



The Adaptation at Scale in Semi-Arid Regions (ASSAR) project uses insights from multi-scale, interdisciplinary work to transform climate adaptation policy and practice in ways that promote the long-term wellbeing of the most vulnerable and those with the least agency.

In India, ASSAR is exploring differential vulnerability and adaptive responses. In the largely semi-arid state of Karnataka in South India, we are examining how climatic, socio-economic, infrastructural and biophysical changes are driving livelihood vulnerability in rural and urban areas.

Focussing on migration as a key livelihood strategy to address vulnerability, and one that spans the rural-urban continuum, we conducted research in the Kolar District. Kolar falls in the eastern dry agro-climatic zone in south Karnataka. The district is characterised by erratic rainfall, low soil moisture, high groundwater exploitation, and rapid land use change, all of which are mediated by social inequalities and governance challenges to shape local vulnerability. Climatic and non-climatic stressors challenge natural resource-based livelihoods in the district and people are coping by moving into tenuous and unsafe employment in urban centres to work as construction labourers, gardeners, and domestic helpers. Migration and commuting has emerged as a key livelihood strategy, but one that may further exacerbate the vulnerability of those who move into cities and those who are left behind.

Introduction

During March and April 2016, ASSAR India's researchers from the Indian Institute for Human Settlements (IIHS) conducted 18 Focus Group Discussions (FGDs) in nine villages in Kolar District, Karnataka. The FGDs were gender-differentiated and ensured representation from different income groups, castes, and religions.

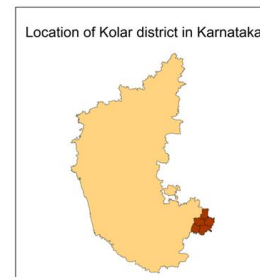
Before the FGDs, our research team visited each village 2-3 times to familiarise ourselves with the sites and build out village profiles, including seasonal calendars and village resource maps. We used the FGDs to further these profiles and to (1) develop an understanding around perceptions of biophysical and socio-economic changes in the villages, (2) identify key risks to livelihoods and people's responses to these risks, and (3) map out the key actors and institutions in each village.

We undertook three activities during each FGD:

- ◆ A **timeline** exercise to chart biophysical, livelihoods, socio-economic, institutional and political changes from 1970 onwards.
- ◆ **Risk and response mapping.**
- ◆ An **institutional mapping** exercise to chart key actors and flows of information and credit.

Livelihood Vulnerability in Kolar

Kolar is known as the 'land of silk and milk', and livelihoods here are strongly linked with the natural environment. Agriculture and its allied sectors – such as horticulture, livestock rearing and sericulture – employ most people in the district. According to the 2011 census 79 % of the total population are main workers (i.e. engaged in economically productive activities for more than half of the year) and, of these, 37.5 % are cultivators while 31.5 % are agricultural labourers. Kolar is also famous for gold mining in the Kolar Gold Fields, which offered a significant source of employment before the mine was shut down in 2001. Kolar's location at the cusp of three key states in Southern India, and the prominent train lines and highways passing through it, makes it a site of cultural and linguistic intermingling and inter-state migration.



Several features contribute to making livelihoods in Kolar vulnerable to climatic and non-climatic stressors. Drawing on secondary literature, key informant interviews with district officials, NGO workers, and scoping visits, we identified the key drivers of livelihood vulnerability to be:

