

# BUILDING RESILIENCE AND COPING WITH WATER INSECURITY:

An Assessment of a Sustainable Livelihoods Framework in Semi-Arid Maharashtra



Authors

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June 2021



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# Acknowledgement

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We are grateful for the financial support of HSBC Software Development (India) Private Limited. Furthermore, we have received full organizational support and valuable suggestions from Dr. Marcella D'Souza, Director, WOTR Centre for Resilience Studies (WCRoS) and Prakash Keskar, Executive Director of Watershed Organisation Trust (WOTR). We owe them a debt of gratitude. We have received enormous support through reflection from WOTR colleagues- Uditā Sangha, Upasana Koli, Prashant Kalaskar, Santosh

Choudhary, Pradnya Thombre, Bhagyashree Moholkar, Subhash Chindhe, Dipak Zade, Sandeep Sonawane, Arun Dahale, Chintamani More and Lala Savare.

In an extraordinary way, we express our gratitude to the field staff and gram panchayat officials and the people of Mogras, Wanjulshet, Pimpri Pathar, Hivre Korda, Kadwanchi and Kolegaon, village for being a part of this study. Without them, this document would not have been possible.

# Executive Summary

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This report explores the resilience and vulnerability of livelihoods within the context of water security across three different agro-ecological zones- assured rainfall zone, transition zone and scarcity zone.

The study looks into spatial factors such as distance to natural water resources, environmental conditions and access to services that affect rural livelihood activities. The key areas of focus assessed are services obtained through institutional interventions including government schemes (infrastructural development programmes, PDS, MGNREGA, Jalyukt Shivar, others), NGO interventions, or the lack thereof. The impact of these factors on livelihood activities and decisions is a key to understanding the

precariousness of rural livelihoods. A few studies have tried to delve into the fragility of livelihoods using a place- based approach. In doing so, one has to deal with the issue of natural resource availability, and how the underlying socio-political factors impact resource use and access, which in turn determines the resilience or vulnerability of households, both within and between the agro-ecological zones.

The results from this multi-scalar approach suggest that policies need to consider place-specific interventions by incorporating different community typologies and their associated issues of power and equity. Policies addressing issues in a context-specific manner will build and strengthen equitable resilience.

# Introduction

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*'Water Security has always been a societal priority- in its absence, people and economies have remained vulnerable and poor.'*

*- (Grey & Sadoff, 2008)*

Over the past two decades, water security has become a focal point in understanding climate change, development and sustainability issues. Interventions to ensure water security have to consider the myriad factors that affect it, such as population growth, hydrology, migration, over-abstraction of groundwater and enduring stress of climate change (Basu, 2015; Evengard et al., 2011). Therefore, water security is not governed by the physical availability of water alone, but by "its equitable and spatial distribution, sustainable use to meet different needs, and resilience to uncertain and sudden risks that include variability in climate" (Grey & Sadoff, 2007 in Basu, 2015: 48). This study looks closely at the interlinkages between water security and rural livelihoods- the coping strategies and livelihood opportunities are undertaken to overcome water-related poverty and achieve sustainable development pathways. Income-based approaches alone have failed to address how rural households adapt to climate stressors and secure their livelihood (Scoones, 2015). This study reveals the inequalities that underlie access to livelihood opportunities and capital, which are spatially conditioned, perpetuating water insecurity and poverty, limiting the household's ability to cope with external shocks based on a sustainable livelihood approach (see de Sherbinin et al., 2008).

Climate change brings along with it the threat of water insecurity, which disproportionately affects

the poor and marginalized, predominantly the rural households who rely on agriculture for their survival. These pockets of poor and marginalized households are further troubled by the improper governance and management of resources alongside poor infrastructure. To achieve water security, action and response at the community level are essential as these vary both spatially and temporally across a region. The success of interventions depends on considering the local and spatial differences within a region at the individual and community levels. An important social component that should be incorporated in interventions is people's perceptions. Perceptions influence and condition the individual's decision to act or not – whether in the long or short term (Alessa et al., 2008). Perceptions, therefore, form a crucial component of adaptation and coping strategies – which vary according to gender, caste/tribe and even class of the rural households. There are limited studies that look into perceptions and the intersectionality of different adaptation and coping strategies utilized, particularly securing water at the household level (See Basu, 2015).

This paper aims to bridge this gap by investigating the spatial distribution of livelihoods determined by environmental conditions, distance to natural resources and access to services. This study demonstrates how household decisions and strategies to secure livelihoods are situated within a particular type of rural community and

are an outcome of power relations prevalent in society. These power relations affect the agency of individual households and shape perceptions towards adaptation and coping strategies. This study indicates that water security policies and poverty alleviation programmes need to look at community specificities aiming for place-specific interventions to reduce precarity conditions among the rural poor.

### The Sustainable Livelihoods Framework:

Water is increasingly becoming a scarce resource, and improved access to this resource is seen as a prerequisite to poverty reduction and subsequent improvements in rural and urban livelihoods (Sullivan et al., 2010). Water flows through three interlinked systems- a food production system, a hydro-geologic and a livelihood system (Cook and Gichuki 2006). Disruptions, disturbances and even interventions in any one of these systems has ripple effects in the others (Kemp-Bendict et al., 2009). The study takes a closer look at the livelihood system across three agro-ecological regions in semi-arid Maharashtra by drawing on the relationship between water and livelihood.

A livelihood system consists of assets, capabilities, and activities required to ensure the survival of households (Chambers & Conway, 1992; Scoones, 2015). Livelihood strategies deployed

by households are determined by the type of activity engaged in and assets availability. Livelihood strategies do not include income-generating activities alone but also encompass numerous social and cultural choices (Ellis, 2000). Assets refer to the resources that comprise both private and public goods. The private goods or household assets can be broadly categorized into five livelihood capitals - a) natural (private natural resource stocks), b) physical (productive assets), c) financial (liquidities and productive assets), d) human (capabilities and capacities of households), e) social (networks and kinships). Public goods or community capitals are differentiated along with three broad categories of common-pool natural resources, social services (access to social amenities) and productive infrastructures (road networks, markets and industries) (Berchaux et al., 2019). Access to these different assets determines the activities and how households are going to meet their basic needs. A household's ability to ensure its survival, particularly when faced with internal or external shocks, determines its resilience or vulnerability.

At the core of these interlinkages lies the idea of 'how different people in different places live' (Scoones, 2009 in Levine, 2014, p.1). The different living conditions of people forms the basic idea of the sustainable livelihoods framework (SLF). This

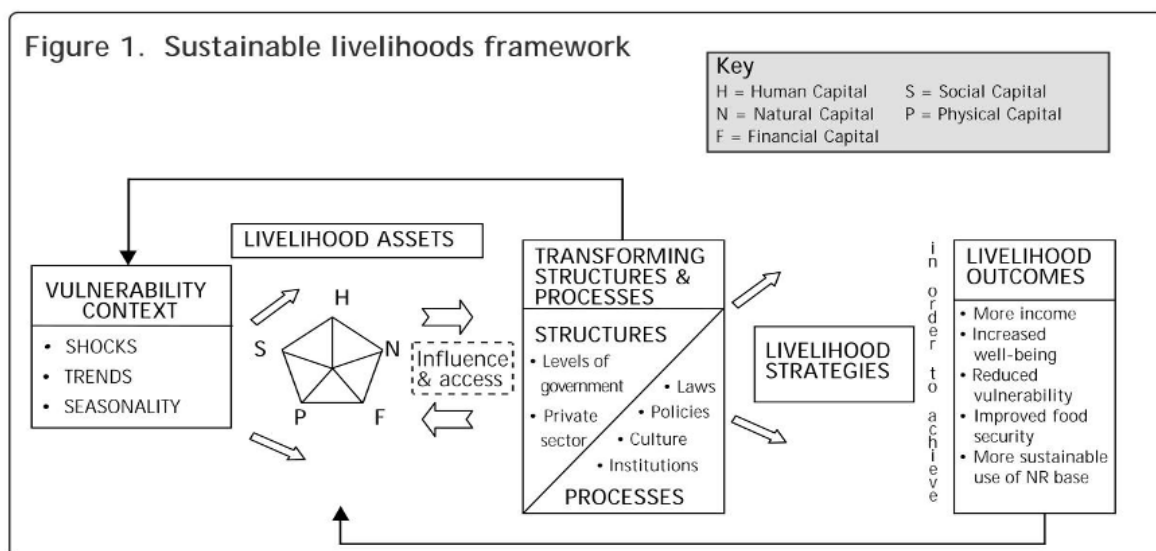


Fig. 1: Sustainable Livelihoods Framework

Source: DFID (1999)

paper draws on the SLF of the UK Department of International Development (DFID, 1999). The SLF framework places people at the centre of the development framework and how best they use their assets within the context of vulnerability to reach their goals.

The livelihoods framework consists of three main components– the vulnerability context, assets (natural, financial, social, human and physical) and policies, institutions and processes. In a standard SLF diagram (Fig. 2), assets and institutional factors shape strategies, and from this, flows of livelihood outcomes. While relevant, this explanation is economically deterministic in nature.

There are significant individual differences between people; the strategies they deploy depend mainly on their perceptions, interest, and

attitudes to risk. Therefore, to understand the link between the various components, it is essential to pay attention to the way people's livelihoods are shaped by different forces (social, economic, institutional and political) and perceptions, thereby incorporating all dimensions of culture, politics and power, also referred to as political economy (Levine, 2015: 8). Combining these components in understanding livelihood as action and outcomes draw us away from the traditional sustainable livelihood framework outlined by DFID. For this study, the ODI modified framework is utilized (Fig. 2).

Incorporating these components in understanding livelihood as action and outcomes draw us away from the traditional sustainable livelihood framework outlined by DFID. Therefore, for this study, the ODI modified framework is utilised (Fig. 2).

