DIVERGENT PATHWAYS TO DROUGHT ADAPTATION IN RAJASTHAN, INDIA

By
Ankita Rathi

Submitted to Central European University - Private University
Department of Public Policy

In partial fulfilment of the requirements for the degree of Master of Arts in Public Policy

Supervisor: Florian Weiler

Vienna, Austria
2025

COPYRIGHT NOTICE

[1]

For bibliographic and reference purposes this thesis should be referred to as: Rathi, A. 2025. Divergent Pathways to Drought Adaptation in Rajasthan, India. MA thesis, Department of Public Policy, Central European University, Vienna.

[1] Icon by Font Awesome.

AUTHOR'S DECLARATION

I, the undersigned, Ankita Rathi, candidate for the MA degree in Public Policy declare herewith that the present thesis titled "Divergent Pathways to Drought Adaptation in Rajasthan, India" is exclusively my own work, based on my research and only such external information as properly credited in notes and bibliography.

I declare that no unidentified and illegitimate use was made of the work of others, and no part of the thesis infringes on any person's or institution's copyright.

I also declare that no part of the thesis has been submitted in this form to any other institution of higher education for an academic degree.

Vienna, 03 June 2025

Ankita Rathi

ABSTRACT

Innovative adaptation strategies are very important because of Rajasthan's arid climatic conditions and the recurring droughts. Two divergent initiatives towards drought adaptation: Tarun Bharat Sangh (TBS) – a bottom up, community driven movement which focused on reviving *johads* and the *Mukhyamantri Jal Swawlamban Abhiyan* (MJSA) – a top-down, state-led program in Rajasthan, India are examined in this thesis. Using a comparative case study approach based on secondary sources and guided by adaptive governance, resilience theory, and political ecology frameworks, the research evaluates how these initiatives differ in terms of agency, environmental governance, and resilience outcomes.

The analysis finds that both initiatives improve water security and contribute to drought resilience, yet they operate through distinct governance pathways. Participatory decision making, strong local agency and adaptive capacity by empowering committees in water management are few of the things fostered by TBS's grassroots efforts. However, the MJSA's state-centric approach achieves rapid infrastructure development but involves limited community participation, potentially undermining long-term adaptive governance. While resilience was bolstered by both the pathways, superior adaptive capacity and participatory governance was demonstrated by the community-driven initiative. These findings underscore the importance of local agency and inclusive governance in building resilient socio-ecological systems under climate stress.

Keywords: climate adaptation, droughts, environmental governance, top-down and bottom-up approaches

ACKNOWLEDGMENTS

I would like to give me warmest thanks and acknowledgment to my supervisor Dr. Florian Weiler, Associate Professor, Central European University, who guided me throughout the process. His advice guided me through all the stages of writing my thesis.

I would also like to give special thanks to my family as a whole for their continuous support and understanding when undertaking my research and writing the thesis.

Lastly, I would also like to thank my friends and the administrative staff of the Department of Public Policy at Central European University for their constant support.

TABLE OF CONTENTS

1. Introduction

Over the past few years, the climate related disasters have increased drastically; leading to extreme economic losses and affecting several people. Unlike other environmental issues, climate change affects institutional structures, people, temporal dimensions and environmental system dynamics (Priyam L. Borgohain et al. 2024). It has far reaching impacts, and these impacts escalate with the increase in the temperature as mentioned in the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) Working Group-1 (Intergovernmental Panel On Climate Change (IPCC) 2023).

One of the extreme climatic events that is insidious in nature is Drought. This climate hazard has a severe impact on food, water, energy production and other socio-economic activities (Mishra and Singh 2010). With every increase in its duration and intensity, it can lead to major consequences, making it one of the costliest natural hazards (Mishra and Singh 2010). One of major reasons behind this climatic hazard is insufficient rainfall (meteorological drought). Over time, it propagates through hydrological cycle to affect soil moisture (agricultural drought) and then eventually runoffs water reservoirs and groundwater aquifers (hydrological drought) (Li et al. 2024).

Due to the increased impact of climate change, these events have become more frequent, especially in arid and semi-arid regions of the world, thereby worsening the water scarcity issues (Lotfirad et al. 2021). They have multifaceted ramifications in agrarian economies and are particularly dangerous in arid regions, areas already lack water resources. This brings me to analyse the drought situation important of an arid region in India, i.e., Rajasthan (Department of Environment and Climate Change and Government of Rajasthan 2022).

The largest state of India, Rajasthan is located in the northwest part of the country. The state is spread over an area of 34.22 million hectares (Samaria 2022) and occupies approximately 10% of the national land with significant regions of deserts, city, mountain, wetland and only 1% of the nation's surface water resources (Everard 2015a). Annually, 90% of the rainfall occurs from July to September (monsoon months) ("25 Years of Evolution" 2009). The temperature usually ranges from 32 - 45 °C during the hottest months of the year (April - June). Due to exceptionally high temperatures, delayed monsoon rains, limited water resources, the state experiences drought conditions very frequently.

Therefore, it is very important to have locally relevant and sustainable adaptation approaches towards such natural disasters (Ayers and Forsyth 2009). In simple words, adaptation process aims at increasing government and community capacity to reduce the possible negative impacts of climate hazards. Adaptation strategies can be either reactive or anticipatory, with both sharing the same goal of reducing vulnerability (Dittrich 2016). Different types of governance models can have a significant influence on the outcomes of these adaptation approaches (Birchall, Bonnett, and Kehler 2023). Broadly, there are two implementation approaches towards these adaption strategies: Bottom-up approach and Top-down approach (Dessai and and Hulme 2004). The government-led top-down initiatives are designed around large-scale infrastructure, standardised intervention models which often prefer uniformity and efficiency over local nuance. Conversely, community-led bottom-up initiatives often embody an ecologically sensitive model of resilience (Mehta et al. 2016).

On one hand grassroots initiatives harness local knowledge and local participation but struggle with scaling up (Alnajem 2024) and on the other hand centralised, technocratic programs achieve scalability but risk lacking local ownership. In this research, I compare Tarun Bharat Sangh (TBS) (bottom-up approach) and *Mukhyamantri Jal Swawlamban Abhiyan* (MJSA) (top-down approach) through the lenses of agency, environmental governance and

resilience (Eriksen, Nightingale, and Eakin 2015) and directly examine how a community driven initiative and a state led program embody different principles in these domains, what are their implications on effectiveness and sustainability.

2. Literature Review

Water governance in India: As an agricultural country, India is always under pressure to provide water supply for the continuously growing population. Policy makers have always given strict attention to water supply in order to increase agricultural production (Khalid 2020). This means that water governance is decentralised at the state level (Lindamood 2017). While, central agencies such as Ministry of Jal Shakti issue broad policies, their implementation and management predominantly remains with the concerned state (Ahmed and Araral 2019). They set their own priorities and fund projects (with financial help from the centre), and several have even adopted their State water policies (Rathee and Mishra 2021). Further decentralisation occurs within states via the Panchayati Raj system. Implementation and maintenance of water infrastructure for irrigation, sanitation, drinking at the local/district level is under the purview of Gram Panchayats and higher Panchayat tiers (Ahmed and Araral 2019). This distribution of power empowers local decision making and accountability. This multi layered systems creates complex interplays, where states are responsible to align their policies with the national objectives, while retaining autonomy.

Drought as a persistent challenge: India has a long history of droughts and water stress, with certain regions, notably some parts of Rajasthan, Gujarat, and southern peninsular India. These regions are perennially vulnerable due to low rainfall and high inter-annual variability. This challenge is particularly exemplified in Rajasthan with much of its area classified as arid or semi-arid (Ranawat 2020). Rajasthan's villages have long relied on indigenous water-harvesting to survive frequent dry spells. The state experiences frequent deficient rainfall and has also endured major droughts affecting millions of people (Rathore 2004). These climatic hazards have devastating impacts on agriculture and rural livelihoods as crop yields and livestock productivity plummet, water sources dry up, and communities face acute water

shortages and economic losses thereby, exacerbating rural poverty and food insecurity (Kanwal, Sirohi, and Chand 2020). Communities in these landscapes have traditionally adapted through ingenious water management practices and maintaing local water commons such as *talabs*[2], *baoris*[3], *tankas*[4], and *johads*[5] to capture rainwater, recharge groundwater, and bridge dry spells. These indigenous strategies are often managed collectively at the community level.

