



EXPANDING WATER HARVESTING PRACTICES IN RAJASTHAN, INDIA THROUGH STRATEGIC POLICY ADVOCACY

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LIST OF ACRONYMS

CAM- Criteria Alternative Matrix
CBO- Community Based Organizations
CBWH- Community-based Water Harvesting
CEO- Chief Executive Officer
CPO- Chief Planning Officer
CVM- Contingent Valuation Method
DDB/DVB- Dang Development Board; **DVB-** Dang Vikas Board
D.S.F- D.S Foundation
DRDA- District Rural Development Agencies
GGS- Gram Gaurav Sansthan
GP- Gram Panchayats
IMF- International Monetary Fund
IRR- Internal Rate o Return
IWMI- The International Water Management Institute
NABARD- National Bank for Agriculture and Rural Development
NGO- Non-Governmental Organizations
NPM- New Public Management
NREGA- National Rural Employment Guarantee Act
GoR- Government of Rajasthan
RGICS- Rajiv Gandhi Institute for Contemporary Studies
SIT- School for International Training
SPDA- Special Purpose Development Agency
SPV- Special Purpose Vehicle
UBC- University of British Columbia
WTA- Willingness to Accept
WTP- Willingness to Pay

EXECUTIVE SUMMARY

The Dang region in Rajasthan is one of the most poverty-stricken areas in India, largely due to the arid local climate. The harsh environment contributes to water scarcity, land infertility and overall low productivity. The grassroots organization Gram Gaurav Sansthan (GGS) has designed and successfully promoted community-led development practices in 75 villages in the region. GGS' work yields significant improvements in the living conditions of participating villages. However, given its limited resources, GGS has been unable to upscale its successful practices across the region. Over 2000 villages across the eight districts that form the Dang region have not benefited from GGS' community-based water harvesting (CBWH) model and still require actions.

In 2004-05, the Government of Rajasthan (GoR) created the Dang Regional Development Plan to address development issues in the region and put in place a Special Purpose Development Agency (SPDA) called the *Dang Development Board* (DDB) to govern the development program. To rise up to the challenge, GGS hoped that the DDB could channel funds to promote the successful CBWH practices. However, such hope never materialized.

To assist Dang region's development in the context of harsh environmental conditions, a UBC research team collaborated with GGS to identify the appropriate policy reforms at the government level and the optimal strategy for advocating them. The team started its research in September of 2019 by studying the conditions in Rajasthan through literature review and meetings with the team's clients and mentors. In early December, the team embarked on a field trip that led to visiting three cities (Karauli, Jaipur, and New Delhi), seven villages, collected quantitative and qualitative data as well as audio and visual records. The team further spent the first quarter of 2020 to conduct more interviews, further literature review, reflection, and data analysis, which resulted in this report.

Overall, the team was oriented to answer the following two questions:

1. What are the barriers and limitations preventing the DDB from enacting policies that enable successful community-based water harvesting practices; and what gaps does GGS need to bridge to help DDB realize its full potential?
2. What policy reforms should GGS advocate for the promotion of successful community based water harvesting practices to the Government of Rajasthan?

To answer these research questions, the team's data collection consisted of primary research--which included in a field visit during the first two weeks of December 2019--and secondary research including literature review and synthesis. During the field visit in India, the team adopted the following data collection methods including but not limited to:

- Focus groups: The UBC research team identified village residents as a primary stakeholder group. As per UBC's ethical guidelines, the team engaged with these

vulnerable persons via focus group discussions. The team conducted a total of seven focus group discussions in seven villages.

- Interviews: To build a more comprehensive understanding of the issues, the research team interviewed bureaucrats, NGOs and academics in Karauli, Jaipur, and New Delhi. Through a total of seven interviews—four with bureaucrats, two with NGOs and one group interview with academics—the team was able to gather information on key insights into the contemporary issues on the ground.

The secondary research consisted of a literature review on land and water management (LWM) in India, Special Purpose Vehicles, Community-based Organizations, women and water inequity, as well as data analysis of records from GGS and DDB. Based on the primary and secondary data collected, the team evaluated and compared three major government land-and-water development initiatives with the GGS model. Informed by both the primary and secondary research, the research team found that all three government schemes were inadequate in various aspects for CBWH purposes. Consistent with the team's initial understanding, most of the government-built micro-water harvesting structures the team visited were in poor shape. These schemes are problematic because:

- The Watershed Department (Watershed Development and Soil Conservation Department) in the region focused on watershed development strategies but lacked emphasis on increasing farms' access to water for irrigation purposes.
- The Dang Development Board was organizationally limited by the lack of decentralization, which prevented DDB from being flexible in the development process. The DDB appeared to be inadequate in evidence-based decision making, outcome of structures, efficient resource allocation, good governance, community involvement
- The NREGA Program had been inconsistent with the quality of its work. Moreover, since NREGA depends on the decision-making at the Gram Panchayat (GP) level, small villages and other villages that are politically disadvantaged at the GP level often find it hard to secure their interests through NREGA projects.

In comparison, the GGS model is based on a participatory decision-making process. GGS assists communities in prioritizing and deciding the most appropriate structures to build and how to administer the resources. Nevertheless, in this model, the communities are key as decision makers. The model is based on the principle of cost-sharing and shared-responsibilities, which generates stewardship and a sense of collective ownership. The team finds that water-harvesting structures built with the help of GGS significantly increased water availability for irrigation and consumption purposes, and improves productivity of farmlands where such structures were built. Given the success rates of the GGS model, the research team considers that this community-based water harvesting approach offers a more suitable alternative to addressing LWM issues.

However, GGS lacks the financial resources to expand their operations across the region, and even to fully cover many of the villages where they have presence. Most of GGS' funding comes from external non-governmental agencies such as RGICS, NABARD, and D. S. Foundation. The speed of GGS' operation process is chiefly dependent on and constrained by

the resources available to GGS. Therefore, acquiring additional resources is paramount for upscaling the GGS model for CBWH practices.

The research team also examined whether government funding that has already been mobilized but not well allocated. While GGS previously hoped that DDB could reform its policies to contribute to the promotion of successful CBWH, the research team finds that the DDB suffers from major operational problems resulted from poor institutional design, and therefore DDB does not appear to be the appropriate policy reform venue. There is not enough evidence suggesting that the Watershed Department would reform its policies, especially as the Watershed Department focuses on a grander strategic level than GGS does. Nonetheless, the NREGA program offers an opportunity for GGS to assist villages and Gram Panchayats to promote CBWH practices. The recent development proves that this opportunity may stand for the future of upscaling CBWH practices in Rajasthan.

Here are the main recommendations that the research team makes to GGS, the detailed account of which can be found on page 38 of the report:

- 1. Utilizing the NREGA scheme as an alternative source of funding**
- 2. Using data to strengthen GGS' advocacy capacity**
- 3. Adopting a gender lens**
- 4. Improving internal capacity**

ACKNOWLEDGMENTS

We recognize that our project was conducted on the traditional, ancestral, and unceded territory of the Musqueam people. This research is part of the authors' capstone project, the Global Policy Project at the University of British Columbia (UBC), Canada. We would like to thank the Rajiv Gandhi Institute for Contemporary Studies (RGICS), particularly Vijay Mahajan, Jeet Singh, and Meeth Kumar and Gram Gurav Sanstha (GGS); especially Sanjeev Kumar and Jagdish Gurjar for giving us the opportunity to engage in meaningful policy work. This project would not have been possible without UBC's School of Public Policy and Global Affairs (SPPGA) faculty and staff for all their support throughout the project with a special thanks to our advisors Dr. Enarth and Dr. Kandlikar for the invaluable input they provided. We are grateful to the bureaucrats and non-for-profit representatives who took time out of their busy schedules to engage with us. We are also very immensely thankful to the village residents who welcomed us in their homes.

ABOUT THE AUTHORS



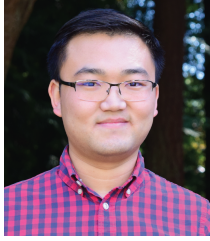
Tamara Friedman is a goal-driven, passionate individual with an intent to focus on community building. Her experiences draw on Migratory issues. Previously, she was a research assistant for the resettlement of Syrian Refugees in Metro-Vancouver, a junior Policy Analyst for Global Affairs Canada (GAC) in the Middle East branch, and is currently a research assistant focused on the meaning to belong on unceded territories in British Columbia. Moreover, she is the co-case monitor for a local NGO where she advocates for the release of wrongfully detained civil activists.

Tamara will make meaningful contributions to this project through her strong analytical, research and communication skills. She will draw on her previous work in cross-cultural settings and domestic development to help implement long-lasting and effective policies in the Dang region.



Sanmini Koffi is a passionate and hard-working critical thinker. Over the past year, she has engaged in policy advocacy research first as a research assistant for the City of Vancouver (CoV); and currently as a policy consultant for Vancouver Coastal Health (VCH). In her research position, she assisted in the design, implementation and data collection of the CoV's Solution Labs. As a policy consultant, she designed a policy advocacy toolkit for VCH. Sanmini is currently working with diverse VCH stakeholders to implement this work on health-related issues in British

Columbia. She hopes that her critical thinking, creative problem-solving and communication skills will help the team deliver a meaningful final product for GGS, RGICS and ultimately residents of the Dang region.



Chengkun Lv prefers to look at policies from a history-informed perspective. He studied history during his undergraduate education, and it remains his interest to learn about how different interests and perspectives have shaped our world. He is an active student organizer of academic events on Canada-China relations. During the past summer, Chengkun worked as a public relations consultant for a private company. He completed reports to help the company understand the policy-making process involved and helped in designing strategies on how to navigate through it. Chengkun is eager to apply his policy training, history and PR toolkits, and creative thinking to expand the land and water conservation practices in the Dang region.



Andrés Peñaloza is a creative and committed problem solver with a great passion for public and social issues. He has a degree in urban planning and over five years of experience working as a city planner in different municipalities from Caracas, Venezuela, where he coordinated, supervised and developed projects in a diversity of geographic and socio-economic contexts. At the same time, he worked with several NGOs focused on violence, education, political engagement and food security. He is currently working with the Housing Research Collaborative, based in UBC, assisting in multiple coordination and production tasks. Andrés hopes to contribute to this project with his process-oriented mind and experience in development environments to help the team create thoughtful outcomes that have a meaningful impact in the Dang region.

CLIENT PROFILE

Gram Gaurav Sansthan (GGS) is a community-based grassroots organization that aspires to improve the living conditions of residents of the Dang region in Rajasthan, India. The region is faced with a significantly arid climate; which limits prosperity for local villages. GGS has been working with local communities to address these issues since 2001. The organization primarily focuses its efforts on the conservation of water and land by refurbishing “indigenous knowledge on water and soil conservation, and [constructs] traditional structures” (GGS, 2018^a).

In order to build the aforementioned structures, GGS designed a cost-sharing model that not only creates sustainable development practices, but also empowers local communities. Indeed, through funding organizations such as the Rajiv Gandhi Institute for Contemporary Studies (RGICS), National Bank for Agriculture and Rural Development (NABARD) and the D.S Foundation; GGS is able to fund a portion of the cost of the traditional structures. Villages are also required to contribute to these costs through financial means, the provision of local materials to build the structures, as well as physical labour.

It is important to note that GGS does not initiate partnerships with local communities. In fact, GGS acquires new partners through word-of-mouth. In other words, villages in the Dang region hear about GGS’ work through their counterparts. If the communities are interested and can afford the partnership, the villages reach out to GGS. In turn, the grassroots organization uses the funds it receives from its funders to finance a portion of the projects. In essence, these projects involve the funding and construction of small traditional water harvesting structures such as *Pokhars*, *Talls* and *Pagaras*. By requiring villages to contribute to the structures, GGS provides a sense of ownership of water and land for local residents. This, in turn, creates sustainable development practices in the partner villages, and ultimately in the Dang region.