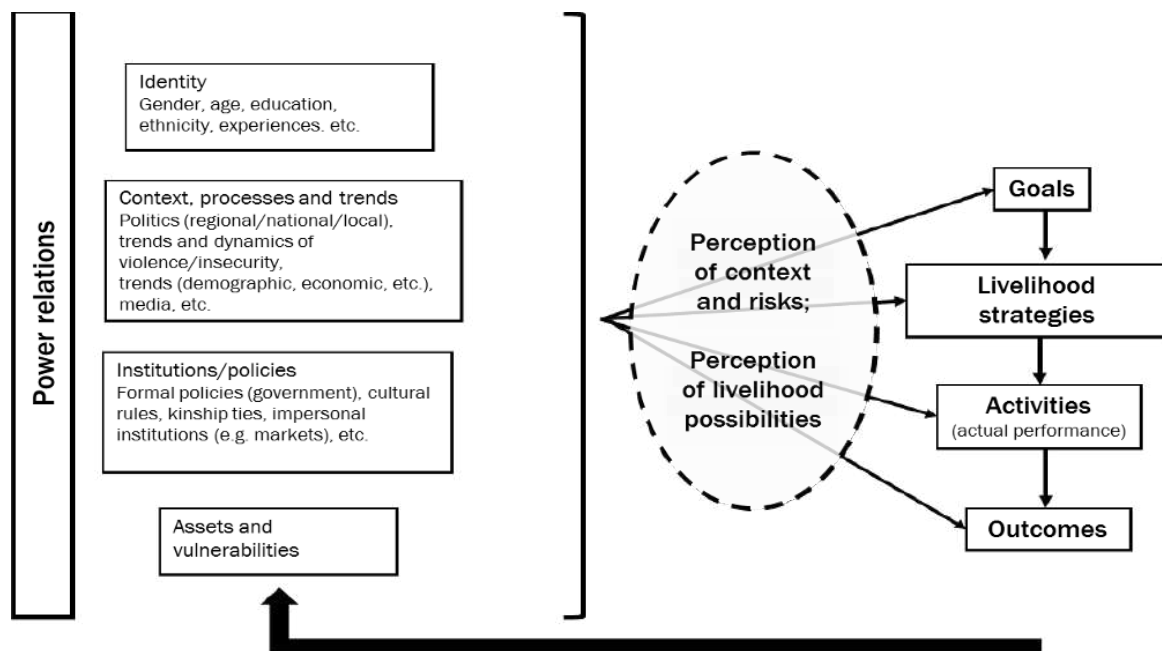


Fig. 2: Operational Map for Research using Sustainable Livelihoods Framework

Source: Levine (2015) p. 10

The livelihood chain from goals to outcomes is highlighted on the right-hand side. The framework, however, incorporates an understanding of power as the driver of specific actions and interventions. In doing so, this framework includes two components of identity and perceptions. First, Identity/subjectivities refer to how people see

themselves and how others perceive themselves (Matin et al., 2018). Identity is seen to influence people's objectives, affecting their opportunities, strategies and livelihood outcomes. This research tries to break away from utilizing a singular identity in determining the factors that shape livelihoods; instead, it proposes the need to



understand the different livelihood outcomes through the lens of intersectionality. The second component of perceptions has not been studied in great detail particularly in the livelihoods framework. Perceptions vary from one individual to the next, affecting both short and long term decision making- in turn determining whether individuals turn to adaptation or coping strategies (Basu, 2015).

With the volatility of crop productivity and agricultural markets, adaptation strategies are few and hard to follow. Very often, farmers turn to coping strategies for immediate quick fixes. Coping strategies are temporary in nature, and households undertake specific actions to survive the undergoing shock (Vogel, 1998). These shocks can be external (environmental hazards, policy changes, market fluctuations) and internal (social rituals, changes in the household composition, health) (Scoones, 2015). Depending on the degree of reversibility, there are three types of shocks- 1) Reversible mechanism (such as temporary activity shifts), 2) Erosive mechanism (disposal of

assets for survival such as selling off one's own land), 3) Destitution (unemployment, distress migration). A closer look at country-level statistics shed further light on these mechanisms and the vulnerability of the poor. In India, the percentage of farmers with land access rights fell from 72 to 45 per cent from 1951 to 2011, and landless agricultural labourers increased from 28 to 55 per cent for the same period (Indian Ministry of Labour and Employment, 2015). The rise of landless labourers suggests using erosive coping strategies to overcome any agricultural shock (Williams et al., 2016). The purpose of highlighting adaption and different coping strategies is to understand that people's actions are conditioned by their perceptions. People's perceptions are not random but are usually shaped by their identity, relative power and wealth, abilities, how they are treated by institutions and policies, spatial factors and so on (Levine, 2014, Berchoux, 2019). Therefore, the primary goal of this paper is to understand how local perceptions of water security and the multi-scalar relations of power determine action and sustainability.

# Methodology and Study Area

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The approach taken in this paper is the sustainable livelihoods framework (SLF). It highlights how different components, under varied socio-political and ecological contexts, generate vulnerability or build resilient communities<sup>1</sup>. For this purpose, three distinct agro-ecological zones were identified in the state of Maharashtra - the assured rainfall zone, the transition zone and the scarcity zone. The purpose behind selecting these three regions was to determine how apart from climate vagaries and the natural availability of water in the region, socio-economic and political structures play a role in the livelihood system.

A total of 6 villages were selected, two from each site, where each region is exposed to multiple stressors, which are both climatic and non-climatic in nature. These shocks are a threat to the rural population that relies primarily on agriculture for its survival.

The first agro-ecological zone is the transition zone 2 (henceforth referred to as transition zone). Here the two villages selected are Wanjulshet and Mogras. Wanjulshet is located in the tehsil of Akola. In this village, the Scheduled Tribe (ST) population accounts for 76.3 per cent, Scheduled Caste (SC) 4.35 per cent and 19.2 per cent accounts for General, OBC and others. This high ST population brings along with it a lower literacy rate at 68.2 per cent. Mogras, also in Akola tehsil has a total ST population of 14.7 per cent, SC population of 7.17 per cent and 78.09 per cent

General, OBC and others. The transition zone receives an annual rainfall ranging from 700mm to 1200mm mainly during the SW monsoons. This region comes under the Western Hilly region of Maharashtra. Wanjulshet is a village where watershed development has taken place, promoting soil and water conservation. Mogras, on the other hand, has had one check dam constructed by the department, which now lies in a dilapidated condition. Under these disparate conditions, what livelihood actions do individuals engage in to secure their survival?

The second is the scarcity zone, where two villages Hivre Korda and Pimpri Pathar, were selected. Hivre Korda is located in the Parner Taluka of Ahmednagar district. Under the pressures of agrarian distress, this village has diversified its activities and modified agricultural practices to address the water shortages experienced in the region, including drip irrigation and multi-crop farming. Pimpri Pathar, also located in Parner taluka, is a village reeling under the effects of acute water shortages and agrarian distress with cases of farmer suicides. To battle water shortage, farmers are turning to bore wells and farm ponds, resulting in the rising indebtedness of farmers across all classes.

The third agro-ecological zone is the assured rainfall zone that receives close to 700-900 mm of rainfall annually. The primary crops cultivated in this region are cotton, pulses, vegetables,

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<sup>1</sup> While a key component of the SLF is providing an estimate of assets, this qualitative study does not go into the quantification of different assets. The approach looks at identifying and addressing the multi-scalar power relations that give rise to different livelihood outcomes which is a fundamental precursor in determining water security and management decisions.

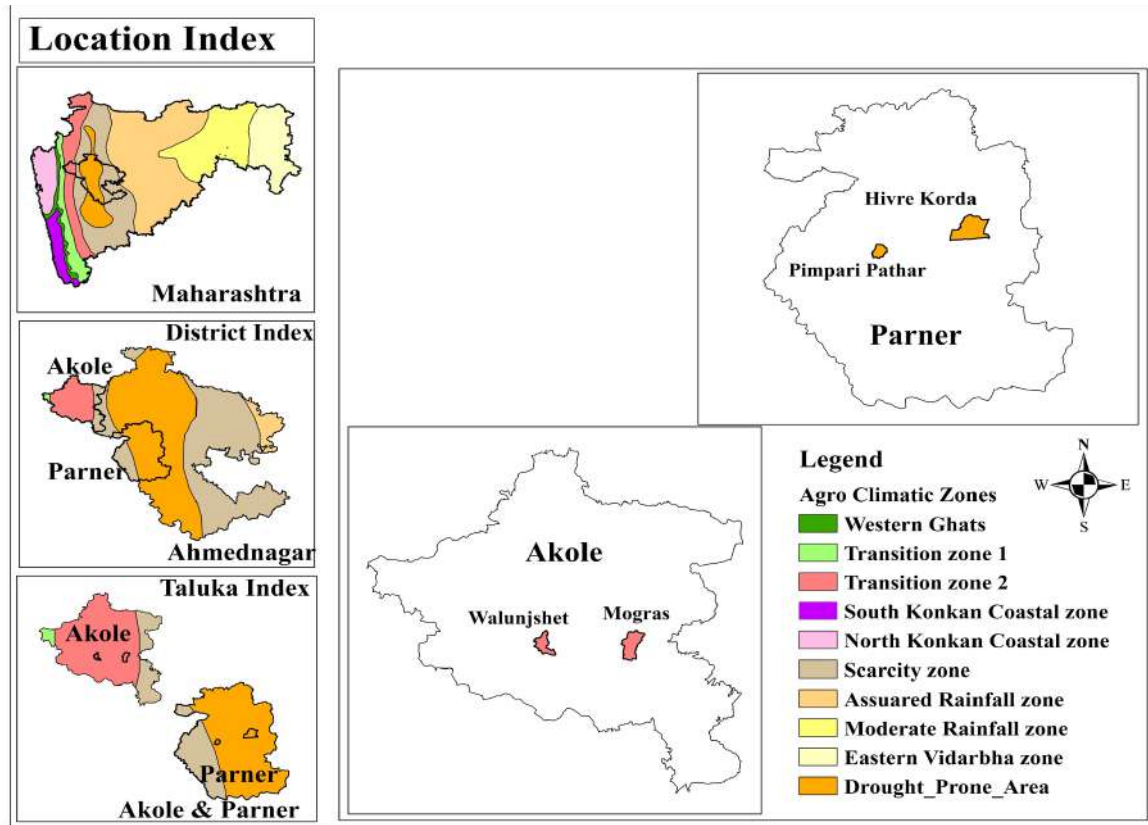


Fig. 3: Location Map of Scarcity and Transition Zone

Source: (R & D Section, GSDA, Pune.)

grapes and other fruits. Kadwanchi and Kolegaon were selected from the assured rainfall zone. Kadwanchi is known for its [water intensive] grape

cultivation, a high income-generating crop that transformed farmers' livelihoods engaging in this practice. The village Kolegaon is experimenting