Asymmetries of Access and Influence in climate adaptation governance: Very often, deep inequalities in access and influence are reflected during climate adaptation policymaking. Scholars find that business and economic interests typically secure privileged access in policy processes, even when formal rules are inclusive. (Weiler et al. 2018) show that in Swiss policymaking economic interest groups enjoy better access than citizen or grassroots groups. In other words, formal pluralism often masks a post-selection bias in favor of corporate actors. In the climate adaptation domain, this pattern means that powerful economic and state actors dominate agenda-setting and decision-making, while vulnerable communities are under-represented. Adaptation policies in South Asia, for instance, tend to be top-down and hierarchical, "dominated by elites, excluding marginalised groups, line agencies, and civil society" (Nagoda and Nightingale 2017). The net effect is that adaptation planning often serves those already in power, rather than the most at-risk populations.

Vulnerability to climate shocks is largely socially produced and leaving marginalised and vulnerable voices out of governance exacerbates inequity at both global and national level (Betzold and Weiler 2017) (Adger 2006). (Stock, Vij, and Ishtiaque 2021) emphasises that vulnerability "is produced by on-the-ground social inequality, unequal access to resources,

[2] *talabs* act as reservoirs used for water harvesting and storage.
[3] *baoris* are stepwells that function as underground water storage and management systems.
[4] *tankas* are small underground tanks which help in rainwater harvesting.
[5] *johads* are small earthen check dams which capture and conserve rainwater.

poverty, poor infrastructure, lack of representation". Policies that ignore this social context simply reinforce existing power structures. In practical terms, this means national adaptation plans or large drought-relief projects often prioritise engineering or market-based solutions, without grounding in local needs.

Climate adaptation paradigms: Climate change adaptation literature distinguishes between top-down and bottom-up paradigms (Pulido-Velazquez et al. 2022). Top-down approaches are driven by central policies and expert planning, often implementing large-scale technical solutions with authority from higher levels of government (Ansell, Sørensen, and Torfing 2017). Bottom-up approaches, in contrast, start at the community level and rely on local knowledge, grassroots action, and stakeholder participation to develop context-specific adaptations (Selje, Schmid, and Heinz 2024). In essence, 'while top-down approaches impose change through policy, bottom-up approaches seek to influence policy through localised behaviour and innovation' ("Top-Down versus Bottom-Up: Two Approaches to Sustainability" 2018). In a top-down paradigm, decisions and initiatives are formulated by central authorities and delivered to local communities. This model emphasises hierarchies of control, standardised solutions, and expert knowledge (Chand 2011). The underlying assumption is often that higher-level institutions have the oversight, resources, and scientific understanding to design effective interventions. Top-down strategies mobilise significant resources and enforce standards but may overlook local needs and social dimensions (Butler et al. 2015). Bottom-up paradigm, by contrast, starts at the local level, which may then scale up or inform higher-level policy. Bottom-up adaptation foregrounds participation, local knowledge, and community agency (Mammadova et al. 2024). It operates on the principle of subsidiarity, which means that decisions should be made as close as possible to those affected.

3. Methodology

3.1.Case Selection

Purposive sampling method was used to select these two cases, Tarun Bhagat Sangh (TBS) and *Mukhyamantri Jal Swawlamban Abhiyan* (MJSA). Having the same regional and climatic context, both cases represent the ideal types of bottom-up and top-down adaptation paradigms. They both aim to address the chronic water scarcity and drought frequency in Rajasthan. This shared environmental context serves as a natural controlling factor and therefore any differences in outcomes can be more confidently attributed to differences in approach rather than differences in climate or geography. Conducting a comparative analysis provides an opportunity to understand and analyse how a proclaimed grassroots model compares with a government program.

3.2.Research objectives and design

I have used a comparative case study design to compare these two initiatives towards drought adaptation in Rajasthan. Case study styles are selected given the research's goal of understanding the complex processes and the context specific nature of both initiatives. Using this method, I have used qualitative data to systematically compare both the initiatives and answer the research question: How do bottom up and top-down drought adaptation initiatives in Rajasthan differ in their paradigms of agency, environmental governance, and resilience? With this study, I have

3.2.1. compared both the initiatives' approaches to agency;

3.2.2. examined their differences in environmental governance;

3.2.3. and evaluated their resilience outcomes.

This comparative study is guided by three hypotheses:

Hypothesis 1: By enabling local ownership, decision making autonomy and participation, bottom-up initiative fosters stronger community agency, while top-down programs focus on centralising power and control.

Hypothesis 2: By leveraging informal institutions and knowledge of indigenous communities in the system, bottom-up initiative reflects participatory and polycentric governance, while top-down program prioritises scalability and uniformity.

Hypothesis 3: The contribution of both the initiatives is towards drought resilience. However, the bottom-up initiative is more likely to have better adaptive capacity, as compared to top-down initiative.

I have used relevant evidence in the subsequent chapters to critically examine these hypotheses. By comparing a proclaimed grassroots movement with an ambitious government campaign, I aim to glean insights into how top-down and bottom-up approaches can contribute to drought adaptation, and how they can be synergised.

3.3. Theoretical Framework

This research draws on three primary theoretical frameworks to analyse the case studies: political ecology, adaptive governance and resilience theory. Together, these three provide a lens to examine the facets of agency, governance, and resilience in drought adaptation initiatives.

3.3.1. Political Ecology:

Political Ecology provides a critical theoratical backbone to examine agency and power relations (Robbins, 2012). While resilience and governance frameworks often assume

consensus on goals, political ecology reminds us that environmental management is inherently political. It examines how power relations, political economy, and cultural narratives shape human-environment interactions. Political ecology emphasised on the important role of external forces like economic modernisation schemes and international development in restructuring local lives and environments in the Global South (Roberts 2020). Applying political ecology to drought adaptation means asking: who defines the problem and the solution? For whose benefit? Are certain paradigms privileged over others, and why? According to (Roberts 2020), 'this field continues to provides a valuable means for tracing the broader structural forces of socio-ecological change to a thorough understanding of the impacts and responses to that change at the local level'. One specific concept from political ecology relevant here is governmentality, by which we can theorise how agency is constructed differently: one as citizens mobilised by the state, another as citizens mobilising themselves (and sometimes pressuring the state).

3.3.2. Adaptive Governance:

A concept that refers to learning oriented and flexible governance systems capable to adjust to environmental uncertainty and change is known as adaptative governance. This concept has emerged from the literatures of environmental management and resilience (Folke et al. 2005). This governance arrangement is usually collaborative and polycentric (Lee, 2023), often spanning local to higher scales. (Folke et al. 2005) identified key four essential features to adaptive governance i.e., participation of diverse stakeholders in decision making; iterative learning; ability to reorganise in response to crises and networks and bridging organisations that connect different levels and sectors. In context of drought, adaptive governance is the way how institutions respond to water scarcity, rainfall variability and other community needs in real time. According to this framework, agency is not concentrated but distributed (Chaffin,

Gosnell, and Cosens 2014). This is relevant to our hypothesis on governance: a bottom-up initiative like TBS may embody adaptive governance traits (community self-organisation, cross-scale networks, knowledge-sharing), whereas a conventional top-down program might be less flexible.

3.3.3. Resilience Theory:

Resilience is the ability of a system to absorb disturbances or magnitude of shocks that it can absorb before it completely changes (Adger 2000). This theory has been extended to social-ecological systems to understand how communities and environments can withstand shocks and persist or transform (Folke et al. 2005). Within this framework, resilience is not simply bouncing back to a previous state but also includes the capacity to adapt and innovate in the face of change, and in some interpretations, to transform into a new, more desirable state if the old system is untenable. It is very important to understand resilience to cope with climatic hazards and have a successful adaptation (Motevalli et al. 2023). In practice, building resilience in drought-prone regions involves enhancing water availability, diversifying livelihood strategies, and strengthening local knowledge and institutions to cope with climate variability. Comparing TBS and MJSA under this lens, means asking how does each initiative conceptualise building resilience to drought? Do they primarily aim for persistence or also transformative adaptation? What elements of social resilience and ecological resilience are emphasised?

These frameworks are complementary. Together, they help to answer the research question about differing paradigms: “Paradigm” here can be understood as a coherent set of ideas about who should act (agency), how decisions should be made (governance), and what the goal is (resilience as defined by the initiative).

3.4. Data Collection

Secondary data is the sole source of data collection for this research as no primary fieldwork was conducted. Relevant and important literature such as TBS's annual reports, prior evaluation of their work and other publications, official government reports on MJSA, progress and audit reports, outcome evaluation studies, academic papers and policy briefs, media articles on Rajasthan's drought and water programs and NGO critiques are the main secondary sources used for the purposes of this research.

3.5. Analytical Approach

Each case study is explained as a narrative, carefully structuring them around sub-themes which align with the three hypotheses (agency, governance, resilience). The qualitative analysis also paid attention to language and narratives and how each initiative portrayed itself. This narrative analysis, informed by political ecology, helped interpret underlying paradigms. Reliability was strengthened by triangulating multiple sources. For instance, if a government report claimed a certain outcome, it was cross-checked with independent evaluations or media reports if available.

