COMMUNITY CONSULTATION ON NATURAL RESOURCE MANAGEMENT

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Glossary of Terms

Commons - Cultural and natural resources accessible to all members of a community, including natural materials such as air, water and a habitable planet
Pastoralism - a form of animal husbandry where domesticated animals are released onto large vegetated outdoor lands for grazing, historically by nomadic people
Bigha – Traditional measurement unit used for land; varies from locations to locations
Panchayat – Panchayat or Gram Panchayat is a local governing institution in Indian villages. It is a political institution, acting as cabinet of the village. The members of the Gram Panchayat are elected directly by the people
Gram Sabha - Gram Sabha is the general assembly of all the people of a village, who have attained the age of 18 years and their name is entered in the voter list. The Gram Sabha work as the general body of the
Palli Sabha – Like Gram Sabha, Palli Sabha too is general assembly of the eligible voters of a sub-unit called Ward or Palli within the Gram Panchayat
Mandi – Wholesale market for agricultural produces like, vegetables, fruits, etc.
Mahua, Tendu leaves – Forest products/ trees/ fruits
Masoor, Moong, Urad – Pulses
Rabi-Kharif – Seasonal for agricultural activity (Winter-Monsoon)
Bhudan - Land donation to the landless. During land reform movement these lands were taken as a voluntary gift from the landlords and were donated to the landless.
Sarpanch - A Sarpanch is the president of Gram Panchayat elected by the village-level constitutional body of local self-government, the Gram Sabha

List of Acronyms

FES - Foundation for Ecological Security
SUPPORT – Society for Upliftment of People with People's Organization and Rural Technology
4S - Sarva Seva Samity Sanstha
MGNREGA - Mahatma Gandhi National Rural Employment Guarantee Act
MVP - Minimum Viable Product, a version of a product with just enough features to be used by early customers who can provide feedback for future product development
NRM - Natural Resource Management
OBC - Other Backward Caste
SEAF - Socio-Ecological Action Framework
SC - Scheduled Caste
ST - Scheduled Tribe
FGD – Focused Group Discussions
HH – Households
SE – Socio-ecology
SRLM – State Rural Livelihood Mission
NALCO- National Aluminium Company Limited
MCL - Mahanadi CoalFields Limited
NTPC - National Thermal Power Corporation
TTPS - Talcher Thermal Power Station
NGO – Non Governmental Organization
NTFP – Non Timber Forest Product
LDC – Lower Division Clerk
PRI – Panchayati Raj Institutions
LULC - Land Use Land Cover
JFM – Joint Forest Management

Context

The Social-Ecological Action Framework (SEAF) aims to strengthen grassroots coalitions to advance community-led governance of natural resources by bringing together existing datasets of social and ecological parameters and creating analytics that render them actionable by local communities. The broad objective is to establish a widely applicable and credible framework that helps integrate ecological and social parameters into civil society action, public investments and programmes, corporate decision-making, and popular narrative. Development and designing of this framework not only involves multiple organisations, community stakeholders, researchers and experts, but takes into consideration multiple indices, tools and other information sets to be built over it.
This report highlights the findings from field visits and consultations conducted in the month of July, across 4 locations in Bihar, Jharkhand, Odisha and Rajasthan, engaging with critical actors and stakeholders with the objectives of developing deeper understanding on –

- Selection of social-ecological parameters/variables required for holistic analyses,
- Data sources for each of these and analysis
- Protocols for data collection, processing and converting into actionable information
- Guidelines for interfacing this information with existing and new knowledge systems and embedding within policy/decision-making structures, like that of the Mahatma Gandhi National Rural Employment Guarantee Act 2005 (MGNREGA) and its convergence with other departments/ ministry schemes

Location	CSO Partner	Dates
Angul, Orissa: Predominantly forest and agriculture dependent communities	FES	12-14th July
Bhilwara, Rajasthan: Predominantly pasture based livelihood of communities	FES	16- 18th July
Gaya, Bihar: Predominantly agriculture and migration based labouring are main income sources	4S	18- 20th July
Dumka, Jharkhand: Predominantly forest and agriculture dependent communities	SUPPORT	20-22nd July

Robust consultations were done across stakeholders including communities, govt. officials, civil society organisations and partners, with specific attention given to ecological and social variations across the regions and the groups. A large part of the findings pertain to common resources and livelihood dependent on such resources.

To plan these field consultations, a two-day workshop was also held in June 2023 to collect feedback from critical ecosystem players involved in Natural Resource Management (NRM) related work. The discussions in the workshop ranged from exploring and understanding possible programmatic integrations, to recommendations and actions tools for community based planning, government led impact assessments, representation and visualisations of visual tools, to integration of variables related to ecology and natural resources.

Based on the field interactions and the workshop, our goal is to come up with a framework to integrate NRM with existing policy/ decision making structures. NRM is also a critical provision of the MGNREGA, particularly in relation to Commons. This report is a first step in this direction.

Background

Public work related to NRM is a critical component in MGNREGA[1]. These natural resources that are collectively owned and managed by communities play a crucial role in sustaining livelihoods for millions of people, especially in rural areas. "*In the context of Indian villages, common property resources include community forests, common grazing grounds, tanks and their beds, foreshores, threshing grounds, rivers and riverbeds, where well-defined property regime may not exist.*"[2] Examples of work on these include, construction and maintenance of water harvesting structures, water conservation, watershed management, works related to micro and minor irrigation, renovation of traditional water bodies,. It further includes works on common land like, afforestation, tree plantation, horticulture, land development, etc[3]. However, several key issues and challenges surround Commons and livelihoods dependent on them. Here are some of the key issues:

Overexploitation and Degradation: Commons resources such as forests, grazing lands, and water bodies, are often subject to overexploitation and degradation due to population pressure and unsustainable practices

Lack of rights: Many communities relying on Commons lack tenure rights. Community-based resource management is undermined when there is no clear legal recognition and ownership of resources, consequently affecting governance and development of such resources.

Climate Change Impacts: Climate change exacerbates existing challenges for communities dependent on Commons. Erratic weather patterns, droughts, and extreme events can disrupt livelihood activities such as agriculture, fishing, and pastoralism, and add to the existing vulnerabilities.

Weak Governance and Enforcement: A lack of effective enforcement of laws and regulations leads to illegal activities such as illegal encroachment, logging, poaching, and water pollution, which further threaten Commons

Decline in indigenous knowledge: Urbanization and migration are having an adverse effect on traditional knowledge related to sustainable resource management. Preserving and promoting traditional knowledge is vital for sustainable use of Commons

Inadequate Support and Alternatives: Inadequate support from the government and limited access to alternative livelihood opportunities hinders the resilience and adaptive capacity of communities reliant on Commons resources.

Unscientific planning: Planning of new conservation works for Commons resources can be done carelessly or unscientifically, which can hurt the local ecosystem or create other forms of inequity such as negative impacts on downstream communities or marginalised groups.

