Aastha Hazarika

Indigenous Environmental Governance in a Data-Driven World: A Case Study from Himachal Pradesh's Hydropower Sector

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Supervisor: Prof. Dr. Vasilis Kostakis
Tutor: Mina Kouvara, PhD

Presented by: Aastha Hazarika

Abstract

This study explores how the growing reliance on data-driven approaches in environmental governance impacts the Indigenous community, using the hydropower sector in Himachal Pradesh, India, as a case study. This renewable energy is meant to meet the growing need for power in industry, agriculture and rural electrification. However, Himachal is also witnessing the loss of agricultural and forest land, the displacement of Indigenous people and animals due to the hydropower projects in the state. As these projects are a result of data-intensive interventions, this study shows that the projects have excluded the Indigenous peoples' epistemologies in environmental decision-making. The study uses a qualitative research method for critical discourse analysis of the datafication and governance of hydropower projects, using semi-structured interviews with the Indigenous community, researchers, officers and activists, as well as analysis of reports and policies. The study critically explores the impact on the Indigenous people using three frameworks: (1) *Datafication (2019),* (2) *Environmental Governance (2018)*, and (3) the *CARE* Principles (2020). The findings show that the datafication of these developmental projects takes advantage of the present environmental governance frameworks in India to continue carbon credits projects while continuing to silence and displace the Indigenous community of Himachal Pradesh. While these systems cannot operate without absolute data-driven processes, it is crucial that the people whose spaces are affected be part of the decision-making process. This thesis calls for reconstructing environmental governance that centres justice, that the Indigenous people are recognised and includes their participation in decision-making in the pursuit of sustainable futures.

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LIST OF ABBREVIATIONS

ADB - Asian Development Bank

ASEAN - Association of Southeast Asian Nations

CBEIA - Community-Based Environmental Impact Assessments

CBO - Community Based Organisations

CBEIA - Community-Based Environmental Impact Assessment

CCA - Carbon Credit Certificate

CDM - Clean Development Mechanism

CFM can stand for Conceptual Framework Model

COP- Conference of the Parties

DoE - Directorate of Energy

DPL - Development Policy Loan

DPR - Detailed Project Reports

EIA - Environmental Impact Assessment

ESC- Environment and Social Cell

E&S - Environmental and Social

EU - European Union

GBV - Gender Based Violence

GEF - Global Environment Facility

HPPCL - Himachal Pradesh Power Corporation Limited

HPPTCL - Himachal Pradesh Power Transmission Corporation Limited

HPSEBL - Himachal Pradesh State Electricity Board Limited

IBSA - India-Brazil-South Africa

ICM - Indian Carbon Market

ICIMOD - International Centre for Integrated Mountain Development

JFM- Joint Forest Management

LADF - Land Area Development Fund

MEA - Multilateral Environmental Agreements

MoEF - Ministry of Environment and Forests

MoEFCC- Ministry of Environment, Forest and Climate Change

MOU - Memorandum Of Understanding

NBSAP - National Biodiversity Strategy and Action Plan

NDAP - National Data and Analytics Platform

NDSAP - National Data Sharing and Accessibility Policy

NGO - Non Governmental Organisations

NOC - No Objection Certificate

OGD - Open Government Data

PAF - Project Affected Families

PAT - Perform Achieve and Trade

PPA - Power Purchase Agreement

PRI - Panchayati Raj Institution

R&R - Rehabilitation & Resettlement

SAARC - South Asian Association for Regional Cooperation

SACEP - South Asia Co-operative Environment Programme

SDGs - Sustainable Development Goals

UNDP - United Nations Development Programme

UNEP - United Nations Environment Programme

UNIDO - United Nations Industrial Development Organisation

ZBNF - Zero Budget Natural Farming

CHAPTER 1

INTRODUCTION

India's adoption of hydropower projects is on the rise, and within the last decade, the electricity generation capacities have almost doubled. The demand for energy consumption growth continues to outstrip supply by approximately 10% (Erlewein, 2013). Kumar and Katoch (2016) state that the idea of the hydropower developments to be 'small is beautiful' and 'sustainable' is not 'completely true', at least in the context of the Himalayan region. With the rise in the growing hydropower projects in the country, especially in the Himachal Pradesh region, one cannot ignore the numerous environmental impacts these projects brings like "the deforestation, emission of GHGs from the reservoirs, biodiversity loss, species extinction, forest areas flooding, habitats destruction, farmland loss, alterations in the water regime, water bodies morphology, fish fauna impact etc." (Kumar & Katoch, 2016, p.1)

On November 7, 2024, the World Bank published an article titled 'World Bank Signs $200 Million Project to Increase Renewable Energy Penetration in Himachal Pradesh'. But, near Ramanand Negi's Himachali wooden house, a private firm built a hydroelectric project over twenty years ago that transformed the once-gushing river that overlooked his house to a trickle (Rathore, 2024). The report by Rathore (2024) in Scroll affirms that these projects profited monetarily from the belief that, as renewable energy sources, they contributed to environmental protection; in particular, they offered carbon credits for sale to oil and gas firms in wealthy nations worldwide. These firms included the 'Hungarian Gas Storage' in Hungary, 'EVD Energieversorgung Dormagen GmbH' in Germany and 'Main Energie' in the Netherlands when Negi and other villagers in the area coped with the effects of these projects.

Himachal Pradesh is a state in India situated in the western Himalayas that showcases a diverse panorama of towering snow-covered peaks, densely forested valleys, expansive lakes, terrace farmlands and rushing streams. "Now, Himachal has seen the loss of agricultural and forest land, displacement of Indigenous people and animals, and loss of jobs due to the hydropower projects in the state" (Asher & Bhandari, 2021). According to geological expert

Prof. Virender Singh Dhar, Himachal witnesses incessant landslides yearly due to the uncontrolled construction of hydropower projects (Alam, 2023). They have continued to transform mountain rivers into mere streams. In 2014, in Jharoda village, Himachal Pradesh, 31 women were arrested for opposing the Bajoli-Holi Hydro Power Project, which in 2021 caused the very damage they feared, including landslides and house destruction (Kajal, 2022). The situation in Himachal offers us a picture of how there is a continued exclusion of the Indigenous people in the decision-making process of these hydropower projects. In Kinnaur, Jiya Lal Negi, a resident of Kalpa village and president of Zila Van Adhikar Samiti, an organisation which works towards implementing Forest Rights in the district, had heard about the sale of carbon credits through the hydropower projects and had questions about the money thus earned. "Is it being distributed within Kinnaur for development, or is it used in some other district?" he said. "We have not been made aware of it." Rathore (2024).

"Like the land grabs of the past, today's data grab converts our data into raw material for the generation of corporate profit against our own interests." (Mejias & Couldry, 2024) Even now, the fundamental premise of Global North conservation has rested in the past and often still rests on a suspicion of (typically Global South) rural actors' interactions with the environment (Murray Li, 2007). The environmental implications we have had and we project to have in the future will increase green grab in India.[1] When it comes to data and the environment, we are dealing with a much larger issue, which is the emerging misuse of data. Mejias & Couldry (2019) stated that:

> In this emerging form of capitalism, human beings become not just actors in the production process but raw material that can be transformed into value for that production process. This transformation of human life into raw material resonates strongly with the history of exploitation that preceded industrial capitalism—that is, colonialism (p. 18)

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[1] Journalist John Vidal first coined the word 'Green Grab' in 2008 and the central idea is that 'we need to sell nature in order to save it', a neo-colonial land grabbing.

The study emphasises that with the growing need to achieve global environmental outcomes, there is also a growing importance of *justice* in the ecosystem. It is very important to pay attention to the social dimensions of sustainability and be critical of India's environmental and climate goals. Understanding the concepts of environmental governance and the use of data is very important to establish how the Indigenous people in Himachal Pradesh become agents at all levels of decision-making. Historically, the Indigenous people in India have been victims of marginalisation, conflict and displacement, so it is crucial that the neoliberal environmental governance does not reinforce these injustices. Indigenous communities in India are a very important and intrinsic to environmental systems. This means designing inclusive, justice-based governance frameworks that promote and support innovation aimed at achieving environmentally just outcomes.

The study critically explores Himachal's hydropower project's impact on the Indigenous people using three frameworks: (1) *Datafication (2019),* (2) *Environmental Governance (2018)*, and (3) the *CARE* Principles (2020). These frameworks help the study understand how to examine environmental datafication's role in the decision-making processes and overall understand the power relations that actually shape the environmental governance in the Himachal region. The CARE principle is essential to understanding the ongoing exclusions of the Indigenous community due to the hydropower projects. For this, understanding the process of datafication for these projects will help justify whether or not they weaken governance.

A preliminary study reveals that the majority of the reports on the environmental assessments in the Himachal Pradesh region are on the impact it has on the measurable environmental indices. These approaches have excluded the Indigenous people of that region. A WRM (2011) reported that India will continue to be a major hub for carbon offset initiatives, with approximately 1,700 projects reporting emissions reductions and seeking to generate carbon credits. However, the majority of these projects are managed by large companies and frequently face criticism for not achieving meaningful environmental outcomes. There are also limited reports available in which the Indigenous community have received full participation in sharing their views and insights on the hydropower projects, while assessments of these projects are more.

Reports on the Indian Environmental Impact Assessment (EIA), in terms of dam building, concluded that there are considerable discrepancies between legislation and implementation. (Dilay, et. al., 2019). There are also very limited monitoring and assessment instruments to improve environmental decision-making for hydropower development (Agrawal et al., 2010, p. 1). And very little literature that discusses the Indigenous communities' perspectives and insights over the hydropower projects in the Himachal Region.

At present, environmental knowledge and environmental governance of areas like Himachal Pradesh in India depend on enormous data flows from "a vast machine" of measuring tools (Edwards, 2010). For Himachal, the Indigenous people have always been the source of the ecological knowledge that can influence environmental sustainability. Their knowledge is a "complex, complete, dynamic and practical system with scientific and logical validity (Battiste, 2002). It reflects the accumulated knowledge and wisdom of the community as they continuously adapt to new challenges and shifting circumstances. These environmental dynamics require that the collective wisdom of the Indigenous communities is a crucial part of governing their environment (Wangchuk et al., 2021).

RESEARCH PROBLEM

In the growing need for climate action, nations have started to make more adaptive decisions on climate funding, infrastructure and governance. This has led to big corporations increasingly using carbon credits to reduce their carbon footprint, while still maintaining their increasing carbon emission. More than 90% of the offset credits have likely been "phantom credits"; they do not represent any proper carbon reduction and are also used the most by these big corporations (Greenfield, 2023)

The research problem is that, in the context of hydropower projects in Himachal Pradesh, the current literature does not address these issues of hydropower projects being just another way for global companies to use their carbon credits. Addressing this is particularly important because it has not only affected the Indigenous people in the region but has also done less to help the climate.

The literature on how these projects are assessed and the role of Indigenous people in decision-making about their land is very limited. This lack of representation contributes to the invisibilisation of their authority and reinforces a view of development as a purely technocratic value-creation process. There is a lack of visibility on why talking about the Indigenous communities when it comes to datafication is important, even when most of the resources are taken from their habitat, depleting the resources they have and slowly reducing their epistemologies and ways of living. When Indigenous land rights are not respected, it can displace communities, or when development projects proceed without their consent, it can disrupt their way of life, and increase poverty and marginalisation. "This disregard can fuel social unrest, erode trust in governments and corporations, and perpetuate cycles of inequality." (Sustainability directory, 2025) There is also very little academic literature on how the indigenous people in the Himachal region have navigated this systematic green garb, indicating that the people are often ignored in the academic space.

This study helps to highlight the issues the current literature has not addressed yet- that the hydropower projects in Himachal Pradesh in India should include the Indigenous communities at the centre of many environment-related discussions. It will explain the need for the Indigenous rights to be respected, and when development projects proceed without their consent, it can further displace, disrupt and marginalise them. The study will also highlight the current governance structure, gaps and pain points of the projects and the way value is generated through the datafication of the environment.

The following outlines the research design of the study-

The second chapter presents a comprehensive literature review and the theoretical frameworks that establish a base for the analysis of the collected data. It critically engages with theories such as Environmental Justice, Governance, and Recognition and Redistribution Theories to structure the socio-environmental issues. This chapter also reviews relevant reports and documents that help in interpreting the empirical outcomes. To position the research within these theoretical frameworks, the chapter provides the basis for a nuanced understanding of justice in the context of environmental governance.

The third chapter outlines the research methodology with a detailed structure of the study. It explains the rationale behind the selected methods, participants, analytical methods, tools and techniques for analysis. It also describes the study's significance and limitations.

The fourth chapter is an explanation of how the three frameworks were integrated from chapter two. It explains the idea behind how the frameworks were interpreted to create the interconnections between different dimensions of governance. The framework is more flexible because it does not follow a rigid thematic coding structure, but follows similar concepts into interrelated thematic categories. This chapter is important to understand how theoretical concepts can be used as practical tools for analysis.

The fifth chapter is the presentation of the research findings, which were derived from the primary and secondary data collected during fieldwork and document analysis. It includes findings received from the semi-structured interviews, reviews of relevant policies and governmental documents. The findings are put into the categories from the comprehensive frameworks explained in chapter four; they are the lived experiences, challenges and gaps in relation to environmental justice and governance.

Chapter six is the critical discussion of the collected data presented in the fifth chapter. It analyses the findings to interpret how the hydropower projects related to justice and governance in the context of the environment, data and the Indigenous people in Himachal Pradesh. This chapter is a deeper reflection on the meanings of data and indigenous people.

The seventh chapter is the conclusion of the study, which summarises the research and the theoretical and practical implications of environmental justice and governance by identifying limitations and suggesting guidance for future research.

RESEARCH QUESTION

The aim of the research is to critically analyse the processes involved in datafication, governance and the inclusion of the Indigenous community within the context of hydropower development in Himachal Pradesh, India.

The study is driven by two overarching objectives: First, to examine the datafication process and its relation to the environmental governance of the region; and second, to explore where the Indigenous people are positioned within the injustices and power dynamics.

There are two central research questions-

1.) Does the process of environmental datafication influence environmental governance in the context of hydropower projects in Himachal Pradesh?

This research question maps the actors, institutions and power relations that shape the value generation aspect of the datafication in the decision-making processes. Because decisions taken post-datafication are only clear with the available governance structure, it is important to understand how they influence each other. It helps to unpack if these frameworks reinforce any hegemonic narratives of "development" while concealing socio-ecological trade-offs.

2.) Do environmental datafication and governance require the involvement of Indigenous communities for hydropower projects in Himachal Pradesh?

This question will help describe the role of the Indigenous communities in these projects and frameworks. As the lack of recognition of Indigenous views in larger societal systems triggers a chain of deleterious consequences, affecting not only social cohesion and economic stability but also environmental integrity at regional and even global levels.

The study will test two hypotheses:
a) Hypothesis 1: The environmental datafication of hydropower projects in Himachal Pradesh tends to adopt a reductionist approach that marginalises Indigenous knowledge systems and perpetuates the green grab.

b) Hypothesis 2: Effective and comprehensive environmental datafication in Himachal Pradesh requires an inclusive and participatory approach that will integrate diverse stakeholders, particularly the Indigenous communities, for sustainable climate outcomes.

SIGNIFICANCE

This study will contribute to the existing body of literature regarding the role of Indigenous peoples within the processes of environmental datafication and governance. The study will help shed light on the justice required, existing gaps and the challenges against the dominant narratives that marginalise Indigenous knowledge systems.

Theoretically, it helps establish critiques of the value generation of datafication in terms of the hydropower projects in India, which are often built on Indigenous land. It will help understand the interdisciplinary nature of environmental rights that has both data and Indigenous people at its centre. It will contextualise technocratic climate adaptation, neoliberal environmental governance and Indigenous sovereignty in the context of India. Practically, the findings aim to provide more insights on how policies and methodology can be improved to make the social and environmental assessment more equitable and inclusive.

This study is significant because the Indigenous people in India face systematic injustice. The public sector should ensure its constitutional rights. Addressing digitilisation and governance together can play a transformative role in providing access to resources and meaningful representation in decision-making processes.

LIMITATIONS

As the fieldwork in Kinnaur spanned across 10 days, it is insufficient to fully capture the complexities of the environmental context and Indigenous epistemologies. Perspectives from a broader range of activist and community leaders would have helped to analyse the governance and justice issues in a more comprehensive way. As the Indigenous knowledge and perspectives are so poorly documented that extending the duration would have given the study more information on the daily interactions, cultural practices and beliefs, which have offered more nuanced insights into how these dynamics operate at the community level.

The governance structure is extremely multi-layered, and to be able to cross-check that thoroughly would have taken a couple more months because that cannot be done without socially auditing it. The study could have had more insights if a financial and social audit could have

been done to check if all the schemes were implemented on the ground, as there was no way to corroborate if the resettlement had been paid in this time.

Another limitation was that it was very hard to get in touch with the officials at the state and national level; being able to interact with the current officers would have added first-hand information to their understanding of what they observe and experience.

CHAPTER 2

LITERATURE REVIEW & THEORETICAL FRAMEWORKS

In recent years, there has been an increase in understanding the role of data in creating more democratic institutions and values as the application of data is more diverse. We are also at the point of making big climate change measures and using data in these measures has become the central focus. This also tells us that understanding data, environmental mitigation, and the intention of the eco-modernist climate approaches will remain an aspect to look into carefully because they often have an imperialist approach and essentially the 'accumulation by dispossession.' In India, the hydropower projects that are built and are under construction have attracted resilience from the people on the ground, and reports suggest that these projects are also carbon credit projects. In this paper, the reasons for how these projects emerge and how they affect the indigenous people will be explored through a critical discourse analysis of qualitative studies of environmental datafication, governance and Indigenous knowledge systems. The literature review and frameworks will draw on research conducted over the themes of datafication, governance, indigenous rights and justice.

Scheidel et. al. (2023, p. 9) point out that the impacts on Indigenous people from extractive and industrial development projects "face severe impacts, such as livelihood loss and land dispossession, environmental pollution, threats to their knowledge systems, racial- and gender-based violence, as well as intimidations and assassinations." These projects when working in jurisdictions that have lax environmental regulations may help worsen the environmental and social conditions in recipient countries (Pasquina, 2025). It is presented in a research by Pasquina (2025) about 'analysis of multinational corporations' role in environmental conflicts' using the largest statistical analysis on the role of multinational corporations in environmental conflicts based on data from the Global Atlas of Environmental Justice including more than 3,300 environmental conflicts and 5,500 companies that the analysis provided evidence that -

MNCs are key actors in ecological unequal exchange and socio-ecological cost-shifting from the Global North towards the Global South. Interpreting the evidence from the EJAtlas, the liberalisation of globalised trade and the promotion of FDI have enabled MNCs from the Global North to extract and appropriate resources from the Global South, distinctively through commodities highly dense in energy, value, and virtual land and water. In addition, the conflicts involving MNCs lead to more frequent socioeconomic impacts, worse outcomes and less remedial action. (p. 1)

People in a community close to nature perceived that urban development is not a desired goal, and that they reject the idea that nature is a threat, where it is unrestrictedly exploited or isolated from protection (Demasi et. al., 2025). Theories of distributive justice do not examine the social, cultural, symbolic and institutional conditions thoroughly, even when they offer models and procedures by *underlying* the poor distribution and by how distribution may be improved (Schlosberg, 2004). So, the injustice in this view is not only due to the lack of recognition but also because it constrains and harms people, making it the basis for 'distributive injustice'. It can be further explained by Sovacool et. al (2022, p. 16) that Recognitional Justice is concerned with the "involvement of increased vulnerability among very specific communities of identity and place (e.g., rural farmers, indigenous peoples, mining towns)" and that also had very "localised negative impacts on the environment" which includes "deforestation or water use (all from below)", and "the risk of ecological distribution conflicts and the broader entrenchment of preexisting patterns of spatial, economic, or political peripheralization (from above)". So, as a global society, it should be possible to reevaluate our relationship with the earth and the developments we choose to impose on the environment are based on the realisation that our future lies in our ability to sustain ourselves (Robyn, 2002).