Over the years, GGS was able to make a significant difference in the lives of local residents. For instance, the GGS model has improved the quality of the soil, livestock, agricultural production as well as access to clean water in over 75 villages. These improved living conditions are transforming the quality of life outcomes for villages in the Dang region. Indeed, sustainable development practices and community empowerment allow farmers to grow crops such as wheat, rice and millet. Households can then use the profits of their labour to feed their families, finance education and have savings. As one village resident explains, “GGS has transformed our lives [...] education is no more a dream for our children” (Rajiv Gandhi Foundation, 2017)

To supplement its capacity, GGS works in close partnership with the Rajiv Gandhi Institute for Contemporary Studies (RGICS), an “independent national policy think tank promoted by the Rajiv Gandhi Foundation” (RGICS, 2017). The organization conducts research and policy development on issues in India. RGICS has been a quintessential source of information and knowledge for the team.

INTRODUCTION

The state of Rajasthan is located in the Northwest of India. It is home to the Thar Desert. The Dang region is located in the South of Rajasthan. It encompasses Karauli, a segment of Dhaulpur, and Sawai Madhopur district of Rajasthan State. In the Dang region, poverty is pervasive. Geographic conditions make it “one of the most resource-deprived, and arid regions of Rajasthan state” (GGS 2018b). The three-month rain season provides around 580mm of water a year, and local rivers are mostly non-perennial, making access to water extremely limited. Moreover, the lack of water has a degrading effect on the quality of the soil. This is especially challenging for the local population because they depend on agriculture for subsistence, mainly growing crops of paddy, pearl millet, wheat, and mustard, as well as livestock food. Since villages are rural, they lack necessary infrastructure. Villages anticipate improved access to health care facilities, roads, education, health, electricity, drinking and irrigation water. Low productivity results in less financial means, hindering their ability to develop infrastructure or services including roads, education, health, electricity, drinking and irrigation water. As a result of these hardships, village residents are forced to migrate to other areas to have access to water for their households, livestock and farm land.

In order to address these issues, in 2004-05 the Government of Rajasthan constituted a multi-member body called the Dang Vikas Board (DVB), also known as the Dang Development Board (DDB). This entity is in charge of providing advice and funds for new development schemes in the region, as well as monitoring the implementation of such projects. However, the evidence suggests that the policies implemented by this body have not been able to generate effective and sustainable change in the region through the construction of “community-based development infrastructure” and “community and physical asset creation”, thus creating a demand for organizations like GGS to intervene and introduce alternatives for development.

While GGS has had a compelling impact in the region, its work has been mainly focused around the Karauli District. Over 2000 villages across the eight districts that form the Dang region have not benefited from their community-based water harvesting model and are constrained by limited resources. The organization aims to expand its approach to assist those in need but its impact is constrained by a lack of resources and operational barriers.

With the help of funding partner and think tank Rajiv Gandhi Institute for Contemporary Studies (RGICS), GGS hopes to remedy its social, political and financial limitations as well as expand and promote its practices throughout the Dang region. Its goals are to upscale successful community-based water harvesting practices and impact the policies carried out by the Dang Development Board and the government of Rajasthan.

This project will be focused on the exploration of ways in which GGS can effectively advocate for the promotion of successful CBWH alternatives at the state level. To do so, our project:

- Analyzed some of the Government's water harvesting programs, including the Natural Resource Management and Institution Development work done by GGS, that studies their strengths, weaknesses, opportunities, and threats.
- Developed a criteria that we refer to as the five broad themes to assess the government and GGS' land and water management models
- Identified the practices that enable and/or limit GGS' capacity
- Provided recommendations to strengthen GGS' advocacy capacity

In addition, our team engaged in fieldwork in India during the first two weeks of December 2019. Our visit allowed us to improve our understanding of the local context and gather primary data. We visited villages in Karauli, the state capital (Jaipur) and New Delhi. The methodology section provides a detailed account of the data acquired and other key insights from the field.

Upon completion of this research project, we expect to contribute to GGS' policy advocacy capacity. We hope to achieve this by providing recommendations that permit the adoption of successful community-based water harvesting (CBWH) practices across the Dang region.

POLICY CHALLENGE

The Dang region is one of the most poverty-stricken regions in India. The arid climate perpetuates a harsh environment which contributes to water scarcity, land infertility and overall low productivity for local residents. To address these issues, the Government of Rajasthan (GoR) created the Dang Regional Development Program in 2004-2005, and the aforementioned DDB was established as the central decision making body of this program. The program mainly tries to fill developmental gaps in the area and take activities such as construction of schools, hospitals, roads, distribution of electricity and water, etc. A notable omission in the scope is natural resource regeneration in the region. Evidence suggests that the policies the DDB has implemented have been unable to generate effective and sustainable change in the region (Mahajan, 2019). Moreover, the data suggest that bottom-up approaches to development such as community-based development can create tangible changes for these communities. Yet, despite this, the government seems to maintain its top-down approach to land and water management programs. It is important to note that change takes time in governmental organizations; it is therefore not unusual for the government to continue to operate according to the status quo. Nonetheless, this significantly contributes to the lack of sustainable CBWH practices in the region and ultimately to the precarious conditions residents face. To remedy the issue, GGS initially sought to upscale its model through DDB's funding; this encourages community-based organizations (CBO) and Gram Panchayats (local governments) to champion sustainable development initiatives that improve the living conditions of disenfranchised households. However, we discovered through our fieldwork that the DDB may not be the most appropriate vehicle to achieve GGS' goals. The following sections will elaborate on this matter further.

Problem statement and Research Questions

There are challenges to upscaling successful community-based water harvesting practices in the Dang region. To better assist GGS in its mission, we ask the following questions:

1. What are the barriers and limitations preventing the DDB from enacting policies that enable successful community-based water harvesting practices; and what gaps does GGS need to bridge to help DDB realize its full potential?
2. What policy reforms should GGS advocate for the promotion of successful community based water harvesting practices to the Government of Rajasthan?

METHODOLOGY

Our research methodology consisted of focus groups, interviews and secondary research. Over the span of two weeks, we conducted interviews with four bureaucrats, five NGO representatives and seven villages—with and without GGS projects. Involving these actors enabled a well-rounded, dynamic environment that laid the foundation of our research. Our intention was to include various perspectives when researching policy change avenues.

The following section will detail our fieldwork and the methods we used to acquire our primary data.

Focus Groups Discussions: Village residents

As previously mentioned, GGS operates according to a community-based initiative model. In light of this structure and literature review on the topic, we identified village residents as one of our primary stakeholder groups. As per UBC's ethical guidelines, we engaged with these vulnerable persons via focus group discussions. We conducted a total of seven focus group discussions in seven villages in Karauli namely Bamuda, Abatki, Motoriyaki, Teen pokhar, Maharajpura, kashiyapura, and a village that the client could not identify.

Each interview was operated by two students, one male and one female. Whenever possible, we facilitated two focus group discussions, one targeting all village residents and the other focused on women in the village.

Interviews: Bureaucrats, NGOs and academics

To further understand the complexities and dynamics at play, we conducted a series of interviews with diverse experts.

Bureaucrats: We were able to interview five ground-level and mid-level bureaucrats including the Chief Planning Officer (CPO), Chief Executive Officer (CEO), Lead Engineer for the Watershed Department of the Zilla Panchayat and one Gram Panchayat representative. Initially, we had hoped to interview the District Collector, however, due to unforeseen circumstances we were unable to do so. These interviews provided key insight into the inner workings of the government, their land and water management models as well as some key challenges.

NGOs: We conducted four interviews with a total of six NGO representatives including GGS, RGICS, the Centre for Microfinance, a former World Bank representative, and an NGO Consultant. The purpose of these meetings was to better understand the relationship between NGOs and the government in India, the barriers and challenges they encounter as well as the strategies they use to foster change. Given their familiarity with

Indian bureaucracy, advocacy and/or land and water management issues in the country, they provided key insights into the realities on the ground.

Academics: While in India, we secured an interview with the School for International Training (SIT). We had hoped to interview additional expertise on policy advocacy relevant to our project to close the knowledge gaps we encountered throughout our research. For instance, our ability to engage with women be it in villages or with bureaucrats and NGOs was limited by various circumstances and realities on the ground. Unfortunately, due to unforeseen circumstances we were unable to use the information provided. Overall, we interviewed academics to widen our perspectives on the issue.

Field Notes

In the process of conducting field work, we were exposed to diverse interactions and environments. Each team was exposed to water-harvesting structures from both the government and GGS implemented throughout the region. The contrast between the two models prepared us for key findings during our field work. Whenever possible, each team member captured the subtleties of these dynamics in their respective field notes as part of our observational data. The latter has been included in our analysis and further supplements our findings.

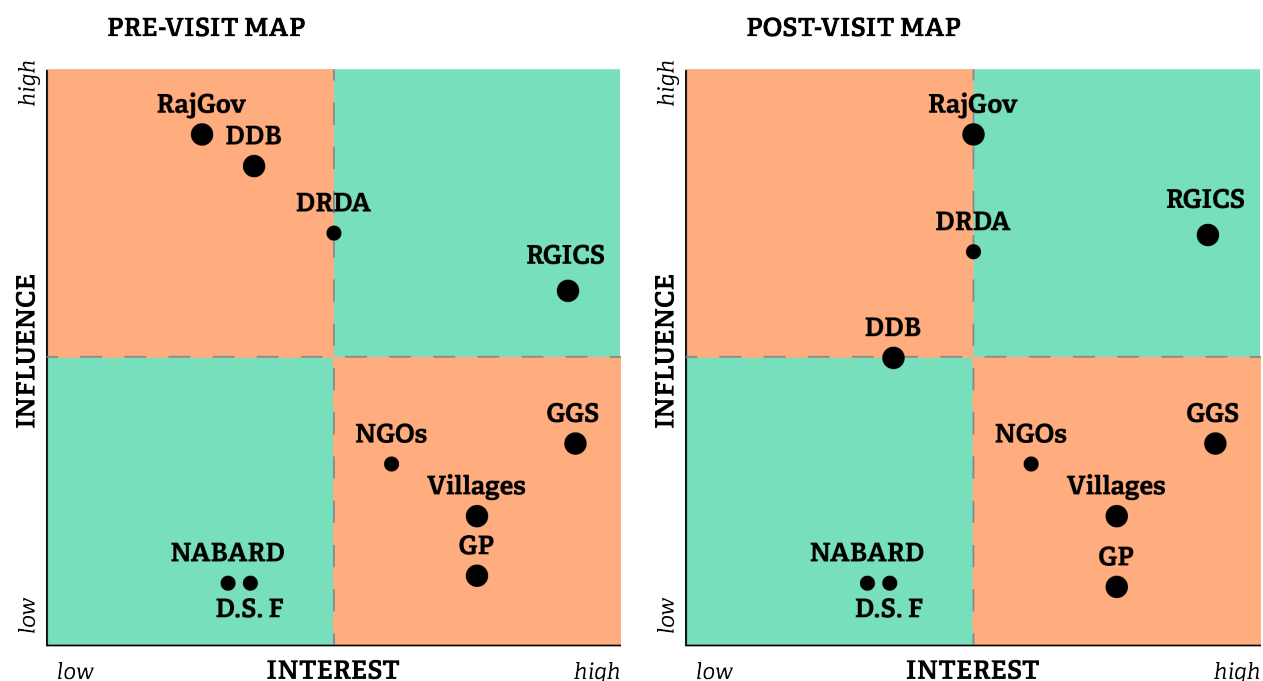
Data Analysis

Over a period of six months, we gathered and synthesized secondary and primary data. We then divided them into qualitative and quantitative datasets. In terms of our qualitative work, the key themes, findings, and challenges across interviews and focus groups are used to support our analysis and recommendations in the following sections. Additionally, our report includes a comparative analysis of the government CBWH management model and GGS' model. Using a standardized set of criteria, we compare the studied models to be able to determine the advantages that GGS' model offers. Our recommendations and advocacy strategy will also be based on this analysis.