Given the qualitative nature of the research, I also considered alternative explanations and looked for any deviant elements, if readily available. For example, if MJSA had instances of strong community leadership or if TBS had moments of dependence on the state, these would complicate a simple dichotomy. Recognising such nuances prevented a biased or over-simplified conclusion of the thesis.

3.6. Validity and Reliability

Throughout the thesis, I have tried to maintain citation integrity and evidence-based research. Use of published and verifiable sources and minimising reliance on potentially biased

grey literature or blogs, ensures that the used information is credible. As a researcher, I remained aware of biases. The use of the theoretical framework provided a consistent lens, but I remained open to findings that might challenge the theories. In writing up, care was taken to present a balanced analysis.

3.7. Ethical Considerations

Since this research did not involve human subjects directly, ethical issues were primarily about representation and respecting intellectual property. Proper attribution is given to all sources of information and ideas.

3.8. Scope and Limitation

The scope of this thesis is bounded to these two initiatives in Rajasthan; thus, findings are context specific. While they can inform broader debates, they are not directly generalisable to all adaptation cases. I acknowledge the limitation of only relying on secondary data might carry some author biases. I attempted to mitigate this by cross-verification and including critical academic perspectives.

In summary, the methodology is designed to carefully dissect and compare the two cases on equal footing under the guidance of the conceptual frameworks discussed. With this approach established.

4. Comparative Analysis

4.1. Tarun Bharat Sangh (TBS)

4.1.1. Introduction

TBS is a Non-Governmental Organisation (NGO) registered under section 28 of the Rajasthan Society Act 1958. Founder, Rajendra Singh established this organisation in 1985 ("25 Years of Evolution" 2009). Currently, the organisation works across 1000 villages of 15 districts in the state having its centre in Bheekampura, Alwar. Initially they mobilised communities around the issue of water scarcity & droughts and supported them in the revival of traditional rainwater harvesting structures called *johads* - small earthen dams or ponds (Gupta 2011). The movement started from one village; *Gopalpura* and eventually spread to neighbouring villages as the local communities started witnessing farmlands becoming more productive and wells being refilled (Everard 2015a). To revive the feeling of oneness with nature, they always built on the existing cultural traditions and created an ethos of integrated ecosystem development ("25 Years of Evolution" 2009) by following a 'bottom-up approach'. While local knowledge and labour (*shramdaan*) was contributed by the villagers, advocacy and guidance was facilitated by TBS . Their work has also been recognised at international level (E.g. Stockholm Water Prize 2015) for empowering communities to combat drought through indigenous practices (*The Economic Times* 2015; Daga 2017).

4.1.2. Case Background

Alwar is home to a population of 3,674,179 people (Yadav 2024). This district of Rajasthan is geographically characterised as 'rocky and precipitous' as from the northern and eastern part it is surrounded by the Aravalli hills and from the southern and western part it is

covered in dry plains (Daga 2017). The semi-arid climatic conditions of the region made it very prone to drought occurrences (Daga 2017). In the 1980s, the region started to experience an environmental crisis with the loss of traditional water bodies (baoris, *johads*), over-extraction of ground water and reduced rainfall infiltration ("Water Management Programme: Tarun Bharat Sangh" 2024). This led to the suffering of livelihoods, causing out-migration of the local population ("To Hell and Back" 1999). It was in this context that TBS started working in *Gopalpura* village with a profound approach of reviving the old rainwater harvesting structures (*johads*) that had fallen into despair. With the guidance from local elders, the TBS team built the first *johad* in 1985 which seemed to be a risky undertaking at that time as it did not promise any positive results (Everard 2015a). However, villagers saw its immediate benefits as it restored soil moisture, rejuvenated local grazing and re-established vitality to the river ("Water Management Programme: Tarun Bharat Sangh" 2024). A few educated unemployed young men supported the mission and were willing to work towards water conservation. They joined TBS and gradually became the key functionaries of TBS (Gupta 2011).

4.1.3. Agency and Community Leadership

While the NGO acts as a main catalyst and facilitator, agency majorly resided with the local community. Eventually, as the local communities prospered and the programme scaled up, a minimum amount was fixed which a village had to contribute, in terms of cash, material and labour ("Water Management Programme: Tarun Bharat Sangh" 2024). This contribution was towards the maintenance and construction of *johads* which eventually rose to 33% from 25%. This participatory ethic was not just a means but an ideological end whereby TBS sought to restore villagers' confidence in their own knowledge and capacity, countering a legacy of dependence on government drought relief. This cost-sharing mechanism exemplified the transfer of agency where the community was literally investing in its own resilience. Over time,

TBS also encouraged villages to form or reactivate Gram Sabhas (village assemblies) to discuss and manage water resources (Kumar and Kandpal 2003).

The kind of leadership provided by the TBS staff members did not focus on centralising control but on empowering others. The local people were often credited by them for their knowledge of where to build structures and how to maintain them. Gandhian principles of 'Trust' and 'self-reliance' played a very important role in TBS's organisational structure(Daga 2017). In terms of institutional agency, one could say TBS cultivated local institutional agency by motivating villagers to form gram sabhas. These sabhas encouraged community ownership of water conservation ("Water Management Programme: Tarun Bharat Sangh" 2024) and acted as a link between villagers and TBS (Gupta 2016). Another vivid example of facilitating institutional agency and self-governance by TBS is the formation of a 'river parliament', the Arvari Sansad (Gupta 2016). This federation brought 72 gram sabhas together to form a collective governing body for the Arvari river - a small seasonal river that had become bone-dry ("Water Management Programme: Tarun Bharat Sangh" 2024). The Arvari Parliament is a striking manifestation of community agency; it had no legal backing per se, but it drew moral and social authority from collective action and even engaged in dialogue with the state government as a united front of villages.

It should be noted that agency within the community was not homogeneous. Local power structures influenced whose voice prevailed in the Gram Sabhas. External analyses have critically noted that TBS's reliance on traditional norms sometimes glossed over internal inequities (Gupta 2016). However, the very act of convening villagers to discuss common water problems was a social shift from earlier patterns.

4.1.4. Environmental Governance and Institutional arrangements

The governance model under TBS is decentralised, community-based, and polycentric. Each village or cluster of villages that TBS worked with essentially developed its own local governance around water, often reviving or adapting the Panchayat (local council) structure to take on water management tasks ("25 Years of Evolution" 2009). Their governance model can broadly be described as community based natural resource management (CBNRM), fitting into broader trends in environmental governance that valorise local stewardship (Brando et al. 2019) (Daga 2017).

TBS was not completely separate from the state's governance landscape. They often collaborated with or at least informed local government officials about their activities. TBS's success even led some district officials to support their work. In one famous incident, the success of water conservation in Alwar under TBS's guidance led to increased forest and water resources. However, this environmental recovery prompted illegal mining interests ("Water Management Programme: Tarun Bharat Sangh" 2024). TBS and local villagers responded by protesting and filing litigation, which ultimately led to a Supreme Court ban on mining in the Aravalli hills surrounding their project area (Gupta 2016). This illustrates a multi-level governance interaction where local communities, a civil society organisation (TBS), and the highest judiciary teamed up to enforce environmental protection (Kumar and Kandpal 2003).

TBS's governance ethos can be summed up as participatory adaptive management. Decisions such as where to build a *johad* were made collectively, often preceded by 'transit walks' across the landscape to understand water flows. There was an element of trial and error; the first *johads* guided the design of subsequent ones, with villagers learning how different structures affect groundwater (Everard 2015b). TBS maintained a horizontal network structure rather than a hierarchy. Each cluster of villages had local volunteers, with TBS's central ashram

(headquarters) in *Bhikampura* serving as a knowledge hub and training centre rather than a command centre (Kumar and Kandpal 2003). This network approach resonates with the adaptive governance idea of self-organising networks (Folke et al. 2005).

However, one challenge in this governance model is sustainability and dependence. TBS prided itself on strong community ownership, but the NGO still provided external support and motivation. A critical question is: would communities continue the practices if TBS withdrew? By design, TBS attempted to institutionalise at the community level so that local governance structures would persist (the River Parliament being a case in point). And indeed, many *johads* continued to be maintained by villagers' years after construction. The fact that TBS has scaled out to over a thousand villages suggests that early villages have not reverted entirely to old ways. Still, some scholars have pointed out that maintenance of structures and equitable sharing can wane if community cohesion falters (Gupta 2016). TBS addressed this by periodic follow-ups and creating forums like the Rashtriya Jal Biradari (National Water Community) in 2001 – a network to keep local water champions connected and vocal at state/national levels (Kumar and Kandpal 2003). This network exemplifies polycentric governance by linking local nodes of governance into a broader coalition advocating for water conservation rights ("Water Management Programme: Tarun Bharat Sangh" 2024).

