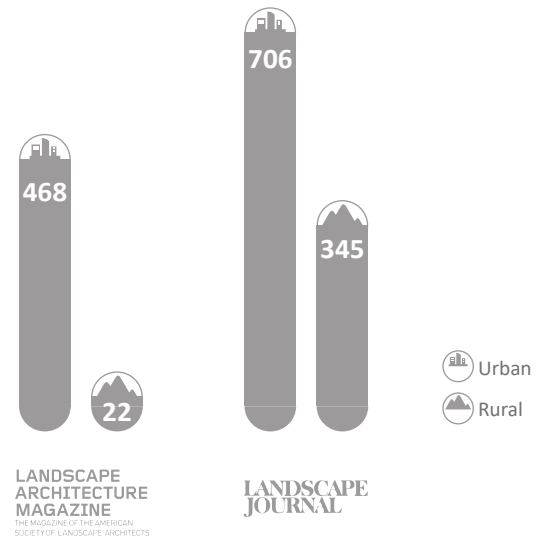
LANDSCAPE
JOURNAL

[5]   The usage of the keywords "urban" or "rural" in the body text of articles published in Landscape Architecture Magazine (LAM) and Landscape Journal (LJ).

1.5 Boundaries & Parameters

India   Maharashtra State   Amravati District   Dhamori, Bhatkuli Block
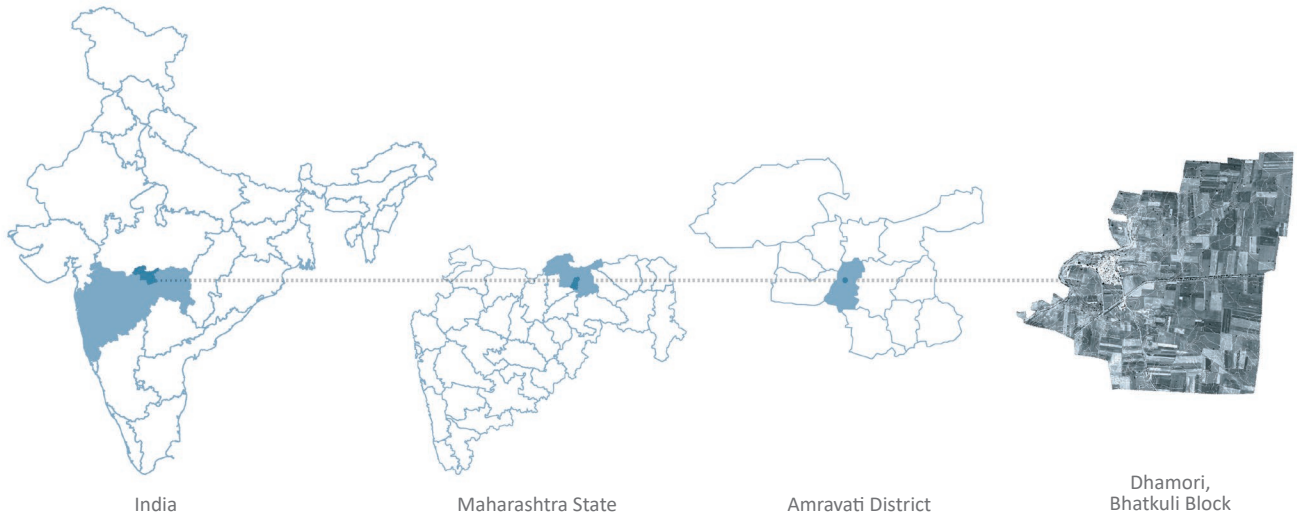
[6]   Site location maps.

This research project is complementary to Professor Nawre's proposal to work with an Indian governmental initiative, The Member of Parliament's Model Village Scheme, regarding the master planning of village development with a focus on resilient water management. Professor Nawre's project is significant to the profession in these four areas: 1. professional knowledge in initiating projects in developing countries, and specifically in designing water infrastructure in India, 2. community and grassroots empowerment, 3. political influence, and 4. pedagogical method in participation learning and research. Considering my personal interest and the limitation of time, my research efforts will focus on the first two areas, involving the design of the physical and social environment of public space assoiacted with water systems that either improves existing water infrastructure or incorporate new water systems.

The selected village that Professor Nawre has been working on determines the physical and ideological boundary of this research project. Dhamori village, located within the Bhatkuli block of the Amravati District in Maharashtra State, India, was selected to be the design site for this project. The village has 610 hectares of settlements and farmland. The community constitutes 480 families with a total population of 2,085 people of which 982 are female, 1,103 are male, and about 200 are children under six years old.

The design framework proposed to respond to Dhamori's actual problems are confined to the physical extent of Dhamori village. Ideologically, the site boundary also informs the research scope of the social, environmental, and economic problems in rural India relevant to this study. Instead of addressing all the social, environmental, and economic problems faced by rural communities in India, the problems the study addresses are based on the observation and data collected on-site. Even though the problems and solutions proposed are a direct reflection on and response to Dhamori village, they are not confined to Dhamori village necessarily. The design approach and strategies proposed aim to be replicable to most of the other villages that have similar socio-cultural issues.

1.6 Project phasing

The project lasted from August 2017 to May 2018 and can be broken up into three phases. The first phase took place in the Fall semester in 2017 from August to December. The research topic and questions were defined, and research methodology was determined. Another emphasis in this phase was to prepare for the site visit scheduled following the end of the Fall semester, which included conducting a literature review of general problems related to the water crisis in India, site analysis, and participatory planning for data collection during the site visit.

The second phase was the site visit during the winter intersession. I travelled to India soon after the end of the Fall semester and arrived at Amravati, the closest city to Dhamori village, on 12/14/2017. I stayed in India with Professor Nawre for two and a half weeks

and left on 12/29/2017. Data collected on-site was recorded and documented for future analysis and use. The findings also generated new enquiries and new knowledge. The enhanced knowledge of the site helped me refine the scope and framework of the project and choose feasible sites for projective design in the third phase.

The third phase began in the Spring semester in January 2018 and lasted until the end of the semester in May 2018. This phase focused on analyzing the data collected and synthesizing them with literature review and site analysis to propose design solutions that could respond to the research question. The site design could then be abstracted and conceptualized into a typological design framework.

Scope of Work	2017|09	2017|10	2017|11	2017|12	2018|01	2018|02	2018|03	2018|04	2018|05
1 Proposals & Work plan	███	███	███						
IRB application		██	██						
Literature review & Methodology		██	██	██		██	██		
Participatory planning		██	██	██					
Preliminary site analysis				██					
2 Site visit				█					
3 Data documentation & analysis					██	██	█		
Report development						██	██	██	█
Design development							█	██	█
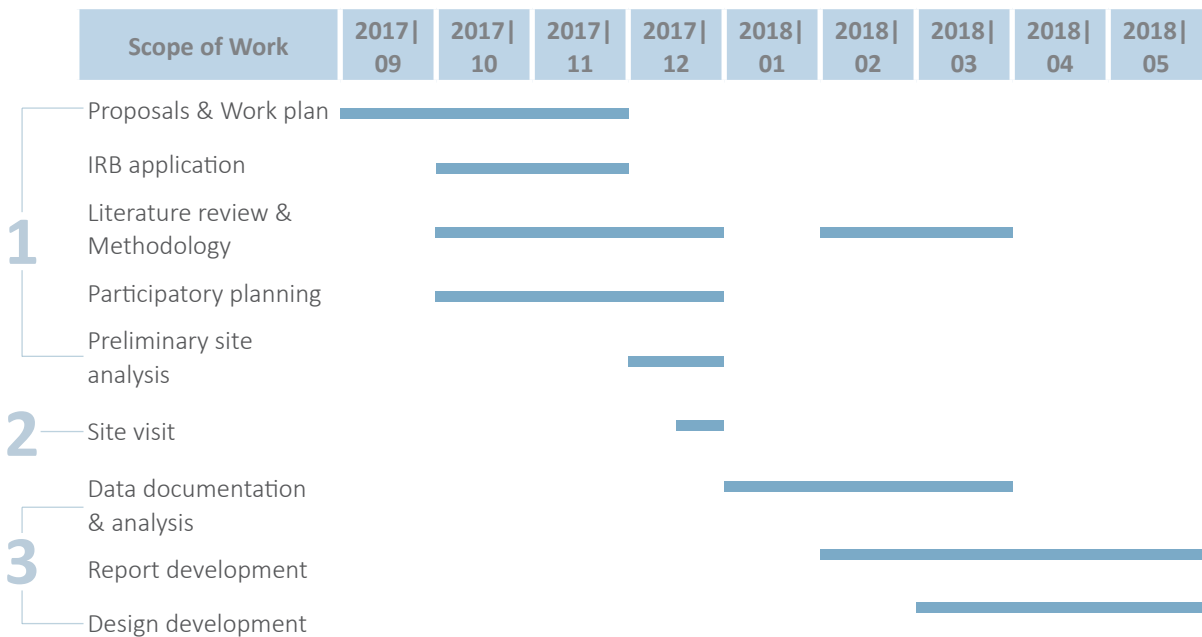
[7] Project phasing diagram.

2
Literature Review

The Literature Review is an important tool in the early phase of this project for various purposes:

1. To define the research direction and questions, a survey of literature permits understanding of socio-cultural, environmental, and economic problems related to the water crisis to gain background information about the problems and the culture of the selected site. It also connects the importance of the research in water management to the landscape architecture profession. Thus, the relationship between water infrastructure and public space design helps determine landscape architect's role in such projects.

2. To gain understanding of the mismanagement of water resources and its relationship to traditional cultures of rural Indian villages, socio-cultural phenomena of rural Indian communities can be studied more deeply and doubtless reveal cultural challenges.

3. Literature about the participatory design process inspires the planning of engagement activities for community participation and data collection for use during the site visit. Additionally, successful projects with rural community settings in India can inspire the design and clarify the role of landscape architects.

The first part of this literature review provides an overview of the water resources and other determining factors to illustrate the context and background of this problem. The discussion further focuses on the social, environmental, and economic problems brought about by the water crisis in rural India to clarify related traditional socio-cultural issues. To try to answer the research questions, this study addresses literature about water management and public space associated with water systems in various ways. Considering the influence of such projects on communities, the participatory design process will be included as a part of the solution to address the stated issues in rural India.

2.1 Water crisis in India

India has approximately 1170mm average annual rainfall across the country (Hegde, 2012). The distribution varies from region to region based on the size of river basins and per-capita water resource availability (Bhat, 2014). Such provision is also uneven throughout a year given that 80% of the annual rainfall occurs during the monsoon season from June to September. Although India is not a water deficit country, only 18% of rainwater effectively is in use while 48% enters the rivers and ocean. Moreover, surface water contributes to the total usable water the most in the form of 728 billion cubic meters of surface runoff and 395 billion cubic meters of replenished groundwater. Nevertheless, despite good rainfall distribution on the surface, the failure to capture and store water for future use with infrastructure such as reservoirs and dams has become a missed opportunity for meeting consumption requirements.

By 2006, the consumption of water in India had already reached 829 billion cubic meters and is expected to grow to 1090 billion cubic meters by 2025 (Hegde, 2012), pushing India and its agricultural sector to the verge of serious water scarcity. The natural supply of water or replenished groundwater is insufficient to meet such demands. Culturally, Indians are the largest freshwater users in the world using it mostly for agriculture, then for domestic and industrial uses (Bhat, 2014). With the second largest population after China, India's rapidly burgeoning population and urbanization combined with rising needs in agricultural production is straining supply. In particular, Indian farmers have traditionally practiced flow irrigation or flood irrigation to grow crops. These methods take huge amounts of water but offer poor productivity. Moreover, to ensure food security for the

growing population and economic development, more and more irrigation water is expected to support food production and livestock husbandry.

Although the mismanagement and lack of water infrastructure and population have loaded a tremendous burden on the water supply, they are not the only culprits creating the water crisis. Climate change, urbanization, technological advances, and economic development have had direct impact on water systems as well (Zaveri et al., 2016). Just as in other regions in the world, global warming has a great influence on the monsoon and precipitation patterns in India. The documented temperature rise promotes more rapid evapotranspiration and hence more runoff into the rivers and less volume for groundwater recharge. There are also data showing that while the quantity of maximum rainfall during a storm event increases, the number of rainy days reduces, suggesting a higher possibility for severe flooding. The melting of glaciers also leads to sea levels rising and causes saltwater intrusion into coastal regions, which further contaminates the groundwater quality.

The factors of climate change are not the emphasis of this research project due to limited research scope; rather, the project focuses on human factors in inefficient water management and infrastructure, which is another major cause of the expected drop in the water supply that will be discussed later.

329 M. ha. Geographical area

2.4% World area
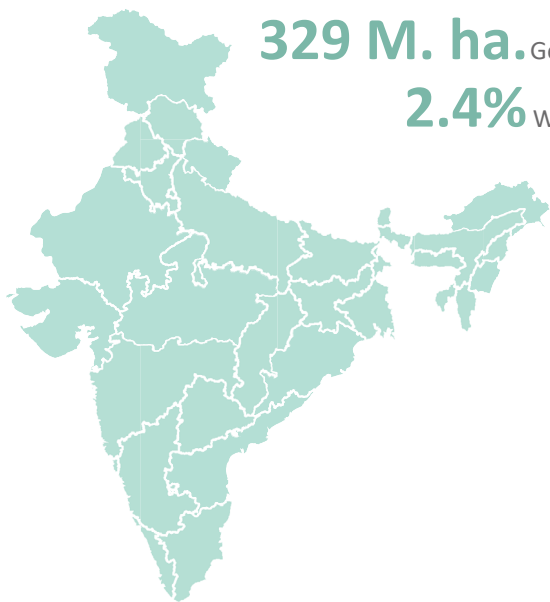
17.2% World population

1208 mm Annual rainfall (2016)

4000 BCM Average annual precipitation

3000 BCM Average precipitation during monsoon (Jun-Sept)

[8]   Area and water resources in India.

India has about **16%** of the world's population as compared to only **4%** of its water resources. **330 million** people in India suffer from water scarcity [United Nations].

1-5 million

10 million or more

5-10 million
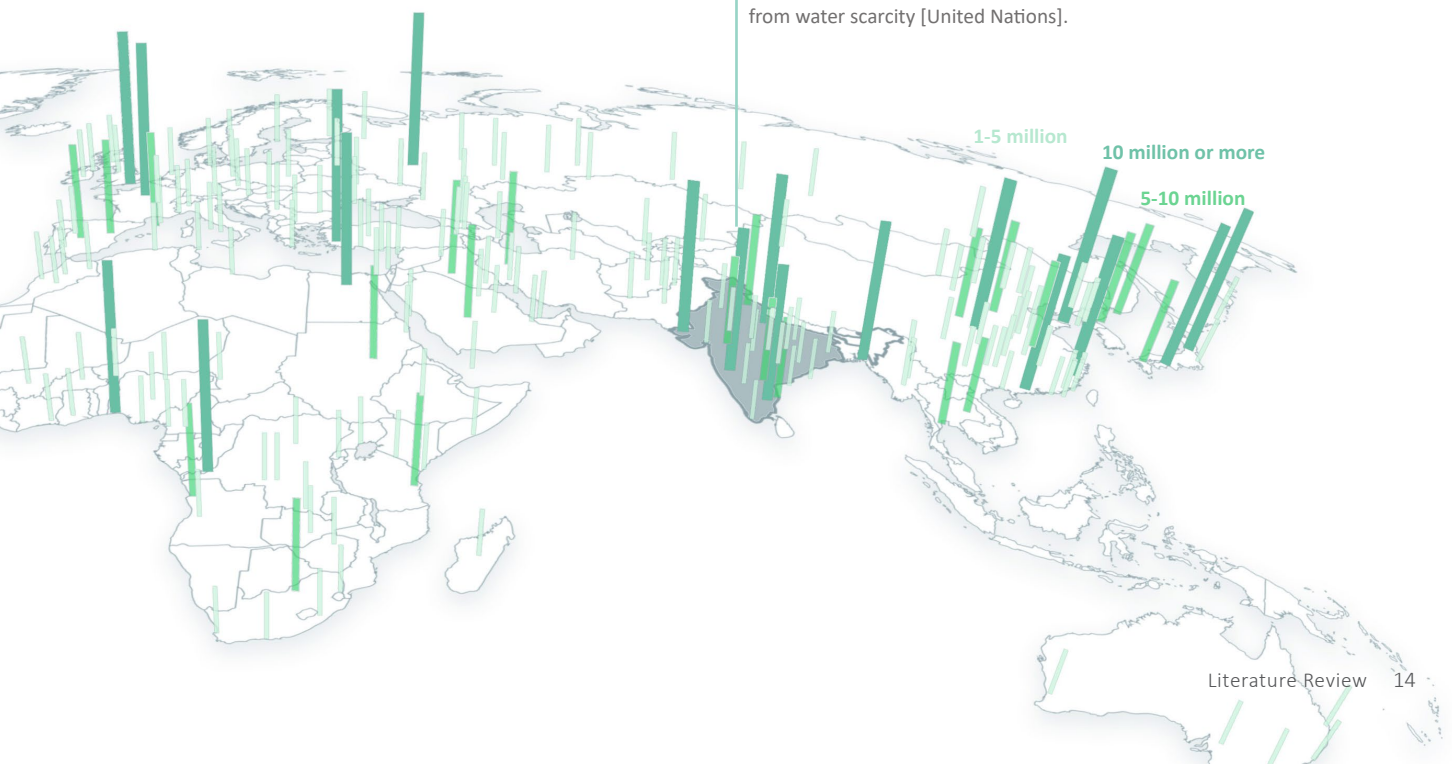
2.2 Issues of water systems in India

Pure Castes

Impure Castes

Brahmar
Priest & Scholar

Kshatriya
Ruler & Warrior

Vaishya
Merchant & Artisan

Shudra
Farmer & Laborer

Dalit
Untouchables
Scheduled Caste
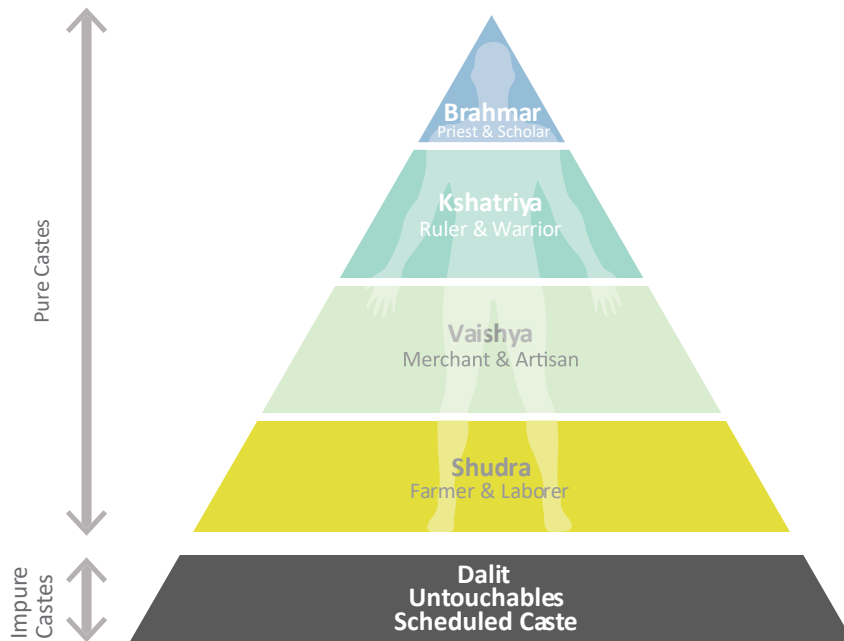
[9]   Hindu Caste system.

Inequality is innate to traditional Indian culture and religious beliefs. In fact, the four main categories- caste, class, gender, and ethnicity- dominate the traditional and contemporary social order, and hence deeply influence every sphere of Indian life including water usage.

The caste system has been part of Hindu culture for thousands of years. Traditionally, there are four Hindu classes in the caste system: Brahmins (highest-ranking caste), Kshatriyas (the second caste: military), Vaishya (the third caste: merchants and farmers), and Shudras (the lowest caste: workers), who are also known as the Dalit or the untouchables (Sanchita Ray, 2004).Indians are classified by caste by virtue of the family's social status, which means they have no way of changing the caste they are born into. The social ranking also

implies the concept of the pollution or contamination. The whole system and its implied discrimination is connected to Hindi views of unclean activities. For example, working with leather, cleaning toilets, and garbage collection are regarded as ritually unclean, and therefore uncleanliness is ascribed to people associated with these activities (Monisha, Iyer, & Mishra, 2013). Ideologically, a lower caste member could pollute higher castes simply by a touch, by a shadow, or by accepting water (Sanchita Ray, 2004). In modern India, the lower classes have been identified by one of these three categories: 1. scheduled castes, which includes the untouchables; 2. Scheduled tribes, which are communities whose members did not accept the caste system and prefer to reside out of the social grid; 3. Other backward classes, whose members include tribes who make a living from crime (Monisha et al., 2013).

Social exclusion takes the form of deprived participation in decision-making and political process, restricted or sometimes denied access to, for instance, employment, material resources, education. Sometimes, multiple forms of exclusion are combined to approximate a physical form that results in a spatial manifestation or an undesirable residential location in a neighborhood (Kumar, 2014). Such segregation and inequality among social groups has been recognized as ideal for and takes the form of spatial organization of those social groups (Louiset, 2012). In the structure of villages, the upper castes usually occupy a center defined by the proximity to a temple, while lower castes settle in peripheral neighborhoods. Groups that occupy the lowest status could even be relegated to hamlets or a "sub-village" located some distance away from the major settlement area (Louiset, 2012).

Other categories further segregate community members based on various social relationships and characters. For instance, class refers to one's financial status or economic position in a society, which is determined by factors such as occupation, education, income, wealth, and family background (Sanchita Ray, 2004). Class is closely connected to caste since many of these determining factors are influenced by one's caste. Another typical and widespread inequity in both Hindu and Muslim communities is gender inequality, which has long defined the social roles and ways of living between men and women. In short, Indian women are subordinate to men, confined to family-related responsibility, and prohibited from participating in activities that go beyond their domestic roles. Without education and job opportunities, women are destined to rely on men for financial support that helps justify men's control over women (Sanchita Ray, 2004).

The following sections further illustrate such relationships specifically the ones between the Indian water systems and socio-cultural, environmental, and socio-economic issues in India. Water systems in this context refer in a broad sense to the hydrological system that includes the natural water regime, water infrastructure, and the water management system in India.
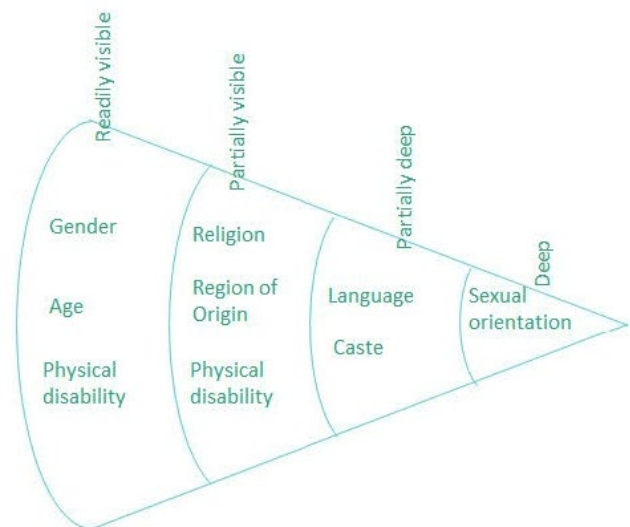
[10] Socio-cultural differentiation in Indian communities.

2.2.1 Socio-cultural aspects of water systems

Water and social inequity

Water is strongly tied to culture and spirituality along with economic value in Indian communities; so are water infrastructures that convey, store, and cleanse water. Therefore, water infrastructures could be conceptualized as a particular facet of the social production of nature (Gandy, 2014). Various stakeholders and parties have differing perceptions about water based on its sacredness and cultural value. Hence, water management in India is contentious with regard to the potential influences of various parties and factions (Naz & Subramanian, 2010).

Water management and socio-cultural issues have a reciprocal relationship. Since water is always recognized as a spiritual symbol in India and Hindu mythology, it occupies an important place in public social life such as in local customs and traditional Hindu festivals, or in private ritual worships. Water also represents purification, serving to regulate the expectations of socio-ritual purity and pollution of the human body. Such notions of purity and pollution are an extension of the caste-based social hierarchy (Joshi & Fawcett, 2006), which in turn has created social differentiation or apartheid (Gandy, 2014).

These concepts have been utilized in local culture to justify inequitable access, control, and distribution of water and water rights (Joshi & Fawcett, 2006). Just like the distribution of other natural resources, giving access to safe water is a complicated issue that traverses a wide range of interests of people of different castes, gender, power, and so forth. (Mehta, Allouche, Nicol, & Walnycki, 2013).

The current management system that determines who has access to safe water imposes procedural injustice. Specifically, the top-down and closed decision-making process disregards marginalized people's interests and needs. Sometimes, participatory planning processes were even adopted as a maneuver to legitimize the unjust outcomes (Mehta et al., 2013). Furthermore, a lacking existence of committed local leadership and support from the government or the irrigation bureaucracy exacerbate the conditions (Naz & Subramanian, 2010). Other social factors like caste-class differences, heterogeneity of farmers, rural-urban dichotomy, extreme ecological conditions, and physical system inefficiency persist to restrain the development of fair water management.

[11] Indian women filling water jugs to collect water for domestic use.

Water and Gender inequity

Women are probably the most vulnerable and deprived constituents in the current management system. "In India all social relations are 'gendered'", indicating that citizenship rights are in flux depending on relationships and expressions of power (Lahiri-Dutt, 2007). Thus, traditional water management has formalized gender inequity by prioritizing men's needs and interests in the public domain, while emphasizing women's water role as belonging to the private domain where the formal sphere of law is out of reach, thereby depriving women of true citizenship (Lahiri-Dutt, 2007). Women are always confined to working within the private realm doing house chores, caring for the family, and child-bearing, while men can be more involved in workplace, decision-making, and formal politics (Lahiri-Dutt, 2007). Such a culturally recognized public-private divide directly leads to gendered exclusion in all aspect of life as a citizen or a community member. Since safeguarding water security of a household is considered to be within the private realm, there, women are typically the primary water managers and educators. In some villages without domestic piped water, women are forced to travel a long distance to fetch water at some public water collection points, such as a well, taps, and rivers every day. There are also cases where women do not only manage household water; they also make huge contributions to the water sector as farmers or irrigators.

In fact, women contribute much more labor and time in securing and managing water than do men. Due to this imbalance, some believe that women possess different local knowledge about natural resources and hence have different interests regarding water use than men. However, regardless of women's efforts and knowledge about natural resources, they are largely invisible in every important sphere of Indian public life and decision-making processes. This unfair system explicitly deprives woman of decision-making powers in water management. Together with the forced economic dependence, women are pushed into a cycle of exclusion, dependence and powerlessness (Lahiri-Dutt, 2007).

Water infrastructure design can be a critical component of gender equality and a tool for the empowerment of women through strengthening their in water-related development efforts (Lahiri-Dutt, 2007). Taking a gender-sensitive approach to the design and management of water systems is likely to ensure more effective and inclusive use, and thus greater benefits to the community as a whole (United Nations- Division for the Advancement of Women, 2005). "Effective, efficient and equitable management of water resources is only achieved when both men and women are involved in consultation processes, [and in] the management and implementation of water-related services" (Derbyshire et al., 2003:1).

[12] Women and girls fetch water at some collection points far away from their home.

2.2.2 Environmental aspects of the water systems

Access to safe water is considered a global environmental justice issue. However, potential tension between water usage and environmental justice could put human needs and environmental quality and sustainability of resources in conflicts (Mehta et al., 2013). The slow development of water infrastructure and inefficient existing systems exacerbate such a negative environment.

Poor water management amplifies the poor water quality caused by various sources of pollution, which pose threats to human health. There are about 27% of the villages that lack access to safe, clean water, and over 70% of the water consumed by the rural population does not meet the WHO standards (Hegde, 2012). About 2300 people per day and 2.2 million people each year die from water-related diseases in India (Bhat, 2014). Contamination of water is usually the result of the illegal discharge of untreated industrial effluents into rivers, unethical farming practices, saltwater intrusion, and corrosion of infrastructure (Hegde, 2012). Failure to manage water quality will enable these agricultural and industrial uses to persist in threatening public health. On the other hand, the lack of well-built and well-maintained toilets and sanitation systems exacerbate the contamination by human excrement, polluting open water source during rainy season and spreading waterborne diseases, like cholera and typhoid (Rosie Stewart, 2017).

Not only is water quality not managed well, but also quantity used for irrigation is poorly managed by the government. Traditional flow irrigation or flood irrigation are inefficient since 70% of the irrigation water is wasted. Farmers flood the field with excess water at no additional cost, but only about 35-40% of the cropping area receives irrigation. Due to the lack of infrastructure or poor management of dams and reservoirs, rainwater is not sufficient for such irrigation practice. Groundwater then becomes the major source of irrigation (Hegde, 2012). This unsustainable practice has led to over-extraction of groundwater, depleting the open water resources and causing the water table in the country to drop by 0.4m every year (National Bureau of Asian Research, 2013). Furthermore, groundwater depletion exacerbates sea water intrusion, which makes agricultural lands infertile for cultivation.

There is always an avoidable conundrum between economic activities and ecosystem preservation in marginal communities (Kumbhar, Kulkarni, & Swami, 2012). To balance the two issues, the design of water management requires applying a holistic, systematic approach to connect engineering techniques for human needs with ecosystem services. Building on this goal, our ability as landscape architects to expand understanding of the relationships between ecological processes, natural processes, and infrastructure is one of the strengths of our profession that can position us for a major role in the design of water management systems (Stokman, 2008).
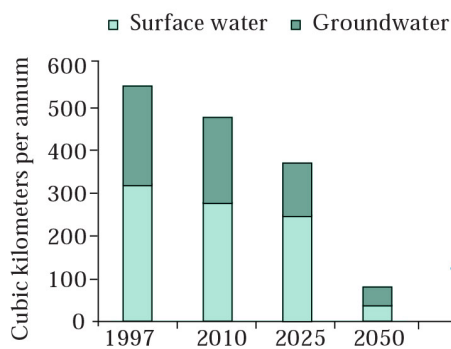
[13] Availability of surface water and groundwater in India from 1997- 2050.
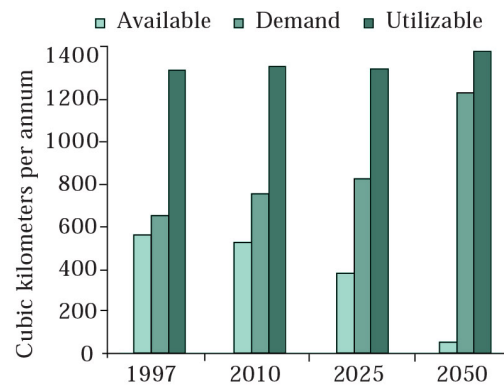
[14] Utilizable water, demand, and residual which is available but not used in India from 1997- 2050.

2.2.3 Socio-economic aspects of the water systems

The majority of the rural poor are mostly located in rain-fed areas, where the agriculture in those regions mainly relies on rainfall for irrigation (The World Bank, 2012). Rain-fed areas are usually the hotspots of poverty, water shortage, food insecurity, malnutrition, land degradation, and poor social and institutional infrastructure (Kumbhar et al., 2012). Since water is the source of food and livelihood for rural communities, limited water resources for irrigation confines agricultural productivity, hence aggravating poverty in rural India. Although the Indian government has begun to improve rural water supply since the mid-1980s, many of those engineered water infrastructures are either no longer functional or have become financially unsustainable (The World Bank, 2016).

The limited water resources may have more to do with the lack of priority and efforts of the government institutions to equally distribute water. "Water politics in India is inextricably linked with the social and economic disintegration of rural communities and widening polarities in wealth between urban and rural areas" (Gandy, 2014). The general disregard of the state government for marginalized people engenders injustice and inequity in citizenship. Although the states have objectives to enhance water provision through water infrastructure projects, those projects usually favor supply to big towns and cities. Not only are rural villages left behind without enough water supply from infrastructures, but also the groundwater that is used

for rural farmlands cannot be recharged. Ineffective regulation on water use gives way to extensive illegal groundwater extraction by some powerful players like merchants and real estate companies to divert groundwater reserves to their industries, exploiting water resources for the nearby farms and villages (Gandy, 2014). There are also problems of collusion between private water suppliers and corrupt local officials who seek to engage in rent-seeking activities by limiting access to piped water supplies (Gandy, 2014).

As a result, villages that have a water deficit are always the poorest ones, and poverty usually induces tremendous social unease such as alcoholism, robbery, and domestic violence. It is estimated that approximately 16,000 farmers commit suicide each year due to huge debts and financial burdens (Merriott, 2016). Other villagers who lose hope are forced to migrate to the urban area, living in equally poor urban slums or places even worse. "The rural water crisis and escalating rural-urban tensions over access to water resources are a significant spur to new waves of migration to the city" (Gandy, 2014). Apart from further tearing the villages apart, the rapid rural-to-urban migration also increases burdens in the urban area where the capacity of cities could not catch up with the population growth. Improving water resources by better water landscape infrastructure and management systems can enhance yields and income to support villagers' livelihood, bringing self-sufficiency and promoting rural development.
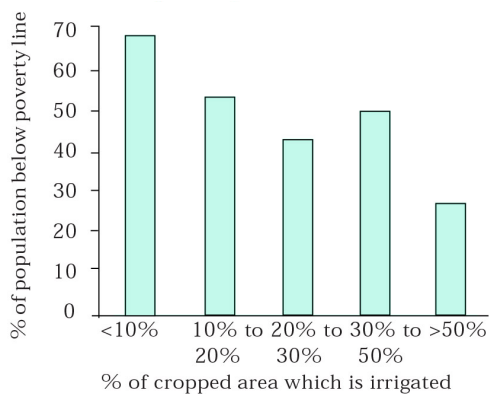
[15] Data that shows irrigation reduces poverty in India.

2.3 Water infrastructure &
Place-making opportunities

Water infrastructure

Before the development of engineered large-scale infrastructures to tame water, traditional water infrastructures served as a major visual and spatial component that structured and organized cultural landscapes, influencing land use patterns and settlement development (Stokman, 2008). Since the development of centrally organized infrastructure systems that transport water from afar, the relationship between human and water has changed rapidly. Humans were no longer living with water. Since water systems are designed to be hidden from our sights and be disconnected from our acknowledgement intentionally, it became not possible to experience the water-related processes anymore (Stokman, 2008). Hence, "the potential of these water infrastructure systems for shaping urban form and meeting broader human, ecological and aesthetic objects has been lost" (Stokman, 2008). Until recent decades, objectives of watershed management have shifted away from a purely engineering and structural solution to concerning livelihood issues.

In 2003, the committee of water management strategies in India outlined the following target achievements in water management or watershed development (Kumbhar et al., 2012):

1. Conservation, upgrade, and utilization of natural endowments using simple, low-cost, effective, and replicable technology

2. Generation of massive employment opportunities

3. Reduction of inequalities in irrigated and rain-fed areas to alleviate poverty

If the watershed is well managed, there is potential to promote agricultural growth and development in vulnerable marginal rain-fed areas, hence significantly improving the livelihood of rural communities. The multiple benefits include increasing food production, protecting the environment, and addressing gender and equity issues along with biodiversity concerns (Kumbhar et al., 2012).

Regarding many water management strategies, Participatory Irrigation Management (PIM) was claimed to be the best method to bring about efficient usage of irrigation water, equitable distribution, and sustainable irrigation service. Though with good intentions, the effectiveness of achieving equity was dubious through mere participation (Stokman, 2008). Joshi and Fawcett argued that water management alone can even reinforce the existing inequality if social equity is ignored in the process of managing and developing the systems (Joshi & Fawcett, 2006). Considering the many water-related inequalities stated in the previous section, the design of water infrastructure should incorporate the physical space and the social groups associated with it as a whole, so that Stokman's ideas in connecting human experience back to water infrastructure can be realized.
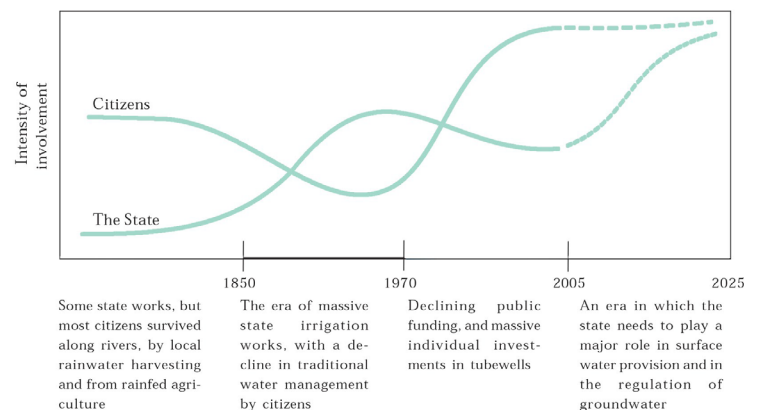
[16] The evolving role of the citizen and the state in water management in India.

Placemaking

Currently, many water infrastructure projects in Indian villages or even in developed cities are singularly functional or solely representational. The associated public space is not perceived to be as meaningful as the water infrastructure itself is to the community. The lack of recognition and definition in those associated public spaces can hinder the resilience of the constructed water infrastructure, which belongs to a crucial part of water management. It is essential to consider the social aspect and its potential to cultivate communities by strategically incorporating public space with social programs. As such, placemaking is an act of making a public space a living place or a place of the soul (Project for Public Spaces, 2018).

Placemaking intersects with the physical, social, ecological, cultural, and even spiritual qualities of a place. "A great public space cannot be measured by its physical attributes alone; it must also serve people as a vital community resource in which function always trumps form" (Project for Public Spaces, 2018). To design equity and inclusiveness in public space, community engagement throughout the design process

is a prerequisite to the placemaking process. This is to educate and galvanize villagers to accept an equal right to use water resources and the surrounding public space as well as the responsibility of stewardship. Both rights and responsibilities, which involve some extent of taking control of public space and civic life, can empower communities.

In the book, "Design for Ecological Democracy," Randy Hester has derived fifteen design principles in shaping physical form and processes that can cultivate a sustainable community. Integrating democracy and urban ecology together, Hester classified those principles into three main categories based on their influence on function, adaptability, and aesthetics: 1. enabling form that can facilitate constructing communities that interact and share; 2. creating resilient form that can create a sound urban ecological system for a sustainable future; and 3. impelling form that promotes active engagement for the community to serve as land stewards (Hester, 2010). Among all the principles, Hester claimed that "sacredness" is the most essential one for placemaking, which involves creating a sense of place, or divining the genius loci.
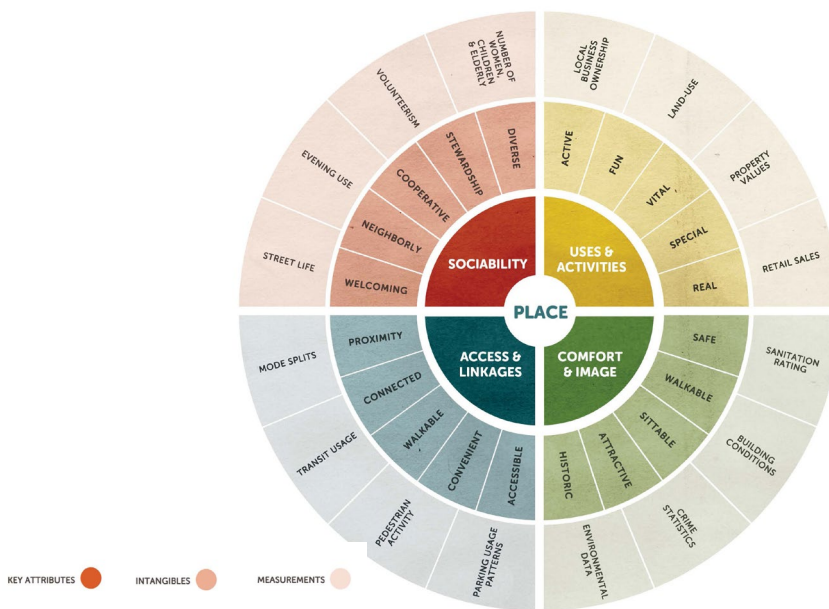
[17]   Place Performance Evaluation Diagram.