Secondary Research: Documents, reports, data and academic literature

We began our data collection with secondary research given the limited amount of time we had in India. Using official government documents, reports and data provided to us by GGS and RGICS, as well as academic literature, we assembled the background knowledge necessary to explore our two research questions. We constructed our questions using both a qualitative and quantitative lens. The majority of the information collected as part of our secondary research forms the basis of our qualitative analysis. The literature review section provides a more detailed account of our secondary research. In addition to our qualitative analysis, GGS and RGICS also provided us with datasets containing over 400 observations capturing variables such as size of affected land, change in crop production, change in available drinking water, and cost of structures. This dataset is not extremely reliable and it required substantial cleaning before being ready for analysis. The latter was used in conjunction with data from our fieldwork to conduct a quantitative analysis.

Moreover, our secondary research also allowed us to map out key stakeholders as per the stakeholder map below. Given the complexity of the issue we explored and selected stakeholders according to their degree of influence and interest on the matter. Based on available resources such as time and stakeholders' availability, we drafted a shortlist of stakeholders for our primary research, and as shown below, our initial understanding of some of the actors changed after the field visit and research. Events explained in later sections demonstrated that the GoR is potentially more interested in supporting GGS' initiatives than we originally anticipated; the same events showed us that RGICS can be more influential thanks to the networks of its members; moreover, the DDB resulted to be less influential due to its lack of autonomy and other considerations on which we elaborate upon in later sections.



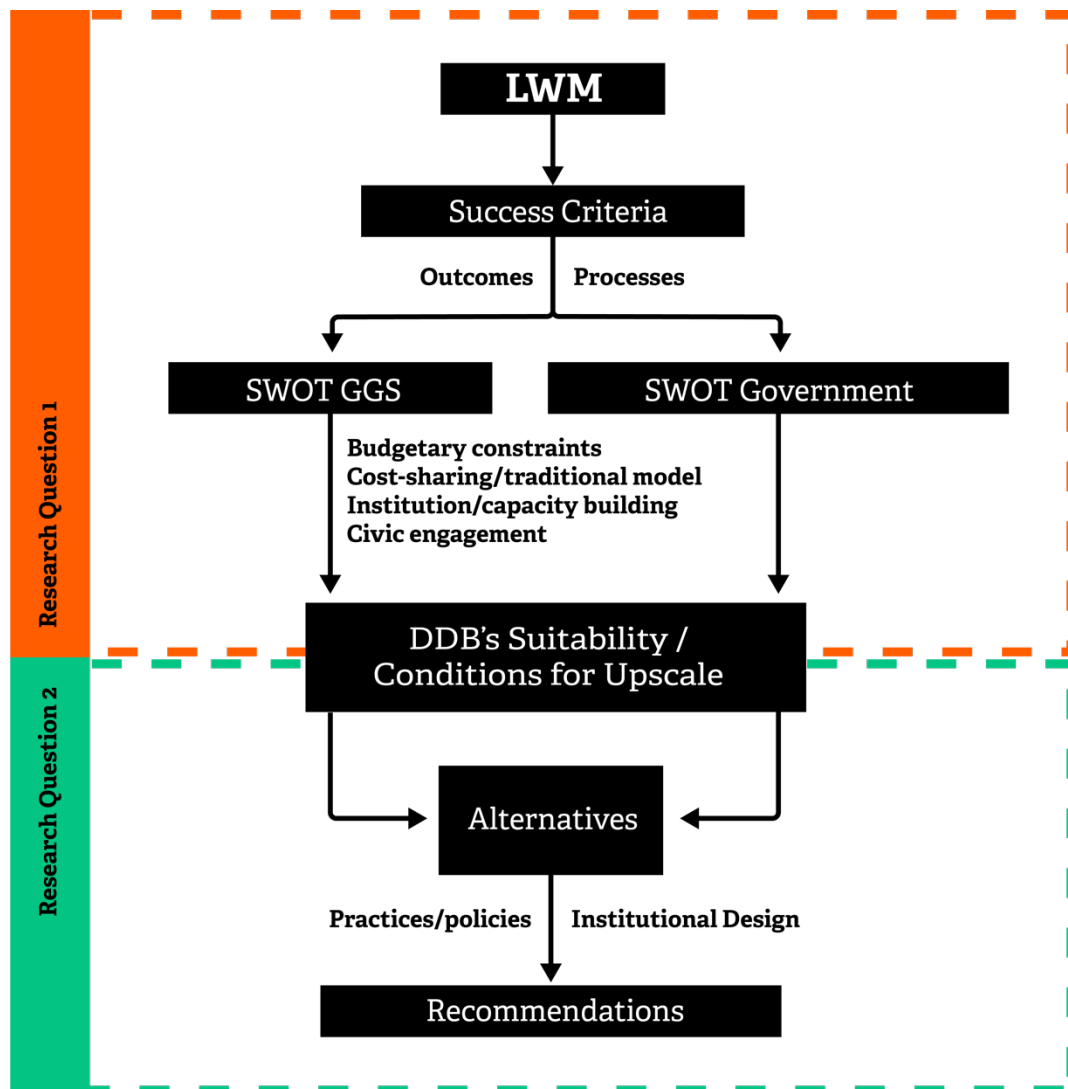
ANALYTICAL FRAMEWORK

The analytical framework developed for this research project attempts to present a logical route to gather and process the information needed to produce the expected deliverables. The proposed framework illustrates the relationship between our two main research questions and the different considerations needed to generate comprehensive and holistic recommendations that ultimately strengthen GGS' advocacy for successful CBWH practices through our findings.

To find the answer to our first research question the framework proposes a comparative analysis between GGS' and the government's CBWH practices and policies. This analysis requires the development of criteria for successful CBWH practices, based on the most appropriate processes and expected outcomes. The criteria serves as a reference for

comparison. It will inform us of the suitability of DDB as a vehicle to address the challenges in CBWH in the region

This comparative analysis will also allow us to understand the conditions needed for an upscale in GGS' operations and furthermore, it will reveal the key advocacy strategies to achieve GGS' goals.



LITERATURE REVIEW

This section will cover land and water management in Rajasthan, Special Purpose Vehicles (SPVs), community-based organizations and advocacy strategies as well as women in terms of water equity. This is to depict how water harvesting structures are being used and implemented in the region, how the government and civil society have approached the situation, as well as how water is domestically used for villagers in their daily lives.

LAND AND WATER MANAGEMENT IN RAJASTHAN

Rajasthan is the largest state in India, with 34 million hectare land area (equivalent to 10 percent of the country's surface), of which 13.3 million hectares is under cultivation. However, only 3.3 million hectares is irrigated, with two thirds of those being through mechanisms that depend on rainfall for recharge, while the rest on the non-irrigated agricultural land is entirely dependent on rainfall. In the arid regions of Rajasthan, approximately 90 percent of the rainfall is concentrated between July and September making it extremely difficult to capture, store and manage the runoff. These conditions puts at risk nearly 70 percent of the population of the state whose livelihoods depend on agriculture and the allied sector (Gupta, 2016; Everard, 2015; Jayanti, 2009; GoR, 2002)

Even before the independence, the focus of the government has been to maximize revenue from agricultural production, prioritizing large reservoirs, canals and wells over small water harvesting structures that primarily help groundwater to recharge and also serves as watering point for cattle (Gupta, 2016). However, historically, government implementing agencies in India have avoided involving local communities (beneficiaries) in decision-making, which according to Shah (1999) is the most important flaw in watershed development in India. On a positive note, Gupta (2016) highlights three shifts in the last couple of decades:

1. Increased role of non-government actors + reduced role of the government,
2. The rise of the sustainability-participation-traditional knowledge discourses,
3. Increased investments from state and non-state actors in "ecologically fragile" regions of India, to increase the productivity of irrigated lands and reduce regional disparities.

A large part of the opposition to building large dams has come from civil society groups, that argue that the control over the water should remain under the control of village-level institutions (panchayats) (Kumar, 2018). "They perceive the state as an aggressor, which leads to the untenable position that water development technologies, (...) are detrimental because of the human displacement and ecological destruction, which ultimately lead to social conflicts." (Lyer, 2005). This is why many groups in India, in their fight against privatization of the water resources, advocate for decentralized management at the village level. However, this mechanism comes with its own set of limitations and caveats. Mainly, one important argument against it is that it potentially allows another kind of privatization

through elite capture, thus hampering all efforts of increase in equity in resource distribution (Kumar, 2018).

To decentralize water management would imply the restructuration of an already complicated affair at the government level. The literature reports that across and within multiple states, watershed development schemes are an issue of overlapping competencies of diverse government agencies, that each imposes their own approach to the policies implemented. “Such uncoordinated planning leads to over-appropriation of the resource. Intensive watershed development desilting of tanks, etc., reduces inflows into reservoirs downstream” (as seen in Kumar, 2015, p.9), however, these concerns can lack of proper legal foundation since the right for prior appropriation of water establishes that the water that reaches an specific area can be kept there for beneficial use and the remaining water can be used by subsequent users.

There are many virtues attached to decentralized management of water supply, especially in rural contexts. Shah (2009), for instance, explains that small water harvesting and recharge is “more cost-effective and capable of producing high incremental returns per unit of water generated” than traditional methods (as seen in Kumar (2018) p.6). Literature has shown how levels of groundwater can improve dramatically with positive management. Through community empowerment initiatives, watershed productivity has risen up to 250 percent, while also reversing the degradation of natural resources and habitats (Wani and Ramakrishna, 2005; Wani et al., 2006). Furthermore, the work by organizations like TBS have helped to elevate the discussion about the necessary legislative reforms concerning the decentralization water management (Everard, 2015).

Despite the fact that the implementation of small water harvesting structures has had a great impact in the increase of crop productivity, recovery of ecosystems, and distribution of the resources, and yet, “successive Five Year Economic Plans developed by central government still regard water as a commodity to be exploited ‘...in exactly the same way as any other resource’” (as seen in Everard (2015), p.132), completely disregarding the vitality of water access for people’s livelihoods.

SPDA, SPECIAL PURPOSE VEHICLES (SPV) AND JOINT VENTURE

Special Purpose Vehicle (SPV) is a form of public-private partnership (PPP); and in the context of India, the more precise word is Special Purpose Development Agency (SPDA). In a PPP, the “public” stands for the government, and the “private” stands for business or not-for-profit bodies such as the World Bank (Skelcher, 2007). The main contexts for SPVs are where development activities are financed by entities, such as international donors, private and corporate foundations, social and impact investors and philanthropies etc. (IDAS, 2017). An SPV is a joint venture, and joint ventures are for long term partnership. There are two primary functions for joint ventures: Firstly, to deliver projects where the “public” and the “private” share interests; secondly, to provide the government with capital from and transfer part of the risks to the “private” side (Skelcher, 2007). For example, one of the key actors in this research -DDB- is a special purpose vehicle as a result of the joint venture between the

Government of Rajasthan and the World Bank, which aims at the long term development of the Dang Region.

There are three probable major factors to explain why the Government of Rajasthan chose to establish a joint venture with the World Bank and create a special purpose vehicle. First of all, the reform movement “New Public Management” (NPM) had swept through many Commonwealth countries (Rainey and Chun, 2007) since gaining prominence in the 1990s (Vining and Weimer, 2007). One of the major drivers behind the movement was the common perception that “public management [i]s inferior to business management and in need of improvement” (Rainey and Chun, 2007). This movement continued well into the 2010s. Such was the international intellectual context for creating the joint venture between the World Bank and the Government of Rajasthan. Secondly, joint ventures are known for “encourag[ing] innovative solutions since the project is specified in outcome terms” (Skelcher, 2007). According to Skelcher (2007), the third reason for a joint venture would allow the government to transfer part of the risks - especially those associated with planning, design, and performance etc.- to the “private” side (2007).