Interventions through NREGA can be an important pathway to cover these gaps and several studies indeed outline the interplay between NRM and NREGA, and their collective impact on rural livelihoods,

[1] https://rural.nic.in/sites/default/files/nrega/Library/Books/MGNREGS_Permissible_Work_List(English).pdf
[2] https://www.lawteacher.net/free-law-essays/property-trusts/common-property-resources-in-indian-context.php
[3] https://rural.nic.in/sites/default/files/MGNREGA_Guidelines_English.pdf

environmental conservation, and socio-economic development. For example, ***Sebastian M., Azeez A. (2014). "MGNREGA and Biodiversity Conservation"***[4] examines the contribution of MGNREGA in conserving natural resources like water, soil, and forests. Various activities being promoted under Mahatma Gandhi National Rural Employment Guarantee Scheme such as water harvesting and soil conservations had a positive impact on environment security and biodiversity and environment conservation. This article acknowledges the importance of biodiversity conservation being integrated into the MGNREGS, but also stresses the need to establish biodiversity registers at the Panchayat level, support individual and institutional efforts to conserve biodiversity, and formulate appropriate policies to do so. Similarly, another paper **Bassi N., Kumar Dinesh M. (2010) "NREGA and Rural Water Management in India: Improving the Welfare Effects"**[5] highlights that efficient planning and implementation of water management works can make NREGS a highly effective social protection initiative for reducing rural poverty and enhancing livelihoods. Nevertheless, it is imperative that when significant funds are spent on creating assets in villages, a small percentage of those funds are spent on planning them with proper scientific and technical inputs, for example, the location of a pond or water body with proper consideration of slope, runoff draining into the pond, soil type, geological features, etc.

These studies highlight the significance of integrating MGNREGA with NRM for promoting rural livelihoods, sustainable development, and environmental conservation. Convergence of efforts and effective planning can enhance the impact of MGNREGA in safeguarding natural resources while providing social protection to rural households. However, challenges related to environmental safeguards, coordination, and capacity-building of community members need to be addressed to fully realise the potential of MGNREGA in supporting sustainable NRM practices in India.

Our goal is to develop a framework, and participatory digital tools centered in this framework, to empower communities to learn, understand their local ecosystem, collectivise to manage it together, be scientific in their approach, and demand relevant works under government schemes such as MGNREGA.

Objectives of the research study

The consultations were conducted by the Gram Vaani, Magasool, IIT Delhi, and IIT Palakkad teams, with help from civil society partners FES (Foundation for Ecological Security), SUPPORT (Society for Upliftment of People with People's Organization and Rural Technology), 4S (Sarva Seva Samity Sanstha) and GIZ to understand key issues with respect to Commons resources and livelihoods dependent on the Commons and determine which socio-ecological (SE) variables could be helpful to represent these issues.
Some of the other objectives of consultation meetings were:

- To get an understanding of issues faced by different communities with respect to livelihood and natural resources. This also includes developing an understanding of challenges faced by vulnerable communities and how NRM works can contribute in addressing these by targeting the most vulnerable

- Accessibility and application of the types of Commons resources, like those of water bodies, and what will communities' demands be in the future

[4] https://www.researchgate.net/publication/260715005_MGNREGA_and_Biodiversity_Conservation

[5] http://www.irapindia.org/images/irap-Occasional-Paper/NREGA-OP.pdf

- To understand the importance of natural resource management, sustainable practices, and the role of MGNREGA in supporting such initiatives

- To capture afforestation and biodiversity conservation efforts by community members and governments with a specific focus on MGNREGA

Methodology

The geographies for the consultations were finalised based on partners' support and keeping the socio-ecological diversity in mind. The consultations aimed to target different socio-ecological systems and intersecting livelihoods such as (a) forest-based livelihoods dominated in Angul, Odisha, (b) primarily agro-pastoral communities in Bhilwara, Rajasthan, (c) agroforestry based livelihoods in Dumka, Jharkhand, and (d) agriculture and agriculture labour based livelihood in Gaya, Bihar. The consultations also aimed to engage with diverse communities in terms of caste composition, like Scheduled Tribes (ST), Scheduled Castes (SC), Other Backward Classes (OBCs) and General castes. A detailed focus group discussion (FGD) guide was prepared for the community consultations and an in-depth interview guideline was prepared for stakeholder interviews.
The team also met and had in-depth interviews with various stakeholders during the field visit including Block Agricultural Officer, District Project Manager (SRLM), Forest Officer, MGNREGA office, Civil Society Organizations' representatives and Elected Representatives of Panchayati Raj Institutions.

Location	Profile
· State-Odisha · District – Angul · Blocks: 1. Angul block 2. Athamalilk block · No. of FGDs- 4 *HH (House Holds)	**Tainsi Panchayat, Tainsi Hamlet, Angul block** 42 OBC HH, 3 ST HH
	Tainsi Panchayat, Bharatpur Hamlet, Angul block 165 households; Large Majority OBC; a few SC and ST
	Tainsi Panchayat, Jayanti Nagar Hamlet, Angul block Large Majority OBC HH, a few SC and ST. 10 SC and 12 ST families are in separate subunits nearby with the STs in the Purnakanthabada subunit. The SC households do not own any land (no titles for homestead also)
	Maimura Panchayat, Kashinathpur Hamlet, Athamallik block Village has 80HH with majority ST HH
· State – Rajasthan · District - Bhilwara, · Blocks: 1. Mandalgarh 2. Asind · No. of FGDs - 4	**Mukungarh village, Srinagar Panchayat, Mandalgarh block** About 120 HH - 30 Gurjar HH, 30 Rajput HH, 65 Nathbabaji HH, 40 Berua samaj HH, 35 kalbeliyas (this community is one of the most vulnerable)HH
	Khakhunda village, Rajgarh Gram Panchayat, Mandalgarh block 110 HH - 20-25 Bhil (ST) HH, 15 Regar (SC) HH, 5 Gurjar HH, 8-10 Daroga (OBC) HH, 20/25 Rajput HH, 1 Doli HH, 12-13 Vaishnav (General) HH
	Barundni village, Burundni Panchayat, Mandalgarh block 200 Meena HH (ST), 200 Ahir HH (OBC), 100 Baniya HH (General), 150 Brahmin HH (General), 50 Bairua HH (SC), 50 Muslim (Pandara) HH, 20 Khatik HH (SC), 60 Balai HH (SC), 40 Gadri HH (OBC)

	Mefaliyas village, Negadiya Gram Panchayat, Asind block Total - 500 HH – 300 Gujjar HH (OBC), 10 Suthan HH (OBC), 2/3 Nai HH (OBC), 4/5 Kumhar HH (OBC), 5/10 Bhil HH (ST), 20 Malai HH (SC), 1 Regar HH (SC), 15 Jogi HH, 10 Doli HH
· State - Bihar · District – Gaya · Block: 1. Mohanpur Block · No. of FGDs - 4	**Khaddi Panchayat Khaddi, Barkat Village, Mohanpur block** All SC HH; 34 women of Barkat and Manjaulia hamlets participated Women of Bhuyan SC community sat separately from the rest
	Masaila Panchayat, Masaila Village, Mohanpur block Village has mix HH of SC. OBC, Muslims 20 OBC women present at the gathering
	Guriawa Panchayat, Jai Prakash Nagar Village, Mohanpur block Village consists of SC HH 34 men and women participated from Shyam Sundar Nagar, Bhawanpur and Saijan hamlets.
	Khardih Panchayat, Surahi Chak Village, Mohanpur block Village has SC and OBC HH SC and OBC women members from Surahi Chak, Kasia Chak and Hadih Hamlet attended meeting
· State - Jharkhand · District - Dumka · Block: 1. Masaliya · No. of FGDs - 2	**Anandpahadi Panchayat, Manjhi Tola Village, Masaliya Block** Village consists of 8 Tolas (Hamlets) and 160 HH, mostly ST (Manjhi, Neem, Ul, Byar, Dhar, Kol, Bur, Pahariya) Meeting attended by 16 ST community members with 50-50% of women & men
	Baliajore Panchayat, Chandna Village, Masaliya Block Meeting attended by Mango plantation beneficiaries, mix of SC and General

Consultation Findings

This section highlights the findings and insights we derived from the four locations of Angul, Bhilwara, Gaya and Dumka. The highlights are divided into -
- Introduction and Ecology

- Introduction and Ecology
- Insights on Livelihoods and MGNREGA
- Insights on Socio-Ecological (SE) Variables
- Additional Insights

Angul - Introduction and Ecology:

The Angul district in Odisha has a diverse ecology due to its geographical location and the presence of various natural features such as a large forest extent, and presence of rivers and wetlands. The Mahanadi River, one of the major rivers in India, flows through this district, contributing to its ecological richness. The district is also known for the Satkosia Tiger Reserve, which is home to a variety of flora and fauna. Many public sector undertakings have set-up up plants and offices here, like National Aluminium

Company Limited (NALCO), Mahanadi CoalFields Limited (MCL), National Thermal Power Corporation (NTPC) and Talcher Thermal Power Station (TTPS). Like many industrial areas, Angul district faces environmental challenges such as air and water pollution due to industrial emissions and waste.