2.4 The nature of public space in rural Indian communities

The term "public space" is often used to describe open space in an urban setting. Documentation of public spaces and behaviors in rural context is lacking, especially for women's uses in rural public spaces. "What constitutes public space is contextual, socially constructed and varies from one society to another (Mazumdar & Mazumdar, 1999)." In this sense, the nature of public space in rural India is studied through understanding the culture and values of Indian rural society. Public spaces in developing countries are different from those in the developed cities in terms of growth and development patterns, as well as functions (Cantada, 2015). Not as designated or defined in landuses as formal cities, public spaces in rural context can be pathways for access to daily shared services, economic activities such as marketplace, or even an extension of household activities that are vastly occupied by women (Project for Public Spaces, 2014).

In general, public space has two major dimensions: the spatial dimension and the symbolic dimension. The spatial dimension is an inherent part of society due to spatial ideology and practical functioning. The system of social relations formed defines the social space (Louiset, 2012) while a symbol is a tangible reality like a temple or a statue that communicates intangible values, ideas, or feelings. The symbolic dimension of space differentiates space into places by different symbolic load and power, forming space in the order of power and identity (Monnet, 2011). "Identity is initially based on a concentration of a group of people from the same caste who shared a network of institutions rather than any fixed territory" (Louiset, 2012). Groups of individuals that can recognize the shared symbolic meaning of a place can form a social group that gives itself an identity (Monnet, 2011). The recognition of place identity and significance in certain places influences territorial behavior (Mazumdar & Mazumdar, 1999). Such symbolic public space can be religious, sacred spaces in the neighborhood that provide spaces for participation in religious activities individually and communally. There is an important role for religion in the relationship between people and the socio-physical environment (Mazumdar & Mazumdar, 1999).

In India, public spaces involve caste segregation, inter-religious relations, and the management of various contradictory heritages (Louiset, 2012). Public space is mediated by caste, religion, and gender that manifests social and gender segregation and that has been privileging upper castes and men. Access to public space is inevitably bound by socio-culture norms and power structures arising from caste, class, religion, and gender.

As discussed, Indian women are often excluded from the public spaces because of the gendered social relations. Women themselves feel a sense of alienation and being out of place and usually figure that the public realm does not belong to them since their familial roles confine them to the private sphere inside the houses. The lack of reference or projection of roles and self-identity for Indian women in public spaces limits their accessibility to the public space unless there is a specific task for them to achieve by entering or passing the public space (Deepika Andavarapu, 2017). Places, activities, and role are all important components of place identity (Mazumdar & Mazumdar, 1999). The territorial gendering of space as female and male domains reduces a woman's mobility and participation in activities outside the home in public spaces, further depriving them of full citizenship and the associated power and rights to the common goods (Lahiri-Dutt, 2007). Instead, women find themselves more comfortable in private spaces with other women in the neighborhood since they can recognize the significance of their familial roles as wives and mothers of their household, their roles as domestic ritual specialists and guardians of the family, and their community roles as members of the women's community (Mazumdar & Mazumdar, 1999).

Due to the homogeneity and imbalance of power in rural public spaces in India, public space design should aim at recreating an inclusive public life through creating interacting chances among different communities to nurture social relations. As we know, individuals have different identities depending on the social groups they are physically present with. By emphasizing the commonality or altering an individual's identity in a public space, that public space may be able to bridge or neutralize the social differences and community segregation among social groups.

For female groups, it is important to develop some public role for women to relate to when using a public space. For example, inside a Hindu house, women have several major domestic roles: they regard themselves as the caretaker to manage the daily ritual space for the family to pray and the kitchen where they maintain ritual purity and cook. They also see themselves as ritual protectors who perform cleansing rites or apply ritual arts like Rangoli in the threshold of the house to bring fortune while prohibiting the entry of evil. Women are also responsible for being an educator to pass on the knowledge of these ritual procedures to the younger generations. The more public form of activity also takes place inside the house or the courtyard for congregational activities or informal entertainment for the female community.

Is it possible to transfer some of the functions or programs performed in these significant domestic spaces to the public realm?

For example, a sheltered shrine of female saints that is set up for collective worshipping can allow women to collectively clean, maintain, and decorate the interior and exterior space. Additionally, an in-house kitchen could be transformed into a community kitchen for women to prepare community ritual meals during some festivals and to organize classes to share experiences. The idea to perform auspicious ritual art for one's family could be extended to the neighborhood-scale, and women groups could perform a larger Rangoli pattern publicly.

Can this new typology of spatial function work as a public initiative or change women's role and identity in the public space?

The provision of chances to maintain, clean, and manage a public space can empower women to act in a more dominant manner and have more control over the space. These thoughts will inform the design proposal in Chapter 5- Projective Design.

[18] Public space at Pushkar Lake, Rajasthan.

2.5 Community participation

By studying and observing the cultural life and behaviors of villagers, we can understand how the system and networks of public space works in a rural context as well as the hidden forces behind it. An adapted ethnographic observation method has to be used to analyze public spaces in a rural context in order to obtain an overall picture of the typologies and corresponding uses of public spaces in a village (Lipovská & Štěpánková, 2013); this will be discussed in Chapter 3- Methodology.

To advocate quality public space design in Indian villages, a more caste- and gender-sensitive approach is necessary throughout the design process. For designers from the outside of the neighborhood to achieve this, community participation is inevitable. As Brown and Kjer asserted, community involvements are necessary not only for the sake of the community we serve, but also to bridge the divide between the professional class and the informal communities since we are distant and disconnected from the day-to-day life within these communities (Brown & Kjer, 2007).

Today, more institutions, designers, and planners have recognized the importance of community participation as a crucial part of the planning and design process in public works. However, the questions remain of who should participate, which methods should be used, what type of knowledge will be co-constructed and how that local knowledge and those capabilities will be integrated and applied into the design process based on the perceived role in decision making. Different intent of the participation calls for different methods and processes of gathering information. In addition, different participatory techniques should yield different results and knowledge, and hence may influence the long-term outcomes of the project (Juarez & Brown, 2008).

	1984	2014	2044
WHAT result of designing	product	interaction person-product	multiple relations between people, products, services, infrastructures
methods and location of designing	sketching, modeling, programming in the office	plus collaborative sessions, also on location of use	plus diverse inter-related networked activities
WHO	**design FOR consumers**	**design WITH users**	**design BY people**
the roles and professions that participate in (co)designing	solo professional working from brief by client	teams and groups involving users and stakeholders	networks of diverse teams and individuals
the values that guide design decisions **WHY**	sales in the marketplace	sales and long-term relations social issues	multiple values, not reducible to a single dimension

[19] Emerging areas for design research and practice.

2.5.1 Participatory action research

Participatory action research framework

There are two major types of participatory action research- rapid rural appraisal and participatory rural appraisal:

(1) Rapid rural appraisal (RRA) is described as a researcher-based process that aims at extracting local knowledge in an efficient manner for guiding decision-making. RRA techniques rely on secondary sources, observation, and verbal interactions such as interviews (Juarez & Brown, 2008).

(2) Participatory rural appraisal (PRA) is known as a community-based approach that attempts to facilitate a bottom-up process of empowering participants to inform, analyze, and make decisions for bringing transformations to the community. The participants in this case are usually described as marginalized or underrepresented groups who have the, "least power in society and have historically been disproportionately adversely affected by planning policies or left out of development activities" (Juarez & Brown, 2008). This requires the shift in practice of professionals from a role of expert-investigator to facilitator of the community process in a form of grassroots empowerment. Through the active participation of practitioners as both participants and co-researchers in the design process, shared learning, shared knowledge, and collaborative analysis are achieved. The process using the indigenous knowledge of people empowers them to co-construct new knowledge and insights for innovation (Howard & Somerville, 2014). PRA techniques are similar to those used in RRA in addition to integrating shared analysis and group processes for insights and validation (Juarez & Brown, 2008).

Similarly, Brown and Kjer also introduced Participatory learning and action (PLA) as a practical tool kit of research methods and techniques for designers to engage in community problems with community members, instilling internal environmental stewardship among community members, and bridging professional skills and local wisdom (Brown & Kjer, 2007).

The levels of empowerment differ from forms of non-participation to authentic citizen control. Full participation or true citizen empowerment is, however, hard to achieve in practice due to various procedural or political constraints. Despite the impracticability of achieving full participation, the engagement can still effectively inform the participatory design, depending on whether the activity is just a showcase, or seeking meaningful action, and the degree to which it gains information whether it is extracting information from or empowering the participants.

Nature of Process	Rapid Rural Appraisal (RRA)	Participatory Rural Appraisal (PRA)
Mode	Elicitive/extractive	Empowering
Professional's role	Investigator	Facilitator
Information owned, analyzed, and used by	Professional	Local people
Typical methods*	Secondary sources, observation, interviews with local experts	Shared visual analysis, Venn diagramming, group checking and validation
Objective	Data collection	Empowerment
Long-term outcomes	Plans, projects, publications	Sustainable local action and institutions

[20] Chambers's RRA-PRA continuum.

If the participatory techniques are not used properly, powerful interests can manipulate the process and increase inequities (Melcher, 2013). That means participatory processes can be abused to make false consensuses, which in turn minimizes differences and masks the needs of marginalized groups (Juarez & Brown, 2008). Despite the fact that it is hard to achieve full participation, clarification of the intentions, end goals, and visions of the participation at the outset of the process should come first prior to focusing on the level of participation. "The focus on participation limits the ability of design to address broader social issues," so it is necessary to realign the process to address broader social issues (Melcher, 2013).

In addition, the analysis of power relations can also shed light on who should participate in the same activities

since this can have a big influence on the group dynamics regarding viewpoints during the participation activities (Juarez & Brown, 2008). These considerations can also inform the role of landscape architects as well as the power relations between local people, community leaders, and institutions or knowledge partners in the process. Juarez and Brown observed that most of the participatory design methods used by landscape architects were inclined to extract rather than empower. Usually, the barriers to strengthen the presence and leadership of landscape architects are the perceived limited understanding of the relevance of landscape architects' work and abilities in facilitating community processes, and logistical concerns such as time invested and accessibility to those marginalized communities (Juarez & Brown, 2008).
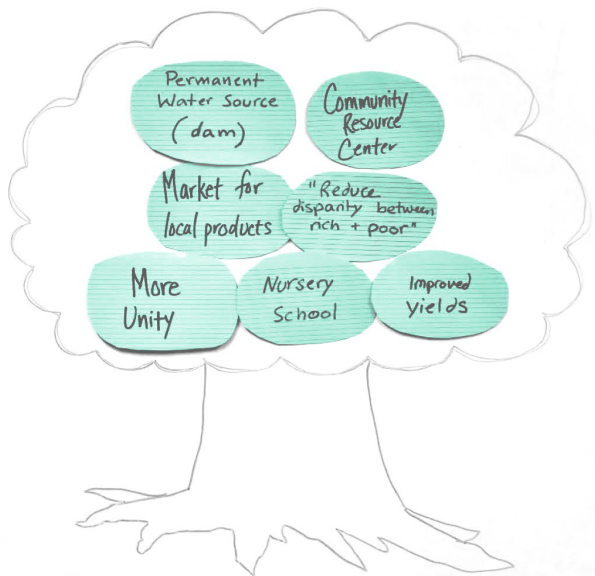
[21] Village goal tree.
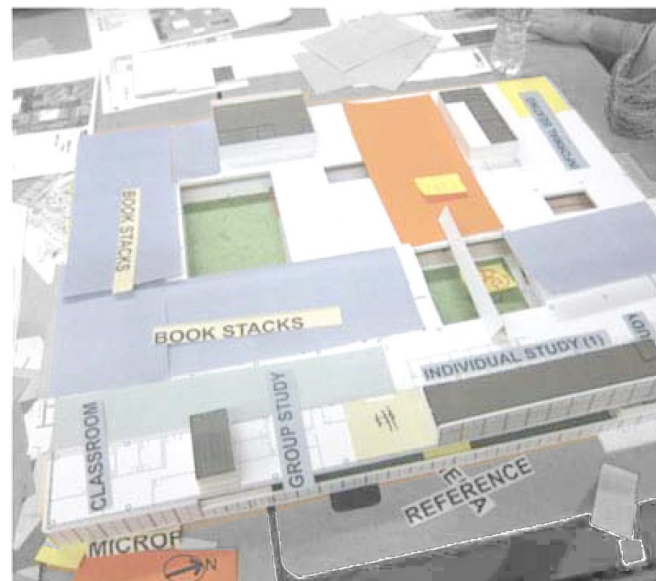
[22] A prototyping model for zoning spaces developed by participants during a design chareette.

Participatory design & co-design

Both Brown and Kjer asserted that community involvements are necessary not only for the sake of the community we serve, but also to bridge the divide between the professional class and the marginal communities since we are usually distant and disconnected from the day-to-day lives of these communities.

According to Hester, there are five domains that democratic and participatory landscape design should cover: 1. Representing people. 2. Co-authoring design. 3. Provoking the familiar and the strange. 4. Nurturing stewardship. 5. Empowering people to represent themselves (R. T. Hester, 2008).

"Participatory prototyping" in the PAR framework shapes both the process and final products instead of merely emphasizing the process, empowering participants to be co-researchers and co-designers who develop a strong investment in the final design outcome (Howard & Somerville, 2014).

Prototyping can be widely used in all design disciplines, particularly in landscape architecture. Landscape is more than an object or scene when site complexity, richness, and uncertainty are considered (Melcher, 2013). "From a qualitative perspective, landscape can be more than conglomerations of functions. By adding meanings, personal memories and emotional connections to a place, landscapes become more than service providers" (Melcher, 2013). Therefore, the designers' role has to be more than that of a service provider. Since political and economic solutions are beyond participatory design methods, we should be prepared to proactively advocate for dialogues with government agency and local community groups to push the prototypes to implementation. (Melcher, 2013)
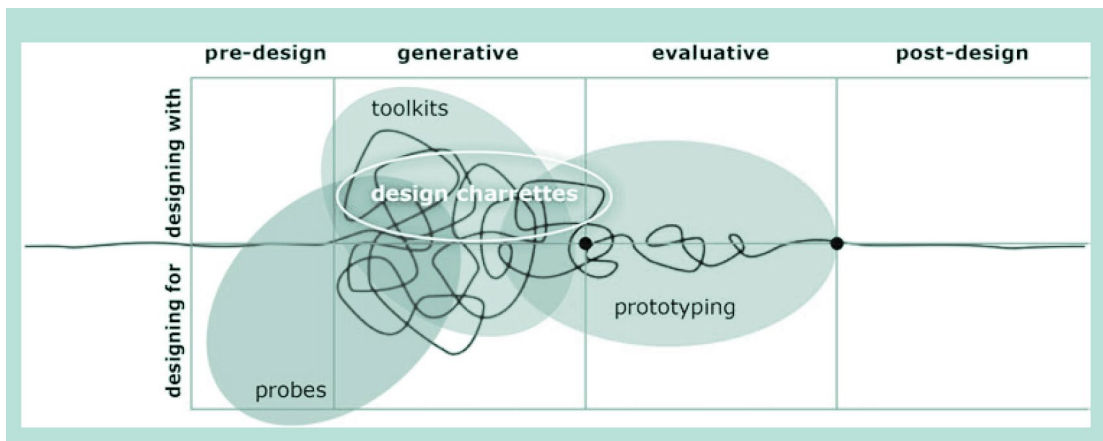
[23] Framework of participatory prototyping.

Data collection methods

Based on Hester's research results, most commonly used non-verbal techniques include recording social ecology patterns, building sense of community through workdays and walking tours, and workshopping (R. Hester, 2005). Among these, the workshop technique is the most frequently used in participatory design. Hester also commented that the workshop process is like a black box due to its elusiveness and the typical lack of discourse about methods, procedures, and how actions and outcomes are drawn from the processes.

"There are far more descriptions of verbal techniques such as listening, interviews, surveys, and storytelling than how that information informed design...or how that content is explicated in spatial or experiential terms" (R. Hester, 2005). As described by Hester, there is a lack of detailed descriptions that illustrate the methods for achieving the goals and final form of the design in most of the academic publications.

[24] Different creative data collection methods that engage participants. Above: Using stones or beans to quantify data from direct contribution from participatnts; bottom: Using "Piga Picha"- photography as a tool for participants to express their emotions.

Visualized Analysis	Spatial Analysis	Temporal Analysis	Relational Analysis
	Participatory mapping and modeling	Seasonal analysis	*Social network mapping*
	Aerial photograph analysis	Daily activity profiles	Matrix scoring and preference ranking
	Transect and group walks	Historical profiles and trend analysis	*Institutional (or Venn) diagramming*
	Gendered resource mapping	Timelines and chronologies	Flow diagrams on systems and impact Pie diagram
Interviewing and Sampling	*Semi-structured interviewing;* Direct observation; *Focus group discussion (SWOT); Storytelling;* Ethno-histories or life histories; *Key informant interviews;* Well-being and wealth ranking		
Group and Team Dynamics	Team contracts; *Team review sessions (SWOT);* Interview guides; Work sharing (in local activities); Rapid report writing; Use of videos; Process notes and diaries; *Shared presentations (SWOT); Popular theater*		

[25] Classification of participatory techniques by form and type of analysis.

2.5.2 Successful projects highlighting participation

According to Handmade Urbanism, the lessons of governance and strategies for community engagement are the most easily replicated in a project. These include the financial models and legislative frameworks that can be documented and abstracted for replication. Also, the physical construction or modification of a site is representative of the particular conditions of the project site and so is often not easy to replicate (Rosa & Weiland, 2013). Therefore, only the critical, replicable components and strategies of implementing water infrastructure projects are studied here.

1. Ralegan Siddhi

Ralegan Siddhi is a model Indian village that transformed itself from a place of misery into a self-sustained community by effective low-cost water infrastructures and social programs. Before the success of harvesting water, Ralegan Siddhi used to have a dark period when the villagers suffered from depleted natural resources, poverty, alcoholism, domestic violence, and so forth.

Ralegan Siddhi is located in a drought-prone area in Ahmednagar district, Maharashtra in India. There were 2,500 villagers living in the village in the 70s. Due to the exploitation of groundwater and unethical farming practice, soil and lands were degraded and infertile. Worse still, the water table dropped very low, so many wells were hardly filled during the winter or the summer. Most of the villagers were famers but their lands were not arable due to the exploited groundwater and degraded land. 70% of households lived below the poverty line. Poverty led to frustration among people and hence bad behaviors such as alcoholism, vandalism, fighting, and domestic violence rose drastically. The whole village was in abysmal despair.

A devoted social activist, Shri Baburao Hazare, who was born in the village and went back in 1975 after getting his education, changed everything. He motivated the young people about his ideas of water conservation and harvesting. They then formed a youth society and a village assembly to gain support from the other villagers. With villagers' faith to follow and donate labors,

Hazare laid out multi-step improvement works based on traditional, localized, and low-cost strategies. The first step was to help bring back villagers' jobs as farmers. They constructed six nalla bunds to store and slow down the stream water for infiltrating and recharging the local aquifer. At the end of the project, they were able to construct 31 nalla bunds, which have a storage capacity of about 74.5 million gallons of water (equivalent to 112 Olympic-sized swimming pools) for the whole village. With the prominent success, the

villagers became committed to build decentralized water infrastructures to conserve and harvest rainwater for self-sufficiency. Along with the nalla bunds they also constructed contour bunds, renovated an old percolation tank, and planted trees along the hillsides of the village. All these improvement works were supported through donation and government grants. With the availability of ground water, the village dug wells shared by farmers who owned plots adjacent to each other. With the wells, the farmers could irrigate 700-800 acres of land and have had water year round since then. Hawaze also completed a challenging canal project that can bring water from a canal from 3 kilometers away. Regardless of many failed attempts by other people, Hawaza and the villagers in Ralegan Siddhi succeeded because they formed the Krishna Pani Purvatha Society to oversee and maintain the project. They set out rules and guidelines to villagers about the right and responsibility of using the water harvested from the canal. A fair labor monitoring system was also developed among the community members to ensure the effectiveness of the project.

Hazare was the motivation who led the villagers to hope and action through active participation. Throughout the participation process, a strong value system that embraced the importance of sharing, equity, and a sense of ownership and pride was developed. With the improved economic conditions, social issues were able to be solved as well. For instance, women did not need to walk a long distance to fetch water, and children had time to get an education.

2. Hiware Bazar

The significant transformation in Ralegan Siddhi inspired another village, Hiware Bazar, which is 40 kilometers away in Maharashtra, to adopt the framework and create an integrated village development model with water conservation as the core. With support from the local government, the partnership enabled scaling up of the project to be a five-year plan in water management scheme and ecology regeneration to bring long-term benefits.

This village used to suffer from similar socio-economic problems as Ralegan Siddhi. However, after the election of Popatrao Baguji Pawar as the head of the local Panchayat in 1989, a large-scale watershed protection scheme that emphasized watershed development was implemented by the villagers as a way of holistic natural resource management. A Joint Forest Management Programme was carried out to regenerate the degraded forests as well as the catchments of the village wells, and also 40,000 contour trenches were built to conserve rainwater and improve water quality and ecosystems.

The integration of water infrastructure and plantation programmes successfully generated enough water to increase irrigation and create employment opportunities for the villagers. Social regulations such as 1. Forbidding tree cutting, free grazing, and liquor; 2. Family planning; and 3. Contribution of labor for village development were adopted to manage the use of natural resources and avoid compromising the effectiveness of the scheme (Singh, n.d.).

The village won a National Water Award due to the effectiveness of this scheme, which was dependent on the decentralization of power structures, empowering the community to be a part of the solution. "The greatest environmental planners are the villagers themselves and the institution of Gram Sabha empowers them to plan for themselves." A resident of Hiware Bazar commented (Singh, n.d.).

Water Balance Sheet, 2007
From scarcity to surplus

Source of water	Quantity of water in million litres
Runoff from rainfall	3,150
Potential water available	3,077
Water lost	
Water as runoff	88.70
Water lost as water vapour	1,077
Water available	
Stored surface water	153.90
Water that percolates into the earth	307.70
Groundwater from water harvesting structures	526.70
Sub-soil water as moisture or groundwater	923.10
Total water available	1,911.30
Water demand in the village	
Drinking water (humans and animals)	33.90
Irrigation	2,295.50
Additional/peripheral farming activities	38.20
Total demand	2,367.60
Water required (deficit / surplus)	-456.30

Source: Department of Groundwater, Ahmednagar

Intense cropping
Hiware Bazar is getting more out of its land

Land use	1996-97	1998-99	2002-03
Gross cropped area (ha)	821	1,007	1,125
Net cropped area (ha)	723	730	748
Multi-cropped area (ha)	99	276	377
Cropping intensity	1.140	1.380	1.500

Source: Talathi (village accountant) records

Massive plantation and contour trenching revived the village's watershed

One of the many structures that helped capture rain, recharge groundwater

With increased grass and water, livestock and milk production increased

Grass yield increased. Village's role in protecting forest earned it state award

- Gaothan (residential area)
- Nullah bunding
- Grazing land
- Percolation tank
- Loose boulder
- Ponds
- Panchayat land
- Private land
- Forest land
- Storage bandharas
- Earthen structure

[26] Watershed interventions and water balance sheet of Hiware Bazar in 2007.

3. Kibera Public Space Project

These precedents also provide insights to landscape architects about what has worked and what has not, and also the gaps that these projects rarely address – the opportunities to turn infrastructure into diverse public spaces. The following project can shed a light on how public space design can be incorporated into a water management scheme and even enhance the effectiveness of the system:

The Kibera Public Space Project is a network of six slum improvement projects in Kibera, Kenya designed by Kounkuey Design Initiative (KDI). Their first project, KPSP 01, addressed a leftover space adjacent to a highly polluted river at the border of a village in Kibera. The site flooded frequently and was deemed as a wasteland due to the undesirable conditions for settlements. The ignorance turned the space into an even more dangerous spot featuring crimes and other social hazards. Under the leadership of KDI, the space has now become a productive public space after the community got dedicated to remediating polluted soil and to cleaning up the site through phytoremediation programs. The community-wide clean-up was then followed by the construction of a simple stone and wire-mesh gabion system along the riverbank to control flooding. Accessibility to the river was improved by building a footbridge. Large-scale planting of bamboo seedlings provided further erosion control, while also providing business

opportunities (Odbert & Mulligan, 2014). KDI creatively utilized existing, unexploited natural resources of the area to restore and harvest ecosystem services and developed them into business opportunities for income. For instance, the "water tap" program sold harvested rainwater and piped city water. "Ecological assets like land and forests are the key employment sources for rural people in India. Any attempt to create employment must focus on these sectors (Singh, n.d.).

This Productive Public Space project (PPS) aimed to focus the concept of productive public space on water management by building educational elements on sanitation, environmental stewardship, and watershed management into an innovative participatory design process.

Phase 1: Understand Watershed – Partnership with local NGOs and regional institutions, compilation of information, preparation of workshops and training materials on watershed issues.

Phase 2: Engage Community- Request for proposal from communities, project and site selections upon requests received, watershed and participatory design workshops.

Phase 3: Reclaim River- Implement three PPS projects including river bolstering, environmental remediation, water supply, sanitation facilities, and community buildings.

[27]   KPSP 03 site before and after construction.

The phases and programs were layered with physical and environmental improvements such as constructing a bridge and a playground, with social empowerment initiatives such as school, church, and skills training, as well as with economic opportunities like water tap, micro-loan program, vegetable business, etc. The economic and social benefits of the reclaimed river and public spaces engendered a new spirit of environmental stewardship, and the learning from the educational sessions permeated along the river and out into the wider settlement beyond the immediate sites.

[28] The five overlapping phases of participation in the Productive Public Space process.

Takeaways

There are still many communities in India and around the world living like Ralegan Siddhi and Hiware Bazar before 1975 and 1995, respectively. The two precedents showcase that the water crisis and subsequent problems a village faces are not totally about the scarcity of rain water. If the limited water resources can be managed well, there are chances for those rural communities to be self-sufficient.

The precedents share four critical components of water management: visionary leadership, community participation, communication and education, and scientific schemes adapted to local conditions.

For the first precedent, Hazare was the arbiter of change. He was originally from the village, so he knew the conditions of the village well and was passionate to help his own village. It took constant communication and education to convince villagers to have faith in him and follow him. Recent reports showed that Ralegan Siddhi was no longer as self-sufficient after Hazare left (Bhaskaran, 2014), further proving the importance of a critical figure as a trustful leader.

In the second case, Pawar is a capable leader who drove the state-sponsored scheme. Most importantly, villagers in Hiware Bazar took up the leadership role and had a sense of ownership of the development scheme. The whole community was empowered and hence committed to implement the scheme properly. "It is about the management of water resources so that the infrastructure is able to reach out to poor people. The implementation and maintenance of these systems require the whole community to be involved; this in turn empowers them (Singh, n.d.). On the contrary, Ramanathapuram village, Tamil Nadu, used to have one of the most efficient traditional rainwater saving mechanisms in the form of Kanmois and Ooranis (Bhaskaran, 2014). However, without the consciousness and efforts of the community to upkeep the system, many villagers cracked the pipelines and polluted the water resources, causing water-borne diseases in the area (Bhaskaran, 2014). "For any programme to be successful one needs a clear property rights regime, whether defining communal or individual rights, strong institutional support as well as a strong and visionary leadership" (Singh, n.d.).

In addition, the effectiveness of the water infrastructure projects or the social schemes was largely due to strategic planning combined with local knowledge of the site. The infrastructure or systems were not randomly installed. Thus, while the government watershed scheme was a huge support to make the construction of the projects feasible, nonetheless, the planning and design of the system had to be technically addressed. For instance, Raichur village, Karnataka, had built many water infrastructures under the government watershed scheme. However, the village has an exceptionally difficult site to modify due to the steep terrain and the shallow depth of bedrock, making the regular methods of water harvesting and groundwater storage difficult (Bhaskaran, 2014). Regardless of leadership and community engagement, the lack of integrated planning based on local conditions and scientific monitoring of the infrastructure, can compromise the effectiveness of the project.

As for the Productive Public Space project, the designers were the outsiders of the community whom they designed for. Instead of randomly selecting a design site to initiate transformative design and improvement works, they required the interested communities to provide a document to illustrate the problems and their needs. They then assessed the feasibility and necessity of design through the Request for Project documents submitted by communities and paid site visits to communities that sought their help. This approach could ensure the community they collaborated with had desires and dedication for change. Community participation was crucial to KDI's work since the community members were the target group KDI designed for. From collecting data to formulating design ideas, input from the community became essential for designers from the outside to understand the problems and people's wants. Their design process and final outcome demonstrated that design and planning of public space associated with water infrastructure can yield even more social, environmental, and economic benefits to the community than anticipated. Such projects can change the utilitarian nature of the system into a multi-purpose one, such as offering educational or entrepreneurial opportunities. Regarding the existence of many government schemes, having the support from the government and partnership with it or NGOs can enable access to resources for implementation.

3
Methodology

This section is to provide a detailed description of the research methods adopted to draw research conclusions. The theoretical basis and rationales for applying those methods are discussed.

Three phases of research are proposed to approach the research questions. The first phase is to understand the design site from foundational background knowledge to first-hand observation on site. Apart from a literature review as background research to refine the question, preliminary site analysis builds from general knowledge gained in the literature review to understand conditions more relevant to the site, Dhamori village. Background information that relates to the site is broadly researched and documented in the preliminary site analysis section. With the GIS data provided by

the Panchayat, a village-scale inventory could be conducted so base maps could be prepared before the site visit. Then, the site visit was to verify data found from the inventory section through observations. The second phase involves strategies to interact with and engage the villagers and officials in Dhamori to collect quantitative and qualitative data about the village. The knowledge about the village and the experience in the participatory methods are documented and reflected. The third phase involves researching precedent studies for inspiring possible solutions and proposing design solutions. Synthesizing the theories and data collected from the first and the second phases helped to generate the projective site design as the method for a typological design framework for rural communities in India.

3.1 Site understanding

3.1.1. Preliminary site inventory

The knowledge base in site conditions is the foundation of land planning, design, and management. Site inventory is an essential step to understand the site character and the physical, biological, and cultural linkages between the site and the surrounding landscape (LaGro Jr., 2008).

Dhamori village is located in the Amravati district in the Northeastern part of Maharashtra state in central India. Regional data of the district such as climate, soil, agriculture, and road systems can be investigated. Provided by the Panchayat of Dhamori, the village-scale GIS data was available for understanding the physical and cultural attributes. The spatial relationship of basic site components can be drawn from the following GIS data provided:

Physical attributes	Village boundary
	Digital elevation model (DEM) and contour
	Hydrology
	Soil types
	Road system
Cultural attributes	Parcel
	Landuse
	Government lands

The outcome of this level of site inventory was the creation of a base map that serves as the template for attribute mapping and analysis for the site visit in the next phase. Additionally, the inventory yielded some basic site information such as the flow direction of surface water and circulation. Detailed findings will be presented in Chapter 4.1- Preliminary site inventory.

[29] Dhamori farm field facing towards the water tower.

3.1.2. Site observation

During my two-and-a-half week visit in India, I lived in the guesthouse of the Irrigation Department in Amaravati City. The entire research team that I worked with was diverse in profession, nationality, and age. The team included my major professor, Alpa Nawre; an engineer, Saurabh Lohiya; an architecture student, Skandha Upadhyay; and a graduate Landscape Architecture student from the University of Minnesota, Leslie Johnson.

I traveled back and forth to Dhamori seven times during the entire visit, and every trip to the village enhanced my understanding and knowledge about the site. The site visit was very helpful to verify data about the physical conditions and the socio-cultural environment of Dhamori village.

There are mainly two data collection methods for this site investigation: an adapted ethnographic approach and participatory action research. An adapted ethnographic approach for field observation was employed to become a part of the community and perceive the culture from a first-person perspective. Compared to participatory action research, ethnographic research focuses more deeply on people's values, behavioral patterns, and a place-based understanding of culture. It is argued that adapting ethnographic approaches to participatory design can help complementing the ineffectiveness of participatory methods in determining the user's authentic values and everyday behavioral patterns during

participatory design activities (Kingery-Page, Glastetter, DeOrsey, & Falcone, 2016).

In a narrative approach, participants' stories, including both verbal and non-verbal cues, were recorded and analyzed. The techniques used to achieve these outcomes contain some widely adopted techniques in landscape architecture such as observational mapping techniques pioneered by sociologist William H. Whyte, site analysis techniques codified by Kevin Lynch, interviews, community workshops, and charrettes that emphasize consensus (Kingery-Page et al., 2016). From our experience, the drone has been an effective recording tool for taking first-hand aerial photos and videos that are not available from other sources or online. Drone footage of the important areas of the village such as the settlement area, the village entrance, and some of the critical water infrastructure was captured. Other data collection tools include taking photographs, audio, and video recording during passive observation and the engagement activities, which will be discussed in the next section.

The data collection methods have been reviewed and approved by the Institutional Review Board (IRB). All the videos and audios taken received consents informally from the participants. The IRB application package is included in **Appendix A**. Findings from the site visit are documented in **Chapter 4.2- Site observation**, while a detailed itinerary can be found in **Appendix C**.

3.2 Participatory planning

Participatory planning is a big part of data collection during the site visit, so this part deserves a separate section. The focus of this method is direct interaction between the designers and the villagers and officials in Dhamori to collect quantitative and qualitative data. To study people's perceptions of water infrastructure, public space, and our proposed design solutions, a multi-step participatory process that involves different levels of engagement was explored to enhance the opportunities of involvement by the community.

There are two major types of participatory action research: rapid rural appraisal and participatory rural appraisal(Juarez & Brown, 2008). The originally proposed engagement methods aimed to be more like a participatory rural appraisal approach, which is a bottom-up process of empowering participants to inform, analyze, and make decisions for bringing transformations to the community (Juarez & Brown, 2008). However, due to the limitation of time on site, the proposed engagement activities had to be adjusted to accommodate the site conditions and the culture of the community. Thus, the engagement methods became more like rapid rural appraisal in the end. The rapid rural appraisal is described as a researcher-based process that aims at efficiently extracting local knowledge for guiding decision-making (Juarez & Brown, 2008).

The following details the process of the engagement activities performed by the team during the site visit:
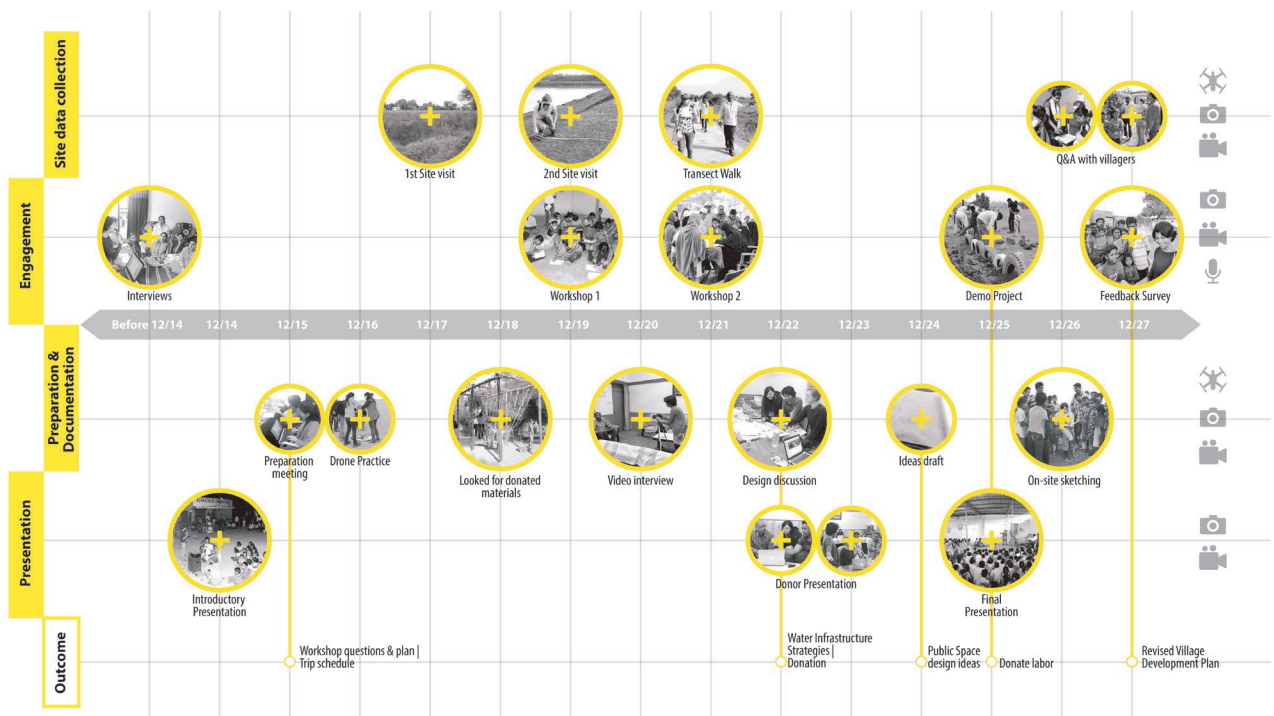
[30] Site visit timeline.

3.2.1. Group interviews

This method involved formal and informal interviews as follows:

A. Scheduled interviews

A series of interviews were conducted by Professor Nawre and her team from 12/5/2017 to 12/16/2017.

Before I arrived in India on 12/14/2017, Professor Nawre and her team had scheduled interviews with the Parliament members, Dhamori-related government officials, or other departments such as the Department of Agriculture & Fisheries, Irrigation & Livestock Department, Forest Department, as well as social groups in different neighborhoods of Dhamori. The scheduled interviews were either one-on-one or as a group. Thorough, relevant questions about water issues and other general problems in Dhamori were asked. Data about people's understanding and opinions of water-related issues including water infrastructure, social, economic, environmental concerns, and recommendations were gathered and documented. The data collected were synthesized and presented to the villagers at the first village presentation on 12/14/2017.

B. Planned interviews

There were two workshops planned and organized on 12/19/2017 and 12/22/2017. Each workshop had a group interview for the interested voluntary participants. A drawing section then followed it. Since the location of the first workshop was held at the Hanuman Temple by the talaab (pond), we invited both men and women who were around the talaab and the temple to participate in the first workshop. Another workshop was held on 12/22 in the Urdu school at the Muslim community. For this second workshop, we targeted the Muslim women community. The female leader of the Muslim women's community was approached and asked to help disseminate information about the workshop. Door-to-door announcements were made before the workshop started to invite and encourage more Muslim women to participate. The students at the Urdu school also participated in the group interview with the Muslim women, though they only sat and listened to the conversation. Both of these planned group interviews focused on understanding the usage of public space, behaviors of men and women regarding social gathering in public space, and the villagers' preferences and perceptions in public spaces of Dhamori.

[31] Dhamori South Entrance.

C. Informal conversations

Some information and knowledge were gathered from ad hoc, casual conversations, which happened whenever there were chances to talk with the villagers while we were walking around the village. This happened one time when we were invited to visit the students in every classroom of the Urdu school. Questions were generated at the moment when we met with the students. For instance, we asked students from different class years about their leisure activities, favorite and the most detested public space in the village. Another time happened when we flew the drone in the lower-class community (Dalit community). We asked the people attracted to the drone questions. Sometimes, we also asked villagers who invited us to their houses for chai questions.

[32] Pop-up conversation with the Dalit community.