However, joint ventures are also associated with a series of risks and barriers. On the public side, a very common institutional barrier is that “political primacy handicaps partnership” (Van Ham, Koppenjan, 2002). This barrier appears to be correlated with the common phenomenon following the NPM movement: intensified politicization that erodes the “public service tradition of impartiality” and “nonpartisan management of the public service” (Aucoin, 2012). Souver governance structures for the SPVs usually involve the owner(s) appointing the governance, and the governance appoints the manager(s) who then run the SPV (IDAS, 2017). Political primacy could severely undermine this process, leading to the owner micromanaging the institution but without willingly sitting at the board of governance (IDAS, 2017). Meaningful autonomy is critical for SPVs to function properly (Anonymous, 2019). Without an appropriate degree of autonomy, SPVs could neither deliver innovative solutions nor properly transfer risks to the “private” side.

On the private side, among the many risks, the most severe ones is political discontinuity and the policy risks (Skelcher, 2007). Political primacy amplifies the damages of political discontinuities and policy changes. These potential damages, combined with the risks transferred from the public side, could severely limit the room for the private side to take advantage of its strength (such as flexibility).

It is no wonder that, during the research trip in India, a former World Bank employee communicated to us that an SPV without proper autonomy is a lost cause (Anonymous, 2019).

COMMUNITY-BASED ORGANIZATIONS, COMMUNITY-LED INITIATIVES AND ADVOCACY STRATEGIES

The debate on CBWH projects in India has various camps. Some studies indicate that “advocacy groups have been highly influential in shaping water-and energy-related policies

in India, as is evident in many policies, programmes and projects of the government during the past couple of decades” (Kumar 2017).

In the early 1990s, India made a commitment to decentralize local projects related to watershed development, rural drinking water supply and sanitation as well as women's development and empowerment (World Bank 2005). This decentralization policy's underlying assumption is that localization improves transparency and accountability in development-related “activities, governance and service delivery” (ibid, p.4). However, decentralization continues to face challenges that limit performance in development projects including:

- “unwillingness on the part of central, state, and substate governments to devolve significant powers or resources to implement the activities provided for by legislation;
- the paucity of funds—particularly untied funds—available to transfer to local bodies, and the lack of a revenue base at the local level; the problem of local elites capturing decentralized organizations and the accompanying resources;
- the inability of local government organizations to respond to local needs and priorities;
- the lack of accountability of service providers to citizens;
- and the poor design of decentralized interventions by governments and donor agencies” (ibid).

Moreover, the study also found that while local government bodies in India are deeply engaged in the execution of local water-related projects such as drinking water supply and sanitation, elected governing bodies such as “gram, tuluk, and zilla panchayats [...] are often ineffective in performing their assigned functions”. (World Bank 2005, p.3).

To circumvent some of these challenges, governments in India and development organizations have increased their dependence on NGOs. However, such organizations lack sufficient financial, material and human resources to achieve their goals (World Bank 2005).

Yet, CBOs have the ability to bring to light the voices and interests of the communities they serve. In doing so, they can empower communities to sustainability improving their living conditions. Indeed, when individuals are dependent on degraded land or land that is susceptible to degradation, their risks of being trapped in a perpetual cycle of poverty increases significantly (van Haren et. al 2019).

Other studies have shown that the use of traditional/indigenous technologies for sustainable land management can lead to significant impact on the land and the communities involved. Moreover, the latter can be achieved with limited resources (van Haren et. al 2019). In fact, this particular study suggests that the communities' resilience relies on the sustainable use of land as well as sustainable responses to land degradation. In such, van Haren et al. argues that given communities' quintessential role in sustainable land management, members of such communities should be supported by enabling policies “to

promote inclusive and sustainable land management in a given physio-geographic and climatic context” (ibid, p.218).

According to another World Bank study on the effectiveness of community-based water projects, involving households in the design process and allowing households to be the final decision makers on the design and implementation of water projects promotes the performance and impact of such projects. Moreover, when households have appropriate information about the cost and maintenance requirements of water projects, they are able to make decisions that “promote the performance and impact of community-based water services” (World Bank 1999, p.40). In fact, the report explains that social capital, particularly in terms of active participation and association, significantly influences the performance and impact of water projects. Moreover, when levels of social capital are low, the allocation of resources for community-based water projects should take into account and reflect the lack of social capital (ibid). Furthermore, Anderson (2011) explains that

“Much previous work has demonstrated a negative correlation between ethnic diversity and economic outcomes (...) more ethnically diverse communities have greater difficulty sharing public good resources , and are less able to impose social sanctions that prevent collective action failures. Previous empirical work, particular to India, has demonstrated that ethno-linguistic fragmentation, applied to cast and religious divisions, negatively correlates with access to public goods” (p.240).

It is important to nuance, nonetheless, that external support to communities is a double-edged sword. Indeed, external support to communities can achieve positive results for the communities when communities request external support. If unsolicited support is given, studies show that communities have difficulty to adapt and it can lead to successful water management practices (Murtinho et al. 2012).

As previously mentioned, the success of community-led initiatives depends, in part, on the support they receive. In addition to financial and material support, CBOs can use policy strategy approaches to increase the support of community-led initiatives through what Sabatier (1986) identifies as “the bottom-up approach”. Our policy advocacy strategy for GGS is based in part on Sabatier’s approach. In essence, this strategy requires:

1. “[The identification of] networks of actors involved in service delivery in one or more local areas and enquire about their goals, strategies, activities and contacts.
2. [The use of] the contacts as vehicles for developing a network technique to identify the local, regional, and national actors involved in the planning, financing, and execution of the relevant governmental and non-governmental programs” (Sabatier 1986, p.32).

Sabatier’s approach echoes James’ (1999) understanding of democratic decentralization. The author explains that when communities are given the opportunity to contribute decision-making through supervision or influence over projects implemented in said community, such initiatives can not only ensure the voices of members of the community are heard, but it also promotes democracy. However, James (ibid) nuances that

this form of supervision and influence is often done informally and is thus contingent on the political will of local public officials.

As Enarh (2008) summarizes, the value of decentralization is a function of its goals. Where decentralization is used to implement and monitor natural resources, it can have positive impacts. However, when decentralization is applied to governance including but not limited to “responsiveness and accountability, diversity and political participation”, it can have both negative and positive effects. On one hand, it can improve political participation; on the other hand, it can result in elite capture whereby dominant groups within the community exercise total control and/or power. In essence, the value of community-based initiatives and advocacy strategies lies in their ability to uphold democratic principles by giving communities a voice in the decision-making process without exclusively representing the interests of dominant groups.

WOMEN AND WATER INEQUITY

Women’s roles in their communities are integral to water activities. In India, water is closely intertwined with notions of purity, regeneration, creation and destruction (Ahmed 2005). Since women are the bearers of children and nurturers of life, they are closely associated with water — rivers are considered goddesses (Ganga Ma) — and said notion is known as ‘ecofeminism’. Women have multiple roles in their communities yet are anchored by domestic duties and child rearing. For instance, women are the domestic water collectors and water users for cooking, cleaning, hygiene and other household activities. Women were previously not considered to be apart of the decision-making process in a patriarchal society since land ownership is for males. If water technologies are available, such as hand pumps or materials to build them, males are the purchasers. Ultimately, women are excluded from water-related decisions, yet are burdened with the responsibilities for its utilization (ibid).

Without access to water pumps, women can travel up to 6-7 hours daily searching for water; with or without hand pumps can walk between 5 to 20 kilometers daily; and take as many as six trips a day to gather and transport water (Everard 2015; Chandran, July 13, 2018; The Water Project). Women transport water by carrying jars or buckets on their heads creating back, feet and posture problems. If a mishap were to happen such as tripping or falling, the carrier would drop her bucket and be forced to return to gather more before returning to her village doubling both her energy and time. Girls as young as ten are required to contribute to household duties and drop out of school as a by-product. Women have a higher risk of infections due to frequent exposure to unsanitary water (ibid). Moreover, during times of drought women are tasked with more duties such as taking care of the elderly and young dependents, tending to the land, and take part in the construction of water harvesting projects since males are forced to temporarily migrate for water (Ahmed 2005).

Previous NGOs and governments have tried to integrate women in the decision-making processes of water resources development, yet they inadvertently overburdened women with more responsibilities. Women perform all the household tasks, fetch the water, and are responsible for household nutrition. Previous introductions to the economic efforts

such as decision-making processes or implementation strategies have varied levels of success. Women are unlikely to attend regular meetings or work in ongoing projects in addition to their required daily duties (UN Women). 1981 marked the era for small-scale, decentralised, community-based approaches that relied on local skills and knowledge of people's participation regarding the management of water related infrastructure (Ahmed, 2005). By the early 1990s, policy consensus related to water were:

- To restructure institutions so the state became a promoter and facilitator of water resources development
- Financial efficiency and cost recovery so both the state and water users contributed to the cost of water harvesting structures
- Community participation and decentralised management so that the decision-making processes were at the lowest and most relevant levels (ibid).

The trajectory for development policies has been to recognize the feminisation of poverty. The appropriate approach is to provide technical assistance for women as well as involve them in policy and research on the structural linkages between gender relations, environment, and development. As mentioned, 1981-90 initiated the International Drinking Water Supply and Sanitation Decade began and was the beginning of recognising the feminisation of poverty. The mid 1990's focused on development and women's issues pertaining to the disadvantaged position women and children hold in the context of environmental degradation, and their pervading lack of access to clean water and sanitation. Circulating narratives included: the acknowledgement of the role of women in water management at the level of the household and community; reinstated the need for women's participation in water management decisions for policies and implementation strategies; called upon governments to promote programmes that reduced the workload for women and girls and facilitate their participation in projects to adopt alternative technologies (Ahmed, 2005). During this era, there was a lack of understanding for gender as an analytical construct. At that point, there were no analyses of gender differentiated needs, uses and constraints in terms of access and control of water (ibid). The International Decade for Action, 'Water for Life' dawned between 2005-2015 and called for women's participation and involvement in water-related development efforts. Moving forward, governments, multi-stakeholders, civil society, and all relevant actors must understand the differences and inequalities between men and women in terms of water resources management. Overall, involving both men and women in water resources initiatives can increase effectiveness and efficiency (UNDESA, 2014).

Access to clean, safe drinking water will eventually lead to poverty reduction. Women would spend less time travelling long distances to attain water, have access to sanitized water and improved hygiene and therefore be able to attend school. If women had more time, they could attend school regularly and earn the same education and skills as their male counterparts. Since women are the nurturers of the family, if their access to water was improved and properly sanitized when they cooked food for their families, cleaned themselves or their families, or dispersed water in any way, they would reduce the risk of infectious diseases and potentially save lives. "If there is water, we have everything and if

there is no water, we have nothing"- Saheli woman from rural village in India (Chandran, July 13, 2018).

CONTINGENT VALUATION METHOD

In recent decades, the management of scarce water resources in dry areas has shifted “from a supply-driven perspective to a more demand-driven” (Sakketa & Prowse, 2017, p.426). This means there has been an increased interest and demand for multi-use schemes that combine productive and domestic uses when addressing water needs. The International Water Management Institute (IWMI) (2006) defines multi-use water services as “participatory, integrated and poverty focused approach which takes people’s multiple water needs as a starting point for providing integrated services” (p.6). “It is also suggested multiple-use schemes can improve gender equity and cost recovery leading to longer-term water supply”(Sakketa & Prowse, 2017, p.428). Women and children are disproportionately affected by inadequate water supply and sanitation services they are the ones who carry the water long distances daily, thereby their productivity decreases and poverty exasperated. Improved water services would increase school enrollment of girls, reduce time spent of drawing and carrying water home, as well as support economic growth. Furthermore, these income benefits may reduce annual costs of health services for both the government and households as clean drinking water could lessen adverse health impacts from water borne diseases. When designed and implemented properly, multi-use water schemes can reduce poverty, health hazards and the vulnerability of rural households (Sakketa & Prowse, 2017). IWMI (2006) argues that water schemes need to incorporate both productive and domestic demand to be efficient, equitable or durable; conventional water schemes that separate productive and domestic demand often fail.