- Climatic stressors:** Kolar typically receives 743 mm rainfall annually with 80 % received from June-September (southwest monsoon) and 20 % from October-November (northeast monsoon). Rainfall is characterised by uneven distribution, unpredictability, and dry spells. Long-term rainfall analyses (1900-2005) indicate deficit rainfall in 20-35 % of years and excess rainfall in approximately 20 % of years.
Climate projections foresee a 3.6 % decrease in monsoon rainfall and an increase of 1.96°C in annual average temperature. It is also projected that there will be a 20% decrease in winter drought and 10-20 % increase in drought during the monsoon. Overall, such projections have direct implications for agriculture and horticulture (especially mango – a summer crop – and tomato – which is sensitive to rainfall fluctuations).
- Biophysical factors:** Kolar faces severe water quantity and quality issues. Groundwater across the district is classified as overexploited and several areas have high fluoride content which leads to health issues. Overall, borewell success rates have decreased from 83 % in 2009, to 66 % in 2015. Successful borewells are also failing: 33 % of successfully dug borewells in 2014-15 and 9 % of borewells dug in 2015-16 have stopped functioning.
- Shift towards high-input, intensive agriculture:** Most farmers are marginal landholders (own <1 ha land). While main crops grown are finger millet, groundnut, pigeonpea, cowpea and rice, cropping patterns have changed significantly, with a shift towards monocrops and horticultural crops such as flowers and vegetables. Although horticulture has increased farm returns, these crops are more water-demanding, more sensitive to climate variability and disease incidence, and directly impacted by market fluctuations in Bangalore and Chennai. Despite severe water scarcity concerns (borewells in the district are now being dug up to 1800 feet deep), farming is increasingly input-intensive with high pesticide and fertiliser use.
- Exposure to market dynamics:** Market dynamics shape profitability and are perceived as beyond farmers' control. For example, sericulture in Kolar has taken a hit in recent years because of cheap Chinese silk flooding the market and lowering prices globally. More locally, tomato growers face very high price volatility and thus their returns are highly uncertain.
- Social stratification:** Social stratification based on caste is prominent across Kolar. Lower castes tend to have fewer assets and restricted opportunities due to historical socio-economic and political marginalisation. Kolar is also one of the poorest districts in Karnataka (42 % people fall below the poverty line).
- Village location shapes service access:** Villages on state borders or away from the *Gram Panchayat* (first rung of local governance) tend to have poorer access to social services, poorer road connectivity and poorer networks with extension officers and NGO workers. This location-based vulnerability affects people's ability to diversify livelihoods, access subsidies, and demand accountability from local leaders.
- Lack of alternative livelihoods:** People supplement farm incomes by working in neighbouring towns and large cities such as Bangalore as construction workers, gardeners, cooks, domestic helpers and drivers. These jobs are strongly gendered, not easy to come by, and only those living close to a road head or having networks in the city are able to secure jobs. Most jobs tend to be ad hoc and temporary, exacerbating household vulnerabilities.

Timeline Exercise: Community-scale changes (1970-2016)

The first exercise in the FGDs was to map changes at a village-scale over the past four decades. We chose the year 1972 as a starting point since it was the most extreme drought in Karnataka's recent history and public memory. We constructed a timeline to capture changes in the natural environment, local livelihoods, institutions and infrastructure. We used probing questions on the status and transition of natural resources, climatic factors, agrarian practices, livelihood opportunities, migration types and destinations. The timeline helped identify tipping points or abrupt changes in livelihoods or social and biophysical systems and paved the way for discussions around risks and responses.

Here, we discuss the case of one of the villages, where the entire village migrates in search of work because of the lack of livelihood opportunities in the village. The village is 30 km away from the sub-district headquarter, which constrains access to government services and various livelihood opportunities.

Digitised timelines made by men FGD (n=14 men)	Changes	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015	
	Biophysical	Lakes are full, open wells yield water. Ugadi festival (late March) would mark onset of rains, Diwali (late October) marked the end.						Tube wells introduced. Depth 350-400 feet.			Groundwater drops to 1400 feet.	
								Rains begin to decline.				
	Infrastructural	No food ration shop – had to travel 30 km away to taluk (sub-district) headquarter.										
		Electricity introduced but supply is limited to 2 hours.										
Agricultural	Staple local food, <i>ragi</i> (finger millet) and paddy cultivation is viable. Agriculture is remunerative.							Mango, eucalyptus cultivation becomes widespread.		Vegetables (tomato) are grown mostly through irrigation.		
Livelihoods						Agriculture unviable.		Migration to Bangalore due to failing rains.				