3.2.2. Drawing activities

The drawing activity was a part of the workshop but served a different purpose and format for data collection. Instead of extracting information from the participants, we asked the participants what one improvement they would like to have for the village. Drawing paper and color pencils were distributed to the participants. Participants were encouraged to suggest and imagine anything they wanted to have for the community through drawing to express themselves. The participants were likely to be the same as those in the earlier group interview section.
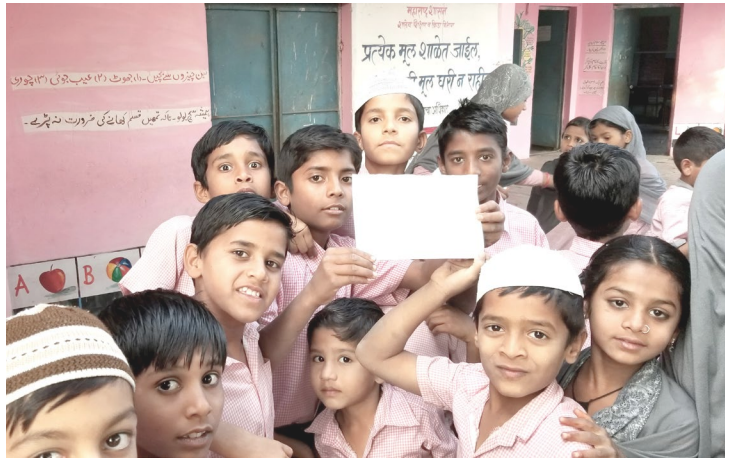
[33] Students at the Urdu School showed their drawings during the Drawing activity.

[34] The first drawing activity held in the Hanumen Temple.

3

[35]   Process of the first workshop and drawing activity in the Hanumen Temple.

3.2.3. Transect walk

We held a transect walk on 12/22/2017 and intended to take participants to three potential sites that have the possibility for future design and development, which will be discussed in detail in Chapter 5- Projective Design. Only men were involved since it was culturally unacceptable for women to participate in this nature of engagement. After we gathered some villagers near the Laxmi Narayan Temple at the South village entrance, we began the walk from the temple. During the process, Professor Nawre was the interviewer who communicated with the participants in Hindi. I was responsible for taking videos, audios, and photographs for the whole transect walk. Our first stop was the talaab, which is one of the potential design sites. We asked the men a list of

site-specific questions about usage, problems, and their perception about the talaab. Later we walked along the main road to the bazaar on the west side of the village. The men showed us an orphanage when we passed by it, so we stopped by and talked to the officials and students there. We continued the journey. After passing the Marathi school and the Panchayat administrative building, we stayed at the bazaar for a while and then proceeded to the second potential site near to the bridge on the west. On our way back to the Laxmi Narayan temple, the men led us to another path and showed us other community gathering places. We did not have time to walk to the third site, which is at the northeast side of the settlement area. Finally, the videos and audios were translated and documented.

[36]   Process of the transect walk.

[37] Process of the first workshop and drawing activity in the Hanumen Temple.

3.2.4. Presentations & Feedback survey

We organized two village presentations on 12/14/2017 and 12/25/2017. The first village presentation was held in the chowk (village square) in the evening. It lasted for half an hour and was about introducing the team, our intention of the visit, and findings from observation and scheduled group interviews until that point.

The second and final presentation took place on 12/25 at the Hanuman Temple by the talaab in the morning. The parliament member, Dr. Vikas Mahatme, the village head, and many other officials were invited to listen to the presentation with the villagers. Due to the limitation of the interior space, villagers had to take turns to participate in the presentation in the temple. This final presentation was to report on what we had done and found out during the two-week research period. Most importantly, we shared our ideas on a set of proposed water management strategies and conceptual public space design for three selected sites, opening up imagination and dialogues among the officials and villagers in Dhamori. For preparing this presentation, I mainly focused on developing the programmatic ideas for three selected developable government lands.

After the final village presentation, we went back to Dhamori two days later and asked villagers about their feedback and comments on our proposed strategies for water infrastructure and public space design. We stopped at three locations: the first one was the streets on the westside of the talaab, the second one was on the main road through the Dalit community, and the last location was the talaab. We asked the same questions to three different groups of people, a group of Hindu men, men and women from the Dalit community, and a small group of Hindu teenage girls, respectively.

Findings from the engagement activities can be found in Chapter 4.3- Participatory process. The scanned villagers' drawings can be found in Appendix D- Selected villagers' drawings. The original methods involved door-to-door household survey, group discussion after presentations, and sub-group workshops that consisted of a transect walk and drawing each time. Details of the original proposed methods can be reflected in Appendix A- IRB application package. Reflections of the participatory process are discussed in Chapter 4.4.3- Reflections on participatory process and Chapter 6.2- Limitation of the study.

[38] Process of the feedback survey with the Dalit community.

[39] Process of the feedback survey with the Hindu community.

3.3 Projective design

Projective design is also known as research by design or experimental design (Deming & Swaffield, 2011). Driven by the purpose to generate new types of conceptual design solution, experimental design is the projection of new landscape compositions that may be applied in many different settings. Projective design can inspire the typologies of design intervention, exploring how new knowledge, values, or priorities might emerge from the act of creative transformation (Deming & Swaffield, 2011).

The findings and reflection documented in the previous section will be synthesized to inspire design ideas, and in turn be transformed into general design strategies as typological form to address the research question. Projective design will be used to experiment such transformation into a typological framework, from the result of the observation and participatory planning process.

This method involves two parts: conceptual site design and a typological framework derived from the conceptual design framework. Their design developments are reciprocal to each other. The schematic site design can provide context and actual site conditions for grounding the design thinking and process. It can inform design inquiry, pushing the envelope of the design framework so that a typology can be derived to generalize the critical social, environmental, and economic benefits of the design framework.

4
Findings

4.1 Preliminary site inventory

Geography

India is a union of twenty-nine states and seven union territories under a Parliamentary system of Government (National Informatics Center, n.d.). Located in the north center of Peninsular India, the physical characteristics of Maharashtra state are dominated by the plateau. The state is geographically divided into the Konkan coastal plains that are composed of paddy fields and coconut gardens, and the great river basins (MapsOfIndia.com, 2014a). The capital of the state is Mumbai, and Marathi is the official language. Maharashtra is further divided by six divisions of districts, and the Amravati district is further divided in fourteen talukas (Fig.). Bhatkuli is one of the fourteen talukas (Fig.) where there are 109 villages, and Dhamori is one of them (Census Population 2015 Data, 2011). Located in central India, the ecoregion of Dhamori belongs to the South Deccan Plateau Dry Deciduous Forests (World Wildlife Fund, 2012).
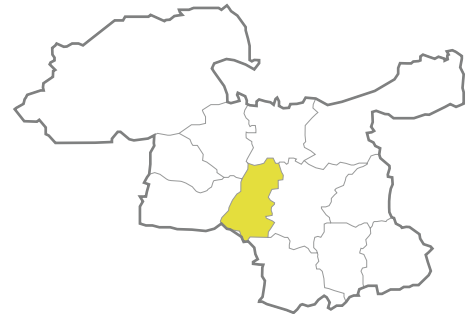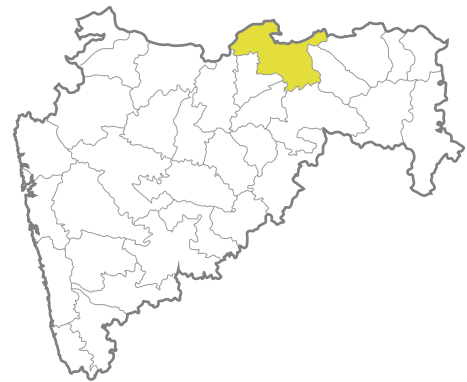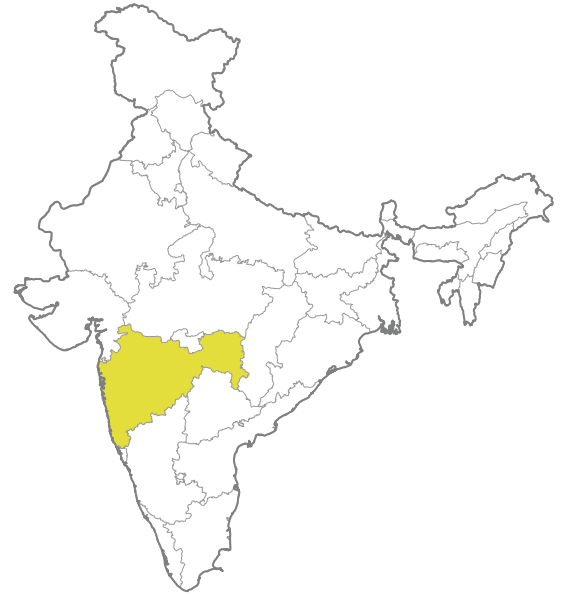
[40] Maharashtra state in India.
[41] Districts and divisions of Maharashtra.
[42] Amravati takula map.

Demographics

According to the Population Census 2011, 480 families reside in Dhamori, making a population of 2085, of which 1103 are men and 982 are women. Children ages 0-6 total 208, which make up 9.98% of the total population of the village.

Maharashtra is one of the states that has the largest populations of schedule caste members according to the 2001 Census data (Monisha et al., 2013). Schedule Caste and Schedule Tribe, as mentioned in Chapter 2, are the officially designated groups of disadvantaged people, known as the Dalit community. In Dhamori, the community is more or less homogenous with most of the population belonging to upper caste Marathas, with two

Scheduled caste and Scheduled Tribe families. There were 463 and 24 people listed as Schedule Caste and Schedule Tribe members (Table.), which constituted 22.21% and 1.15% of the total population in Dhamori village (Census Population 2015 Data, 2011).

Agriculture is the mainstay of the local economy along with animal husbandry. Of 985 villagers who were engaged in work activities. 573 of them were agricultural laborers while 54 of them were cultivators (owner or co-owner). Also, 74.31 % of workers described their work as main work, which means the employment or earning would last more than six months (Census Population 2015 Data, 2011).

Particulars	Total	Male	Female
Total no. of houses	480	-	-
Population	2,085	1,103	982
Child (0-6 yrs old)	208	118	90
Schedule Caste	463	260	203
Schedule Tribe	24	11	13
Literacy	86.2%	91.98%	79.82%
Total Workers	985	667	318
Main Workers	732	30,614	0
Marginal Worker	253	169	84

Table. 1   Dhamori Census data.

Climate

The climate of India is usually described as tropical monsoon type, which is mainly influenced by two seasonal winds, the northeast monsoon and the southwest monsoon. The northeast monsoon happens from October to December, blowing the monsoon wind from land to sea. Conversely, the southwest monsoon usually occurs from June to September and brings most of the rainfall during a year (National Informatics Center, n.d.).

In Amravati, the average rainfall during the northeast monsoon is 70mm while that during the southwest monsoon is 775mm. Thus, the rainfall during winter from January to February and summer from March to May is comparatively minimal, which is 30mm and 12mm respectively (Department of Agriculture Cooperation & Farmers Welfare, 2016). The maximum temperature during summer can go up to 108F while the minimum temperature during winter drops to as low as 50F (Office of the Senior Geologist, n.d.).

Soil

The soil in the Deccan plateau is mostly black basalt. This type of soil is clayey, which is good at retaining moisture and rich in humus. The soil is commonly known as 'black cotton soil' because it is best suited for the cultivation of cotton (MapsOfIndia.com, 2018).

There are different types of black basalt soil. The major black soil type in Amravati district is deep and shallow black soils, which occupy 55.9% and 42.9% of the total geographical area respectively (Department of Agriculture Cooperation & Farmers Welfare, 2016). The black soils are a type of shrink-swell soils or expansive soils developed in alluvium due to the weathering of the Decca basalt (Padekar, Bhattacharyya, Ray, Tiwary, & Chandran, 2016). These soils contain a high proportion of

swelling clays, which are inherently low in permeability. The high shrink-swell capacity makes black soils swell whenever there is a high content of soil moisture and shrink when the moisture content is low. This soil property makes structures more difficult to maintain. The soil has poor drainage, accumulating salts in the soils and hence increasing salinity. The problem of poor drainage results in water stagnation in kharif cropping season during the southwest monsoon and moisture stress in rabi cropping season in winter. The use of saline groundwater for irrigation is discouraged since it would adversely affect soil health, resulting in poor crop production (Padekar et al., 2016).
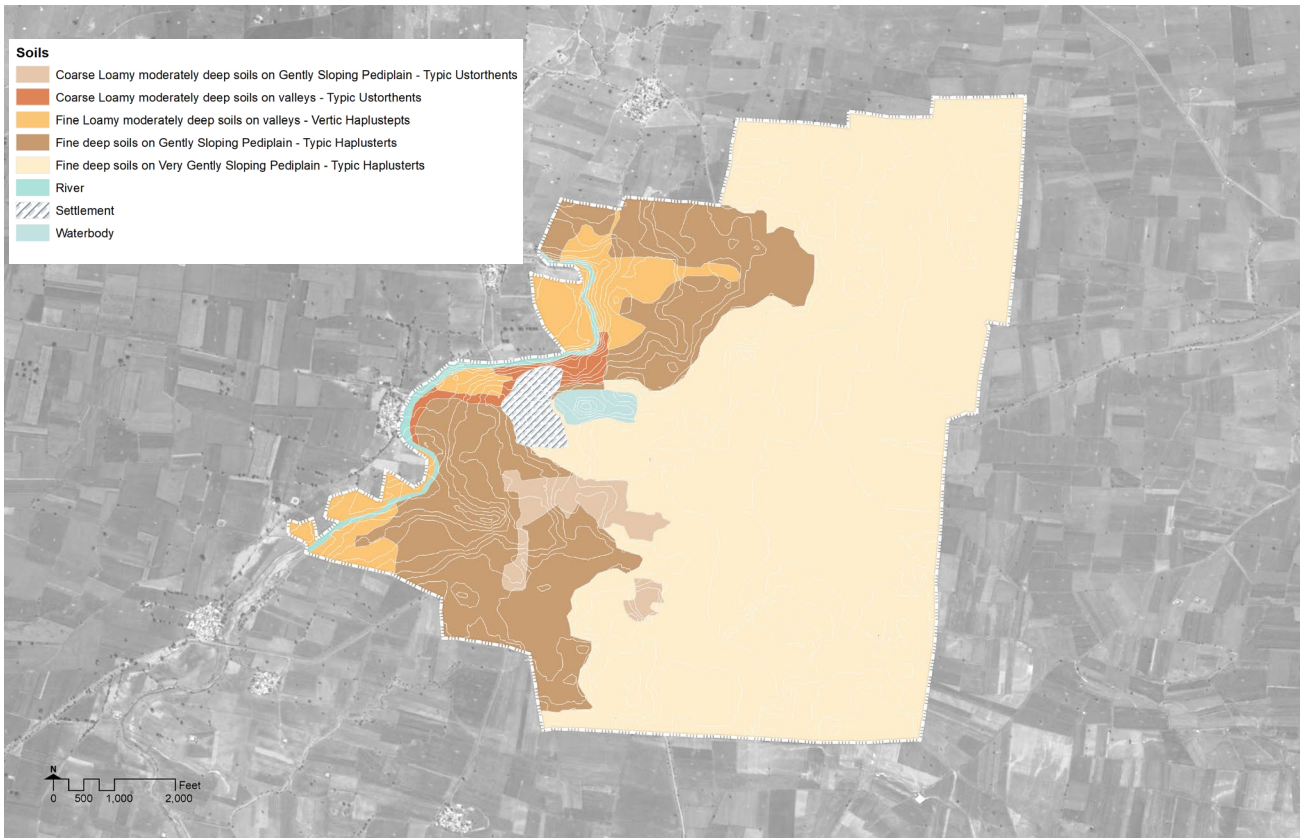
[43] Soil types of Dhamori village.

Hydrology & topography

Out of five major rivers in India three main rivers flow through Mahrashtra state: Godavari, Krishna, and Tapi. Dhamori is located in the upper Tapi basin, and the river that flows through Dhamori is the Ambada river, which joins two of the major tributaries of the Tapi river system: the Purna river and the Pedhi river (Dandekar, 2016).

In Amravati, the depth of the water table generally varies between three and twenty-five meters below ground level. The average annual recharge to the groundwater is about 8% of the average annual rainfall, which is approximately 700-800 mm. The groundwater in this area is not used for irrigation nor drinking purposes due to the saline characteristics. Therefore, irrigation sources are from rivers, canals, and predominantly deep tube wells instead (Padekar et al., 2016).
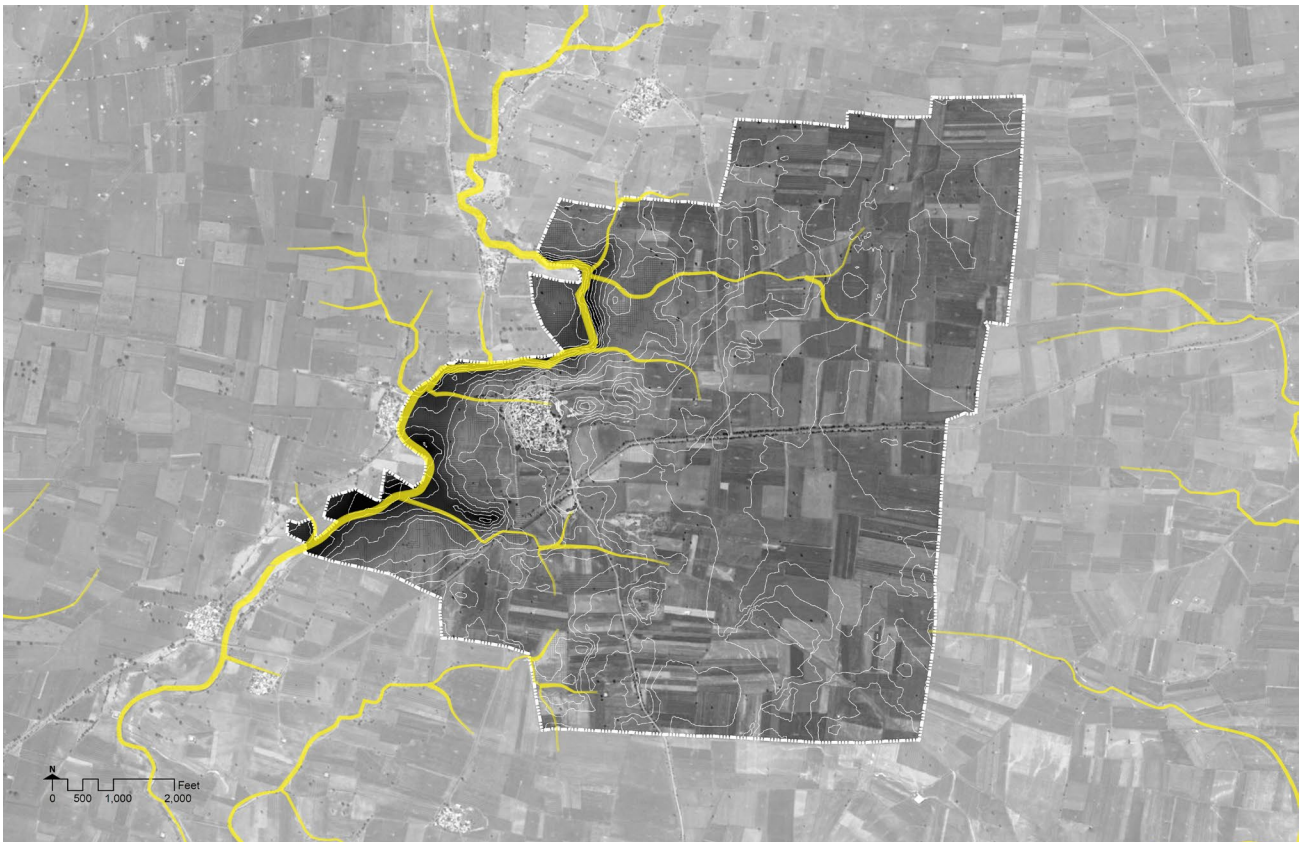
[44] Rivers & tributaries.
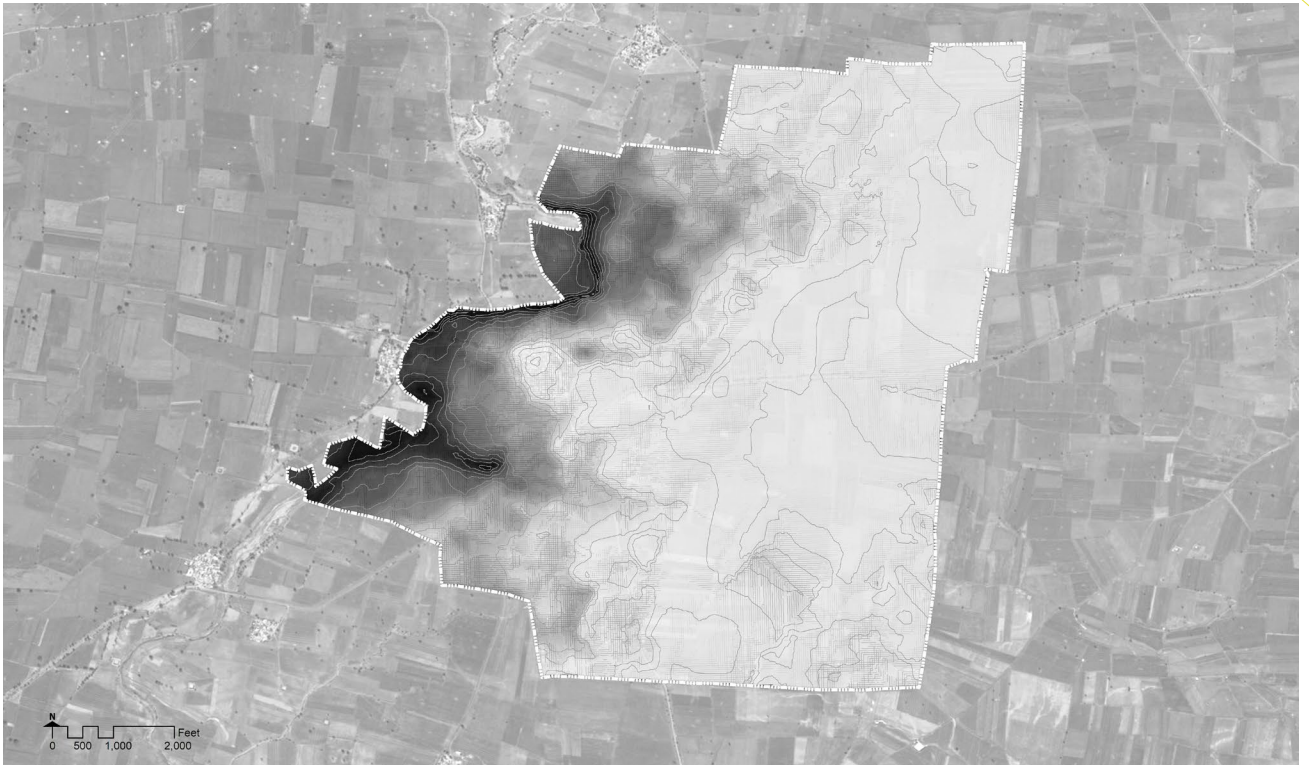
[45] Contour & digital elevation model (DEM).

[46] Village roads connecting the settlement area and the farm fields.

Agriculture

The major field crops and horticulture crops cultivated in Amravati are as follows. Most of the field crops listed below are rain fed, and only wheat is irrigated (Department of Agriculture Cooperation & Farmers Welfare, 2016).

Field crops		Area ('000 ha)
Kharif crops	Soybean	317.6
	Cotton	179.4
	Pigeon pea	102.1
	Sorghum	49.1
	Green gram	37.1
Rabi crops	Chickpea	79.0
	Wheat	45.4
Horticulture crops		Area ('000 ha)
Fruits	Mandarin orange	80.8
	Mango	5.1
	Mosambi (Lemon)	4.2
	Kagzi lime	1.1
	Banana	0.4

Table. 2   Major field crops & horticulture crops produced in Amravati.
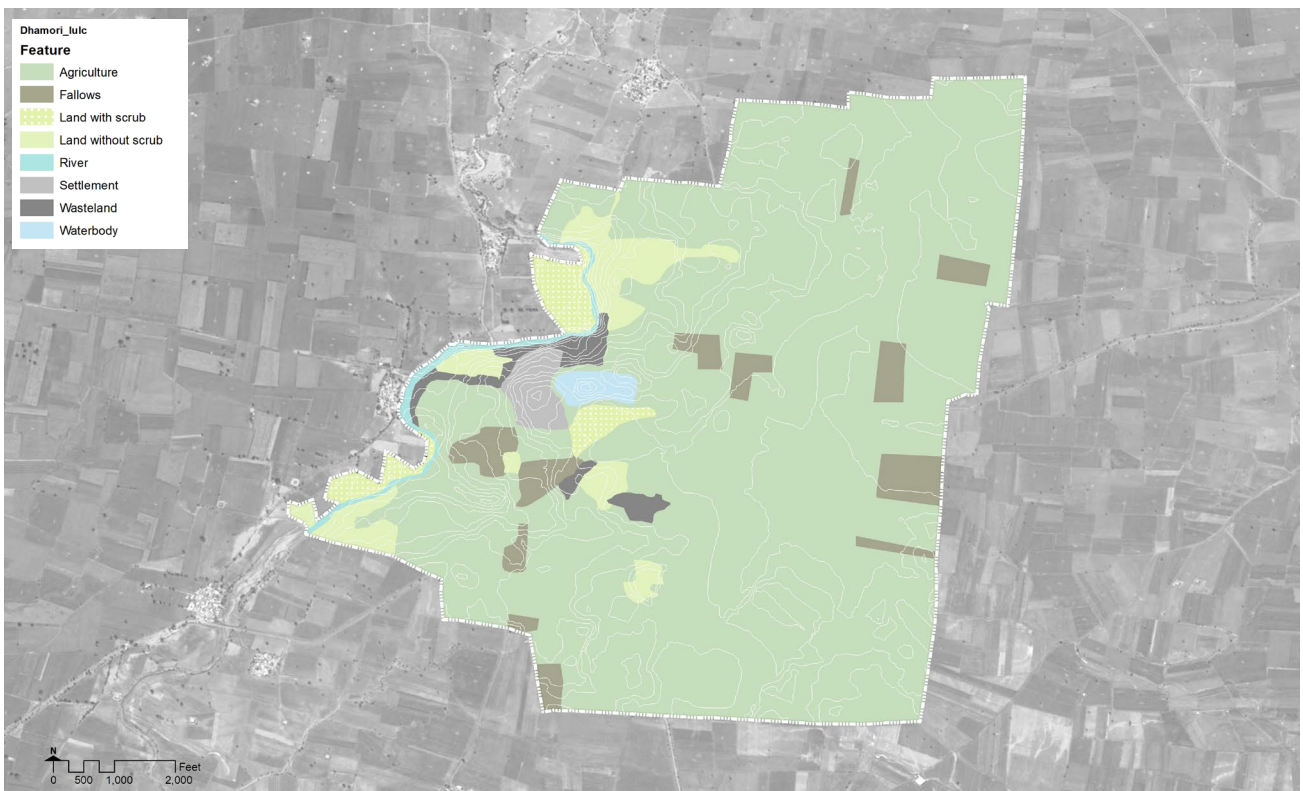
[47]   Land use classification.

4.2 Site observation

4.2.1 Village features

Physical features of the village and activities of villagers were observed. Photographs, videos, and drone footages were used to record these observations.

Water infrastructure

The following seven major water infrastructures give a sense of how villagers in Dhamori use and perceive water resources. Their ownership, status of use, and physical accessibility are noted:

	Farm pond	Talaab	Natural nalli
Ownership	Private	Public	Public
Status of use	In use	In use	In use
Accessibility	🚶	🚶	🚶

	Concrete nalli	Community well	Community cistern	Water tower
Ownership	Public	Public	Public	Public
Status of use	In use	Abandoned	Abandoned	In use
Accessibility	🚶	🚶	🚶	✗

[48] Existing water infrastructure in Dhamori.

Pond (The talaab &
farm ponds)

Nalli

Wastewater
discharge point

Community well

Community cistern

Water tower

4

1. Farm pond

The farm ponds are scattered in the middle of the fields beyond the settlement area. They are roughly about 30 x 30 x 3 feet in a rectangular shape, which is the standard size that can be developed with government funding. They are privately owned. Most of them are surrounded by farm fields without any structures besides, not even trees. After the soils were dug, they were piled up at the edge of the pond to form the embankment. The first one we visited only had an earthen embankment with little vegetation on the edge to prevent erosion. The second one looked more maintained since the four edges were fully vegetated and there was even a fruit tree planted besides to provide some shade to reduce evaporation of the water stored. The specified farm ponds are just a utility to provide irrigation water to the surrounding farm fields, which were mostly grams, lentils, and cotton at the time of the visit. Some farmers did consider incorporating a poultry-aquaculture system to maximize productivity, but no one has started the practice yet.

[50] The second farm pond visited during the site visit

[51] Standard farm ponds subsidized by government funding.

2. The talaab (Pond)

This is the largest pond in Dhamori, which is comparable to the size of the settlement area. The pond collects runoff from the highlands on the east side through an inlet channel at the southeast corner of the talab that extends all the way from the main road. The spillway is at the southwest corner of the Southern entry road to Dhamori. The water is not permitted to be used for irrigation due to local politics. Only the west edge of the talab is attached to the settlement area. The government has filled this side of the embankment into flat open land to provide more open space for future agritourism. Most of the villagers can be benefited by having more open space for active or passive recreation, but this action caused some low-lying houses at the northwest side of the pond to flood during rainy seasons. At the farthest end on the east, the pond was shallower, so aquatic plants are grown. The other three edges are surrounded by farm fields. All four sides of the pond embankment are at a considerable height from the village ground level, and there are only a few banyan trees on the edge of settlements. There is barely any vegetation except weeds like Ipomoea cairica, which is commonly called Besharam (which means "shameless") in central India. Severe soil erosion is evident with the many scours on the pond edge.

[52]   Prominent soil erosion along the edges of the Talaab.

[53] Main access ramp to the Talaab and the banyan tree

[54] A men taking water from the Talaab

3. Natural nalli channels (Natural wastewater channels)

The natural nalli channels usually lead to the discharge outfall of untreated wastewater into the Ambada river. As shown in Fig., there are two natural nalli channels to divert wastewater from household or runoff to discharge points. The major one runs past the bazaar and discharges at the west bridge to the adjacent village. Solid waste was accumulated along the channel and was piled up near to the discharge point. The secondary nalli started near the cell phone signal tower and ran to another discharge point next to the bridge at the northwest of the settlement. They are both connected to the concrete nalli channel within the settlement area. Stagnant polluted water stayed along these channels for several days sometimes before discharge.

4. Concrete nalli channels (Concrete wastewater channels)

Concrete nalli channels can be found on the road throughout the settlement area in front of houses. Storm water runoff and wastewater from the houses goes into these channels. Without covers, the channels accumulated trash, mostly plastic products like plastic wraps of some snack, plastic cups, or cartons, and so on that people threw or were flushed. Floating on stagnant water, the trash blocks the downfall of wastewater. The standing water generates mosquitos easily, posing a critical health issue to the village.

5. Water tower

The two water towers were on one side of the main road at the south of the Marathi middle school. Guarded by watchmen, the water tower site is usually locked with restricted access to the public. The water tower, which was built a few years ago, pumps water from a new dam, Sahanoor Dam. The water was stored and pumped in the tower so that some farm ponds can be kept filled with water all year round.

[55] Concrete nalli channel.

6. Farm well

There were some big and deep shaft wells within the farm fields. Most of them were not in use anymore because of the salty groundwater in the region.

7. Community well

The villagers used to rely on these community wells for drinking water. Since the construction of the dam and the water towers, villagers now have piped water into their house. The supply of drinking water apparently was not a problem since nobody ever complained about anything related to the drinking water. Most community wells that contain salty groundwater were abandoned, but those that retain rain water were treated as a backup water sources.

8. Community cistern

There were two big cisterns at village squares. They were cylindrical in shape and were as tall as a building. Before 2012 when people received piped water, the cistern by the bank would be filled once a week from Asegaon Purna. Back then, people had to solely rely on these cisterns and wells, which were not currently in use since people now have piped water for drinking and domestic uses.

[56] Abandoned farm wells due to salty groundwater.

[57] Abandoned community well adjacent to the Mazaar.

[Failed]

9. Sandbag weir

Two weir structures constructed by sandbag piles were built across the streambank. One was found near the bridge at the northwest, and another one was at the river bend at the northeast of the settlement area. Both were failed because the shrink-swell alluvial soil is not stable enough to support the structures. The collapsed sandbags were left in the river course.

10. Stream bank

The stream is the lowest level of the village, and it naturally receives runoff from farm fields and wastewater from the settlement area at a higher elevation, so it is polluted. However, there were reed beds grown on the river bed, which can provide natural filtration of the polluted water. Also, the reed beds and vegetation attract butterflies and birds.

[58] Failed sandbag structure remained in the stream course.

There was no sign of recreational use along the stream bank. The embankment was high enough to block the sight of the stream course from villagers at the ground level. There were many babul shrubs along some portions of the stream embankment. Babul, or Acacia nilotica is a native tropical plant commonly found in wet, plain areas with alluvial soils. The thorns on the shrub prevented people from trespassing or walking along the stream embankment.

The portion of embankment through the Dalit community was known as a popular spot for open defecation.
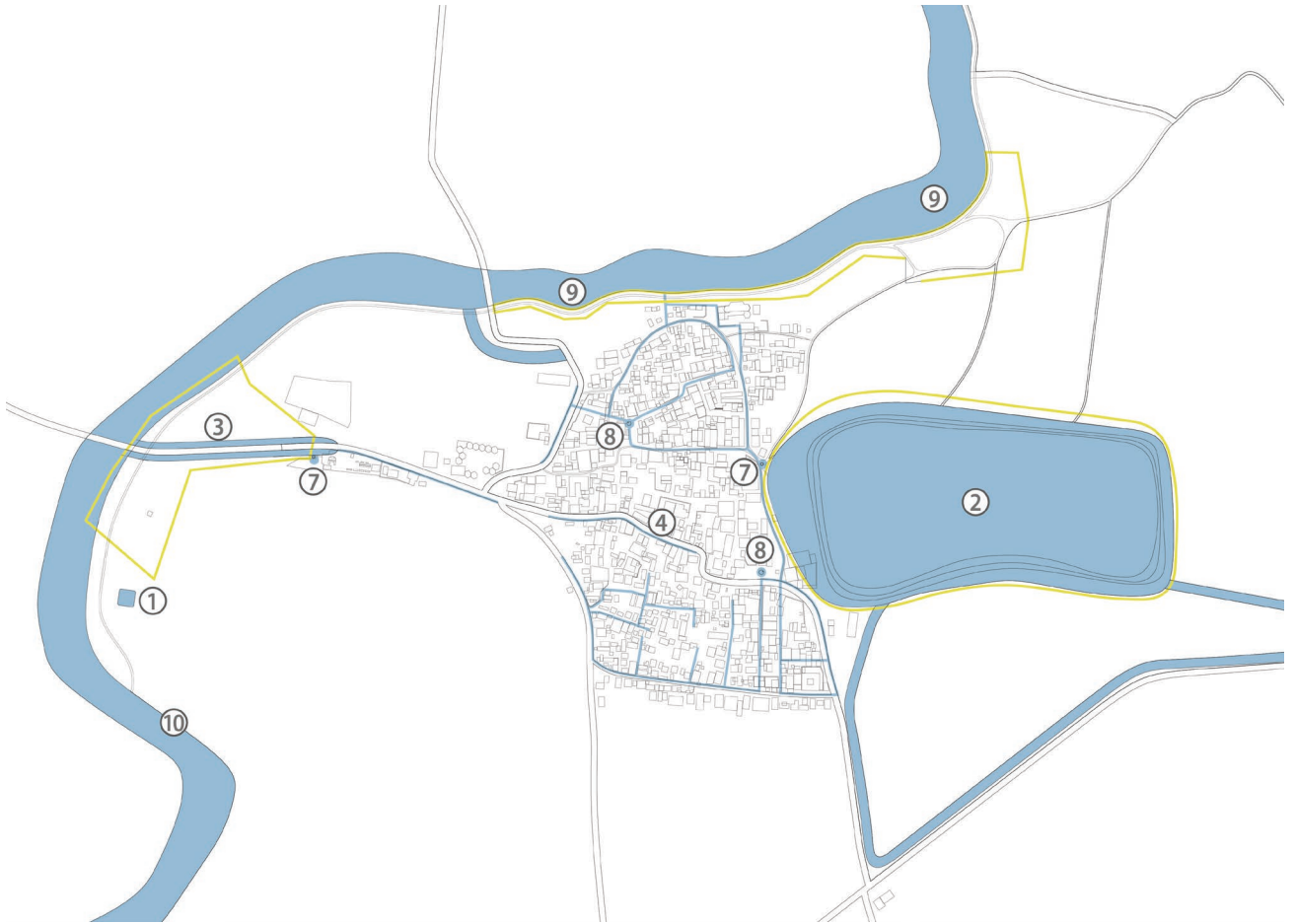
[59] Location map of existing water infrastructure in Dhamori.

Agriculture

By the time of visit, most of the farmlands were growing lentils, pigeon peas, grams, or cotton. Both lentils and grams are pulses. Lentils are a kharif pulse while grams are a major rabi pulse in Maharashtra. The lentils were above heads and should be mature enough to be harvested. The green grams, on the other hand, were just sowed not long ago, so they were still short. The cotton was still growing, but some plants already have cotton flowers in bloom. Due to the high clay content in soil, wide cracks were found.

Grams

Lentils

Cotton

[60] Crops and other agricultural products harvested or planted in Dhamori.

Land and water pollution

1. Solid waste

Wherever the public lands were not in use or maintained, people dumped garbage, turning those lands into a landfill. Most of the trash found was plastic products, which are non-biodegradable.
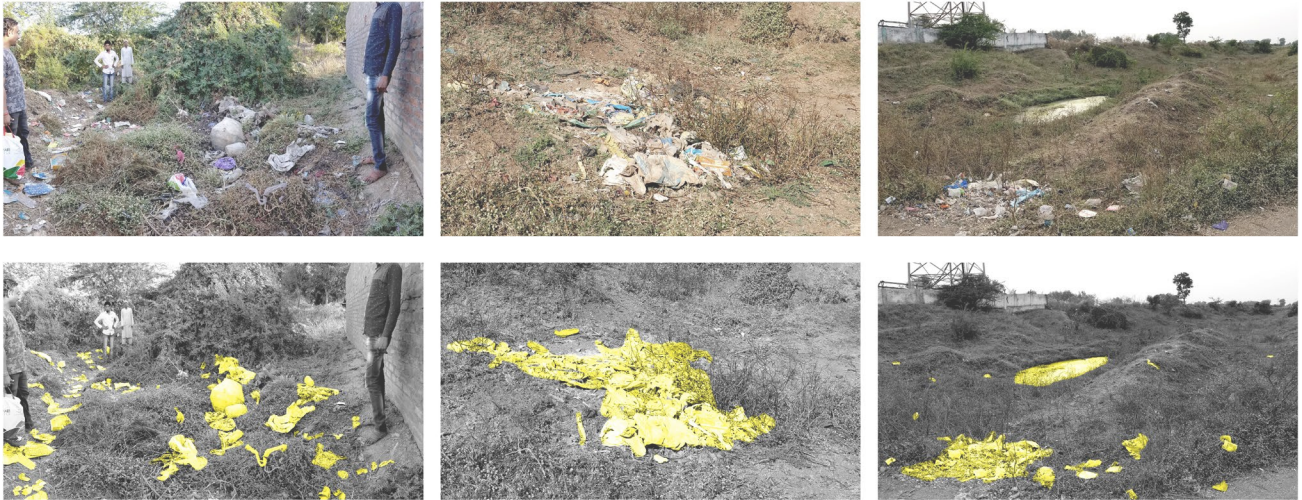
[61] Prevalence of solid waste in public land.