As per 2011 census the SC population is 2,39,552 (18.80%) and ST population is 1,79,603 (14.10%).

The average annual rainfall of the District is 1421 mm. However there is a great variation of rainfall from year to year. The rainfall in the district during the last 10 years varied between 896 mm & 1744 mm. Rainfall has become erratic, with larger rainfall events interspersed with longer dry spells, and the overall rainfall is decreasing. Owing to hilly terrains, flooding was never a problem.

Angul - Insights on livelihood and MGNREGA:

In Angul district, the team conducted FGDs in four locations, three of which are separate hamlets of the same Panchayat in Angul block, while one was in one of the hamlets of a Panchayat in Athamallik block. The discussions in these locations have had a fair representation of both men and women in the meetings. In two of these locations members present in the meetings were mostly OBCs (which is representative of the dominant caste groups in the villages), while two were dominated by STs (one of the hamlet is ST dominated in caste compositions, while for the other OBCs are the dominant caste group).

Livelihoods of these communities are a combination of two or more of these options, agriculture, agricultural labour, NTFP, horticulture, poultry, goat and cattle rearing, local and migration oriented daily labour. A large proportion of the ST population especially depends on forest resources, like Mahua, Tendu leaves, and collecting firewoods, mostly for their own consumption and selling some of them to nearby small traders.

The average landholding of the OBC communities is between 1.5-3 acres, with a few families owning more than 10 acres for cultivation, while a significant proportion of the ST communities owning fallow lands and lands without proper ownership registration or records . In terms of agricultural crops the major produce is paddy along with vegetables and pulses, mostly depending on water availability beyond the monsoon. As per the communities, crop production has increased owing to the use of hybrid seeds and chemical fertilisers, but crop-diversity and soil quality has reduced over the period. Communities and villages where FES is working have access to various water bodies constructed under MGNREGA and other schemes. For communities with significant land to cultivate, this has improved food security and livelihood to a great extent. Most people in all the hamlets have job cards. Generally, works like creating trenches, digging pits for water conservation, creating water storing structures, constructions of roads, cutting woods of fallen trees in forest are covered under such schemes. In terms of asset creation for communities with cultivable land, the scheme seems to meet its goal, while the same is applicable for creation of work and jobs. Panchayats take input from people for work types. Often, the community decides what it wants to accomplish and then takes it to the Panchayat. However, it was also reported that the demands are not always listened to or granted. This is especially reported by the ST groups who either have fallow lands or own no lands with proper registrations.

It will be also pertinent to note that incidences of migrations are high among the ST communities with almost nil to negligible migration among the OBC communities for work. Another important aspect in this regard is political participation and representation of these communities in various meetings to raise demands related to NRM and asset creations. In both the meetings with the OBCs, it was reported that they participate in Palli Sabhas (equivalent to ward sabhas) and have politically influential and active members, while both ST communities reported that their participation and raising demands in the Palli

Sabhas yield no results and neither they have influential and active members representing them in such meetings. Women's participation across all four communities in such Sabhas are nil or negligible.

Major problems faced by the communities include wild animals (elephants, pigs) destroying crops as fruit-bearing trees are not available in the forest. Discussions revealed that primarily some species of trees were planted by the communities near the forest without taking into consideration that wild animals might attack them. One of the OBC communities also reported that rainwater structures at foothills need to be enlarged to store more water, but repeated requests have not been met. There are also issues with payment delays ranging up to 6 months. Marketing and market linkages of products doesn't seem to be an issue with any of these communities, where both local small-scale traders and government supported cooperatives either come to the villages or are accessible easily, although prices offered by the local traders are generally less than what is offered in government mandis. Communities for whom cultivation is the major livelihood, have to sell excess produce to local traders.

Dumka - Introduction and Ecology:

Dumka district is the part of Santhal Paragana Commisionary and is bounded by Godda and Banka district in the North, Pakur in the East, West Bengal in the South and Jamtara and Deoghar in the West Dumka, and is known for its diverse vegetation and forests. The region includes parts of the Chotanagpur Plateau, which features mixed deciduous forests with species like Sal, Mahua, Teak, and Bamboo. The main rivers flowing in the district are Brahmani, Baslo and Mayurakshi, along with their many tributaries. Geomorphologically the district can broadly be divided into three well defined units: (i) the hilly area, (ii) the rolling country or (valleys) and (iii) the flat country. There are 6.02% SC and 43.22% ST in the population in Dumka district.

The climate of Dumka district represents a transition between the dry and extreme climate of northern India and the warm and humid climate of West Bengal. The timing of rainfall has changed significantly, as has the intensity of rainfall. For the last 3-4 years, there has been a decrease in rainfall according to the community.

Dumka - Insights on livelihood and MGNREGA:

In Dumka, one community meeting was conducted with ST community members of , Anandpahadi Village of Masaliya block. The main sources of livelihood are NTFP, agriculture and migration oriented daily wage labour work towards neighbouring state West Bengal. Most people have 2 bighas[6] land per household and also have animals like pigs, goats, and cows. A significant percentage of the population - both men and women - temporarily migrate to West Bengal for agricultural work. Community members mostly grow paddy, red-gram and long-beans. Interestingly, community members highlighted that they started eating rice as a staple food from only a decade back. Earlier, community members used to eat different types of millets, the varieties of which are not cultivated now owing to non-availability of seeds. Many communities are dependent on forests for mushrooms, Mahua, long-beans, and firewood. It was reported that the forest cover has increased over a period of time due to community and Government efforts.

Although there is a general sense of overall improvement in quality of life in terms of access to roads, food security, availability of work, MGNREGA work allocation was reported to be erratic. As per the communities' accounts, they primarily receive wage employment from the forest department followed by

[6] 1 bigha in this case is equal to 0.67 acres

NREGA. The work under MGNREGA has not been available this year, since no work has been opened in the village. During the last year, communities have worked with the forest department for wage employment. Some of the community members have also received wage employment under MGNREGA for approximately 30 days. It was also reported that access to drinking water remains a challenge to this day, owing to drying of handpumps and no supply from the government, leaving the villagers at the mercy of availability of water in natural springs. The group members also reported that groundwater has decreased over a period of time in some of the villages, with not much work on water conservation and irrigation work done under MGNREGA. For plantations, community members are more dependent on the forest department, and on the irrigation department for check dam construction. An added challenge of wild animals (monkeys and wild pigs) destroying crops is also reported by the villagers, which as per them was absent in earlier times. Most of the community members highlighted issues related to MGNREGA payments and demand-related challenges. Majority of the families echoed that they look for work outside (and migrate) the ambit of MGNREGA, because of these issues –

i. The scheme is not meeting their demands for jobs creation. Though the works are selected through Gram Sabha, communities have no say in opening of work in their village or Panchayat.

ii. Delayed payments for work done

iii. Lack of information about the scheme, especially about possible integration of schemes for irrigation and forest related work

iv. Lack of transparency in raising and in registering demands raised by villagers, further affects their participation in the process

Angul & Dumka - Proposed SE variables:

This section highlights the critical socio-ecological variables that seem relevant based on the discussions. Dumka and Angul were taken into consideration together because of similar ecological contexts.