The 'Indigenous Knowledge' directs towards observation and contact with the plants, animals and the ecosystem- it encompasses a wide range of "cultural and spiritual knowledge and values that form the basis of human–environment relations" (Berkes, 2018, p. 1) which differs from the science, the local knowledge and the citizen science. And because this knowledge has been based on a long-term observation of species and ecosystems, Indigenous Knowledge is also "able to identify future management objectives and priorities, e.g., the choice

of biocultural indicator species" (Lyver et al. 2016; Sterling et al. 2017). Broadly, the Indigenous Knowledge cannot be removed from the value systems that underpin the decision-making processes in the applied ecology (Artelle et al. 2018).

In terms of the Indigenous people's Environment Governance, Indigenous data governance refers to the mechanisms that increase Indigenous people's control over data (Kukutai & Taylor, 2016). To increase control over the data and also to enhance capacity for participation in governance, the Indigenous people requires support to overcome barriers such as "language, process exhaustion, as well as a lack of or inadequate information being shared before participation" (Zurba & Papadopoulos, 2023, p. 95) Indigenous people cannot be abstracted out from space because they are the components of livelihoods and social relations as they arise as understandings and performances of livelihoods and social relations. "They need a continuing relation and renegotiation between individuals and location across time and space" (Coombes et. al., 2012; Fletcher et. al., 2021). Recognising how that knowledge and practice is learned and relearned in human projects (song, dance, tale, politics, etc.) and ecologies is crucial to the understanding of relations between people and place in conservation work (Clement, 2017; Theriault et. al., 2021).

The close connection between Environmental Justice and Indigenous Governance highlights the significance of decolonising environmental governance frameworks. The narrow definition of justice as distributive equity, procedural inclusion, or recognition of Indigenous rights is challenged by Indigenous Environmental Justice. Artelle at. Al (2018) argues that: "Major and expanding global environmental problems suggest that humanity must fundamentally alter our overall relationship with the natural world, appreciate how our actions affect our environments, and develop values that guide more sustainable relationships with them." So, despite the criticism by Indigenous peoples, Indigenous scholars, and many others in the academic and civil society, the forest in conservation practice only serves to disempower Indigenous and local peoples and to mislead non-Indigenous individuals to the imaginary conceit of a sovereign "nature" which is for free. And that the presence of most corporations and extractive industries is detrimental for the environment, it is the same local and Indigenous peoples that are the best positioned to protect the natural resources (Vigil, S., 2018).

When we look at the data structures and the procedural domain the of developmental projects, the quality of data in general raises ethical issues like threats to privacy and data protection, responsibility, fairness and the very collection of facts and data to be compelled into conservation designs and practice (Büscher & Dressler, 2012; Coeckelbergh, 2020). Conservation practitioners and scientists need to recognise Indigenous and local knowledge and experiences as having been shaped by situated practices, transformations, and events over time and space. Based on extensive knowledge of organisms and ecosystems, applied ecological research using Indigenous Knowledge has also been aiding modern management by Indigenous and non-Indigenous governments. Indigenous long-term observations equate to species and ecosystem monitoring, which holds rich promise for sensitive and rapid detection of modern ecological alterations (Berkes et al. 2007; Skinner-Thompson et al. 2022). Instead, it promotes pluralistic approaches based on Indigenous ontologies and epistemologies, which include the need for justice for people of different generations and beyond human beings. Indigenous environmental movements have advocated for reciprocal responsibilities among a variety of entities, including humans, non-humans, and collectives like forests, in global environmental politics.

Scholars from low- and middle-income countries have stressed the importance of climate justice by creating a development space. To develop this space and construct the right theory of justice, we have to step behind what he calls a 'veil of ignorance' and focus on demonstrating that justice requires attention to *both* distribution and recognition; that culture is a legitimate, even necessary terrain of struggle (Rawls, 1971; Fraser, 2000). It reinforces the general point that global climate models tend to not explore the space for justice options and continue to make similar justice assumptions, descbribes justice in climate research as "the scope could be widened to all beings capable of suffering (sentientism) or all living beings (biocentrism), instead of just human beings (anthropocentrism)" (Zimm et. al., 2024, p. 23).

The Procedural justice refers to the way policies, research and decision-making are carried out and who is involved. Skinner-Thompson (2022) explains procedural justice as:

In the context of research, some important ways that this form of justice could apply involve the tools and models scientists select and the ways that their conclusions are communicated - that is, the science-policy and science - public interfaces. In order to make meaningful change, an environmental justice agenda must provide impacted communities not just the formal right, but the substantive ability to participate as partners at every level of environmental decision-making. (p. 400)

Given that most Indigenous data is held by non-Indigenous governments, institutions, and agencies (Carroll et al., 2019), increasing Indigenous peoples' participation in environmental datafication is central to realising good ecological governance. There is a need to apply insights generated from these frameworks within data ecosystems to help address the challenge of producing data that reflects Indigenous peoples' interests and governance needs (Carroll et. al., 2020).

Governance is generally the *institutions, structures and processes* that can inform who will make the decisions, how and for whom the decisions will be made, whether, how and what actions to be taken and by whom and to what effect (Graham et al., 2003 and Lockwood et al., 2010). The aim of environmental governance, in particular, is to manage individual behaviours or collective actions in pursuit of public environmental goods and related societal outcomes (Armitage et al., 2012). To be able to understand environmental governance is to see how decisions related to the environment are made and to check whether the policies and processes as a result lead to environmentally and socially sustainable outcomes. Environmental governance focuses on the capacity, functioning, and/or performance of the institutional, structural and procedural elements of governance (Bennett & Satterfield, 2018).

Bennett and Satterfield (2018) outline that environmental governance has four objectives: 1.) to be effective, 2.) to be equitable, 3.) to be responsive, and 4.) to be robust across the institutional, structural, and procedural elements. The Governance's four objectives should be able to interact with each other and the interactions can have both synergies and trade-offs between them. Institutions that do not enable responsive, equitable and effective environmental governance become ineffective or inequitable and will continue to be this way if robustness is not positioned (Bennett & Satterfield, 2018). Thus, environmental governance as a framework

for research should be on the practice of addressing the four objectives simultaneously while at the same time seeking to better understand their relationships with one another and achieve balance across objectives. This framework helps in the design of indicators for evaluating governance.

Mejias and Couldry (2019) state that the term "datafication" was introduced in a 2013 review of "big data" processes, to datafy a phenomenon is to put it in quantified form so that it can be tabulated and analyzed" (Mayer-Schönberger & Cukier, 2013, p. 78). Datafication, is no longer converting symbolic material into digital form and has much more as it is datafication and not digitisation which "made (digital) text indexable and thus searchable" (Mayer-Schönberger & Cukier, 2013, p. 84). Through the process of datafication, now large domains of human life have become vulnerable to being processed. These domains of life can now be analysed via forms of analysis on a large scale. The social process's dynamic that drives datafication as a social form then becomes apparent: the drive to "render ... human behavior… into an analyzable form" in a process that in the review mentioned above was already called "the datafication of everything" (Mejias and Couldry, 2019) and it means that:

> The production of data cannot be separated from two essential elements: the *external infrastructure* via which it is collected, processed and stored, and the *processes of value generation*, which include monetisation but also means of state control, cultural production, civic empowerment, etc. This infrastructure and those processes are multi-layered and global, including mechanisms for dissemination, access, storage, analysis and surveillance that are owned or controlled mostly by corporations and states. Put another way, datafication combines two processes: the transformation of human life into data through processes of quantification, and the generation of different kinds of value from data. (p. 3)

How corporations or states use datafication to discriminate against individuals, particularly from disadvantaged classes and ethnic populations, in particular sectors (from credit ratings to social services) has sparked significant social justice debate (Eubanks, 2017;

Benjamin, 2019). Decolonial theory, political economy, and legal studies, among others, take a variety of approaches to the social quantification sector's work.

The CARE Principles for Indigenous Data Governance, which is the - Collective Benefit, Authority to Control, Responsibility, and Ethics empower Indigenous People through value-based relationships by shifting the focus from regulated consultation and to position the data's value creation within Indigenous cultures and knowledge systems in a way that it benefits the Indigenous People (Anderson et al. 2003; Castellano, 2004).

The articulation and recognition of Indigenous Peoples' rights and interests are very important in the context of open data and open science because they help reclaim control of the Indigenous people, communities, cultures, and territories in data, data ecosystems, data science, and data narratives. The CARE principles' assertion of control and a focus on collective benefit and equity on data help Indigenous peoples, nations, and communities get repositioned from being merely data subjects to self-determining data users for development and wellbeing and no longer maintain the unequal power distributions. Caroll et al. (2020, p.1) state that "Harnessing data for governance and acting in the governance of data, shifts Indigenous Peoples from invisibility within data ecosystems to vibrant contributors to data policies, practices, ethics, and innovation."

The main gap in the literature is the climate structures that have been critically analysed. These structures are about climate finance, climate assessments and what exactly gets played out in the Global South. There is very limited academic literature on how Indigenous people face extreme marginalisation in India, additionally, the Indigenous people's perspectives on livelihood, their attachment to nature and overall cultural significance in Himachal Pradesh. This is not to say that literature on Indigenous rights does not exist but the multitude of contests in India is missing.

CHAPTER 3

METHODOLOGY

This chapter outlines the research methodology applied in the study. The research design, sampling methods, data collection and analysis methods, ethical considerations, and limitations are all discussed. Through interaction with a variety of stakeholders involved in these frameworks, the study aims to investigate the intersection and integration of data production infrastructures, environmental governance objectives, and Indigenous data governance principles, particularly the CARE Principles.

Research Design

The study examines the processes of Datafication, Environmental Governance, and the inclusion of Indigenous narratives of the hydropower projects in the Kinnaur district of Himachal Pradesh, a state in India. It currently has the highest number of hydropower projects in the country and this particular district holds the highest number in the region. The study implements a qualitative, single case study research method, analysed through critical discourse analysis.

Intentionally, a single-case research methodology was used to make the research both novel and revelatory (Yin, 2018). Himachal Pradesh, a place where conflicting national, international and local governance frameworks meet and where the conflict between Indigenous knowledge, policy and practice is evident. Figure 1 shows the satellite image of the geographical distribution of hydropower projects in the Kinnaur district of Himachal Pradesh, India. The blue tags are the marked locations of the major hydropower installations along the Sutlej River and its tributary, the Baspa River. They are concentrated between the towns of Sarahan, Reckong Peo, and further on the right in the high-altitude region of Sangla. These projects are located in glaciated mountain ranges and river basins which are in proximity to ecologically fragile zones.

Figure 1

A satellite image of the hydropower projects in Kinnaur District, Himachal Pradesh.
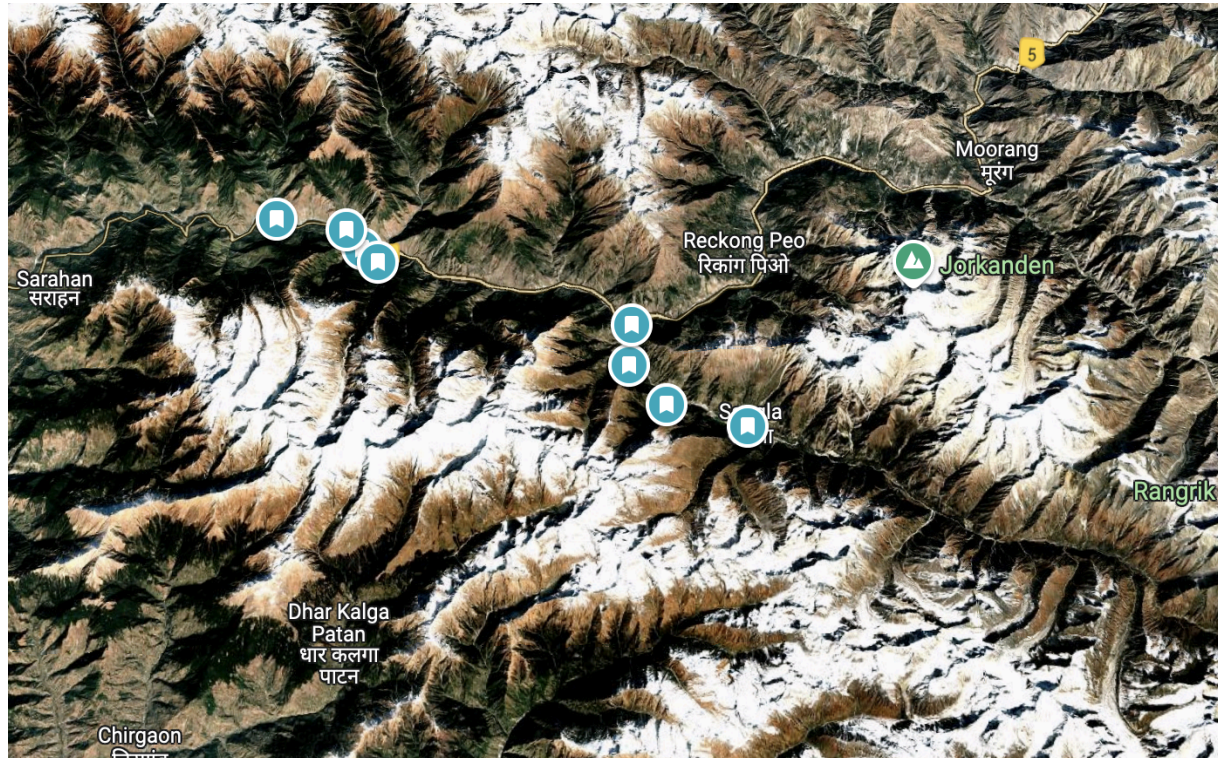
Note: A satellite image of the hydropower projects in Kinnaur District built on the Sutlej River (the tags on the left) and Baspa River (on the right after the diversion) in Himachal Pradesh.

Studying this ecosystem allows for a context-rich, deeply integrated assessment of how different governance and data systems function or malfunction when faced with maintaining social justice. This case study is contextual, interpretive and bounded (specific geographical area). Aiming not to generalise findings statistically but rather to offer analytical generalisations that can inform broader discourses on data justice, environmental governance and Indigenous rights in other similarly situated regions globally.

The case study is examined using the intersections of the three foundational frameworks: 1.) *Datafication (2019)*, data production and its infrastructure and value-generating processes by Mejias Ulises A. Mejias and Nick Couldry, 2.) *Environmental Governance (2018)* characterized by its multidimensional objectives (effectiveness, equity, responsiveness, and robustness) by Nathan J. Bennett and Terre Satterfield, and 3.) the *CARE* Principles (2020) for Indigenous Data

Governance (Collective Benefit, Authority to Control, Responsibility, and Ethics) by The International Indigenous Data Sovereignty Interest Group.

The selection of these frameworks is due to several reasons. First, the *Datafication* conceptualises the journey of data, expands the meaning and utility of value generation of the data collected and processed which provides the most appropriate way to understand its value generation and data control in terms of the hydropower project and the Indigenous people of the region. This helps to move beyond the technical understanding of data and places itself in the broader socio-political context. Second, *Environmental Governance (2018)* by Nathan J. Bennett and Terre Satterfield is a comprehensive, multidimensional governance model that emphasises the effectiveness, equity, responsiveness and robustness to assess the governance outcomes associated with hydropower development. It helps with the analysis of distributive and participatory roles of the Indigenous people that are critical for social justice and sustainability of these hydropower projects. Third, the *CARE* Principles addresses deeply embedded institutional, ethical and structural questions which provides guidance on how data management can be reoriented toward greater justice for Indigenous people.

Sampling & Participants

For the primary data, open ended semi-structured interviews were conducted. The study used a purposive sampling strategy to increase the depth (as opposed to breadth) of understanding for the qualitative nature. A very small and purposefully chosen sample will make efficient use of scarce research resources (Palinkas et al., 2015) and is "used to select respondents that are most likely to yield appropriate and useful information" (Kelly, 2010, p. 317).

The purposive sampling method is to make sure that the participants had a wealth of information with unique, pertinent insights based on their lived experiences, professional roles and institutional affiliations. The deliberate selection of participants from specific categories also helps answer significantly to the research questions of the study. This also extends to the aim that the data will capture a range of viewpoints that can shine the intersections of the three

frameworks - Indigenous data principles, Environmental Governance mechanisms, and the external infrastructure of data production (CARE).

The four criteria of sampling consist of four major categories of stakeholders:

1. The Indigenous community members from Kinnaur district in Himachal Pradesh, India, who were car drivers, shop owners, farmers, specifically those who reside beside the river first hand accounts of environmental impacts.

2. People from organisations that work in the management of environmental data or digital infrastructure, if these developmental projects provide an inside look at how data is collected, processed and used (or misused).

3. For people involved in the Environmental Governance of these regions were researchers and department heads from the Forest Department of government institutions in Himachal Pradesh that work closely with the Department of Environment and local Panchayati Raj Institutions.[2]

4. To understand the current issues regarding governance, datafication and internal clashes were discussed by researchers and reporters writing investigative pieces.

The purposive sampling and the process of accessing and engaging with participants were conducted by the following criteria -

1. Indigenous people of Himachal Pradesh, specifically from Kinnaur district. Direct engagement with environmental governance structures or processes in Kinnaur. Indigenous and not local because they are typically the original descendants of the region and they demonstrate a concern for maintaining the ecological processes within that region. Out of the four participants, one of them was the caretaker of the place we lived in Himachal, who was kind enough to guide us, the second was a car driver who drove

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[2] See Das (2022) about the Panchayati Raj Institution (PRI), " a system of rural local self-government in India and the basic units of administration. It has 3 levels: village, block and district. "Panchayat" literally means assembly (yat) of five (panch) and 'Raj' literally means governance or government. The Panchayati Raj System is not a new concept and therefore is considered as one of the best ways of governance of rural India."

me from Shimla to Kinnaur, the third was a shopkeeper who I managed to start a conversation and continued to explain why am I there and why was my project important and the fourth one was met accidentally who were on the site visit, on her way home. Figure 2 below is a picture of how she guided us to the place where the river had changed its course due to excessive flooding and provided us with valuable insights. All four participants' trust was built by first asking how their lives have been in the region, especially with the state and from thereon it is easier to ask for more information about the environment, resources and the state.

Figure 2

An Indigenous woman of the Kinnaur region, Himachal Pradesh.