Digitised timelines made by women FGD (n=17 women)	Changes	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015	
	Biophysical	Village had 9 open wells.						Tube wells introduced.			Groundwater drops to 1400 feet.	
		Major drought.						Rains begin to decline.				
	Agricultural	Diverse crops: horse gram, paddy, mustard, <i>ragi</i> , sugarcane, groundnut, vegetables.			Mango identified as a promising crop.				Mango, eucalyptus cultivation becomes widespread.		No agriculture.	
Livelihoods	Migration to Andhra Pradesh (quarrying, construction).				Men start migrating to Bangalore.			Migration to Bangalore due to failing rains. This time, entire families begin to move.				

Responses around natural resources were uniform across men and women and people linked large-scale eucalyptus cultivation with depleting groundwater. Men were more aware about services such as distribution of food rations; this is because, in keeping with societal norms and behaviour, they are more likely to travel to the town to procure supplies. While responses on livelihoods were similar, women discussed trends of increasing migration and its implications on families. They also had intimate knowledge of crops grown, perhaps because women tend to cultivate diverse crops for subsistence.

Overall, there were reports of the biophysical system becoming more stressed, agricultural livelihoods more tenuous, and livelihood diversification into non-farm activities on the rise. Across the villages, key perceptions of change were:

- ◆ People identified that rainfall has been decreasing and groundwater levels falling, especially post 2000. Around the same time, lakes began drying, green cover decreased and there was a consequent decrease in livestock ownership. Open wells stopped yielding water in the 1980s and tube wells became prevalent around the same time. Today, most of these tubewells have failed, and water is only available at depths beyond 1000 feet. Respondents perceived rainfall to be becoming more erratic towards late onset and regular droughts.
- ◆ There has been a shift in livelihoods away from agriculture towards commuting and migration to Bangalore (80 km away) to work in informal jobs such as construction sites. This migration has increased significantly since 2000, which was a severe drought year.

Risk and Response Mapping

Our second exercise involved mapping risks to three key livelihoods: (1) agriculture and allied livelihoods (livestock rearing), (2) wage labour (in agriculture or construction), and (3) business (petty shops managers, drivers, skilled labour). After the risks were mapped, we charted current strategies used to deal with or respond to these risks.

Risks to agriculture:

