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Women paying the cost of the climate crisis with their wombs

Quantifying loss and damage faced by women battling drought, debt and migration

Ritu Bharadwaj, N. Karthikeyan, Ira Deulgaonkar and Arundhati Patil

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As climate change intensifies, it is imperative for policymakers to address the escalating loss and damage it inflicts on vulnerable communities in developing countries. In India's Maharashtra state, these impacts are forcing rural families into life-altering decisions and migrations to work in sugarcane fields, where exploitative practices by contractors, including fines for work absences, are prevalent. The fear of losing income drives many women to have hysterectomies to avoid having to take breaks due to menstrual pain. This paper uses two frameworks to analyse and quantify the economic and non-economic loss and damage faced by these communities, offering insights into the multifaceted nature of climate impacts.

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Summary

In Beed district, Maharashtra (India) the adverse effects of climate change are not just environmental but deeply socioeconomic, disproportionately impacting communities with limited economic assets. This research paper delves into the substantial non-economic loss and damage borne by these communities, particularly women, girls and children, and underscores the need for a comprehensive policy framework. It highlights the necessity of integrating climate finance and social protection that addresses exclusion, marginalisation and gender issues, to effectively support these vulnerable groups.

The climate impact analysis of Beed district, focusing on rainfall variability and its socioeconomic implications, reveals a shifting pattern with significant repercussions for local communities, particularly those reliant on agriculture.

Rainfall variability and its increase in deficit years

1. **1986–2011 rainfall analysis:** This period saw a deficit year frequency of 19.23%, indicating that approximately one in every five years experienced a significant shortfall in rainfall.
2. **2012–2022 rainfall analysis:** A marked increase in rainfall deficit years was observed, with the frequency escalating to 36.36%. This period saw over a third of the years grappling with substantial rainfall deficits, nearly doubling the frequency compared to the previous period.
3. **Long-term trend:** There has been an average annual decrease in rainfall of about 2.31mm per year over the period from 1986 to 2022, highlighting a gradual but consistent decline in precipitation levels.

Migration patterns and economic pressure

1. **Drought-induced migration:** The data analysis was conducted for two distinct groups — Group I (households migrating for sugarcane cutting labour) and Group II (non-migrating households). Group I, characterised by Indigenous tribal populations with limited landholdings, resources and education level, showed 80.24% of families migrating for work in the last year, in stark contrast to just 1.18% from Group II.
2. **Shift in migration patterns:** A notable shift was observed among Group I households, with 55.67% having started migrating in the last decade, up from 5.42% three decades ago. This trend correlates with the increasing frequency and severity of drought conditions aggravated by climate change.
3. **Drought and indebtedness as key drivers:** The primary motivation for migration among Group I is the relentless drought, scoring 77.83 on the impact scale. This has led to significant financial hardships for these families. Additionally, lack of access to social protection programmes (score of 69.81) remains a challenge, further compounding their economic distress.

The 'mukkadam' system of recruiting migrant workers perpetuates debt bondage and exploitative labour

Climate change, manifesting through erratic weather patterns, prolonged droughts and unpredictable monsoons, has led to repeated crop failures in the region. These agricultural disruptions directly impact the economic stability of families dependent on farming, pushing them into a cycle of distress migration and debt bondage. These families, including women, are forced to seek employment in sugarcane cutting — a labour-intensive and precarious occupation.

This shift to sugarcane labour entails migrating for several months to distant farms, under the control of labour contractors known as mukkadams. The working conditions in these sugarcane fields are gruelling, and the contractual arrangements are exploitative. Women labourers, in particular, face a stringent regime where taking breaks, even for natural biological reasons such as menstruation, can result in substantial fines from the mukkadams. This punitive system, borne out of a climate change-induced economic crisis, leaves these women in a vulnerable position where they feel compelled to undergo hysterectomies.