2. People involved in the environmental data production or those who deal with projects like hydropower and other developmental projects in the Himachal region, mostly that require mapping the region using different tools and assessment. These people are also involved in both the production and analysis of its production or analysis. This set of participants was referred to me by an organisation with which I was affiliated as a

research fellow. As the organisation works exclusively on climate (including sustainability, climate finance, climate risk assessment, etc.) as it was easier to obtain the participants of this specific category. Their response to the questions was done over a call.

3. They have stakeholder interest in Environmental Governance, understand the structures and outcomes of , data control or environmental decision-making within the government framework and or in some capacity are involved in the governance structure whether governmental, civic or corporate. These participants were mailed by me and out of the 8 emails sent, four of them accepted to answer the questions. One of them spoke over a call, the rest wrote the answers to the questionnaire that was sent.

4. That they belong to positions in institutions or organizations that work closely with the indigenous communities within the region or may have had contact regarding their work. These participants were chosen from the reports on Himachal and they are actively involved in covering the reports from Himachal over the hydropower projects.

The demographics and sample size of the participants-

A total of 12 in-depth interviews were conducted during a 10-day fieldwork period in Himachal Pradesh, while the remaining interviews were carried out between February and April of 2025. For the anonymity and confidentiality of my participants, I have assigned code names for them. It will replace all identifiable and unidentifiable as R, followed by numbers that indicate their category. They will be R1, R2, R3 and R4. This is consistently used in the data collection, analysis and the transcripts.

1. Category 1: Four Indigenous/local community members (1 man, 3 women, ages 20 - 65)
2. Category 2: Two experts in data and infrastructure of hydropower projects.
3. Category 3: Four research officials in government and policy institutions.
4. Category 4: Two researchers from non-governmental organisations.

Now, they will be referred as:

R1 - R1a, R1b, R1c and R1d

R2 - R2e, R2f

R3 - R3g, R3h, R3i and R3j

R4 - R4k and R4l

Data Collection Methods

The study uses a combination of primary and secondary data. The primary data was collected through semi-structured interviews from all the participants and secondary data is the government governance frameworks, assessment reports on the frameworks and government websites that have open access and geographical field observations to generate the results and improve their validity.

1. Interview

For the primary data collection, semi-structured interviews were taken for their adaptability and depth. This kind of interview structure helped to engage with the respondents in a safe manner, allowing them to provide nuanced opinions with the topic being sensitive in nature. It also allowed the responses to expand freely, introduce unanticipated opinions and reflect deeply on personal or institutional experiences. The questions were tailored to the different participants and in accordance with the layers of the framework.

The interviews were conducted in person for the indigenous people, for the rest it was a mixture of phone calls, video calls and also just writing back the answers to the questions sent over the mail. The average duration of the calls were from 30-45 minutes. The interviews with the indigenous people were recorded over the phone but for the rest, they did not want any recording. The interviews with the indigenous people were taken in Hindi, whilst for the rest were in English.

2. Field observations

The field visits to Kinnaur were in the particular locations of the hydropower projects currently running in the region. This gave a firsthand understanding of the socio-environmental landscape. The visits were taken near these projects mentioned in Table 1 -

Table 1

Hydropower projects in the Kinnaur District

Sl. No.	Project Name	Basin	River/Tributary	Location
1	Kashang HEP	Satluj	Kashang Khad	Kinnaur, HP
2	Shongtong Karcham HEP	Satluj	Satluj	Kinnaur, HP
3	Kashang	Satluj	Kashang & Kerang Khad	Kinnaur, HP
4	Kashang	Satluj	Kerang Khad	Kinnaur, HP
5	Khab HEP	Satluj	Khab	Kinnaur, HP
6	Bara Khamba HEP	Satluj	Sorang Nallah	Kinnaur, HP

Figure 3

Kinnaur, Himachal Pradesh

Note: This image is of a road that is under construction. After crossing Manalai, these roads are constantly under construction in Himachal Pradesh.

Figure 4

Sangla, Himachal Pradesh

Note: This image was taken near Sangla, where a flood changed the course of the river bed.

These visits were extremely difficult as only local buses and private cars can reach these locations. It takes around 27 hours to reach from New Delhi and the nearest airport is in Shimla, around 200 kms away. The terrain is tough and the roads are often blocked by landslides. The visit showed environmental degradation in its physical form, deteriorated riverbeds, landslides and forest loss due to the ongoing infrastructure projects as shown in the Figure 3 and Figure 4.

3. Document and Report Analysis

To provide a formal context to the primary data, a systematic literature review and document analysis were conducted and the documents reviewed included:

a. For Environmental Governance, governmental and legal documents, including Environmental Impact Assessments (EIAs), Environmental Information (EI), Environmental Information System (EIS), India State-Level Basic Environmental Information Database (ISBEID) were taken from Indian Governmnet's websites. Along with these documents on forest clearances, public hearing records and other relevant open access documents were considered.

b. For policy frameworks related to data governance, Indigenous rights in India, regulations, Indigenous rights in India, planning were consulted.

c. Investigative reports, new articles, reports of white papers regarding climate crisis, especially of Himachal Pradesh-based crisis. Disclosures and reports from independent journals that exposed the carbon credits scheme done through these hydropower projects. Each of these documents were critically analysed using the same six-layered framework to maintain analytical consistency across all data types.

Data Analysis

The study uses a Critical Discourse Analysis to analyse the data. Critical Discourse Analysis is a thorough, close reading that analyses between text and context to explore the discourse, organisation and functions of discourse, it is an interpretation, grounded by detailed argument and deep engagement with the material to be studied (Bloor & Bloor, 2007).[3] "focuses on social problems, and especially on the role of discourse in the production and reproduction of power abuse or domination" (Van Dijk, 2001, p. 96). Rogers (2004, p. 3) explains that "Critical Discourse Analysis differs from other Discourse Analysis methods in that it includes not only a description and interpretation of discourse in context, but also offers an explanation of why and how discourses work." The study aims for this analysis to answer questions on relations of power and ideology and the effects it has upon social identities, relations, knowledge and beliefs within the selected context.

As the study uses three different frameworks, it incorporates a comparative analytical element by examining perspectives from diverse stakeholders, which includes people from the Indigenous communities, state officials/NGO representatives and data practitioners. The different perspectives help to test validity - invalidity, discover patterns, gaps and pain points. This approach will not only reveal institutional gaps and power imbalances but also increase the findings' credibility and richness. The three theories are assembled by a custom-designed six-layered analytical framework, which will be further explained in a separate chapter. The framework helps to operationalise the convergence of data infrastructure, governance performance and Indigenous principles. A brief description of the layers is:

1. Institutional layer - The institutional layer are the state agencies, corporates, NGOs, and Community Based Orgnaisations (CBO). This layer will help recognise who are among the formal and informal institutions involved in governance and policy implementation.

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[3] See Bloor and Bloor (2007) further state that "Critical Discourse Analysi is interdisciplinary and can be used by professionals from a variety of backgrounds such as historians, business institutions, lawyers, politicians, etc., to investigate social problems relating to their work."

2. Structural layer - This analyses the technological systems and infrastructures that mediate environmental interventions and governance actions in the institutions.

3. Procedural layer - This layer describes the decision-making processes, mechanisms, and workflows, particularly in relation to participation and access of the stakeholders (agencies, the state and the Indigenous communities).

4. Value generation and use - This layer will examines how the environmental and data resources are used to produce value and for whom. It helps actualise the usefulness of data and governance and their impact on the Indigenous people.

5. Ownership and control - It explores questions of Indigenous data sovereignty, environmental justice to answer questions of who holds control over knowledge production, resources and the decision-making.

6. Global Integration - It helps contextualise the case of hydropower within broader transnational networks, international agreements and the global environmental outcomes that shape national and ground level realities through investment regulation or global governance frameworks.

Each of these layers are made through understanding of the frameworks and bringing the common tones of argument into different layers. It serves as an analytical lens through which empirical data that has been gathered through interviews and literature review would be interpreted. These layers are interconnected which helps to identify any systemic bottleneck, governance limitations and the opportunity for reform, especially to understand if one or more frameworks (technological, environmental, Indigenous) fail to align or reinforce each other in practice. This multi-layer approach in analysing the primary data is to bring a more holistic and interdisciplinary understanding of governance which will help move beyond siloed analyses and toward a more integrated, justice-oriented evaluation of policy, power and practice, supporting an all-encompassing knowledge as it manifests in the actual world.

Using these frameworks to critically analyse the primary and secondary data helps us answer our research questions and prove hypotheses that can also help identify possible asymmetries and demonstrate how different elements interact.

Ethical Considerations

Ethical considerations for this study are extremely important as the topic itself may pose as a sensitive area to work as most literature stems out for the need of justice. So to make responsible academic research and to ensure participants' rights, dignity and welfare were protected throughout the research process. This study put special attention to confidentiality, informed consent and the responsible inclusion of Indigenous communities making sure they did not feel vulnerable while answering questions.

For confidentiality, all the primary data collected are stored securely and accessible only by the primary researcher. The repondants are not referred to by their real names during analysis, rather anonymised through the use of pseudonyms to protect participants' identities in both data storage and dissemination of findings. Participants were informed beforehand about the storing of their information and the audio recordings, transcripts and the digital files are stored in password-protected devices.

The participants were made to understand the study's objectives and in what capacity the information will be used. They were also informed that they can anytime approach the researcher to either add/omit any information they like so that no data is given without proper knowledge or stated without full permission. The participants were also informed where the study is going to be presented and who are the readers/stakeholders involved.

Declarations

Some sentences may have been corrected for grammar using AI tools such as ChatGPT. (like this sentence itself)

CHAPTER 4

FRAMEWORK FOR ANALYSIS

The three frameworks- *Datafication (2019)* , *Environmental Governance (2018)* and the *CARE* Principles (2020) can be further coupled under six categories- 1.) Institution, 2.) Structure, 3.) Procedure, 4.) Value creation , 5.) Ownership and control, and, 6.) Global integration. This coupling does not limit the broader meanings and outcomes of these frameworks but is made to understand these frameworks more coherently. This merging of the frameworks is done to give a more interdisciplinary meaning to understand the situation of the hydropower projects in Himachal Pradesh, India. This is also to understand the meaning of the research, that is, understanding CARE principles also require simultaneous interpretation of Datafication and Environmental Governance structures.

Below is a description on how these frameworks are philosophically compatible and is built into a meaningful synthesis in order to justify merging. Table 2 shows the layers in a tabular form.

A. INSTITUTIONAL LAYER

According to North (1990, p. 4): "Institutions are the rules of the game in a society, […] the humanly devised constraints that shape human interaction. […] They structure incentives in human exchange, whether political, social or economic". Institutions include, for instance, contracts and contract enforcement, safeguarding property rights, the rule of law, government bureaucracies and markets. They also, nevertheless, encompass customs and beliefs, norms, social structures and educational traditions (so-called informal institutions). Formal institutions generally tend to represent the crystallisation of informal institutions (North, 1990), since social norms within the areas of gender, class and caste, for instance, set rules of political participation

and representation, economic exchange methods, and inclusion of various groups within society (Pateman, 1988).[4]

The institutional framework decides who the stakeholders in governance structures are. This layer places the Indigenous people within the environmental governance of the hydropower projects in Himachal Pradesh. This layer includes the formal roles, legal systems and decision-making portion of the governmental agencies, regulatory institutions, project developers and councils for the local people. It holds the people in power and lays out the enforced and established guidelines on who gets to be included and excluded from the government processes.

Mejia and Couldry (2019, p. 2) state that "actors, we have corporations, states, and various civic (activists, journalists, etc.) and even non-state (terrorists, hackers) actors, all of which can produce, collect and analyse data for different purposes."

For Himachal Pradesh's hydropower projects, the institutional level in datafication helps understand- 1.) Whether or not Indigenous communities are formally consulted or just notified, 2.) Whether or not their traditional knowledge and right over land is recognised, 3.) and whether or not they have an enforceable voice in project clearance, benefit sharing, and environmental monitoring.

The CARE Principles observe that "The pervasiveness of bias across data ecosystems (digital infrastructures, analytics, and applications), within sub-systems (regions/platforms), as well as institutions and communities, indicates the importance of addressing inequities at multiple levels." It is here at the institutional layer that sovereignty, representation, and accountability are negotiated and made operational.

In Himachal Pradesh, the institutional structures-including the structure of Environmental Impact Assessment (EIA) panels, legal recognition of customary land rights, and grievance redressal mechanisms-directly determine the level and quality of Indigenous participation.

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[4] Hodgson (2006) similarly defined an Institution as both that "constrain and enable behavior." "They involve (a) criteria to establish their boundaries and to distinguish their members from nonmembers, (b) principles of sovereignty concerning who is in charge, and (c) chains of command delineating responsibilities within the organization. Institutions are the kinds of structures that matter most in the social realm: they make up the stuff of social life. The increasing acknowledgement of the role of institutions in social life involves the recognition that much of human interaction and activity is structured in terms of overt or implicit rules. Language, money, law, systems of weights and measures, table manners, and firms (and other organizations) are thus all institutions."

Unless institutional reforms that integrate CARE Principles (particularly Authority to Control and Collective Benefit) are undertaken, Indigenous people are likely to be excluded from effective governance and from benefiting from hydropower development.

The institutional level is the most significant one as it regulates the rules of engagement, division of powers, and Indigenous self-determination mechanisms in environmental management. For Himachal Pradesh hydropower development projects, the construction of this level based on CARE Principles is crucial in achieving justice, sustainability, and authentic Indigenous participation.

The Carroll et al. (2020) in CARE principles state that "The pervasiveness of bias across data ecosystems (digital infrastructures, analytics, and applications), within sub-systems (regions/platforms), as well as institutions and communities, indicates the importance of addressing this at multiple levels" and that the Indigenous people can be made visible by harnessing data for governance and within the data ecosystems to vibrant contributors to data policies, practices, ethics, and innovation. The principal emphasis is that there is a *need* to follow the insights into the frameworks of data ecosystems to help address the challenge of producing data that reflects Indigenous Peoples' interests and governance needs.

This layer in all three frameworks emphasises the institutional layers to be 'more adaptable to changing conditions' and 'More flexible institutions that can be altered to work in different contexts.'

B. STRUCTURAL LAYER

The "structural" aspect, then, often refers to the arrangement, organisation, or framework within which institutions operate. In the context of institutional analysis, "structure" is about the configuration of organisations and rules that together shape outcomes (Cole et al., 2013).[5]

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[5] While the article is primarily focused on "institutional" analysis, he does touch on the importance of structure in the context of institutions. Distinguish between "institutions" as rules and "organizations" as structures that implement or act within those rules.

This layer differs from the "Institutional", which generally refers to the rules and norms (and sometimes organisations) that shape behaviour, but the "Structural" refers to the overall arrangement or framework of those organisations and rules.

Indigenous Peoples' data comprises data created by Indigenous Peoples and governments and institutions on and regarding Indigenous Peoples and lands, and data regarding Indigenous communities and the individuals, Indigenous and non-Indigenous, who inhabit within.

In terms of 'Structures', the datafication can go within the various architectures that include platforms, services, apps, databases and hardware devices, -

The production of data cannot be separated from two essential elements: the external infrastructure via which it is collected, processed and stored, and the processes of value generation, which include monetisation but also means of state control, cultural production, civic empowerment, etc. This infrastructure and those processes are multi-layered and global, including mechanisms for dissemination, access, storage, analysis and surveillance that are owned or controlled mostly by corporations and states. (Mejias & Couldry, 2019, p. 3)

Bennett and Satterfield (2018) states that the *Environmental Governance* should also be Robust in nature, they should be - resilient to shocks, adaptive to change and viable over the long term. That the framework they made helped be applicable to the design, evaluation and analysis of environmental governance in "different social and political contexts, to diverse environmental problems and modes of governance, and at a range of scales." (p. 3) and that this part should be considered simultaneously with other objectives- to be effective, to be equitable, to be responsive which will fall under the rest of the layers. These objectives also need to be "considered simultaneously across the institutional, structural, and procedural elements of environmental governance." (p. 1)

CARE (Carroll, et al. 2020) describes that the structural layer provides information on the 'Responsibility' and that it supports the data use to be sustainable and be accountable. It states "Those working with Indigenous data have a responsibility to share how data are used to support

Indigenous Peoples' self-determination and collective benefit" (p. 6), "Indigenous Peoples' rights and wellbeing should be the primary concern at all stages of the data life cycle and across the data ecosystem" (p. 6) and "Harnessing data for governance and acting in the governance of data, shifts Indigenous Peoples from invisibility within data ecosystems to vibrant contributors to data policies, practices, ethics, and innovation" (p. 2)

C. PROCEDURAL LAYER

Procedural is the knowledge of how to do something. Consequently, it is also referred to as the 'know-how' (Baroody, 2003). Procedural knowledge is conceived as the implicit or explicit knowledge of rules and action sequences (Star & Newton, 2009), which serves as the foundation for the ability to act (action competence) and therefore to solve problems. In this case, automation is viewed as a quality attribute instead of an attribute of procedural knowledge (Rittle-Johnson & Schneider, 2015).[6]

The procedural layer Datafication (2019, p. 3)- "the external infrastructure via which it is collected, processed and stored, and the processes of value generation, which include monetisation but also means of state control, cultural production, civic empowerment, etc."

The framework of digital data as a complex structure and actors, which diverse fields can assist us in analysing at several levels. At the actor level, we find "corporations, states, and civic (activists, journalists, etc.) and even non-state (terrorists, hackers) actors, all of whom can create, gather and examine data with different goals." (Mejias & Couldry, 2019, p. 2)

This process is subsequently turned into profit either by leveraging the collected data to market products or services to users, or by selling the data to third parties aiming to shape or persuade user behavior for specific objectives. The extent of this practice varies by country, with

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[6] Arnold., Mühling, & Kremer (2021) further explains that the Procedural understanding comprises knowledge about or understanding of scientific methods with their limits, and possibilities and the role of the cognitive part of procedural knowledge is knowing how to proceed.

some nations exhibiting stronger connections between this sector and government efforts to collect data for citizen surveillance. (Mejias & Couldry, 2019)

Environment Governance's attributes related to the Procedural Layer are Governance being equitable and responsive, stated in the framework as the policies and processes should ensure the acknowledgement of, respect for and incorporation of perspectives, values, cultures and rights that is diverse in nature. This is when all the views are considered, especially of the marginalised and the vulnerable groups. That there is participation and collective choice are present, enabled by the spaces and processes. Different stakeholder groups should share and assign the rights and responsibilities fairly and that the structures ensure the representation and engagement of are in place. These spaces and processes should be able to consider the unequal circumstances, laws and policies because then it can be present to protect the local rights, mechanisms, and, ensure that groups have access to justice.

Bennett and Satterfield (2018) write that processes and platforms are in place to co-produce knowledge and enhance social and institutional memory to enable stakeholder debate, negotiation, and conflict resolution. This will help enable adaptation to new information, changing conditions, and diverse contexts.