Climatic: It was noted that the communities specifically needed climate-related indicators, on how they changed over time and how they have affected them.

Soil Health: They also need to know the specifics of soil which has deteriorated over a period of time, especially due to the use of chemical fertilizers.

Land usage: Land use is another aspect that needs the attention of communities, so they can plan for plantations and decisions on activities like rotational grazing, etc., based on that data.

Land & Resource Ownership: NRM related work through several schemes, have remained limited and constrained by the present ownership of resources by these communities, leading them to opt for labouring jobs outside their villages and also their participation in management and governance of natural resources around them. The caste based allocation of work and their effects on these communities, is a critical indicator to be considered in case of existing resource mapping.

Biodiversity index: One of the major variables is a biodiversity index to capture tree species present in the forests as communities highlighted that wild animals attacking their crops is common mainly due to the lesser number of fruit-bearing trees in and around the forest. The Forest officer additionally requested for tracking tree species density and health, and forecasts that can be utilised for predicting forest fire and such events.

Besides this, migration variables would be critical to point out communities' high outflow even when opportunities are available in the villages.. And lastly, usage of government schemes, especially their intersections that can help communities, especially ST communities residing nearer to the forested areas.

Additional insights from Angul and Dumka:

Education – In Angul, education varied significantly among the four groups that were consulted. In one of the OBC villages, most members have completed their primary schooling, while for the other OBC dominated group, most have completed secondary education, including many who have graduate degrees. In one of the ST hamlets women and younger generations are mostly deprived of any education, while boys of present time are now attending schools. In the other ST hamlet elder women and men cannot read or write, while most youths of less than 25 years have attended both schools and colleges. This has to be considered while designing digital tools and therefore, it is pertinent to have a voice-based system with local language options so that older people and women can be engaged. One of the major points to be noted here is that young people mostly travel outside villages and even migrate, so the older population needs to be reached out for interventions.

In Dumka most of the community respondents have studied till 8th standard and below, while some had completed up to 10th standard.

Language – In both Angul and Dumka, it was noticed that while men and boys are fine to converse and consume information in Hindi, women are more comfortable in local languages, which for Angul is Oriya and for Dumka are Santhali and Bengali. This point conveys two things - the importance of using local languages in voice-based services, and of engaging community stewards to facilitate usage of the services for making it participatory.

Mobile Ownership and Usage – In Angul, it was noticed that most of the families have at least one smartphone. However, smartphone penetration is less (40%) in tribal villages. On the other hand, every household has a feature phone. Smartphones are used for watching YouTube videos, WhatsApp, Instagram, games and even Google searches through voice command. In one of the villages, some literate people use apps like Plantix for better plantation management. Some of the young people who are studying in college can read maps. They play games like PubG and Free fire which have layers of complexities. By this we can understand they can grab a certain level of complexity and they might be able to consume visual information. With their confidence and technical aptitude, they can potentially guide others, including elders. Strategies are needed to be built to engage youth in the intervention. However, it should be noted that they also migrate as they are studying outside villages in cities.

In Dumka phone ownership at household level is 100 percent while 50% of households have at least one smartphone. Only a few young people in the community could understand maps even after many rounds of explanation. Therefore, it is essential to focus and groom young people in the villages and devote some time in capacity building before planning technology based interventions.

Bhilwara - Introduction and Ecology:

The team visited two blocks in Bhilwara district, Mandalgarh and Asind. These were selected because these two blocks represent two extremes in terms of water availability within the district. Mandalgarh is locally also called the Cherapunji of Bhilwara, since it receives the highest rainfall in the district (about 600 mm). On the other hand Asind block is one of the driest blocks which frequently depends on tanker supplies to meet water needs. FES has been working in Mandalgarh since the early 2000s, and their work has resulted in significant care for the Commons - through awareness building, construction, institution building and collective action. Asind has witnessed a lot of mining activity for quartz and feldspar, which

has been a constant threat to the Commons. There is a lot of migration in Asind. This is despite the fact that conservation works began in Asind in 2002.

The team visited three villages in Mandalgarh, Mukungarh, Khakhunda and Barundni. Of these, the first two have seen a lot of work on pasture land, while the third has had most works on forest land.

The FGDs revealed that the villages in both the blocks consisted of mixed caste groups. Land holding and livelihood options are dictated by caste dynamics. For instance, in one village it was found that there are nomadic tribes, whose traditional work of snake charming is no longer popular. They have very little land holding (2-3 bhigas as opposed to 7-8 bhigas that some of the upper castes own)[7]. The women participate in MGNREGA work, but they don't participate in village meetings (caste dynamics played a role in this as well, but it needs further investigation).

In the Mandalgarh block, significant dependence on wells as a source of water was observed. The villagers shared that wells were typically shared among neighbours, for a small fee. In one village, the number of wells have gone up from about 19 in 2010, to about 35 today.

In another village, the discussions revealed that 2-3 new wells have been dug in the past year alone. One of the villages is along the Banas river, and the river water is also used as a source for farming. Borewell construction has started a couple of years ago, and it was mentioned that in one of the neighbouring villages, 8-10 bores had to be dug to get one working bore. However, there is currently no community rule against digging borewells.

Asind block is extremely dry and tanker water needs to be bought to meet the needs of livestock, and for domestic use. There are borewells here also, but they were constructed about 10 years ago, and the lack of availability of water in them means they're used for basic survival needs and not intensive agriculture.

Bhilwara - Insights on livelihoods and MGNREGA:

Mukangarh village is in the command area of Jedhpura dam. There are two to three canal rotations in Rabi which recharge their shallow wells. Hence, a significantly high share of the agricultural land is under double cropping. The main livelihoods are agriculture, livestock keeping and wage labour. Approximately 50% cultivable land is under sharecropping where those with less land work in other's land for a share of the output. Corn, Peanut and Urad are grown in the Kharif season, and Wheat, Channa, Sesame and Masoor are grown in the Rabi season. About a decade ago, Corn and Wheat dominated. However, more recently, sesame and Masoor have taken over due to higher profitability and lesser costs involved. Sesame is also used in the production of oil and that has also been a factor for the shift.

In the second village we visited, the major occupations were agriculture, animal husbandry and agricultural labour.

In the Asind block, livestock keeping was the predominant livelihood. Farming supports this in terms of fodder cultivation. The livestock population has increased over the years and in drought years the price of fodder becomes more than the price of Wheat. Practically each family has at least one youth who goes out to work in other regions such as Madhya Pradesh, Gujrat, Maharashtra, Delhi etc. A dairy was established here in 1958 and the milk production varies significantly depending upon the intensity of rainfall.

[7] The definition of a bhiga varies in Mandalgarh and Asind. In Mandalgarh, 1 ha = 6.25 bhiga and in Asind, 1 ha = 4.25 bhiga

The team met with a Lower Division Clerk (LDC) who manages the MGNREGA job cards and job applications. Job card applications are processed on the 13th and the 28th of every month, and about 75% of MGNREGA applications are about maintaining natural resources. We learnt that there are multiple implementation agencies for MGNREGA work, and they differ based on the type of land and other factors - it's the forest department for work on forest land, Gram Panchayat for Commons, and it could also be an NGO partner such as FES. The development plan is common however, and is passed through the Gram Panchayat.