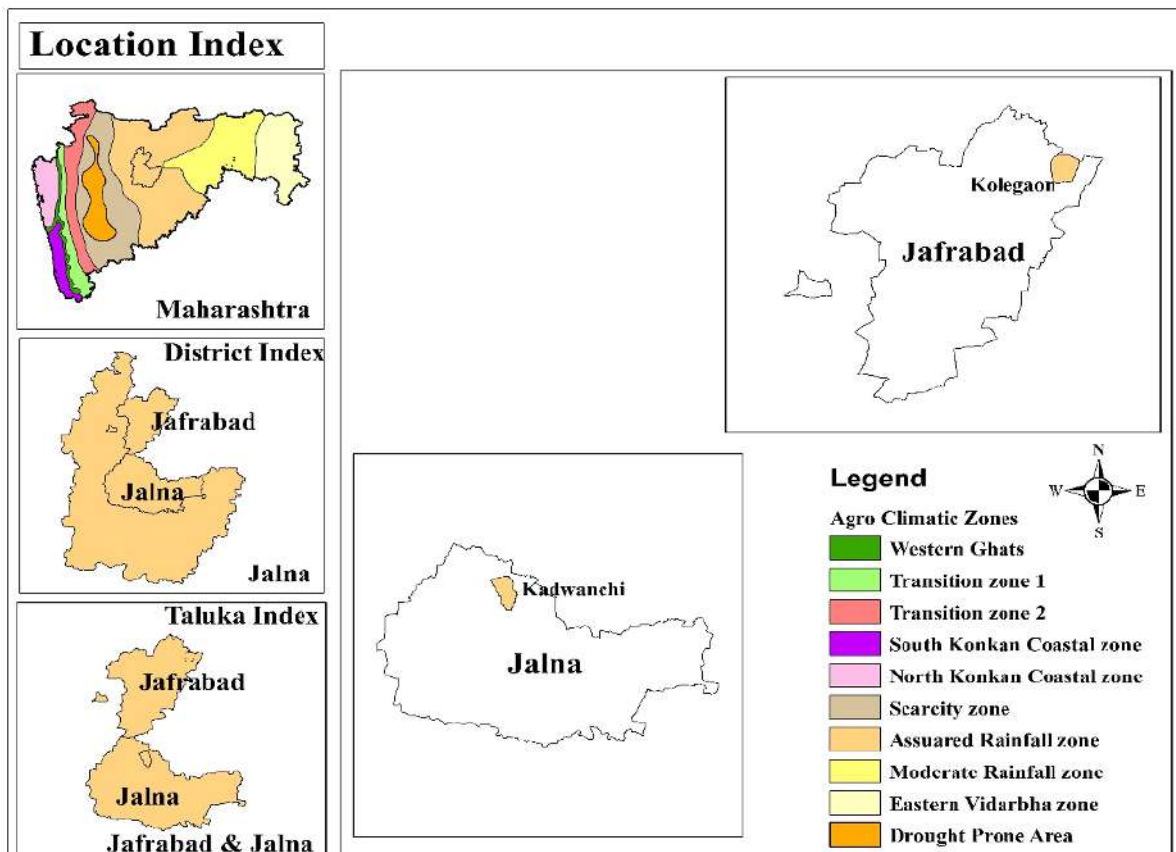


Fig. 4: Location Map of Assured Rainfall Zone

Source: Author's Own (2020)

with water budgeting and crop planning to cope with recurring droughts and counter the unregulated extraction of groundwater in the region.

A purposive, quasi-random sampling design methodology was used to collect the data for this study. The purpose was to obtain a 'heterogeneous sample' to ensure that the selected participants represent maximum variability in diverse characteristics of cultural identities, gender, socio-

economic status, ownership to water resources and landholding size. In addition, the diverse nature of the data allows for an analysis through the lens of intersectionality.

A total of 43 semi-structured in-depth interviews were conducted in the three agro-ecological zones. Fourteen were from the assured rainfall zone, twelve from the transition zone and seventeen from the scarcity zone.

**Table 1: Sample Distribution for different agro-ecological zones**

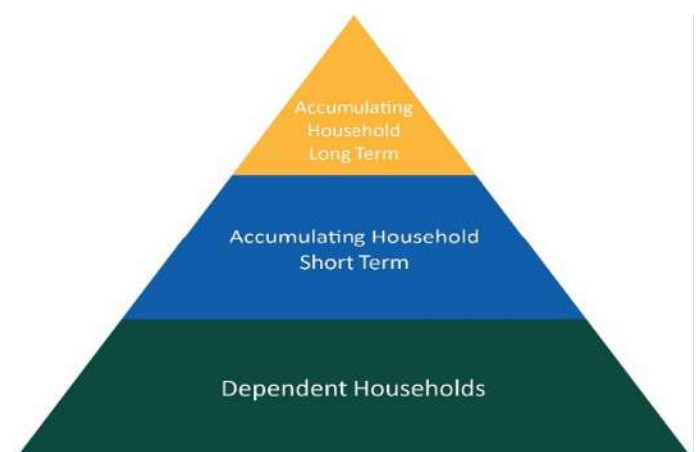
*Source: Author's Own (2020)*

| Agro-Ecological Zones | Village       | Sample size |
|-----------------------|---------------|-------------|
| Transition            | Mogras        | 4           |
|                       | Wanjulshet    | 8           |
| Scarcity              | Pimpri Pathar | 9           |
|                       | Hivre Korda   | 8           |
| Assured rainfall      | Kadwanchi     | 6           |
|                       | Kolegaon      |             |
| <b>Total</b>          |               | <b>4343</b> |

In each agro-ecological zone, two villages were selected to conduct the interviews. Women representation in the sample is around 49 per cent. Out of the total 43 respondents, seven are landless households, nine marginal, six small, eight medium and twelve are large landowning households.

The interviews were recorded after taking consent from the respondents. The raw audio data files were initially transcribed and then translated into English to obtain a high data accuracy. Finally, these interviews were coded, and the qualitative data were extracted and analysed from this.

To obtain a multi-scalar analysis of how power relations drive livelihood outcomes, the data was further disaggregated into different household clusters. These are identified as follows-



**Fig. 5: Household clusters**

*Source: Author's Own (2020)*



Two key factors were taken into consideration when identifying the different households- land and livestock ownership. Accumulating long term households consist of farmers with landholding size above 5 hectares. Accumulating short-term households are primarily medium farmers with a landholding size of 2-5 hectares. While accumulating capital, the latter households can

only do so for a short period, making them prone to external shocks and stressors. The third category is dependent households, which rely on insecure, oppressive and scarce wage employment. This category consists of small, marginal farmers and landless labourers. This category comprises the majority of households in all three regions.

# Findings

In this chapter, agriculture, water infrastructures, livelihood actions and climate perception across regions is studied. It is observed that the available irrigation sources alter the livelihood strategies in different types of households and the impacts of climate change also vary for different household categories.

## Agriculture Water Infrastructures

Different types of household clusters have access to various sources of water for agriculture. Fig 6 highlights the household cluster wise sources for each zone. Transition zone villages have the advantage of having water sources near the village. The mountainous terrain in the zone makes lift irrigation from streams and rivulets an

essential source of water. Own wells and farm ponds are the substitute sources of water in the transition zone. Dependent and short-term accumulating households from the scarcity zone have minimal access to the water sources; hence farmers perform rainfed agriculture. However, in the same zone, the long-term accumulating households have multiple sources of water, which provides better water security. There is extensive use of farm ponds across all three household clusters in the assured rainfall zone. However, it is primarily the long-term accumulating households with access to both financial and physical assets which can construct and reap the benefits of farm ponds. However, despite these multiple water sources, households still need to bring in water

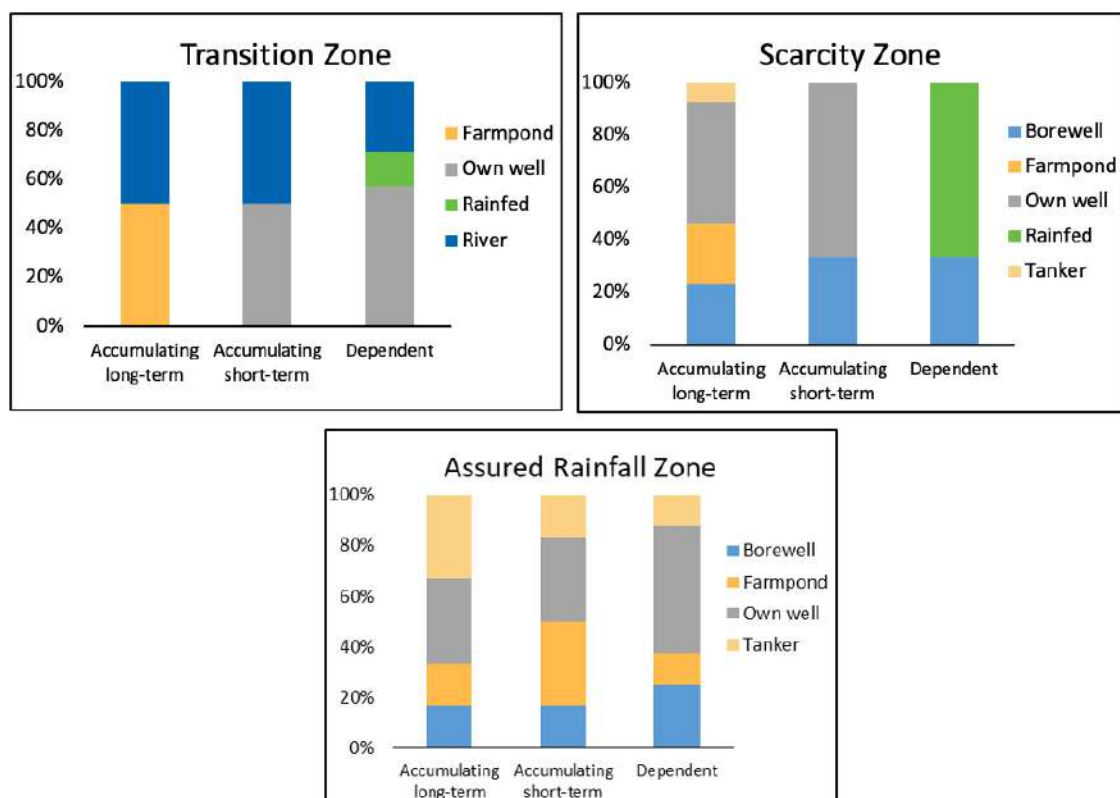


Fig. 6: Agriculture Water Infrastructures utilized across the three agro-ecological zones

Source: Author's Own (2020)

tankers to make up for water shortages during drought-like situations.

During drought situations the gram panchayat brings in water tankers in the assured rainfall and scarcity zones<sup>2</sup> to counter acute drinking water shortages. While the gram panchayats are known to take such initiatives, long-term accumulating households with financial assets bring private water tankers to overcome any shortfalls for agriculture, livestock, and domestic purposes. Such cases were observed in the scarcity and assured rainfall zones to a much greater extent than the transition zone. Short-term accumulating households are also known to purchase water tankers at exorbitant rates, which often push these farmers into severe debt. It is estimated that in Maharashtra, approximately 94% of water tankers are privately purchased, whereas only 6 % are obtained from the government (Marar, 2019)<sup>3</sup>. The data above highlights that to maintain rural livelihoods, especially those dependent on agriculture and animal husbandry, all the three household clusters have to rely on obtaining water from multiple sources. The natural availability alone cannot help explain what drives people to take up water-saving technologies and certain livelihood trajectories. The socio-political and economic conditions that shape an individual's decision are just as crucial if one is to understand what triggers certain behaviours and outcomes.

The following sections address the various components that drive livelihood outcomes towards resilience or vulnerability by tracing livelihood pathways.