2. Nalli

There were many waste water overflows throughout the village, particularly on the streets where there were no nalli. For households that were connected to the nalli system, the family was responsible to clean up the deposits at the bottom of the nalli in front of their house. The waste excavated was discarded besides the nalli on the road without further clean up and removed to some collection locations for treatment.

[62] Wastewater on streets and in nalli.

3. Open defecation

While cow dung is usually found on the streets, apparently people prefer to defecate in vacant public lands such as in the spaces along the stream embankment and beside the talaab.

[63] Common sites for open defecation.

Agriculture

By the time of visit, most of the farmlands were growing lentils, pigeon peas, grams, or cotton. Both lentils and grams are pulses. Lentils are a kharif pulse while grams are a major rabi pulse in Maharashtra. The lentils were above heads and should be mature enough to be harvested. The green grams, on the other hand, were just sowed not long ago, so they were still short. The cotton was still growing, but some plants already have cotton flowers in bloom. Due to the high clay content in soil, wide cracks were found.

Settlement

There were three major distinct communities living in the settlement area. The Hindu community was the largest, living below the Mosque to the south entry of the village; the Muslim community lived in area above the Mosque but at some distance away from the stream; and the Dalit community lived in the lowest area beside the stream.

Most of the houses were made of mud and bricks, and some were plastered. Dr. Agarwal's residence at the center of the settlement area demonstrated the finest architecture in Dhamori. The only heritage building is Lakshmi Narayan Temple.; but due to the varying religious beliefs, most of the villagers are not interested in visiting.

⊠ Hindu
⊠ Muslim
⊠ Dalit

[64] Settlement area of different communities in Dhamori.

Legend:
- Community use
- Temple
- School
- Shop

Map labels:
- Muslim burial ground
- Idgaah
- Bazaar (Market)
- Mazaar/Dargah
- Panchayat Office
- Phone signal tower
- Marathi school
- Urdu school
- Shankar temple
- Mosque
- Clinic
- Agarwal residence Orphanage
- Hanuman temple
- Laxmi Narayan
- Hanuman Temple
- Laxmi Narayan
- Imambada chowk (Village square)
- Gujri chowk
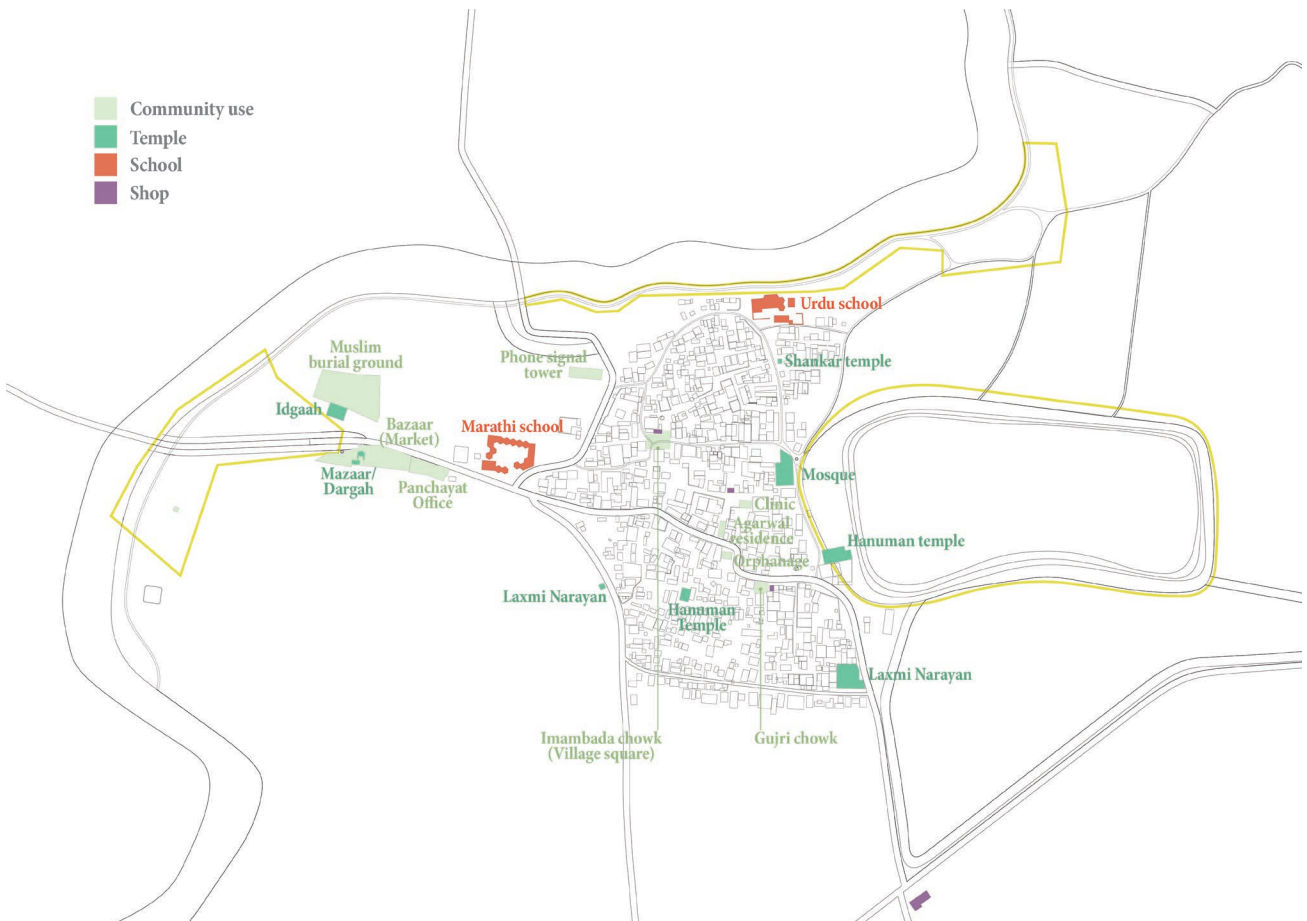
[65] Community assess of Dhamori.

[66] Road network and trees in Dhamori.

[67] Alley road.

Public space

The largest open public space in Dhamori is the talaab edge, which villagers would see as a community gathering space. People like gathering under the Banyan trees at the edge of the talaab or down the embankment slope for passive leisure. The central space of the talaab is a favorable spot for sports like playing cricket or flying kites.

Other public spaces where men gather include village chowk or squares, formed within a cluster of settlements. The major squares are the Gujri chowk and the Imambada chowk. There are usually shops in the square that provide an anchor point for people to interact. A thela was sometimes at the square to sell street snacks. Men like gathering in front of the shops sitting on benches or the steps of the shop. Sometimes, villagers used the space of the square to dry crops like wheat. The temples are also a common place for particular communities to gather outside. For instance, there were benches outside the Hanuman temple beside the talaab. The Hindu men like sitting there individually or as a group. In addition, the village streets are also an important public space for connecting with and encountering other community members.

All the communities in Dhamori can use the main roads so they are critical connectors among communities. The alleys are instead mainly used by the particular residential community nearby. Other communities feel excluded and uncomfortable passing through alleys that they do not belong to their group. However, these alleys are usually the most vivid place for public or semi-public community life. They serve as an extension of the private house in that since people prefer to keep open their doors, walking along the alley, could we look into the private front court inside a house. Women prefer sitting together on the steps of one's house, and children usually play on the streets. A mobile food cart was observed stopping by the front of different houses to sell vegetables or fruits to the women.

• Children & teenagers

Children and teenagers were the most active and frequent users of public space. Older children like playing as a group in the talaab, while smaller children play on streets or alleys near to their mother.

[68] Activities of children and teenagers in public space.

• Men

Men stayed in public spaces including the talaab, village squares, space outside temples, main street, and so forth. They stood or sat to rest or talk with the others.

• Women

Women seldom just appeared to be in the public space alone. They either had something to do or somewhere to go when they were out, or they were with their husband. Most of the time, they stayed at their house or gathered at the steps, a semi-private space in front of their house to socialize with other women.

[69] Activities of men in public space.

[70] Activities of women in public space.

4.2.2 Possible materials for construction

Bamboo

Inspired by the Chinese or Japanese garden, the Bamboo Garden in Amravati largely built some of the structures and play equipment with bamboo, which is an environmental-friendly material for construction. Time would have to be considered since it takes a few months for bamboo to process to be safe for use.

Reused tire

During the site visit, the team also managed to raise funds and ask for donated materials to direct a "Demo Project" with volunteer efforts from the villagers. Led by Professor Nawre, the team proposed ideas like a tire playground, a swing, a mural wall as playground elements to be constructed in the talaab. In the end, we found donors of a hundred used tires, some exercise equipment, and colored paint for turning the side wall of the Hanuman Temple into a mural of everyone's hand prints.

Tires are a relatively low-cost material and have the potential to be upcycled into many other products, like play equipment, planters, ponds, etc.

Donated labor from villagers

Once the donated materials were exported to Dhamori, villagers were engaged to start the preparation and construction work. Just over a weekend, the volunteered villagers efficiently cleaned and dried all the tires and started building a colorful tire ramp to the talaab and hung a few tire swings on the banyan trees. They also installed a few pieces of gym equipment once they arrived.

Right after the final presentation on 12/27/2017, people started to finish the tire ramp and create tire play equipment with the remaining tires. Smaller children also helped clean up a space by removing bigger rocks as told. They created a vertical climbing structure at the end using the remaining tires by themselves.

[71] Play equipment in the Bamboo garden featuring bamboo as the main construction material.

[72] Dedicated villagers helped organizing the reused tires received for the improvement work or "Demo Project" on the Talaab.

4.3 Participatory process

4.3.1 Group interviews

A. Scheduled interviews

The following comments are classified as general aspects to add to the understanding about Dhamori from the observations listed in the previous section, and as social, environmental, and economic problems and recommendations suggested by interviewees.

Water infrastructure

Rain water is the main water resource for irrigation in Dhamori, and farm ponds are the only formal water infrastructure for harvesting irrigation water. Groundwater in the area is not used for irrigation due to the black soil that makes water salty.

Since 90% of the villagers can access piped water, there is enough domestic water supply for most of the public buildings and schools. Therefore, the major need is to secure more water for irrigating the second crops after February and March. Since summer is too hot without precipitation, the farm ponds would be dried up. The farm fields were hence left unused, and people had no job during hot summer periods. Therefore, farmers prefer to have more water to produce crops all year round and to have a small garden.

Agriculture

In Dhamori and the surrounding villages, the most widely grown kharif crops are toor daal, soybean, and cotton while the main rabi crop is gram. Farmers in Dhamori also grow vegetables and fruits like custard apple, guava, ber, bananas, oranges, papaya, and mango.

Farmers in Dhamori mainly cultivate by plowing and by hand. They use a sprinkler irrigation system instead of flood irrigation. DAP, 10-36 Super Phosphate, and Potash are some of the most commonly used pesticides. There are a few farmers who are willing to practice organic farming because the organic crops are less likely to

damage soil structure. With soft and healthy soil, the second cycle of organic crops could happen in a shorter period without the need to wait for the recovery of soil nutrients before summer comes, hence increasing production. The profit for organic crops is also higher than for herbicide-grown crops. One of the reasons many farmers still hesitate to change was because organic farming is deemed too much work.

Other than agriculture as the main income source in Dhamori, there is also one ginning factory to process the cotton cultivated.

Public space

Villagers hold important festivals and events in the public space in front of the temples, the mosques, or at the village squares. Festivals celebrated include Diwali, Holi, Pola, and Dushna. The talaab also serves as a ritual place for clay statues of Hindu gods to submerge in the water during festivals.

Other than at the talaab, children and teenagers play at school. There is a playground at the Marathi school and some play equipment at the Urdu school.

Fauna & Flora

Villagers typically have little consideration for the value of ecosystem and habitats for plants and animals. However, the neem tree, or Azadirachta indica, is traditionally considered a favorable plant due to the medicinal value of different parts of neem. However, the babul tree is considered a pest, though people may sometimes use the plant as a natural fence due to its spiky characteristics. For fauna, langur monkeys, boars, and deer have been much loathed by farmers since they eat the crops in the fields.

[73] Participatory process of the scheduled interviews.

B. Planned interviews

Workshop 1

It was held on 12/19/2017 in the evening after the men or children had left from their work or school. We gathered interested people at the talaab and led the workshop inside the Hanuman Temple nearby. There were 11 males and 12 females, among whom 13 people were adult, two were elderly at above 60 years old, five were teenagers at 13-18 years old, and also three children who were younger than 12 years old. The participants live near the Hanuman Temple, so they should all be from the same Hindu neighborhood.

Men naturally sat on one side, and the women sat on the other, leaving a gap space in between. Professor

Nawre first started to explain to the participants our purposes and asked their permission to take photographs and video of the process. She used Hindi to ask general questions about their way of using public spaces and form of social gatherings. Initially, more men were willing to speak than women. Only the men responded to her questions in the beginning, but later when Professor Nawre explicitly asked the women to talk, a few started to open up, but many still remained silence.

The following is the additional knowledge about Dhamori and the villagers from this workshop:

[74] Participatory process of Workshop 1.

Aspect of issues	Useful information
Environmental	The animals that they find in the farm fields are deer, snakes, wild boar, monkeys, and fox. These wildlife is regarded as pests, and they often come to the talaab to drink water. Other animals such mongoose, squirrels, rats, etc. can be easily found in the settlement area.
Socio-cultural	For men, they meet with their friends outside of their house the most and sometimes stay under the Banyan trees at the talaab. They used to fly kites or play sports when they were children. Men sometimes go to the main village chowk or Gujri.There is no specific place in the village that they do not like.
	For women, they also meet with the other women outside or inside of the house. They seldom go to any particular public space, not even the talaab because there are no amenities and hence daily purposes for them to go. The only purpose for women to go to the talaab is when they celebrate the Vat Savitri Pooja at the banyan tree near the talaab. The Hindu women would be allowed to go to a garden if there was one, even if men are there
	The most common festivals the Hindu community celebrate are Durga Puja Festival, Navratra, and Ganesh Puja Festival in the Fall. The community usually submerges the clay statues of Durga (a Hindu goddess) and Ganesha (the most worshiped Hindu deities), at the talaab as a ritual after the festival is over. Villagers celebrate Holi by burning Holika at three particular public spaces: in front of the Hanuman Temple near the talaab, in front of another Hanuman Temple or the Madhi Temple, and at the center of the main road. Farmers use the open space in front of the Urdu school and that in front of the Shankar Temple to celebrate Pola Festival (a bull-worshipping festival). There is also a Mata Maar Temple (Mata means pox; Maar means to kill) far away from the settlement area in the farm field. Couples go to the Mata Maar Temple to pray before weddings.

Table. 3   Interview notes of Workshop 1.

Workshop 2

We had the second workshop on 12/22/2017 in the late afternoon at the Urdu School in the Muslim community. The workshop targeted the Muslim women. Although there were 47 participants in total, 40 of them were children who study at the school. There were six Muslim women and one male teacher present during the workshop. Among the six Muslim women, one of them was a teacher at the Urdu school, and two of them wore the chador. The children at the Urdu school prepared tables and chairs for us to sit on like a forum. All the children sat on a mat on the ground. Again, Professor Nawre started by explaining to the participants our intentions of the workshop and assured them the information recorded would be confidential. The women agreed to take photos only when they put their face veiling on.

The following is additional information learned about the Muslim community:

[75] Participatory process of Workshop 2.

Aspect of issues	Useful information
Environmental	Open defecation takes place along the river embankment behind the Urdu school, the village road near the Marathi school and the talaab.
	The Panchayat of Dhamori should also sponsor vegetation for greening the edge of the talaab and other areas in the village. As a precedent, there is a village near Dhamori called Bellora Village, where public toilets are used to make manure and people are keeping them clean. Water is harvested for the toilet use. Every family was given some trees and tree guards to take care of as a strategy to green the village. For villagers who showed good care of the plants would be presented with prizes.
Socio-cultural	Muslim women can go to public spaces if they wear a chador to cover their body and face with black veiling. Currently, although the view of the water at the talaab is nice but since it does not have any amenities, women would not go for socializing.
	In the Muslim community, most of the houses had private toilets. Some houses did not have toilets because they had no place to build a toilet. Some people would still go out for open defecation even if they have toilets, suggesting that education in sanitation has to be provided if public toilets are built so that the culture and behaviors of villagers can change for the operation and maintenance of public toilets to work.
	The Muslim women and men suggested a list of amenities that they want to have in Dhamori or the surrounding: • A library: Women need to access knowledge to help them become a better mother and home caretakers. • An enclosed area for exercise: In Amravati, there is an outdoor gym, but the Muslim women cannot go there since there is no privacy. The men of the family would not allow unless there are walls or screening from onlookers and there are no other men to use, suggesting the usage of public amenities have to separate women from men through spatial separation or the time of usage, otherwise men would not permit women to go. • A healthcare center: There is no hospital in Dhamori for women to labor. They have to go to another village for giving birth. • A public garden: They would like to have a public garden by the talaab. But they concerned maintenance issues of the open space since it is usual that children or other people pick up the plants. Animals like goats can also eat up the plants, so fences have to be installed, or a guard should watch out for the space. • A community hall: There should be a community center for each neighborhood in Dhamori. • Drinking facilities for the animals: The use of the talaab by human has to be separated from animals.
	Local politics and the caste system have been a big to development or improvement projects in Dhamori.

Table. 4   Interview notes of Workshop 2.

C. Informal conversations

With students at the Urdu School

It was in the afternoon when we were invited to go inside the Urdu School to visit the classes, from the kindergarten-age students to upper-level students. They all stood up and clapped in rhythm as a form of greeting when we entered their classroom. Different classrooms have a different sitting arrangement. The older the class, the more students follow the rule that boys and girls have to sit separately due to the religion. We asked who the class captain was first, and sometimes, surprisingly, it was a girl. We asked the class captain questions about what places they liked and disliked going. Only the kindergarten children said they like the school playground the most since they don't go to public spaces on their own. Everyone else in the other classrooms would immediately respond that the talaab is their favorite place to hang out, while the stream embankment is the most undesirable place that everyone avoids. Most of the houses in the Dalit community still do not have a private toilet. Therefore, that linear strip of public space in between the back side of the settlement and the embankment became preferred for open defecation. The teachers told us that everyone got toilets when the village conducted a survey. But still, some people were left out when they were not at home to take the survey. Later, we saw a few very simple steel structures in the school playground as play equipment when we left the school.

With the Dalit Community

We had a conversation with Dalit people near the stream when we were flying the drone over the stream course and derived more understanding of the Dalit community through this conversation:

[76]   Informal conversations in Urdu School.

Aspect of issues	Useful information
Water-related	There are about three to four times a year during the monsoon season that people need to be evacuated from their houses since the area of Dalit community as the lowest-lying region is prone to flooding. The flood water only reaches the edge of the road on the side of the Dalit community. The settlements in the Muslim community across the road are high enough and are not affected. The flood water normally could stay for a few days. The community has to prepare to evacuate to the Marathi school once the monsoon rains start. About 200 villagers are relocated to stay temporarily in five of the rooms in the school during the heavy rainy days. Usually, some of their properties might be flushed away by the floods. People also have to clean up the sediment deposited themselves.
	The houses have piped water, but they still use the sweet water wells as a backup water source.
Agro-economic	Nobody from the Dalit community owns land even though most of the families have stayed in Dhamori for at least 10-15 years. They work as farm laborers or workers.
Environmental	The wastewater from the Madrasa school used to flow into the talaab, making the water in the talaab unsuitable to use. The connection was stopped several years ago, but the Dalit community did not know about it, so they did not use the water in the talaab.
	Some families did not have toilets. People would be happy to have a toilet shared by two families. There are different spots of open defecation in this area for men and women. If they have to defecate openly, men always go toward the main road, while women use the area along the river closer to the ginning factory.
Socio-cultural	The children in this neighborhood have less chance to play at the talaab since they do not live as close as some Hindu children or bigger teenagers. Instead, children play by the river or in front of their houses.
	The community celebrates festivals among themselves but not always with the rest of the villagers. They hold festival rituals in front of their houses or the nearby temple.
	Some desirable improvements in Dhamori for the community would be: 1. Better government-subsidized housing designed with a higher foundation that would not flood 2. A children playground at the proximity of the neighborhood 3. Public amenities for the adult like a garden and a swimming pool

Table. 5   Interview notes of the informal conversation with Dalit community.

4.3.2 Drawing activities

The drawing activities followed the interviews in both the workshops. We asked the participants to draw one improvement that they would like to see in the village. Colored pencils and drawing paper were distributed. People started to get excited once they received the drawing tools, especially the children. In the first workshop, the men's group drew very quietly and did not discuss among themselves, but the atmosphere was totally different on the women's side. Young girls immediately gathered together to form a small circle to draw and chat. Young children also joined and wanted to draw with their mother and friends. In the second workshop, we at first only targeted the Muslim women, so we had prepared enough drawing paper and colored pencils for all the women participating. In fact, two of the women left after the interview, so only four women stayed for the drawing activities. Some of them were not comfortable drawing at first, but they still managed to draw what we asked individually. Since we did not expect the students to join before, we did not have enough paper and stationery for all the students. Nevertheless, students who received the drawing materials formed groups and discussed happily.

[77] Drawing activities (Above: Workshop 1; bottom: Workshop 2).

Although we did not get to ask everyone to talk about their drawing, we collected the drawings and differentiated them into adults' and children's drawings for the record and further interpretation. The following is a list of villagers' wants we interpreted. The features shown in the villagers' drawings can be categorized into softscape, infrastructure, passive recreation, active recreation, and animals.

Softscape	Freq.	Infrastructure	Freq.	Passive recreation	Freq.	Active recreation	Freq.	Animals	Freq.
Adults (Older than 18 years old)									
More trees (fruit trees, flowering trees, banyan trees)	5	Wall to restrict entrances	1	Benches	4	Gym equipment	3	Peacock	1
Landscaping	1	Lighting (light poles powered by solar energy)	2	Library	5	Playground	3	Duck	2
Garden	7	Rainwater harvesting	1	Picnic table	1	Boating	10	Bird	1
Flowers (water lilies)	1	Solar panels	1	Beach	1	Swing	9	Butterfly	1
Water fountain	1	Better house	1			Slide	4		
Lawn	1	Better road with pavement	3			See-saw	3		
		Women hospital	1			Flying kites	1		
		Community hall (for marriage)	2			Badminton court	1		
						Merry-go-round	2		
Children (Younger than 18 years old)									
More trees	6	Toilets	1	Library	1	Playground	3	Bird & nest	1
More pond	1	Better house	2			Boating	6	Butterfly	1
Garden	5					Swing	3	Peacock	1
Potted flowers	1					Cricket pitch	1		
Lawn	1					Ball field	1		
Both adults & children									
More trees	11	Better house	3	Library	6	Playground	6	Bird	2
Garden	12					Boating	16	Butterfly	2
Flowers	2					Swing	12		
Lawn	2					Slide	4		

Table. 6   Summary of comments and ideas collected from the drawing activities.

There were similar wants between adults and children. Improvements that everyone wanted are a better, more aesthetic environment with more tree planting and landscaping. Gardens would be the most imagined form of public space with more flowers, lawn, and water features. For infrastructure, both groups wanted an improved housing to live. Some villagers also pointed out the need for better lighting for night use in public spaces, sustainable design such as harvesting rainwater and using renewable energy. Women also suggested a hospital and a community hall. Both groups drew a library with many books, suggesting people wanted the accessibility to reading and learning. Other passive forms of structure preferred by adults include benches and tables. The most favorable active recreation was boating. Playgrounds with play equipment like swings, slides, a see-saw for children, and a sports field for playing badminton, cricket, and ball games were also popular among both the groups. Some drawings either only featured animals or included animals with other features. The recurring animals appearing in drawings included birds, butterflies, and ducks.
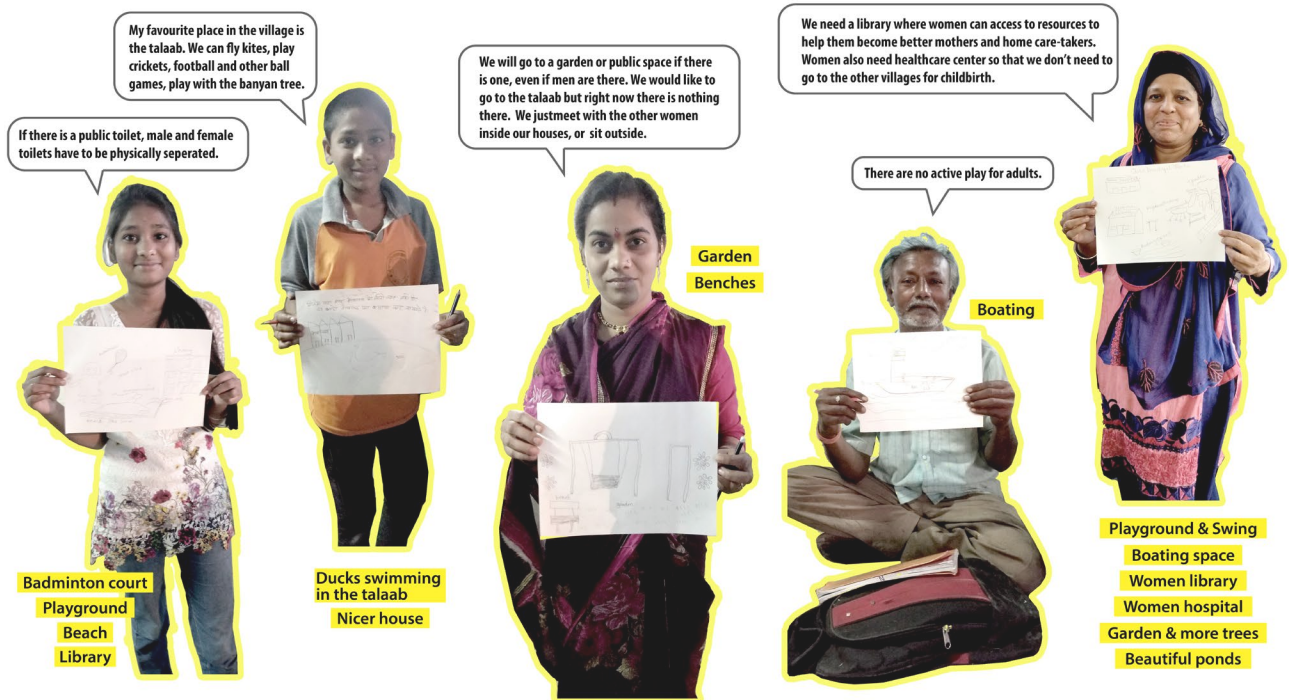
[78] Some of the participants in the drawing activities showing their drawings about what they want to improve for Dhamori.

4.3.3 Transect walk

The transect walk took place on 12/22/2017 at around 1 in the afternoon during villagers' lunchtime. There were eight villagers who participated at some point in the walk, among whom four were with us from the beginning to the end. Six of the participants were adult, whose ages ranged from around 20 to 50. Also, an elderly person and a boy participated. Apart from the age, their occupations were diverse as well. Three of them were farmers; other occupations included a shopkeeper, a temple caretaker, a vet doctor, an unemployed youth, and an elementary school student.

Talaab (Pond)

The first stop was the talaab. People talked about the relationship of the talaab to their daily lives, how they use and perceive the talaab, possible ideas and wants, and relevant problems associated with the talaab.

Men like coming here for the soothing view of the water, and since the talaab became a significant place for social gathering, they would still come even if the talaab was not filled with water. They usually went to the pond in the evening after 4:30 pm. Like many other villagers, the group would like to have more trees planted to increase the aesthetic value of the talaab. Other than the lack of vegetation, the men also detest some of the villagers' behaviors such as open defection on the edge of the talaab. They suggested that such unhygienic practice should be avoided by some kind of a physical barrier like a wall or a fence.

We also learned more about the general daily work schedule of farmers: they get up early in the morning at 4:30 or 5 a.m. and begin work by 7 a.m. They take a break at around 10 a.m. and then work again until noon for an hour lunch. Then, they usually work until 6 or 7 p.m. depending on the seasons.
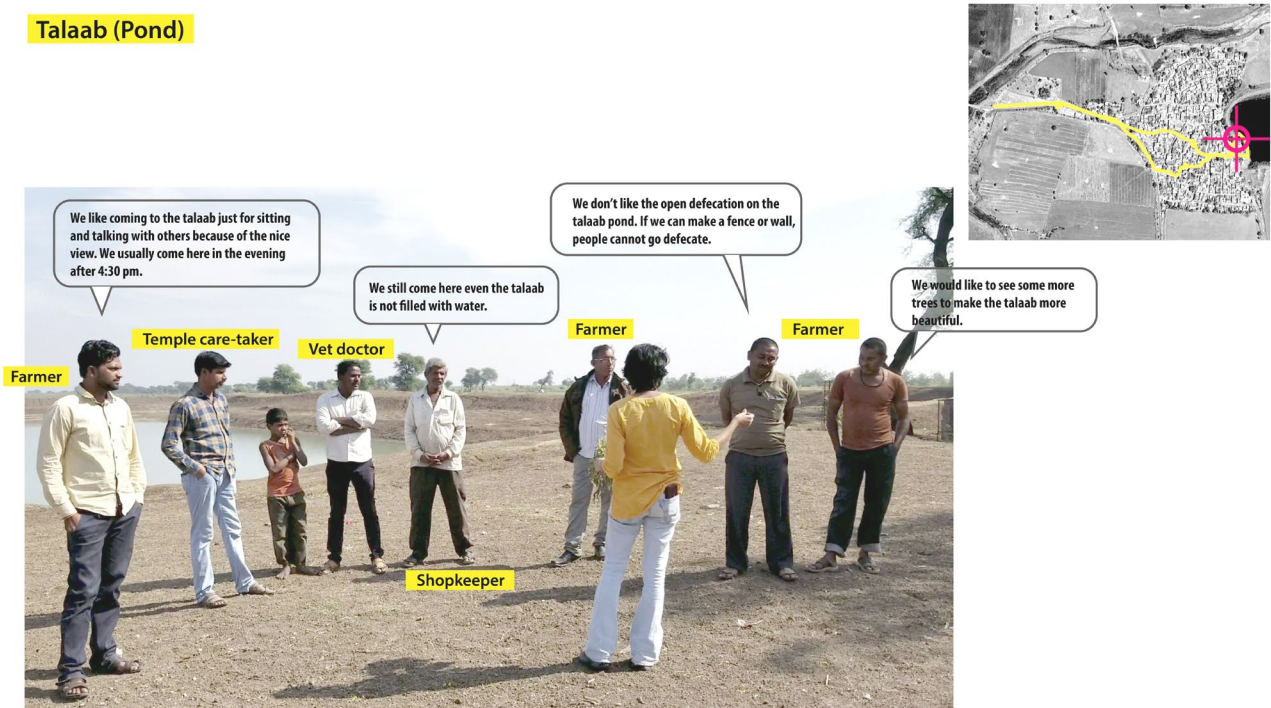
[79] Process of the transect walk- at the talaab.

Main road

While walking to the next destination, the villagers told us the above section of the main road is one of the places where people celebrate Holi and set up Holika fire.

Main road

In the village square (Gujri), we st up Durga and Ganesh dieties, which are biodegradable statues sourced locally from Amravati.

We set up holika fire here on the main road.

In the madhi near the Hanuman Temple, men and women both gather for communal meals during festivals.
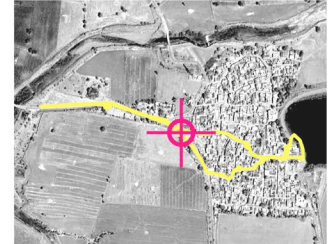
[80]   Process of the transect walk- on the main road.

Mazaar (Praying area for the Muslims)

The group was standing right beside the mazaar, which is another place the community likes visiting other than the talaab. People like the shade trees and the seating space provided. Children also like playing here because it is some distance away from the settlement area and their parents. The adjoining open space is where the Saturday bazaar is held every week. Some concrete slabs were found for sellers to sit and show their food crops. The land behind the Mazaar and that near to the Idgaah are the burial grounds for the Muslim community.

Bazaar (Market)

Idgaah

Regardless of whether you are muslims or hindus, every people in the village or other villagers gather in the mazaar once a year to celebrate a big festival and have communal meals together.

The mazaar is another place we like to come for gathering and socializing, just as the talaab.

Children like playing in the bazaar because it is near enough from the settlement but still have some distance away from their parents.

The wastewater nali here needs to be cleaned.

Wastewater channel

[81] Process of the transect walk- besides the mazaar.

Government land on the west

The photograph above shows a currently vacant public land. In contrast to the talaab, people would not consider this as a significant public space with any value. The vacant land is beside the main road to other villages and is also close to the burial ground of the Muslim community and a cremation pyre of the Hindu community (Kolhi and Dhangar). The men suggested the site could be developed as a healing or meditative garden for those who come to bury or burn their dead.

Government land on the west

Every community has their own funeral pyre. The dhangar commuity burn their deads in this field adjoining the idgaah.

So women may not like to hang out here because they could be afraid of it. But this land could be a good place for a healing or meditation garden for those who lost someone.

Muslim Burial Ground

Idgaah

Wastewater channel
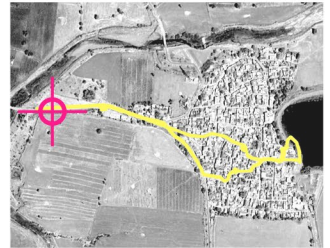
[82] Process of the transect walk- on a village road to the West bridge.

4.3.4 Presentations & Feedback survey

For the first village presentation, more than two hundred villagers attended. Most of the participants sitting at the square were men and children, while some of the women stood at the far end back at the alley closer to the settlement area. Men preferred sitting on the steps of the shops or standing at the edge of the village square, while children all clustered to the very front and close to the screen. The presentation finished at around 7:30 p.m., so the surroundings were very dark. People might have needed to go back home for dinner, so nobody raised questions or had any comments after the presentation. Some who were rather interested in the project were mostly young people who stayed behind to ask Professor Nawre and Saurabh Lohiya questions.

For the final presentation, Professor Nawre, Saurabh, Leslie, and I made the presentation collaboratively and presented different sections.

Due to the scheduled Demo Project to build a playground in the afternoon, Professor Nawre and I went back to Dhamori and visited the Hindu and the Dalit community

for feedback on the proposal presented. For the Hindu group, only men gathered and responded. The Hindu women were also curious, but they only sat back and looked at the group from a distance. They were not used to participating in group discussion with men. When we were in the Dalit community, women and children who were curious also came out and gathered as a group with the men to listen and speak up. According to Professor Nawre, women's and men's status tended to be more equal in the lower classes since women were also members of the working class. By that time, we found out that neither of the Dalit people had been to the presentation. We also asked some teenage girls randomly for their comments when they were playing at the talaab.

Ultimately, the main feedback came from the Hindu men and the teenage girls. Most of the people were happy to see any kinds of improvement in Dhamori. The major comments people raised for one of the community toilets proposed were about the necessity of separating male toilets from female, and about each community having at least one community toilet.

[83] The first village presentation.

[84] Final presentation.
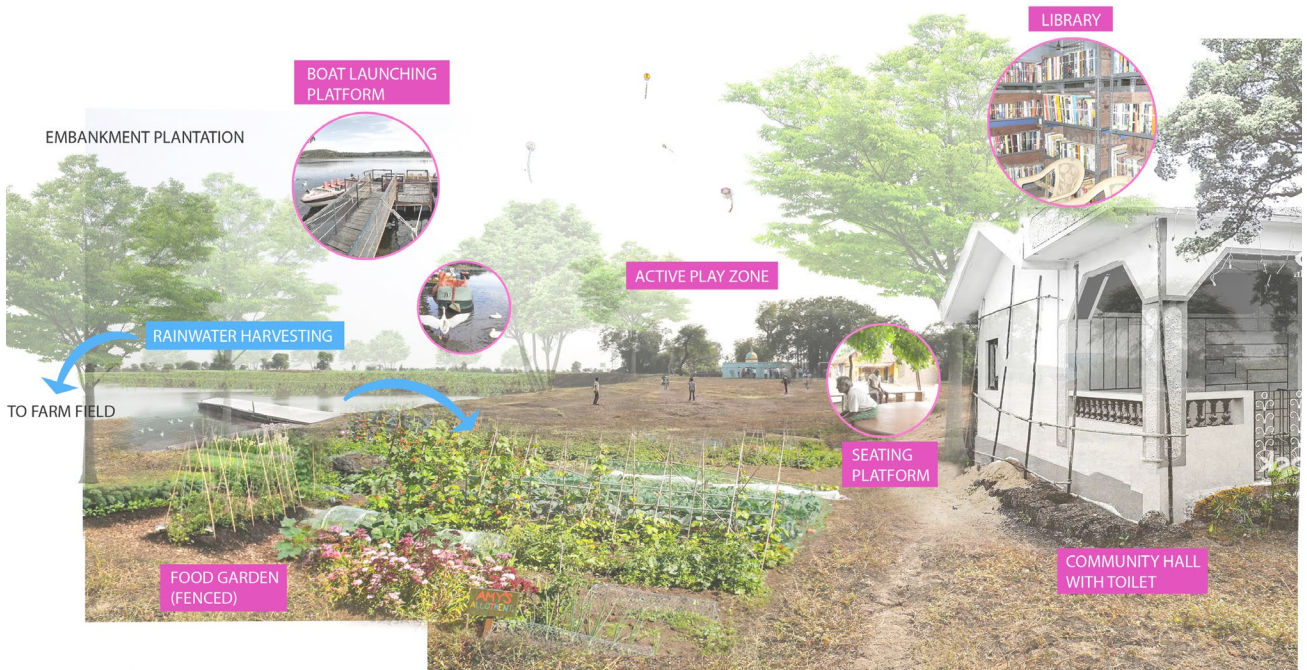
[85] Montage showing ideas to improve Site 1 presented in the final presentation.
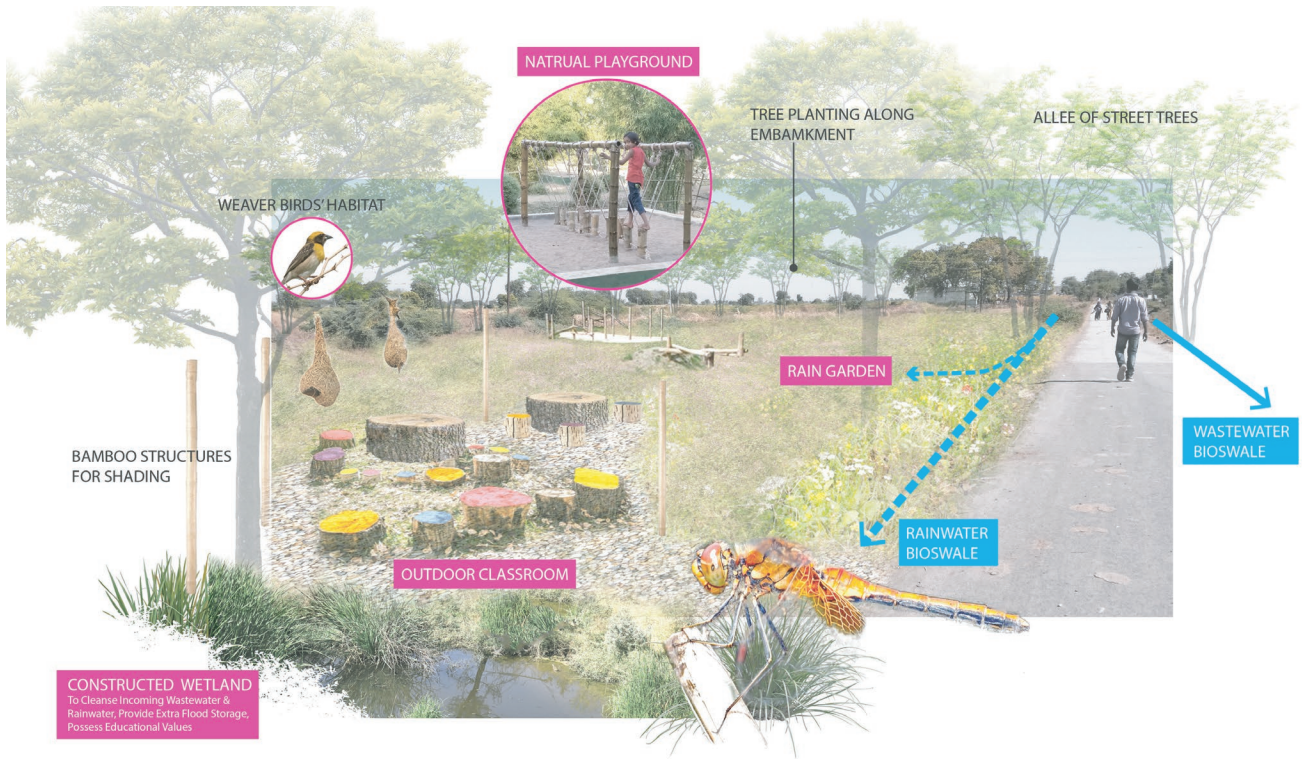
[86] Montage showing ideas to improve Site 2 presented in the final presentation.