In the Asind block, a learning that emerged was that there was MGNREGA saturation, a view shared by FES as well. MGNREGA began around 2008, and there has already been a lot of construction work already done - roads, ponds, gabions, small dams etc. A lot of the people in the village have job cards but there isn't enough work to fill-in 100 days of employment. However, it wasn't immediately clear if MGNREGA saturation has led to improved lives for the people of Mefaliyas. This point needs to be investigated, and understood in-depth.

Bhilwara - Proposed SE Variables:

Rainfall: Mukangarh village receives good rainfall (600mm) compared to the rest of the district while Asind is the driest.

Irrigation command area: Mukangarhis in the command area of the Jedhpura dam. There are 2-3 canal rotations during the rabi season and this recharges the wells. Hence pressure on the ground water is comparatively less and there is significant double cropping. A water budget approach that does not capture water released from the dam will not accurately capture the social-ecological situation.

The community's approach and commitment towards the governance of Commons: As a theme, this is something that FES gives a lot of importance to - they generally ask the community to demonstrate commitment and eagerness by taking up a small project. For any investment to bear fruit and remain sustainable, the community's involvement remains critical.

Distance from the block office: Remote villages seem to be 'out of sight, out of mind'. The villagers reported how they get fewer visits from officials, fewer NGO intermediaries etc.

MGNREGA saturation: A suitable indicator or proxy may need to be developed.

Influence of conservation policies: LULC mapping can be helpful to contrast changes between forest areas that were left for open grazing, vs. forest areas that were under protection (and looked healthier). This can be used to discuss the influence of different conservation policies with the community.

Vulnerability: Certain communities (e.g. share-croppers or Kelbaliyas) were found to be relatively more vulnerable than others within the villages visited

Bhilwara - Additional Insights:

Mobile Ownership - In the Mandalgarh block, phone ownership seems biased in favour of the men. While most of the women who attended the meeting either had a feature phone or a phone that they had to share with other members in the household, the men had smartphones.

Mining Activities **-** Villagers in the Mandalgarh block shared that sand mining was a major problem in the village. Banas, the local river, used to flow throughout the year, but that has now been affected due to the mining. This is the case in Asind also.

Gaya District - Introduction and Ecology:

Gaya in Bihar has a total of 2,886 villages, spread over 24 blocks. As per the 2011 Census 13.24% people in Gaya live in urban areas while 86.76% in rural areas. 30.39% of the total population belongs to SC and 0.07% to ST. Of the total geographical area of 4,93,774 ha, 46.3% is classified as agricultural land, 15.7% is under forest cover and about 5% is regarded as infertile land. Paddy, Wheat, Moong, Sesame and Sugarcane are some of the major crops grown. It has a subtropical climate with average annual rainfall of 944 mm. June is the hottest month when temperature goes up to 490C while December is the coldest month when temperature goes down to 20C.

Gaya - Insights on Livelihood and MGNREGA:

Group discussions and meetings were conducted in 4 Panchayats in Mohanpur block of the district. Of these locations, the group in Khaddi Panchayat consisted of SC population, in Masaila Panchayat consisted of OBC members, in Guriawa Panchayat was attended by SC population and the group in Khardih panchayat was a good mix of SC and OBC community members. We learned from the community discussions that agriculture, labour and livestock rearing were the main livelihood activities.

In terms of agriculture land ownership 10 to 60 percent of the population in these villages has agricultural land on which share-cropping is also practiced. One community of SCs among the four groups reported that 50% of the households in the village are landless and those who have lands have received it through Bhudaan, the quality of which are poor and got highly fragmented over generations. Members of all the four groups further added that most of the agricultural produce is either for self-consumption or a part of the same is sold to local traders or within the villages itself. Major crops include Paddy, Wheat, Pulses and vegetables like Potato, onions, Chilli, and Brinjals. At least one group reported buying seeds and fertilisers from private shops.

Almost all the communities reported to have livestock consisting of cows, buffalos, oxen, pigs, goats, and one group mentioned raising poultry as well. Pigs and goats are raised mostly by SC and OBCs as these activities are not preferred by socially and economically well off communities. Those who do not have cows reported buying milk for consumption. All the communities use Panchayat's Commons for grazing their livestock.

Three of the communities reported not having any forest nearer than 25 Km of distance and highlighted that availability of firewood is an issue, in place of which at least one of the communities use cow-dung cakes. The only group that reported having forest near their village, further added that 50 acres of the forested land, is now degraded and host to invasive species and Palm trees. This community also mentioned that they get fire-woods from this forest.

Most of the households in three villages have MGNREGA job cards, while one village with a mixed population of OBC and SC reported complete lack of knowledge about MGNREGA, although the women in this group are all members of Bihar SRLM (JEEViKA). Major works done through MGNREGA in the villages where families have job cards are limited to construction of ponds, canals and houses. One community mentioned to avail the scheme for tree plantation. It will further be important to note that all groups reported having no say in raising demands for specific types of work under MGNREGA. They further added that there is no focus on creating structures for irrigation, and on one occasion it was reported that a channel has been constructed with a wrong slope and hasn't been corrected even after repeated requests and follow-ups.

Scarcity of water both for drinking and cultivation is a major concern in all of these villages. The major problems highlighted by the groups in this regards are erratic rainfall, depleting ground water, for which

borewells are not adequate to fetch water, drying of ponds, lack of and no maintenance of canals, no water for drinking especially in summer months, no electricity for using motors to lift water, few handpumps shared amongst several families, limited connection of piped drinking water which fall short of supplying water round the year. It is also important to note that borewell are privately owned and at occasions might be shared with neighbours. With depletion of water resources, the communities also mentioned about using chemical fertilisers and HYV seeds that they highlighted need more water.

Participation of women in Gram Sabhas/ Aam Sabhas are nil to limited, with one group mentioning that they do not know of such Sabhas and directly approach the Sarpanch for any requirements. Migration is high in all the villages including seasonal for agriculture labour to migrating in big cities like Mumbai and Varanasi for full-time employment. Generally the men migrate. All the communities reported improvement in quality of life from earlier, and specified high availability of work/ jobs (including outside the village), better food security, access to concrete houses, better roads and connectivity and improved agricultural yield to be contributing toward the same.

Functionaries like MGNREGA Program Officer, Agriculture Officer, PRI representatives highlight several issues with planning, implementation and sustenance of NRM activities. On one hand these are related to difficulty in planning, especially where interactions between departments, schemes and administrative areas (Panchayats for examples) are involved, while on the other the challenges emerge from lack of broader vision and ambitions of the villagers/ beneficiaries further affected by lack of information for deciding what kinds of work will benefit them and how. These are explained in detail in the SE Variable section below.

Gaya – Proposed SE Variables:

A consolidation of the insights received from the field consultations both with beneficiaries/ villagers and the functionaries highlights the importance of following SE variables to be considered.

Land: Usage, ownership, quality and fragmentation came out as major challenges. Percentage of cultivable lands which are cropped individually and on which share-cropping is practiced can also be considered as a parameter. High fragmentation of privately owned land by SC communities makes them unsuitable for any kinds of interventions, and hence deters the owners to also demand activities on their development and utilization.