### **Livelihood Actions- Past and Present:**

Under the pressures of increasing water scarcity, rural farming households diversify their portfolios (Smiley 2016; Ranganathan et al., 2018). While

arguments are present for labour to diversify and move out of low productive agricultural activities (Djurfeldt & Djurfeldt, 2013) to further the economy's growth, the choices available for such diversification are not always welfare-enhancing (Ranganathan, 2018). In the three agro-ecological regions, the primary activities are related to farming and agricultural labour. However, with the variegated impact of water scarcity in the region, many turn to low paying non-farm activities eg. Tailoring, driving, small scale businesses and distress migration to cities.

In the three different agro-ecological regions, the spatial and temporal variability of rainfall affects livelihood activities. Rural households turn to alternate water sources to deal with water scarcity issues, which are government promoted farm ponds, tankers, and community wells, depending on the type of household category, as discussed in the section above. Thus, in the three agro-ecological zones, livelihood trajectories vary for the different household clusters.

In the transition zone, accumulating households, both long and short term, identifies cattle rearing as essential in improving household conditions. Dependent households in the transition zone are moving towards their cultivation. However, the region's hilly terrain makes it difficult for households distant from a source to access water. Limited access to land and water often results in the produced grain used for household consumption rather than sales in the market.

<sup>2</sup> There are instances that instead of waiting for the gram panchayat to send water tankers, the village as a whole has come together to distribute water amongst themselves.

<sup>3</sup> The state ministry of water supply and sanitation records show that a total of 3117 tankers had supplied water to 2485 villages in the Marathwada, Nashik and Pune region (Marar, 2019)

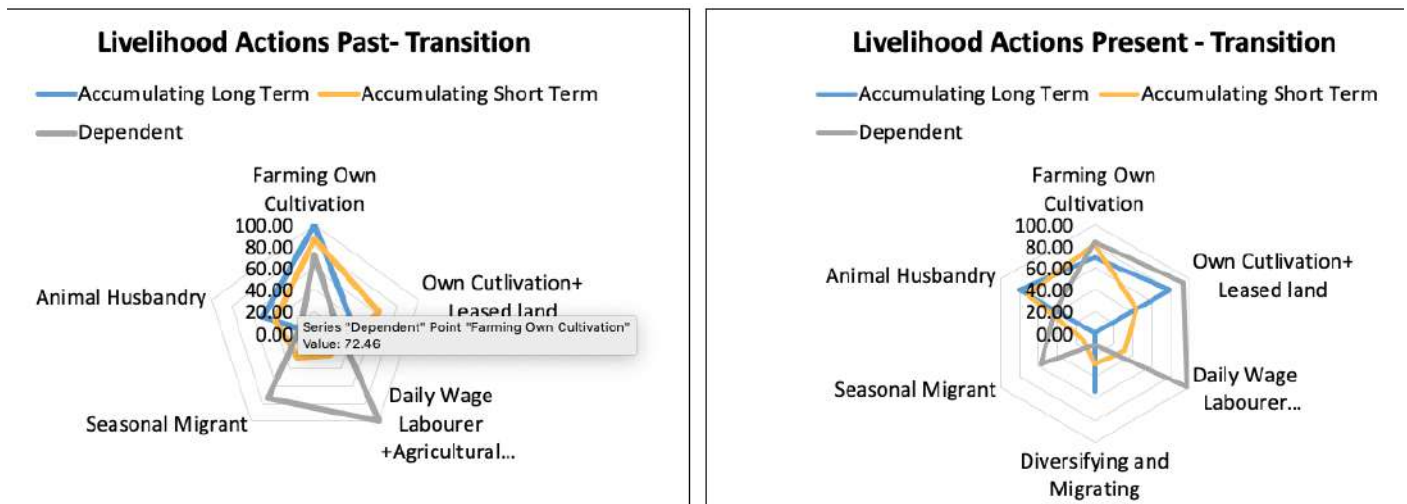


Fig. 7: Livelihood Actions in Transition Zone

Source: Author's Own (2020)

Livelihood actions in the scarcity zone highlight a slightly different picture than the assured rainfall and transition zone. Alongside farming, cattle rearing was a livelihood activity undertaken

by both the long and short-term accumulating households. However, the lack of continued access to water resulted in a move away from this activity.

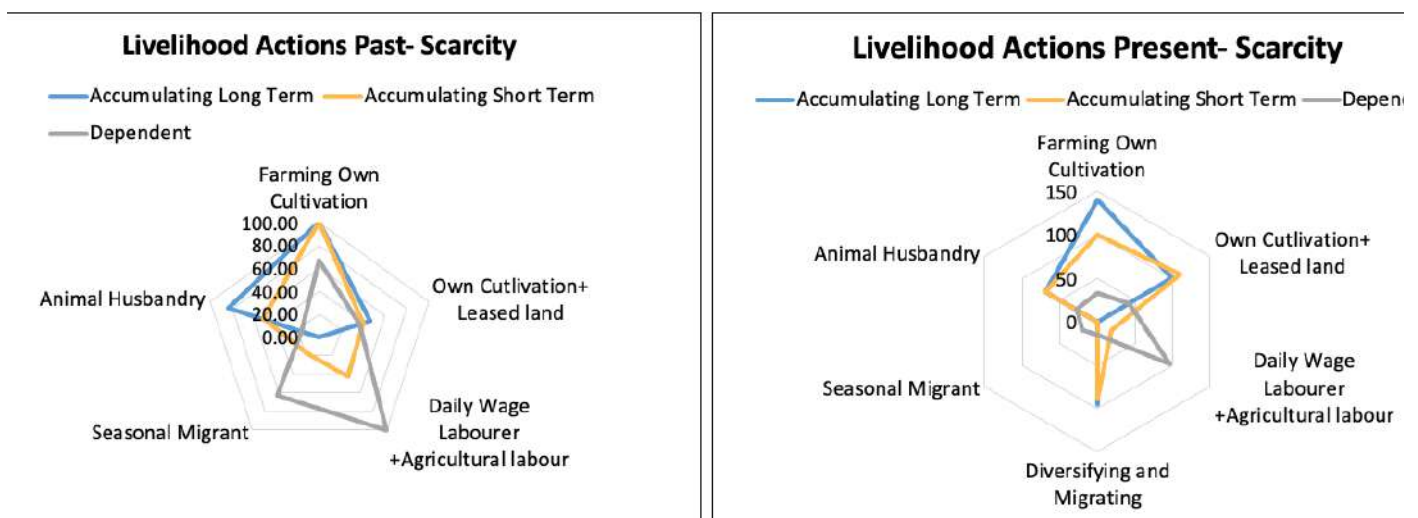


Fig. 8: Livelihood Actions in Scarcity Zone

Source: Author's Own (2020)

Erratic rainfall patterns and increased groundwater extraction for agriculture, particularly in Pimpri Pathar, brought along a reduction in water levels, and people moved away from cattle rearing businesses. In Hivre Korda, to counter the increasing water shortages, both long and short-term accumulating households engage in a diverse set of activities, such as small grocery shops and making muzzles for cattle. These activities are extended to dependent households, resulting in a steep drop in seasonal migration.

People stated that daily wage tasks in and around the village help them. In areas where watershed development has taken place, agricultural work is available to them for longer periods in the year. Moreover, many of those who belong to the Scheduled Caste community in the region receive orders from a nearby factory to make decorative items for the cattle, where they earn Rs.300- 400 per day. However, an important sentiment among many is that they do not wish to stay away from their families. Shravan, a 26-year-old daily wage



labourer who belongs to the SC community, says-

*"It is difficult to leave one's family behind for long periods of time. So, I would rather look for jobs in and around the area. Though it is difficult, with every family member working, we try to make ends meet. My mother works in a factory, my wife is an agricultural labourer, and I make decorative pieces for cattle... at least my family is together."*

While alternate forms of employment are available, as they are contract-based, it is difficult to generate employment all year round. During periods of severe water shortage, dependent households, in particular, lose out on agricultural labour days, which adds to their household poverty. Not having recourse to any other form of employment, dependent households rely on money lenders and loans from SHGs for their survival. Therefore, taking loans becomes a vital coping strategy for addressing poverty (see

Lerche, 2010).

In the assured rainfall zone, dependent households rely primarily on daily wage labour to survive, including farm and non-farm work. With the rise in groundwater extraction, small and marginal farmers rely on agricultural production on their land and leased land. This is to meet market demands and is a move towards self-sustenance. Short-term accumulating households rely on production from their own land. However, both short-term and long-term accumulating households have also moved towards cattle rearing. This usually involves large stables with crossbred cows, producing close to 20 litres of milk per day per cow. The cross bred cows have resulted in an increase in household income for both short and long-term accumulating households.

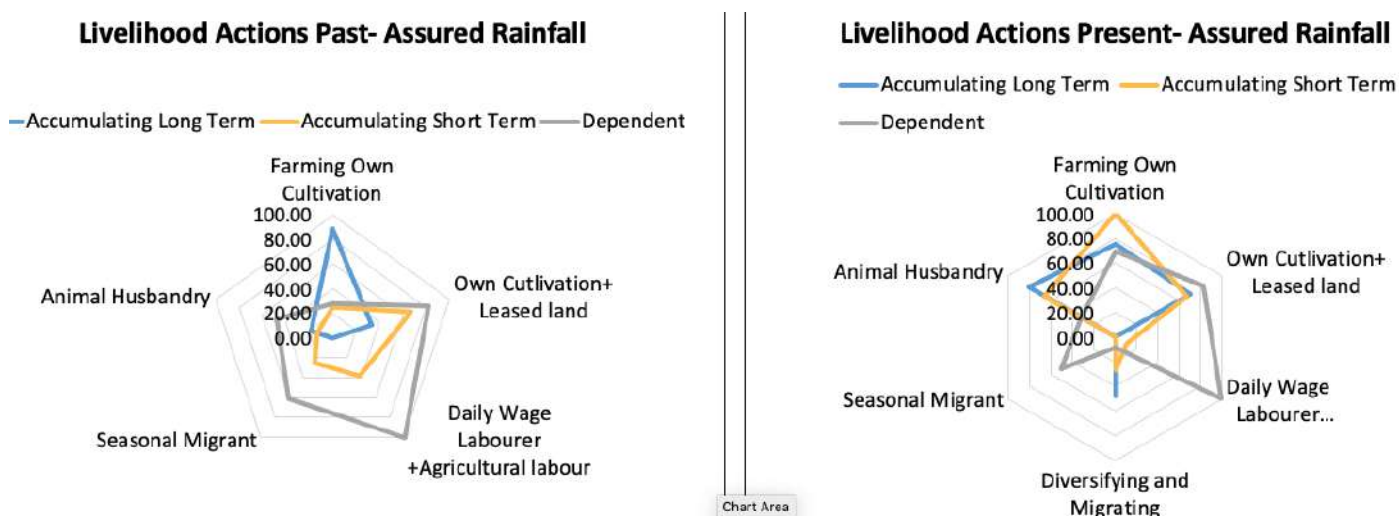


Fig. 9: Livelihood Actions in Assured Rainfall Zone

Source: Author's Own (2020)

While cattle rearing has gained importance, farming is still an important income source for long-term accumulating households. This is particularly true for farmers in Kadwanchi, where large scale grape cultivation has brought prosperity to the farmers. Such growth is not

without its problems. The benefits of grape cultivation are reaped predominantly by the long-term accumulating households with control over and access to land and water resources, allowing them to diversify income-generating activities.