4.4.1. Findings

In conclusion, the critical problems synthesized from all the findings are as follows:

1. Lack of water for irrigation

- Salt in groundwater

- Flooding during the monsoon season

2. Lack of waste management

- Uncovered drains and nallis in the settlement area often stagnant and filled with trash

- Untreated wastewater outfall to stream

3. Solid waste & trash

4. Open defecation in open land

5. Lack of public amenities in vacant public land to define those open space

[87] Site aerial photo.

4.4.2 Reflections on site observation

• It is important to develop a metric for observation before the site visit. If I can visit the site again, I would put more focus on observing the street life since the streets are where the private and public spaces overlap. To women, it is the extension of private space, as a semi-public space to them where they hang out with friends and neighbors on the doorsteps. The streets connect these semi-public spaces to more public open space like the village square where shops are located. The streets also contain nallis as the water infrastructure physically most closely connected to villagers.

• I would also observe or get information about the scope of physical activities each community has within the village to get a sense of the social boundary of each community.

[88] Drone flying.

4.4.3 Reflections on participatory process

Group interviews

• There were 23 and 47 people participating at the first and the second workshops, respectively. For Workshop 1, men and women participants were not separated, while there were only women from the Muslim community and children at the Urdu school in Workshop 2. Professor Nawre was the only one who led the discussion in Marathi for both the workshops. The rest of us who did not know the language took either photos or videos to record the process.

• Language could be an obstacle in leading a workshop and collecting data. In a group setting, people liked to confer amongst themselves. There were a lot of conversations happening simultaneously when Professor Nawre asked the participants questions. It was not possible for Professor Nawre to capture all the opinions and to translate all the opinions in time for the rest of us who could not understand the language.

• Due to the social hierarchy of the village, men have more freedom of speech compared to women, and the older generations have more power than the younger generations. At Workshop 1, without separating the men and women, women would not speak unless we directly questioned the women instead of asking the men. Sometimes, Professor Nawre needed to ask the men to give opportunities for women to speak first; otherwise, women would not voice opinions. At Workshop 2, most of the Muslim women we invited did not join us at the Urdu school because of family restrictions on going outside. They needed to ask for permission from their husband or even mother-in-law. In both the workshops, the youth and children never spoke in front of the adults in a group setting unless they were asked individually or in similar age groups.

• The responses usually came from a consensus reached by the most confident or outspoken leader of the group. In this regard, we might have missed out on some minority opinions raised that did not go along with the consensus. It was also hard to expect people to express profound personal feelings or memories in such a big group setting.

Drawing activities

• The drawing activities were followed by the group interview sections. In the interview sections before the activities, we asked questions about participant preference for and usage of public space and outdoor activities. During the drawing activities, we asked the participants if there was any one improvement that they would like to see in Dhamori. Most of the drawings about the types of improvements were related to public space and amenity. There may have been a guiding influence in the questions we asked concerning the theme of the drawing or the type of improvement the participants drew.

• The effectiveness of the drawing activities depends on age groups and gender. The younger the age of the person, the more comfortable and eager they are about drawing. Therefore, children or young people were more willing and excited to draw. On the contrary, older people did not feel so comfortable drawing because they either did not feel like they could, or they did not know how to express their ideas through drawing. Men were also more comfortable and confident with drawing than women.

• Both the drawing activities showed that people liked forming discussion groups while they drew. This phenomenon was particularly prominent among women. There were lots of discussions amongst women about the drawings than between the men who drew more individually. Some of them only discussed ideas at the beginning.

• It would be helpful if we could have a sharing after the drawing activities to ask people to share their thoughts. This discussion could happen in a group setting, so that people could discuss ideas among themselves, so we could have a more accurate interpretation of what they might want to express.

• Although we separated drawings of adults and children, it would be helpful to classify by gender as well, since different genders perceive and use space differently. Ideas from men may be expected to be different from those of women.

Transect walk

• The transect walk is an effective strategy to understand more about the village when the participants can be a tour guide to show us around their neighborhood. The general atmosphere of the walk was very casual. The casual dynamics and the more extended period of interaction encouraged participants to talk about their experience, feelings, and knowledge about the village, which might be hard to provoke in an indoor environment.

• The major problem is to get women to walk around the village with us. It is traditionally frowned upon for women to hang out around in public spaces or to take the lead.

• We could allow the people to lead us so that we can learn their routes to certain places or places they avoid passing through for getting to some destinations.

Presentations & Feedback survey

• Although both the presentations invited all the villagers and some community group leaders to participate, time and locations picked for the presentations determined the inclusiveness of the activity. The work schedules of most of the villagers had to be taken into account when deciding the time of the presentations. The locations, such as which communities were at the proximity to the hosting location, the capacity, outdoor versus indoor, etc., have to be thought through during the planning phase. For instance, though both the presentations were held in public community spaces, one at a village chowk besides the talaab and the other inside the Hanuman Temple, they were both in the Hindu neighborhood. When we visited the Dalit community, who lived the farthest away from the presentation locations, for the feedback survey, the Dalit community reported that none of them had attended the presentations.

• People did not give comments after either presentation. Therefore, more time devoted to planning and doing the small group feedback survey is necessary to understand how villagers thought about our proposals.

4.4.4 Role of landscape architects

From first-hand experience and observation, I learned that any design interventions in the public space in rural India can be appreciated by the community as social amenities. The problem is whether the design can be equitably used and maintained.

Depending on reaction to and anticipation of changes by the Panchayat and the community members, designers have a variety of roles for working in the rural context in developing countries, and that should vary from time to time given different project phases. In reference to the critical components summarized from the previous village precedents (Chapter 2.5.2), which are leadership, community participation, communication and education, and partnership for up-scaling the local efforts into a long-term practice, the role of landscape architects can be accommodated as follows:

1. Provoke [Leadership]

The first step is to evoke and raise awareness of the Panchayat and the community to make improvements. Take Dhamori as an example; the Panchayat has intentions and initiatives to improve the village, but the villagers did not seem to be ready for long-term improvements. The role of designers at such a point can be more about provoking awareness and imagination among community members. As the stewards of land who possess the knowledge of ecosystems and natural resources management, landscape architects can provide scientific assessment and planning for large-scale water management projects as a guiding framework for the community to implement. This can formulate a solid basis for the government and the community to believe in future possibilities to improve the village.

As designers, we need to be visionary leaders with long-term goals, but to turn visions into reality takes the whole community to understand and manage, so that community members can make informed decisions. Therefore, it is better to shift the leading role to some interest group in the community by empowering its members to become our successors and the leaders and administrators of the design.

2. Produce [Communication and education]

India's caste system, and its different religions segregate communities into varied neighborhoods. According to Brown and Kier, our professional role in part should provide critical awareness about transforming the existing social structures that lead to injustices through effective dialogue with communities during the design process (Brown & Kjer, 2007).

Naturally, as foreign outsiders coming into a village, designers may not able to fully comprehend the cultures of one community. Communication is the only way to eliminate or minimize the cultural differences between foreign designers and local villagers. Developing better ways to communicate complex information meanwhile ensuring equal access to information for villagers is necessary from the beginning of the project. The participatory design and implementation process is considered one of participatory learning and action (PLA), suggesting a mutual education process between designers and local people to enhance understanding and learning from each other, which can help co-produce knowledge and revise values, and thereby influence the design outcomes for the good of all.

Designers working in a foreign or unfamiliar community should be active observers and listeners as the first step to learn about the behaviors and pattern of the community. The villagers have local knowledge and usually are well aware of the problems. Sometimes, the villagers might feel helpless to solve problems or have got used to the issues and feel numb. Through interaction, we can compare the villagers' lens and ours as outsiders. This approach in actively learning about a community set a foundation for designers to interpret site observations and social relationships through physical design.

3. Perform [Community participation]

The participatory process should aim at nurturing in everyone a sense of ownership of the water infrastructure and the associated public space. This is because exclusion of any groups can lead to a broken link, which would jeopardize long-term management of those water infrastructure and community space. Only by cultivating a sense of ownership and belonging can villagers feel responsible for properly and equitably implementing, using, and maintaining the design and natural resources, just as they safeguard their own houses and property.

Typical design projects with a client-consultant relationship are overseen mainly by the developers from the beginning to the post-construction period. The owners rather than the designers or users of the property are expected to govern and maintain the built design. The problem in the setting is that the intention of the design may not always be upheld in the future when communication and supervision from the designers has ceased. Moreover, for foreign projects, designers are likely to leave the village at some points after constructions have completed. The villagers are then the one who will live with and are responsible to maintain the effectiveness of the improvement work.

Nevertheless, we can help with the governance and maintenance of the built work with advanced communication and education in the early phases. Designers can build community capacity by advocating the local government and villagers to structure a leading committee to oversee the implementation and maintenance of the project. "What is more important than the person who builds the toilet is the person who maintains the toilet. And it's also important to find out what people want and respond to their needs and demands rather than designing abstract projects" (Rosa & Weiland, 2013). This statement applies not only toilets, but all infrastructure and improvement work informed in this research project.

4. Proliferate [Partnership]

For short-term changes, designers can propose small-scale, low-cost, tactical intervention as a catalyst to spur imagination, discussions, and motivation. Even if we only stayed at the site for a short period, perceptive, psychological and societal changes can still be brought about by micro actions. Though small interventions or pilot projects sow the seeds and reveal opportunities for larger and more systematic projects, to ensure ongoing growth, projects have to be well networked and integrated, and better yet strategically scaled up through bridging bottom-up and top-down efforts (Rosa & Weiland, 2013).

As Chapter 2.5 Literature Review shows, problems related to water resources connect to larger ecosystems. The remedies for the water crisis should not focus only on constructing pieces of water infrastructure but should consider the whole watershed as an ecoregion. We can propose a holistic management strategy for natural resources, which requires concerted efforts from both the government and the locals. We can also propose local-scale placemaking interventions to emphasize public space as a critical component of the water management strategy. Partnering with the government or NGOs, we can leverage the capacity to scale up the effectiveness of local interventions physically and socially.

While the government can provide resources such as project budgets, materials, and training, the community can share collective labor for implementation and management including maintenance and evaluation of system performance. As for NGOs, some of them offer social programs or help forming self-help groups in the community to keep activate the social, environmental, and economic intentions of the design, thereby bridging segregated communities.

5
Projective Design

5.1 Introduction

Design purposes

This research project aims to answer the question, "How can critical water infrastructure be designed as a placemaking tool to generate social, environmental, and economic benefits in rural India?" The design goal is through applying the findings documented in Chapter 4 to propose a conceptual design for three selected sites. As a "placemaking tool" suggested in the research question, the design of the water infrastructure requires thinking about how the relationship between humans and the landscape or the public space associated can be strengthen, hence transforming the functional system into a meaningful place to the community. In this regard, site design thinking at the human scale is a fundamental aspect of placemaking. By investigating the specific site issues and the context of the selected sites, I can propose three specific designs that address particular site issues to facilitate the generalization of a conceptual framework to address general water and socio-cultural issues in rural India.

Since this research project highlights the design of effective water infrastructure as a solution to solve connected issues of the sites, the design proposals prioritize site problems that can be addressed by existing water infrastructure or by proposing new blue-green systems. The programmatic ideas inspired by the participatory process can inform the physical, spatial arrangement of landscape elements that enable human interactions with the improved or proposed blue-green infrastructure. The design outcomes are expected to yield a community space associated with those blue-green infrastructures that can address existing site issues as well as generate social, environmental, and economic benefits to the community.

Each of the three selected sites has similar and different issues. Instead of proposing three congruent designs, I highlighted different site problems to devise a set of distinct design goals and strategies to enable a
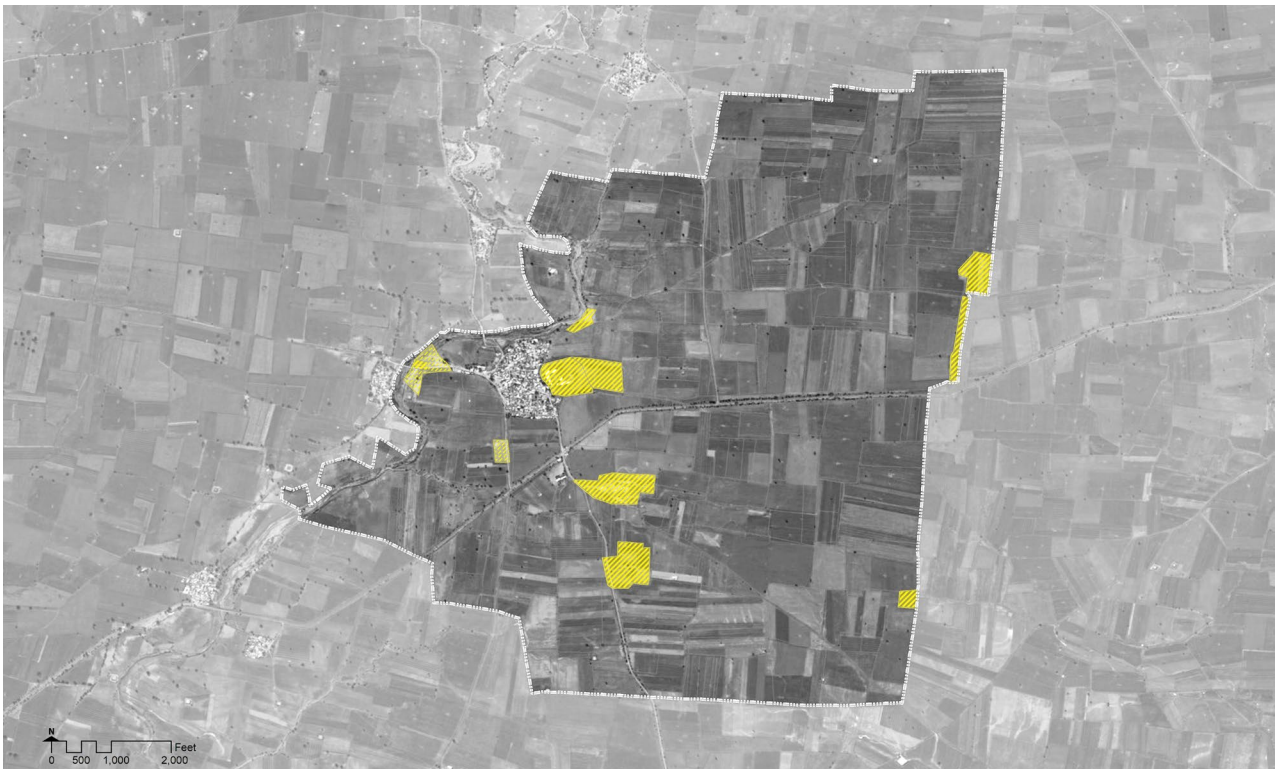
[89] Government lands available for design interventions.

diversity of design concepts. The purpose of developing a conceptual design is to envision a customized stage for target users, in this case the rural Indian, to interact with, learn about, and manage blue-green infrastructure through engaging with public space.

The design is experimental in nature. Instead of focusing on physical formal design and technical implementation of systems, the projective design aims to put forward scenarios in which the associated public space of water infrastructure can nurture a sense of equitable community, and hence enable a better, more equitable and inclusive water management plan. Given these aims, a composite typology is derived from general design elements of the three different design proposals. The conceptual design elements generalized and categorized in the composite typology can be replicable.

Selected sites

Three sites within the Dhamori boundary were selected for design investigation: The Talaab, Westland, and North Arc. The criteria for site selection are dominated by the ownership of lands and the proximity to the settlement area. Only government lands are considered due to the feasibility of proposing design interventions. The final selected sites are the closest to the settlement area, which can be accessible by most of the community members. Some of the government lands that are in the middle of fields far away from the settlement area were not chosen, considering their limited daily influence on most of the villagers. The individual site inventory and conceptual design schemes of each site are demonstrated in the following sections while a design framework and typology are presented as the final design outcome of this exploration.
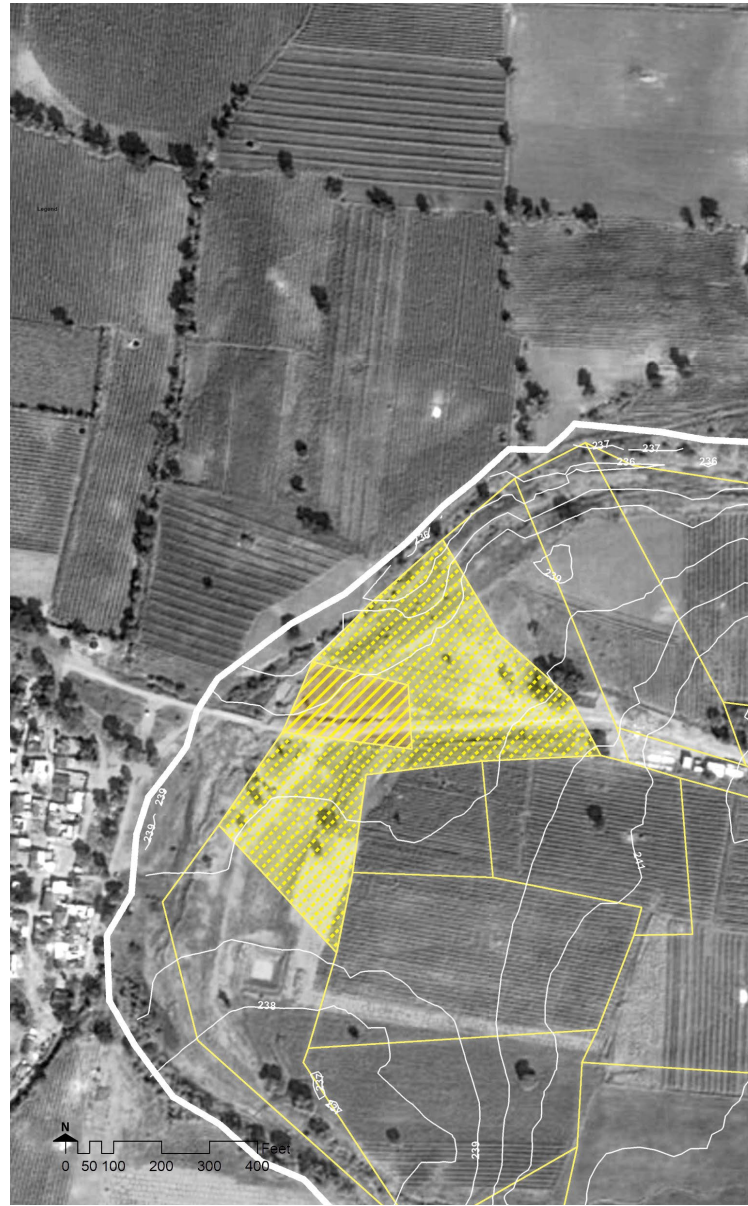
[90] Location map of the three selected design sites.

5.2 Site analysis

5.2.1 The Talaab

The talaab is basically a retention pond that captures rainwater and collects stormwater from the surrounding farm field. After the filling and widening of its embankment on the west side, the associated public space on the embankment becomes the largest open space in Dhamori. Due to the soothing natural quality of the water view and large canopies of banyan trees clustered on the edge of the talaab, the site is a community hub that is frequently occupied by various groups of people throughout the day for both active and passive recreation. It is adjacent to the settlement area and the Hanuman Temple. Therefore, it is a hotspot for the Hindu community to gather. The community and the Panchayat have had many hopes and expectations for improving the environment of the talaab.

5

Water source

RAINWATER captured by the talaab

STORMWATER runoff from surrounding farmlands

Outlet to main road

Surface water flow

Site access & Circulation

Settlement

Muslim Community

Mosque

Hanuman Te mple

Hindu Community
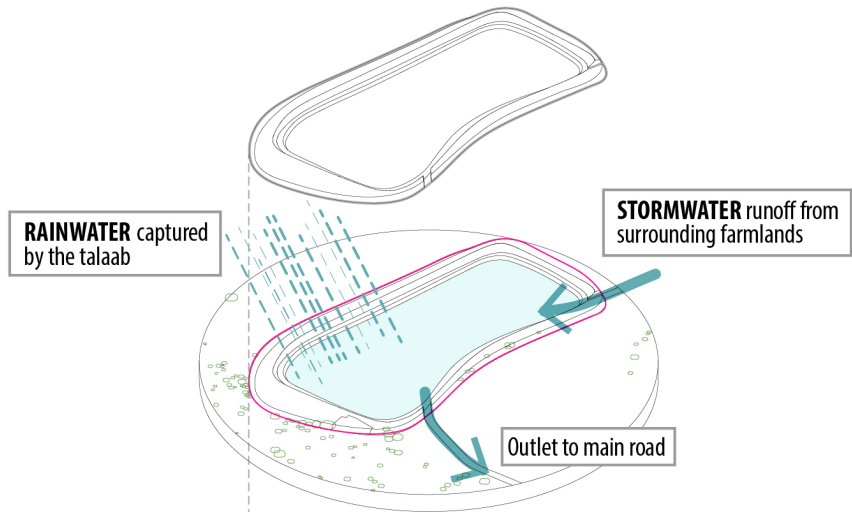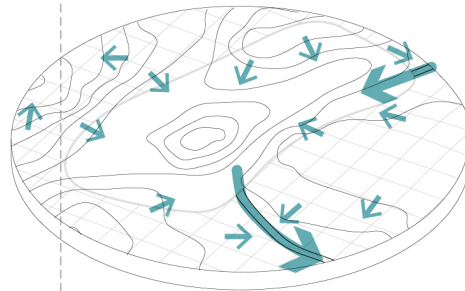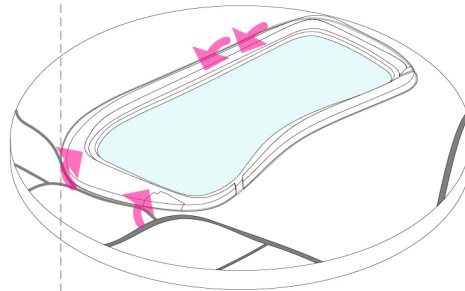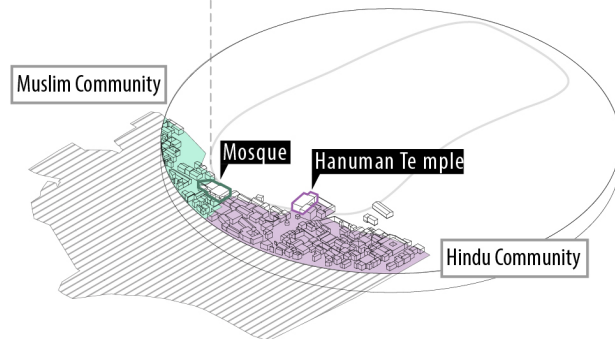
[92] Site analysis diagram of the Talaab.

• Access and circulation

The main entrance of the talaab is considered the ramp next to the Hanuman temple at the Southwest. There are also some ramps or steps on the West and the North edge, where they are closer access points for the Muslim and Dalit communities. It is thus physically accessible to all the communities in general, but some groups of people experience fewer chances to access the open space, such as the Dalit community at the farthest distance from the talaab, and women in Dhamori.

• Users and usage

Mostly, men and children are the frequent users of the talaab. Children like playing cricket, flying kites, playing ball games, and cycling on the open space, while adult villagers like sitting or standing under the Banyan trees and along the embankment edge. It is the only public space used for celebrating festivals in the three selected sites.

• Site issues

The retained water in the pond is not in active use for irrigation and hence is not under extensive management. Without vegetation, the pond looks barren, and all the edges have traces of scour and erosion. The lack of canopy trees along the edges precludes shade for the people and reduced evaporation of water.

The lack of amenities also fails to encourage women to go outside and use the public space. The Dalit community additionally has fewer chances to use the talaab compared to those who live closer. The absence of public toilets in public space results in open defecation in vacant space. For the talaab, open defecation constantly occurs at the space between the embankment edge and the Hanuman temple.

5.2.2 Westland

This site is at some slight distance from the settlement area in Dhamori and closer to one of the other villages. It is at the junction of the footbridge across the stream. Having a lower gradient than some parts of the village, it is the discharge point where two open channels convey greywater and rainwater from the settlement area. In addition, there are many vegetation and reed beds growing naturally along the course of the stream that provide natural filtration to the untreated graywater discharged. Moreover, ecological value is associated with the site, for instance, weaver birds' nests next to the road.

[93] Existing condition of Westland.

Water source

STORMWATER channel

GREYWATER channel

Surface water flow

Site access & Circulation

Settlement

Burial Ground

Idgaah

Mazaar

Marathi School

Hindu Community

Cremation pyre
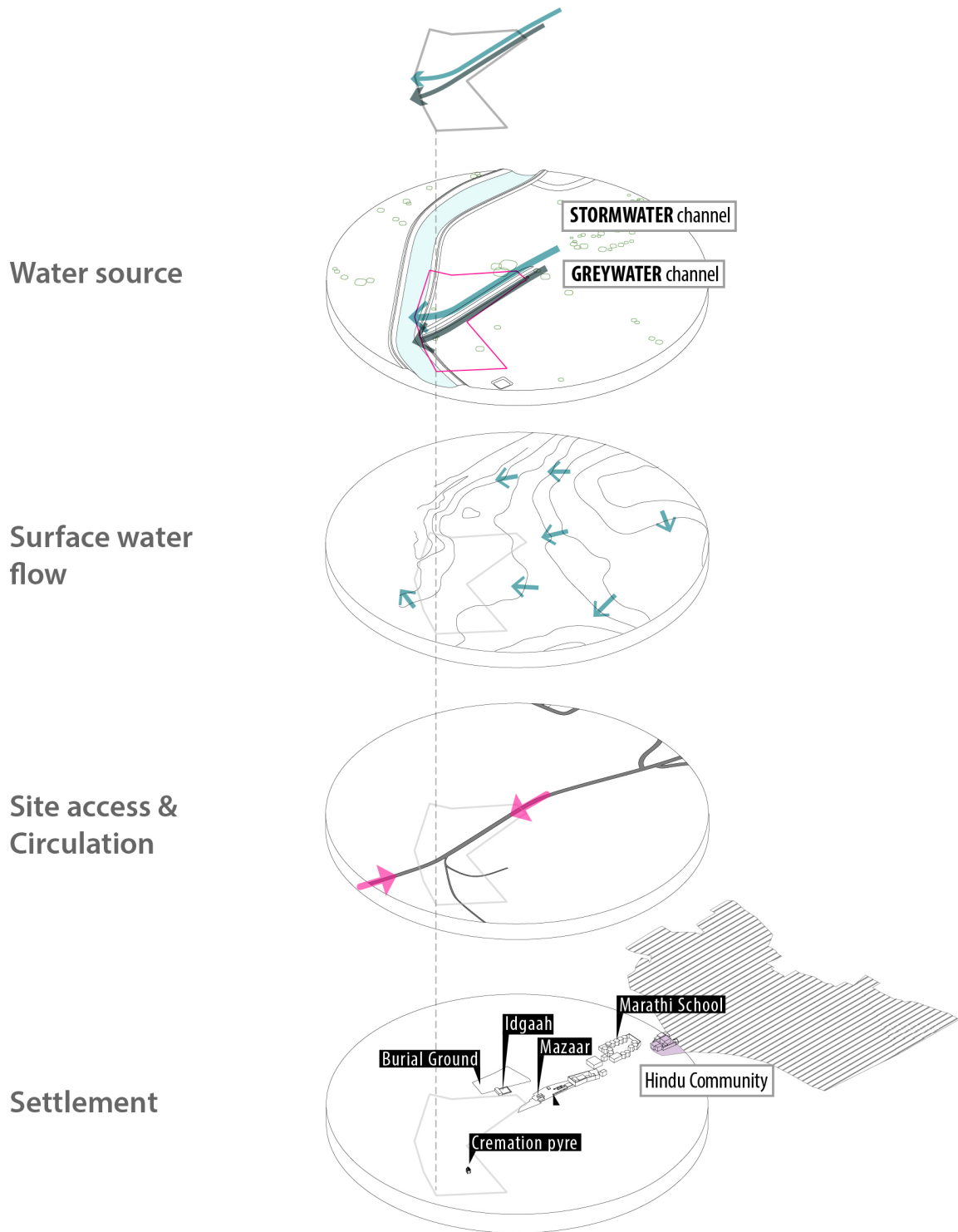
[94] Site analysis diagram of Westland.

• Access and circulation

The site is bisected by a straight asphalt road that directly connects to other villages. On the north side near to the Islamic structure called Idgaah is a burial ground for the Muslim community, and on the other side is a funeral structure for the Hindu community to cremate dead bodies located within the site boundary. Although there are no formal paved paths, some traces of paths can be found, suggesting that people walk across the site to the adjacent farmlands and to a farm pond to the south.

• Users and usage

Farmers are used to bringing cattle to the site for herding. Also, since the site is at the junction of a path to the other village, many people from other villages walk past the site to visit the weekend farmer's market in the bazaar on the east of the site. The site is also close to the mazaar, a seating platform for the Muslim community and also for the whole village to have communal meals together during some festivals. Children go to the site to play regardless of the burial ground nearby since the site is some distance from their homes and parents.

• Site issues

The stream is polluted by the untreated greywater collected from the nalli and the open channels through the site. Also, a lot of non-biodegradable solid waste such as plastic products has accumulated at the discharge point of the rainwater channel. There are thorny babul shrubs growing indigenously all along the stream edge, making the edge of the stream inaccessible. Culturally, the symbolic meaning of the site, which relates to death, may prohibit women or children from using the space.
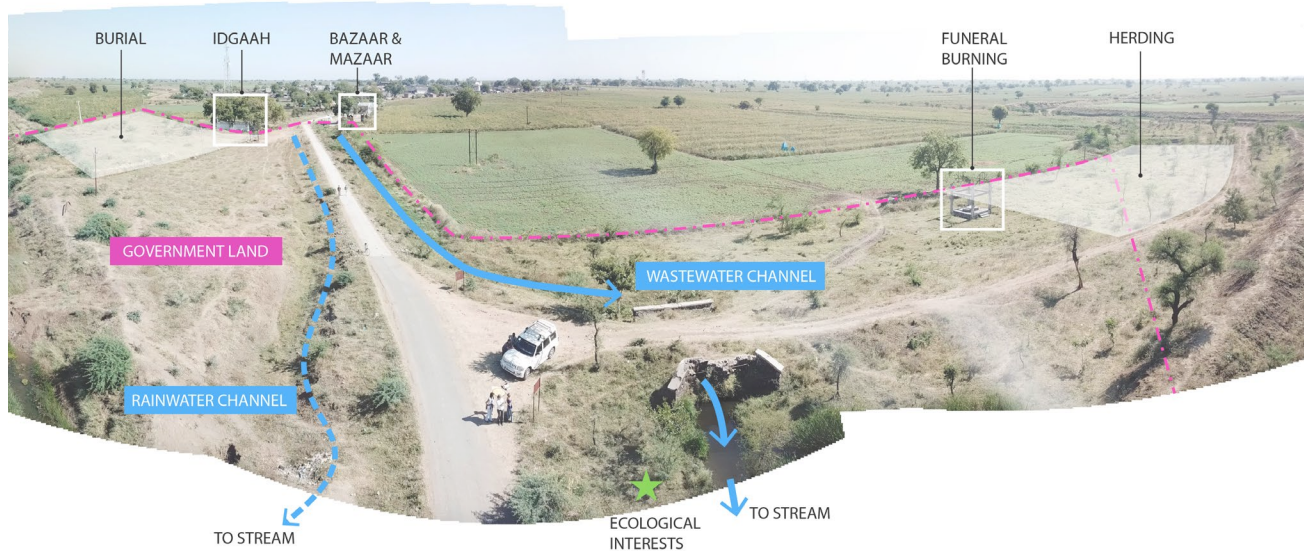
[95] Site context of Westland.

5.2.3 North Arc

The site starts from a strip of space between the Dalit community and the stream embankment on the north of the settlement area and extends along the stream until the stream bends. The site is surrounded by farm fields and is used to store the soils dug from the talaab.
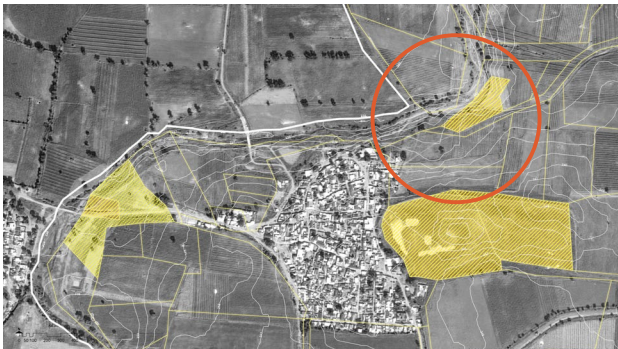
[96] Existing condition of North Arc.

5

Water source

Surface water
flow

Site access &
Circulation

Settlement

Dalit Community   Muslim Community
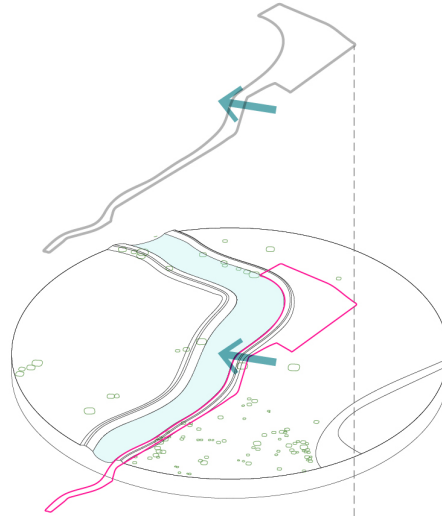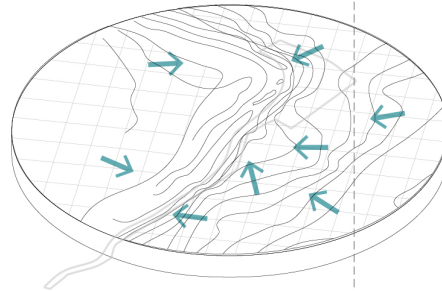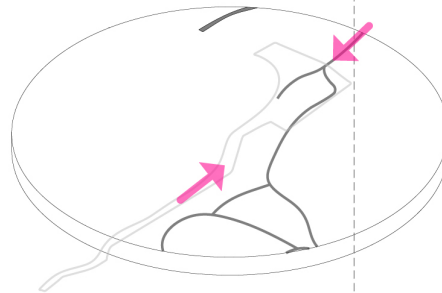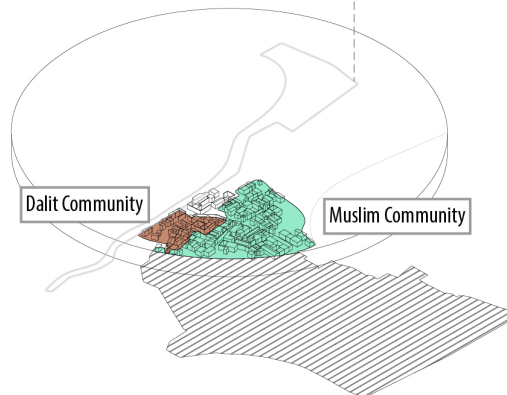
[97]   Site analysis diagram of North Arc.

• Access and circulation

There are no paved roads connecting to the site except some traces of path leading to narrow paths in the farm fields. People can use the stream embankment to get to the site, but most villagers avoid accessing the space between the Dalit community and the embankment because of the prolific open defecation.

• Users and usage

No active use or significance to the community were observed or recorded. It is considered as one of the most undesirable public space in Dhamori.

• Site issues

The monsoon flooding is the major water problem the Dalit community has to face annually. At such times, about 200 people in the Dalit community have to temporarily move to the Marathi School to avoid flood water, which floods everything in their house, making it uninhabitable during those days. Flooding occurs in part because sand gabion walls in the stream failed structurally and functionally due to the unstable quality of the black soils in the stream bed. In addition, many houses in the Dalit community still do not have a toilet in their house; people therefore choose to defecate openly along the stream, with men on one end and women on the other. Consequently, people from other communities avoid going there because of the serious health problem of exposure to human waste.

STREAM EMBANKMENT

SETTLEMENT

WASTEWATER CHANNEL

GOVERNMENT LAND

RAINWATER DISCHARGE INTO THE STREAM

LENTILS FIELD

NALI BESIDES THE STREAM (FLOWING FROM WEST TO EAST)

[98] Site context of North Arc.

5.3 Conceptual site design

	The Talaab	**Westland**	**North Arc**
Site design goal	Sharing/ Equity A sociopetal community hub that allows daily cross-class and cross-generational interaction Diversity An event space that allow larger village rituals/ festival to take place that involve everyone's participation	Healing A more intimate space for meditation and religious ritual Educational Eco-revelatory education to reconnect people to a healthy, ecologically sound natural system & processes	Resilient Provision for additional flood storage for active reuse in aquaculture Economically productive Provision for green jobs
Focused groups of users	Women	Different communities using the burial ground or the cremation pyres	Lower-caste Dalit community
Placemaking strategy	• Strengthen its place identity and community role • Empower women by transferring some of their familial role to roles in public uses • Improve the water quality and embankment conditions for recreation and comfort • Become a potential tourist destination	• Treat wastewater and capture solid waste • Construct wetland habitat and improve stream ecology • Enhance the communities' ecological awareness via blue-green infrastructures • Create green job opportunities for maintaining the community toilet & orchard	• Create a circular economic system that provides job opportunities and income to the Dalit community • Mitigate flood by providing additional flood storage capacity • Empower the lower-class community
Defining key words of the associated public space	Recreational	Meditative Educational	Productive

Table. 7   Conceptual site design framework.

Social benefits

Sharing

Educational

Diversity

Healing

Resilient

Environmental benefits

Economically productive

Economic benefits

The Talaab

Social
Strengthen its place identity and community role
Empower women by transferring some of their familial role to roles in public uses

Environmental
Improve the water quality & embankment conditions

Economic
Become a potential tourist destination

Westland

Social
Enhance the communities' ecological awareness via blue-green infrastructures

Environmental
Treat wastewater and capture solid waste
Construct wetland habitat and improve stream ecology

Economic
Create green job opportunities for maintaining the community toilet & orchard

North Arc

Social
Empower the lower-class community

Environmental
Mitigate flood by providing additional flood storage capacity

Economic
Provide job opportunities and income to the Dalit community

[99] Site design goals priority of the three selected sites.