Most of the data of the Indigenous people is held by non-Indigenous governments, institutions, and agencies, so from CARE, we get to know it is therefore increasing Indigenous Peoples participation in data governance activities is:

> Central to realising Data Sovereignty and its governance includes both the stewardship and the processes necessary to implement Indigenous control over Indigenous data (collection, storage, analysis, use, reuse) [...] Being "Responsive" is to make the datafication people and purpose-oriented, reflecting the crucial role of data in advancing innovation, governance, and self-determination among Indigenous Peoples [....] This will help promote equitable participation in processes of data reuse, which will result in more equitable outcomes, and there is a need to apply insights generated from these frameworks within data ecosystems to help address the challenge of producing data that reflects Indigenous Peoples' interests and governance needs. (p. 3)

CARE's role in the procedure would mean that -

> Mainstream values related to research and data are often inconsistent with Indigenous cultures and collective rights [.....] Indigenous worldviews have typically centred 'people' and 'purpose' through governance processes that emphasise collective ownership and control of data [.....] The CARE Principles [...] guide the inclusion of Indigenous Peoples in data processes that strengthen Indigenous control for improved discovery, access, use, reuse, and attribution in contemporary data landscapes [...] Underlying this need were the primary goals of fostering Indigenous self-determination by enhancing Indigenous use of data for Indigenous pursuits and honouring the 'FAIR Guiding Principles for scientific data management and stewardship'…including data sharing on Indigenous terms. (Carroll et al. 2020, p. 3)

D. VALUE CREATION/ USE

The Resource-Based Theory is understood as being 'market-specific' (Bowman & Ambrosini, 2000), where the services and resources are considered to be of worth if they meet and are also allowed to meet the customer needs more effectively and efficiently. [7] Mejias and Couldry (2019) describe the value creation through *Datafication* as that the is:

> The production of data cannot be separated from two essential elements: the external *infrastructure* via which it is collected, processed and stored, and the *processes of value generation,* which include monetisation but also means of state control, cultural production, civic empowerment, etc [.........] The process is then monetised by using such data to sell products or services to the users, or by selling the data to parties wishing to influence or persuade users towards various goals. (p. 3)

In the *Environmental Governance* framework, it states that value creation should benefit communities and not just external entities and that the environmental policies and processes

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[7] See Eurodiaconia (2015) for the measure of an organisation's performance has led to a growing interest in terms such as "value for money", "value added" and "outcomes" as ways. In many ways the distinction between "output" and "outcomes" encapsulates what is meant by measuring social value.

ensure acknowledgement of, respect for and incorporation of diverse perspectives, values, cultures and rights. The Governance should be able to put down mechanisms that ensure socio-economic costs and benefits are 'just and fairly distributed' and it can ensure 'unequal circumstances are considered.'

The *CARE* principles states that-

Indigenous data must facilitate collective benefit for Indigenous Peoples to achieve inclusive development and innovation, improve governance and citizen engagement, and realise equitable outcomes. Benefits accrue when data ecosystems are designed and function to support - 1.) Indigenous nation and community use and reuse of data, 2.) use of data for policy decisions and evaluation of services, and 3.) creation and use of data that reflect community values. (p. 6)

The collective benefit of CARE is that the data taken should be beneficial for the Indigenous peoples and that it is through inclusive development and innovation which comes from governance and citizen engagement that strives for just and equitable outcomes.

E. OWNERSHIP AND CONTROL

Dosis and Zantman (2020) explains that the best way to assign data ownership depends significantly on how valuable the data is, or more specifically, on the relative importance of the market where the data is created versus where it is utilized. If the market where data is generated holds more value, it is better for consumers to retain ownership of their data. However, if the market where data is used is more critical, granting ownership to firms could lead to greater overall welfare.

Data infrastructures are globally interconnected, requiring governance that operates across local, national, and global scales (Fumega, 2024). Effective global data governance depends on multi-level cooperation, harmonised standards, and respect for sovereignty and local protocols (Fumega, 2024). "Datafication is a contemporary phenomenon which refers to the

quantification of human life through digital information, very often for economic value" (Mejias & Couldry, 2019).

The CARE Principles explicitly call for global respect and implementation of localised Indigenous protocols, ensuring Indigenous authority, ethics, and benefits are upheld in the globally integrated data system (O'Brien, 2024).

F. GLOBAL INTEGRATION

These data structures and processes are inherently global where they are able to turn human life into quantifiable data, which are then used for value generation by the instituions. The data collection, storage and analysis are occurring across multiple nations and also the rise of consequences thereof. Now, governance are not confined to one nation but are shaped by global flows of information and power.

The environmental governance framework (Bennett & Sattefield, 2018) is structured to work at a global scale. It emphasises governance procedures to be practical and adaptable so that it can be effective, equitable, responsive, and robust. And governance is considered across the institutional, structural, and procedural layers and work in differentsocial and political contexts. That, even the environmental challenges can be addressed from a local to global level. This governcne structure help address environmental issues across regions and be able to respond to global challenges- like climate change, climate justice and sustainability.

The CARE Principles can be used research, policy, and innovation internationally. The advocacy for collective benefit, authority to control, responsibility, and ethics in data structures should promote Indigenous sovreignty and participation in these ecosystems.

These three frameworks focus on global applicability because they recognise how data flows through environmental challenges and governance transcend national boundaries. They have establish structures that can be applied internationally to ensure the global systems are effective and inclusive for all.

Table 2

Three framework table

	DIMENSION / LAYER	DATAFICATION	ENVIRONMENT GOVERNANCE	CARE PRINCIPLES
1.	**INSTITUTIONAL LAYER**	Institutions involved in **data production**: corporate, state, civic, and global actors	Governance must be **effective** (functioning institutions, policy coherence)	**Authority to Control**: Indigenous peoples' rights to govern data about them.
2.	**STRUCTURAL LAYER**	Global, **multi-layered** systems for **data collection, dissemination, storage, and surveillance**	Governance must be **robust** (resilient, long-term viable structures)	**Responsibility**: Ensuring data use supports sustainable systems and accountability.
3.	**PROCEDURAL LAYER**	Data is **processed and analysed** via **external infrastructures** that **embed corporate/state interests.**	Governance must be **equitable** and **responsive** (**inclusive, adaptive procedures**).	**Ethics**: Centering **Indigenous rights, cultural relevance,** and **dignity in procedures.**
4.	**VALUE GENERATION / USE**	Data used for **economic gain**, **state control**, **civic empowerment**, etc.	Interactions and trade-offs between **governance goals must be managed**.	**Collective Benefit**: Data should **benefit Indigenous communities**, not just external entities.
5.	**OWNERSHIP AND CONTROL**	**Corporate/state ownership** and control dominate data flows and access.	Governance must navigate and **balance power asymmetries.**	**Authority to Control & Responsibility** reaffirm community sovereignty over data
6.	**GLOBAL INTEGRATION**	Data infrastructure is **globally interconnected**, affecting local and global outcomes.	Need for multi-scale governance integration	CARE principles call for global respect of localized Indigenous protocols.

Note: Datafication (2019), Environmental Governance (2018) and the CARE Principles (2020)
can be further coupled under six categories: 1.) Institution, 2.) Structure, 3.) Procedure, 4.) Value
creation, 5.) Ownership and control, and 6.) Global integration.

CHAPTER 5

MAPPING THEORETICAL AND OBSERVATIONAL REALITIES

The Directorate of Energy (DoE) is the nodal agency for the program development and forming the policy frameworks and directions for the hydro power projects in Himachal Pradesh. The Himachal Pradesh Power Corporation Limited (HPPCL) plans, promotes and organises the development of all facets of hydroelectric. The Himachal Pradesh Power Transmission Corporation Limited (HPPTCL) undertakes the state-level transmission of electricity through the intra-state transmission system. (HPPTCL, n.d.) The Himachal Pradesh State Electricity Board Limited (HPSEBL) the generation, transmission, and distribution of electricity within Himachal Pradesh. (HPSEBL, n.d.) HIMURJA is the state nodal agency responsible for the promotion of clean energy in Himachal Pradesh. (Himurja, n.d.). The Government of Himachal Pradesh holds a 60% stake in HPPCL, while the Himachal Pradesh State Electricity Board (HPSEB) owns the remaining 40%. Two former HPSEB entities - Pabber Valley Power Corporation (PVPC) and Kinner Kailash Power Corporation (KKPC) - have been merged into HPPCL to facilitate the development of new hydropower projects within their respective river basins ICFRE (2014). In Figure 5, a road towards Sangla showing the project names and boards.

Figure 5

A road towards Sangla showing the project names and boards.
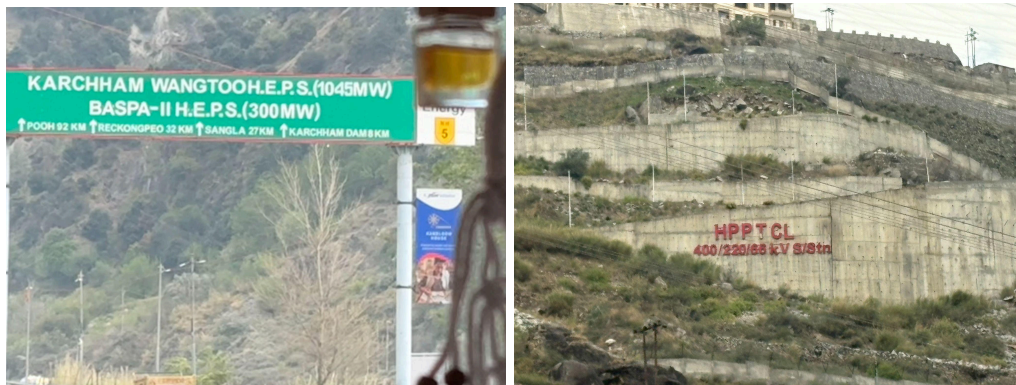
The Project Developer is required to follow environmental related issues that concerns with the disposal of excavated muck at the designated dumping sites with the prescribed manner. In Himachal Pradesh, because of the peculiar topography, the availability of land is scarce to have dumping sites. The project developer shall utilise such material for the project after following all the prevailing guidelines, as may be found suitable for construction and the remaining material shall be managed as per norms. Manshi Asher of Himdhara Collective also informed DTE (2025) that deforestation and soil displacement near project sites "obstruct natural water flows, intensifying flood risks and that environmental impact assessments are often inadequate or ignored altogether. Grassroots movements have emerged in districts such as Mandi, Chamba, Kinnaur, Shimla, and Lahaul-Spiti."

DoE (nd.) states that "All efforts shall be made by the Government of Himachal Pradesh to expedite the process of environmental clearance to the projects and the Directorate of Energy shall be the nodal department to oversee and monitor the process." Single window clearance system shall be placed in operation to "grant speedy clearances including Environmental Clearance to the project developers." There are some streams, portions of river and in between stretches which have been restricted for Hydro Development on account of Social & Environment concern.

From the government documents, it is noted that the Himachal Pradesh Power Transmission Corporation Limited (HPPTCL) will undertake the study and develop an in-depth Environmental Impact Assessment (EIA) spanning three seasons of data. It is also to be noted that these corporations have commissioned multiple other agencies, like the Indian Council of Forestry Research and Education (ICFRE) or the Pollution Testing Laboratories, to carry out the EIA for their projects. The clearance for 'Forest Clearance' lies in the jurisdiction of the Ministry of Environment, Government of India, for project components and other infrastructure.

While the role of the Environmental Impact Assessment portion of these hydropower projects is to only assess the environmental changes like soil quality, air quality and the like, a small portion of the assessment is for the 'socio-economic' aspect of the projects. "An

environmental impact assessment (EIA) is a thorough examination of the possible favourable and unfavourable effects that a project's environmental impacts might have. Several aspects are considered in this evaluation, including environmental, social, and economic ones." (Pathania et. al., 2024)

For the EIA study to take place, they do these steps -

1. Assessment of the existing status of physico-chemical, ecological and socioeconomic aspects of the environment.
2. Identification of potential impacts on various environmental components due to activities envisaged during the construction and operation phases of the proposed hydroelectric project.
3. Prediction of significant impacts on various aspects of the environment.
4. Delineation of Environmental Management Plan (EMP) outlining measures to minimise adverse impacts during the construction and operational phases of the proposed project.
5. Formulation of Resettlement and Rehabilitation (R&R) Plan.
6. Formulation of Catchment Area Treatment (CAT) Plan.
7. Estimation of cost for the implementation of the Environmental Management Plan and Environmental Monitoring Programme.

For the EIA, the socio-economic survey is carried out in the villages near the proposed project areas. Data is collected at two levels - the village/ block level and the individual household level within the project study area. The socioeconomic survey at the block/ village level is to measure the status and level of amenities and resources at the block/ village level. The household surveys to evaluate the existing immovable and movable assets for designing and developing compensatory and rehabilitation packages for families that would be made houseless, landless and whose land would be purchased for different project activities. As per the estimation of the demographic profile of Project Affected Families (PAFs), the Resettlement and Rehabilitation Plan, according to guidelines and norms as set by National Policy on Resettlement and Rehabilitation (2007, 2013) and R&R Plan of HPPCL, is drawn.

"People have been shouting and screaming, running to the courts and holding protests but this has had no impact… it seems like the Himachal Pradesh Power Corporation (HPPCL) has the full support of the state government and the bureaucracy," (Pardikar, 2020)

Prashar (2025) in Down to Earth (DTE) reports that there was a rising case of climate-related disasters in Himachal Pradesh and people started correlating that these escalating natural calamities might be due to the role of hydropower projects. Environmentalists drew attention to the fact that four of the six affected sites host existing or ongoing hydropower developments, claimed six lives and left 47 missing. Environmental activist Kulbhushan Upamanyu told DTE that these projects have had a significant impact like changes in weather patterns and increased disaster frequency in areas where dams are constructed. DTE (2025) further reports that:

> From January to July 2024, cloudbursts occurred at seven locations across Himachal, four of which had hydropower projects. These caused 73 deaths and damages amounting to ₹648 crore and in 2023, disasters linked to hydropower project zones caused losses of ₹12,000 crore and claimed 441 lives. Similar destruction was reported in 2022 and 2021. Experts like Prof. Sunil Dhar from Jammu Central University attributes the increasing fragility of the mountains to human interventions such as deforestation, soil dumping, and unregulated construction.

The Environmental Governance of Himachal Pradesh consists of the Ministry of Environment and Forests (MoEF), Govt of India. It passes acts, legislations, guidelines and standards periodically. The chief environmental regulatory body in India is MoEF. It sets environmental policies and grants environmental clearances for various projects. Himachal Pradesh is the first state to own a State Environmental Policy that emerged in 2005 before the National Environmental Policy 2006. The HP Government, on paper, has pledged to preserve and improve the environment through sustainable development.

The second focus is the Environment and Social Cell (ESC), responsible for the ongoing management, monitoring, and compliance with environmental and social impact throughout the

life of a project. They are responsible for- 1.) Payment of adequate compensation and loss of assets to the PAPs as per approved policy, 2.) Compensation for the loss of crops & trees/structures is paid as assessed by the State Agriculture, Horticulture, Forest, or Revenue Department, whichever applicable, 3.) Grievances/complaints are received from the public, 4.) The grievance redressal mechanism is displayed on the office notice board, 5.) A complete record of the representations received must be maintained, including photographs, 6.) Organise regular consultations with stakeholders. - Prevent project-induced Gender-based violence, 7.) Reporting and Documentation: A complete record of the Environment and Social Management measures is maintained and reported to the funded agency as per the scheduled reporting period.

Himachal Pradesh Power Corporation Limited (HPPCL) is a company currently with 22 Hydropower Projects in the region. It claims to overcome the challenges of changing business and environment to establish a sustainable relationship with the stakeholders for optimum benefits and economic growth by attaining performance excellence.

From HPPCL's website, it states that their principles and philosophy are "based on partnering with communities by recognising them as a project stakeholder," and that they will make concerted efforts to enhance the quality of life through their CSR endeavours. With the involvement of people (CSO, CBOs and local government institutions), CSR activities will include the eradication of hunger and poverty, health care, education, protection of the environment, conservation of national heritage & culture, and infrastructural development and community development.

It also states that "some of the projects of HPPCL are located in tribal areas, whereas others are located in far reaches of mountainous regions. HPPCL, being a responsible corporate, strives to bring about an overall positive impact on the societies living in the project areas." From its CSR goals, it wants to -

> HPPCL will endeavour to eradicate hunger and poverty in its project area by creating employment opportunities in the project areas as well as in the state of Himachal Pradesh. HPPCL proposes to support health institutions/centres facilitating health care to people in the project-affected areas as well as in the state of Himachal Pradesh. HPPCL proposes to support educational institutions by creating/augmenting infrastructure facilities. HPPCL

will extend help in promoting organic farming, vermicomposting, social forestry and silviculture practices. HPPCL will also support protection of National Heritage and provide financial assistance for cultural and public places etc. HPPCL will also support training to promote rural sports, nationally recognized sports, paralympic sports and Olympic sports. Infrastructural Development and Community Development: HPPCL will support creation of community assets/ institutions in the project areas. HPPCL will make contribution to the Prime Minister's National Relief Fund /Chief Minister's Relief Fund or any other fund set up by the Central Government for socio economic development and relief and welfare of the Schedule Castes, the Scheduled Tribes, others backward classes, minorities & women. HPPCL will also support rural development projects.

The World Bank in 2015 published a report titled ' Himachal Pradesh Towards Green & Inclusive Development', marking it as 'A Green and Inclusive Road to Development'. The introduction of the report is about the amount of loans India had taken to build the hydropower projects in Himachal. It states that "in 2009, the World Bank's first Development Policy Loan (DPL) provided the state with $200 million in budgetary support to implement much-needed fiscal reforms." and that it 'embarked on a path of green and inclusive development that is the most sustainable way forward for a state with unique environmental and cultural assets.' The two DPLs that followed, for $ 100 million each, between 2011 and 2014. It also mentions that it helped "the state promote environmentally and socially sustainable development in hydropower, tourism, and industry, as well as in the development of watersheds." The report states that it was the first time India had accessed a loan from the 'Clean Technology Fund'[8]. The loan taken also helped establish the Department of Environment, Science & Technology (DEST). [9]

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[8] See https://fiftrustee.worldbank.org/en/about/unit/dfi/fiftrustee/fund-detail/ctf "The Clean Technology Fund provides new large-scale financial resources to invest in clean technology projects in developing countries, which contribute to the demonstration, deployment, and transfer of low-carbon technologies with a significant potential for long-term greenhouse gas emissions savings."

[9] See World Bank (2015) "DEST is a "strong advocate of environmental issues and coordinates the efforts of various government departments, enabling them to plan their development activities in an integrated and environment-friendly manner. In 2013, DEST developed an Environmental Master Plan (EMP) that established baseline data for the state's natural and physical resources. The plan identifies ecologically sensitive zones and the critical issues that impact them, while outlining corrective measures as well as the manpower and regulations needed to implement them. The centre is a technical hub that serves as a repository for all data on the state's environment, as well as its natural and man-made resources, and

On March 25, 2014, at least 31 women from Jharauta village in the Chamba district of Himachal Pradesh were detained while protesting the initial construction of the 180 MW Bajoli-Holi Hydropower Project (BHHPP). Kajal (2022) reported that Kavita Devi, a ward member from the village located in the Bharmour region, informed her that the community had been engaged in protesting against the construction for over ten years, yet their demands did not call for the project's cancellation. Pardikar (2020) found that -

Additionally, given that Kinnaur is a Schedule V area, special provisions like the Panchayats (Extension to Scheduled Areas) Act, 1996 say that the consent of the gram sabha is necessary if local natural resources are to be diverted towards 'development projects'. HPPCL, however, did not get an NOC from the gram sabha. This was one of the main grounds on which the clearance was challenged in the NGT in 2011 by Paryavan Sanrakshan Sangarsh Samiti, an organisation formed by the villagers of Lippa. Other grounds include concerns regarding ecological fragility, dam safety and impact on livelihoods and cultural rights.