## Climate Perception

Apart from coping and adaptation strategies to secure livelihoods being driven by external institutional interventions, environmental,

political and socio-economic factors, decisions are also driven by people's perceptions of their experience of the climate.

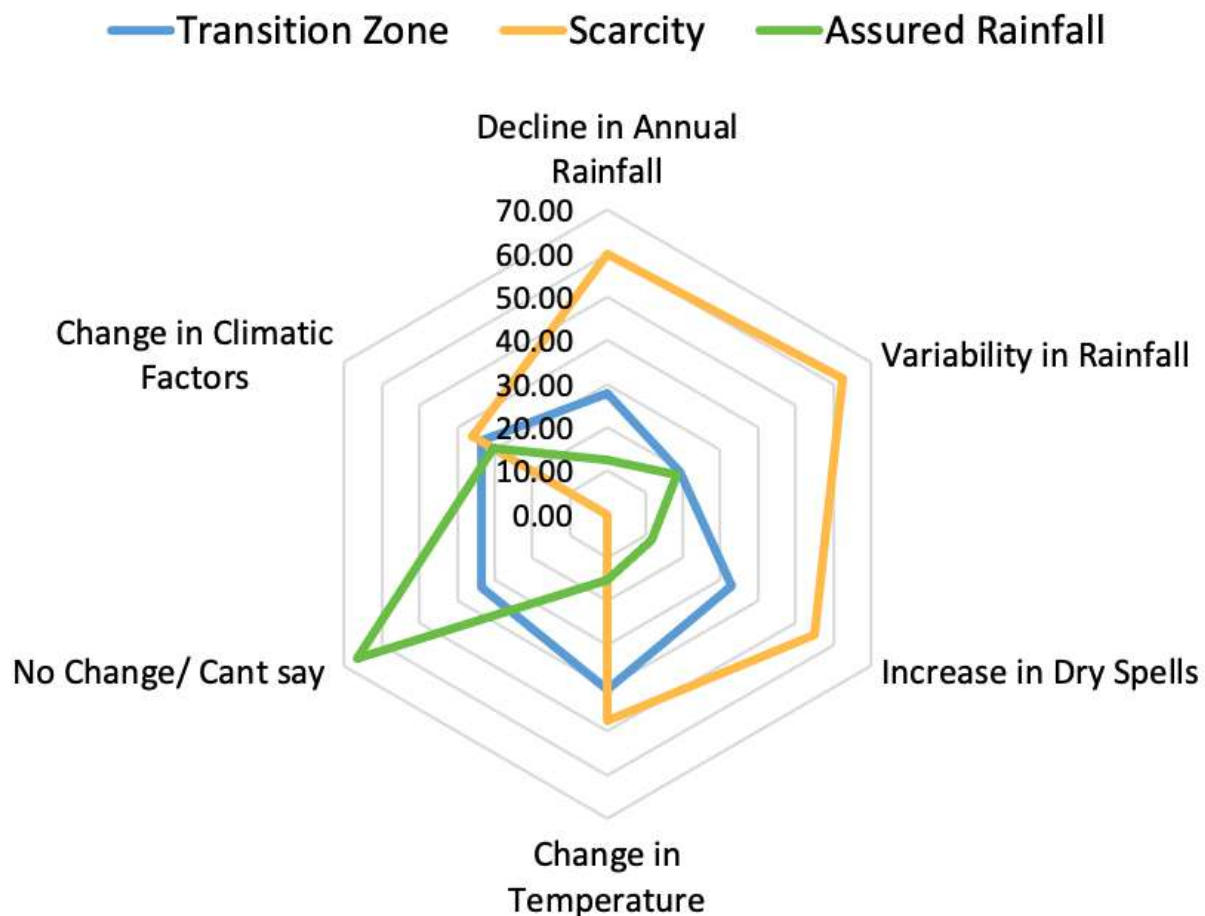


Fig. 10: Agro-ecological Zone-based Climate Perceptions

Source: Author's Own (2020)

The chart above (Fig 10) shows varying perceptions regarding climate change in households of the three agro-ecological zones. There is a clear understanding of the environmental changes for the scarcity zone, such as decline/ variability in rainfall, increase in dry spells and changes in the temperature (with longer periods of higher temperatures) that impacts the livelihood strategies of all three households clusters. In comparison, the assured rainfall and transition zones receive more rainfall and have access to water, which affects their perception of the climatic distortions that might be occurring. In the assured rainfall zone, droughts are at times treated as anomalies. The following section identifies how climate and its impact on water

availability affects perceptions and in turn the livelihood related actions and outcomes.

To understand the rationale behind why the different household types take up different livelihood actions, one needs to look further into the livelihood challenges communities face and their resultant livelihood outcomes. These challenges, actions and results are discussed in the following section to construct a sustainable livelihoods framework map.

# Discussion

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This paper attempts to put forward a geographical perspective of livelihood systems when faced with a multitude of shocks and stressors and their impact on livelihood activities. The results largely suggest that those who belong to the long-term accumulating households are more resilient to the different shocks across the three agro-ecological regions, be they environmental, market or institutional. Food security and economic welfare continue to remain the key livelihood goals for the long-term accumulating households, particularly having access to assets such as land, water, and labour, which allows for more stable livelihoods- whether cultivation

or self-employment. Households that are more vulnerable to shocks engage in more precarious livelihood activities, agricultural labour being one of them. Therefore, access to these two essential resources can significantly reduce the likelihood of communities dependent on agricultural labour, or even be driven to unemployment. However, access to these assets alone does not solve the problem of vulnerability and precarity. The following livelihood maps will highlight how power relations are driven through identity, socio-economic processes, policies, and institutions that affect livelihood outcomes for different communities.

### Livelihood pathways in the transition zone:

In the transition zone, the vulnerability context consists of six factors: declining rainfall, water scarcity, crop loss, market volatility, lack of income, lack of transport.

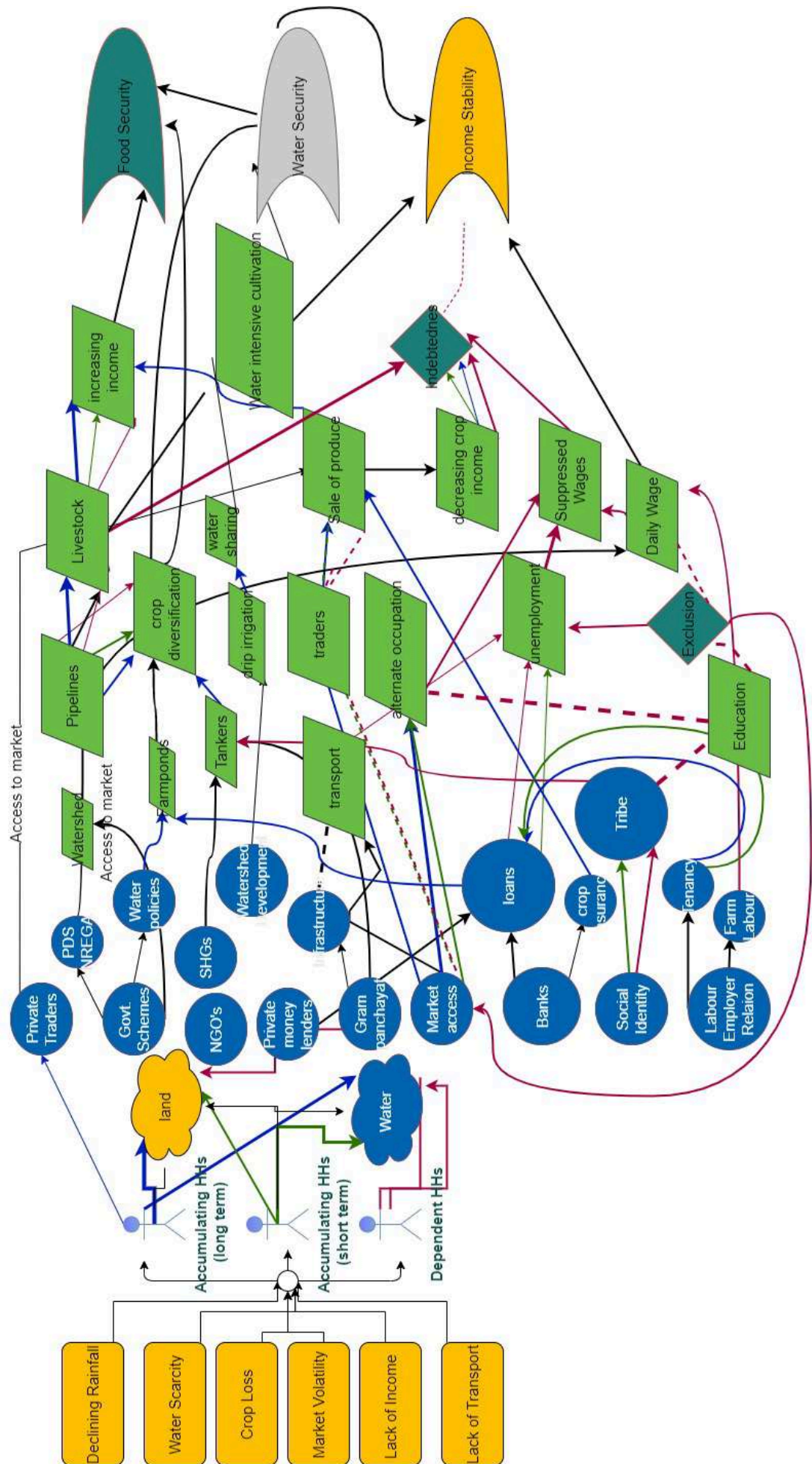


Fig. 11: Livelihood Pathways, Transition Zone

Source: Author's Own (2020)



Market volatility in this region is controlled through the presence of private traders. Households (usually the long term accumulating households) access the market through private traders. For the long term accumulating household, the relation with private traders is a trader-supplier one. Information about market rates and product availability determine profits for both. For dependent households, this relationship is far more asymmetrical, with greater power in the hands of the traders. These households have limited networks, hence limited bargaining capacity. The sale of produced grain is often determined by the demands of the private traders, especially where these private traders provide dependent households loans for cultivation. The hilly topography and poor transport infrastructure further increase the dependence on private traders. Along with this, private money lenders are also an important conduit to procure loans for cultivation. Among the dependent household category, further disaggregation is required in the transition zone, predominantly an ST population, where the caste/ tribe positionality determines their livelihood actions.