Mosque

Hanuman temple
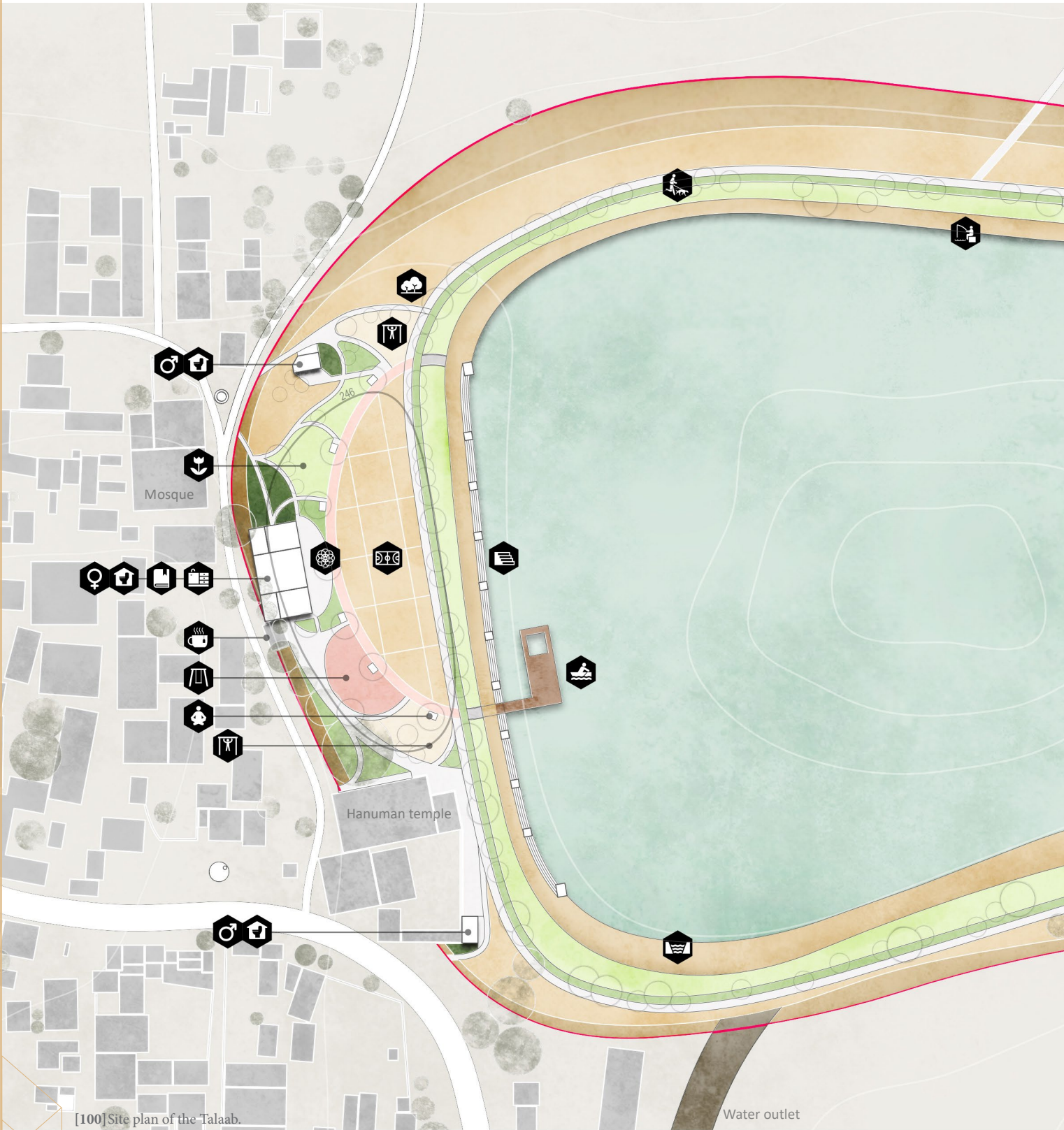
[**100**] Site plan of the Talaab.

Water outlet

🚻 ♀	Women's toilet	🧑	Trail	🎣	Recreational fishing
✳️	Rangoli plaza (Women)	🚶	Boardwalk	🛶	Boating
🌷	Floral garden	🧘	Seating platform	〰️	Embankment stabilization planting
📖	Library	📚	Seating steps	🌳	Planting for shade & screening
🗄️	Community kitchen	🛝	Playground	🌱	Floating wetland panel
🚻 ♂	Men's toilet	🏟️	Open field for active uses & festivals	🪷	Water lily farm
🤸	Exercise zone	☕	Tea house		

Water inlet
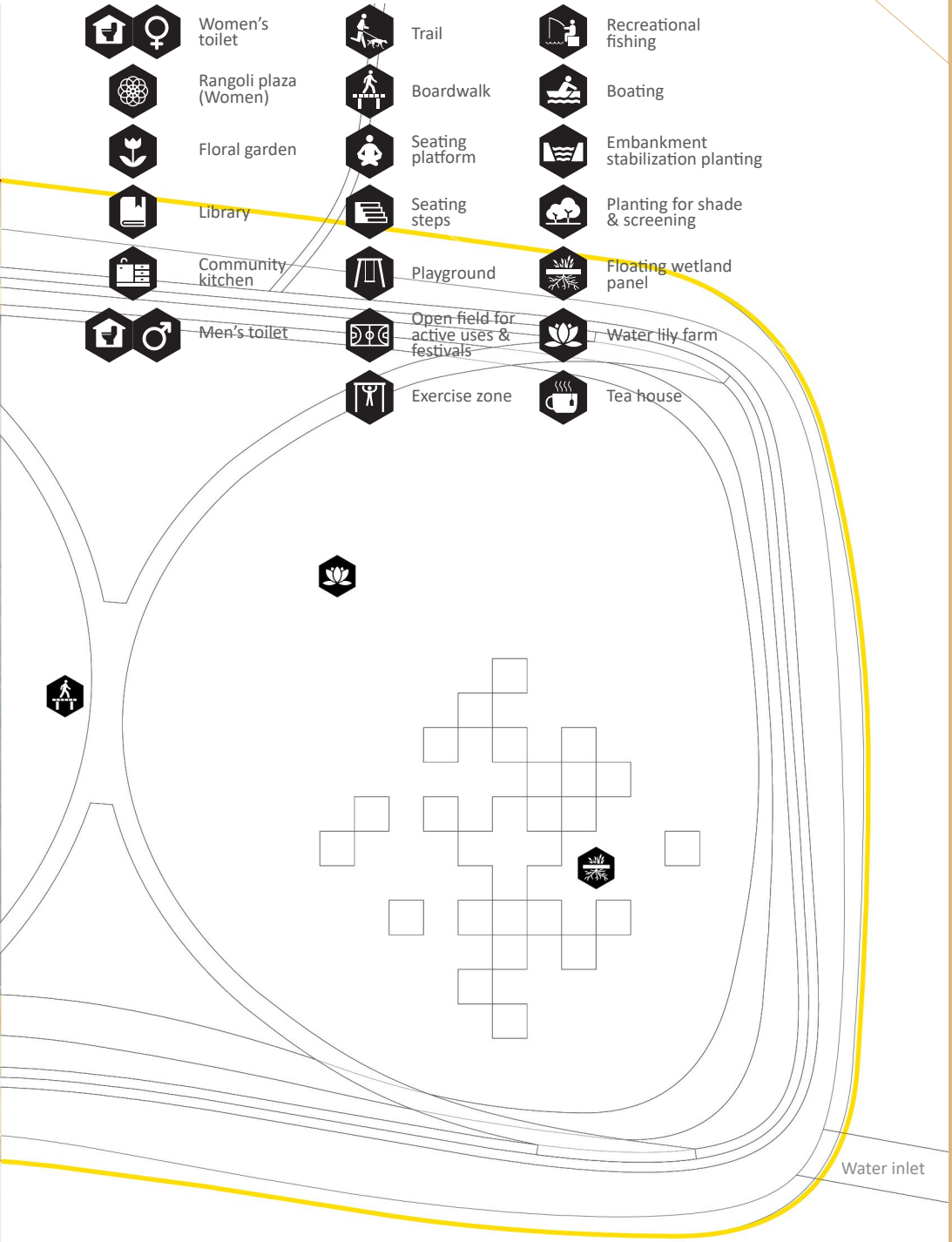
0   50   100
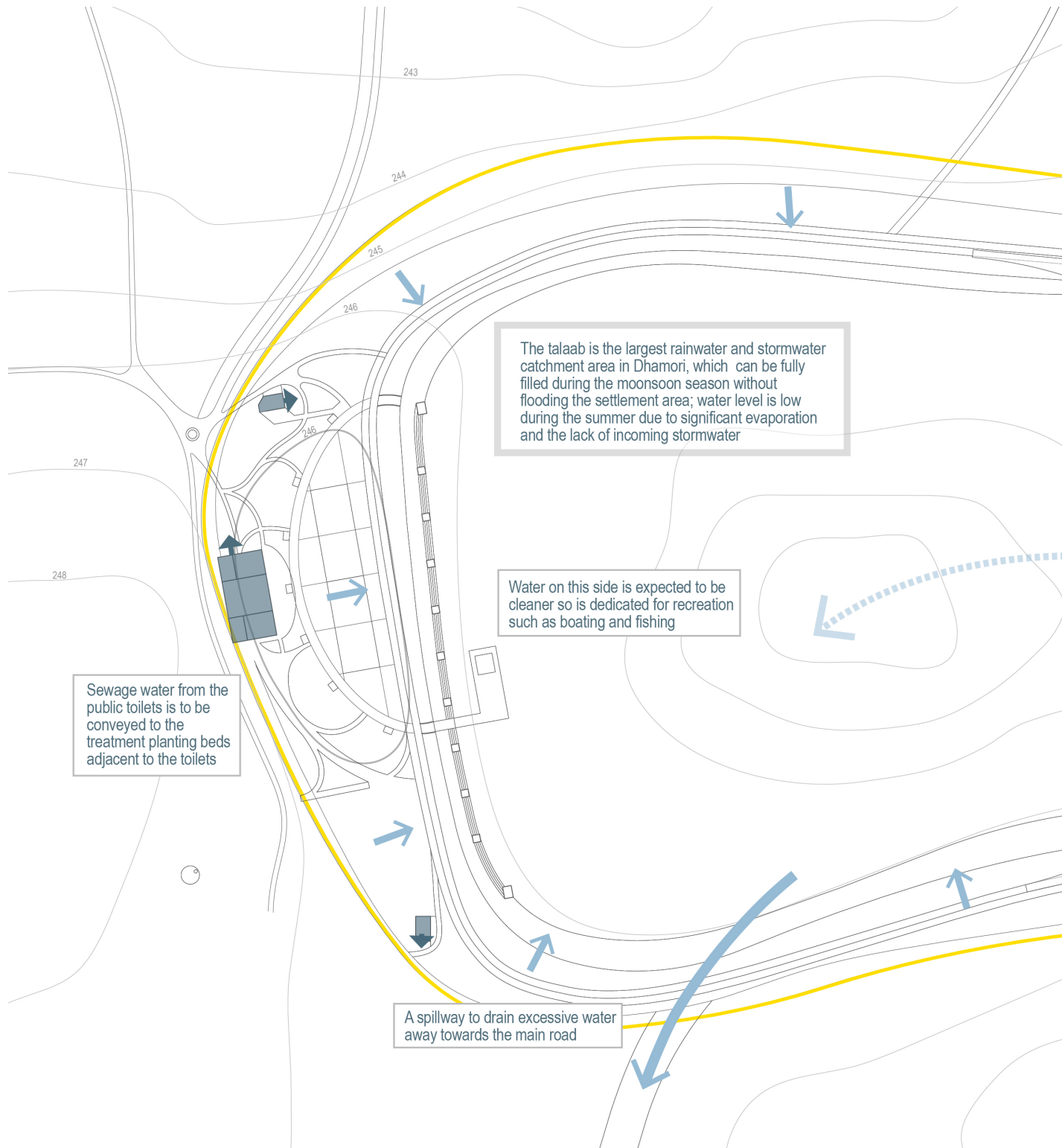
The talaab is the largest rainwater and stormwater catchment area in Dhamori, which can be fully filled during the moonsoon season without flooding the settlement area; water level is low during the summer due to significant evaporation and the lack of incoming stormwater

Water on this side is expected to be cleaner so is dedicated for recreation such as boating and fishing

Sewage water from the public toilets is to be conveyed to the treatment planting beds adjacent to the toilets

A spillway to drain excessive water away towards the main road

[101] Contour & water flow of the Talaab.
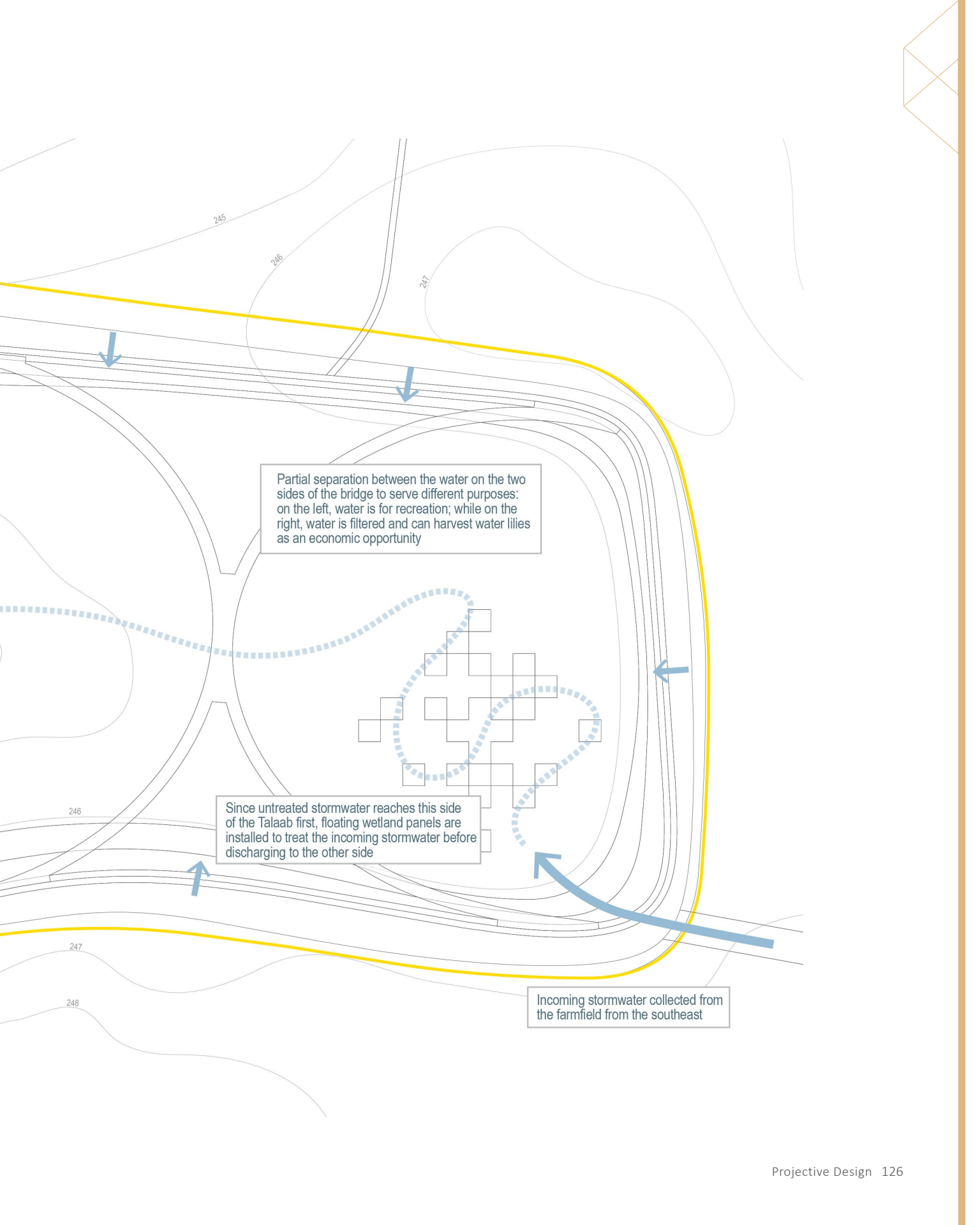
Partial separation between the water on the two sides of the bridge to serve different purposes: on the left, water is for recreation; while on the right, water is filtered and can harvest water lilies as an economic opportunity

Since untreated stormwater reaches this side of the Talaab first, floating wetland panels are installed to treat the incoming stormwater before discharging to the other side

Incoming stormwater collected from the farmfield from the southeast

245

246

247

246

247

248

5

Cremation
pyre

Farm pond

[102] Site plan of Westland.
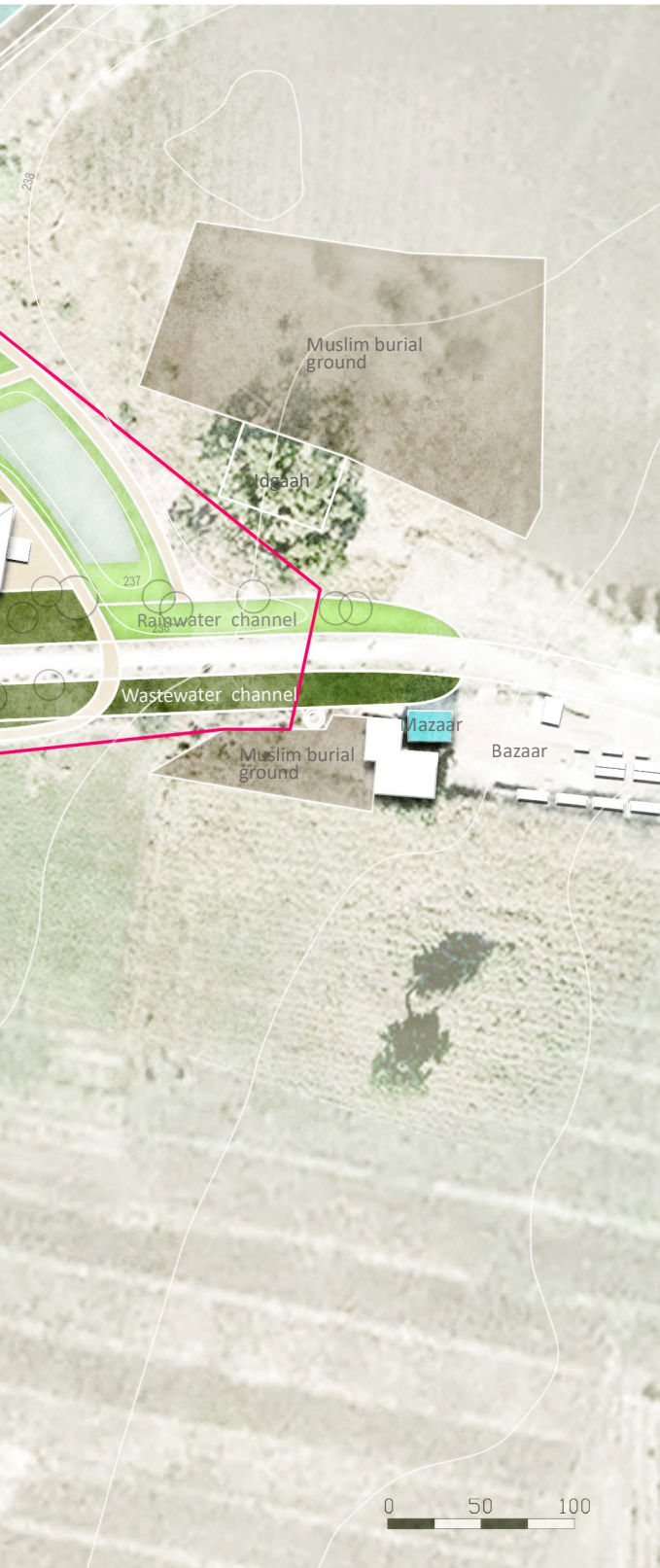
Constructed wetland

Community toilet

Biofilters

Outdoor classroom

Boardwalk on improved stream embankment

Playground

Planting for shade & screening

Hindu healing garden

Community orchard

Muslim healing garden

Water plaza

Bench seating

Muslim burial ground

Idgaah

Rainwater channel

Wastewater channel

Mazaar

Muslim burial ground

Bazaar

0   50   100

5
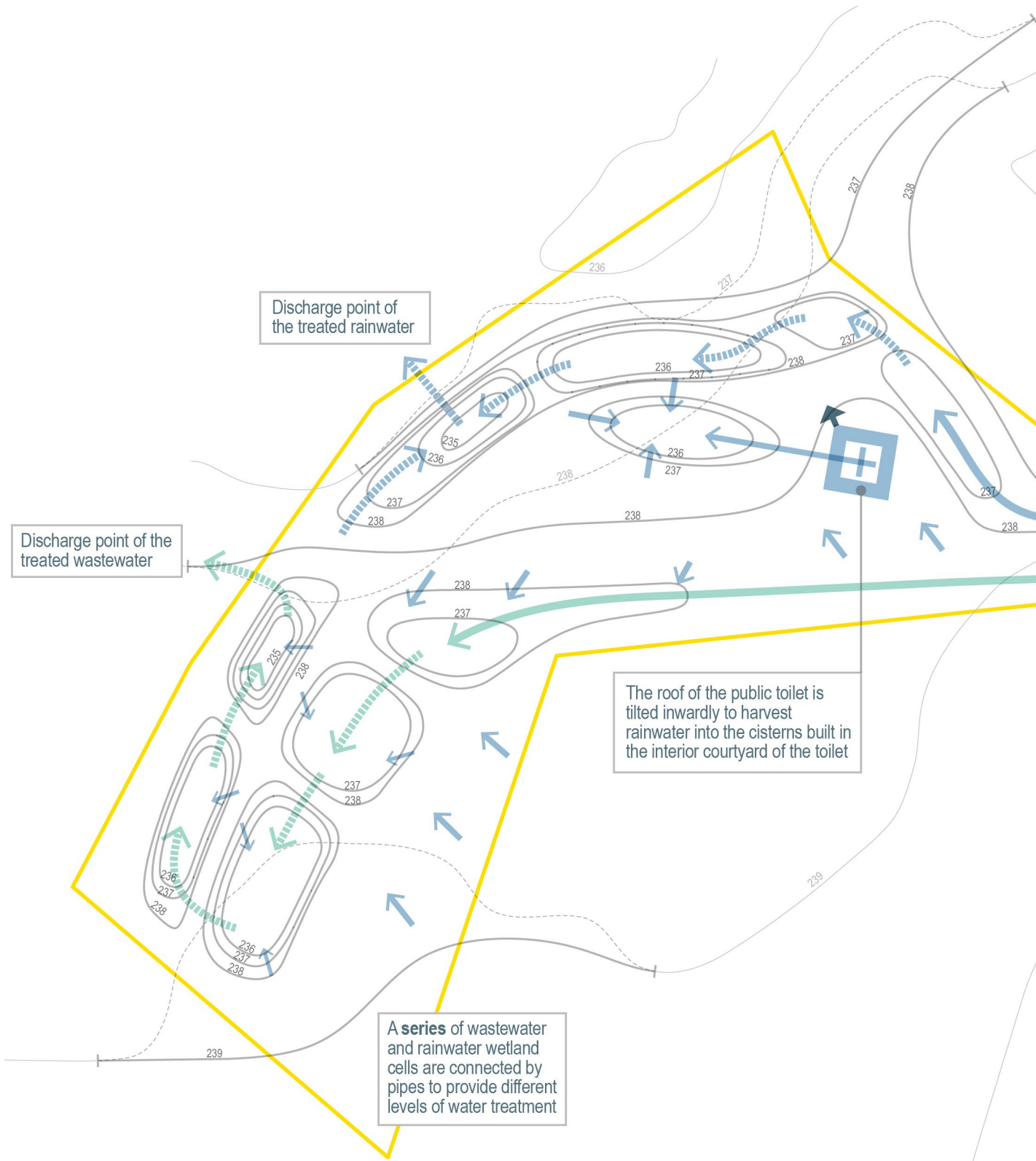
Discharge point of
the treated rainwater

Discharge point of the
treated wastewater

The roof of the public toilet is
tilted inwardly to harvest
rainwater into the cisterns built in
the interior courtyard of the toilet

A **series** of wastewater
and rainwater wetland
cells are connected by
pipes to provide different
levels of water treatment
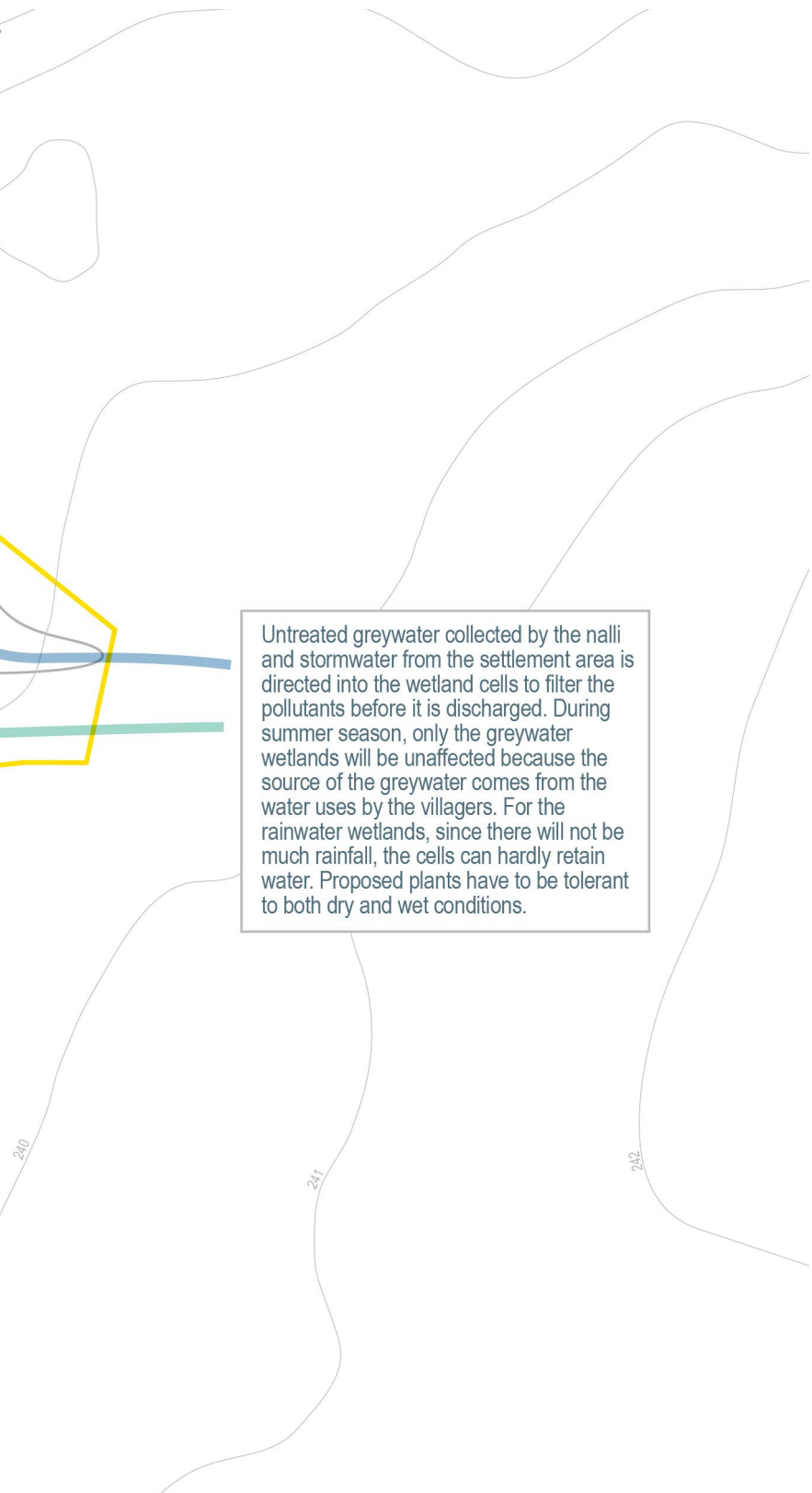
Untreated greywater collected by the nalli and stormwater from the settlement area is directed into the wetland cells to filter the pollutants before it is discharged. During summer season, only the greywater wetlands will be unaffected because the source of the greywater comes from the water uses by the villagers. For the rainwater wetlands, since there will not be much rainfall, the cells can hardly retain water. Proposed plants have to be tolerant to both dry and wet conditions.

[103] Contour & water flow of Westland.

To the Talaab

5

Symbol	Label	Symbol	Label	Symbol	Label
⬡	Community toilet	⬡	Aquaculture pond	⬡	Trail
⬡	Composting facility	⬡	Detention pond (monsoon season)	⬡	Community orchard
⬡	Labour house for storage	⬡	Embankment stabilization planting	⬡	Seating platform
⬡	Cattle shed	⬡	Planting for shade & screening		
⬡	Poultry shed				

0   50   100

[104] Site plan of North Arc.

5

This strip of space is used to have constant defecation, which has long generated health and environmental problems, especially for the closest community, greywater from the settlement is directed to the site through nalli for further treatment before discharching them. The wastewater can continue to be the source of water to the aquaculture ponds throughtout the year.

A green corridor is created along the stream embankment to connect the North Arc (Site 3)

[105] Contour & water flow of North Arc.

During monsoon seasons, the depressed space between the stream bank and the community orchard will become a detention pond to provide extra flood storage for mitigating the flood issues faced by the Dalit community.

Poultry farming is proposed along with the aquaculture ponds in a parallel arranagement.

Pre-treatment of human wastes

A central urine-separated composting toilet is proposed for the Dalit community in which many families do not have private toilet installed in their house. Separation of the urine can keep it out of the compost chambers and can be used as a fertilizer for sales or for the community orchard.

Stormwater from the settlement is directed to the site.

5

Rainwater

Outlet

Floating Wetland Module

Farm Fields

Stormwater

Greywater

Blackwater

System Characteristics

Bowl

Series

Irrigation

Flood water

Dalit
Community

Settlements

Irrigation

Dalit
Community

Composting
Toilet

Pre-treatment by
wasterwater ponds

Parallel

[106] Water systems of the proposed blue-green infrastructure.

5

ENVIRONMENTAL

Blue-green
infrastructure
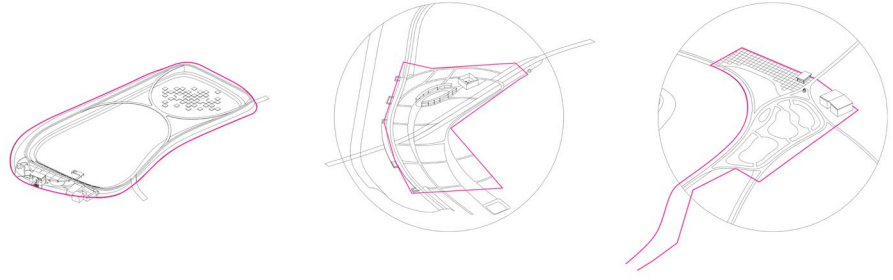
Placemaking tool
● Embankment improvement
● Waste management
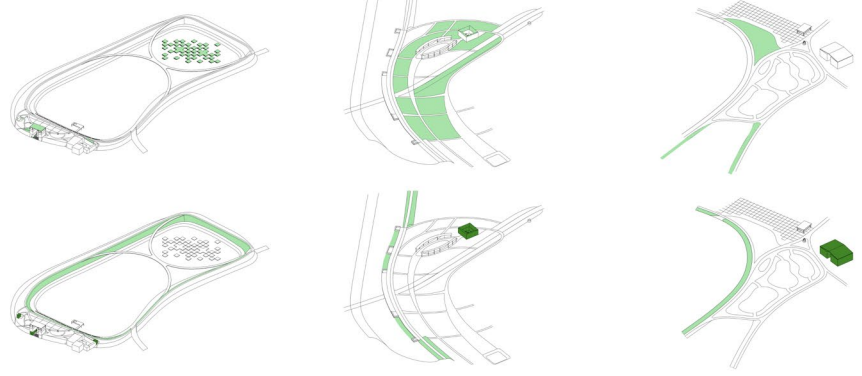
SOCIAL

Blue-green
infrastructure
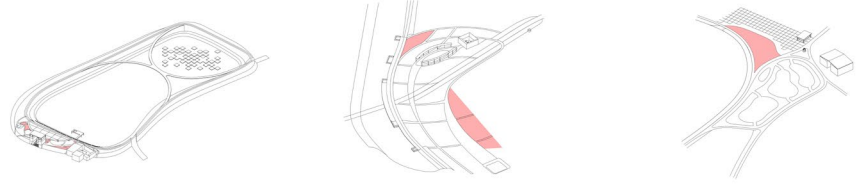
Placemaking tool
● Passive program
● Active program
● Connection
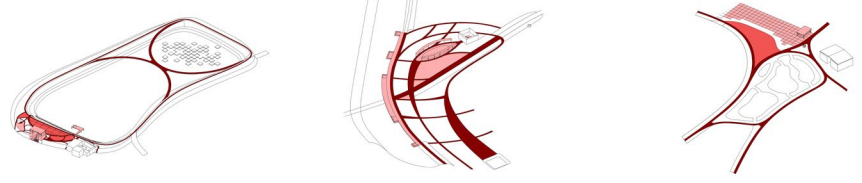
ECONOMIC

Blue-green
infrastructure
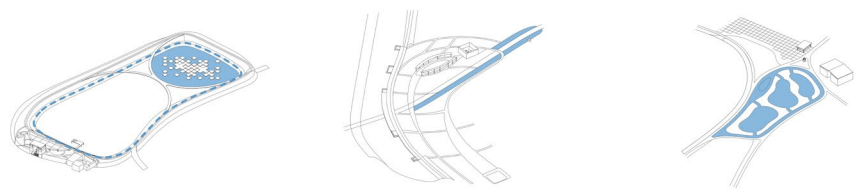
Placemaking tool
● Empowerment
● Community Co-op

[**107**]Design framework.

Input water	Rainwater	Stormwater	Greywater	Blackwater

System Characteristics

Bowl — Series — Parallel

Output public space programs

Recreational facilities | Water features | Landscaping | Community toilets | Irrigation | Aquaculture ponds

Level of water treatment Low → High

Level of maintenance Low → High

Proximity of human interaction Close → Distant

Abstracted form of human movement in the associated public space

LOOP — CROSSING — NODE

[108] Typological framework.

6
Discussion & Conclusion

6.1 Financing approach

One of the biggest challenges of the implementation of the project is the uncertainty in availability of funding. For small-scale projects, meeting with potential donors to raise funds can be effective, but for large-scale infrastructure projects or holistic social programs, support from the government is necessary to secure the financial viability of the project for long-term influence.

According to the guidelines of Saansad Adarsh Gram Yojana (SAGY), the Government Department of Rural Development in India is dedicated to transforming villages and improving villagers' livelihood based on model villages such as Hiware Bazar. The following are the schemes for rural development provided by different government departments that would be applicable to fund this proposal:

Aspect	Activity	Schemes	Expected outcomes	Applicable proposals
Social	Managing watershed: • To revive traditional water bodies through water harvesting and soil conservation • To improve irrigation, drainage, and erosion conditions	• Integrated Watershed Management Program (IWMP) • Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGS)	• Enhanced rainwater storage capacity for irrigation • Improved aquifer quality and increased groundwater level	• Talaab • North Arc
	Harvesting rainwater as a local practice	• National Rural Drinking Water Programme • MGNREGS	• Enhanced availability of water for drinking and landscaping	• Talaab
Environmental	Cleaning villages: • To provide universal access to solid and liquid waste management • To provide toilets and toilet-linked or compost-linked biogas plants to prepare for farmyard manure • To identify appropriate solid and liquid waste management technologies	• MGNREGA • Swachh Bharat Abhiyaan • Members of Parliament Local Area Development Scheme (MPLADS) • Ministry of New & Renewable Energy (MNRE) • Schemes of Ministry of Agriculture	• Open defecation free village • Clean public spaces and streets	• Talaab • Westland • North Arc

Economic	Increasing coverage of trees in rural areas: • To plant trees that have economic, environmental, social and cultural value in public spaces • To develop green walkways in and around the village • To assign usufruct rights over public trees to poor households • To create local nurseries	• MGNREGS • National Horticulture Mission • Schemes of the Ministry of Environment, Forests and Climate Change	• Green job creation that provides income and employment • Prevention of soil erosion • Mitigation of climate change	• Talaab • Westland • North Arc
	Applying sustainable agriculture and organic farming: • To promote diversified agricultural livelihoods, including livestock and horticulture	• Schemes of the Ministry of Agriculture • Mahila Kisan Sashaktikaran Pariyojana(MKSP)* under National Livelihood Rural Mission(NRLM) • MGNREGS	• Transition to more sustainable, water-saving farming technologies • Enhance production of organic manure and use of organic pesticides	• North Arc

Note: * Mahila Kisan Sashaktikaran Pariyojana (MKSP) is a sub-component of the National Livelihood Rural Mission(NRLM) announced by Government of India aimed to improve the present status of women in Agriculture and to enhance the opportunities for empowerment (NRLM, 2017).

Table. 8 Supporting government schemes.

6.2 Limitation of the study

The design outcome is the result drawn from the findings from the site visit. Hence, the limitation of the study reflects the limitation of the process and data collected from the site visit:

• While multiple engagement activities were proposed before the trip (See Appendix 1), the nature and the time of the site visit limited the feasibility of implementing some of the planned engagement activities. There are differences between the planned activities and the actual participatory process:

1. The door-to-door household survey and the survey kiosk were cut out due to insufficient time and manpower to conduct surveys of all the villagers. In the planning of the household survey, all the households in the village were to be visited to ask survey questions about how households use water and their perception of the problems of the village. The survey kiosk was to be a temporary cart placed in the village's public space to reach out to villagers not available at the time of the home visit to be able to participate in the survey. Since there are about 480 households in Dhamori, these activities would require a long time. Instead, Professor Nawre was able to arrive India a month earlier to ask those very questions through group interviews with the villagers and Parliament members. The original plan to use the K-State Qualtrics survey app was later found to be not feasible. Since there was no network in Dhamori, an offline survey app was needed instead, but the K-state subscription did not support the offline feature.

2. The presentations were to be followed by an open-ended discussion to allow villagers to give feedback, comments, or raise questions. For this intention, the first village presentations were planned separately for male and female villagers to allow women to participate and speak up who may otherwise not attend with men. Due to the time limitation, the first village presentation did not separate men and women. At the end of the presentation, no one raised questions or discussed issues in front of the large group.

3. The workshop was supposed to separate the men and women communities. It was also planned as a multi-stepped engagement activity, which included a discussion to establish common design goals at the beginning, a transect walk as an asset mapping activity, a drawing exercise, and a group discussion section to share the participants' proposed ideas through the drawings. Participants were to be provided with a village map and two different colored dots at the beginning of the workshop to denote village assets & problematic sites. This activity was to determine a route for the transect walk and provide the foundation for further discussion during the walk to understand such perceptions. The actual on-site activities changed since this plan required a lot of time that both the team and the villagers did not have. First of all, it was hard to find participants who could devote that much time during weekdays because they needed to work. Secondly, most of the villagers did not know how to read maps, so the mapping exercise would not work unless we could explain and teach them, which also took time. Thirdly, transect walks with a group of women in the outdoor public space might be perceived as peculiar to the community.

• The expected outcome of the two-and-a-half-week visit included site inventory and analysis, and a design proposal. For site understanding, the time constraints did not permit the team to follow the original plan of engagement since there were also not enough team members who could speak the local language to interact with the participants or take notes. In addition, since it was the first time for me and some of the team members to work in a village, it took time for us to understand the existing conditions due to the differences in culture and language. The bigger socio-cultural problems are hard to figure out and address from an outsider on only one trip.

• Since the research methodology emphasizes participatory planning, the ethnographic research that requires a metric for observation was not prepared. There were also difficulties with staying at a spot and observing on my own due to safety reasons. Since this was my first time in the village, I stayed with the other team member, so random wandering activities around the site were restricted. I could not stay alone at a spot to observe and record behaviors. Even if I had the chance, the villagers were very curious to see foreigners. It was not possible to observe and make sketches or notes in the village without raising awareness, which would possibly change people's behaviors.

• Due to the scope of this research, the nalli system and streetscape were not included in the projective design phase. From observation, however, the village streets were interesting public spaces where the private and public realms overlap, forming a semi-public space which is especially vital to women for whom streets or alleys are the extension of the private domestic spaces where they hang out with friends and neighbors on the door steps. The streets connect from these semi-public spaces to more public open space like the village square where shops are located.