CVM is based on “direct expression of individuals’ willingness to pay [WTP] or willingness to accept [WTA] in compensation for any change in environmental quantities, qualities or both” (Bogale & Urgessa, 2017, p.147). CVM allocates economic value to a wide range of nonmarketable commodities that “measured in relation to utility functions through the concepts of [WTP] and [WTA] compensation, as well as through the related measures of consumer’s surplus” (ibid). Bogale & Urgessa (2017) found that there was a positive correlation between age, wealth, household size and educational level “related to WTP for improved water services” (p.147). Both age and educational levels increase the likelihood and behaviors of those affected to pay for improved water sources since they recognize the relationship between time efficiency and improved productivity—i.e. the possibility of increased income. These results were observed in Ethiopia, Tanzania and Sierra Leone (ibid). In Tanzania for instance, 30 households were “willing to pay higher for the existing tariff charges” to improve community-based rural water utilities (ibid). In all, variables including the existing water condition, time spent to collect water, treating the water, quality of the water source and water expenditure of the household “have positive effects on WTP for improvement” (ibid). Therefore, supplying water for rural households at an affordable price is important to curtail financial burden of the government and enhance sustainable services within the community.

DATA PRESENTATION AND ANALYSIS

ANALYSIS LIMITATIONS AND CRITERIA

In cases where various projects/programs/alternatives are designed to address the same problem, one of the best ways to choose the most adequate one is by using a Criteria Alternative Matrix, in which such options are ranked depending on how they perform across the different variables studied. To make a fair assessment, the information for each of the alternatives needs to be comparable. However, due to the limitations in the process data collection (see Appendix 1), the information available about the existent government schemes for water harvesting projects, including their internal processes, and outcomes of the projects, among others variables, is inexistent or it has been estimated through triangulation of secondary sources. Therefore, the comparative analysis here on, while based on the same criteria, mixes qualitative and quantitative data in the same variables to be able to study each variable.

Moreover, considering that the impact of improved access and increased supply of water has in a village and its people expands to benefits beyond what is easily quantifiable, and/or associated to markets like change in groundwater level or change in productivity, this analysis can be enhanced in the future by incorporating Contingent Valuation Methods (CVM). Through CVM, it is possible to assign economic values to non-market resources and variables such as leisure time, improvements in health, etc., in order to be able to compare them to market-based variables.

Criteria Based Evaluation

During the process of literature review, interviews, focus group, and other observations during the study, we identified a few major criteria for deciding the quality of the structures. With particular attention to end users and local experts' voices, the set of criteria is designed to reflect the reality and opinions on the ground about what are project are most likely to succeed and fulfill the function of water harvesting.

We identified five broad criteria for successful water harvesting-structure development models: Evidence-based decision, efficient resource allocation, good governance, community involvement, outcomes of structures. As indicated below, all these five criteria are based on more specific sub-sets criteria:

A more descriptive explanation about these criteria can be found in Appendix 2.

Outcomes of Structures <ul style="list-style-type: none"> • Increase in water tables • Quality of construction • Improvement of yield • Improvement of access to water for livestock • Improvement of access to water for consumption 	Good governance over the model <ul style="list-style-type: none"> • Speed • Response time • Implementation • Accountability • Transparency • Leadership • Maintenance
Efficient resource allocation <ul style="list-style-type: none"> • Cost-effective • Opportunity cost 	Evidence-based decision <ul style="list-style-type: none"> • Knowledge technical • Knowledge traditional • User-centric
Community Involvement <ul style="list-style-type: none"> • Gender gaps • Caste • Sense of ownership • Prevention of elite capture • User friendliness 	

EVALUATION OF GGS' MODEL

GGs has focused most of their work in communities on traditional small water harvesting structures called Pokhar, Pagara, and Taal. Through a participatory process, GGS assists the community prioritizing, and deciding the most appropriate structures to build and how to administer the resources. Most of the projects are originated in the communities, that is, village representatives reach out to GGS for assistance. According to information gathered in the focus groups, most villages learned about GGS' work through common word-of-mouth from one village to another.



Figure 1 Pagara



Figure 2 Pokhar



Figure 3 Tall

The key feature of GGS' projects is that they are based on a principle of shared responsibility enforced through a cost-sharing model, that empowers the community to become the main stakeholder in the decision-making process. They help communities organize them by building leaderships and establishing new institutions (village committees) to create awareness on topics like equity and women rights and inclusion. One of GGS' staunch and pressing issues is how to incorporate women. Rural areas are typically patriarchal in Rajasthan, and most of the community participation thus far has been with men. By building social capital they increase the value of the structures they help get made in terms of long-term sustainability, quality control, and equity.



Figure 4 Community Plan

Most of GGS' funding comes from external agencies like RGICS, NABARD, and D S Foundation. Additionally, in GGS' cost-sharing model, benefiting communities collaborate with 30 to 50% of the costs in materials or labour. This approach generates a distinguished barrier when presenting new opportunities for communities. Heretofore, communities are accustomed to having projects built, financed and completed by the government or external actors. The uncertainty that comes with new experiences and, in this case, a community-based paradigm for rural development challenges the willingness to pay of many residents of the villages. As discussed in some of the focus groups, members of the community did not entirely trust GGS' capacity to deliver and were hesitant to put their hard-earned money and valuable time into the projects. Moreover, GGS (2019) stated that they lack the financial resources to expand their operations across the region, and even to fully cover many of the villages where they have presence, therefore, the fundraising process continues through multiple stages of the project as shown in the diagram below.



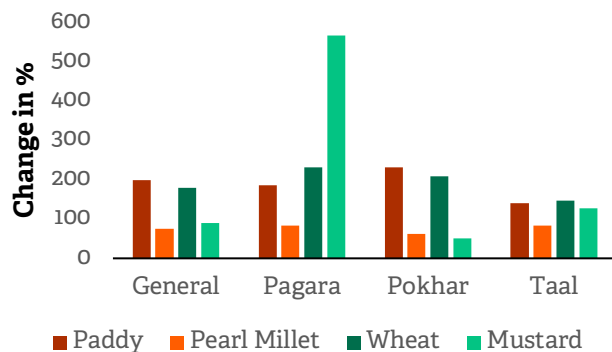
Quantitative Analysis

Motivated by the team's visit, GGS consolidated a database (2019) with information collected about the performance of the different structures they have helped built between 2002 and 2017. The data accounts for identification information for each structure like price, type of structure, and year of construction. Moreover, the data reports the before and after of the production of various market-based crops such as paddy, pearl millet, wheat, and mustard, as well as the impact on the land and availability of water. The analysis in this section is fully based on the aforementioned GGS database

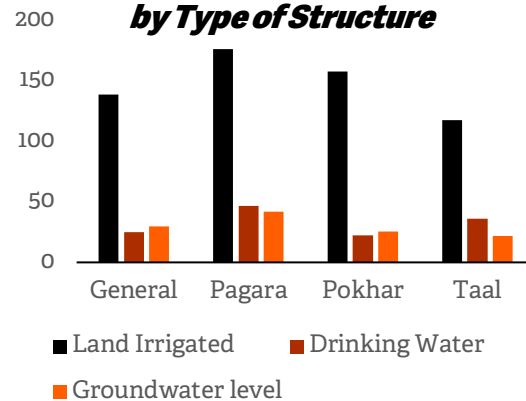
Pertaining to the GGS database (2019) mentioned above, one of the main takeaways from analyzing the data is the evident impact that these structures have on the yield of the crops. As shown in Chart 1, crop productivity has risen in over 75% on average in the four cases. The data suggests that pagaras are, among the different structures, particularly effective in increasing production of paddy, pearl millet, and mustard. It is also evident that the amount of land irrigated increased by approximately 140% on average, and what is also relevant, the groundwater level has improved by approximately 30% on average.

Considering that the various structures are significantly different in terms of technical requirements, scale, compatibility with the terrain, and expected outcomes, the cost of these structures has ranged from ₹7,658 to ₹886,857. As shown on Chart 3, the type of structure with the lowest average cost are pagaras.

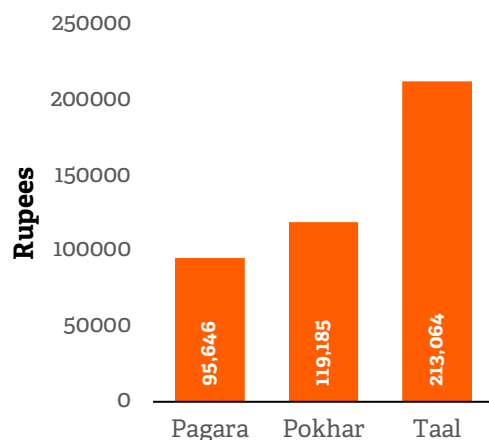
**Chart 1. Change in Productivity:
by Type of Structure**



**Chart 2. Change in Land & Water
by Type of Structure**



**Chart 3. Average cost
by Type of Structure**



The database provided by GGS, allowed us to conduct case studies for each kind of structure to do a cost-benefit analysis in which to estimate a potential Internal Rate of Return (IRR). These three case studies use structures built between 2008 and 2010 with costs of construction close to the average per structure. We calculated the value of production based on the modal prices of these products at the Gangapur market as of March 2020, and adjusted to the yearly inflation rate for India between the year of construction and the present (Inflation.eu, 2020). The results of these case studies are not conclusive for all the structures but rather exemplify the capacity of these structures to generate large market-based benefits at a very low cost.

We also used the data to explore the relationship between the cost of the structures and the increase in productivity. To do so, we first estimated the correlation between the percentage increase in crop yield and the cost of the structures by type of structure. The results suggest that this correlation is generally not strong nor statistically significant. In the case of pagaras, the average correlation across all four crops is negative, however, the increase in paddy production has a positive correlation of 27% that is statistically significant, which means that, there is a 95% chance that for every ₹1000 invested in the cost of the structure, there will be an average increase of 27% of crop yield. The results for pokhars suggest that the correlation is positive in average, although only mustard crops are statistically significant, with a relation of 72% (the highest value of the four). Finally, increase of crop yield by taals seems to have a slight positive correlation to the cost, albeit wheat crops are the only ones with a statistically significant correlation of 57%.

Additionally, we estimated the average increase in crop yield (in quintals) per ₹1000 invested in the structure. With no sufficient data on mustard crops, pagaras increase in 0.12 quintals for every ₹1000 invested on average, with similar values for all crops. Pokhars have a higher average but also a higher variance between crops, and the data suggest that the increase in mustard is negligible while the increase in wheat is substantial at 0.55 quintals per ₹1000. The case of taals is consistent with its correlation, as the data suggests that wheat crops are highly responsive to the cost, with an expected increase of 1.24 quintals per ₹1000 invested, while the average across all crops is 0.55 quintals per ₹1000.

This information shows that, though costs have an impact on the agricultural productivity of water harvesting structures, it does not usually account for large increments of crop yield and it is not largely correlated with its relative increase either. There are many considerations to explain these results, including that larger structures (such as taals) are likely to produce larger benefits per unit of investment. However, these generally low ratios can also suggest that a significant part of the increase in productivity can be attributed to the other inputs that GGS brings to the projects: Quality in the construction, appropriateness of the location, planning, sense of ownership, management, and conservation.