Brief Introduction to Carbon Credits in India

India has both compliance-based and voluntary carbon market mechanisms like the Programs like the Perform Achieve and Trade (PAT) scheme and Clean Development Mechanism (CDM) projects that help enable industries to reduce emissions and earn credits. Globally, India has registered the second-largest number of CDM projects and is an active participant in a robust carbon market.

The Indian Government is developing a National Framework for the Indian Carbon Market (ICM) which will include a national electronic platform to issue carbon credits. To support this, the Energy Conservation (Amendment) Act, 2022, was updated to formulate a carbon trading scheme. It will allow agencies to issue Carbon Credit Certificates (CCCs) and enable non-obligated entities to register projects that 'reduce, remove, or avoid GHG emissions' (BEE, n.d.).

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climate change. It helps government departments make evidence-based development decisions and to monitor results."

Mishra (2023) found that NGO Corporate Accountability and The Guardian analysed data of the top 50 carbon offset projects in the world and identified that 39 out of the 50 did not account for cutting any extra greenhouse emissions and were just "likely junk" and "worthless". It also discovered that the top carbon offset projects are in India and nine such projects in India include five hydroelectric dams, two solar plants and two wind farms. Lakhani (2023)[10] highlights that:

> All 10 hydroelectric dams in the top 50 carbon offsets – including the Teles Pires dam in the Brazilian Amazon and the Karcham Wangtoo plant in the Himalayas, India, which have both faced opposition from tribal communities – were classified as likely junk in our analysis as the climate benefits would have happened anyway, regardless of carbon credits. A number of previous studies have shown that although large dams cut national emissions, they do not lead to new or additional reductions needed for effective carbon credits. In some cases large dams have been associated with land disputes, displacement, increased poverty and environmental damage – including some greenhouse gas emissions emitted from water reservoirs.

Indigenous Knowledge

Choudhary and Pandey (2025, pp. 1230–1231) outlines a general understanding of the traditional Indigenous practices in India. Most Indigenous communities in India follow the practices that were historically orally passed down, using small scale tools and kwnoldeg they gathered and passed down for years.

As for forest conservation, the Indigenous traditions have been deeply rooted in the idea of community participation. Sacred forests play a key role in preserving biodiversity as management systems like the Community Forest Management (CFM) and the Joint Forest Management (JFM) in India help empower the local and Indigenous communities to sustainably manage and protect forest's resources (Choudhary & Pandey, 2025, p. 1232). In India, most of

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[10] See Lakhani (2023) for additional information on the offset schemes exaggerating climate benefits and underestimating the potential harms.
https://www.theguardian.com/environment/2023/sep/19/do-carbon-credit-reduce-emissions-greenhouse-gases

the forestry approaches are typically government-controlled. With very limited involvement of the local and Indigenous communities , it is very market driven and has been met with displacement, exploitation and ecological degradation.

The Indigenous Knowledge has always kept humans in its central point of nature. Bruchac (2014, pp. 3814–3824) states that the traditional ecological knowledge:

> Is a collection of primitive survival tactics, a system of awareness that offers both moral guidelines and practical advice. Local practitioners conduct their activities (e.g., plant medicine, shelter construction, hunting skills, craft manufacture) using natural materials; they must rely upon intimate understandings of local flora and fauna to collect the necessary resources. Conversely, modern systems often adopt an anthropocentric perspective, treating nature primarily as a resource for economic development, which can contribute to environmental degradation and loss of biodiversity.

For agricultural methods like Zero-Budget Natural Farming (ZBNF) - uses cow dung and urine instead of chemical fertilizers. They also rely on mixed cropping and agroforestry to maintain soil health and biodiversity. In contrast, the standard agricultural practice will often involve the usage of chemical-intensive farming (that started around the mid-1960s after the Green Revolution.), monocultures which have also advanced the degradation of soil quality, harming the ecosystems over time.

The management of resources by the Indigenous communities like water has been decentralised. They use more sustainable techniques such as rainwater harvesting along with sacred forests to protect the watersheds. There are also traditional structures like stepwells that help manage the efficient use of the local water resources (Choudhary & Pandey, 2025, pp. 1231–1232). Whereas, the modern water management is on a large-scale infrastructure like dams and borewells- resulting in over-extraction and long-term stress on groundwater reserves.

1. INSTITUTIONAL LAYER

Institutions involved in data production: corporate, state, civic, and global actors	Governance must be effective (functioning institutions, policy coherence)	Authority to Control: Indigenous peoples' rights to govern data about them.

R3h and R3i responded to the institutional aspect that the institutional structure has been a very multi-layered institution, as also seen from the document analysis. The primary control is exercised by the Directorate of Energy (DoE) and the Himachal Pradesh Power Corporation Limited (HPPCL). They also function with specific guidelines and are very well-established, concerning the environmental-related guidelines.

Respondents highlighted the existence of clear frameworks and processes, extending from the national level down to village institutions, to ensure policy coherence and effective implementation. R4k stated that 'The governance structure is very complex because multiple Institutions, organisations and Agencies are included and they often overlap in the local state and national levels. It is almost like a maze for the local people, and this poses a great challenge for both activists and ordinary people." But R3h responded with "Yes, we definitely have the Indigenous people or the people from the local community part in these consultations." So the institution is fulfilling very formal requirements rather than proactively looking at making substantive decisions, which may further remove the indigenous people from being a part of these institutions.

There is also the use of digital systems for monitoring for project status and performance as R2e mentions "The coordination happens through regular meetings, where we also have common data sharing platforms and also systems that are used for reporting for quarterly updates" but R4k states that "open data but our extremely buried and of an a lot of them are missing or are incomplete." So, there seems to be a gap between these digital systems existing and their accessibility by the indigenous people or the data being shared.

The respondents in datafication and governance did suggest how the multiple agencies coordinate it, mostly to align developers' activities to maintain the environmental standards set by the agencies and the state. So, the analysis indicates that most of the datafication is done by these corporations, evaluations by the other external agencies, and when these reports are submitted, the final decision-making power remains concentrated within government and regulatory authorities, leaving out the indigenous local communities over outcomes.

The Indigenous people did not have any idea about the processes and the ways the hydropower projects get built. Upon asking about their knowledge of the institutions around them regarding the hydropower projects, mainly 'Who do you feel makes important decisions about your environment or land?' and 'Are you or your community consulted when these hydropower projects are made?' The replies to these questions were heavy with uncertainty, as R1a said, "Honestly, we don't really know who makes the big decisions. It must be the government [………] one day you just see new people doing surveys, marking stones, and then they say a road or a dam will be made." There was a consistent uncertainty about their knowledge of the key decision-makers, when there are several institutions, with several people making these decisions.

R1b said that "we're not sure if they even listen. Most of the time, they decide before even talking to us," to suggest that the projects come with a sort of suddenness and indirectness that they often may not get to process in time to properly interact. They also informed how there are no "proper channels" and that it can sometimes create communication gaps between who is taking the decision and for whom.

Asking the Indigenous people about the control of these institutions, they frequently mentioned the Panchayat, which is actually how the people in these regions go for consultations. R1c says that they "hear that our panchayat knows something, but even they say decisions come from higher up. We are just told - 'this is happening now.' " There is consistency in the knowledge of knowing that the Panchayat is the go-to person for any governance matter or general concerns, but also a common perception that the Panchayat itself may have limited influence over these decisions taken up by big corporations or projects of such a large scale. R1d said that he often "felt small" but had trust in the 'panchayat'.

These convey a sense of exclusivity from the decision-making process and control. It also is telling of its top-down approach and some limits to transparency and opportunities for collaboration or participation in decision making affecting their environment and livelihoods, along with the coherence with the policies laid out for the indigenous people.

2. STRUCTURAL LAYER

Global, multi-layered systems for data collection, dissemination, storage, and surveillance.	Governance must be robust (resilient, long-term, viable structures)	Responsibility: Ensuring data use supports sustainable systems and accountability.

The structures of the institutions are extremely multi-layered, with multiple stakeholders. There is also the use of digital tools, which include remote sensing platforms such as AGiSAC, GIS-based mapping, and IoT sensors for real-time monitoring of river flows and environmental parameters. Most of the answers were to monitor the infrastructure of the environment, which can bring about a lot of meaning to the land itself.

When it comes to storage and surveillance of the data collected, R2e responded that "processed data in the centralised platform, which is actually managed by the government of India", indicates that there is a structured approach to data storage and that there is an active surveillance of these regions and the projects. So the data collection, dissemination, storage, and surveillance occur at both the district and headquarters levels, with the processed data uploaded to centralised platforms managed by the Government of India.

So, the environmental data is not readily available to the public and is tightly controlled. The interviewees repeatedly mentioned the "many legal frameworks," specifically citing the

"EIA notification of 2006," "Environment protection Act 1986," and "very specific policies that are only made for the hydro power projects," including the "hydropower policy of 2001" (and later, "2021") which shows there is a strong structural layer that later helps in the procedural dimension of the datafication and governance.

There was emphasis on the multiple agencies being able function in a "very standardised way" for data control and that in a "timely manner" the assessments were carried out by various institutions.

According to CARE Principles stance on Responsibility is to ensure data use supports sustainable systems and accountability.

While R3h explicitly states, "In every step of the project, the people involved are responsible in their own ways and it is very clearly outlined who is supposed to carry what kind of roles and responsibilities." This directly addresses the principle of accountability. It was also informed that the websites are not something that is easy for them to access or navigate - widening the gap of information of the people responsible for different roles and responsibilities.

The respondents who worked with the state for governance and datafication repeatedly emphasised using data for "real-time environmental monitoring systems," "GIS-based" to map for "hydro power potential that will help sitting with minimum sort of throwbacks," and that it ensures compliance with "EST frameworks". From the literature available there seems to be no state-level information on how the land that is required by the private institutions and community will affect their livelihood. The assessment done for EIA cannot be located on any government website. There are a couple Eof IA assessments done, but these documents are not present in the websites or portals.

The account of the Indigenous community is different from the streamlined structural processes. While R1c states that "We've seen people come with machines and take notes, take photos.", but also mentions that "We don't know what they are doing.". R1c mentions an important point that " a lot of people from our village did get jobs at these projects", which corroborates the EIA frameworks about providing jobs to the local people. R1d, informed that "my knowledge is very limited to this."

3. PROCEDURAL LAYER

Data is processed and analysed via external infrastructures that embed corporate/state interests.	Governance must be equitable and responsive (inclusive, adaptive procedures).	Ethics: Centring Indigenous rights, cultural relevance, and dignity in procedures.

"To assess the overall E&S performance of HPPTCL, combined reports on performance against key social indicators bi-annually or annually are not available" stated a report from the World Bank (2022). And that the existing documentation offers minimal insight into the accessibility, efficiency, and effectiveness of the Grievance Redress Mechanism (GRM). There is no established system at the state level to evaluate employment generation or to provide disaggregated data by project categories. Information regarding labour camps, working conditions, and mechanisms for addressing labour grievances or assessing Gender-Based Violence (GBV) risks linked to labour influx is also lacking. Furthermore, the current GRM framework is weak in tracking complaints, and there is an absence of data on the implementation of targeted initiatives for Scheduled Tribes within utility-led projects.

R1c informed that "Once we told them that these places are sacred, don't build there. But they still did. So sometimes it is the question of, what is the use of speaking up? But I know some people further near Karcham, who protested against these dams, I did hear people talk about people coming from outside the state to stage protests, which I don't know in great detail, but I know it happens." The EIA of Chanju in Himachal Pradesh stated that-

Most often, development projects are planned based on the availability of exploitable natural resources. This attracts the flow of finances, investments, jobs and other livelihood opportunities, which brings in people from different cultural and social backgrounds. Such planned activities not only provide impetus to the local economy but also bring about a multi-dimensional economic, social and cultural change. Most often, it has been observed that such development projects are commissioned in economically and socially backward areas, which are inhabited by some of the indigenous populations. (pp. 9-8)

R3h mentions that they are "not sure if we include any traditional practices because in such a large-scale project, these traditional practices may not be of so much use." and R3j responds to - How do you integrate local or Indigenous perspectives into state-level procedures? by "Sometimes, maybe the follow-up is not really done [.......] I believe that most of their concerns must have been taken up by the concerned party"

As the environmental management systems are tailored to typically suite the individual projects which are driven by regulatory or funding obligations. However, they remain fragmented due to the project- or agency-specific approaches. It requires integration into a more comprehensive system that can address broader environmental and climate-related risks. This can be done with proper documentation and approval from the relevant authorities for consistent implementation. Additionally, there is a lack of an effective monitoring and evaluation mechanism to ensure adherence to public and health safety standards (World Bank, 2022) Out of the 27 proposed projects, seven are situated in Kinnaur, with projected capacities ranging from 5 to 205 MW. The largest among them, the Ropa Khadd Hydroelectric Project, planned on the Ropa, a tributary of the Sutlej was intended to generate 205 MW of power. However, despite two rounds of bidding, no developers came forward, largely due to strong local opposition. The local residents physically intervened and halted construction because the project continued to face serious procedural violations. It is to note that despite receiving No Objection Certificates (NOCs) from only two of the 15 Gram Panchayats, it continued to go ahead with the project

which led to widespread resistance - and consequently met with severe repression by the state (Gaur, 2023).

About the procedural aspect, where data is processed and analyzed via external infrastructures that embed corporate/state interests, it is required to be responsive, equitable and for Indigenous rights should centre on cultural relevance, and dignity in procedures. R4k states that "About the procedural layer we are quite familiar with the entire who needs to do what and how but if it comes to being responsive and equitable I really cannot say for sure", and R2e "While we are not in touch with the community because most of our data is taken by software I believe that the people who do the assessment are in touch with them and that they follow proper consent and guidelines."

Himadra, 2022 affirms that the EIA done for the hydropower projects have failed to do a genuine assessment- it ignored the impacts of the landslide proneness, seismicity issues or disaster susceptibility of the selected areas. R1d's response is "We are powerless in these things, as they require proper education. We have some knowledge, especially what the situation looks like before, during and after these projects and which slopes are dangerous, where animals live and how water moves.", highlighting the existing gap between formal processes and responsiveness to local concerns.

4. VALUE GENERATION / USE

Data used for economic gain, state control and civic empowerment.	Interactions and trade-offs between governance goals must be managed.	Collective benefit: Data should benefit Indigenous communities, not just external entities.

The value created through datafication of these hydropower projects can be divided into three categories- 1.) Economic Value, the most important aspect of these large-scale development projects. Hydropower is the primary source of revenue for Himachal Pradesh, which holds

around one-fourth of India's total hydropower potential. Its development has contributed significantly to the state's infrastructure development by providing electricity, road connectivity, and essential services like particularly benefiting remote mountainous regions as stated by a one of the assessment done by the World Bank (n.d.), 2.) Environmental Value, as it stands as a renewable, non-polluting, carbon reducing source of energy, and, 3.) Social Value.

From the document analysis, there is economic gain, state control, and civic empowerment. Looking at the correlation to governance and the CARE, which is about the Collective benefit, the value generated should benefit indigenous people and move beyond the external entities.

As the focus remains to be more on the 'economic benefit' where, the Himachal Pradesh Power Corporation Limited (2020) states that it has welfare schemes which will include- 1.) ITI Scheme, 2.) Merit Scholarship Scheme, 3.) Training cum Awareness Camps, 4.) School competition Scheme, 5.) Sports Tournament Scheme, 6.) CBO Involvement Scheme, 7.) Self Employment Scheme, 8.) Medical Fund Scheme, 9.) Forest Right Scheme, 10.) Minor Mineral Scheme, 11.) LADF (Local Area Development Fund), 12.) R&R Grants , 13.) Other R&R Activities. It also states that "it is essential that people must know that hydro-power projects are basically the engine of growth and back-bone of the State's economy so essential for their livelihood and prosperity."

The Environment Policy for hydropower projects (2017) also mentions applying the principles of good governance (transparency, rationality, accountability, reduction in time and cost, participation and regulatory independence) to the management and regulation of environmental resources.

R2f, when asked about the value generated and if there had been any conflict regarding profit, community benefit, and state interest, responded that the data generated was helpful for environmental management because it helps governments and authorities to foresee how the project will impact, and how to actually design assessment frameworks for climate. It helps them to design mitigation and also monitor compliance. While a few tensions remained, R2f assured

that the community's voice was safeguarded. And that the state is keen on green energy, and they maintain a good balance between profit and environmental protection.

For R3i, the social and environmental assessments are the backbone of the projects, and they are conducted by proper researchers and accredited consultants and are correlated by the government agencies. It is well planned to incorporate all the adaptation and mitigation measures and make sure that they benefit the local people who are affected by these projects. "That the value generated is extremely significant … may not have been possible without these hydro power projects."

R4l says that the main benefits of these projects are received by the state and the private sector. And that a lot of these have improved infrastructure, but again, they are also said to be affected by the loss of land. It is also mentioned that "conflicts have been frequent, sometimes they are large and sometimes they are small" and that there exists environmental degradation, but there is a belief that there is room for actual greater valuation for the Indigenous community.

Indigenous community's response to understand value creation is about them seeing themselves as merely labourers during the project's construction. R1b says that the fields near the road are full of stones now. And R1c believes that the government and the company benefit the most, but people from their community got recruited to be part of the projects, as mix of low- to semi-skilled worker which means that most jobs dissapoer or is limited after the construction phase ends. They mentioned how there was no clear pathways for upskilling or a long-term future for permanent employment. Additionally, a dejected R1d responded "We get electricity, they come and take the water, stone, forest and we're left with less than before" and that it doesn't feel like a benefit to them.

5. OWNERSHIP AND CONTROL

Corporate/state ownership and control dominate data flows and access.	Governance must navigate and balance power asymmetries.	Authority to control & responsibility reaffirm community sovereignty over data.

People in Kinnaur said that they are aware that the state officials people do come to take their information for surveys, and that it is limited to 'household surveys'. They are unsure whether the individuals conducting the surveys are independent or affiliated with the corporations, and whether the companies actually collect or use any of the information gathered. R1c believes that they should have ownership of their information and that most of the comments they have signed off on don't really belong to them, as they don't have copies of the same.

The National Data and Analytics Platform (NDAP) is responsible for data dissemination and gives access to published government datasets across India's administrative domain in a "user-friendly fashion." (ESCAP, n.d.) NDAP enables users to "quickly search, consolidate, visualise, and download datasets." For the implementation of the National Data Sharing and Accessibility Policy (NDSAP), an Open Government Data (OGD) Platform was developed by the National Informatics Centre, Ministry of Electronics & Information Technology. The Open Government Data platform offers open access by releasing the data under the control of various ministries/ departments/organisations of the Government of India. All datasets/resources, including metadata published on the Open Government Data portal, are licensed under the Government Open Data License - India (ESCAP, n.d.).