• Accurate site data such as site topography, volume of flood water, and so forth was not gathered during the site visit due to the limited time and technology. This limits the level of design detail ultimately.

• The proposed designs for the three selected sites are highly conceptual. The purpose is to create a design framework which can further generate an abstracted typology of different interactions between water and humans through the design of water infrastructure as a community place. The design focuses on the social, environmental, and economic aspects through the juxtaposition of program ideas, which are developed from either the participatory exercises or site observations. This is both the strength and weakness of this project. Since the detailed site design level is not the focus, the possibility to implement the design is limited, unless further studies in the proposed blue-green infrastructural systems, hydrological data, site grading, seasonal changes, materials, and so on are investigated.

• It would be difficult to evaluate the performance of the design outcome, if not impossible to verify the effectiveness of the design proposals in terms of the social, environmental, and economic benefits without re-visiting Dhamori and conducting participatory activities.

All in all, there is room for many improvements with better planning of the site visit and more resources and assistance in language translation and technical problem resolution. Many of these difficulties were unforeseen and unpredictable before this study. With the reflections documented in this section and in Chapter 4.4, possibilities arise for building up the work in this study and further developing the research outcomes in the future.

6.3 Potential for future work

6.3.1 Potential for further development of this study

This research is to create a public space or a common ground through water infrastructure design to facilitate adaptive reuse and future maintenance, and hence sustainability of the community. Since this research focuses on physical and typological design, several areas warrant development for the proposed design to function:

• A detailed version of the three selected sites based on accurate site data and a refined version of the design framework and the typology derived

• Strategies to enhance the connections among the three proposed public space design

• The nalli system and streetscape being included as incremental design opportunities of small interventions to solve bigger problems

• A master plan of a network of public space to promote the connections between small site interventions

• A framework for how the proposed strategies could be implemented

• Research and design of some social, self-help projects to allow equity and diversity to flourish

Apart from the particular physical design, there is also potential to deepen the discussion about lessons learned through the research methods:

• The Indian government has a booklet about community participation of survey and data collection, which is a good reference and resource for developing an adapted participatory planning process. From the designers' perspective, the work can be focused on how to adopt the lessons learned from the Panchayat's past experience or guideline to reframe participatory design process in a rural context in development countries

• A new partnership with the Panchayat can be formed to investigate more villages so that a more rigid design framework and better water management in the public space can be proposed. With more experience in planning and implementing the engagement process, better workflow in research and design can be set up. With guided and more efficient workflow and design strategies, a good practice, such as the Kounkuey Design Initiative (KDI) can be formulated.

• More observations of the streetscape and street life could be conducted using ethnographic research methods since streets are public spaces that have a semi-public nature so that the socio-cultural aspects of each community could be better understood.

6.3.2 Future research opportunities to extend this study

At the beginning of 2018, the Member of Parliament contacted Professor Nawre asking her to conduct a similar participatory research and design investigation for the other 70- 80 villages in summer 2018. The village clusters selected by the Parliament are in Rajnandgaon block, Chhattisgarh State in India, where about 2,000 local villagers live. Professor Nawre will lead a team from May 21 to August 15, 2018, carrying out field and studio-based work for the selected villages.

This new partnership for us to work with and for 70 more villages will be a great research opportunity to extend and further develop this research project. The issues faced by the villages in Ranjnandgaon and our project focus are expected to be similar to that encountered by Dhamori. Therefore, the lessons learned and documented in this report, and the current design framework and typology can be utilized and applied to similar future projects. With the opportunity to accumulate my experience and knowledge to design and plan for rural India, I can take the ideas further to develop a more rigid design framework for sharing and advancing the profession in the direction of rural planning and design. For example, future work can demonstrate to the Indian government and the Landscape Architecture profession how landscape architects can play a major role in improving water infrastructure and public space as a critical part of village development in such developing countries.

6.3.3 Recommendations on the planning process for designers

In summary, participatory planning that works in developed countries like in the United States may not work for rural Indian communities. The following are some challenges designers need to consider or adjust for while planning for engagement activities in the rural context in developing countries:

1. Communication

Language

The team needs a balanced number of researchers who can also speak and understand the local language. For researchers who do not speak the local language, the best scenario is to have real-time translation for them. Otherwise, the translation should be done shortly after the engagement activities. Knowing the full picture of that engagement can inspire the researchers with more questions to research or ask the community in the following site visits.

Representation

Considering the target groups may not be well educated or may be illiterate, the team needs to come up with representation tools that can effectively communicate and work with the villagers. Videos and animation could be a more legible and understandable form of visual representation as compared to conventional design representation tools like site plans, sections, and elevations.

Collaboration among team members

Each of the team members needs to have a clear or specific role during the workshop. For researchers who cannot speak the language, they can be responsible for recording the conversation and process. Hence, it is vital to make sure that they be familiar with and be well prepared for using the technologies.

2. Locations

The locations where the engagement activities are held and where participants gather matter. Although the communities in Dhamori are living in close proximity, a member of one neighborhood usually does not go to the other neighborhoods where they don't belong. For instance, only the Hindu community participated in activities held in the Hanuman Temple by the talaab since it is the temple they used to visit, and they happened to be around while we were gathering people. If necessary, the same engagement activity may need to take place in a different neighborhood for engaging as many communities as we can. For instance, at least one transect walk for each community is necessary to identify problems from a variety of perspectives given that different communities are likely to experience the issues diversely.

Whether the place is a private or public one for the engagement activities can be a concern for some social groups. For example, for the Muslim women, a home visit would probably offer a more desirable location for the women in the community since there might be cultural concerns relating to their going outside.

3. Time

Time involves several considerations: 1. the time when the engagement activities take place, 2. the time when we inform villagers about the activities matters, and 3. the time the research team has for conducting the participatory research.

What time the engagement activities should be held hinges on the work schedule of the villagers. In Dhamori, most of the villagers are farmers. Although there is no fixed work schedule for farmers, they usually get up early in the morning at 4:30 am or 5 am, begin work by 7 am until 9:30 am or 10 am when they stop for a short break, then continue until noon to have lunch. Their work day typically ends in the evening depending on the seasons. This pattern implies that men would not be able to attend most of the daytime activities.

The time when we inform the villagers about the event has to be carefully planned. Since the most common mean of propagation is by words, it is essential to remind villagers of the time of events on a regular basis.

Due to the limited time, the team should grasp every opportunity on site to ask the villagers questions, even if it was not planned beforehand. Also, due to our time constraint, we ended up abandoning carrying out the door-to-door survey and the survey kiosks (See Appendix I). Instead, Professor Nawre's earlier interviews and interactions with the village head, the Panchayat members, and villagers generated enough data for us to work on.

4. Target groups

It is crucial to understand the attributes of the target groups. Apart from culture and religion, gender, age, education level, and literacy rate are important attributes to consider when planning for engagement activities. Engagement activities should vary depending on the different characteristics of the target groups as follows:

Culture and religion

A village usually comprises several communities based on different castes and religions. Each community has its own rules for their people to abide by, such as how women should behave in outdoor spaces. Therefore, the culture and behavior of the target groups should be studied before holding group participation activities with them, especially the cultural norms and behaviors of women or younger people. Earlier focus groups or one-on-one interviews can help designers identify the intricate layers of these cultures.

Age

It would be more effective to have a transect walk with the older people since they are very knowledgeable about the village where they have lived for a long time. However, for younger people who usually did not speak up in front of the older people in a group setting, drawing could be a better way for them to express their opinions.

Education level

Engagement activities have to be designed according to the education level of the participants, or else training needs to be provided. In Dhamori, since most of the villagers were not educated, they had difficulty reading maps. Therefore, the original plan of the transect walk, which was to ask the villagers to put colored dots on the village map to indicate their most and least favorable sites in the village, could not be carried out.

5. Size and combination of the group

Depending on the breadth and depth of the information we aim to collect, some data can only be collected in a smaller group setting. For more in-depth questions related to people's feelings and personal stories, it would be better to have a more private, small group interview or one-on-one interview inside the person's house. Another possible situation is that discussions among the big group may turn out be dominated by destructive comments, since some vocal person with extreme views might take advantage of the opportunity to complain or even blame or irritate the others. Sometimes this happens when the interview group consists of several neighborhood members who face different problems or conflicting interests. In such a case, having people with authority to ask people to calm down in addition to providing education about the purposes and process of participatory design would be necessary.

6. Local supports

As outsiders of the village, teams need help gaining support from the local government and communities. Since the nature of our work involves transformations of the norm and status quo of the village, it can arouse political conflicts if our intentions are not well communicated to the local government and communities, which would hamper the participatory process.

The participatory process would be much more effective if the majority of a community shows readiness to improve the village. As part of KDI's process to respond to a Request for Project (RFP) from communities, the

KDI team only works with communities who seek such help rather than reaching out to an entirely unfamiliar community, where voluntary input or support on design and improvement work from villagers there is unknown. Having the community put together an RFP demonstrates that the villagers have some directions and ideas how their community can be improved. Community's awareness and dedication to make improvements are two fundamental elements for designers to work effectively with the community.

7. Technical issues

New technology for data collection

The drone was very effective to capture high resolution aerial imagery for site design. However, there are more capabilities and data that the technology can provide, if used appropriately. The team needs to be experienced with the technology, and that would happen best before the trip.

Internet

The network issue the team had has always been a limitation to the workflow and the efficiency of production. Portable wi-fi was a necessary purchase for the team. The data amount needed should be tested for the first few days.

8. Design

Public space design need to be more programmed for villagers' daily life and big ritual events in the rural context in developing countries. Unprogrammed space will more likely be considered as vacant trash land for dumping garbage or open defecation. Current vacant public space should be revitalized through re-programming.

Regarding more detailed site design, some of the proposed materials should be thoroughly evaluated for safety before use. For instance, recycled tires can be a hidden spot for snakes and breeding grounds for mosquitos if water captured is not drained.

6.4 Conclusion

This report endeavored to document the village conditions, engagement process, and lessons learned from each phase in detail. Consequently, with the first-hand experience visiting the site, interacting and working with stakeholders, the informed design interventions demonstrate a possibility to culturally adapt landscape architecture skills to the existing site conditions. This was after all my first attempt to work on this kind of project, so my knowledge base is expected to grow. As a learning process, this report is considered as a living document for building capacity as a designer to work on projects in the rural context of developing countries. The learning experience convinced me of the importance of community participation as a way to communicate and co-create knowledge and visions among designers and stakeholders. Everyone can make an impact to help improve villages as long as we have access to knowledge and resources. Regarding this, there is a role for landscape architects in advocating community engagement and quality public space design as a powerful source of governance in the context of a developing country.

As landscape architects, we facilitate and advocate for sustainable water management systems through our expertise and design. It is our role as designers to explore the full potential of the associated open space of landscape infrastructure, to address the right of every community member to use public space as an inclusive and equitable place, and to promote the responsibility of the community to operate, govern, and maintain the infrastructure, which can in turn unite the segregated community. Through projective design, we can bring innovative ideas to the table for discussion with community members and try pushing to improve some of the inequality issues.

For the profession, this topic can help accumulate professional knowledge in effective spatial design and processes that maximize sociability and sustainability of water infrastructures through the cultivation of a sense of community and stewardship in a rural setting. The experience with the participatory planning methods is valuable for discussing the role of landscape architects in such projects. Through mediating discussion and leveraging supports from both municipal authorities and grassroots efforts, landscape architects can provoke or advocate, co-produce knowledge, design performance of programs and systems with the community members, and proliferate the efforts by partnering with the government and NGOs. The inclusive processes of these efforts are to plan for a stage for sustainable water management of blue-green infrastructure through transforming the associated public space into a diverse, inclusive public assets together with community members.

7
Appendix

A / IRB application package

ADMINISTRATIVE INFORMATION:

Title of Project/Course: Participatory design of water-harvesting landscape as public space in rural India

Type of Application:
(check one box)
- [✓] New / Renewal
- [ ] Revision (to a pending new application)
- [ ] Modification to an existing approved application #: _____

Principal Investigator Details: (must be a KSU faculty member):

Name: Stephanie Rolley   Degree/Title: Professor & Department Head

Department: Department of Landscape Architecture and Regional & Community Planning   Campus Phone: (785) 532-5961

Campus Address: 1086 Seaton Hall, Manhattan, KS 66506

E-mail: srolley@k-state.edu   Fax #: N/A

Responsible Graduate Student: (Person to contact for questions/problems with the form):

Name: Astrid Tsz Wai Wong   Campus Phone: (785) 770-6601

E-mail: astridtw@ksu.edu

Does this project involve any collaborators not part of the faculty/staff at KSU? (projects with non-KSU collaborators may require additional coordination and approvals):

[✓] No   [ ] Yes

Project Classification (Is this project part of one of the following?):

- [ ] Thesis   [ ] Dissertation   [ ] Faculty Research
- [✓] Other: Master's Report

Note: Class Projects should use the short form application for class projects.

Copy of the Consent Form: [ ] Copy will be submitted to comply@ksu.edu with this application   [✓] Consent form not used

Funding Source: [✓] Internal   [ ] External   (Identify source. You will also need to provide a copy of the sponsor's grant application or contract as submitted to the funding agency. This should be submitted to comply@ksu.edu with your application.)

Based upon criteria found in 45 CFR 46 – and the overview of projects that may qualify for exemption explained at http://www.hhs.gov/ohrp/policy/checklists/decisioncharts.html, I believe that my project using human subjects should be determined by the IRB to be exempt from IRB review:

[ ] No   [✓] Yes   (If yes, please provide the category of "Exemption" in the space below)

Exempt Projects: 45 CFR 46 identifies six categories of research involving human subjects that may be exempt from IRB review. The categories for exemption are listed here: **http://www.hhs.gov/ohrp/policy/checklists/decisioncharts.html#c2** If you believe that your project qualifies for exemption, please indicate which exemption category applies (1-6). Please remember that only the IRB can make the final determination whether a project is exempt from IRB review, or not.

Exemption Category: 46.101(b)(2)

MODIFICATION:
Is this a modification of an approved protocol?   [✓] **No**   [ ] **Yes**   **If yes, please comply with the following:**

If you are requesting a modification or a change to an IRB approved protocol, please provide a concise description of all of the changes that you are proposing in the following block. Additionally, please highlight or bold the proposed changes in the body of the protocol where appropriate, so that it is clearly discernible to the IRB reviewers what and where the proposed changes are. This will greatly help the committee and facilitate the review.

I.   **NON-TECHNICAL SYNOPSIS** (Please provide a brief narrative description of proposal. This should typically be less than 75 words and be <u>easily understood by nonscientists</u>):

This research aims to understand stakeholders' perspectives regarding water management and public space. After the research is accomplished, I will use the outcome and data from the research for my Master's Project to design water infrastructure as a placemaking tool that can address water problems and address socio-cultural issues in rural India, as possible. Several engagement activities are designed to enhance participation rate and inclusiveness of the research and design process.

II.   **BACKGROUND** (concise narrative review of the literature and basis for the study):

This study is based on Professor Alpa Nawre's research on the design of resilient water management in rural India. In 2017-18, Astrid Wong's co-major professor of this master's project, Professor Nawre received support from the Landscape Architecture Foundation Fellowship to progress her research efforts. The project, which targets to propose a feasible landscape infrastructure plan, will be a pioneering landscape architectural design effort in rural India that can help the community to harvest water for sustaining and improving their livelihood. Professor Nawre's project inspired Astrid's research interest and formed the basis for her Master's research project.

In developing countries like India, water is about basic survival and plays a major role in sustaining the livelihood of rural families. Significant water scarcity and poor water management in rural India have caused low productivity in agriculture and hence insufficient food and poverty for many rural families, leading to other socio-cultural issues. Hence, the management of water is tied to different aspects of socio-cultural problems in rural villages, such as issues of gender and class inequities. It is critical to incorporate these different interests with a gender- and class-sensitive approach into the design and management of water infrastructure systems and public space.

In 2017, Professor Nawre started working with an Indian governmental initiative, The Member of Parliament's Model Village Scheme, about resilient water management in an existing Indian village, Dhamori in Amravati District in Maharashtra State. In order to understand stakeholders' perspectives regarding water issues and public space in Dhamori, as well as to engage stakeholders in the design of water management landscape solutions, Astrid will join Professor Nawre to visit Dhamori village in December to conduct participatory design research on site. Professor Nawre's research work includes preliminary interviews with The Member of Parliament and other knowledge partners working in Dhamori. On the other hand, Astrid will collaboratively work with Professor Nawre on understanding and interacting with the resident villagers, which is the focus of the proposed research activities and this IRB application.

III.   **PROJECT/STUDY DESCRIPTION**

(Please provide a concise narrative description of the proposed activity in terms that will allow the IRB or other interested parties to clearly understand what it is that you propose to do that involves human subjects. This description must be in enough detail so that IRB members can make an informed decision about the proposal).

This project consists of multi-step participatory design research activities in an Indian village, Dhamori in Amravati District in Maharashtra State to study people's perceptions of water infrastructure, public space, and design solutions. Both quantitative and qualitative research methods are used to collect data and engage the villagers. The different engagement activities are:

Step 1. Household survey
This household survey will gather preliminary information about families' experience and perceptions in using water resources and community public space. The survey is anonymous so no personal identification data will be collected. To enhance participation rate of the villagers in Dharmori, two ways to conduct the household survey: a) door-to-door, and b) temporary survey kiosk will be adopted:
1a) For the door-to-door survey, researchers will visit all households in the village and conduct the survey using Qualtrics offline app.
1b) The survey kiosk will be temporarily located in the village's public space. It is mainly for villagers who are not available at the time of home visit, so that there will still be an opportunity for them to visit a temporary survey kiosk to conduct the same survey.

Step 2.Interim Presentation and discussion
The presentation will introduce villagers to the research project, preliminary village site inventory and analysis, successful precedents, and preliminary survey results. It will be followed by an open-ended discussion to allow villagers to give feedback, comment or raise questions. The presentation will be held separately for male and female villagers to allow women to participate in it, who may otherwise not attend if jointly held with men. The content of the presentation will be dependent on site studies and

hence not possible to prepare now. No personal identification data will be collected during or after the presentation.

Step 3.Workshops
There will be two types of workshops: a) sub-group workshop, and b) joint workshop. No personal identification data will be collected for either of the workshops.

3a) Sub-group workshop: Women and men are separated into two different sub-groups. Both groups will have the same engagement activities to collect qualitative data of villagers' narratives about their experience of using water and public space. Participatory design activities will be used to discuss design goals and solutions. During the sub-group workshop, participants will have discussions to establish common design goals for a later discussion in design solutions. It will be followed by a walking tour around the village as an asset mapping activity. In this activity, each participant will be provided with a village map and two different colored dots to denote village assets & problematic sites, which are to be further discussed during the village walk. In the end, participants will be asked to draw the improvements they want to see in their village in terms of better water management or public space. This drawing exercise will be followed up by a discussion about the opportunities and constraints of participants' proposed ideas.

3b) Joint workshop: This joint workshop is to discuss the synthesized approach in designing water infrastructures and associated public space, as well as future steps. Everyone in the village will be invited to participate this joint workshop, including knowledge partners, and stakeholders such as leaders and appointed officials who oversee development works in the village. In this engagement activities, researchers will present the results of the survey and ideas presented in sub-group workshops. Professor Nawre and Astrid will also propose several preliminary design solutions that they will develop after the sub-group workshops for participants to vote and discuss.

For all the above activities, they will seek informed voluntary oral consent from villagers for participation before any of these activities begin. Villagers can choose to participate voluntarily. Withdrawal from complete participation will not be penalized.

The research collaborator will translate all English documents into local language. There may be a local translator to help with immediate translation from English to local language for all the engagement activities, if needed.

IV.   **OBJECTIVE**
(Briefly state the objective of the research – what you hope to learn from the study).

There are four main goals to be achieved through the participatory research and design methods:

1. To understand the problems in the current water systems (delivery, distribution, and usage) and how these problems influence the daily life and livelihood of villagers, leading to socio-cultural issues in the village, if applicable.
2. To understand villagers' perceptions about their community's most meaningful and least meaningful physical environments.
3. To inspire all villagers to re-imagine the design and design process of water-harvesting public space, and to develop solutions to address socio-cultural issues, as applicable.
4. To empower villagers from different gender, social status, class and caste to collaboratively design a better physical environment for the village.

V.   **DESIGN AND PROCEDURES** (succinctly outline formal plan for study)
    A.   List all sites where this research will be conducted:

The site is Dhamori Village located within Bhatkuli block of Amravati District in Maharashtra State, India. All the research activities will be conducted within the village boundary. Here is the link to the google map of Dharmori: https://earth.google.com/web/@20.98944592,77.58828644,316.72175671a,504.422856d,35y,140.4115691h,2.32007746t,-0r

    B.   Variables to be studied: Variables for Step 1 Household survey are: Domestic & Irrigation water problems related to quantity, quality, reliability, schedule; public space; aesthetics in the village.

Variables for Step 2 Interim presentation and discussion are: Domestic & Irrigation water problems related to quantity, quality, reliability, schedule; public space; aesthetics in the village.

Variables for Step 3 Workshops are: living experience and perception to water infrastructure and public space in the village; community assets and liabilities; priorities and preferences of design solutions.

C.   Data collection methods: (surveys, instruments, etc - **copies must submitted to comply@k-state.edu**).

Step 1 Household survey
Researchers will use the Qualtrics offline apps for data collection and analysis. A copy of the survey and a prompt are attached with this application form. The informed voluntary oral consent will be included in the prompt and be asked as question 1.

Step 2 Interim presentation and discussion
The content of Interim presentation will focus on synthesized Step 1 household survey results and site analysis conducted before and during the site visit. A copy of the prompt for Step 2 is attached. The informed voluntary oral consent is included in the prompt and poster will be shown at the location of the activity to inform participants the possibility of the process being photographed and recorded. The follow-up discussion will be transcribed but no identifiers will be attached to the participants.

Step 3a Sub-group workshop
This sub-group workshop will include an asset mapping, village walk, and a drawing exercise. Each are followed up by discussions among participants, which will be documented. A copy of the prompt for Step 3a is attached. The informed voluntary oral consent is included in the prompt and poster will be shown at the location of the activity to inform participants the possibility of the process being photographed and recorded.

Step 3b Joint workshop for all villagers, leaders, and knowledge partners.
This joint workshop will collect participants' votes that represent their preference in design solutions. A copy of the prompts for activities is attached, including the consent for participation which will be stated on posters and orally sought.

D.   List any factors that might lead to a subject dropping out or withdrawing from a study. These might include, but are not limited to emotional or physical stress, pain, inconvenience, etc.

Workshop participants may not be able to complete the whole session due to time constraints. In addition, the researchers may not be able to handle all the coming participants if the number of participants exceeds my capacity.

E.   List all biological samples taken: (if any)

N/A

F.   Debriefing procedures for participants:

No debriefing form will be provided. But villagers will be informed that the research outcomes and data collected during the interim presentation and the joint workshop are a part of the participatory process.

VI.   RESEARCH SUBJECTS:

A.   Source:

Step 1 Household Survey: Any adult member of every household in Dhamori who is 18 years or older
Step 2 Interim Presentation and discussion: All adult women and men living in Dhamori Village who is 18 years or older
Step 3a Sub-group workshop: All adult women and men living in Dhamori Village who is 18 years or older
Step 3b Joint workshop: All adult women and men living in Dhamori Village who is 18 years or older, leaders, and knowledge partners

B.   Number: (provide a brief rationale for your sample size)

The purpose of the research activities is to engage all the community members so that everyone in the village can have a sense of being a part of the design process. The total population of Dhamori villagers is 2,085 people, constituting of 480 families with 982 females and 1103 males.
All the women and men will be invited to participate in all the engagement activities but it is hard to predict how many villagers will participate - it is estimated that there will be a 50% participation rate for Step 1 Household survey, 30% for Step 2 Interim Presentation, 5% for Step 3a Sub-group Workshop and 25% for Step 3b Joint Workshop.
Therefore, attendance is anticipated as follows:

Step 1: Household Survey results from at least 240 families
Step 2: Interim presentations to 300 women and 300 men separately

Step 3a: Sub-group Workshop with 50 women and 50 men separately
Step 3b: Joint Workshop for 500 people.

C.   Inclusion criteria: (List any unique qualifiers desirable for research subject participation)

Participants will be every community member who is 18 years or older.

D.   Exclusion criteria: (list any unique disqualifiers for research subject participation)

Anyone under the age of 18 will not be targeted.

E.   Recruitment procedures:
How will subjects be identified?

Step 1 Household survey
Each household in the publicly available census document will be approached in the door-to-door survey. In households where there is no response at the time of visit, a flyer translated in local language will be distributed to notify of the location of the temporary survey kiosk. The survey kiosk will be at a strategic location in the village and easily approachable by pedestrians.

Step 2 Presentation and open-ended discussion
All the women and men will be verbally invited to participate through Step 1 household survey and other informal communication channels.

Step 3 Workshops
All the women and men will be verbally invited to attend the sub-group workshops during Step 2 the interim presentation.

How will subjects be recruited (advertisement, associates, etc.) ?

For the sub-group workshop, researchers will invite participants during the interim presentation to join the subsequent sub-group workshop. One or more sub-group workshops will be organized at different times or dates depending on the number of villagers that shows interest.
The other research activities will recruit participants by verbal invitation or flyers distributed to households, at the survey kiosk, or during the presentation.

How will subjects be enrolled?

All the research activities will be open to all adult villagers above 18 years old who are interested in participating.

Describe any follow-up recruitment procedures: (reminder emails, mailings, etc.)

1. Recurring verbal invitations for all engagement activities
2. Flyers will be distributed to households who are unavailable by the time of door-to-door visit for informing the survey kiosk and other engagement activities.
3. Posters will be put up at public space to inform all villages of the date, venue and time of Step 2 and Step 3 activities.

VII.   **RISK - PROTECTION - BENEFITS:** The answers for the three questions below are central to human subjects research. You must demonstrate a reasonable balance between anticipated risks to research participants, protection strategies, and anticipated benefits to participants or others.

A.   **Risk for Subjects:** (check all that apply)
☐ Exposure to infectious diseases
☐ Use of confidential records
☐ Exposure to radiation
☐ Manipulation of psychological or social variables such as sensory deprivation, social isolation, psychological stressors
☐ Examining for personal or sensitive information in surveys or interviews

☐ Presentation of materials which subjects might consider sensitive, offensive, threatening, or degrading

☐ Invasion of privacy of subject or family

☐ Social or economic risk

☐ Risk associated with exercise or physical exertion

☐ Legal risk

☐ Review of medical records

☐ Review of criminal records

☐ HIV/AIDS or other STD's

☐ Employment/occupational risk

☐ Others – Please explain below (Indirect risks, risk to individuals who are not the primary subjects):

> B. **Minimizing Risk**: (Describe specific measures used to minimize or protect subjects from anticipated risks.)

All raw and synthesized data files will be stored in encrypted hard drives.
For Step 1 Household survey, the informed voluntary consent will be included in the Qualtrics survey as the first question. It will also be read to the participants. The survey will only be carried on if verbal consent is obtained from participants.
For activities from Step 2 to Step 3b, informed voluntary oral consent for participation in the activities will be the first announcement before the presentations or workshops begin in order to provide anyone an opportunity to leave at any time. The audio or video recording taken during the activities will be confidential and only be accessible among the research collaborators. The audio and video recording will be transcribed as soon as possible. Once being transcribed, all those files will be deleted.

> C. **Benefits**: (Describe any reasonably expected benefits for research participants, a class of participants, or to society as a whole.)

The development of design solutions may address the research participants' problems with water management and associated socio-cultural issues. Community members from different social classes or castes can share experience and be empowered to co-design a better physical and social environment for the village during the participation process.

> D. **More than Minimal Risk?** In your opinion, does the research involve more than minimal risk to subjects? ("Minimal risk" means that "the risks of harm anticipated in the proposed research are not greater, considering probability and magnitude, than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or tests.")
>
> ☐ Yes   ☑ No

VIII. **CONFIDENTIALITY:** Confidentiality is the formal treatment of information that an individual has disclosed to you in a relationship of trust and with the expectation that it will not be divulged to others without permission in ways that are inconsistent with the understanding of the original disclosure. Consequently, it is your responsibility to protect information that you gather from human research subjects in a way that is consistent with your agreement with the volunteer and with their expectations.

Explain how you are going to protect confidentiality of research subjects and/or data or records. Include plans for maintaining records after completion.

No personal information such as name, date of birth, and house address is collected in relation to the data records during the research. Qualtrics will be used for offline survey and the results will be uploaded and saved to a Qualtrics account. The original data will only be accessible to the researchers involved in this research process and will be stored in encrypted hard drives.

IX.   **INFORMED CONSENT:** Informed consent is a critical component of human subjects research - it is your responsibility to make sure that any potential subject knows exactly what the project that you are planning is about, and what his/her potential role is. (There may be projects where some forms of "deception" of the subject is necessary for the execution of the study, but it must be carefully justified to and approved by the IRB). A schematic for determining when a waiver or alteration of informed consent may be considered by the IRB is found at **http://www.hhs.gov/ohrp/policy/checklists/decisioncharts.html#c10**

Even if your proposed activity does qualify for a waiver of informed consent, you must still provide potential participants with basic information that informs them of their rights as subjects, i.e. explanation that the project is research and the purpose of the research, length of study, study procedures, debriefing issues to include anticipated benefits, study and administrative contact information, confidentiality strategy, and the fact that participation is entirely voluntary and can be terminated at any time without penalty, etc. Even if your potential subjects are completely anonymous, you are obliged to provide them (and the IRB) with basic information about your project. See informed consent example on the URCO website. It is a federal requirement to maintain informed consent forms for 3 years after the study completion.

Answer the following questions about the informed consent procedures.

☐ Yes ☑ No **A.** Are you using a written informed consent form? If "yes," include a copy with this application. If "no" see B.

☐ Yes ☑ No **B.** In accordance with guidance in 45 CFR 46, I am requesting a waiver or alteration of informed consent elements (see section VIII above). If "yes," provide a basis and/or justification for your request.

> The informed voluntary oral consent will be announced to the participants before all the activities start.

☐ Yes ☑ No **C.** Are you using the online Consent Form Template provided by the URCO? If "no," does your Informed Consent document have all the minimum required elements of informed consent found in the Consent Form Template? (Please explain)

> The informed voluntary oral consent will be read out to the participants instead of using a written consent form.
> The reason for this is mainly because of the fact that there is a high possibility that a large number of the targeted human subject is illiterate. Another reason is due to the cultural difference. Putting a signature on paper is not common in India. Most villagers in India live their entire lives without putting their signature on any document. Exceptions are signatures (or thumb-prints if illiterate) on bank loans or land deals (contracts of financial/legal nature). Written consent forms will be extremely frowned upon and looked upon with suspicion.
> Therefore, consent will be informed and voluntary but will only be sought orally from villagers for all the engagement activities.

☑ Yes ☐ No **D.** Are your research subjects anonymous? If they are anonymous, you will not have access to any information that will allow you to determine the identity of the research subjects in your study, or to link research data to a specific individual in any way. Anonymity is a powerful protection for potential research subjects. (An anonymous subject is one whose identity is unknown even to the researcher, or the data or information collected cannot be linked in any way to a specific person).

☐ Yes ☑ No **E.** Are subjects debriefed about the purposes, consequences, and benefits of the research? Debriefing refers to a mechanism for informing the research subjects of the results or conclusions, after the data is collected and analyzed, and the study is over. (If "no" explain why.) **Copy of debriefing statement to be utilized should be submitted to comply@k-state.edu with your application.**

F.   **Describe the Informed Consent Process:**

Who is obtaining the consent? (i.e. Principle Investigator, Graduate Student, etc.)

Researchers will ask for consent before any research activities begin. A local translator may be needed to provide immediate translation from English to the local language during Step 1 household survey. One of the researcher collaborators can speak the local language and can translate for Step 2 and Step 3 engagement activities.

When and where will consent be obtained?

Consent will be obtained before any research activities begin and it will happen at the location where the research activities are taken place.

Step 1 Household survey
Informed voluntary oral consent will be the first question in the Qualtrics survey. Researcher will verbally read the consent statement to participants before asking survey questions related to the research project.

Step 2 Interim presentation and discussion
Posters will be put up prior to the event at the location of the presentation to inform participants that the activity could be photographed or video-taped. And before the presentation begins, an announcement will be made that the process could be photographed or video-taped. Participants will understand that they can choose not to participate before the presentation begins, or can withdraw at anytime without penalty.

Step 3a Sub-group workshop
Posters will be put up prior to the event at the location of the presentation to inform participants that the activity could be photographed or video-taped. Researchers will verbally read the consent statement to notify participants that the activity could be photographed or videotaped. Participants will understand that they can choose not to participate before the presentation begins, or can withdraw at anytime without penalty.

Step 3b Joint workshop
Posters will be put up prior to the event to inform participants that activities in that public venue could be photographed or video-taped. And before the presentation begins, an announcement will be made that the process could be photographed or video-taped. Participants will understand that they can choose not to participate before the presentation begins, or can withdraw at anytime without penalty.

If assent (for minors) is required, please describe who will obtain the assent? (Assent means a child's affirmative agreement to participate in research)

N/A

If assent (for minors) is required, when and where will assent be obtained?

N/A

How will consent be obtained from non-English speaking participants? (a translated written form, orally, identify the name and qualifications of the individual providing the translation)

All consent, survey questions, and activity prompts will be translated and read aloud in the local language by one of the research collaborators or with the help of a local translator.

Informed Consent Checklist

Items	YES	NO	N/A

Question	Col 1	Col 2	Col 3
Does the title appear at the top of the consent/assent form?			✓
Is the consent/assent form written toward the subject?		✓	
Is there a statement that explains that the study is *research*?	✓		
Is there a statement that explains the *purpose* of the research?	✓		
Are the procedures to be followed explained clearly and adequately?	✓		
Does the consent document describe *risks or discomforts* to subjects as a result of participating in the research?			✓
Is the consent/assent form written in the *native language* of the potential subject?			✓
Are participants compensated?		✓	
If the subjects' identity is known to the PI, does the form detail how confidentiality of records will be maintained?	✓		
Is contact information for both the PI and the URCO/IRB office included?			✓
Does the consent document indicate to the participant that he/she can withdraw at any time from the project without penalty or loss of benefit?	✓		
Are there probable circumstances which would require the PI to terminate a subject's participation regardless of his or her consent?		✓	
Is the consent document written in lay language (Recommended 8th grade level)?	✓		

X.   PROJECT INFORMATION: (If you answer Yes to any of the questions below, you should explain them in one of the paragraphs above)

☐ Yes   ✓ No   A.   Deception of subjects? If "YES" explain why this is necessary.

☐ Yes   ✓ No   B.   Shock or other forms of punishment

☐ Yes   ✓ No   C.   Sexually explicit materials or sexual experience

☐ Yes   ✓ No   D.   Sexual orientation

☐ Yes   ✓ No   E.   Sexual abuse

☐ Yes   ✓ No   F.   Handling of money or other valuable commodities

☐ Yes   ✓ No   G.   Extraction or use of blood, other bodily fluids, or tissues (if "yes', you must comply with facility and handling protections detailed in the 5th Edition of the Biosafety in Biomedical Laboratories (BMBL))

☐ Yes   ✓ No   H.   Questions about any kind of illegal or illicit activity

☐ Yes   ✓ No   I.   Questions about protected health information as defined by HIPAA

☐ Yes   ✓ No   J.   Purposeful creation of anxiety

☐ Yes   ✓ No   K.   Any procedure that might be viewed as invasion of privacy

☐ Yes   ✓ No   L.   Physical exercise or stress

☐ Yes   ✓ No   M.   Administration of substances (food, drugs, etc.) to subjects

☐ Yes   ✓ No   N.   Any procedure that might place subjects at risk

☐ Yes   ✓ No   O.   Will there be any use of Radioactive materials and/or use of Radioactive producing machines

☐ Yes   ✓ No   P.   Any form of potential abuse; i.e., psychological, physical, sexual

✓ Yes   ☐ No   Q.   Is there potential for the data from this project to be published in a journal, presented at a conference, etc?

✓ Yes   ☐ No   R.   Use of surveys or questionnaires for data collection. **Copies should be submitted to comply@k-state.edu with your application.**

XI.   SUBJECT INFORMATION: (If you answer yes to any of the questions below, you should explain them in one of the paragraphs above)

☐ Yes   ✓ No   a.   Under 18 years of age (these subjects require parental or guardian consent)

✓ Yes	☐ No	b.	Over 65 years of age
☐ Yes	✓ No	c.	Minorities as target population
☐ Yes	✓ No	d.	Physically or mentally disabled
✓ Yes	☐ No	e.	Economically or educationally disadvantaged
☐ Yes	✓ No	f.	Unable to provide their own legal informed consent
☐ Yes	✓ No	g.	Pregnant females as target population
☐ Yes	✓ No	h.	Victims
☐ Yes	✓ No	i.	Subjects in institutions (e.g., prisons, nursing homes, halfway houses)
☐ Yes	✓ No	j.	Are subjects likely to be vulnerable to coercion or undue influence

✓ Yes   ☐ No   k.   Is this international research? If yes, provide details as to if OHRP regulations apply in or near the area you intend to conduct research or if you have contacted individuals for applicable regulations to human subject research.

☐ Yes   ✓ No   l.   Are research subjects in this activity students recruited from university classes or volunteer pools? If so, do you have a reasonable alternative(s) to participation as a research subject in your project, i.e., another activity such as writing or reading that would serve to protect students from unfair pressure or coercion to participate in this project? If you answered this question "Yes," explain any alternatives options for class credit for potential human subject volunteers in your study. (It is also important to remember that: Students must be free to choose not to participate in research that they have signed up for at any time without penalty. Communication of their decision can be conveyed in any manner, to include simply not showing up for the research.)

✓ Yes   ☐ No   m.   Is audio from the subjects recorded? If yes, how do you plan to protect the recorded information and mitigate any additional risks?

> All the audio recorded will be confidential. The audio will be translated and transcribed into text without revealing individual's identity. The audio files will be deleted once the recording is transcribed.

✓ Yes   ☐ No   n.   Are research subjects' images being recorded (video taped, digitally recorded, photographed)? If yes, how do you plan to protect the recorded information and mitigate any additional risks?

> All the raw and synthesized data files will be stored in encrypted hard drives. All audio recorded will be confidential. The audio will be transcribed into text without revealing any individual's identity. The audio files will be deleted once transcribed and will not be used for any other purposes.

XII. FDA ACTIVITIES: Answer the following questions about potential FDA regulated activities:

☐ Yes	✓ No	a.	Is this a Clinical Trial?
☐ Yes	✓ No	b.	Are you using an FDA approved drug/device/diagnostic test?
☐ Yes	✓ No	c.	Does this activity involve the use of FDA-Regulated products? (biological products, color additives, food additives, human drugs, etc.)
☐ Yes	✓ No	d.	Has the protocol been submitted to the FDA, or are there plans to submit it to the FDA?
☐ Yes	✓ No	e.	Have you submitted an FDA form 3454 or 3455 (conflict of interest)?

XIII. CONFLICT OF INTEREST: Concerns have been growing that financial interests in research may threaten the safety and rights of human research subjects. Financial interests are not in them selves prohibited and may well be appropriate and legitimate. Not all financial interests cause Conflict of Interest (COI) or harm to human subjects. However, to the extent that financial interests may affect the welfare of human subjects in research, IRB's, institutions, and investigators must consider what actions regarding financial interests may be necessary to protect human subjects. Please answer the following questions:

☐ Yes   ✓ No   a.   Do you or the institution have any proprietary interest in a potential product of this research, including patents, trademarks, copyrights, or licensing agreements?

☐ Yes   ✓ No   b.   Do you have an equity interest in the research sponsor (publicly held or a non-publicly held company)?

☐ Yes   ✓ No   c.   Do you receive significant payments of other sorts, eg., grants, equipment, retainers for consultation and/or honoraria from the sponsor of this research?