In both Wanjulshet and Mogras, pipelines are a vital water infrastructure. Those further away from the water bodies spend more money on pipelines. In 1990, the Mogras gram panchayat, with government support, dug one well along the banks of the Mula river and lifted water from there to the village water distribution tank to address the drinking water needs in the village. By taking this as an example both the short and long-term accumulating households came together in groups to install pipelines by sharing expenses between themselves. At present, 15 groups have installed pipelines from the river. Each pipeline costs around 17 to 18 lakhs to cover the stretch of 4-5 kms. Apart from the installation costs, there is an annual maintenance cost of Rs. 10000-15000/-. With such high infrastructural costs, dependent households, especially those from the SC and ST communities, cannot access water regularly. They

have to rely on tankers and wells. In Wanjulshet, the tribal population face a similar problem; the infrastructural cost of installing pipeline is ranging from 3 to 4 lakhs, has resulted in growing indebtedness. Moreover, with paddy being the primary crop in the region, water consumption is also high. In addition to this, dependent households from the ST community brought to light the power struggles with the bureaucracy as an impending problem. Ashok, a 28-year-old, a farmer from the ST community, says-

***“My agricultural land is not very far from the dam, approximately 3 kms uphill. The neighbouring village is supposed to release water at a set time so that we can use this to irrigate our fields. However, the local MLA only releases the water on time if we pay him in advance. There have been times when some families have refused to pay or delayed in making the payment. Only after the money is received, the water is released for the village. Such delays have resulted in massive crop loss for us. Many families have suffered huge losses. To avoid such situations, we pay the people responsible for releasing water to our village. It is one way of protecting our livelihoods.”***

For Ashok, his tribal identity places limits on how he can negotiate with the bureaucracy, which usually consists of people higher up in the caste hierarchy. Also, for the tribal community, lack of education is an additional hindrance to any form of vertical mobility in the occupational hierarchy. Like Ashok, many others have barely completed secondary level education, with women completing the primary level. This places limitations on the type/nature of alternate livelihoods they can access, where they are bound to low skilled jobs at suppressed wages. Unlike in other regions, where the youth are moving away from agriculture in search of better-paying jobs, tribal communities see agriculture as their primary source of livelihood. Many households like Ashok's send their children to school but are resigned to the ideas that just like

them, their children will also take up cultivation and agricultural wage work. Their tribal identity restricts the extent to which they can dream of a better life for their children.

The work of NGOs is prevalent in this region. The impact is visible directly and indirectly. In Wanjulshet, WOTR implemented a watershed project under the Indo-German Watershed Development Program. This activity brought the entire village community together, where people's participation transformed the landscape, in stark contrast to its neighbouring, much drier areas. This allowed for the implementation of water-saving technologies such as drip

irrigation and water sharing. While Mogras is not an intervention village under WOTR, the village heard of water conservation success in Wanjulshet. All three household clusters in Mogras mentioned the benefits they had received in using drip irrigation technologies. However, these are not widely implemented through the gram panchayat. Respondents from Mogras said that if interventions such as WSD and related activities take place, then it will be easy to get people in the villages to work together. People's active participation is vital in the success of such programmes. While the efforts come from the people themselves, they still look out to external institutions to transform the region.

Livelihood pathways in the Scarcity Zone:

The vulnerability context in the scarcity zone highlights four key components- declining or variable rainfall, crop loss, market volatility and lack of employment.

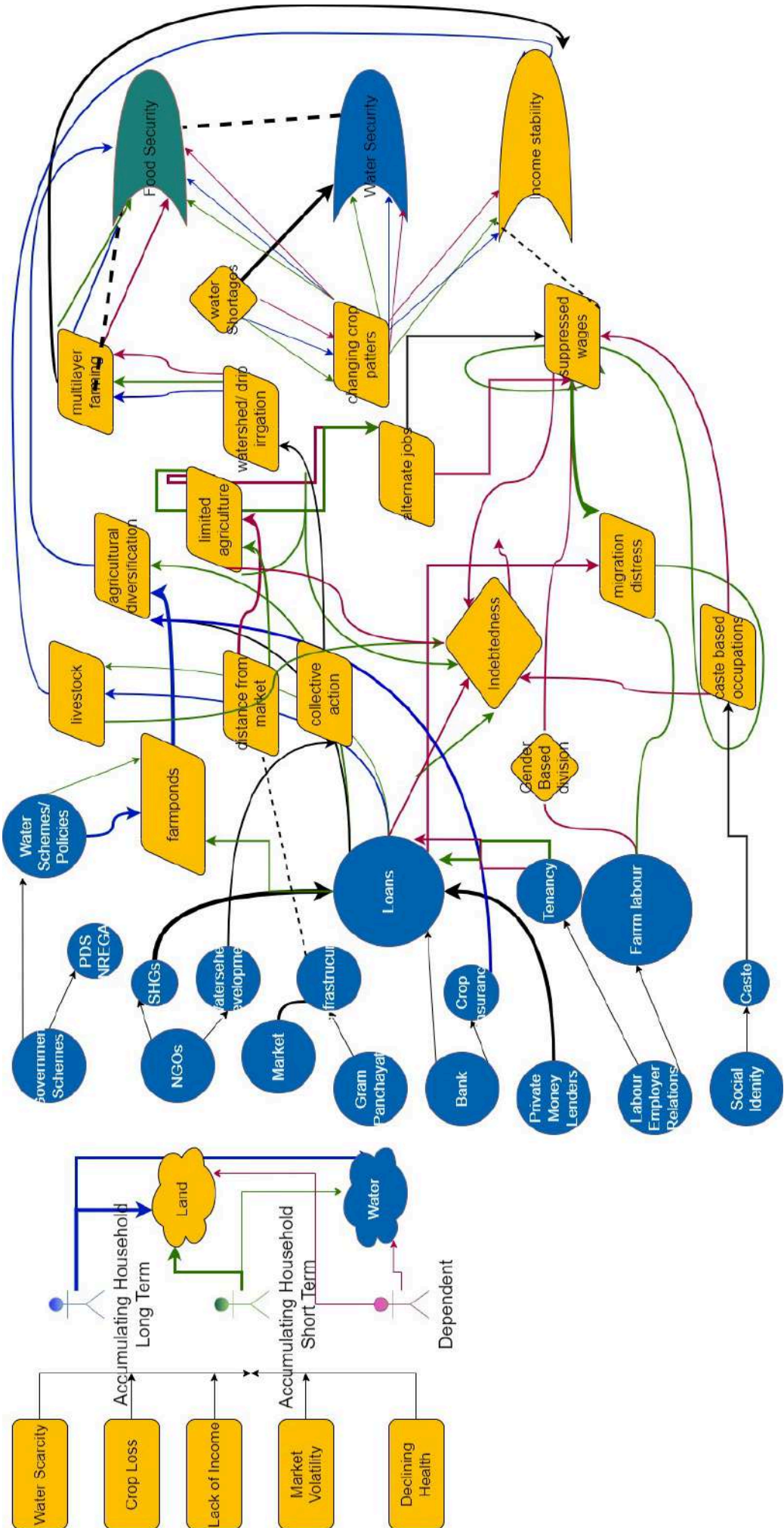


Fig. 12: Livelihood Pathways, Scarcity Zone

Source: Author's Own (2020)

Water scarcity in the region calls for more judicious use of water. However, greater asset ownership by the accumulating long term households results in diversification of agriculture, where farmers turn to horticultural plantations and livestock rearing (see also Fig 5). The two villages in this zone, while displaying similar livelihood actions, have distinct water conservation methods. The introduction of the Indo-German Watershed Programme in Hivre Korda encourages community participation to promote watershed development, as observed in Wanjulshet (Transition Zone). The visible impacts of watershed development have allowed people to take up water-saving technologies, especially for agricultural purposes. Farmers from all three household clusters engage in multi-layer farming practices and drip irrigation. The increase in yield and the rising water levels in wells are evidence of successful experiences from this village. Madhav, a 57-year-old farmer from a short-term accumulating household, spoke of how-

***“Saving water during the drought has been possible due to watershed interventions. Now, if someone needs water, people are willing to share.”***

Kishan, a 60-year farmer from the long term accumulating household from Hivre Korda, spoke of similar experiences of water-saving technologies being applied in the region. These technologies have allowed him to diversify into livestock rearing. He now has a stable with 15 crossbred cows, bringing in income. Though farm ponds are fewer in number than in the assured rainfall zone, farmers like Kishan are constructing large farm ponds. Despite experiencing periods of acute water shortages, long term accumulating households are drawing water from wells to fill up farm ponds. There are no bore wells in this village as there are no deep aquifers due to the lithology of the region. However, when Kishan was

asked whether, despite knowing the drawbacks of exaggerated water extraction, they would still construct bore wells, the answer was yes. Therefore, the impact of behavioural changes upon water conservation is limited, as everyone tries to accumulate this asset to secure their livelihood. This is no different from what is taking place in Pimpri Pathar, which has had limited to nil support from NGOs. Long term accumulating households have the means to dig bore wells and farm ponds- with some farmers reporting to own three farm ponds and seven bore wells individually. The rising cost of procuring water and making agriculture viable has even resulted in farmer suicides in this village.

To overcome such debilitating circumstances, households in the scarcity zone look to diversify household incomes. In the scarcity zone, livestock rearing is carried out primarily by the long and short-term accumulating households as rearing these cattle requires water. Dependent households take up smaller livestock such as poultry and goats, with the latter fetching more in the market. Those households who choose to take up cattle rearing do so by a cattle sharing system. The dependent household rears the cattle, and upon sale, the profits are shared with the cattle owner. This is not a widespread practice due to water and fodder requirements, a cost that becomes too heavy to bear. Dependent households rely on wage labour to secure their livelihood, and with little work available in the village, they are forced to migrate for work. In Pimpri Pathar in particular, those families who cannot migrate become tied labourers<sup>4</sup> for certain long-term accumulating households as this ensures they have work throughout the year. Labour tying arrangements are not present in Hivre Korda due to the availability of alternate occupation.

<sup>1</sup> Tied labour is driven by relations of debt, where advance payments are taken by the labour to ensure work available throughout the year with a particular employer. Once the loan/ advance is repaid the labour ceases to be attached to a particular employer. This is a change from the traditional form of labour bondage which tied labourers to the employers for an indefinite period of time.