Gaur (2023) reported that the Himachal Pradesh government's plan to "generate 722.4 MW by constructing 27 hydropower projects has triggered a boycott of hydel energy in the state. The boycott, with the tagline 'NO MEANS NO', is a youth-led campaign strongly supported by villagers, especially in the Kinnaur district."

The control of data in Himachal Pradesh falls under a combination of central government bodies, the state government agencies, and developers (both public and private). The Himachal Pradesh State Electricity Board Limited (HPSEBL) maintains the operational data for the

state-run hydropower projects. Himachal Pradesh Energy Development Agency (HIMURJA) maintains data on small hydropower projects, Himachal Pradesh Directorate of Energy (DoE), which is also the nodal agency for planning and policy for hydropower development in the state, essentially collects and maintains data from all hydropower developers (both public and private) for regulatory, planning, and monitoring purposes, Central Electricity Authority (CEA) of the Ministry of Power, Government of India also is the 'Central authority that monitors generation data across all Indian states.' The ownership and control of the processes is shown in Table 2.

Table 2

Hydropwer project workflow

Sl. No.	Stage	Actor	Responsibility
1.	Project initiation	Corporations	Propose for projects and apply for clearances
2	Screening	HIMURJA/DoE	Screens the projects and provides clearances
3.	Regulatroy Approvals	MoEFCC/SEIAA/ State departments/ HPSEBL	Grants environemental/ forest clearances for water and land acquisition, and signs Power Purchase Agreements (PPAs)
4.	Project Development	HPPCL/HPPTCL/Corporations	Carry out project construction and intra-state transportation infrastructure
5.	Operation and monitoring	HPPCL/HPPTCL/Corporations	Collect and report data, monitor performance and aggregates data for national planning.

Note: This governance structure do not include the bilateral agreements India has with international organisations for climate mitigation measures.

The private and public sector developers, NHPC, SJVN (Satluj Jal Vidyut Nigam), L&T, JSW Energy, etc., own the data collected by them and may share it with investors or other regulatory bodies which can be seen in Figure 6.

Figure 6

JSW funded hydropower project in Karcham, Himachal Pradesh.

6. GLOBAL INTEGRATION

Data infrastructure is globally interconnected, affecting local and global outcomes.	Need for multi-scale governance integration.	CARE principles call for global respect of localised Indigenous protocols.

From the government documents and assessments of the hydropower projects, it can be seen that these projects are globally interconnected data infrastructures that have influenced local governance and the broader environmental outcomes. The climate financing and projects in

Himachal are now increasingly shaped by the global targets, such as - clean energy transitions, reducing carbon footprint, net-zero and the like. The investments directed towards these projects are advocated as "green" energy which is the central mission of the 'carbon accounting systems' that prioritise renewable generation.

The assessments are carried out by the investors themselves. In Kinnaur, environmentalists and prominent activists have pointed out that the hydropower projects have destabilized the mountain terrain and the 'naturally' occurring environmental disasters such as landslides and flash floods are due to the projects. In Figure 8, the researcher is in Sangla, Kinnaur in March 2025, where a flood changed the course of the river where people did not receive any compensation for the houses that washed away.

R4l informs that the projects come with compliance, compliance to the need for Clean Energy and Carbon Credits. So, the government is obliged to follow certain mandates and guidelines that the data scientists of the government associated researchers do not really have much to say.

The Ministry of Environment, Forest and Climate Change's (MoEFCC) (2024) Annual Report, is the nodal agency for all the multilateral environmental agreements (MEAs). India coordinates with global bodies like the United Nations Environment Programme (UNEP), Global Environment Facility (GEF), and participates in achieving the Sustainable Development Goals (SDGs) (MoEFCC, 2024). "The Ministry's International Cooperation (IC) Division explicitly coordinates with all major MEAs and international organizations, including UNEP, SACEP, ICIMOD, UNDP, World Bank, UNIDO, SAARC, ASEAN, ADB, EU, and IBSA. It also manages bilateral and multilateral agreements and contributions to international environmental funds" [11].

India maintains Memoranda Of Understanding (MOUs) in the field of environment and climate change, including technical cooperation and joint conservation initiatives with countries

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[11]   See   MoEFCC   (n.d.).   International   Cooperation.   Retrieved   from:
https://moef.gov.in/international-coorperation-ic

such as Switzerland, Finland, Namibia, and Myanmar[12]. Through the National Biodiversity Strategy and Action Plan (NBSAP) and COP Participation, India actively participates in global conferences, also regularly submits its national targets and action plans to the Convention on Biological Diversity (CBD) that aligns with national policies with the international frameworks (PIB, 2024)

Figure 8

Researcher in Sangla, Kinnaur in March 2025

Note: Behind the river is where a flood changed the course of the river. The people in that place did not receive any compensation for the same.

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[12] See Ministry of External Affairs (n.d.), Treaty List by Ministry. Retrieved from: https://mea.gov.in/treatylist-ministry.htm?20

Rl talks about the International climate agreements help justify these projects and it is always about meeting the Global targets. And that these large scale projects may not necessarily look at the local needs and practices. The Global finance market carefully weaves these processes under the banner called green energy.

R3i informed that the 'Carbon Credits' and that "we can actually generate quite a good lot of revenue from Carbon credits." It supported the idea that the state had set up proper committees to "align with international standards and maximise the returns from these projects." Upon asking how it goes along with the indigenous people - " We do have a lot of influence globally but also make sure that the last power rests with our country itself." meaning India can take the ultimate decision. R3i acknowledges that the regions do see environmental conflicts with the local demand, such as what to use, and sometimes they do interfere with project implementation, and it is an ecosystem everyone is trying to have to deal with, with different agencies."

For the indigenous people, understanding global goals remains a distant knowledge as R1a said "what happens in Delhi or in foreign countries. But sometimes we hear they want more electricity and eventually our rivers are dug" They also have no interaction with any of these stakeholders that will help liaison the indigenous people with more national-global actors. R1d said that they wanted to "Consider our knowledge to be valuable rather than pointless. Ask us. Listen to us."

CHAPTER 6

MAPPING THEORETICAL OBSERVATION REALITIES

This chapter discusses the main findings in relation to the research questions and tests the hypothesis. The research questions were:

1.) Does the process of environmental datafication influence environmental governance in the context of hydropower projects in Himachal Pradesh?

2.) Do environmental datafication and governance require the involvement of Indigenous communities for hydropower projects in Himachal Pradesh?

The study will test two hypotheses:

1.) Hypothesis 1: The environmental datafication of hydropower projects in Himachal Pradesh tends to adopts a reductionist approach that marginalises Indigenous knowledge systems and perpetuates the green grab.

2.) Hypothesis 2: Effective and comprehensive environmental datafication in Himachal Pradesh requires an inclusive and participatory approaches that will integrate diverse stakeholders, particularly the Indigenous communities for sustainable climate outcomes.

A.) Environmental datafication of hydropower projects in Himachal Pradesh's influence on environmental governance

The findings from the above sources indicate that environmental datafication has failed to meaningfully incorporate social, political, or ecological dynamics and has largely remained a technical process. It also reveals how the data infrastructures mediate power relations among stakeholders such as the government and project developers which ultimately influences the governance of environmental resources.

To start off with the environmental datafication, in Himachal Pradesh these hydro power projects rely on data to justify environmental impact and other social feasibility and sustainability but these only limit to understanding the flow data, seismic risk assessments, calculating the carbon offset and and some amount of displacement. The analysis reviews that, what can be excluded or what should be measured has been shaped by the institution and the global frameworks. Every approach points us to the fact that these developmental projects are in alignment with the economic utility and technocratic decision-making. While, focusing on economic utility does not necessarily mean to all together deter these projects, aspects such as 'river flow volumes', 'cost-benefit' analyses are more emphasised in documenting project variables, outcomes and goals. Data that is not very quantifiable like traditional ecological knowledge, cultural practices and values associated with nature are not to be found in any government / funder's reports which leads us to seeing these frameworks as a marginalising tool.

Going through the literature and the interview from the experts on environmental datafication, it is seemingly clear that these are not local issues but are tangled with the existing global infrastructures. So, there is a continued evaluation of how the hydropower projects get to be approved based more on what the global climate goals ask for rather than how it would align with the local/Indigenous goals towards creating a more sustainable approach.

This goes on to show that the Environmental Datafication has a lot of influence over the Environmental Governance in the region of Himachal Pradesh which also extends to India creating climate finance in alignment with International climate finance institutions. So this is the classic route of dismissing that 'Global framing' may automatically bring 'local environmental benefits'. Because then why do these hydropower projects, when credited with 'lowering carbon emissions', often bring deforestation, displacement and increased vulnerability to the indigenous people's lives? But, it also at the same time raises technical questions like- why did the existing environmental assessment tools couldn't properly calculate the fragility of 'mountain geologies, glacial dynamics, and microclimatic patterns'? We see a paradox of couple more things than just

data at play - what can appear as "green" in the global dataset may also have the potential to bring deeply unsustainable outcomes.

The influence of Datafication on Environmental Governance is about creating the ecosystem of political contestation. So, local communities, environmentalists and activists have continued to question the validity, comprehensiveness and neutrality of the data mediated through Environmental Impact Assessments (EIAs) and other reports which serve as the official basis for project state approval. The interviews of the activist and the people in Kinnaur were either unrecorded or underrepresented in final reports. So, it brings us to the question of "data capture" reinforcing that even the external structure of datafication obeys strict institutional authority which has potentially continued to marginalise any alternative indigenous epistemologies and lived experiences.

The Governance of Himachal as seen from the document analysis shows to have left a very small space to the indigenous people to debate on ethical, cultural or long-term ecological questions which seems to override democratic processes. This shows that the environmental governance in India, is shaped with more technocratic logics than of participatory engagement by all the stakeholders.

Even though the research and literature is so little on the struggles of the Indigenous people in Himachal Pradesh, from the collected data, it is important to note that the Indigenous people have not remained passive. Organisations such as the Himdhara Collective and the Himalaya Niti Abhiyan have documented a "growing wave of counter-data practices where that focuses on the need for anecdotal histories of disasters, forest cover changes, and biodiversity loss, through a community-led environmental monitoring, local disaster mapping and digital storytelling platforms." The respondents from Kinnaur did not show very proper desire (answered but wasn't extremely enthusiastic) to engage with these questions and that brings to my observation that collecting and analysing their data is not easy but this requires proper effort and time in gathering their narratives and perspectives on these things- we cannot continue to displace and reparate with money continuously. Because, yes, there will be money, there are huge loans paid to India but displacing someone from their indigenous land has not often yielded any social - economic and ecological benefit at large.

This also extends to understanding the Ownership and Control segment where questions like environmental authority, data authority, knowledge authority rise. Because the respondents did not know anything about data or owning data so we can clearly get the sense that the Indigenous people's data may not even be informed to make the decisions. So, to answer if the assessments are legitimate requires us to rethink the present governance models because it acts like the mediary and is the main institution that can incorporate indigenous knowledge and make more participatory data infrastructures.

Now, coming to the EIA assessments that are so fragmented, extensive and have very little 'social' assessment portion even though the 'socio-economic' portion comes under the particular assessment. These institutions need to reform to ensure that the data collection, processing and analysing are transparent, participatory and ecologically rigorous. There is no space to check for validity of the data collected. A good way to collect and validate socio economic data is to create a hybrid knowledge system that can integrate digital tools such as GIS mapping with cultural epistemologies.

It is notable that one cannot understand from the data collected if the central government in India critically assess any third party assessment frameworks. They should ideally have in-house consultants making sure that the data collection process follows ethical guidelines. In this respect, environmental governance should be participatory where the data can be co-produced, contested, and democratized, to become more effective, equitable, responsive and robust.

B.) Involvement of Indigenous communities strengthens environmental governance for the environmental datafication of the hydropower projects in Himachal Pradesh

To achieve *Collective Benefit*, it is ethically essential to create a foundation for strengthening more meaningful participation of the indigenous people in the decision making process. This is also to say that these developmental projects, which are very important to create renewable sources of energy should also make sure that the central point of these projects should keep in mind the well-being of the Indigenous communities.

The lived experiences of these communities do not end up in these official datasets as most of the respondents involved in the datafication could not respond to the questions regarding the Indigenous community. One possible explanation is that the *Authority to Control* does not affirm the "Indigenous peoples' rights to govern the collection, access, use, and interpretation of data about their lands, cultures, and resources." The EIAs do not have any community insights, so the data continues to remain inaccessible to the affected communities. This means that the data needs "not just involvement, but control."

The examination of these schemes and going through the interviews gives a closer look at the gaps in the consistency, transparency and accountability of these systems in place, especially how they generate, manage and disclose data on social assessments. Reiterating from the CARE principles, *Responsibility* is that it "demands that those involved in data processes ensure accuracy, transparency, and accountability, not only to scientific standards but to the communities impacted by the data." but this has been repeatedly violated by omitting community values and testimonies.

Hypothesis 1: The environmental datafication of hydropower projects in Himachal Pradesh tends to adopts a reductionist approach that marginalises Indigenous knowledge systems and perpetuates the green grab.

The datafication processes (collected, processed and stored) of the hydropower projects in Himachal Pradesh is a reflection of a reductionist and technocratic model. Not to state that overlooking the important quantifiable metrics but Environmental Governance largely prioritises the quantitative metrics like river flows, rainfall patterns over local and indigenous knowledge systems. But prioritising one aspect not only neglects Indigenous epistemologies but also violates distributive justice. This distributive injustice may lead to Indigenous people getting affected by environmental risks and social exclusion- which supports Fraser's argument that both Recognition and redistribution are "essential and must be addressed together to achieve full justice."

As Rawls (1971) explained that to develop a right theory of justice, we have to step behind what he calls a 'veil of ignorance' and the environmental datafication in Himachal Pradesh appears to reinforce this logic.

The result expands on the work of data colonialism, that there is a continued lack of acknowledgement of Indigenous knowledge systems from formal data governance. Then indigenous communities "lack access to, or agency over, the data that shapes decisions about their land, livelihoods, and safety." and that for environmental justice no group should be a disproportionate burden of environmental changes. However, in Himachal, Indigenous communities often find themselves with minimal voice. In countries with little or no human rights protections- "climate projects often end up effectively justifying the displacement of the most vulnerable populations and concentrating control over natural resources in the hands of the political and corporate elites who are originally responsible for causing climate change." (Vigil, 2018, p. 3)

Hence, from a theoretical perspective, this supports the notion that Hypothesis 1 can be confirmed as that datafication does not lead to any sense of civic empowerment or cultural production in the case of the hydropower projects in the Himachal region of India. Being blind to justice reproduces and legitimises environmental and epistemic inequalities.

Hypothesis 2: Effective and comprehensive environmental datafication in Himachal Pradesh requires an inclusive and participatory approache that will integrate diverse stakeholders, particularly the Indigenous communities for sustainable climate outcomes.

The review on the Director of Energy in Himachal Pradesh displays limitations in including the indigenous people within their environmental and social assessment for the hydro power sector. As they serve as the nodal department, there seems to be a more fragmented governance down the line which is very difficult to follow regarding how these policies are and schemes and redressal mechanisms and how they all now come together. One cannot simply attribute these extremely fragmented systems to bureaucratic inefficiency- rather, I also point to a broader epistemological issue, which reflects a tendency toward a highly technocratic model of knowledge systems.

Inclusive and participatory datafication would mean that these present frameworks showcase knowledge that is co-produced and it does not. Co-production is important to bring the epistemic (knowing) balance in creating the governance frameworks for environment and data to build the developmental projects. Doing so, creates a comprehensive datafication that will enrich

data with trust, accountability, ownership - which currently does not hold space in the context of the case study carried out.

The need for improved environmental governance that integrates diverse stakeholders, including Indigenous communities, must embody principles of procedural and distributive justice. Because a system based on justice frameworks will ensure that the indigenous communities have better access to information and a role in decision-making.

India's Environmental Governance frameworks poses as a challenges to the survival of the Indigenous communities because it continues to show a neoliberal green imperialism which means that "wealthier nations are able to impose environmental standards and solutions that appear progressive but ultimately sustain extractive and consumption practices." (Boretti, 2025) The Indigenous population in India is significant in number yet their socio-political rights and autonomy have always been silenced by state policies and structures. The governance have prioritised economic growth over respect towards their existence and preservation. This is done very systematically where they are able to frequently marginalise through a combination of inadequate representation, restrictive laws and development policies. "In India 16 land and environmental activists died in 2016, making India the fourth deadliest country according to a to a new report Defenders of the Earth by an international NGO Global Witness." (Vyawahare, 2017). They are the most vulnerable and the most important for the environment's well being.

There is a lot of bureaucracy, a lack of awareness, and administrative resistance which results in the continuation of getting dispossessed from their lands. This dispossession is escalated by the state's pursuit of industrial projects and infrastructure development in tribal areas- which gets approved without consent from the Indigenous communities. The tone set by the State is that it is framing Indigenous communities as obstacles to "progress". This pro-development displacement echoes the colonial and settler mindset. This further alienates the communities and weakens sustainable outcomes.

CHAPTER 6

CONCLUSION

This research contributes to the growing body of literature on environmental governance by critically examining the process of environmental datafication in the context of hydropower projects in Himachal Pradesh. This research elucidates that the hydropower projects, in the pursuit of economic value, as carbon credit companies, should not result in any great damage to the environment and climate. That, most of the information available points out to the fact that it may have reduced a country like India which already bears the burden of excessive climate change impact into a haven for international companies to get away from their carbon set offs.

By integrating the three frameworks, the study shows how these three domains are interconnected and how they need to work together to reach better outcomes. Future policies and research should look into these existing problems of the development projects being made to cover the companies that harm the environment with their carbon emission and that in India, governance is more equitable and resilient.

This study set out to explore interconnectedness of the three different areas of data, governance and indigenous people and in doing so, has demonstrated that there are still a lot of questions to be asked and answered regarding the physical environment we live in.

Assessment frameworks and datafication practices

The assessment frameworks are very important to evaluate these approaches and processes, which enables these processes to become more accessible, efficient and effective. As these frameworks continue to only capture the demographic information of the indigenous people, they also continue to deplete them of life. Monitoring has been extremely difficult in a country like India, while you can take up tools and measure the length of a region but under the breadth is a difficult task. This also shows that the assessments done over the years have continued to stay in very standardised templates showing a very one size fits all data logic that again reinforce how these matrices have always tended to be a more quantifiable metric rather than having proper contextual insights. This requires that third-party by developers be hired for

evaluations, that these evaluators are given care for. It is also necessary to keep updating these assessment frameworks, especially the ones used by the government, as most of the officials are reluctant to change these frameworks. These assessments are also best done alongwith the Indigenous community that 2-3 people are rigourously evaluating the same region and looking at the same metrics and come to a comprehensive conclusion.