☐ Yes   ☑ No   d.   Do you receive payment per participant or incentive payments?

e.   If you answered **yes** to any of the above questions, please provide adequate explanatory information so the IRB can assess any potential COI indicated above.

XIV.   **PROJECT COLLABORATORS:**

A.   **KSU Collaborators**: List anyone affiliated with KSU who is collecting or analyzing data: (list all collaborators on the project, including co-principal investigators, undergraduate and graduate students).

Name:	Department:	Campus Phone:	Campus E-mail:
Stephanie Rolley	Department of Landscape Architecture and Regional & Community Planning	(785) 532-5961	srolley@k-state.edu
Astrid Wong	Department of Landscape Architecture and Regional & Community Planning	(785) 770-6601	astridtw@k-state.edu

[Add Row]   [Delete Row]

B.   **Non-KSU Collaborators**: List all collaborators on your human subjects research project not affiliated with KSU in the spaces below. KSU has negotiated an Assurance with the Office for Human Research Protections (OHRP), the federal office responsible for oversight of research involving human subjects.

Name:	Organization:	Phone:	Institutional E-mail:
Alpa Nawre	Department of Landscape Architecture, University of Florida	352 294 1445	alpa.nawre@ufl.edu
Leslie Johnson	University of Minnesota	605 760 3413	joh06725@umn.edu

[Add Row]   [Delete Row]

C.   **Does your non-KSU collaborator's organization have an Assurance with OHRP?** (for Federalwide Assurance listings of other institutions, please reference the OHRP website under Assurance Information at: **http://ohrp.cit.nih.gov/search**).

☐ Yes   ☑ No

If yes, Collaborator's FWA # | University of Florida- FWA00005790; University of Minnesota - FWA00000312 |

Is your non-KSU collaborator's IRB reviewing this proposal?

☑ Yes   ☐ No

If yes, IRB approval # | As the primary PI of this project, Professor Alpa Nawre is submitting an IRB application to University of Florida. This number will be provided as soon as it is available. |

XV.   **IRB Training:**

    A.   **The URCO must have a copy of the Unaffiliated Investigator Agreement on file for each non-KSU collaborator who is not covered by their own IRB and assurance with OHRP.** When research involving human subjects includes collaborators who are not employees or agents of KSU the activities of those unaffiliated individuals may be covered under the KSU Assurance only in accordance with a formal, written agreement of commitment to relevant human subject protection policies and IRB oversight. The Unaffiliated Investigators Agreement can be found and downloaded at **http://www.k-state.edu/ research/comply/irb/forms**

<div align="center">

Online Training
TRAINING REQUIREMENTS HAVE RECENTLY CHANGED
The IRB has mandatory training requirements prior to protocol approval. Training is now offered through the Collaborative Institutional Training Initiative (CITI) Program. Instructions for registration and access to training are on the URCO website http://www.k-state.edu/research/comply/.

Use the check boxes below to select the training courses that apply to this application.   If you have any questions about training, contact URCO at comply@ksu.edu, or (785) 532-3224.

</div>

Mandatory Training **Required for all Principal Investigators, research staff and students**

☒ Responsible Conduct of Research

☒ IRB core modules

<div align="center">

Required (Provost-mandated) for all full-time K-State employees

</div>

☑ Export Compliance

<div align="center">

Required procedure-specific training (check all that apply to this protocol):

</div>

☐ International Research   ☐ Research in Public Elementary and Secondary Schools   ☐ Research with Children

☐ Research with Prisoners   ☐ Internet Research   ☐ Vulnerable Subjects - Research Involving Workers/Employees

☐ Research with Subjects with Physical Disabilities and Impairments   ☐ Illegal Activities or Undocument Status in Human Research

☐ Gender and Sexuality Diversity in Human Research   ☐ Research with human blood, body fluids, or tissues

☐ Research with Older Adults

All new personnel or personnel with expired training are required to register for CITI and take the new training requirements. If you previously completed online IRB modules, your training status will remain current until it expires. URCO will verify training from the previous system as well as the new system prior to approval of any protocol.

INVESTIGATOR ASSURANCE FOR RESEARCH INVOLVING HUMAN SUBJECTS

(Print this page separately because it requires a signature by the PI.)

P.I. Name: | Stephanie Rolley |

Title of Project: | Participatory design of water-harvesting landscape as public space in rural India |

XVI.   <u>ASSURANCES</u>: **As the Principal Investigator on this protocol, I provide assurances for the following:**

A.   <u>Research Involving Human Subjects</u>: **This project will be performed in the manner described in this proposal, and in accordance with the Federalwide Assurance FWA00000865 approved for Kansas State University available at http://www.hhs.gov/ohrp/assurances/forms/filasurt.html, applicable laws, regulations, and guidelines. Any proposed deviation or modification from the procedures detailed herein must be submitted to the IRB, and be approved by the Committee for Research Involving Human Subjects (IRB) prior to implementation.**

B.   <u>Training</u>: **I assure that all personnel working with human subjects described in this protocol are technically competent for the role described for them, and have completed the required IRB training accessed via the URCO website at: http://www.k-state.edu/research/comply/irb/training. I understand that no proposals will receive final IRB approval until the URCO has documentation of completion of training by all appropriate personnel.**

C.   <u>Extramural Funding</u>: **If funded by an extramural source, I assure that this application accurately reflects all procedures involving human subjects as described in the grant/contract proposal to the funding agency. I also assure that I will notify the IRB/URCO, the KSU PreAward Services, and the funding/contract entity if there are modifications or changes made to the protocol after the initial submission to the funding agency.**

D.   <u>Study Duration</u>: **I understand that it is the responsibility of the Committee for Research Involving Human Subjects (IRB) to perform continuing reviews of human subjects research as necessary. I also understand that as continuing reviews are conducted, it is my responsibility to provide timely and accurate review or update information when requested, to include notification of the IRB/URCO when my study is changed or completed.**

E.   <u>Conflict of Interest</u>: **I assure that I have accurately described (in this application) any potential Conflict of Interest that my collaborators, the University, or I may have in association with this proposed research activity.**

F.   <u>Adverse Event Reporting</u>: **I assure that I will promptly report to the IRB / URCO any <u>unanticipated</u> problems involving risks to subjects or others that involve the protocol as approved. Unanticipated or Adverse Event Form is located on the URCO website at: http://www.k-state.edu/research/comply/irb/forms. In the case of a serious event, the Unanticipated or Adverse Events Form may follow a phone call or email contact with the URCO.**

G.   <u>Accuracy</u>: **I assure that the information herein provided to the Committee for Human Subjects Research is to the best of my knowledge complete and accurate.**

You may sign this form using a digital signature. DO NOT sign the form until it has been completed.
You cannot edit the form entries once the form has been digitally signed. If you are making revisions to a previously signed form, right-click the digital signature and select Clear to remove the signature (this can only be done by the person who originally digitally signed the form). Forms that have not been signed will not be accepted.

P.I. Signature: | Stephanie Rolley *Digitally signed by Stephanie Rolley / DN: cn=Stephanie Rolley, o=Kansas State University, ou=LARCP, email=srolley@ksu.edu, c=US / Date: 2017.11.09 10:52:59 -06'00'* | Date: |

1. Household Survey: Qualtrics Questions

PROMPT

1. Introduction
Good morning/ afternoon, Sir/ Madam. I am a landscape architecture student from Kansas State University. I am visiting all the families to conduct a research project about designing water-harvesting infrastructures and their associative community public space.
Do you have about 10-15 minutes now? I would like to ask you 11 questions about your daily experience in using water resources and public space. Your participation will be very helpful for further analysis and discussion in designing improvements to your community.

2. Qualtrics Survey Questions
(Link to the Qualtrics form: https://kstate.qualtrics.com/jfe/form/SV_5pzC8tKDHWZO9OI)

1. Your participation in this survey is voluntary. I will record your response using an electronic survey program called Qualtrics in the process. Your responses documented will be anonymous with minimal risks. The information will be stored in an encrypted storage device. You do not have to answer any questions that you do not wish to answer. You have the right to withdraw this survey at any time without penalty. If you decide not to participate, you will not be penalized as well.

   Do you want to participate in this survey? (Yes/No)

3.1) If the villagers nod or say yes, I will proceed to ask the following questions:

2. How many family members are there in your household? (1, 2, 3, 4, 5, 6, 7, 8, 9, 10 or more)
3. What is the major income source of your family?
4. What one improvement would you like to see in the village? (multiple choice; Describe)
5. Do you face any problems with meeting your domestic water requirements? (multiple choice: quantity, quality, reliability, schedule, none; Describe)
6. Do you face any problems with meeting your farm water requirements? (irrigation & livestock use: quantity, quality, reliability, schedule, none, NA; Describe)
7. What space do you like to visit most in the village? (market, street, pond, farm, other)
8. Do you like to spend time at water bodies such as rivers, canals, ponds? (Yes/No)
9. Do you think Dhamori is a beautiful village? (Yes/No) Which is the most aesthetically pleasing spot for you in the village? (Describe)
10. Which is the most culturally meaningful spot for you in the village? (Describe)
11. Do you think you can change things for the better in the village? (Yes/No; Why not - no time, no interest, no hope)
12. Can you or someone in your home work with us to develop a better water infrastructure? (Yes/No; Would you donate: Time, Labor, Money/Land?)

3.2) If the villagers say no, I will thank them and give the household a flyer about the survey kiosk.

4. Ending
We have also set up a temporary survey kiosk at [Location] to invite everyone's participation. If you know anyone in your family or your neighbors who are interested but haven't had the chance to talk to us yet, please let them know. We will also organize a presentation and workshops in the coming two weeks. We will present today's survey result to you all. Please make time to join us!

5. Other data input from researchers' observation

- Living and House Condition (Poor, Average, Good)
- Roof Type (RCC, Thatch/loose Tile; Flat, Sloping)
- Other Descriptive Text

MATERIALS NEEDED

For participants:
- Flyer

For researchers:
- Portable device with the offline Qualtrics apps e.g. Ipad
- Dhamori map
- Notebook

2. Interim Presentation: Prompt

PROCEDURE
1. Introduce the activity and seek for informed voluntary oral consent
2. Presentation on project intention, possibilities, successful precedents, and people involved in this research project.
3. Presentation on problems identified in the preliminary interviews.
4. Presentation on the site inventory and survey findings completed up to the event.

PROMPT

1. Introduction
Script:
Good morning everyone! Thank you for coming to this presentation. I am a landscape architecture student from Kansas State University. I am conducting a research project about designing water-harvesting infrastructure and associated public space. All the findings will be used to inform design that can make improvements to your community. Therefore, we sincerely invite everyone in Dhamori to participate our coming engagement activities and design together.
In this presentation, we are going to introduce you to the intention of the research, some findings about the village we collected before coming to Dhamori. We have also started household survey, so we are also going to present the preliminary findings from the survey conducted up to date. You can feel free to give comments during the presentation.

2. Informed voluntary oral consent
Script:
Before the presentation, we have to seek your consent of participation first. Your participation in this activity is voluntary. In order to document the process, we may need to take photographs or videos during the process of this workshop. Any audio recorded will be confidential. The audio will be transcribed into text without revealing any individual's identity. We will not ask you to provide any of your personal information that can identify your identity during the process. These recordings will be deleted once they have been transcribed. If you feel uncomfortable to being recorded, you can leave without any penalty. You have the right to withdraw from this activity at any time for which you will not be penalized.

3. Presentation

4. Conclusion
We will have a sub-group workshop later today after this presentation and on [Date]. We would like to invite all female residents and men residents to join our workshop separately. Unlike this presentation, we will go outdoor and some other interactive activities in the coming workshop. If you are interested, please stay behind so that we can inform you the details of time and activities. We will also organize a final presentation and workshop for everyone to join on [Date] at [Time]. We welcome everyone's participation!

MATERIALS NEEDED

For researchers:
- Translated informed consent posters
- Presentation slides
- Notebook
- Camara
- Audio recorder

3a. Sub-group workshop: Prompt

PROCEDURE

1. Introduce the activity and seek for informed voluntary oral consent
2. Provide a map for participant to identify and spatially locate community assets and problematic sites
3. Lead a discussion to set common goals and priorities to solve identified problems among the participants
4. Lead a village walk to walk around sites that participants identified before
5. Participants are asked to draw a place and one improvement they would like to see there
6. Discuss about participants' drawings and inspire participants' programmatic ideas and solutions to solve identified problems based on their common goals
7. Discuss about the problems that could come up for these solutions

PROMPT

1. Introduction
Script:
Good afternoon everyone! Thank you for coming to this workshop. I am a landscape architecture student from Kansas State University. I am conducting a research project about designing water-harvesting infrastructures and their associative community public space. All the findings will be used to inform design that can make improvements to your community. Therefore, the outcome of this workshop and your participation means a lot to bring positive changes to Dharmori in the future.
In this workshop, we would like to know more about your daily experience in using water resources and public space, and also your perception or feelings towards these community spaces. We will first talk about some general problems related to water usage and public space. Together, we will establish some common design goals for later discussion. Then we are going to walk around your community to create a collective asset map of the village. At the end, we would like you to draw the improvements in terms of better water management or public space that you want to see in the village.

2. Informed voluntary oral consent
Script:
Before the presentation, we have to seek your consent of participation first. Your participation in this activity is voluntary. In order to document the process, we may need to take photographs or videos during the process of this workshop. Any audio recorded will be confidential. The audio will be transcribed into text without revealing any individual's identity. We will not ask you to provide any of your personal information that can identify your identity during the process. These recordings will be deleted once they have been transcribed. If you feel uncomfortable to being recorded, you can leave without any penalty. You have the right to withdraw from this activity at any time for which you will not be penalized.

3. Asset mapping
Script:
Before going for a walk, each of you will receive a map of the village and two colored dots. By looking at this map, can you identify the location of places that you think are very important/ precious to you or to your community? If so, please put a green dot on those locations. On the contrary, if there are any places you dislike or are a menace to the community, please put a red dot to mark those spots.

Actions:
Provide a map and a few colored dot stickers for participant to identify and spatially locate community assets and problematic sites.

4. Discussion of goals and priorities
Script:
- What are your major concerns in using water?
- What is the most pressing problems in the existing water systems that have to be fixed or improved? What are the most critical issues? Which one of these would you prioritize to solve first? Would you like men/ women to help?

- What are your major concerns in using public space?
- What are the other critical socio-cultural/ environmental/ economic issues in the village? How did you deal with them? Can you prioritize their urgency or importance to be solved?

Actions:
One of the researchers will lead the discussions and mark down all the goals and ideas suggested by the participants on a white board.
Another researcher will collect all the maps and colored dot stickers from participants, and decide the route of village walk based on the locations denoted.

5. Village walk
Script:
- Where do you like to hang around in the village, and why? [At locations with many green dots] What is the happiest moment or activity you have had here?
- Where do you dislike to go in the village, and why? [At locations with many red dots]
- Are there any common gathering public space that you are the most attached to?
- Who do you use these space with mostly?
- Are there any public space in the village representing the community identity?
- What kind of public spaces would you like to see?

Actions:
Lead the participant to the locations they mapped and have conversations about their experience and memories to those places.
Produce a collective asset map on-site and other field notes.

6. Drawing activity
Script:
- Do you want to see changes in your community? What aspects you want the community to change and what to retain?
- How do you want your community be like in 5 years? 10 years?
- Here are some paper and crayons. You can feel free to use this to express your idea in one improvement you would like to see in your village.

Actions:
Provide some crayons, drawing paper (images, scissors, glues), and other drawing tools for participants to make collages or draw or write to represent their design ideas.

7. Design ideas
Script:
- Why do you draw this? Why is this the one improvement that you feel so strongly and would like to see in the village? What are the opportunities and constraints of this idea?
- Do you feel like you can change things for the better in the village? Why or why not?
- Are you willing to put in the time, effort, money to improve conditions? Why or why not?

8. Conclusion
Script:
We will have our final workshop on [Date] at [Time]. We welcome everyone's participation. We will present all our findings and solutions we discussed to everyone. See you there!

9. Contingency
Conditions: number of participants exceeds 25

Script:
Thank you for your interest and participation. We are sorry that we cannot hold the workshop with all of you at one time. We will hold the same workshop here later today at [Time]. If you are not available by that time, please consider to come back to on [Date] at [Time].

MATERIALS NEEDED

For participants:
- Dhamori aerial satellite map
- Green & red dot stickers
- White board + pen
- Images, scissors, glues, crayons, drawing paper

For researchers:
- Translated informed consent posters
- Dhamori site map
- Notebook
- Camara
- Audio recorder
- Offline GPS tracker apps (?)
- A slideshow showing images of design ideas or successful precedents

3b. Joint workshop: Prompt

PROCEDURE

1. Introduce the activity and seek for informed voluntary oral consent
2. Presentation of research findings
3. Present proposed preliminary design schemes
4. Voting of preference and follow-up discussion
5. Debriefing about the project timeline including the next steps & future process

PROMPT

1. <u>Introduction</u>
Script:
Good morning/ afternoon everyone! Thank you for coming to this joint workshop. I am a landscape architecture student from Kansas State University. I am here to conduct a research project about designing water-harvesting infrastructures and their associative community public space. With your participation in the previous activities, we have a better understanding of Dhamori.
This joint workshop is a milestone for us to present what we have found during the last few weeks. Most importantly, we want to present the different synthesized design proposals developed by your comments. At the end, we will give each of you a colored dot sticker to vote for your preferred design, so that we can understand your preference and concerns, and hence know which direction of design we should take in the future.

2. <u>Informed voluntary oral consent</u>
Script:
Your participation in this activity is voluntary. We may need to take photographs or videos during the process of this workshop. All the audio recorded will be confidential. The audio will be transcribed into text without revealing any individual's identity. We will not ask you to provide any of your personal information that can identify your identity during the process. These recordings will be deleted once they have been transcribed. If you feel uncomfortable to being recorded, you can leave without any penalty. You have the right to withdraw this activity at any time and you will not be penalized.

3. <u>Presentation of research findings</u>
Script:
- We have visited each house by door-to-door in Dhamori to conduct most of the survey during [Period of days and times]. We also set up a temporary survey kiosk to collect data from passengers or anyone who were not available by the time of visit. Here are what we found…
- We have organized [4] sub-group workshops on [Dates]. From these workshops, we understand the major issues that both women and men are facing include [Common problems raised by both the sub-groups]. We also find out that women think that [Particular issues faced by women]; and men think that [Particular issues faced by men].
- The common goals for every participant group are [Similar goals suggested by both the sub-groups]. Other specific goals include [Different goals suggested by the sub-groups].

4. Presentation of proposed design schemes
Script:
- We have carefully listened to your voices and opinions from the household survey and sub-group workshops. We analysed your responses and synthesize the knowledge produced to generate the following design ideas, based on different scenarios or parameters.
- The first scheme is about…
- The second scheme is about…
- The third scheme is about...
- Do you have any questions?

5. Voting and discussion
Script:
- Each of you have received a colored dot sticker. Please come out and use this as a vote to pick the schemes that you like most.
- [For the proposal that has the most votes] Why do you like this one the most? (for participants who voted for that proposal)
- [For the proposal that has the most votes] Why didn't you pick this one as your favourite scheme? (for participants who didn't vote for that proposal)
- [For the proposal that has the least votes] Why didn't you pick this one as your favourite scheme? (for participants who didn't vote for that proposal)
- [For the proposal that has the least votes] Why do you like this one the most? (for participants who voted for that proposal)

Actions:
Provide a colored dot sticker for each participant to vote their favourite scheme.

6. Debriefing
Script:
- When do you want such improvement to happen?
- What will be the major obstacles for you to participate in the future?

Thanks you for your time and participation!

MATERIALS NEEDED

For participants:
- Colored dot sticker

For researchers:
- Translated informed consent posters
- Presentation slides to show the outcomes
- Collective asset mapping
- Design boards of different proposals
- Notebook
- Camara
- Audio recorder

Want to talk about water in your community and development in your community's environment?

Please go to our survey kiosk at the above location
from [–/–] to [–/–] during [:. to _.].

We would like to know more from you!

Any questions, please contact:

Survey Kiosk

हम आपके समुदाय के पानी के बारे में और वातावरण के विकास के बारे में बात करना चाहते हैं।

उपरोक्त स्थान पर [–/–] से [–/–] तक [:. से _.] के बीच कृपया हमारे सर्वेक्षण के कीओस्क पर जाएं।

हम आपसे और जानना चाहते हैं!

कोई प्रश्न, कृपया संपर्क करें:

सर्वेक्षण कीओस्क

Photographs or video will be taken at this place on

--/--/--

_ _: _ _ to _ _: _ _

More Information:

This activity is a part of an academic research project to find out how participants use water and public space in the community.

[Contact]

Poster Sample (English)

तस्वीरों या वीडियो को इस जगह पर लिया जाएगा

- / - / -

_ _: _ _ से: _ _ तक।

अधिक जानकारी:

यह गतिविधि एक शैक्षणिक अनुसंधान परियोजना का हिस्सा है, जो यह पता लगाने के लिए है कि प्रतिभागी समुदाय में पानी और सार्वजनिक स्थान का कैसे उपयोग करते हैं।

[संपर्क करें]

Poster Sample (Hindi)

PARTICIPATORY PLACEMAKING OF WATER

Astrid Tsz Wai Wong - Gr
Alpa Nawre & Stephanie Rolley
Katie Kingery Page & Howard

Background

In developing countries, water is about basic survival. Particularly for rural communities, water is essential to support irrigation for agriculture and hence, the livelihood of villagers. Due to poor water management, pollution, climate change, most of the rural area in India suffer from water scarcity. Not only does crop productivity being hugely affected, food insecurity and poverty has further led to many social, environmental, and economic problems in India. Better water infrastructure and management is the key to sustainability of the community. This research adopts a participatory design approach to engage the rural community during the process of designing water infrastructure as a placemaking tool to cultivate inclusiveness and empower villagers to improve the living environment themselves.

Research Question

How can the design of critical water-harvesting landscape as community-gathering public space address specific socio-cultural issues in rural India?

Subgroup Workshops

Survey Kiosk

-HARVESTING LANDSCAPE IN RURAL INDIA

raduate student| LARCP
y - Co-major professor | LARCP
d Hahn – Committee | LARCP

Methods

The participatory design process aims to understand, inspire, and empower the community through a variety of engagement activities like door-to-door survey, village walk, drawing activities, etc to collect quantitative and qualitative data.

Anticipated Results

Observations and any audios or videos taken during the participatory process will be transcribed and documented in the final report. Design ideas from the engagement activities will be synthesized and transformed into a design proposal and theories that can answer the research question

सर्वेक्षण कीओस्क

Flyer (in Hindi)

Village Walk

हम आपके
समुदाय के पानी के बारे में और वातावरण के विकास
के बारे में बात करना चाहते है।

उपरोक्त स्थान पर [--/--] से [--/--] तक [_:_ से _:_] के दौरान कृपया हमारे सर्वेक्षण
केओस्क पर जाएं।
प आपसे और जानना चाहते है!

C / Itinerary

| Date	Activity
12/14	• Arrived at Nagpur Airport. • Traveled to Dhamori village the first time at the evening for a village presentation to introduce about the project and our work in the following weeks to the villagers.
12/15	• Prepared the detail schedule and questions for the sub-group workshop and other engagement activities.
12/16	• Practiced flying the drone in order to take footages of Dhamori in the following weeks for collecting data and making promotional materials in the future.
12/17	• Traveled to Dhamori village and had a guided site visit by Professor Nawre and other team members who have done scheduled or informal interviews in the village before.
12/18	• Visited a local park and the Bamboo Garden in Amravati to see if there were opportunities to get donated materials for building a temporary playground, which is also known as the "Demo Project" in Dhamori.
12/19	• Conducted the first group workshop with men, women, and children at a Hanuman Temple. • Interviewed with some workshop participants. • Visited the Urdu school in the Muslim community of Dhamori village. • Took drone footages and site photos.
12/20	• Discussed and prepared for the final presentation scheduled on 12/25. • Prepared and presented the playground design and construction ideas to some potential donors for funding the "Demo Project".
12/21	• Conducted the second group workshop with men during a transect walk and with the Muslim women in the Urdu school • Analysed the potential site and design of the temporary playground project.

| Date	Activity
12/22	• Discussed and prepared for the final presentation on 12/25. • Presented to potential donors for funding the temporary playground project.
12/23	• Prepared for the final presentation on 12/25. • Visited a local carnival.
12/24	• Prepared for the final presentation on 12/25.
12/25	• Organized a final presentation to the member of Parliament, Dr.Vikas Mahatme, and other officials, the village head, villagers that include men, women, teenagers, and children. • Helped build the temporary playground project with the villagers.
12/26	• Took drone footages and site photos.
12/27	• Interviewed with the villagers for comments and feedback on the final presentation. • Took more drone footages and site photos. • Had a farewell "ceremony" with the village head and other villagers inside a villager's house.
12/28	• Toured around Chikhaldara in Nagpur.
12/29	• Left India at Nagpur Airport.

D / Selected villagers' drawings
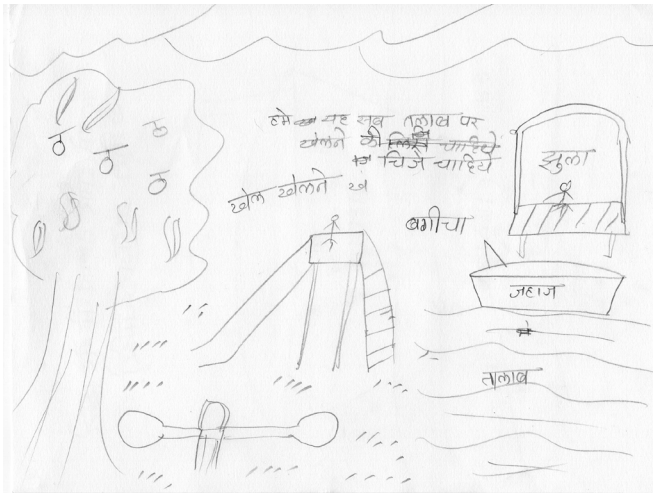
Ideas interpreted:

» Play equipment such as swings, slides and see-saw
» Boating
» More trees
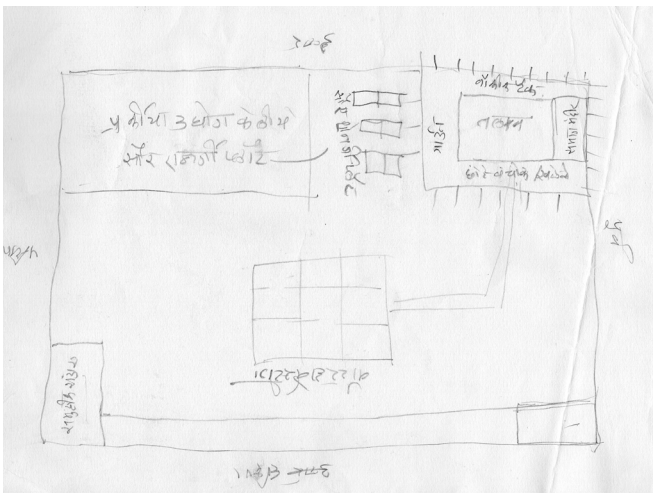
Ideas interpreted:

» Rainwater harvesting device
» Children's playground
» Garden
» Solar energy
» Light poles that use solar energy
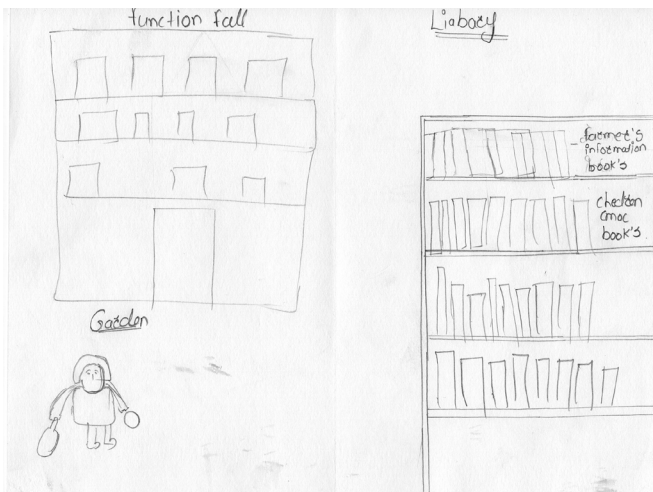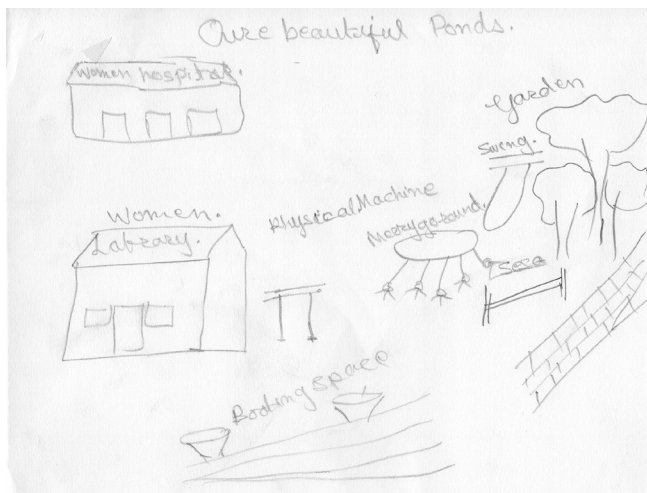

Ideas interpreted:

» A library with books providing information about farming techniques and child-care
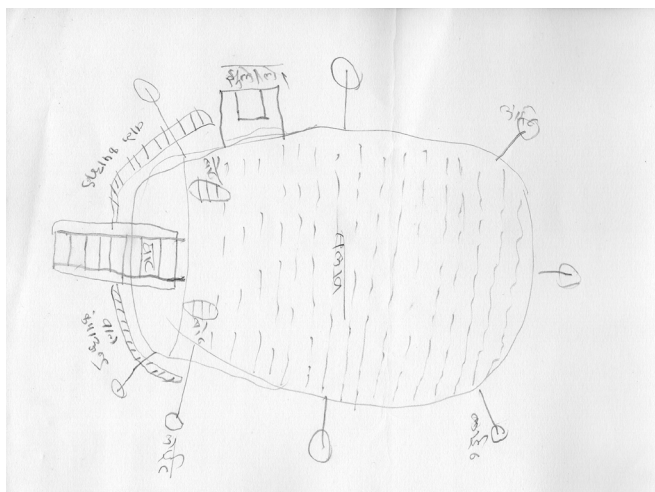» A community hall for events
» A garden for recreation

Ideas interpreted:

- » Water lilies in the talaab
- » Boating
- » Kite-flying
- » Wildlife like peacock and ducks
- » Benches

Ideas interpreted:

- » A more beautiful talaab
- » Women's hospital
- » A library for women use
- » Gym equipment
- » Play equipment like merry-go-round
- » Boating
- » Well-paved paths
- » - a garden

Ideas interpreted:

- » Wall to restrict entry or exit
- » Boating
- » Swings
- » Lighting

E / Bibliography

Bhaskaran, K. (2014, April 21). The 3 things Hiware Bazar taught us about development.

Bhat, T. A. (2014). An Analysis of Demand and Supply of Water in India. Journal of Environment and Earth Science, 4(No.11).

Branam, E. L. (2012). Spanning the Rural Urban Divide: Toward an Expanded Theory of Landscape Architecture, 61.

Brown, K., & Kjer, T. (2007). Critical Awareness in the Era of Globalisation: Lessons for Landscape Architecture from an informal Community in Tijuana, Mexico. Landscape Review, 12(1), 26–45.

Census Population 2015 Data. (2011). Villages & Towns in Bhatkuli Taluka of Amravati, Maharashtra. Retrieved March 17, 2018, from https://www.census2011.co.in/data/subdistrict/4010-bhatkuli-amravati-maharashtra.html

Dandekar, P. (2016). State of India's Rivers- Maharashtra. Retrieved from https://sandrp.files.wordpress.com/2017/04/maharashtra-report.pdf

Deepika Andavarapu. (2017, September 27). Gendered Public Spaces. Retrieved November 8, 2017, from https://favelissues.com/2017/09/26/gendered-public-spaces/

Deming, M. E., & Swaffield, S. R. (2011). Landscape architecture research: inquiry, strategy, design. Hoboken, N.J: Wiley.

Department of Agriculture Cooperation & Farmers Welfare. (2016). Agriculture Contingency Plan-Amravati.pdf. Retrieved from http://agricoop.nic.in/agriculturecontingency/maharashtra

Dutta, S. (2017, September 22). 76 Million Don't Have Safe Drinking Water: India's Looming Water Crisis |

World Water Day Special. Retrieved April 25, 2018, from http://swachhindia.ndtv.com/76-million-dont-have-safe-drinking-water-indias-looming-water-crisis-5606/

Gandy, M. (2014). Water, Poverty, and Urban Fragmentation in Mumbai. In The Fabric of Space : Water, Modernity, and the Urban Imagination. MIT Press. Retrieved from https://ebookcentral-proquest-com.er.lib.k-state.edu/lib/ksu/detail.action?docID=3339897#

Hegde, N. G. (2012). Water Scarcity and Security in India. Presented at the BAIF at the Indian Science Congress, Pune.

Hester, R. (2005). Democratic drawing: techniques for participatory design. Reconstructing Communities.

Hester, R. T. (2008). No Representation without representation. In Representing Landscape Architecture (pp. 96–111). New York: Taylor Y Francis.

Howard, Z., & Somerville, M. M. (2014). A comparative study of two design charrettes: implications for codesign and participatory action research. CoDesign, 10(1), 46–62. https://doi.org/10.1080/15710882.2014.881883

Joshi, D., & Fawcett, B. (2006). Water, Hindu Mythology and an Unequal Social Order in India. In A History of Water: The world of water (Vol. 3, pp. 119–154).

Juarez, J. A., & Brown, K. D. (2008). Extracting or empowering? A critique of participatory methods for marginalized populations. Landscape Journal, 27(2), 190–204.

Kim, S. (2015, March 30). Public spaces- not a "nice to have" but a basic need for cities [Text]. Retrieved April 1, 2018, from http://blogs.worldbank.org/endpovertyinsouthasia/public-spaces-not-nice-have-basic-need-cities

Kingery-Page, K., Glastetter, A., DeOrsey, D., & Falcone, J. M. (2016). Examples of adapted ethnographic approaches for participatory design. Landscape Research Record, 5, 261–275.

Kumar, V. (2014). Inequality in India: Caste and Hindu social order. Transcience, 5(1), 36–52.

Kumbhar, V. P., Kulkarni, S. S., & Swami, V. A. (2012). Watershed Management: Concept, Principles and Challenges to Improving Productivity, Resources and Livelihoods. I-Manager's Journal on Civil Engineering, 2(2), 1.

Lahiri-Dutt, K. (2007). Diluted Citizenship: Women, water and rights in the midst of inequities in India. Development, 51, 63–67.

Lipovská, B., & Štěpánková, R. (2013). Assessing Observation Methods for Landscape Planning Practice in Rural Villages. Current Urban Studies, 01(04), 102–109. https://doi.org/10.4236/cus.2013.14011

Louiset, O. (2012). A Cultural Geography of the City: "A Passage to India." Annales de Géographie, No 684(2), 172–193.

Mackenzie, A. (2015, February 19). Placemaking and Place-Led Development. Retrieved April 1, 2018, from https://www.pps.org/article/placemaking-and-place-led-development-a-new-paradigm-for-cities-of-the-future

MapsOfIndia.com. (2014, June 2). Agriculture in Maharashtra. Retrieved March 17, 2018, from https://www.mapsofindia.com/maps/maharashtra/maharashtraagriculture.htm

MapsOfIndia.com. (2018, January 6). Maharashtra Soil and Vegetation. Retrieved March 18, 2018, from https://www.mapsofindia.com/maps/maharashtra/geography-and-history/soil-and-vegetation.html

Mazumdar, S., & Mazumdar, S. (1999). "Women's significant spaces": Religion, space, and community. Journal of Environmental Psychology, 19, 159–170. https://doi.org/10.1006/jevp.1999.0117

Mehta, L., Allouche, J., Nicol, A., & Walnycki, A. (2013). Global environmental justice and the right to water: The case of peri-urban Cochabamba and Delhi. Geoforum, 54 (2014), 158–166.

Melcher, K. (2013). Equity, Empowerment, or Participation Prioritizing Goals in Community Design. Landscape Journal, 32(2), 167–182.

Merriott, D. (2016). Factors associated with the farmer suicide crisis in India. Journal of Epidemiology and Global Health, 6(4), 217–227. https://doi.org/10.1016/j.jegh.2016.03.003

Monisha, S., Iyer, A., & Mishra, M. (2013, March). Schedule Caste and Schedule Tribes. Retrieved from https://www.slideshare.net/manasimishra31/schedule-caste-and-schedule-tribes

Monnet, J. (2011). The symbolism of place: A geography of relationships between space, power and identity. Cybergeo, 2011. https://doi.org/10.4000/cybergeo.24747

National Bureau of Asian Research. (2013, August). India's Water Crisis: Causes and Cures.

National Informatics Center. (n.d.). States Uts-Maharashtra- Know India: National Portal of India. Retrieved March 17, 2018, from http://knowindia.gov.in/states-uts/maharashtra.php

Naz, F., & Subramanian, S. V. (2010). Water management across space and time in India. ZEF Working Paper Series.

North, A. (2012). Operative Landscapes: Building Communities Through Public Space. Basel, Switzerland: Birkhauser Architecture.

NRLM. (2017). Best Practices in Sustainable Agricultural Practices, 53.

Odbert, C., & Mulligan, J. (2014). THE KIBERA PUBLIC SPACE PROJECT. Now Urbanism: The Future City Is Here, 177.

Office of the Senior Geologist. (n.d.). Ground Water Survey and Development Agency, Amravati. Retrieved March 17, 2018, from http://amravati.nic.in/other_dept/GSDA.html

Padekar, D., Bhattacharyya, T., Ray, S. K., Tiwary, P., & Chandran, P. (2016). Influence of Irrigation Water on Black Soils in Amravati District, Maharashtra. Current Science, 110(9). Retrieved from https://www.researchgate.net/publication/301946009_Influence_of_Irrigation_Water_on_Black_Soils_in_Amravati_District_Maharashtra

Project for Public Spaces. (2018, January 25). What is Placemaking? Retrieved April 2, 2018, from https://www.pps.org/article/what-is-placemaking

Rosa, M., & Weiland, U. (Eds.). (2013). Handmade Urbanism: Mumbai, São Paulo, Istanbul, Mexico City, Cape Town: From Community Initiatives to Participatory Models (Har/DVD edition). Berlin: Jovis.

Rosie Stewart. (2017). Wild Water- The State of the World's Water 2017. WaterAid. Retrieved from file:///I:/1.%20Master's%20Project/Revised%20literature%20review/WildWater-Low.pdf

Sanchita Ray. (2004). Caste, Class, Gender and Ethnicity as Distinct Categories and their Interconnection. Sage Publication, 13–15.

Singh, S. (n.d.). Local Governance and Environment Investments in Hiware Bazar, India. Center for Schience and Environment, 14.

Stokman, A. (2008). Water purificative landscapes–constructed ecologies and contemporary urbanism. In Proceedings of the 45th World Congress of the International Federation of Landscape Architects (IFLA) (Vol. 30).

Thapliyal, M. (2017, March 21). India ranked first in the world for most rural people without access to clean water. Retrieved April 25, 2018, from http://wateraidindia.in/media_release/india-ranked-first-world-rural-people-without-access-clean-water/

World Wildlife Fund. (2012). Southern Asia: India. Retrieved March 18, 2018, from https://www.worldwildlife.org/ecoregions/im0209

Zaveri, E., Grogan, D. S., Fisher-Vanden, K., Frolking, S., Lammers, R. B., Wrenn, D. H., … Nicholas, R. E. (2016). Invisible water, visible impact: groundwater use and Indian agriculture under climate change. Environmental Research Letters, 11(8), 084005. https://doi.org/10.1088/1748-9326/11/8/084005