Households of Hivre Korda, particularly those from the SC community who also belong to the dependent household category, are engaged in making decorative pieces for the bull festival in Maharashtra called “Bendur”. The village is well connected to the nearby markets. The establishment of a small enterprise over 15 years back sells decorations made for cattle. The dependent and short term accumulating households alike have benefitted from this particular activity and, for the time being, is one that provides additional income to households, especially during the extended agriculturally lean seasons. For Pimpri Pathar, on the other hand, poor transportation networks leave them out of such opportunities. Respondents in Pimpri Pathar reported that poor transportation networks meant losing out on markets and even NGO interventions. Such conditions indicate that for dependent households, in particular, there is increased dependence on government schemes such as MGNREGS and PDS to secure livelihood survival. Respondents identified service delivery problems for both these schemes- Sumati, a 35-year-old farmer and daily wage labourer, says-

*“We rely only on government schemes. This is the only way. However, I don’t remember when we have received all that was promised under PDS. (MG)NREGA work also doesn’t come to everyone; those with good connections to the supervisor have the upper hand.”*

The coping strategies for such households in the scarcity zone are distress driven migration or engagement in poorly paid non-farm activities. The third and most commonly sought option is one of the loans, primarily from private money lenders. Unlike in the other two regions, a tenancy is not a viable option for dependent households as a livelihood diversification strategy. The rising cost of water, acquired through tankers and the inaccessibility to low-interest bank loans, leaves little choice in terms of the type of work to procure to ensure income, food and water security. Under the constant pressures of extended droughts and dry spells, households in the scarcity zone need to build resilience by accumulating financial and physical assets, improved transportation and access to services such as water, banks, and markets. The promotion of these factors will also allow for vertical movement up the occupational hierarchy. In addition to this, the sheer scarcity of water makes people in this zone more motivated and aware of the judicious utilization of water. NGOs and governments need to engage in activities that encourage and promote such behavioural changes to secure the futures of the people in this region.

### Livelihood pathways in the assured rainfall zone:

The Livelihood Map for the assured rainfall zone chalks out livelihood pathways and helps build resilience through three distinct outcomes- income stability, food security and water security. Respondents identified the vulnerability context through the following four factors- a) declining and variable rainfall, b) crop loss, c) market variability, and d) unemployment. The three household types interact with different institutions, both formal and informal, determining their actions and outcomes.

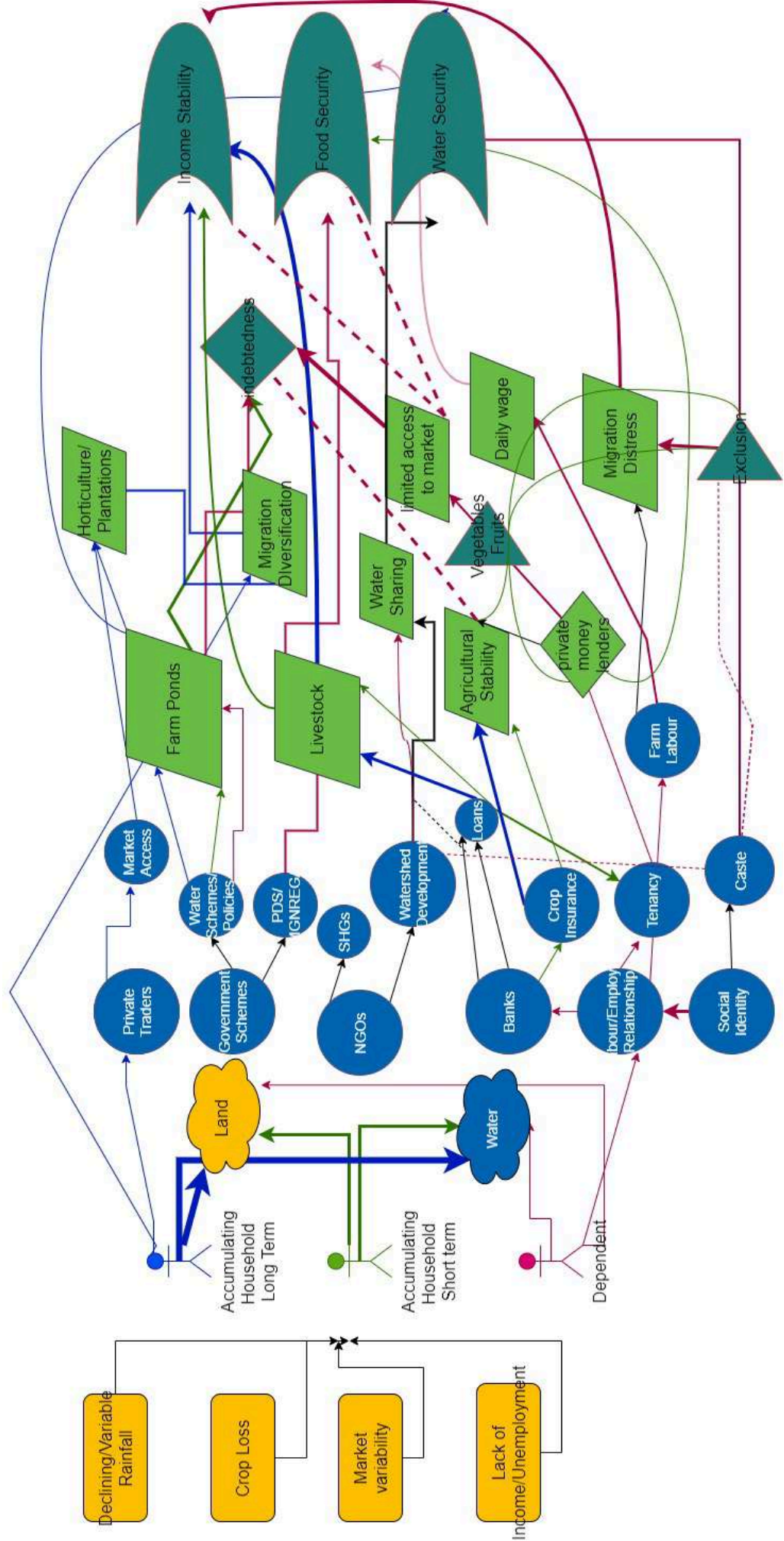


Fig. 13: Livelihood Pathways: Assured Rainfall Zone

Source: Author's Own (2020)

For the long term accumulating households, income stability is achieved through agriculture (especially horticulture) and livestock rearing. The success of many in agriculture is contingent upon the construction of farm ponds. Farm ponds have been heralded as an important innovative water management measure through the process of rainwater harvesting. They have been promoted through schemes such as the Jalyukt Shivar (JYS, 2014) and Magel Tyala Shettale (farm pond on demand). Farm ponds are said to be 'cost-effective, improve water control, promote agricultural intensification and give a boost to farm incomes' (Chowdhury & Tiwale, 2019, Bendapudi et al., 2020). The State government of Maharashtra, under the Pradhan Mantri Krishi Sinchai Yojana (PMKSY, 2014) and Rashtra Krishi Vikas Yojana (RKVY 2017) provide farmers with a subsidy of up to Rs. 50,000/- for the construction of farm ponds. These structures are meant to collect rainwater runoff. What is observed instead is the unregulated extraction and storage of groundwater into larger surface structures (farm ponds). Despite the availability of subsidies and the rationale behind these structures, one observes that it is mainly the long-term accumulating household that can reap benefits.<sup>5</sup> WOTR's (2017) study on farm ponds shows that the net returns from farm ponds are highest for the large farm ponds, followed by small farm ponds, with medium farm ponds providing the most negligible average returns. The high costs and the minimal returns result in households stacking up considerable debts in this race to build an enormous farm pond. In Kadwanchi in particular, for many short term accumulating and dependent households, farm ponds are viewed as their ticket to income security. However, the paucity of land often results in them using up cultivable land to construct farm ponds. Anita, a 33-year-old farmer who comes under the dependent household category, faces

severe water shortages and rising debts due to constructing a farm pond. She used one acre of her land for building a farm pond and has a principal loan amount of Rs.40,000/-. The water to fill this farm pond was to be taken from the canal after the rains. However, with her husband spending most of the money on alcohol, they lost out on the water to other members of the village. With scanty rainfall and declining agricultural output, she has to work as agricultural labour to ensure food security for the survival of her household. Two important factors emerge, one of access to water sources and water infrastructures such as farm ponds, and the impact of policies that vary, based on the socio-economic position of the household, i.e. whether they are accumulating long term, short-term or dependent households. Second, as observed in Anita's case, the gendered/familial relations place restrictions on the extent to which women can access such services.

Caste positions continue to impact the income, water and food security of households. The exclusion from jobs and being restricted to carrying out daily wage agricultural work results in suppressed wages. Tenant farming is considered a way out of such exclusionary practices. Many of the dependent households turn to agriculture and fruit production. However, limited access to the market does not allow higher income generation to repay loans and earn profits. As observed in Kadwanchi in particular, for accumulating households, apart from asset ownership, the success of the vineyards is maintained through the timely purchase by the private traders. Dependent households who belong to caste groups lower down in the hierarchy have limited access to private traders and cannot access larger markets which would have fetched them higher prices. Dependent households end up selling their produce in the village and neighbouring

<sup>5</sup> In a study conducted by WOTR (2017) on farm ponds, the cost of constructing a large farm pond came to a total of Rs 584, 948/- (\$7,940.00), medium farm ponds cost Rs. 1,44,041/- (\$1955.00) and small farm ponds cost Rs. 74,491/- (\$ 1011.18) (Bendapudi et al. 2020).

areas.

Kolegaon is heralded as a model village for water budgeting, which became successful through community participation. The efforts made by the NGO Watershed Organisation Trust (WOTR) have been instrumental in making people aware of various water conservation techniques and promoting community-based water governance. Depending on the annual rainfall, actions such as shifting from water-intensive crops like cotton and maize to pigeon peas and soybean, and reducing the areas of cultivation under water-intensive crops, has helped the village save close to 40 per cent of the groundwater. While the village has been able to see the benefits of water budgeting on groundwater resources, those who belong to the scheduled caste community still feel that their caste position results in their voices not being heard. Ajay, a 40-year farmer from the SC community, says-

*“We attend these meetings where the water stewards<sup>6</sup> inform us about different water-saving techniques; however, this process of information transfer is one way. Moreover, with limited land and water storage capacity, the benefits of water budgeting only go so far to secure household incomes because those with greater storage capacity have more water- so the question here becomes one of distribution as well. Due to water shortages, we have to take up multiple jobs in a year, just to make ends meet.”*

Ajay wants a more inclusionary process in nature, where there is greater participation from those belonging to the dependent household category. However, it is essential to mention here that such interventions by WOTR has allowed for water sharing to take place but requires close and

continuous follow-up.

Another important government policy that needs mention here is the Crop Insurance Scheme. The problems related to this scheme spread across all three agro-ecological regions. The scheme calls for coverage of crop losses and loans at reduced rates. However, access to these loans is determined through ownership of land, which ends up excluding a large group of tenant farmers. Dependent and short term accumulating households rely on tenant farming to protect themselves from climatic and non-climatic shocks. But when faced with crop losses, these farmers have to lean on private money lenders to access loans, further increasing their indebtedness and precarity.

The following takes a closer look at the different opening and adaptive strategies that result in varied livelihood outcomes.

### **Strategies for Resilience:**

Across the three agro-ecological regions, rainfall variability and subsequent water insecurity emerge as one of the most important drivers of vulnerability. As discussed in the sections above, no vulnerability can be viewed in isolation; instead, they operate as a part of a much larger system governed through relations of power. However, based on the perceptions of local communities, certain coping and adaptive strategies are adopted to mitigate the impacts of water insecurity driven by both climatic and non-climatic factors.