4.1.5. Resilience Outcomes

As reported by the Council on Energy, Environment and Water, India, TBS claims to have built almost 13,800 rainwater harvesting structures and rejuvenated 13 rivers across Rajasthan and neighbouring states in this 40 year period ("Water Management Programme: Tarun Bharat Sangh" 2024). They further claim that by 1999, TBS had revived rivers including the *Arvari, Ruparel, Sarsa, Bhagani*, and *Jahajwali* ("Water Management Programme: Tarun Bharat Sangh" 2024). This led to formerly abandoned lands being cultivated again, and

pastoralists reported increased fodder availability ("To Hell and Back" 1999). A Harvard Kennedy School case study (2013) noted that TBS's mobilisation resulted in improved livelihoods for around 1,000 villages, with agriculture productivity increases and migration declines (Jayaram 2024).

From a resilience theory perspective, TBS's initiative enhanced absorptive capacity i.e., villages could better absorb rainfall because of increased soil moisture and groundwater storage, reducing the shock of a dry monsoon and adaptive capacity i.e., communities learned to manage water budgets, diversify crops, and plan for drought ("Water Management Programme: Tarun Bharat Sangh" 2024). Resilience is not just hydrological but also social. The revival of water commons reduced conflicts over water – for instance, instead of upstream villages hoarding, the River Parliament facilitated coordinated use so that downstream villages also benefit (Kumar and Kandpal 2003). Women, who used to spend hours fetching water, found local wells recharged, freeing time for other activities ("25 Years of Evolution" 2009). Additionally, having water security allowed communities to venture into new which are less vulnerable than rain-fed grain farming alone.

One measure of resilience is how the system performs during drought years. For example, during the 2002 drought, many villages with *johads* still had some water in wells and were able to harvest a reduced but existent crop, whereas other areas had complete crop failure (Suutari and Marten 2005). This kind of anecdotal evidence supports the idea that TBS built buffer capacity. Furthermore, the presence of local institutions meant that in crises, villages organized collective responses rather than descending into chaos or total dependency on government tankers. Resilience theory also talks about transformative capacity; so, did TBS's work lead to systemic changes? Arguably yes, in 2001, it initiated the formation of the *Rashtriya Jal Biradari* (Kumar and Kandpal 2003), a national network aimed to promote community-led water conservation efforts throughout India. TBS has influenced national and

state policies on water conservation, leading to initiatives such as Maharashtra's '*Aao Nadi Ko Jaane*' river revitalization program and government-funded rainwater harvesting programs like 'Catch the Rain' ("Ensuring Sustainable Water Security for Communities in India | Earthna," n.d.). In this regard, the resilience impact extended beyond the local level, contributing to a broader shift in perspective, demonstrating that returning to fundamental approaches (small-scale, community-driven water conservation) could serve as a viable adaptation strategy in response to climate change.

TBS stands as a pioneering bottom-up paradigm of drought adaptation. It frames drought not as an inevitable disaster to be alleviated by external aid, but as a manageable condition if communities restore their relationship with the environment. In TBS's paradigm, agency lies with the villagers, governance is local and adaptive, and resilience is built through reviving nature and community spirit. This case, therefore, provides a strong contrast to the next case of MJSA, where the state takes the driver's seat in pursuing drought resilience

4.2.Mukhyamantri Jal Swawlamban Abhiyan (MJSA)

4.2.1. Introduction

The MJSA was implemented in 2016 by the Government of Rajasthan to address water scarcity and over exploitation in the state. The groundwater tables lowered due to heavy water extraction, also deteriorating its quality (Singh 2019). This called for a state government led 'top-down approach' initiative. MJSA was launched by the Hon'ble Chief Minister of Rajasthan *Shreemati Vasundhra Raje* with an objective of making every village 'water self-reliant' ("Water Conservation Mission in Rajasthan Kicks Off" 2016). The four main objectives of this project include: raising groundwater levels, increasing water storage, ensuring drinking water supply, building resilience against droughts and boosting agricultural productivity

(Department of Watershed Development & Soil Conservation, n.d.). Various committees were set to achieve the above-mentioned objectives of the *Abhiyan*. This ambitious scheme by the Rajasthan Government emerged as a mass movement to tackle drought and water scarcity issues in the desert state (Singh 2019). More than 94,000 water harvesting structures were constructed in approximately 3500 Rajasthan villages within the first six months (Sengupta 2017). It also engaged with various civil society organizations (CSOs) to align district level actions plans with the village level action plans with an aim of being flexible and adaptation to social changes (Katyaini et al. 2024). By ensuring that all the important segments of society participate in the development initiatives under this scheme, it promoted social inclusion.

4.2.2. Case Background

The program's formulation considered lessons learned from earlier initiatives such as the national Integrated Watershed Management Programme (IWMP), *Pradhan Mantri Krishi Sinchai Yojana*, Hariyali Guidelines, etc. The IWMP was criticised because of low community involvement, however, Hariyali Guidelines centred all of its work around public participation (Verma and Shah 2019). The best approach was to incorporate the best of both these ideas and that is what MJSA focused on. It aimed at leveraging modern technology and departmental coordination while also ensuring the presence of local participation in planning and maintenance (Everard 2020). Even though the slogan of this initiative; '*Jal Swavlamban*' is a government-coined term, it reflects a nod towards the idea of community self-sufficiency. To manage this massive effort, a multi-tiered governance structure was put in place. At the state level, the Rajasthan River Basin and Water Resources Planning Authority (RRBWRPA) was the nodal agency to coordinate with seven line departments (Watershed Department, Groundwater Department, Water Resources, Forest, Agriculture, Horticulture, Public Health Engineering) with each focusing on their domain works but under a common umbrella (Verma

and Shah 2019). At the district level the District Collector was the nodal officer coordinating a team comprising all relevant departments. This team conducted surveys, prepared Detailed Project Reports (DPRs) for each village, sanctioned projects, and monitored execution (Department of Watershed Development & Soil Conservation, n.d.).

4.2.3. Agency Dynamics

The primary agency in MJSA lies with the state apparatus. The vision, targets, funding, and technical guidelines flowed from the top (Chief Minister and state-level officials) downward. However, villagers had a consultative agency. They could voice preferences, and indeed some works were demand-driven. The campaign itself was not initiated by them; it came as an external impetus. The state's agency was exercised through mobilising bureaucratic machinery and resources at an unprecedented scale. One could say MJSA practiced a model of 'invited participation', where the government invites citizens to participate in a program it designed, as opposed to 'organic participation' where citizens set the agenda. This invited participation is not necessarily token; in some villages, people likely shaped the plans meaningfully. But the ultimate decision on resource allocation (which village gets how many structures, how funds are prioritised) remained in bureaucratic hands, constrained by the overall budget and targets (Katyaini et al. 2024) (Verma and Shah 2019). MJSA also sought agency from other societal actors through convergence. The scheme proactively sought Corporate Social Responsibility (CSR) funds and donations (Sharma 2018); it was sometimes dubbed a crowd-funded water scheme (Singh 2019), although in practice the majority of funding still came from departmental budgets and the rural employment guarantee schemes (Verma and Shah 2019).

4.2.4. Governance Structures and Processes

The governance of MJSA can be characterised as centralised coordination with decentralised implementation. It was not pure top-down in the sense of uniform execution; rather, it combined top-level guidance with district-level discretion. Each district prepared its plan and could select villages based on criteria like water scarcity level, community willingness, etc. Many villages selected were those identified as most drought-prone or previously less served by watershed projects (Katyaini et al. 2024). Technology played a role in governance. MJSA made heavy use of GIS mapping, satellite imagery, and geotagging. All structures built were to be geotagged and photographed for monitoring and transparency (Department of Watershed Development & Soil Conservation, n.d.) (Verma and Shah 2019). A central MIS (Management Information System) tracked progress. This techno-bureaucratic oversight shows the top-down instinct to control for efficiency and prevent fund leakage.

4.2.5. Resilience Outcomes and Efficacy

According to the Government of Rajasthan, by mid-2018, MJSA had completed three phases (2016, 2017, 2018), covering around 12,000 villages with more than 2,00,000 water conservation works. The state government claimed notable successes and media releases highlighted villages where, for the first time in decades, wells and ponds were full after monsoon, crop yields had increased, and even drinking water availability became year-round (Sengupta 2017) ("Rajasthan Makes Rapid Strides in Water Conservation," n.d.). For example, farmers in Sikar district reported being able to irrigate wheat without buying water tankers, attributing it to 19 new water structures that raised soil moisture and groundwater. Another village saw the time to fill their public water tank drop from 3 hours to 80 minutes due to higher groundwater recharge (Sengupta 2017). These anecdotes indicate short-term resilience gains including increased water storage and availability immediately translated to better agricultural

and domestic water security. Additionally, by expanding irrigation potential, MJSA aimed to convert more rainfed area to irrigated (targeting at least 40% of rainfed area to have protective irrigation) (Verma and Shah 2019), thereby reducing vulnerability to monsoon failure.