CASE STUDY – POKHAR

Name: Nimdi wali Pokhar
Year of Construction: 2009-2010

Village: Ghatli
Total Cost: ₹163,335

District: Karauli

Production in Quintals:

	Before	After	Difference
Paddy:	10	40	30
Pearl Millet	20	70	50
Wheat		60	60
Mustard		40	40

Value of Production	₹43,500	₹431,200	₹387,700
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10-year Cost-Benefit Analysis

IRR:	121%
NPV:	₹2,033,026.07
Cost-Benefit Ratio:	9.12



* Referential image

CASE STUDY – PAGARA

Name: Phutara Wala Pagara
Year of Construction: 2009-2010

Village: Daulatpura
Total Cost: ₹164,320

District: Karauli

Production in Quintals:

	Before	After	Difference
Paddy	15	40	25
Pearl Millet	6	-	-6
Wheat	15	30	15
Value of Production	₹52,200	₹115,550	₹63,350

10-year Cost-Benefit Analysis

IRR:	11%
NPV:	₹121,201.40
Cost-Benefit Ratio:	1.48



* Referential image

CASE STUDY – TAAL

Name: Dwariya Tall
Year of Construction: 2008-2009

Village: Kaklawas
Total Cost: ₹296,393

District: Pali

Production in Quintals:

	Before	After	Difference
Paddy:		10	10
Pearl Millet	8	20	12
Wheat	350	525	175
Value of Production	₹548,100	₹1,018,500	₹470,400

11-year Cost-Benefit Analysis

IRR:	72%
NPV:	₹2,307,433.96
Cost-Benefit Ratio:	16.26



* Referential image

Moreover, there are additional benefits that these analyses are unable to capture but actually represent an important part of the impact that the GGS' model has on the villages where they work, such as: Reduced travel time to access water and its implications on gender roles and inclusion of women in dynamics outside household-related tasks, increased capacity to determine the crops to work on, increased access to services like private education for children thanks to the greater economic returns of the harvest, among others.

Qualitative Analysis

After the implementation of GGS' model villages have the ability to decide the crops they want to produce. They can pair different crops according to the season. For instance, during the rainy season villages can grow paddy and pearl millet since there is more water available, and sell them for market value. During dryer times they can grow mustard as a source of income since it requires less water. In some cases, villagers mentioned that they were able to change from subsistence crops to cash crops, which yield higher market value, thanks to the increased availability of water.

GGS' projects helped grow healthier grass, which appeared fuller and greener , increased water availability, and improved livestock productivity. One village reported up to 30% increase in milk production, while most of them agreed that animals had become healthier. There is also less need for temporal migrations with animals.

Expansion of agriculture has decreased the villager's reliance on the market and has increased the workload for both genders. Such an increase in workload has had a bigger impact on women when they have been incorporated to these projects, as they become overburdened in addition to their regular household-related tasks. For instance, men are more concerned with water availability for crops, while women are concerned with water for domestic use. If crops can prosper, men are compensated for their services yet women are not since domestic water accumulation and dissemination is not considered a market value. With the increase of crop production, more labourers are required and by incorporating women into agricultural practices they are then required to fulfill both domestic and agricultural duties. These are some of the unintended consequences of the implementation of GGS' CBWH structures projects that the team was able to identify.

Criteria Evaluation

Evaluating GGS based on the criteria helps to establish a benchmark to understand gaps to bridge and how other models perform against GGS.

Evidence-based decision	Good	GGS' projects join technical and grassroots knowledge to design projects that suit the needs of the village. They do this by designing large plans with the community and technical advisors, to learn about the most appropriate locations of the structures and setting up priorities and key
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		roles. We consider this as a highly evidence-based process, as it tries to take advantage of all the sources of information and stakeholders possible to make sound decisions.
Outcomes of the structures	Good	As shown before, GGS structures are capable of doubling and tripling agricultural production and the amount of land irrigated. Moreover, drinking water and underground water level show average improvements of over 50%. Quality control and maintenance of these structures are in the hands of the villagers and thanks to the cost-sharing model, they become empowered and understand the benefits of meeting high standards. Therefore, it is fair to say that this model is likely to produce high quality outcomes in terms of building quality and impact in the villagers' livelihood.
Efficient resource allocation	Medium	The cost of these structures significantly varies, but, as it was discussed, the most affordable option is also the one with the highest percentage increase in agricultural productivity. Despite the benefits of the cost-sharing model in terms of quality control and community empowerment, it also represents a challenge for many families because it imposes an additional economic load on them, making villagers hesitant to work with GGS. The evidence suggests that GGS does make the most efficient resource allocation while trying to overcome the challenges that its own model imposes onto them.
Good governance over the model	Medium	Besides basic funding, GGS helps building social capital, which is a long-term investment in decision-making and monitoring management. Since the planning phase, these institutions, alongside the cost-sharing model, help improve transparency and hold accountable all stakeholders involved. The speed of the whole process is largely dependent on the resources available (especially on the GGS end). We consider that these mechanisms enable a good governance system.
Community involvement	Medium	GGS has created a model that empowers villagers in all stages of the project. The cost-sharing strategy generates a sense of ownership that enhances villager's participation and helps prevent problems of elite capture and unequal access to water. However, GGS' model still does not have frameworks in place to fully address gender and caste inequalities, and is tasked with introducing ways to adequately include women, although they claim to be currently exploring ways to do so. Thus, GGS' community involvement strategies have room for improvement.

THE GOVERNMENT'S MODELS

Government projects receive funding through a variety of government programs, and there are a variety of government programs funding, designing, and sometimes implementing water-harvesting structures. The three programs that are the most relevant to watershed development in the Dang region are the Micro-Watershed Development Program at the Watershed Department (Watershed Development and Soil Conservation Department), the Dang Regional Development Program, and the NREGA Program (Mahatma Gandhi National Rural Employment Program). The first of these three programs is specifically dedicated to developing watershed structures, while the other two programs develop a variety of other structures, too.

Gov. Model 1: Watershed Department's Micro-Watershed Development Program:

The Watershed Department designs and coordinates the watershed strategy for each district, aiming at increasing the water table of different water zones. The water zones are divided according to geography and terrain, and micro-watershed structures are developed according to the conditions of each water zone and specific watersheds. Watershed Department takes a “ridge to valley approach”, focusing on “in-situ moisture conservation”, “reducing runoff velocity”, “rain water harvesting” (Watershed Development and Soil Conservation Department, Rajasthan, 2020). In comparison with GGS models, the Watershed Department's development goal concerns more about the strategy for water zones, without paying the same degree of dedication to details and quality of the specific implementation. The general process for executing these projects is captured in the following diagram.



According to our interviews with engineers and information on the government website, the decisions by the Watershed Department are mostly based on terrain surveying. The most important outcome is to increase the water table. The resource allocation is area-based, but its efficiency remains unknown. In theory, the decisions are made in consultation with Gram Panchayat Raj, and there is a degree of community involvement (Watershed Development and Soil Conservation Department, Rajasthan). However, during the field trip, we did not visit/identify specific structures implemented by the Watershed Department, and therefore we cannot speak of the quality of the works. We did find out that many structures commissioned by the local government were in very poor quality, and some were not operational at all. At the same time, we noticed that the Watershed Department did not put a strong emphasis on access to water for irrigation purpose, and, in consideration of the popularity of GGS models (which was very helpful in enhancing access to water for irrigation purposes), it is very likely that there has been a lack of focus on access to water for irrigation

purpose. This problem likely cannot be taken care of by the Watershed Department's grand water strategies.

Gov. Model 2: Dang Regional Development Program

The Government of Rajasthan developed the Dang Regional Development Program for the Dang Region specifically. The program is entirely state-funded, and 300 crore rupees were allocated for the five financial years between 2015-2020. (Government of Rajasthan, 2015) Water-harvesting is not the only area that the development program is responsible for. In fact, the five major areas for the program are: sanitation, health, rural connectivity, education & medical facility, and energy (Government of Rajasthan, 2015). Unsurprisingly, water-harvesting projects does not enjoy priority at the Development Program.

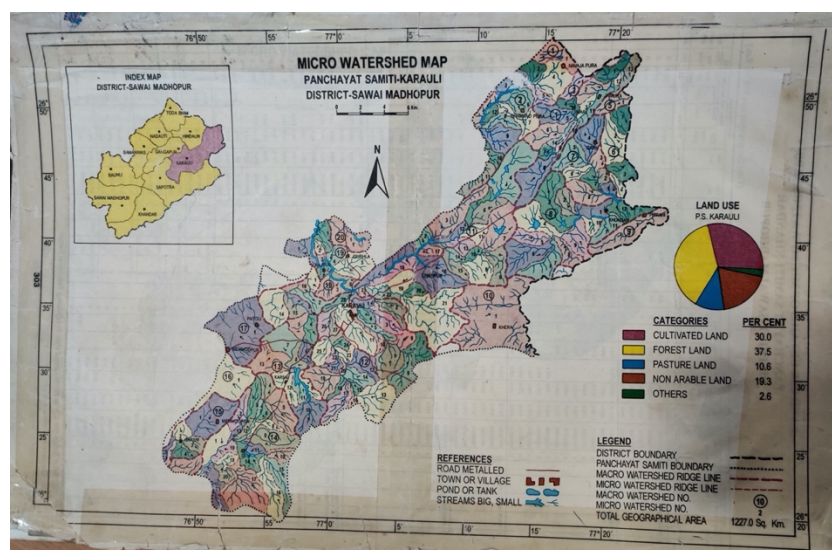


Figure 4 Micro Watershed Map for Karauli

The program's central decision-making body, the DDB, is supposed to show flexibility in the development process. However, the DDB presents a variety of problems which will be further explained in the next section of this report. Moreover, while the Dang Regional Development Program involves a high degree of community engagement on paper, the decision-making power remains at higher levels of the government. The prolonged bureaucratic process and the lack of decentralization make the DDB particularly important for the program's proper function. Thus, as will be explained later in the report, the DDB's problems severely limit the utility of the program. The following diagram captures the general process for executing these projects.



As a result, according to our observations, interviews, and focus group, we conclude that the program is critically inadequate in all five major criteria: evidence-based decision making, outcome of structures, efficient resource allocation, good governance, and community involvement.

Gov. Model 3: NREGA Program

The NREGA Program is named after its funding scheme: Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA, or more commonly the NREGA). The primary purpose of the NREGA is to create a social security net for rural households, i.e. “providing work of 100 days to those who demanded work under MGNREGA.” (Institute of Economic Growth 2018) It is the State Government’s responsibility to provide such jobs. Financially though, “while the Central Government bears 90 percent of the cost [...] The State Governments bear the remaining [...] 10 percent of the total cost.” (Institute of Economic Growth, 2018).



The NREGA is in nature a welfare program, and it puts emphasis on providing social security instead of quality work or asset creation. A few major selection criteria are:

1. “A 60:40 ratio is needed to be maintained for wages and materials requirements for the work. Notably, deployment of contractors and machineries were strictly prohibited.” (Institute of Economic Growth, 2018).
2. “Work should be provided within a radius of 5km from the village and worksite facilities (like Crèche, drinking water, first aid and shade) should be provided.” (Institute of Economic Growth, 2018)
3. “[W]omen should constitute at least one-third of the total workers.” (Institute of Economic Growth, 2018)
4. “A shelf of projects for a village is to be recommended by Gram [Panchayat] and approved by the Zilla Parishad.” (Institute of Economic Growth, 2018)

As a result, NREGA works are predominantly a) unskilled manual work, b) in the rural areas, c) “predominantly includ[ing] water and soil conservation, irrigation, afforestation and land development works,” d) promising “up to 100 days of work on demand to every rural household,” per financial year (Institute of Economic Growth 2018).

NREGA provides untapped opportunities for rural development. The NREGA Program has the potential of both providing social security and creating quality assets (such as the water-harvesting structure built by GGS) on lands at the same time. The creation of quality assets are highly important for the development of the area. It is worth noting that since 2018 there has been at least one government-sponsored study calling for increased

attention to be paid to asset creation (Institute of Economic Growth, 2018). This trend provides hope for NREGA to become more useful for funding water-harvesting structures.

However, for the NREGA Program to actually focus on creating quality assets, such as funding water-harvesting structures, the change needs to happen at multiple decision-making levels. First of all, the Government of Rajasthan needs to include quality asset-creation in the criteria. More fundamentally, decision making at the lower levels also need to embrace quality asset-creation. While the program requires Gram Panchayats to make recommendations and requires villagers to take initiatives to apply, due to the recent field trip we realize that Gram Panchayats could be in fact detached from communities' interests. Smaller villages are politically disadvantaged, and disadvantaged villages (including but not exclusive to small villages) do not fare well with the Gram Panchayat. Thereby, villages and applying villagers are not likely to have substantial or meaningful involvement in the decisional making phase, and yet these villagers may well be the people most in need of quality assets-creation. Therefore, for the NREGA program to do justice to quality asset-creation, there needs to be changes at both the Gram Panchayat level and the higher policy level.