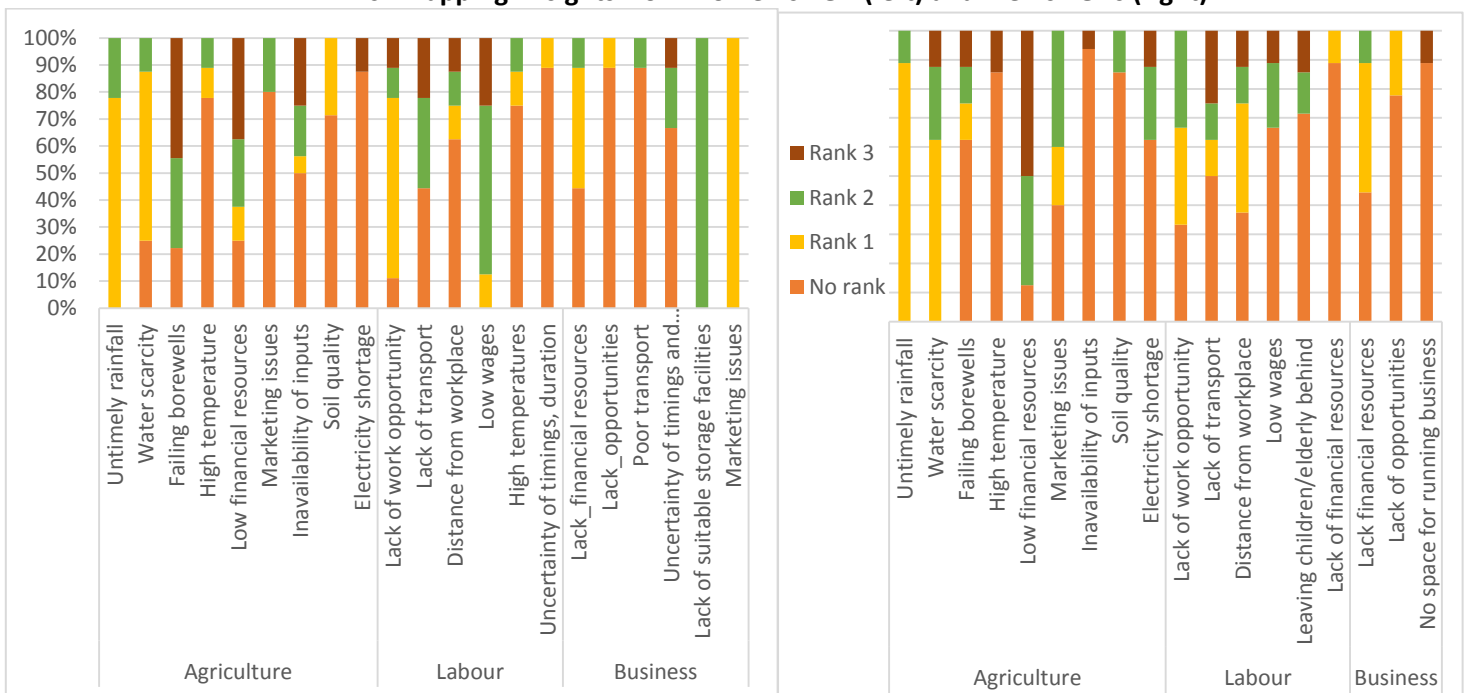
Men and women ranked untimely rains and water scarcity as the biggest risks to agriculture (*see charts*). Differential risk perception was mediated by normative gender roles.

- ❖ Men reported market issues more frequently than women because men are typically in charge of selling farm produce in towns. Problems related to markets involved inadequate and unreliable transportation, distance from mandis (agricultural markets in towns), and price fluctuations. One male farmer illustrated, “Yesterday, a sack of cucumbers was worth Rs.200 in the morning, spiked to Rs.300 at noon, and crashed to Rs.100 at 3pm.”
- ❖ Women ranked sowing related issues (typically done by women), such as poor soil quality and lack of seeds, higher than men. However, electricity issues were highlighted by men since they were mainly in charge of irrigation (which requires electricity) and securing diesel to run water pumps in case of power outages.

Risks to labour and business:

- ❖ Women identified several difficulties related to labour work which men didn’t identify such as uncertain timing of work and physical stress due to heat.
- ❖ 50 % of the women also identified lower wages as a significant issue (ranked 2) which is reflected in lower female wages (Rs.160-180 per day compared to Rs. 250-300 for men).
- ❖ In businesses, discussions with women highlighted the issue of troublesome middlemen which alluded to safety issues and cultural norms of women interacting with men beyond their immediate sphere.

Risk mapping: insights from women’s FGD (left) and men’s FGDs (right)



Responses: coping or adapting?

“Ours is a cursed village”. We are mostly from the scheduled castes and have very little land. In bad [dry] years, even migrating is difficult. Migrants have to stay on road sides and take away their kids, just 9-10 years old, to work with them. The manual labour work they do is very exhausting and they don’t get good food.”
 - Quote from a woman in female FGD in a remote village

People were relatively hesitant to articulate their responses to risks. Upon prompting, they argued that while they wanted to undertake strategies of diversification, resource constraints were a barrier. Most responses were around water management (drip irrigation), livelihood diversification (into wage labour, dairy), and credit access (taking loans, joining self-help groups [SHGs]). Migration repeatedly came up as a livelihood strategy but the wages, after accounting for travel costs and stay in cities, were reported as very little. We reflect that while some strategies might build adaptive capacity, most strategies were, at best, coping measures and were taken in response to short-term concerns and not in anticipation of wider climatic changes.