Economically, the immediate returns reported include farmers earning multiple times more due to better yields, as noted in Down To Earth, one farmer's profit increased five-fold after MJSA works improved irrigation in his village (Sengupta 2017). The World Bank assessment concluded that such water conservation efforts, if sustained, could significantly drought-proof rural livelihoods and even enhance ancillary benefits like fisheries and livestock, citing increases in fish production in some water bodies (Verma and Shah 2019). However, these outcomes come with a caveat: they largely measure output and short-term outcomes. Long-term resilience would require that these water gains persist over years and that institutions maintain them. By 2019, the program slowed – partly because a new government (of a different party) took office and the scheme was not their brainchild. The Times of India reported that after three phases, MJSA ground to a halt due to budget cuts, with Phase 4 and 5 not completed as originally envisaged (*The Times of India* 2019). This highlights a vulnerability of top-down schemes: political discontinuity. A community movement like TBS, once internalized, is relatively immune to election cycles; MJSA, being an administrative program, was subject to shifting political priorities. The new state government in 2019 talked of redesigning it or awaiting a national scheme, reflecting a loss of momentum (*The Times of India* 2019).

From a resilience perspective, one can argue MJSA improved infrastructural resilience – basically boosting the water storage capacity in the landscape. But did it strengthen community resilience in terms of knowledge or organisation? The claim that it was a 'people's movement' (Department of Watershed Development & Soil Conservation, n.d.) suggests an attempt to galvanise community spirit. Indeed, some local success stories involved enthusiastic

collective action ("Rajasthan Makes Rapid Strides in Water Conservation," n.d.), which if continued could build social capital. Yet, it's unclear if communities felt a sense of empowerment or just saw it as a beneficial government project. If villagers merely saw it as the state providing assets, they might be less inclined to maintain them proactively. The essence of *self-reliance* (swavlamban) in water would mean communities can manage and replenish their resources without constant external inputs. Achieving that in four years on a large scale is challenging.

Having detailed both case studies, we now move to a direct Discussion and Comparison of the two. We will revisit the hypotheses and assess them against the evidence from TBS and MJSA, using comparative analysis to tease out insights.

5. Discussion

In this section, I compare the Tarun Bharat Sangh (TBS) initiative and the *Mukhyamantri Jal Swavlamban Abhiyan* (MJSA) across the three dimensions of agency, governance, and resilience and critically examine how each hypotheses holds up.

5.1. Hypothesis 1

Hypothesis 1: By enabling local ownership, decision making autonomy and participation, bottom-up initiative fosters stronger community agency, while top-down programs focus on centralising power and control.

TBS was initiated by villagers and an NGO activist responding to local problems. The impetus came bottom-up as villagers sought help for water, local youth joined hands, and leadership emerged from within (Rajendra Singh becoming an accidental leader grounded in the community). In contrast, MJSA was conceived at the highest political level, i.e., by the Chief Minister's office, as a grand plan for the state. Its launch was top-down, using bureaucratic channels to reach villages. This difference is foundational; in TBS, villagers could feel "We did it ourselves", in MJSA, the sentiment was more "The government is doing this for us".

TBS's approach to agency can be termed community self-mobilisation. Community members actively planned, contributed resources, and even took collective. People's sense of agency was intrinsic as they experienced the efficacy of their actions and thus gained confidence to do more. MJSA's approach, meanwhile, was state mobilisation of community. Villagers participated, but in a manner orchestrated by the state. It was like a large-scale 'invited participation' model. Agency here is trickier because even though many villagers took active part in MJSA, the locus of initiative remained with government functionaries. This suggests

that the driving agency was with the state, even if the operational agency was shared during implementation.

Another metric of agency is whether the initiative left communities with greater capacity to autonomously manage droughts. TBS clearly built local leadership capacity as numerous villagers became adept at water management, some even travelled to share knowledge through networks like via the *Jal Biradari* network. The River Parliament is a form of collective agency that persisted beyond TBS's direct involvement. Conversely, MJSA's capacity-building efforts were limited to awareness campaigns and training a subset of local functionaries in maintaining records. It did not create new, durable community institutions.

TBS's approach cultivated self-reliance as communities learned to solve their water issues through collective action, arguably reducing dependency on government tankers or relief. With MJSA, if a drought were to hit a few years later and structures silted up without maintenance, villages might again need a government intervention. True self-reliance would have been if MJSA catalysed a continual local process. There are few indications of such spontaneous continuity in the documents reviewed, suggesting that agency largely remained external.

In conclusion, the Agency Hypothesis is validated. TBS embodies a community-agent paradigm, while MJSA is a state-agent paradigm with community involvement. Communities under TBS acted as subjects of change however, under MJSA, they were more objects of change. This difference influences everything from motivation (intrinsic vs. extrinsic) to continuity (persistent vs. project-tied).

5.2. Hypothesis 2

Hypothesis 2: By leveraging informal institutions and knowledge of indigenous communities in the system, bottom-up initiative reflects participatory and polycentric governance, while top-down program prioritises scalability and uniformity.

TBS's governance was decentralised to the level of each community and even each watershed. Villages set their priorities. TBS as an NGO provided a facilitating structure but not a command hierarchy where decision-making was situated locally. MJSA's governance, by contrast, was centrally planned with targets, templates, and orders cascading down. The creation of umbrella coordination bodies implies a top-heavy design. Implementation was spread out, but even at village level, the decision framework was guided by the DPRs prepared largely by engineers. Hence, vertical authority was strong in MJSA, whereas TBS operated in a horizontal network mode.

Both initiatives had participatory elements, but their quality differed. In TBS, participation was empowering where communities initiated, controlled resources, and the process was open-ended and iterative. In MJSA, participation was more of consultative participation where structured meetings were held to input into a plan that would then be executed by contractors or departments. There's a fundamental difference between consultation and deliberation. TBS's Gram Sabhas were forums of deliberation where villagers debated what to do, and doing it, whereas MJSA's Gram Sabhas were forums of consultation where villagers giving opinion on government-drafted plans.

Governance also involves how institutions interact. TBS largely built parallel institutions alongside the formal state institutions. MJSA explicitly tried institutional integration within government, breaking silos of departments by having them work jointly under MJSA. It also sought to integrate community institutions into this framework by using

the Panchayat system. To some extent, MJSA may have strengthened local governance by giving Panchayats a role in water planning. Therefore, MJSA's governance cannot be dismissed as purely top-down as it had a multi-stakeholder structure, but the mode of operation remained bureaucratic as various rules, guidelines, forms, and sanctions defined much of the process.

In TBS's model, accountability was social i.e., if a *johad* failed, the community discussed it and TBS as an NGO would face the community's questions directly. In MJSA's model, accountability was administrative i.e., contractors were liable for 2-year maintenance, and officials had targets to meet. Politically, the government would claim credit or face blame. For villagers, if something didn't work, they would petition the officials. Thus, TBS had downward accountability i.e., to the people, whereas MJSA had largely upward accountability.

Adaptive governance theory emphasises learning and flexibility. TBS's approach was inherently adaptive as it expanded phase by phase. MJSA had a fixed timeline and blueprint for four phases, which is less adaptive. That said, MJSA did incorporate learning from past programs as a design input. But within its implementation, there was less room to change course. If monsoons failed or an approach wasn't effective, the bureaucracy might not readily overhaul the plan because they are compelled to execute as per guidelines.

In conclusion, the Governance Hypothesis stands. TBS represents polycentric, community-cantered governance, while MJSA represents hierarchical, state-cantered governance with limited but structured community engagement. The two exemplify nearly opposite ends of the governance spectrum for drought adaptation.

5.3. Hypothesis 3

Hypothesis 3: The contribution of both the initiatives is towards drought resilience. However, the bottom-up initiative is more likely to have better adaptive capacity, as compared to top-down initiative.

TBS's interventions restored ecological systems by increasing groundwater, reviving rivers, reforesting hill catchments, thereby reinforcing the natural buffers against drought. This is classic ecosystem resilience where the landscape's water was retained, capacity was improved, biodiversity returned, and microclimates became more humid. MJSA's interventions, while spread across ecological elements too, emphasized engineered structures built quickly to hold water. The ecological processes were secondary. The risk with an engineering approach is if structures are poorly sited or built, they may fail to deliver intended hydrological benefits beyond the immediate term. TBS's slower, iterative approach likely ensured each structure was well-adapted to its location with community feedback ensuring it solved the right problem.