<sup>6</sup> The water stewardship programme initiated by WOTR, pushes people towards more efficient harvesting and use of water. Water Stewardship' approach and practices, which sensitise communities, build a cadre of local 'water stewards' (jal sevaks), put in place community defined access and use rules and establish representative and effective governance mechanisms that enforce these (Kale, et al. 2020).



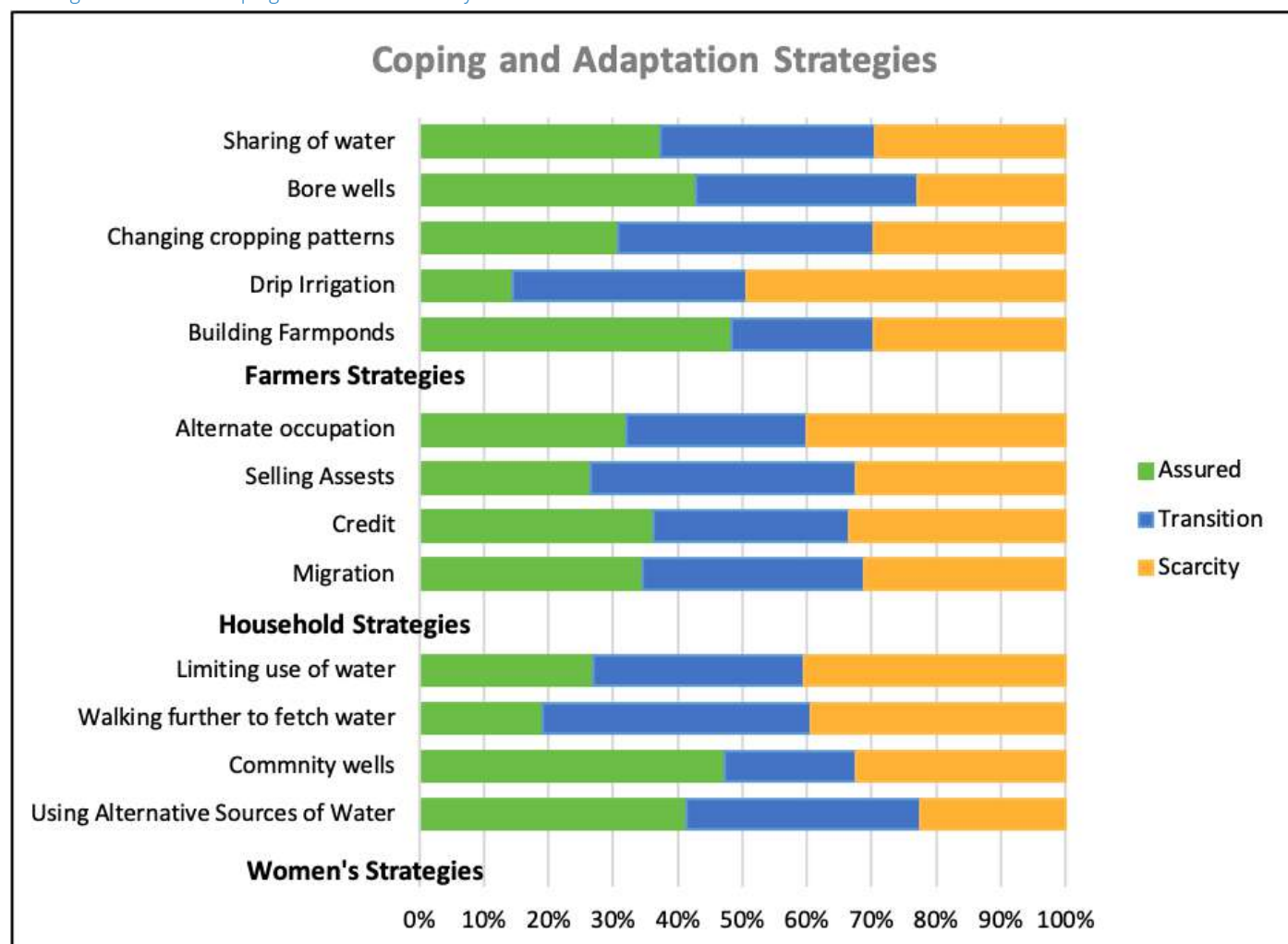


Fig. 14: Coping and Adaptation Strategies

Source: Author's Own (2020)

Farmers' coping strategies to mitigate livelihood risks involve actions such as building farm ponds or digging bore wells. This is evident in the assured rainfall zone, where tapping into immediate water sources is a way to counter rainfall variability, even if this comes at the cost of depleting groundwater levels. Digging of bore wells and farm ponds go hand in hand, especially in the assured rainfall zone, where farm ponds are filled up using groundwater instead of collecting rainwater runoff. With the investment required for digging bore wells and constructing farm ponds, dependent households are seen to run into severe debt. A set of adaptation strategies utilized by farmers includes changing cropping patterns<sup>7</sup> and utilization of micro-irrigation. These strategies have long-term impacts on

livelihoods and resilience to weather shocks and water shortages. The second adaptive strategy of micro-irrigation is beneficial to farmlands with limited access to water. This is observed in the scarcity as well as the transition zones. However, in the assured rainfall zone drip irrigation is used mainly for horticulture and cash crops as these micro irrigation sets last for 5 to 7 years, besides drip irrigation reduces the weed infestation. A reason for the widespread adoption of drip irrigation in these areas can be attributed to NGOs' interventions to promote water security.

Declining agricultural yield and crop failures due to the vagaries of the climate tend to push families further into deprivation (Basu, 2015). Families turn to alternate occupations, which include

<sup>7</sup> Multi-layer cropping patterns as observed in Hivre Korda, has helped with water conservation and ensured the supply of food.



low paying non-agricultural wage work. There were instances where dependent households, in the scarcity and the transition zones, spoke of tied labour within agriculture where loans were taken as advance payments from employers and landowners. This was done to secure agricultural wage employment, particularly in the lean seasons, where both water and food security were under threat. Unless the move to alternative sources of income is long term and preferably in salaried employment, higher up in the occupation hierarchy (Lerche, 2010), this strategy tends to be a reversible coping mechanism. The selling of assets is another coping mechanism that tends to be erosive in nature. Dependent and short-term accumulating households, particularly when faced with the threat of rising debts, tend to sell their assets to repay their loans- with the sale of land and livestock in local markets to overcome a household crisis. The sale of land is often seen as the last resort. With more and more households rearing goats, sheep and cattle, often during an emergency, sheep and goats are sold, followed by cows and buffaloes. This is a strategy used in the transition zone, with over 50% of responses referring to the sale of assets.

Credit, especially from private money lenders, is another coping strategy that can be reversible if it is repaid. However, for dependent and short-term accumulating households, this can become an erosive strategy, also leading to destitution. For dependent households borrowing money from influential people in the village and paying this back helps in overcoming any immediate crisis. With the increasing inaccessibility of loans from banks for the poor and marginalized, households are drawn into a vicious cycle of debt as they access usurious credit from private money lenders with high-interest rates of 8-12% per month. The fourth strategy of migration is considered a coping and adaptation strategy (Adger et al. 2003). Often, migration is an outcome of the family being unable to bounce back to "normal" living conditions. Among the

long-term accumulating household's migration is observed among the youth, who do not wish to continue in agriculture as a livelihood. However, for dependent households, the movement is to low paying jobs in factories or construction sites to name a few.

Women's coping strategies to counter water insecurity situations are often seen as a reaction to a particular situation, often considered unsustainable (Basu, 2015). However, this might not necessarily be the case in all instances. Limiting the use of water through water budgeting ensures sufficient water being available for the household, livestock, and farms. A coping (erosive) strategy is women walking long distances to collect water. This is seen to take place in the scarcity and transition zones. In the transition zone, in households that live further away from the water sources in both Mogras and Wanjulshet, women ended walking longer distances to fetch water. Moreover, the hilly terrain makes the walk all the more arduous. Access to alternate water sources, such as community wells and community drinking water tanks, are beneficial as water is shared among women in the village. However, the success of this is tied to the interventions laid out by NGOs and government schemes. Kolegaon, Wanjulshet and Hivre Korda have water-sharing mechanisms that benefit other farmers who do not have a resource. This was made possible through the interventions of NGOs working on water conservation.

# Conclusion

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Rural poverty is spatially distributed both within and across the three agro-ecological regions. Extreme events like droughts and dry spells are on the increase in intensity, and the ability of families to build resilience will determine the shift from transient to chronic poverty (Krishnan & Dercon, 2000). This study uncovers various livelihood pathways of different communities, highlighting the multi-scalar relations and multi-attribute nature of the communities. Across the three agro-ecological zones, those who belong to the dependent household category find themselves distanced from land and water assets. With the looming threat of unemployment, coping strategies involve engaging in more precarious labour. The overlapping nature of caste and household categories is apparent, confirming that those with higher caste status have higher asset ownership, better networks to institutions and information, making them more resilient to various shocks that drive vulnerability. These endowments further aid their absorption into off-farm work/ markets.

Agriculture is the mainstay of the region, and the livelihood pathways in the three agro-ecological zones focus on two key assets, land and water. The purpose of the study was to identify how people perceive changes and decisions regarding water, food and income security. Respondents described rainfall variability, and climate uncertainties as bringing about both physical and financial changes in their livelihoods. Despite governmental and non-governmental interventions taking place in the region, much of the water supply and storage are accessed on an individual basis. This places restrictions on the extent of distributive justice

taking place because of the location of different communities in different regions. A multitude of coping and adaptive strategies are put in place. Erosive coping strategies such as asset depletion, borrowing from formal and informal institutions and migration in search of work highlight the lack of adaptive capacities, especially among dependent households, deepening poverty.

Institutions, both formal and informal, play a key role in determining the resilience or vulnerability of households. Access to banks, policy implementation, information networks, kinship and caste, ties the linkages between macro-economic policies and micro-level processes as these operate through multi-scalar power relations. NGOs and governments working on and implementing pro-poor policies cannot perform when isolated from these multi-scalar power relations. Knowledge generation through interventions alone cannot influence behaviour towards water security and livelihood survival. This highlights the gap between perceiving and reacting to change, as observed clearly in the case of the tribal population in Wanjulshet. Despite having an external stimulus and motivation through formal institutions in the region, the discrimination and exclusion faced due to their identity, limits their ability to bring about any transformative change in their livelihood pathways. Therefore, it is important to identify typologies of communities, assess their needs and carry out successful targeted interventions. Policymakers and NGOs both need to consider contextual factors that are drivers for precarious livelihoods, using a specific, strategic and targeted approach instead of using a one size

fits all models. Inclusive community participation is key if water security is to be achieved in these

drought-prone regions, which will motivate them to improve their livelihood conditions.

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