Institutional mapping exercise

Our third and final exercise was institutional mapping. The objective was to build a comprehensive understanding of the stakeholder landscape in which the community operates for their day-to-day activities and functional needs, specially regarding their livelihoods. The exercise also tried to capture social and institutional actors and networks people leverage to make livelihood choices.

Questions were framed keeping in mind that people's information and credit networks are not always confined to the administrative and geographical boundaries of a village. For instance, the government units at the *panchayat* level

(village administrative unit) don't operate in silos but form part of an entire administrative chain, making access to information and services an exchange flow across a spectrum of actors.

As in the previous exercise, questions centered around three livelihood categories of agriculture and allied sectors, labour, and business. Three livelihood categories were pinned at the top end of the chart. Participants were invited to choose from loose cards denoting stakeholders (e.g. rural banks, SHGs) to depict the order and magnitude of credit and information flows for each livelihood.



Information sources are multiple but gendered

- ❖ Information about agriculture and allied livelihoods (e.g. related to weather, schemes and subsidies, market prices) is most commonly acquired informally, through peer networks (observed across all 9 villages).
- ❖ Respondents reported dependence on media (TV/newspaper/radio) which amplify information sharing via peers as well as formal-channels (through government line departments).
- ❖ Villages near towns and *panchayats* reported relatively higher ease of access to information provided by government actors such as *Raitha Samparka Kendra* (Farmer Contact Centres), which are responsible for providing climate information, technical guidance on agricultural inputs and details of schemes. Interestingly, women did not highlight this as much as men, indicating how gender norms dictate interactions with stakeholders within and outside the community.

People access credit from formal and informal institutions

- ❖ Credit facilitation through village-level SHGs was common. SHGs are typically membership-based groups of women representatives established by NGOs and function like community-based microfinance institutions.
- ❖ Finances from formal institutions such as rural banks, nationalised banks and private banks were also identified as important. This varied depending on socio-economic profile, as the borrowing regime (governed by fixed rules regarding rates of interest and time period) allows only higher caste, relatively economically better off and educated individuals to benefit from them.
- ❖ Moneylenders work on relatively less rigid rules of borrowing and return and thrive on alternative sources of credit. However, such borrowing often exacerbates farmer debt, especially when high interest rates coincide with drought or low market prices. Interestingly, women across villages spoke about high incidence of borrowing from money lenders, despite such dealings in Indian villages considered as falling on the man. This reflects men's reluctance to discuss issues of debt and to expose their financial vulnerability among peers.

Key Messages

- ❖ Climatic factors such as drought and erratic rain shape livelihood vulnerability (especially of farmers in Kolar). Other factors such as natural resource degradation, lack of capital to invest in farming, market fluctuations, village proximity to road networks, one's gender and caste, as well as changing aspirations of the youth shape the choices that people are making to deal with this vulnerability.
- ❖ In Kolar, many people are coping with everyday risk by diversifying their livelihoods into non-agricultural jobs, but these jobs are often informal and impermanent in nature.
- ❖ While external actors such as the government and local NGOs are investing in building local capacity, without addressing the multi-scale structural issues that drive vulnerability (e.g., caste-based differential access to subsidies), these investments may not meet intended outcomes of adaptation.



ASSAR is a five-year, multi-country research project, which aims to deepen the understanding of the barriers and enablers for effective, medium-term adaptation within the dynamic and socially differentiated semi-arid regions of Africa and Asia. ASSAR will generate new knowledge about how adaptation processes – especially those linked to governance systems, policies and adaptation responses – can be modified or improved upon to achieve more widespread, equitable and sustained adaptation. We are particularly interested in understanding people's vulnerability and, in doing so, exploring the dynamic structural and relational aspects linking vulnerability to social difference, governance and ecosystem services.

For more information visit www.assaradapt.org or contact csingh@ihs.ac.in

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