TBS significantly strengthened social resilience by organizing communities, preserving and reintroducing traditional knowledge, and fostering networks. Villages learned collectively how to manage water, a skill that can be applied to future climate challenges. MJSA's contribution to social resilience is more debatable. On one hand, it raised awareness and possibly changed attitudes. On the other hand, it didn't institutionalize new community practices beyond the project.

By design, MJSA achieved immediate relief. Within a year, thousands of villages saw the water situation improve. TBS's impacts unfolded over years, sometimes decades, to fully manifest. But once achieved, TBS's resilience outcomes were more enduring because they were maintained by communities. With MJSA's halt after 2018, there was a concern raised

whether the gains would hold or gradually reverse. A resilience perspective values robustness and longevity. TBS's model shows robustness as many of its early *johads* from the 1980s still function today. In contrast, the sustainability of MJSA's structures is uncertain.

Environmentally, TBS improved ecosystems. MJSA improved some environmental indicators but possibly did not address underlying environmental issues like cropping patterns or water-intensive agriculture. Economically, both improved incomes and reduced drought losses in the short term. But TBS made livelihoods more diversified and secure by encouraging practices like water-efficient crops, whereas MJSA largely aimed to support existing farming better. Thus, TBS's resilience is systemic, MJSA's resilience is symptomatic (treating the symptoms of drought with added water supply). Symptomatic relief is valuable but may not alter the vulnerability context if, say, population or water demand keeps growing without structural changes.

The Resilience Hypothesis appears valid: TBS produced a deep resilience rooted in environmental regeneration and empowered communities, whereas MJSA yielded a broad but shallow resilience.

6. Trade-offs and Synergies

Having contrasted them, it is also worth exploring whether these paradigms are inherently at odds or could be complementary. Could a model combine the strengths of both – the scale and resources of government with the empowerment and sustainability of community action? This question is crucial for policy implications. The analysis indicates some trade-offs like rapid scale-up vs. depth of participation, uniform planning vs. local customization, short-term impact vs. long-term process. However, it also shows potential synergies such as MJSA tried to inject participation and learn from community methods, while TBS's successes influenced state policy.

In Rajasthan's case, if MJSA had another phase focusing on consolidating and training local water committees to take over, it might come closer to TBS's sustainability. Conversely, grassroots movements like TBS can sometimes benefit from state support e.g., when the Supreme Court banned mining in *Aravallis* at TBS's behest, that was a crucial external enforcement for resilience. Also, in scaling out beyond one region, NGOs often do partner with government schemes. The general takeaway is that multi-level governance – linking bottom-up and top-down can potentially yield the best results. But alignment of political will and community readiness is needed.

The discussion would not be complete without acknowledging that not all bottom-up initiatives are automatically successful, nor all top-down ones' failures. TBS is somewhat of an extraordinary case, with a charismatic leader and favourable community mobilization contexts. Similarly, some government schemes in India like the Gujarat check dam program in early 2000s sustained beyond politics and did yield lasting benefits by institutionalizing community maintenance funds. So, while TBS and MJSA exemplify the extremes, there is a spectrum in practice.

From this comparative discussion, we can derive that both the initiatives had successes and limitations, but in markedly different ways. TBS's success was in quality and sustainability of resilience, whereas MJSA's was in quantity and speed of coverage. TBS's limitation was slower reach, MJSA's limitation was weaker longevity. These insights inform the concluding chapter, where I consider what these findings mean for future adaptation efforts and how policy might aim to harness the best of both approaches, and what further research is needed to optimise drought adaptation paradigms in Rajasthan and beyond.

7. Conclusion

Through an in-depth comparative analysis of Tarun Bharat Sangh (TBS) and the *Mukhyamantri Jal Swavlamban Abhiyan* (MJSA), the research has confirmed that these two cases indeed represent divergent paradigms.

In the bottom-up paradigm (exemplified by TBS), local communities are the primary agents driving adaptation, decision-making is decentralized and rooted in participatory governance, and resilience is built as a long-term, socio-ecological process intertwined with community empowerment. This approach led to sustainable water management practices, revival of ecosystems, and community institutions that continue to function and adapt over time. In the top-down paradigm (exemplified by MJSA), the state spearheads the initiative with hierarchical coordination, involving communities in a structured but limited role, focusing on delivering tangible infrastructure and immediate drought relief. This approach achieved impressive short-term gains in water availability and agricultural output, but its resilience benefits may be transient if not backed by ongoing local stewardship. The agency remained largely with government bodies, and the sustainability of outcomes is contingent on post-project maintenance and continued community engagement which were not fully ensured.

The three hypotheses are largely validated by the evidence:

- Agency: TBS empowered villagers as change-makers in water conservation, whereas MJSA retained central control, treating villagers more as participants than originators of adaptation.
- Governance: TBS operated through participatory, community-led governance structures that were tailored to local contexts and could adapt over time, aligning with theories of adaptive, polycentric governance. MJSA, conversely, operated

through bureaucratic channels, albeit with attempts to incorporate community input, reflecting a classical top-down public administration approach to environmental governance.

- Resilience: TBS's model resulted in enhanced social and ecological resilience where villages achieved drought-proofing that endured across years and climate variability, and communities gained the capacity to manage resources collectively. MJSA's model provided a buffer against drought during the project's active period, but it does not address the challenges in maintaining those resilience gains over the long run once the intensive external support was withdrawn.

The comparative insights from this study enrich our understanding of climate adaptation paradigms. They underscore that 'who drives adaptation' and 'how adaptation is governed' are not just procedural questions, but outcome-determinative factors. In theoretical terms, the research illustrates the practical manifestations of adaptive governance and political ecology principles. It shows that adaptive governance, with its emphasis on local involvement, feedback loops, and multi-level networks can yield robust resilience, as seen with TBS. It also shows that political dynamics can shape adaptation efforts in ways that favour scale and visibility at the possible expense of depth and community ownership.

For practitioners and policymakers, a key implication is the value of integrating bottom-up and top-down approaches. Rather than viewing them as an either/or choice, Rajasthan's experience suggests that durable solutions may lie in hybrid models. For instance, state programs could invest more time and resources in community institution-building, drawing on NGOs' grassroots experience, even if it means slower rollout. This could involve training village water committees during the project, allocating funds for long-term local maintenance, and officially recognizing and liaising with community networks. Conversely, community initiatives could seek strategic partnerships with the government for resources and policy

support; TBS's journey shows that scaling out impact often required interfacing with state structures.

Another practical takeaway is the importance of continuity and insulation from political cycles. Adaptation, by nature, requires foresight beyond electoral terms. The abrupt standstill of MJSA after a government change is a cautionary tale. Institutionalizing water conservation into the regular mandates of local governments and communities can help ensure efforts persist irrespective of state-level political shifts. One mechanism could be legislative or policy instruments that guarantee funding for maintenance of water assets and require local water security plans to be updated annually, thereby embedding the adaptation process into governance routines.

The contrast between TBS and MJSA highlights that sustainability is not guaranteed by scale alone. Large investments can yield big results fast, but without local buy-in, those results risk being one-off. On the other hand, small-scale efforts can aggregate into significant change if they inspire and involve those who have the most at stake i.e., the local population. Resilience is ultimately a local property. Even if aided by external resources, it manifests in how local systems cope and reorganize. Therefore, policies that treat communities as equal partners, or better, leaders in adaptation, tend to cultivate resilience more deeply. This aligns with global calls for locally led adaptation, which emphasize inclusion, equitable participation, and building on local knowledge and initiative.

In answering the central question of this thesis – How do the bottom-up and top-down drought adaptation initiatives differ in paradigms of agency, governance, and resilience? we have seen that they differ profoundly. Each paradigm carries implicit philosophies. The bottom-up paradigm believes in the power of local action and traditional wisdom to create change from the ground up, while the top-down paradigm relies on the state's capacity to deliver and scale

solutions using modern techniques and organisational might. Rajasthan's experience with drought adaptation indicates that sustainable progress against climate challenges like drought likely requires both these philosophies. Neither can achieve the optimal outcome in isolation: local efforts need enabling environments and resources, and state efforts need local legitimacy and endurance. In a world where climate change is intensifying droughts and water scarcity, the lessons from these case studies resonate beyond Rajasthan.

Communities worldwide possess rich adaptive knowledge and social capital and igniting that from the bottom-up is crucial for resilience. Simultaneously, governments control large resources and can coordinate large-scale action and steering that from the top-down in a manner that complements and empowers local initiative is equally crucial. The challenge and opportunity lie in designing adaptation initiatives that are of the people, by the people, and for the people, with government as a facilitator and supporter, essentially blurring the line between bottom-up and top-down. As the adage goes, we need to 'think globally, act locally', but also perhaps 'plan nationally, empower locally'. In conclusion, the divergent paradigms of TBS and MJSA have provided a rich comparative insight: demonstrating that agency, governance, and resilience are deeply interlinked in determining the effectiveness of climate adaptation. Bottom-up and top-down approaches each have their paradigmatic strengths, and bridging the gap between them is the way forward for creating water-secure and climate-resilient communities in Rajasthan and beyond. Through critical analysis and reflection on these cases, this thesis contributes to a more nuanced understanding that can guide future adaptive governance and policy innovation, ensuring that efforts to combat drought are not only technically sound but also socially rooted and resilient for generations to come.