Crops – It was noted that in many of the cases crops were grown for self-consumption, selling whatever is left to the local traders. Understanding whether climate-based cropping can improve the scenario may be of help. In this case it will be important to note how much crops cultivated contribute to the earning of such families. One of the functionaries also mentioned that the Govt. is trying to encourage farmers to move beyond cultivating traditional crops and providing seeds and linkage support for lemon grass cultivation. Whether such plan can be facilitated by engaging volunteers from village will be important to take note of.

Livestock and grazing – Since many of the families are into livestock rearing, grazing, although reported to be done in Panchayats' Commons mostly, leads to forest degradations as per villagers' account. One of the functionaries mentioned that plantations are done in grazing lands and results in lows survival of such plantations.

Forest – Forest distances from the communities, availability of resources from the same for the villagers (firewood for example), factors leading to their degradation, location of where plantations are done, spread of invasive species, kinds of trees planted, are highlighted as major parameters to be considered.

Suggestion for planting more fruit trees was provided to make villagers interested in maintain the forests. Allowing of plantations by forest dept. in denuded forest lands and satellite based tools for plantation health monitoring are ways suggested by MGNREGA Program officer.

MGNREGA – Non-availability of work despite having job cards, no say in demanding work, faulty structures, non-maintainance of earlier assets created, limited provisions for working on private lands of SC communities, and limited efforts in diversifying work are some of the major challenges highlighted by the villagers, while functionaries reported lack of clarity to raise demands that would be beneficial, work on Commons influenced by powerful are major aspects that need attention to make MGNREGA planning and implementation useful. It was suggested that GIS and Satellite based tools can be used to plan better, as much as synergies between interaction of schemes/ depts., administrative areas and activities such as farming, forestry, grazing, etc.

Gaya - Additional Insights:

Education: Most members across the four groups have completed schooling till 10th standards, while members above 40 years of age in one specific SC group have nil to limited schooling.

Mobile Ownership: The two SC groups reported to have at least one mobile per household with some households having access to smartphones. The two other groups of OBC and SC, OBC mixed members reported to have both smartphones and feature phones for all households. These community members, including the women know about apps like PhonePe, Paytm and use their phones to consume entertainment centric content.

Socio-ecological variables

A table of SE variables has been created based on the discussions and consolidating the insights gained from the consultations across the four locations. The table can be accessed on this link[8]. The major sections in the table are on:

Agriculture
Water Bodies
Forests
Pastures
Social
Climatic variables
Welfare variables
Interaction between different "systems"

Insights from Community Consultations and the Workshop: Synergies and Scope for Further Learnings –

The broader aim of this first round of the community consultations were to test the assumptions and insights recorded through the multi-partners' workshops to contribute to the development of the MVP

[8] https://docs.google.com/spreadsheets/d/1_ue5FB6KaLYo4BIfV9htzhEFCyy20DVE/edit?usp=sharing&ouid=108558272158063464640&rtpof=true&sd=true

(Minimum Viable Product). The consultations played a critical role to develop in-depth understanding of the socio-ecological variables that are imperative to be considered to develop this community facing tool/MVP, as well as provided a clearer perspective of available data sources, and intersection of existing schemes (like MGNREGA) with NRM activities. This in turn will further be helpful to lay down the protocol for data collection, analyses and converting the same to act as actionable information.

If we map the insights from the workshop with those of the community consultations, we can clearly see synergies in capturing data related to social and ecological variables such as caste-composition, education, primary and secondary livelihoods, prevalent practices around cropping/ farming/grazing and activities contributing to their livelihoods, mobile ownerships, migration patterns and primary reasons, remoteness in terms of distances (and the resultant reduction in visits from government officials). Availability and usage of natural resources for these communities, intersection and interface of existing schemes for NRM activities, use of common lands, processes or lack thereof for forming groups and committees to maintain NRM initiatives and their impact, roles of civil society organisations, and most importantly perspectives and perceptions of the community that exist at the core of the decisions they make and the factors that influence their actions related to NRM, need to be studied and understood in detail.

Most of these indicate that the lines on which the MVP is being planned and developed are fairly placed. At the same time, however, there are questions and areas that will need further deliberation and exploration. For example, activities such as sand mining in specific villages are contextual information that can be considered to be included in indicators affecting water availability and its impact on the villagers' livelihood, alongside considering how NRM and interfacing schemes can address that. It also needs to be explored further whether tools can play a role in shifting traditional livelihood practices, like that of snake-charming, nomadic-pastoralism, which are not only getting less-viable for communities, but also often leave them at the cross-roads of what to do next and how. Are there provisions and options available for such extremely vulnerable communities to make use of tools to demand for land re-distribution and allocation? Another area that came out starkly is a perceived sense of (also backed by data) the fact that activities under MGNREGA attained saturation within geographical peripheries of hamlets and villages. But a question that is currently unanswered is whether the saturation has helped improve the lives of the marginalised. In villages that report MGNREGA saturation, an analysis of who the saturation has benefited, and who it has hasn't, needs to be carried out. This should help calibrate future works to ensure power imbalances are not reinforced.

The same point applies to another critical thing that came out of these consultations. While schemes like MGNREGA have a clear mandate to consider demands of SC/ST and indigenous communities on high priority, and while that has been followed in certain cases, the communities are not sure about how that improved their conditions as compared to earlier times, especially when scope of work on private lands owned by such communities face challenges like extreme fragmentation, and poor soil-quality. Lastly, the consultations highlighted the fact that there are stories of success and challenges that are common across certain communities with similar resources and social compositions. But these stories and insights are limited to the members of the respective communities, or with the CSOs working with them. A Mobile Vaani like interactive voice based platforms for cross-sharing knowledge, experiences and insights can be of help to the communities to learn from peers and practitioners, beside contributing critically to collect periodic data and sharing the same back as findings with the community aiding their perspective building.

Management of forests - a case story from Burundni, Mandalgarh block, Bhilwara

In Burundni village, FES started working with the communities (in the early 2000s) when they showed their eagerness to work on their Commons. A tripartite agreement was made between FES, the forest department and Joint Forest Management (JFM) committees. The village had 600 hectares of forest land. The local people remember the forests for their lushness from 60-70 years ago. However, much of the forests were destroyed by tree cutting over the years.

Under JFM, there is a limitation of 50 hectares as the maximum land that can be handed over to the community for governance. The villagers formed ten institutions, demarcated the land to be governed by each committee and thus began rejuvenating the forests. The JFM committees made rules that included no cutting of trees. And with the technical support provided, by FES, identified areas where a series of check dams and gabion structures were built. In total, close to 200 gabions were built.

The project was so successful that the Forest Department handed over an additional 50 hectares to them to manage.