Based on our field observations, interviews, focus group, our evaluation for the NREGA Program is as the following: The NREGA program is inadequate in making evidence-based decision for asset creation purpose, and the outcome of structures usually did not present strong utility during our visits, the resource allocation did not seem to efficiently create economic benefits beyond employment creation, and better governance and community involvement are in need to enhance the asset creating aspects. We did not have enough data to evaluate NREGA's benefits in creating jobs and ensuring social security.

THE DDB

DDB's Institutional Design

As explained in earlier chapters, SPDAs were designed to enable more flexibility in the public administration in order to fill gaps that the traditional government structure can't. One of the main characteristics of these bodies is that they are usually staffed specialized professionals rather than career public officials, with a strong leadership that allows the organization to address problems with a more private sector approach.

In the case of the DDB, despite being conceived with an SPDA-like spirit as mentioned by a former World Bank representative (Anonymous, 2019) who worked in the formation of DDB, it has always been staffed with current government officials. According to a GGS report (2019), DDB is constituted by the following members:

1. Chairperson nominated by the Minister for Rural Development Govt of Rajasthan
2. Member of Parliament of the area
3. Member of State Assembly of the area
4. Elected District Head or Zilla Pramukh

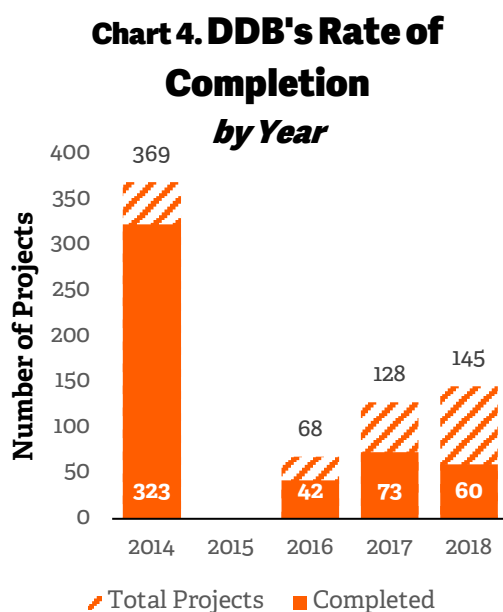
5. Secretaries to State Govt representing 10 departments (Rural Development, Finance, Planning, Agriculture, Livestock, Water Resources, Public Works Department(road construction), Forest, Health, Education, Watershed)
6. Commissioner & Secretary Panchayatiraj (Gram Panchayat, Block Panchayat, and Zilla Panchayat)
7. Divisional Commissioner
8. District Collector
9. Technical Resource Organizations/ subject matter specialists (“need based”)
10. Voluntary/Non-government Organisations (“need based”)
11. Secretary Rural Development as Member Secretary of the Board

At the district level, this board is supported by a “district level regional development committee” that is also mainly formed by government officials.

Moreover, the report indicates that the “Rural Development department is the controlling authority for the Dang Regional Development Board”, which significantly reduces DDB’s autonomy to act separately from the government as it would require the DDB to act based on the Rural Department’s values and standards.

DDB’s Performance

Using data from the Rural Development and Panchayat Raj Department of the Government of Rajasthan we were able to study the reported performance of the “Dang Area Development Program” (an alternative name of the DDB scheme) for the years 2014, 2016, 2017, and 2018 (the data for 2015 are not available) (GoR, n.d. a, b, c, d).

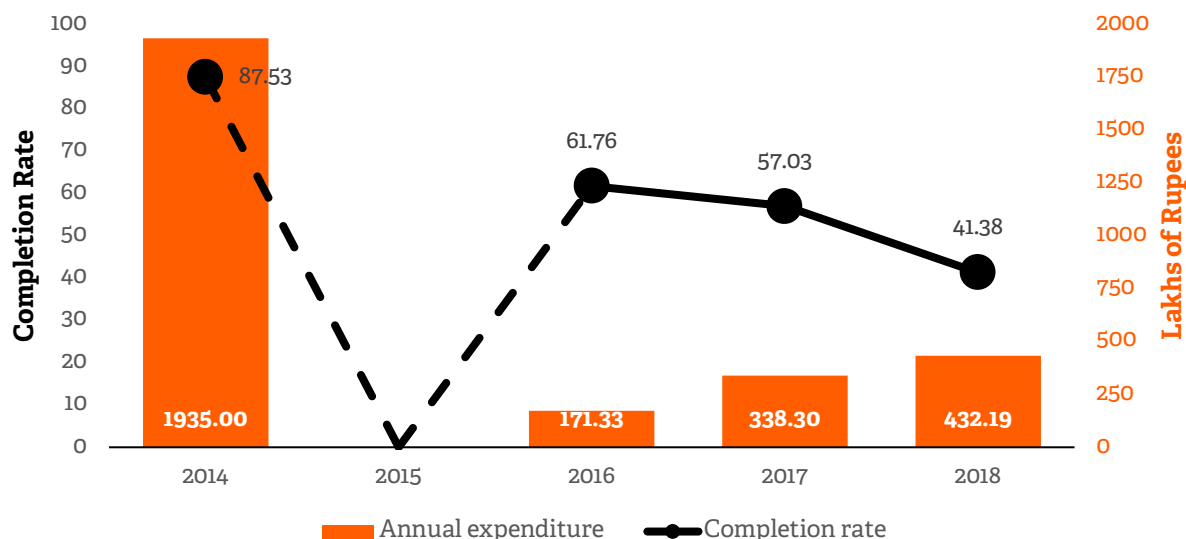


The findings support the claims collected in the focus groups in the villages and interviews with GGS, and bureaucrats: the DDB’s projects are often incomplete and mostly unrelated to water harvesting initiatives. In the four years of available data, DDB reports a total of 710 projects of which 498 (70.14%) are completed. As shown in chart 4, the performance has changed significantly from 2014 to 2018, going from 323 (87.53%) projects completed in 2014 to 60 (41%) in 2018.

This decrease in completion rates contrasts with the budget allocated to the program. In the four years reported, a total of ₹2,876.82 lakhs, with an average ₹3.34 lakhs per project. However, in the last three years, such expenditure has more than doubled. This contrast with the decrease in completion rate found in the same period (see chart 5).

One more finding can serve as an explanation for these disparities, and simultaneously illustrate the priorities of the DDB in regards to water harvesting projects. Approximately 97% of the projects are mainly associated with works on roads, hand pumps and superficial water tanks. Most of these project do address the issue of access to water, but only from the demand side. This means that the government is facilitating ways for people to obtain water (mainly groundwater), without actually increasing the supply. The projects built by the DDB will only be effective if there is water available.

Chart 5. DDB's Expenditure vs Completion



Testimonials

On December 5th, 2019, we interviewed the CEO and the Lead Engineer of the Zilla Panchayat of the Karauli District. In both conversations, the bureaucrats expressed their perception about the work of the DDB, indicating that this scheme was properly active for only two years, but it has become a “political stunt”. Both interviewees suggested that DDB’s agenda is defined by political interests rather than technical evidence.

In an interview with a former World Bank representative, who worked closely with DDB and other NGOs in Rajasthan, he indicated that the role of the DDB has been undermined by the influence of political interests over the community’s in the decision-making process. Similarly, representatives of RGICS also expressed the same idea in our meetings in Delhi, explaining that DDB is usually more active before elections time and it is full of “unfulfilled promises”.

Coming from three different and independent stakeholders, these testimonials about the perceived real purpose of the DDB, build a very strong case for the idea that this program is mainly used as a political tool that is activated to gain support and that the DDB is not evidence-driven entity but instead their decisions usually follow a political agenda.

ALTERNATIVES

Considering that GGS' original goal was to use the DDB as a vehicle to access more funds that could help them expand successful water harvesting practices in the Dang Region, the evidence suggests that such pursuit is not likely to bring the expected outcomes. As it was mentioned, most DDB's projects do not align with the approach that GGS brings to rural development and to community empowerment, moreover, being subjected to existing government department reduces their capacity to shift their current policies. Therefore it is fair to say that there are few reasons to believe that DDB could become a suitable source of funding for GGS projects in the near future.

An alternative route for achieving GGS' goal should enable them to channel funds from the government into their projects with sufficient autonomy over the processes and outcomes of the investment. This autonomy should ensure that their projects meet their own standards, and could be repurposed into new models such as to include women and enforce gender equity. Moreover, GGS should also focus on securing resources that allow them to innovate, monitor, and explore new strategies to improve in areas like women's roles, equitable access to water and its benefits, etc. This is a common practice for many NGOs in developing countries like Venezuela where non-profits are in constant need of reaching out for multiple agencies to access sufficient funds to implement their projects. In these cases, though the national government is expected to be the primary benefactor, other governmental agencies, such as foreign embassies, can be reached as they usually offer alternative forms of funding that are project-based.

To expand its practices, GGS must find creative ways to take advantage of the existing funding opportunities that some existing national and state policies provide. Such policies don't necessarily have to have GGS as the main benefactor, as the money will ultimately stay in the participating villages. Conversely, to be able to innovate, conduct research, and ultimately grow as an organization, GGS should receive direct funding from other sources, with little to no restrictions

A WINDOW OF OPPORTUNITY

In December of 2019, the Director of Rajeev Gandhi Foundation Vijay Mahajan was able to secure a meeting with the Chief Minister and introduce the work done by GGS, which attracted the Chief Minister's attention. Two senior engineers from the state NREGA department were later sent to look at the water structure constructed by GGS.

The engineers went to GGS and particularly saw pagaras. Pagara was not one of the permitted constructions for NREGA, but nonetheless standing for perhaps the most appropriate way to conserve water in certain areas. The senior engineers were impressed by the structures they saw and reported back to the NREGA Department. After receiving these engineers' notes, the commissioner from the NREGA Department then issued an order declaring that pagaras have become permitted construction structures for NREGA.

At the same time, pokhars (ponds) are permitted as well. This is particularly noteworthy, because pokhars, unlike pagara, are often built on private lands. While NREGA does not prohibit developing assets on private lands, it usually prioritizes structures on common lands. The permission for building classifying pokhars as permitted NREGA construction does demonstrate the level of flexibility of NREGA program.

GGs WORKING WITH NREGA PROGRAM

With the NREGA commissioner's recent auspicious order, public funds (NREGA funds) became available for water-harvesting structures such as pagara and pokhar, removing a previous bottleneck that had previously financially prevented the upscaling the success of traditional water-harvesting structures such as pagaras and pokhars.

GGs will be able to get involved in assisting the Gram Panchayats evaluating and proposing to build pagaras and pokhars under the NREGA Program. GGS will be able to facilitate the process, without acquiring the NREGA fund, and thus improving the quality of NREGA decisions and the prospects of asset creation.

There are indeed potential limitations for GGS's role in this facilitation process. First of all, according to the information gathered from our field trip, GGS was consistent in making sure that the involved labors do get at least the minimum wages, while the NREGA are not always able to honor the promise of paying minimum wages. This could potentially put GGS in ethical dilemma. Secondly, with GGS being involved in more facilitation process—but without securing additional funds for itself—it will potentially stretch itself thin, which could lead to a decrease in GGS' works.

CONCLUSIONS AND RECOMMENDATIONS

The purpose of our research was to contribute to GGS' advocacy strategy to upscale their successful CBWH practices. GGS' initial strategy focused on advocating for policy reform via the DDB. The underlying assumption was that DDB was functioning properly as an SPDA, and policy reforms would activate a series of changes to improve water harvesting outcomes in the region. We sought to explore the barriers and limitations preventing the DDB from enacting policies that produce successful CBWH practices. Moreover, initially we sought to identify the gaps GGS needs to bridge to help the DDB realize its full potential. However, we found that the agency is constrained by its:

- Lack of autonomy from the government
- Inability to complete a significant number of its projects
- Prioritization of non-water harvesting-related projects such as roads, hand pumps and superficial water tanks

Therefore, the DDB is an inadequate SPDA for making good policies and enabling them. That means, if GGS still wants to choose the DDB as the policy venue to achieve the policy goal—securing continuous funding for upscaling GGS' successful CBWH practices in the region—then GGS needs to restore the proper function of the DDB in the first place. Of course, GGS could still pursue the DDB as a vector for policy reform. However, according to our findings, it would be too time and resource-consuming for GGS to restore the proper function of the DDB.