8. Bibliography

"25 Years of Evolution." 2009. Tarun Bharat Sangh. https://upload.wikimedia.org/wikipedia/commons/d/d5/25_Years_of_EVOLUTION.pdf.

Adger, W. Neil. 2000. "Social and Ecological Resilience: Are They Related?" *Progress in Human Geography* 24 (3): 347–64. https://doi.org/10.1191/030913200701540465.

———. 2006. "Vulnerability." *Global Environmental Change* 16 (3): 268–81. https://doi.org/10.1016/j.gloenvcha.2006.02.006.

Ahmed, Masood, and Eduardo Araral. 2019. "Water Governance in India: Evidence on Water Law, Policy, and Administration from Eight Indian States." *Water* 11 (10): 2071. https://doi.org/10.3390/w11102071.

Alnajem, Ahmed Abdel Qader Ismail. 2024. "The Role of Grassroots Movements in Achieve Community Sustainability." *MEDAAD* 2024 (February):15–20. https://doi.org/10.70470/MEDAAD/2024/003.

Ansell, Christopher, Eva Sørensen, and Jacob Torfing. 2017. "Improving Policy Implementation through Collaborative Policymaking." *Policy & Politics* 45 (3): 467–86. https://doi.org/10.1332/030557317X14972799760260.

Ayers, Jessica, and Tim Forsyth. 2009. "Community-Based Adaptation to Climate Change." *Environment: Science and Policy for Sustainable Development* 51 (4): 22–31. https://doi.org/10.3200/ENV.51.4.22-31.

Betzold, Carola, and Florian Weiler. 2017. "Allocation of Aid for Adaptation to Climate Change: Do Vulnerable Countries Receive More Support?" *International Environmental Agreements: Politics, Law and Economics* 17 (1): 17–36. https://doi.org/10.1007/s10784-016-9343-8.

Birchall, S. Jeff, Nicole Bonnett, and Sarah Kehler. 2023. "The Influence of Governance Structure on Local Resilience: Enabling and Constraining Factors for Climate Change Adaptation in Practice." *Urban Climate* 47 (January):101348. https://doi.org/10.1016/j.uclim.2022.101348.

Brando, Nicolás, Christiaan Boonen, Samuel Cogolati, Rutger Hagen, Nils Vanstappen, and Jan Wouters. 2019. "Governing as Commons or as Global Public Goods: Two Tales of Power." *International Journal of the Commons* 13 (1): 553. https://doi.org/10.18352/ijc.907.

Butler, J. R. A., Wise ,R. M., Skewes ,T. D., Bohensky ,E. L., Peterson ,N., Suadnya ,W., Yanuartati ,Y., et al. 2015. "Integrating Top-Down and Bottom-Up Adaptation Planning to Build Adaptive Capacity: A Structured Learning Approach." *Coastal Management* 43 (4): 346–64. https://doi.org/10.1080/08920753.2015.1046802.

Chaffin, Brian C., Hannah Gosnell, and Barbara A. Cosens. 2014. "A Decade of Adaptive Governance Scholarship: Synthesis and Future Directions." *Ecology and Society* 19 (3): art56. https://doi.org/10.5751/ES-06824-190356.

Chand, Basir. 2011. "Public Policy: Implementation Approaches." *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.1744286.

Daga, Gaurav. 2017. "Politics of 'Community-Based Natural Resource Management' in Rural Alwar: A Critical Analysis of Tarun Bharat Sangh's Work on Water Conservation." University of Cambridge. https://www.researchgate.net/publication/318108961_Politics_of_'community-based_natural_resource_management'_in_rural_Alwar_A_critical_analysis_of_Tarun_Bharat_Sangh's_work_on_water_conservation.

Department of Environment and Climate Change and Government of Rajasthan. 2022. “State Action Plan on Climate Change.” Department of Environment and Climate Change. 2022. https://environment.rajasthan.gov.in/content/environment/en/environmental-information-system/State_Action_Plan.html.

Department of Watershed Development & Soil Conservation. n.d. “MukhyaMantri Jal Swavlamban Abhiyaa For Climate Change Adaptation and Water In Arthuna, Anandpuri and Sajjangarh Blocks of District Banswara.” NABARD. https://www.nabard.org/auth/writereaddata/File/Rajasthan-DPR.pdf.

Dessai, Suraje, and Mike and Hulme. 2004. “Does Climate Adaptation Policy Need Probabilities?” *Climate Policy* 4 (2): 107–28. https://doi.org/10.1080/14693062.2004.9685515.

Dittrich, Ruth. 2016. “Top-down and Bottom-up Decision-Making for Climate Change Adaptation. An Application to Flooding.” Edinburgh: University of Edinburgh. https://core.ac.uk/download/pdf/429712155.pdf.

“Ensuring Sustainable Water Security for Communities in India | Earthna.” n.d. Earthna. Accessed June 3, 2025. https://www.earthna.qa/prize-finalists/earthna-prize-tarun-bharat-sangh.

Eriksen, Siri H., Andrea J. Nightingale, and Hallie Eakin. 2015. “Reframing Adaptation: The Political Nature of Climate Change Adaptation.” *Global Environmental Change* 35 (November):523–33. https://doi.org/10.1016/j.gloenvcha.2015.09.014.

Everard, Mark. 2015a. “Community-Based Groundwater and Ecosystem Restoration in Semi-Arid North Rajasthan (1): Socio-Economic Progress and Lessons for Groundwater-Dependent Areas.” *Ecosystem Services* 16 (December):125–35. https://doi.org/10.1016/j.ecoser.2015.10.011.

———. 2015b. “Community-Based Groundwater and Ecosystem Restoration in Semi-Arid North Rajasthan (1): Socio-Economic Progress and Lessons for Groundwater-Dependent Areas.” *Ecosystem Services* 16 (December):125–35. https://doi.org/10.1016/j.ecoser.2015.10.011.

———. 2020. “Managing Socio-Ecological Systems: Who, What and How Much? The Case of the Banas River, Rajasthan, India.” *Current Opinion in Environmental Sustainability* 44 (June):16–25. https://doi.org/10.1016/j.cosust.2020.03.004.

Folke, Carl, Thomas Hahn, Per Olsson, and Jon Norberg. 2005. “ADAPTIVE GOVERNANCE OF SOCIAL-ECOLOGICAL SYSTEMS.” *Annual Review of Environment and Resources* 30 (1): 441–73. https://doi.org/10.1146/annurev.energy.30.050504.144511.

Gupta, Saurabh. 2011. “Demystifying ‘Tradition’: The Politics of Rainwater Harvesting in Rural Rajasthan, India” 4 (3).

———. 2016. *Politics of Water Conservation: Delivering Development in Rural Rajasthan, India*. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-21392-7.

Intergovernmental Panel On Climate Change (Ipcc). 2023. *Climate Change 2021 – The Physical Science Basis: Working Group I Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. 1st ed. Cambridge University Press. https://doi.org/10.1017/9781009157896.

Jayaram, Amitha Ablud. 2024. “Mitigation of Groundwater Depletion in India.” Havard College. https://www.hks.harvard.edu/sites/default/files/SYPA_2024_AbludJayaram.pdf#:~:text=mobilizing%20communities%20across%201058%20villages,Rajasthan%2C%20India%27s%20driest.

Kanwal, Vinita, Smita Sirohi, and Prem Chand. 2020. “Effect of Drought on Livestock Enterprise: Evidence from Rajasthan.” *The Indian Journal of Animal Sciences* 90 (1): 94–98. https://doi.org/10.56093/ijans.v90i1.98229.

Katyaini, Suparna, Kangkanika Neog, Tejaswi Joshi, Gursimer Gulati, Don Paul, Upasna Negi, Arpit Srivastv, and Nitin Bassi. 2024. “Improving Policy Coherence in Food, Land, and Water Systems to Advance Sustainable Development in India: A Case Study of Rajasthan.” https://hdl.handle.net/10568/170032.

Khalid, Iram. 2020. “Interstate Water Politics: An Analysis of Indian Case Water Governance in India.” *Pakistan Social Sciences Review* 4 (II): 01–16. https://doi.org/10.35484/pssr.2020(4-II)01.