The structures, formed very fragmentally again reinforces a form of green imperialism because most of these frameworks and data that is turned into information is produced without the collaboration with the Indigenous people. So questions of whether these assessments are very holistic and participatory do arise. Because most of these assessments remain very project specific silos we need to know further as to if they can even form to the broader strategic planning and community engagement that might be needed. There is no information regarding the understanding of vulnerability when a diverse group of indigenous live together in the sense of their livelihood. It is also the extension of not being able to have good monitoring culture in the Indian Governance structure. How do we know that the recent socio-politcal EIA is not just a copy-paste from a previous one? While taking demographic information is fine- it doesn't tell anything about the experiences- the experience of pollution, the experience of loosing land, the experience of turning land ownership to cash, the experience of losing homes and so on…. One cannot really equate a fertile land that the Indigenous people must have chosen to stay from years ago to getting displaced to land that might not yield anything substantial.

Data Colonialism

The people at the governance or from the developer, have extracted the data they required to build a particular hydro power project in a place but most often these are done without the community's proper consent, input or benefit. The policies that include the reparations show that there is a simplification of the complex social realities (historical trauma and cultural loss) that are turned into data, and may start the reinforcement of data colonialism. It has also been mentioned by few assessment documents, one by the World Bank, that the assessments are mostly done to safeguard project-centric and donor-driven standards. It is interesting to also find such an assessment by the World Bank which serves as the biggest funder of hydropower projects in India and its overall impact on the other South Global countries. These policies had

the potential to make the assessments over what could have been a very locally embedded indigenous knowledge system.

Why is this necessary to call it Data Colonialism? Even though the term 'colonialism' seems strong for a post-colonial country, it is because even today the Indigenous people not only get dominated, exploited, and silenced but are also murdered on a day-to-day basis. Many local/Indigenous activities that have raised voices against big corporations are being killed. In the eastern part of the country- Indigenous people in the Red Corridor or from the parts of Jharkhand and Orissa in India, are tricked into surrendering their resistance for years. Historically, lower caste, tribals and other backward caste people in India continue to go through displacement and discrimination; they often don't get basic rights, basic dignity, no protection over the ownership of their land, forest and many other forms of violation to their being.

What may help?

It is important that India start taking a census (the last census of India was taken in 2011). This is indicative of how, through demographics, it is difficult to evaluate a lot of things, and most of the data is not available. It is crucial to document the existence of Indigenous groups in India. Many tribal or Indigenous groups remain undocumented, meaning that even their identities and names are not recorded in any government records. They don't even exist on paper! After this, Indigenous knowledge is a legitimate form of knowledge and expertise in environmental policy-making.

If India wants to be a digital country, it needs to improve digital portals, tools, reports, and accessibility. The grievance section on most government sites is a nightmare to navigate, making it almost impossible for someone capable of using these platforms to file a complaint on behalf of someone who cannot. Due to the extreme fragmentation of governance, it is very difficult to understand whom to approach or contact. Because the CARE Principles talk about the collective benefit, it is very important to reimagine these frameworks that may often come under the guise of sustainable development.

Some components should be legalised- having every stakeholder participate in the discussions and decisions taken for these projects, and preferably at every stage. The assessment

was also made to be Community-Based Environmental Impact Assessments (CBEIAs) in parallel to the process alongside traditional EIAs. This can, I believe, decolonise the data-gathering process where they are co-authored by the representatives from the concerned communities.

Social Audits are a great way of making sure a resource is used. Except for one state, none of the states allow or mandate social audits of their government schemes and which also imposes a problem. Abiding by the CARE principles can help counter data colonialism (Collective benefit, Authority to control, Responsibility, Ethics).

The carbon credit system in India offers very little transparency throughout its entire process. The country already faces extreme climate-related risks, and even in collecting data for this study, it was difficult to find more than five reports that critically engage with the processes of carbon credits in India.

Finally, Indigenous knowledge remains an under-documented subject in the country, making it difficult to cross-examine it against standard or contemporary practices. There has always been a growing discomfort with large-scale extractive (minerals) projects in India that are often framed as symbols of 'progress' and national development. But behind these lie displacement, erasure and exclusion. My research is rooted in justice, where I ask - *Whose development is this and at what cost?* In highlighting the systemic injustice, I've tried to capture how these projects come about without prior and informed consent. Hopefully, this research isn't limited to interpreting and critiquing the legacy systems and policies but is able to draw attention to the injustices people face in the name of 'development'. Justice has to be challenging not just the institutions, structures and procedural frameworks but should be able to tackle and demand ownership, values and recognition. I believe this topic could have been substantially enriched with more time and resources to delve deeper into the policies, politics, and semantics of hydropower projects in India and to shed more light on the decades-long injustices faced by Indigenous communities.

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Appendix A: Interview Transcript

CATEGORY 1: Community Members / Indigenous Community

1. Institutional Layer

    a. Who do you feel makes important decisions about your environment or land?
    b. Are you or your community consulted when these hydro power projects are made?

R1a: Honestly, we don't really know who makes the big decisions. It must be the government. Sometimes we hear the "sarkar"(government) is doing something, but no one comes here to explain anything properly. One day you just see new people doing surveys, marking stones, and then they say a road or a dam will be made.

R1b: The state government is making the decisions, they listen to the panchayat and that's how we are able to tell them because we can go to the panchayat. No, they don't really ask us. Sometimes they come for a meeting, but it's all in official language. We don't understand, and we're not sure if they even listen. Most of the time, they decide before even talking to us.

R1c: We hear that our panchayat knows something, but even they say decisions come from higher up. We are just told - "this is happening now."

R1d: Even if we try to ask questions, people from the company or the government talk in big words. We feel small in front of them. But, if we want to say something we know that we have to go to the panchayat and they will speak to the higher ups.

2. Structural Layer

    a. Have you noticed any changes as a result of projects from the outside, like roads, hydroelectric dams or surveys?
    b. Do you trust the systems that collect or store information about your land or identity?
    c. Do you know the people in Governance ?

R1a: Yes, we've seen changes. Since the hydro projects came, the mountain has become unstable. We feel tremors now like small earthquakes. Our water source is drying too as the rivers sometimes tend to change course and you can see here. A lot of houses got washed away due to this, you can see they are breaking down the big stones and this will go for months but no one is getting any house replaced.

R1b: They blasted near our forest. The trees are falling, the animals have gone deeper but some have also come out because they lost their habitat. I am aware that the panchayat head sits with all the officials and discusses our needs and wants and that's how our queries are transferred.

R1c: We've seen people come with machines and take notes, take photos. We don't know what they are doing. But , a lot of people from our village did get jobs at these projects and also helped with the electricity. Now the roads can be built at a much faster pace.

R1d: No, I don't know what to answer because I don't understand these things. We haven't studied so much to understand the thing you are asking me. I am not really concerned with

these, I hardly go out, sometimes we go to Shimla to get clothes etc but it's very limited. I have my own vegetation and I collect the waterfront from this river and my knowledge is very limited to this.

3. Procedural Layer

    a. How often are your panchayat meetings?
    b. Do you feel that the decision-making processes about the projects, land, water or even forests include your opinion?
    c. Is there a way your traditions are used to going through the process of environmental change? Have there been any protests so far?

R1a: There is one every month and that happens in the office you saw near the bus stand. We are informed but we mostly talk about more minor things that we day-to-day have interaction with. Maybe, we are not supposed to be really included. Sometimes they call a meeting, and they say we must sign papers. But we don't understand what those papers mean, just the overarching ones but not everyone has to sign.
R1b: Once in a couple months as far as I know, and about our rituals ….. they do not inquire …..most of them are hardly followed , our rituals, forests, or river gods…. . They simply care about the work on their project.
R1c: Once we told them that these places are sacred, don't build there. But they still did. So sometimes it is the question of , what is the use of speaking up? But I know some people further near Karcham, who protested against these dams, I did hear people talk about people coming from outside the state tio stage protests, which I don't know in great detail but I know it happens.
R1d: We are powerless in these things, as they require proper education. We have some knowledge , especially what the situation looks like before, during and after these projects and like which slopes are dangerous, where animals live and how water moves. But they think we are uneducated but if something really bad happens, we will speak up, even though we are so less in number but you go down and gather more people and yes maybe protest can happen.

4. Value Generation / Use

    a. Has there been any benefits to the community due to the hydropower projects in the Kinnaur region?
    b. Would you have any idea on who exactly benefits from these projects? Are you in any of the meetings held by the corporations?

R1a: Some people were hired for a few days as laborers, but nothing permanent.
R1b: The road they built helped a little. But it also brought dust, trucks, and outsiders. Our fields near the road are full of stones now. Tourists have also made the area extremely … not good. The trucks have broken the roads…..too heavy
R1c: We believe that the government and the company benefit the most. But a lot of local people are included in the staff of these hydropower projects, People who could send their children for better education in the cities from our region, also get to work.

R1d: We get electricity, They come and take the water, stone, forest and we're left with less than before. That doesn't feel like a benefit to us.

5. Ownership and Control

    a. Are you aware that someone takes your information? Would you know who keeps that information?
    b. Do you believe that you should be made to know who does what with your information about your community, land and resources?

R1a: I know people do take our information, they use it in surveys and the government wants to recognise us this way. Now that you are specifically asking….. I don't know who has what information about us but I think the government has it. Maybe the company? Maybe the government?
Yes, of course but I know it is taken for our benefit and that it should be kept somewhere safe but then information keeps changing.
R1b: They took photos, our names, and specifics about the land. But they never said what they'll do with it.
R1c: Yes, we should have control. It's our land, our forest. Few months back, some protests broke out near the city.
R1d: I don't remember anyone taking any information about us, years and years back once it was taken , they asked us about the property we owned. We don't even have copies of the papers we signed. If we had more say, at least we could protect our things better.

6. Global Integration

    a. What has been your interaction with the developers?
    b. I can see an office near the bus stand. How often are people interacting with the officers inside, provided they work for this region's development? Do you know the officers inside?

R1a: It has been fine, we speak mostly to the Panchayat, the state office is too far for us. We don't know what happens in Delhi or in foreign countries. But sometimes we hear they want more electricity and eventually our rivers are dug.
R1b: No interaction with everyone, I don't know. I am aware of some workers because one of my neighbours works inside as a clerk
R1c: We definitely see the officers near the dams and while they build roads but what has that got to do with us? We would occasionally demand courtesy, that's all. Having the proper food during all the seasons, drinking water and electricity and it should be fine. If someone wants to do something here, we would of course welcome but sometimes these things go beyond for us.
R1d: How will we interact with them? People do engage with them, I have not yet. They should believe us, not just listen. For years, we have lived like this, except that the skies have become darker and it feels more polluted than ever.

CATEGORY 2 : DATAFICATION WITH PRIVATE CORPORATIONS

1. Institutional Layer: Do you work with the government institutions that help you through the process of datafication ? How do you coordinate with the public and private institutions?

2. Structural Layer : What kind of technologies or platforms do you use to collect, process and share data? As a part of these projects, do you ensure there is security, resilience, and interoperability in these systems?

3. Procedural Layer: Can you tell me about some ethical guidelines that are followed when collecting data from indigenous communities? Are there any consent procedures in place?

4. Value Generation / Use : How do you see the value generated? Has there been any conflict regarding (profit vs. community benefit vs. state interest)?

5. Ownership and Control: Do you have any control over the data and how it is to be managed? Do you also engage with the communities?

6. Global Integration : Do you follow global standards or guidelines in your work? We have so much conversation surrounding data colonialism etc . What do you think of the local data sovereignty?

R2e

1. Institutional Layer: I work closely with the Government Institutions like the directory of energy and they help our entire team with the guidance on how and what data is required and also the formats that are required for proper reporting of these data fight information. We also coordinate with the private sector that we have and all the central agencies like …….. specially when these projects and they are mostly joined or projects that are coordinated with the private sector. The coordination happens through regular meetings, where we also have common data sharing platforms and also systems that are used for reporting for quarterly updates. These institutions that are public actually help with the regulatory oversight and then we have the in-house dashboard which provides support on the proprietary kind of technology that we use.

2. Structural - there is a range of digital tools and Technology is that we use because we are also and lot of in a lot of work we use a lot of bottles and they are like the AGiSAC which are for even for Remote Sensing and land use mapping we use iot sensors for actually river flows and for real time monitoring then we also have the data entry at the district and headquarter level.
We have very specific software that is used to process the data and we upload the processed data in the centralised platform which is actually managed by the government of India. there is a lot of security because the access to this data is restricted until unless it has to be reported and put down publicly. we actually restrict access to a lot of data which can be sensitive in nature and then also go through a lot of data or that's. for interoperability we have state mandatory so all the Institutions and organisations can access and use the data in a responsible manner.

3. Procedural: There are a lot of ethical guidelines setup which you can actually go through in the open data that are there on the websites. While we are not in touch with the community because most of our data is taken by softwares I believe that the people who do the assessment are in touch with them and that they follow proper consent and guidelines.

4. Value generation and use

There are multiple values that are actually generated from these hydro power projects and I believe that the datafication that we do ensure that the projects meet the standards and the guidelines for the projects to actually get carried out properly. Our measures and our datafication definitely helps support the decision making for the measures that are helpful for mitigating or compliance reporting to the state and Central authorities. while I am in contact with tensions yet from the ground I am sure that these definitely profit community that one benefits and the minimal description to their environment because we do very proper good datafication. Even though I have seen conflicts, for the project that I work on there has been very minimal conflicts and sometimes the profits are actually more valuable than the kind of concerns that the local people actually have.

5. Ownership and Control: We do not have any ultimate control over the data because they are mostly managed by the government agency. we do not directly engage with the communities but we have other departments that actually do Especially to carry out social and environmental assessments but the final decision is on the authorities of the data use and also of the data sharing. I am very sure that the community can actually access the analysed data but I am not sure of the raw data.

6. Global Integration : We follow proper National and global standards for the projects that also have International funding and for Carbon credits. we are aware of the debates of data colonialism but I think personally it is very important that we try to balance Global best practices with of course a lot of respect for the local rights and colleges and I think our government does a good work in making sure that the local people are not covered up but at the same time the control still rest a lot with this state and Central Agencies and necessity not with the community is.

R2f
Institutional : We coordinate with all the institutions that we work with whether they are public or private and because they said the guidelines and also help review our work we often coordinate with all the private developers and other people involved in the technical part of the process. Everything is extremely structured. The communication is pretty clearly definitely having data entry portals. We have to report that I am extremely formal and natural and follow proper guidelines and these help for the project tracking.

Structural: there are platforms we rely on that provide us with the special data remote sensors or the parameters for the environment and help secured data for the Government and also help upload and update information as and when required there are many legal frameworks I cannot really describe them right now but then we follow them while collecting the data and how to handle the date of. I think our organisation shows that we do our best to keep the system in a very standardized way and for all the data submissions that we actually do.

Procedural: we are definitely bound by very project specific laws and national guidelines so we follow the usual process when it comes to dealing with the Indigenous communities.

Value Generation: The data that we actually generate is so helpful for environmental management because the data that is generated by us actually helps teaser governments and authorities to actually see how the project will impact how to actually design assessment frameworks for climate. It actually helps them to design mitigation and also monitor compliance. There have been tensions which are actually for faster currencies but then I think they are so and them with ensuring that the community voice is an environmental safeguard. The state is very key in promoting the pro climate and green energy and force we do have to maintain between profit and environmental protection because we may not necessarily have the privilege.

Ownership and control: when we collect or analyse the date also we have to understand that the final ownership that live it's the curvement. I don't think the community has much power over the data.
Global Integration: Our entire process is in line with the standards that are set.

CATEGORY 3: Government Officials / Researchers

1. Institutional Layer

   a. Who controls the mechanisms that exist to ensure equity and responsiveness in environmental decision-making?
   b. Who is making sure that the policies are coherent across levels of governance? Are the Indigenous people in Himachal Pradesh included?

2. Structural Layer

   a. Can you tell me a bit about the Governance structure ?
   b. What are the primary digital, legal, and institutional infrastructures that support environmental and data governance?
   c. How do you assess the framework's robustness and long-term sustainability? Who is responsible?

3. Procedural Layer

   a. Which institutions (local, state, national, or international) are involved in data and environmental policy implementation in this region?
   b. How do you integrate local or Indigenous perspectives into state-level procedures?

4. Value Generation / Use

a. In this region, are the social and environmental assessments made? Who and how uses environmental or social data?
b. What are the main resources or values that come out of these hydropower or development related projects? and environmental/social goals?

5. Ownership and Control

a. Do you have access to and control over the environmental and community data collected? Is it regulated, can you tell me about it?
b. Do the indigenous people in the Kinnaur region, where mostly these hydropower projects exist, are aware of this datafication that is taking place?
c. Do the communities have any role in shaping data ownership or consent mechanisms?

6. Global Integration

a. Are you aware of these projects just being made to sell carbon credits?
b. Any ideas on how global agreements, donors, or multinational actors shape your regional environmental governance?
c. Has there been a situation where challenges arise when local needs and global frameworks don't align? What have they been ?

R3g

Institution -

Yes we have to make sure that in these areas the frameworks are there to ensure that the equity and responsiveness in the decision making regarding hydro power projects of the environmental concerns are primary primary control by the Himachal Pradesh Power Corporation Limited. They are also in the most institutional sense controlled by the Directorate of energy. So definitely these agencies work under the clear guidelines of the environment policies that we have for hydro power projects which are very nicely designed to address and mitigate whatever environmental and social impacts that we have. They also make sure that the concerns of the local communities are fully considered and blaze by the guidelines.

If you go through the documents you will see that we also have the expert appraisal committee at the very Central level that helps us review the environmental impact assessments and also both the state and the national policy are very nice communities on the ground.

As you already mentioned that the ministry of environment forest and climate change also makes sure that there is a regular code of Nation between all the states just like the people and cannot be formally included. They are included in a very formal way through the gram sabha and this is All under the forest rights act of 2006 and then you will see on the reports on final Report. but yes I will agree that sometimes they are often limited and because of the more procedural and substantive.

Structural -

Yes about the structural layer I understand that the governance structure of these hydro power projects in Himachal Pradesh is extremely multiplayer. we have at the top the state government

that you know is setting the policy is the regulator frameworks like the hydro power policy of 2001 and then we have these Agencies like age HPPCL and HPPTCL which are purely responsible for executing the projects and the compliance Infrastructures that are very Digital in nature that does include real time environmental monitoring systems and are often GIS based and they are used in these hydro power atlases.

And all the available legal frameworks have been in The pioneer of the EIA notification of 2006 along with the Environment protection Act 1986 then we have these very specific policies that are only made for the hydro power projects. These institutions have been assessed through a very timely manner by the catchment area treatment plants and are always checked by the pollution control board and we also have the high court to make sure that these are also laid out and plan a reliable system. so the idea of it being sustainable and their people responsible for every step that took our share among these multiple agencies that we have and that also the national bodies make sure that we are in tandem with everything that we actually need to follow.

Procedural-

If I can understand your question well I think you are talking about the implementation and that these implementation are actually in involvement with a lot of other Institutions like no let's see the in the most local sense that the gram panchayat will be very closely attached to the local people and then we have the forest committees and then we have the state level bodies and other national body like the central electricity. yes sometimes even International Agencies like the World Bank I think are making sure that the local people are there in these public hearings and that these local gram panchayats can actually go and help them understand about the projects. yes I see a lot of research that indicates how these processors often are not working and I think maybe lakh genuine influence from these like project outcomes that we actually have so that we have to see. For the procedure, I am sure the locals go to the panchayat and then we have the state, the state boards, there are also some international groups, organisations and reports from funding institutions like the World Bank who do the 'how' ……. I believe these are very independent in nature.