Close to 200 such gabions were built, to reduce flooding, increase groundwater recharge, and rejuvenate forests

Note: Overall envisioned process:	
1	Landscape boundary, marking of agri/forest/pasture and other land-uses, pre-population of various SE vars from remote sensing and secondary data; these variables are listed under the "aggregate" category in the S2, SE Vars Section
2	Community discussions facilitated by the data above; identify convergence and divergence between the data and community observations
3	Primary data collection; these variables are listed under the "aggregate" category in the S2, SE Vars Section; variables at the hamlet scale may be recorded formally in the social mapping qfield/odk apps
4	Do a situational analysis and loop back to step 2 until a broad strategy is identified with the community on the way forward: what kind of supply/demand side changes should be brought about
5	Additional primary data collection; these variables are listed under the "unit wise" category in the S2, SE Vars Section; can be collected using qfield
6	Planning stage; actual plans with site identification, feasibility assessment, farmer agreement
7	Plan finalization based on efficiency and equity factors; loop back to step 6 until consensus is achieved
9	Plan presented to the Panchayat, government officials; follow-up on the plan for sanctioning and allocation of funds; initiation of work
10	Subsequent assistance for wage payments, fund release, monitoring, etc.
Key Headings For Variables in the Next Sheet_'SE Vars_S2'	
1	Agriculture aggregate
2	Agriculture unit wise
3	Water Bodies - unit wise
4	Forests - aggregate
5	Pastures - aggregate
6	Social - aggregate
7	Climatic variables - aggregate
8	Welfare variables - aggregate
9	Interaction between different "systems"

	Variables	Source	Pre-computed unit	Cues for Community Consultations	Insights from Community Consultations	Applicability of the variable
				Agriculture - aggregate		
1	Rainfall - annual	Remote sensing: JAXA	Micro-watershed	Has rainfall decreased over the years?		
2	Rainfall - fortnightly	Remote sensing: JAXA	Micro-watershed	Is rainfall more erratic and causes dry spells that hamper rainfed agriculture?	Various insights - less rainfall, erratic, non-seasonal, etc.	Flood and drought prediction Crops to be grown based on the rainfall patterns
3	Rainfall - daily	Remote sensing: JAXA	Micro-watershed	Numbers of rainy days to categorize years into low, medium, high rainfall years		To compare between good/bad years; or across different villages
4	Soil conditions	Soil health cards data	Micro-watershed	Is soil degradation happening?	Texture, Depth, Soil pH, Organic carbon, compaction, erosion, fragmentation and quality of land owned by community type; Nutrition present vs nutrition required	Will help farmers plan the right amount of nutrients to use Also for suitability of structures
5	Evapotranspiration - fortnightly	Noah LSM L4 output	Micro-watershed	Has cropping intensity increased? More water guzzling crops being grown?		
6	Runoff - fortnightly	Computed	Micro-watershed	Scope for water recharge structures?		
7	Surface water storage - seasonal	Computed: WIP	Micro-watershed	Usefulness of existing water strorage structures? Excessive silting has rendered them ineffective?	Cubic meter (or mm) of storage available, water level in water bodies, quality (alkaline), sedimentation, algae, etc; Season-wise water availability	Where to build structures or other interventions for improvement. Raise demainds through MGNREGA and other schemes
8	Groundwater recharge - fortnightly	Computed	Micro-watershed	Increased use of borewells due to increased cropping intensity / crop selection / dry spells / less rainfall / drying up of open wells?	Where to build plantations and water bodies	Will help farmers to raise MGNREGA demand accordingly
9	Well depths - annual	CGWB	Watershed	Drying up of open wells? Dropping water levels in wells?	Limited number of wells	

10	Area under cropping - annual	Computed: ML models	Micro-watershed	Has cropping area increased or decreased?	Area under rainfed and irrigated cropping; Type of crops; Estimated production	Help farmers to plan cropping and deal with agriculture oriented issues
11	Cropping intensity - annual	Computed: ML models	Micro-watershed	Has cropping intensity increased or decreased?		
12	Area under horticulture plantations - annual	Computed: ML models	Micro-watershed	Shift towards tree plantations?		
13	Land use and land cover	Computed	Micro-watershed		Relation of change in land use on overall climate change; Forest land used for grazing	Will help farmers understand deforestation, degradation of forest land when used for grazing
14	Terrain potential - one time	Computed: WIP	Micro-watershed	Amount of land suitable for cropping? For tree plantations for income or for soil conservation? Readily or with water structures?		
15	Rabi planning and sown area	Primary data	Hamlet level	How actively is Rabi planning done? Individually or collectively? Increase in Rabi cropping?		Indicator of agri intensification and water use; useful to plan market interventions
16	Collective agri planning	Primary data	Hamlet level	Is crop planning done collectively? For Rabi?		
17	Market linkages	Primary data	Hamlet level	How much of sales? Sales via APMC/local traders/contracts? Individual or coops? Challenges, e.g. remoteness?		
18	Land ownership	Primary data	Hamlet level	Average agri land holding size? How many landless? Absentee landlords? Private/govt./Commons	Social group wise land holdings / lack of land; Encroachments; Fragmentation now and over time	Visualise and understand inequalities
19	Land fragmentation	Primary data	Hamlet level	Land heavily fragmented or segregated?		
20	Water quality	Primary data	Hamlet level	Salinity? Suitability for cropping?		
21	Agri livelihood	Primary data	Hamlet level	Crops grown? Crop yield? How much for subsistence? Average income from sales? Fraction of total income?		
22	Agri nutrition	Primary data	Hamlet level	Kitchen gardens? Self consumption?		
23	Agri diversity	Computed/ Primary data	Micro-watershed	Mix of crops being grown? Risk from single point of failure?		

24	Crop suitability	Computed/ Primary data	Micro-watershed	Crops are suitable for the area, e.g. based on water requirements?		
25	Crop water requirements	Computed/ Primary data	Micro-watershed		Share of cropping under different crop categories (from low water intensive to high water intensive crop types)	Suitability of cropping pattern to water availability
26	Crop choices Historical	Primary data	Hamlet level	Are choices defined by suitability or market?		
27	Agri sustainability	Computed/ Primary data	Micro-watershed	Are the above practices sustainable? Challenges? What can aid a transition?		
28	Government support	Primary data	Hamlet level	Access to government schemes? Awareness? Other challenges, e.g. context specificity?		
29	Collective water planning	Primary data	Hamlet level	Water governance committee? Water use rights?		
30	Command area of canals	Primary data	Micro-watershed		Locations within the command areas may have less dependence on MGNREGA works	Contribute in planning
31	Livestock (milch animals like cow, buffaloes, goats)	Primary data	Hamlet level		Many families have livestocks beside agricultural practices; For own consumption as well to sell locally/to local traders	Predicting diseases, incidences, types Help preparedness to tackle shocks and diseases
32	Crop insurance	Primary data	Hamlet level		Utilization of crop insurance? Disbursement amount by crop vs damage?	Help farmers understand how it can help financially

Agriculture - unit wise						
33	Waterbodies (wells, ponds, reservoirs, canals, checkdams)	Computed	Per-waterbody	Seasonal availability? Uses? Who uses (which hamlet)? Problems, such as drying up, silting, broken bunds?		
34	Horticulture plantations	Computed: WIP	Per-plantation	Plantation health? Problems? Market access? Income?		
35	Cropping fields	Computed	Per-field	Field health? Problems? Market access? Income?		

Water Bodies - unit wise						
36	Individual water bodies to track number of months of water availability	Primary / Computed		Points with location and depth attributes		Equity in access to irrigation
37	Distributional equity in private vs public works	NREGA MIS		Public structures (point locations): DW source locations, percolation tanks, check dams, community ponds etc.; Private structures (point locations): wells, borewells, ponds		Indicator of current storage or use, an input to indicate equity

Forests - aggregate						
38	Forest ownership	Primary data	CFR map, beats map	Level of CFR granted? Under process? No activity? Reasons?		
39	Area under forests - annual	Computed	Forest beats	Has forest area increased or decreased? Illegal logging events? Activities of forest department?		Plantation drive in the long run (wildlife dependency) and species suggestion; Will also help to reduce wild animal attacks
40	Forest health and degradation (tree height, canopy density) - annual	Computed	Forest beats	Logging events? Water problems in the forest? Effect of rainfall changes?	Lack of firewood	Will help planning how to improve the forest/ use the land for any other purpose
41	Forest biodiversity index - annual	Computed	Forest beats	Planned planting of trees? Native trees that have been lost? Percentage of each tree species present in the entire forest		Which plantations and where Highlight endangered species Overall forest prosperity
42	Invasive species	Primary data	Forest beats	Extent? Origin? Steps undertaken to control?		
43	NTFP market linkages	Primary data	Hamlet level	Yield? Portion sold? Income? Portion of total income? Sold via local traders/markets/coops? Challenges?		
44	Other associations with forest	Primary data	Village level	Nutritional? Medicinal? Cultural? Firewood?		
45	Collective forest conservation	Primary data	Village level	Forest conservation committee? Local rules in place? Active? What hinders greater collective planning? What can aid a transition?		
46	Human-animal conflict/ wildlife-crop/forest conflict	Primary data	Village level	Frequent conflicts, e.g. crop destruction, tree destruction, house destruction, deaths?	Species of trees in vicinity of cropped areas - fruit bearing/non-fruit bearing	Will help mitigate conflict with wildlife