Kumar, Pankaj, and B Kandpal. 2003. *Project on Reviving and Constructing Small Water Harvesting Systems in Rajasthan*. Stockholm: Sida.

Lee, Myungsuk. n.d. “Conceptualizing the New Governance: A New Institution of Social Coordination.”

Li, Qiaoqiao, Aizhong Ye, Yoshihide Wada, Yuhang Zhang, and Junju Zhou. 2024. “Climate Change Leads to an Expansion of Global Drought-Sensitive Area.” *Journal of Hydrology* 632 (March):130874. https://doi.org/10.1016/j.jhydrol.2024.130874.

Lindamood, Danielle. 2017. “Towards a More Sustainable Water Future: Water Governance and Sustainable Development Goal 6 Achievability in India.” Waterloo, Ontario, Canada: University of Waterloo.

Lotfirad, Morteza, Arash Adib, Jaber Salehpoor, Afshin Ashrafzadeh, and Ozgur Kisi. 2021. “Simulation of the Impact of Climate Change on Runoff and Drought in an Arid and Semiarid Basin (the Hablehroud, Iran).” *Applied Water Science* 11 (10): 168. https://doi.org/10.1007/s13201-021-01494-2.

Mammadova, Aida, Seira Harada, Tuba Azhar, and Romain Milesi Phisbien. 2024. “Understanding Community Capacity for Bottom-up Management of Mount Hakusan UNESCO Biosphere Reserve.” *European Journal of Sustainable Development* 13 (1): 1. https://doi.org/10.14207/ejsd.2024.v13n1p1.

Mehta, Lyla, Bill Derman, Synne Movik, Alex Bolind, and Emmanuel Manzungu. 2016. “(PDF) Flows and Practices: The Politics of Integrated Water Resources Management in Eastern and Southern Africa.” *ResearchGate* 9 (3): 389–411.

Mishra, Ashok K., and Vijay P. Singh. 2010. “A Review of Drought Concepts.” *Journal of Hydrology* 391 (1–2): 202–16. https://doi.org/10.1016/j.jhydrol.2010.07.012.

Motevalli, Saeid, Mansor Bin Abu Talib, Christopher John Henshaw, Chan Nee Nee, Jean-Marc Roda, and Ghayth Kamel Shaker Al-Shaibani. 2023. “Resilience on Climate Change Through the Literature.” *International Journal of Education and Cognitive Sciences* 4 (2): 53–61. https://doi.org/10.61838/kman.ijecs.4.2.6.

Nagoda, Sigrid, and Andrea J. Nightingale. 2017. “Participation and Power in Climate Change Adaptation Policies: Vulnerability in Food Security Programs in Nepal.” *World Development* 100 (December):85–93. https://doi.org/10.1016/j.worlddev.2017.07.022.

Priyam L. Borgohain, Triambak Baghel, Pooja Sankhyayan, Vidya S Naveen, Himani Narwal, Aarifah Jan, Surbhi Vyas, et al. 2024. “District-Level Climate Risk Assessment for India: Mapping Flood and Drought Risks Using IPCC Framework.” https://doi.org/10.13140/RG.2.2.26471.76968.

Pulido-Velazquez, Manuel, Patricia Marcos-Garcia, Corentin Girard, Carles Sanchis-Ibor, Francisco Martinez-Capel, Alberto García-Prats, Mar Ortega-Reig, Marta García-Mollá, and Jean Daniel Rinaudo. 2022. “A Top-Down Meets Bottom-Up Approach for Climate Change Adaptation in Water Resource Systems.” In *Climate Adaptation Modelling*, edited by Claus Kondrup, Paola Mercogliano, Francesco Bosello, Jaroslav Mysiak, Enrico Scoccimarro, Angela Rizzo, Rhian Ebrey, Marleen de Ruiter, Ad

Jeuken, and Paul Watkiss, 149–57. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-86211-4_18.
"Rajasthan Makes Rapid Strides in Water Conservation." n.d. https://cdnbbsr.s3waas.gov.in/s3a70dc40477bc2adceef4d2c90f47eb82/uploads/2023/02/2023022156.pdf.
Ranawat, Dr Seema. 2020. "CHIEF MINISTER'S WATER SELF-RELIANCE SCHEME," no. 2.
Rathee, Ravish K, and Sudipta K Mishra. 2021. "Water Policies in India: A Critical Review." *Indian Journal of Science and Technology* 14 (47): 3456–66. https://doi.org/10.17485/IJST/v14i47.1828.
Rathore, M. S. 2004. *State Level Analysis of Drought Policies and Impacts in Rajasthan, India*. Colombo, Sri Lanka: International Water Management Institute.
Robbins, Paul. n.d. "Political Ecology."
Roberts, Jason. 2020. "Political Ecology." Edited by Felix Stein, Hildegard Diemberger, Matei Candea, Sian Lazar, Joel Robbins, Andrew Sanchez, and Rupert Stasch. *Cambridge Encyclopedia of Anthropology*, September. https://doi.org/10.29164/20polieco.
Samaria, Harish. 2022. "Drought Crisis In Rajasthan and Their Management." In *5th World Congress on Disaster Management: Volume II*. Routledge.
Selje, Tom, Lena Anna Schmid, and Boris Heinz. 2024. "Community-Based Adaptation to Climate Change: Core Issues and Implications for Practical Implementations." *Climate* 12 (10): 155. https://doi.org/10.3390/cli12100155.
Sengupta, Sushmita. 2017. "Rajasthan's Fight against Drought Is Showing Positive Results." Down To Earth. March 30, 2017. https://www.downtoearth.org.in/water/dry-no-more-57481.
Sharma, Jaykrishan. 2018. "Raje's Crowd-Funded Water Scheme Has Least Political Donors." Hindustan Times. July 19, 2018. https://www.hindustantimes.com/jaipur/raje-s-crowd-funded-water-scheme-has-least-political-donors/story-Ktaucu1h0hmWbekGmXBhUO.html.
Singh, Rajvendra. 2019. "MUKHYA MANTRI JAL SWAWLAMBAN YOJANA: A GAME CHANGER FOR RAJASTHAN." *Institute of Constitutional and Parliamentary Studies* 1 (11): 1–7.
Stock, Ryan, Sumit Vij, and Asif Ishtiaque. 2021. "Powering and Puzzling: Climate Change Adaptation Policies in Bangladesh and India." *Environment, Development and Sustainability* 23 (2): 2314–36. https://doi.org/10.1007/s10668-020-00676-3.
Suutari, Amanda, and Gerry Marten. 2005. "Water Warriors: Rainwater Harvesting to Replenish Underground Water (Rajasthan, India)." *The EcoTipping Points Project* (blog). June 2005. https://ecotippingpoints.com/our-stories/indepth/india-rajasthan-rainwater-harvest-restoration-groundwater-johad/.
The Economic Times. 2015. "Activist Rajendra Singh Wins Stockholm Water Prize 2015," March 21, 2015. https://economictimes.indiatimes.com/news/politics-and-nation/activist-rajendra-singh-wins-stockholm-water-prize-2015/articleshow/46647148.cms?from=mdr.
The Times of India. 2019. "Government May Redesign CM Jal Swavlamban Abhiyan," June 24, 2019. https://timesofindia.indiatimes.com/city/jaipur/govt-may-redesign-cm-jal-swavlamban-abhiyan/articleshow/69919658.cms.
"To Hell and Back." 1999. March 15, 1999. https://www.downtoearth.org.in/environment/to-hell-and-back-19488.
"Top-Down versus Bottom-Up: Two Approaches to Sustainability." 2018. Office of Sustainability. July 3, 2018. https://sustainability.wisc.edu/top-down-bottom-up-sustainability/.

Verma, Shilp, and Manisha Shah. 2019. “Drought-Proofing through Groundwater Recharge: Lessons from Chief Ministers’ Initiatives in Four Indian States.” World Bank, Washington, DC. https://doi.org/10.1596/33240.

“Water Conservation Mission in Rajasthan Kicks Off.” 2016. *Business Standard* (blog). January 30, 2016. https://www.business-standard.com/article/pti-stories/water-conservation-mission-in-raj-kicks-off-116013000530_1.html.

“Water Management Programme: Tarun Bharat Sangh.” 2024. CEEW. March 15, 2024. https://www.ceew.in/sustainable-agriculture-initiatives/tarun-bharat-sangh-johad-water-conservation-harvesting-and-revitalisation.

Weiler, Florian, Steven Eichenberger, André Mach, and Frédéric Varone. 2018. “More Equal than Others: Assessing Economic and Citizen Groups’ Access across Policymaking Venues.” *Governance* 32 (2): 277–93. https://doi.org/10.1111/gove.12372.

Yadav, Sapna. 2024. “Geographical Study of Demographic Structure of Alwar District” 12 (2): 164–69.