I am not sure what you mean by traditional knowledge? Are you talking about the flora fauna, I don't think we use that , since most of the tools are very digital and they are automated and can be taken from softwares at any point of the day by directly interacting with the environment. I am not sure if the traditional knowledge you are talking about makes into the final plans , as for the work we do, we mostly check things like soil quality, air etc…

Value Generation/Use

There are a lot of environmental and social assessments which Hello hi okay so a lot of the external consultations also handled these kinds of external value that you are talking about. These data are an added benefit to the projects that are planned and of course the data that is collected from the indigenous people get used for planning and they are extensively used for reports and also compliance. We have to understand that these are projects that are extremely fast and that to understand value generation for the indigenous community we have to understand the kind of negotiation we are trying to do. As these projects are mostly about bringing a lot of electricity and other added values which are tangible in nature, that's why sometimes a lot of

these social factors are overlooked if you are talking about the main resources we have for the environment. These hydro power projects bring in a lot of money and jobs for the local or indigenous community.

Data ownership?

As far as data ownership, Most of the data collected weather the technical and infrastructure data or the environment and social data collected are pretty centralised I cannot really say if the community have these kind of Axis to the wrong numbers but I am sure that the panchayat will make sure that these are summarised at their meetings which I think does happen often. about consent I am sure that consent is very technical here and may not necessarily be very participatory like how you would and I understand why it might be a difficult thing at the same time.

 Global players?

We have to keep these projects at the forefront and also let them go in a certain flow for a lot of environmental and resource purposes. I am not aware if these are for the Carbon credits as I believe these are development projects for the local and the country as a whole. As far as I am aware there hasn't been any destruction between the local aims and but we have as a structural plan for the development project.

R3h

Institutional -

There are a number of agencies that make sure the infrastructure the concerns are running smoothly like the pollution board HIMCOSTE and so on. Yes definitely we make sure that all the policies, the guidelines, the frameworks and the processes are lined up from the national level down to the village level. Of course it is very tough because we have a lot of other departments and other resources to work with and we try to juggle it as fairly as we can.

Yes, we definitely have the indigenous people or the people from the local community part in these consultations. we have to be very real here because we are using proper online systems for clearance is an project tracking and that they may not have the knowledge and skill to go to these tech or literacy to use the apps. in number of different faces of the project and everything comes together and then we try to make sure that the project runs only. We definitely make sure that whatever is taken from them whether it is their land or their knowledge or the information from the indigenous community that we put it in a way that they understand and no harm is gonna happen to them.

Structural -

In terms of the structure that you are talking about, yes we definitely have the hydro power Atlas, we have a lot of digital monitoring tools, and a bunch of frameworks that these projects have to comply with legally. We are definitely following all the guidelines that make our project as sustainable as they can and every year we take orders and make sure that these projects are in a line with all the EST frameworks that we are required to follow.

In every step of the project, the people involved are responsible in their own ways,s and it is very clearly outlined who is supposed to carry what kind of roles and responsibilities. We have Institutions like HPPCL and they are all that by policies like the hydro power policy of 2021.

Procedure -

The Environmental data that you are talking about is being used by these agency in a mode hot full manner and not just limited to clear inches. I think we do under Rs all the impacts and adjust that I need it for the projects to run well not just in terms of the economic terms but also for what happens to the local areas to the people and to the environment. we definitely ask the committees that are there to protect the forest and people for their Input and I cannot really sure if all there ideas make it to the final project but That there worries are not overlooked entirely. we also work with few NGOs which help bridge the gap between these governance structures and the local people and make sure that they help explain things to them in a clear manner so that it can also be helpful as a feedback to the Future cores that we take.

I am not sure if we include any traditional practices because in such a large scale project, these traditional practices may not be of much use. but I am sure that it helps for their own lifestyle and benefit and also make sure that small groups of people can be helpful but I am not sure if in these kinds of very scientific development projects it is very helpful. is now being used more thoughtfully and not just for clearances, but to understand risk, monitor health impacts, and adjust projects if needed.

Value Generation/ Use?

The hydro power projects in India make up over 90% of our contracted capacity and have given a huge incentive in the sense of economic terms. It has been a great benefit for everyone whether it is in Himachal Pradesh or even the country as a whole because this is a great way of producing electricity. the data can be used for the weather stations and also the monitoring insights from the disaster and planning department of the central government.

If you see in the guidelines you will know that people who are displaced are also given compensation of either money or land and that they do not really go or notice. Yes, sometimes the EST may not be given too much priority because they might be in comparison very miniscule to actually what can be generated from these hydro power projects.

Ownership of data -

The data is mostly controlled by the state Agencies and also is very open so you can actually go and check all the assessments and all the data has been done on a particular region. so if the local people wants to know what kind of datafication be there in order to put up such a project day can definitely go to these websites or even file RTI is to actually no on based on what did we actually put up these kind of life projects. yes you are definitely right in the sense that most of them are open and I think the process is not really open rather than the results but then we also have external agencies doing a lot of assessment so even they have a lot of data with them regarding the community insights.

Global Integration -

Yes climate goals has to be met and that on this kind of energy is actually really great and does also some point reach to the Global investors that we actually have. of course I am not saying that the cost of crushing local community but they definitely have help a lot of great projects and that Institutions like World Bank and ADB are funding for the upgrades that we require like the green updates. I do not believe that are very unrealistic don't are goals that we have and that sometimes you know there are better priorities like great stability order we have like emissions and sometimes they may not match what the local phone but it's actually really helpful for their flirt protection and compensation of plan. a lot of the electricity that is produced actually helps them with transportation and then the schools and their homes and for which tissue to be really glad.

R3i

Institutions?

Yes I think a lot of days institutional way of operations are actually handled by a lot of the corporates and the corporations or the control boards that we have. They are often very guided by the state's hydropower and the policies that we have for the environment and that often these are very quickly addressed which are actually very increased structures that we have. I have to say that these are not very escapable parts of the policy that we have and that the hydro power policies of the state. As these projects are very intensive in nature a lot of this coordination by the state departments and the central ministers and then we also have something called the hydro power producers for room with actually brainstorming all the developers of the different projects to make sure that their activities are aligned and then they maintain minimum environmental flows.

Kinnaur is an area that has always had these projects for quite some time now and I understand they are a bit sensitive in nature but they are definitely included in the meetings that are actually held at the very local level. such meetings were held in the Satluj basin alone before they actually constructed them. considered in the final decision making power so I have to say that the government and regulatory about it will definitely have the end .

Structural-

At the top I can say that we have the state level agency that setter and force the regulations required in the governance structure and then also and then we go down and we see that at the project level implementation is carried out by the developers. all the legal frameworks are actually anchored in policies like the environment policy for hydro power projects and the Environment protection Act of 1986. all of the monitoring that we do or embedded in proper Infrastructures that are actually I am talking about like the laws and also help the public to see if these projects follow the minimum 15% lean season flow in rivers. Every mapping is GIS based and that is used to access hydro power potential that will help sitting with minimum sort of throwbacks. When it comes to the water flow and every management we have the hydro power producers forum.

 Procedural -

There are so many institutions that I involved in the entire procedural layer you know they always make the decisions on how to do something and that they also set of the article guidelines

that I required stop we are also very focus on the green development and that's so many of the International Organisation so included in the procedural Framework. A lot of DE is information or open public that Global people can address and that we can address at each stage of the project development because multilayer assessment is done. I cannot really say that day influenced a lot but these procedures really exist on paper.

Value Generation and Use -

For every major hydro power project the social and environmental assessments are the backbone of the party. They are conducted by proper researchers and accredited consultants and are correlative by the government Agencies. They all use proper plans and adaptation and mitigation measures and make sure that they also prepare proper companies that can benefit the local people who are actually affected by these projects because let's keep it real people do get affected by fall.

the value of generation from this hydro power projects are extremely significant and that they are very economical in nature and that it makes the Himachal Pradesh revenue it is actually the main source of revenue for Himachal Pradesh that has actually roads and create more development related projects that are very I am that may not have been possible without this hydro power projects.

Ownership and Control ?

Access to the data is very controlled and regulated by the government Agencies only. while you may find a lot of data open especially in the reports which are made public and maybe for other data sets you can file proper enquiry. I believe that the Awareness of the term that you said, like the datafication in these cannot and other environmentally sensitive regions are actually growing especially among the youth and that maybe they are not involved much in the data management I think they are pretty aware. We have a lot of space for the committees to come up and put down their variables.

Global integration?

Yes, About the Carbon credits we do definitely pursue you actively in the Global carbon Credit market so that we can actually generate quite a good lot of revenue from Carbon credits. the state has actually set up a proper carbon Credit committee to align with international standards and maximize the returns from these projects. We do have a lot of influence globally But also make sure that the last power rests with our country itself. We do have environmental conflicts with the local demand such as for what to use and sometimes they do to leave project implementation and everyone is trying to have with different agencies.

4. R3j

Institutional -

Hi yes if I understand correctly your question I think in the most institutional layer we have the states Power Corporation of a known as the age HPPCL and then we also have the DoE which is

the director rate of energy which are actually the main authorities that ensure all the social and environmental concerns are addressed A and B hydro power and. we have different communities under different Agencies like the state expert appraisal committee and and they make sure that the enforced policy have coherence specially through the entire process I definitely thing that being used people or let me see the people from the villages are really properly then these consultations and that the panchayat makes sure that day all are dissipated in nature like all their meetings. I also do want to highlight that sometimes the participation is often limited to the formalities started in actually making sure that we do have some sort of the decision making power. most of the data that you also ask if actually based on the data And that they are mostly structural in nature may not necessarily be used but to make sure that they are not really really overhead and.

structural?

here the governance structure is very high people and that it involved multiple agency is also would have said and that day all operate in the state and the central there are policy is like the hydropower policy and environmental policy for hydro power projects which actually make sure that the legal under procedure frameworks are in place and followed. he has definitely we use a lot of territory interest structure is quite well that's why I will be able to carry on these hydro power projects and that it also cross the monitoring photos and gives us real time information because of the GIS marking that we have. For as I know and that comes at the top of my head I think the Environment protection Act of 1980 provides the proper background for these and forces on them complaints frameworks required for the environment and social inclusion to take place.

There are regular orbits. There are a lot of programs like the catchment area improvement program that make sure that it is in line with all the other frameworks. yes and that no one single person is responsible for any sort of process we also have the responsibility of sustainability distributed among all these Agencies that are involved in the project completions and succession and also we have additional checks by third party slide the international parties that often help in these projects.

Procedural?

We believe that we are very collaborative in nature and that everything is done in a very collaborative sense, likely involving the local Panchayat all the stages and seas (HPPCL, HPPTCL, HPPCB) are there and that there are national authorities MoEF&CC. We also have all these international organisations which also help us that stand also regarding the final structures because of the funding. and sometimes maybe the follow up is not really done. I believe that most of their concerns must have been taken up by the concerned party.

Value generation/ Use?

Definitely the social and environmental assessments that we do our proper standard practices and they are repeatedly and continuously reviewed by the state and the central authorities. so this datafication or whatever you just said is actually it forms mitigation Strategies and helps company all the environmental management that is actually required. and we have to understand these hydro power project actually first contribute to the local people first and then it was lastly to like the states economy and the also gives us proper and its supply which also helps to have

ecological changes in sometimes and that me not be favourable in nature but largely I think does have the local community yes the mean uses of this data and necessary not the local and their actually the government agency is developers and sometimes even the researchers like us.

 Ownership and control -

Yes I mean this is a thing that you proudly don't talk about a lot but then it is also very quite clear that a lot of the ownership of data and control is actually with only the government agencies. but a lot of the impact that we may have from these hydro power projects also share very publicly and may Maybe in English and. in Kinnaur people being aware of their data collection and use I think is increasing but still not really good and also for sure it really do not have any control over the data and I don't know how much of the concert today even I have give me have been need to understand these concern mechanism should exist and yeah I believe there also but I really not sure how the social impact assessments are actually taken by people actually

Global influence?

But then we have to see it in a way that we receival out of global investment because they need a lot of money at the end of the day to create huge interest structures and also compensate at the same time these people. because we have a lot of external owners who influence some amount like the local government by having like you know me collaborate. I do believe sometimes it isn't that some of the climate kind of golds that we are trying to have and tell me are not really alive with the local news. complicated more because of the existing tension that we have on the ground.

CATEGORY 4 : ENVIRONMENTAL RESEARCHERS / ACTIVISTS

1. Institutional Layer:
   a. What capacity have you engaged with the indigenous communities and authorities?
   b. Which government or regulatory body should people approach to raising concerns about the hydropower projects?
2. Structural Layer:
   a. Do you face challenges navigating through such a multi layered governance structure?
   b. How easy are the reports of environment datafication to be accessed?
3. Procedural Layer:
   a. Do you think the procedural layer is very responsive and equitable?
4. Value Generation / Use:
   a. Who, In your view, have benefited from these structures? Like, of course there is state economic benefit, how do you see the indigenous people benefiting?
   b. Do you see conflicts?
   c. Can there be a greater sense of value that can be achieved for the indigenous communities? Are we fair to them?

5. Ownership and Control:
    a. Can you talk about control over data and the relation to the indigenous communities?
    b. Do you and how do you advocate for data rights or transparency regarding their rights?
6. Global Integration:
    a. How do these fall in the greater scheme of things like the international standards or climate agreements?
    b. What has been your perspective on carbon credits and "data colonialism" in the context of Himachal's hydropower development?

R4k

I have spent years engaging with local communities and Indigenous people all throughout the country and I have been advocating for the people in the Himachal region in India. When it comes to the **institutional layer** I have made sure that my work is involved in the gram sabha meetings Where the local people meet the panchayat and I also make sure that I can help the villagers file their files and help document their insights and testimonies regarding the hydro power projects impacts. This is very true that in reality the hydro power corporation and the forest department are very hard to access and be responsible and responsive to the local grievances.

The governance structure is very complex because multiple Institutions, organisations and Agencies are included and they often overlap in the local state and national levels. It is almost like a Maize for the local people and this poses a great challenge for both activists and ordinary people. About the environmental datafication you are asking about, these kinds of data are supposed to be public and most of them are but I think a lot of them are very hard to access because they are very buried in the government websites and mostly are available in English which the locals cannot read. I wouldn't say that it doesn't exist as open data but it's extremely buried and a lot of it is missing or incomplete.

About the **procedural layer** we are quite familiar with the entire who needs to do what and how but if it comes to being responsive and equitable I really cannot say for sure. A lot of these consultations that are made with multiple Agencies I believe are often Rush and a lot of all data is used to make decisions. A lot of these consent regarding the indigenous people are actually mandatory under the forest rights act and reduced to just mere formalities.

Definitely the state and private developers and other international Institutions benefit the most from these hydro power projects when it comes to revenue and infrastructure and definitely the benefits for the indigenous communities remain minimal till today. One cannot deny that there are new roads and schools being built but that also comes at the cost of the forest, the cultural identity and the land. I know the areas near Kinnaur which are called Sangla people have lost their orchards and their livelihoods because of natural and unnatural activities going on regarding their environment. and you can clearly see it on the news that the conflicts have been around and they have been around this placement about the loss of access to water about the compensation even when on paper the compensation for displacement is mandatory. much larger value can be achieved for the indigenous community in Kinnaur Himachal Pradesh if they were actually

genuinely respected and that the entire process for fair and transparent and I completely will stand by my previous statement that we are still not being fair to them

it is quite clear that the **control over data** is entirely in the hands of the corporations and the government bodies. definitely the indigenous community have very little se on the data is collected and over how it is used and who should have control over it. My team helps advocate the data types and transparency so that they can demand access to the reports , organize public hearings and also file complaints. This process definitely means it will be slow because of the capacity that we have and I often meet with a lot of resistance.

International climate agreements are to justify these projects. It is always and always about meeting these Global targets. We try to meet things as Global as we cannot really look at the local needs and practice. very real and that the Global finance market in the climate carbon markets are extremely real and they have been feverish over the indigenous community for years in our country. The projects are under the banner called green energy but it is always there.

R4l
In my research and the amount of reporting that I have done over the years I have been interacting with both the government authorities and the indigenous community in Himachal Pradesh so around the country. I have documented the experience and perspective numerous interviews and visits where I have reached concerns about the hydro power project especially about the regulatory bodies that they have and sometimes also we have gone to the district magistrate in the state. here the gram sabha which includes the panchayat is supposed to play a huge role especially under the act and that it actually ends up influence saying a lot on the projects

We have a governance structure that is often very confusing and extensive even for us, even for researchers who are starting about D and night and every agency or level such as the state district and the central have room protocols that they have to follow which are extremely detailed. When it comes to accessing this sub structure and understanding the institutional it can be very difficult because the access is often not easy and most of them are available online but I do not think they are ever friendly so for someone from the indigenous community to come and actually try to access it would be very very difficult. You will see that most of this information that we and I are talking about actually comes from the other non governmental organisations who have collected their own data.

I have been observing that a lot of these procedural layers like the words that you have used are equitable and responsive and not really following any of those or as it should be underdog guidelines. Most of these consultations regarding assessments are also very per functionary but I wouldn't say that this is not wrong. Most of them are done very regularly and are often very reliable. but I think a lot of what we talk about regarding Carbon credits and the whole hydro power projects the local community have very less chances to have a meaningful dialogue as a whole and that they are not always listen to and most of the decisions are usually done in such mechanical or report like manner that the hearings even take place before they can come and speak to the indigenous community.

Of course from the revenue and increase in energy production the main benefits from this environment is actually by the state and the private sector. Now coming to the indigenous community we have to agree that a lot of these have health improved infrastructure in the room community but again they are also said to be affected by the loss of land. Conflicts have been frequent, sometimes they are large and sometimes they are small and we're to see a lot of environmental degradation. I mean when you actually went there for your ground work you must have seen. I do believe there is definitely such a room for actually greater valuation and greater value to be delivered to these indigenous people and that it can be done only when their rights and needs are prioritized better.

Ownership and control again are owned by the Institutions and corporations and the community have limited access to them specially these projects that we are talking about. I do believe that things are getting better for indigenous community and that on the first day or more than before change is quite slow.

There is this need for Clean Energy and Carbon credits so of course the compliance with the projects that are set by the Global corporations. It is not something that these data or the local or the corporates are actually interested in understanding and the benefits of the carbon trading really reach these local community is an offender voice is a lost in the Global recognition and funding.

Annex B: Declaration of Authorship

I hereby declare that, to the best of my knowledge and belief, this Master Thesis titled "Indigenous Environmental Governance in a Data-Driven World: A Case Study from Himachal Pradesh's Hydropower Sector" is my own work. I confirm that each significant contribution to and quotation in this thesis that originates from the work or works of others is indicated by proper use of citation and references.

Tallinn, 02 June, 2025

Aastha Hazarika

Appendix C: Consent Form

for the use of plagiarism detection software to check my thesis

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Student number: r0965395

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