Given these findings, the team revised its focus to examine the second research question, namely *what policy reforms should GGS advocate for to promote successful community based water harvesting practices to the GoR?* While we were unable to provide new policies for advocacy purposes, the data revealed that GGS could utilize existing policies and funding opportunities from the district and state governments to promote and expand successful CBWH practices. To achieve the latter, our team identified gaps in GGS' current advocacy capabilities that could be bridged to adequately promote their CBWH model and secure supplementary funding. We have established four key action areas to achieve these goals, more specifically:

1. Utilizing the NREGA scheme as an alternative source of funding
2. Using of data to strengthen GGS' advocacy capacity
3. Adopting a gender lens
4. Improving outreach capacity

A more detailed account of these recommendations is discussed below.

1. Utilizing the NREGA scheme as an alternative source of funding

Thanks to the incorporation of pagaras to the list of admissible rural projects supported by NREGA, GGS now has the opportunity to support villages where it is appropriate to build pagaras and pokhars. We recommend the following:

- To design standardized procedures to assist villages to produce successful applications for NREGA projects, as well as advising Gram Panchayats in evaluating such proposals.
- To upscale its activities, update its strategies, and adapt to the new dynamics to reinforce the villagers' sense of ownership over the projects in villages benefiting from NREGA funds. The sense of ownership GGS inspired in villagers in the past was partially the consequence of asking villagers to contribute to part of the construction costs, and that became a pillar for and signature of GGS' success. With the NREGA funds coming in though, that sense of ownership will hypothetically get diluted. Therefore, it might be worthwhile to increase the efforts to strengthen the sense of ownership.
- GGS should lobby for including social capital building as an essential component of all NGO and government water harvesting programs.
- To liaise with NREGA officials to include taals into the list of admissible projects.
- To build and maintain the liaison with the NREGA commission, the principal secretary of Rajasthan, and a few supporting local politicians.
- GGS should advocate for additional funding to support NGOs investing in social capital building processes, in addition to increasing direct funding to Gram Panchayats.

Short-term benefit - GGS: An alternative source of funds will help expand CBWH in the region, while helping to overcome the limitations the cost-sharing model has in terms of reaching new communities.

Long-term benefit - The region: By building GGS-related projects under the umbrella of a government program such as NREGA, GGS will strengthen its case for CBWH practices and will give them leverage to advocate for the inclusion of social capital development as a fundamental element in future government projects.

2. Using data to strengthen GGS' advocacy capacity

As shown in this report, collecting and analyzing data brings to light factual evidence that can be used for many purposes. GGS' capacity to advocate for funding or policy reforms will improve as they become more equipped to prove the effectiveness of their projects. We recommend the following:

- To dedicate continuous efforts to the collection of data, exploring new variables to measure productivity, water accessibility, and quality of life.
- To perform cost-benefit analyses, such as the ones used in this report, regularly, in order to evaluate the effectiveness of the work performed and to complement the decision-making processes.

- To explore the possibility of incorporating CVM to evaluate the impact that the work performed has on non-market resources, and further strengthen their advocacy capacity.

Short-term benefit - GGS: Collecting and processing data will enable GGS to monitor, evaluate, and showcase the outcome of its activities, thus improving its advocacy capacity.

Long-term benefit - The region: With more data collected and analyzed, GGS' lessons will be more easily communicated across the region with both the governments and other organizations for improved outcomes in natural resource regeneration.

3. Adopting a gender lens

Although previous attempts were made to include women in CBWH practices, GGS incidentally overburdened women with community-based tasks. To avoid this miscalculation, we recommend the following:

- To apply CVM and compensate women for their time. This would allow women to maintain their role within the household without applying strenuous pressures.
- To establish mechanisms that break down the stereotypical role of women in patriarchal societies by increasing women's involvement in the decision making process through educational campaigns for instance. Although complex and timely, there is a need for said issues to be addressed.
- To consult women on ways they want to contribute to community-based tasks: GGS can provide options of how their schemes can include women as well as provide them with training for the suggested task, such as animal husbandry. GGS could frame women's training and inclusion in the decision making process as a benefit to the family, this would preserve family trust.

Short-term benefit - GGS: Including women would provide additional household income, or provide women more time to do other tasks other than domestic duties.

Long-term benefits - The region:

- a. Both communities and the government would be spending less money on health care facilities as there is potential for less injuries from gathering water.
- b. Including women in community tasks and compensating them would introduce them to the economic market and lead to poverty reduction and increased gender equity in the region.

4. Improving outreach capacity

As it was shown in the report, bringing attention towards and increasing awareness about GGS' activities and outcomes, even in informal settings, can create windows of opportunities for new sources of funding or other collaborative activities. Using strategies such as digital newsletters with stories and statistics, or guided visits to villages, GGS could promote their successful practices with influential stakeholders and foster the creation of said windows of opportunities. GGS could find support for these activities in partners such as RGICS.

Short-term benefit - GGS: By communicating its challenges and success stories to a broader audience GGS will be able to rise interest in its activities and find new partners and potential sources of funding.

Long-term benefits - The region: Increased outreach will enable GGS to foster the development of long-lasting networks, coalitions, and partnerships to advocate for and ultimately upscale CBWH. In addition, this could promote GGS' prestige.

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APPENDIX 1 – RESEARCH LIMITATIONS

- We faced linguistic and cultural barriers. During our field-work in villages, the information we gather will need to be translated.
- The literature we review may be constricted, limited in scope and untranslatable. For example, the official Government of India website provides useful documents such as tenders which outline watershed development and soil conservation for previous or upcoming annual reports. Yet, they are written in Hindi and published in PDF format, therefore are non-translatable and are illegible for our group.
- Our time in India was limited. This undermined our capacity to establish trusting relationships with the villagers we visited, which would have allowed us to obtain more nuanced information.
- There were political constraints between GGS, and government actors, which reduced our capacity to interact with bureaucrats both in Karauli and Jaipur.
- There is a potential biased in the sample of villages visited in Karauli due to the inconvenience in applying a randomized sampling
- The database GGS has provided us does not use the metric system, and it has missing information which negatively affects the significance of our descriptive and inferential statistics.
- There were limited resources for the literature review. Those available were often 10 years or older, not of scholarly publication, or written in hindi and had to be translated. This shows there is a need for more work to be done in this field.
- Although RGICS has acknowledged the need for women's integration to water resources management, there was little to any mention on their website, within their policy briefs, or public documents alike.

APPENDIX 2 – EVALUATION CRITERIA

CRITERIA	FACTORS	SIGNIFICANCE
Outcomes of Structures	Increase in water tables	Sustainable development depends on sustainable water resources, and a water table is one the strongest indicator for changes in the amount of water resources. Increase in water table suggests improved ease for access to water and resilience to droughts.
	Land fertility	Land fertility directly reflects the potential of farm soil to yield economic benefits. Good land fertility is tied to good soil conservation, which is in turn tied to good LWM. TBD
	Improvement of yield	Easy-to-measure, quantitative indicator to reflect the changes in land-and-water management of small parcels of farmlands. It is particularly tied to the proximity between water-harvesting structures and the farmlands.
	Improvement of access to water for livestock	The type and numbers of livestock, and the average time it takes to access water all have strong potential economic significance for villagers. Such improvement, when taking place without decrease in water tables, indicates improvement in water conditions.
	Improvement of access to water for consumption	This improvement suggests the ease to meet villagers' most basic daily needs.
Good governance over the model	Response time	The length of time required to get the support needed to build the structure after a request is made. This could range from a week(s) or less to more than one year. Significant economic opportunities are associated with response time, which means response time could significantly influence which development scheme applicants would apply to when all other things are equal.
	Speed	The implementation speed is similarly important to response time. However, GGS projects usually start immediately once enough resources are accumulated, while some government projects may not be constructed immediately. For example, NREGA works may require villagers to first apply for the job.
	Implementation	The quality of implementation weighs significantly when villagers are deciding which development

CRITERIA	FACTORS	SIGNIFICANCE
		program to utilize. During the field visit, government-built water-harvesting structures usually appear less effective than their NGO-built counterparts. In some extreme conditions, villagers would rather pay for building quality structures with NGOs than relying on poorly-constructed government structures.
	Accountability	The development organization should clarify its responsibilities for the development process, fulfill them, and remain to such responsibilities.
	Transparency	Bidding and contracting are particular areas that all implementational organizations should be transparent about.
	Leadership	Leadership at the development organization should be effective. Effective leadership depends on many factors. One common reason for poor leadership, as identified by the team, was lack of organizational autonomy and heavy political influence.
	Maintenance	No structures last forever, but well-maintained structures last longer. Responsible development programs pay attention to maintenance as much as implementation.
Efficient resource allocation	Cost-effective and cost-efficient	The structures developed should be worth its costs. Prioritizing cost-efficient projects is the key to maximize social impacts with limited resources.
	Opportunity cost	The initial opportunity cost of investing time and economic resources in a particular alternative and potential outcomes
Evidence-based decision	Knowledge technical	AppTechnical expertise should be the foundation of technical expertise. For example, a villager who worked with GGS claimed he had built pagara twice without consulting engineers and ended up in failure. He succeeded a third time with the help of experts from GGS.
	Knowledge traditional	In some cases, traditional and local expertise could prove very useful and necessarily complementary to technical expertise.
	User-centric	Good development puts the users at the center and optimizes designs in terms of the users' experience. Users' experience should be carefully considered during the decision making process.
Community Involvement	Gender gaps	Different genders should be included in the community planning processes and this should be reflected in the development process. Moreover, females are usually more involved in the household

CRITERIA	FACTORS	SIGNIFICANCE
		economy, and consulting women could enhance the role of evidence and information in the decision making process, creating more socio-economic impact.
	Caste	Decision making should consider equitable distribution of opportunities, resources, and benefits across different castes.
	Sense of ownership	When the community has a sense of ownership over structures, these structures tend to be better maintained. Moreover, associated with this sense of ownership is usually community participation in the decision making, which is likely to lead to improvement in the quality and legitimacy of the decision.
	Prevention of elite capture	Equitable development model should take care of the welfare of the community instead of the few.
	User friendliness	As much as users' experience should be considered and considered during the decision making process, it would be ideal to consult the users themselves during the decision making process.

APPENDIX 3 – COST-CHANGE IN YIELD RATIO

PAGARA

Variable	Paddy	Pearl Millet	Wheat	Mustard	Average
Mean Ratio	0.1078	0.123059	0.142652		0.12450367
SD	0.0759	0.068661	0.105618		0.083393
correlation	0.2763	-0.9932	-0.1422		-0.2863667
significance	0.0172	0.0743	0.4978		
observations	74	3	25		

POKHAR

Variable	Paddy	Pearl Millet	Wheat	Mustard	Average
Mean Ratio	0.2468	0.154111	0.557964	0.004755	0.2409075
SD	0.26	0.238085	0.93783	0.185738	0.40541325
correlation	0.0825	0.1519	0.1042	0.72	0.26465
significance	0.3959	0.1963	0.3485	0	
observations	108	74	83	29	

TAAL

Variable	Paddy	Pearl Millet	Wheat	Mustard	Average
Mean Ratio	0.24978	0.211511	1.247093	0.5202	0.557146
SD	0.424338	0.331207	1.352065	1.324424	0.8580085
correlation	-0.1263	0.0189	0.5701	0.289	0.187925
significance	0.629	0.924	0.0005	0.1214	
observations	17	28	33	30	