Pastures - aggregate						
47	Pasture ownership	Primary data	Hamlet level	Full access to commons land? Ownership problems? Encroachments?		
48	Area under pastures - annual	Computed	Pasture beats	Has pasture area increased or decreased? Seasonal variation?	Availability of pastures; Leading to forest degrations	Will help to plan improving/craeting/maintaining pastures
49	Pasture health - seasonal	Computed: WIP	Pasture beats	Water problems in the pastures? Effect of rainfall changes?		
50	Invasive species	Primary data	Pasture beats	Extent? Origin? Steps undertaken to control?		
51	Pasture usage	Primary data	Hamlet level	Livestock owned? Income? Portion of total income?		
52	Pasture conservation	Primary data	Village level	Rotation across beats for pasture usage? Committee? Local rules? What hinders greater collective planning? What can aid a transition? Fencing? Erosion?		

Social - aggregate						
53	Population by caste	Primary data	Hamlet level	Segregated or mixed villages? Nature of discrimination?		
54	Women-led households	Primary data	Hamlet level	Segregated or mixed?		
55	Remoteness	Primary data/ Computed	Hamlet level	Distance from village center? From panchayat? From block? Road access?	Marginalized areas where officials seldom visit	Highlight areas needing more attention
56	Drinking water	Primary data	Hamlet level	Access? Taste? Acidity? Private/ public	Scarcity in dry months/ summer; Need to buy water tankers; Less piped water; Overhead tanks going dry or with very low water pressure	Help reduce costs for buying tanker-water; Plan for sustainable availability of drinking water
57	Various ameneties: Electrification	Primary data	Hamlet level	Access? Availability? Utilization? Challenges?	No electricity leading to non-usage of motor of cultivation	
58	Education	Primary data	Hamlet level	Primary education? Secondary? College?		
59	Mobile Ownership	Primary data	Hamlet level	Smartphone ownership? Per adult/youth, per household? Gender-wise?		
60	Bonding social capital	Primary data	Hamlet level	Solidarity in the community? Openness for collective planning?		

61	Bridging social capital	Primary data	Hamlet level	Agreements with other hamlets? Conflicts?		
62	Political connectedness	Primary data	Hamlet level	Somebody from the hamlet is a ward member? Panchayat member? Water/forest/pasture committee representative? Administration links? Also segregated by gender?		
63	Awareness and knowledge	Primary data	Hamlet level	Awareness and understanding to be able to plan for improved socio-ecological outcomes?		
64	Working capital	Primary data	Hamlet level	Capital that can be invested to cover for gaps in government/donor sanctioned funds?		
65	Extent of migration Availability of jobs outside	Primary data	Hamlet level	Seasonal? Changing livelihood patterns causing increase in migration? Patterns, age, gender, return migration, Timings when migration is high Trends/ contribution to earning/who	Scopes for traditional livelihoods dwindling; Need to shift livelihoods/ learn new skills; Resource-gaps	Highlights hamlets that need prioritization Possibly help in reverse migration with more revenue in agriculture and work in MGREGA
66	Culturally valued or protected areas, e.g. devrai (sacred groves)	Primary data	Hamlet level			

Climatic variables - aggregate						
67	Heat index	ERA5-Land	Micro-watershed	Increased humidity and discomfort? Effect on livelihood?		
68	Max temperature	ERA5-Land	Micro-watershed	High temperature frequency and intensity increased? Affecting crops/NTFP/pastures? Variability has increased?	Other than effects on crops/water scarity, relation with pest attacks on crops expressed	Will help prepare for any shocks; Max, Min, Average round the year/ monthly forecasts
69	Min temperature	ERA5-Land	Micro-watershed	Low temperature frequency and intensity increased? Affecting crops/NTFP/pastures? Variability has increased?		

70	Rainfall variability	JAXA	Micro-watershed	Has rainfall decreased over the years? Changed its timing? Is it more erratic? Hampers agriculture/NTFP/pastures?	Decreased; Erratic; Non-seasonal	Affects cropping; Will help to be prepared to absorb shocks/ plan for crops/ varieties accordingly
71	Flash drought index	WIP - 2nd phase	Micro-watershed	Increased dry spells with no rain? Need for protective irrigation through borewells and water storage structures?		
72	Drought prone-ness: Government method	JAXA	Micro-watershed	Poor crop yields? Declaration of drought? Compensation from the government? Use of weather insurance policies?		
73	Extreme weather events	Primary data	Village level	Increased frequency of heat waves, cloud bursts, etc?		
74	Future projections of all these variables	TBD	Micro-watershed	Thoughts on risk management for future planning?		
75	Influence on future projections of other agricultural/forest/pasture related aggregate variables	TBD	Micro-watershed	Thoughts on risk management for future planning?		
76	Use of tanker water	Primary data	Hamlet level		Tanker water reported to be brought in to tackle water shortage, especially for drinking; Years this has happened	Understanding and tracking vulnerability owing to water-shortage
77	Sand mining/ other mining activities	Primary data	Micro-watershed		Change of course of river, water presence in the river	Will help community acknowledge the menace of illegal sand mining
Welfare variables - aggregate						
78	Welfare utilization: PDS, NSAP, PM-KISAN, NREGA	Primary data	Hamlet level	For different government schemes and services: Awareness? Utilization? Challenges faced in access? Redressal options?		Application links to websites (if possible); Help with schemes uptake and utilisation
79	Inequity in allocation of NREGA funds	NREGA MIS	Panchayat-level	Problems in utilizing NREGA, e.g. job cards, vendor payments, fear of loss?	Yes. Influenced by Political participation, Awareness, Influential members/Elected members, Social dynamics, Unavailability of resources - like fallow lands/ no land titles	

80	Source of inequity in allocation	NREGA MIS	Panchayat-level	Caste as a factor? Due to poor awareness and mobilization, or actual discrimination? Level of discrimination - panchayat/block?		
81	MGNREGA Saturation	NREGA MIS	Panchayat-level		Several issues: Lack of work, Delays in payments, Lack of maintainance of existing work, Faulty design, No say in demands, No scopes for raising demands - ultra vulnerable communities	Will help to understand: (a) Work sanctioned; community members involved, (b) Type of communities/ people benefitted, (c) Water structures/ plantations vs individual or group land, (d) Indicators to understand saturation, (e) Overall help in raising demands

	Also to investigate: Interaction between different "systems" - forests with agriculture/water, cross-micro-watershed interactions
1	Degradation of forest owing to grazing, or use for firewood
2	Animal-crop conflict owing to presence & absence of fruit bearing trees in the forest
3	Dependence on departments such as forest and irrigation, beyond MGNREGA
4	Effect of fertilizers on drinking water quality
5	Prioritising works for historically deprived communities may continue to be difficult because of inherent inequity in the ownership of resources
6	Milk production depends on cattle health, which can depend on rainfall