The rationale behind this drastic decision is steeped in the fear of losing out on wages or incurring fines for taking frequent breaks. By opting for a hysterectomy, these women aim to eliminate the 'problem' of menstruation, which in their precarious economic situation, is seen as an impediment to continuous work and income stability. This grim choice, while offering a short-term solution to avoid financial penalties, overlooks the long-term health consequences and further exemplifies the severe impact of climate change on individual lives. The interplay between economic pressures and non-economic loss and damage in the context of distress migration is a critical aspect of climate change's impact. Migratory decisions, while economically driven, result in significant non-economic loss and damage, including the loss of home and community, and life-altering health impacts.

Quantifying economic and non-economic loss and damage

We have developed the Comprehensive-Climate Impact Quantification (C-CIQ) methodology to quantify both economic and non-economic loss and damage. It employs composite indices designed for simplicity, replicability and clarity, so as to facilitate the methodology's use in policymaking and practice.

The comprehensive analysis of households in Beed district, categorised into Group I (migrating for sugarcane cutting labour) and Group II (non-migrating), reveals stark disparities in the impact of climate change,

Tangible–functional loss and damage index

1. Loss of income index:

- **Crop loss:** Group I had 22.53% of households experiencing crop loss (average value: 9,150.20 Indian Rupees (₹)), while Group II had a higher incidence at 32.94% (average value: ₹20,735.29). Here it is important to note that Group II households have bigger land holding while Group I households are essentially marginalised.
- **Livestock yield loss:** Both groups have similar percentages (Group I: 6.72%; Group II: 6.47%), but Group II faced higher average financial loss (₹1,523.53) than Group I (₹1,019.76).
- **Employment days lost:** Group I lost more employment days on average (72.69 days) than Group II (37.95 days). The higher average value of income lost due to lost employment days for Group I (₹15,613.64) compared to Group II (₹9,637.65) demonstrates a greater financial vulnerability for Group I.
- **Income loss due to livestock death/sale:** Group I faced higher losses (death of animals: ₹3,851.38; sale of animals: ₹2,086.96) compared to Group II (death: ₹1,623.53; sale: ₹614.12). The greater losses for Group I reflects the necessity to sell livestock at lower prices during drought conditions, especially for households that rely on migration for income.

The data indicates that both groups suffer from the economic impacts of drought, but the relative impact on Group I's financial stability is greater, highlighting their increased susceptibility to climate-induced economic stress.

2. Water scarcity index:

- Both groups experienced high water scarcity levels (Group I: 83%; Group II: 82.35%) and had to purchase water during droughts (Group I: 80.63%; Group II: 80%).
- Both groups are compelled to purchase water during drought periods. Group I, spend an average of ₹3,820.55 per month. In contrast, Group II households spend slightly less, with an average of ₹3,517.06 per month.

While the difference in spending between the two groups is not stark, it is indicative of the nuanced ways in which economic assets can influence the capacity to manage and mitigate the effects of water scarcity.

3. Water fetching drudgery index:

- Time spent fetching water increases during non-drought periods, with Group I spending nearly 3 hours and Group II approximately 2 hours and 40 minutes, which could be due to the longer distances travelled.
- In Group I, 62.45% of households reported illness due to long-distance water collection in drought periods, with Group II at 47.65%.

The average treatment cost for illnesses due to water collection in Group I is ₹1,643.88, which is nearly double that of Group II (₹880.59), suggesting that the health impact is not only more prevalent but also more costly for Group I.

4. Elevated indebtedness index:

- Group I's total average indebtedness was ₹124,703.58, with significant debts to local moneylenders (₹29,407.11) and sugarcane middlemen (₹60,474.33), resulting in debt bondage and exploitative labour.
- Group II showed lower indebtedness (₹45167.06) and better access to formal lending (bank loans: ₹16,235.29).
- Indebtedness increased more during droughts for Group I (high: 38.74%; very high: 26.48%) compared to Group II (high: 34.71%; very high: 20.00%).

Intangible–functional loss and damage index

1. Forced labour index:

- There is a high incidence of wage labour in Group I (96.05%) with long workdays at destination sites (average: 14.36 hours).
- Group I faced severe labour rights violations, including working while sick (72.29%) and during menstruation (69.90%).

2. Human rights index

- There were severe human rights violations perceived by Group I at destination sites (index: 84.37), including extreme exposure to environmental elements and high rates of abuse.

3. Gynecological problems index

- Group I shows a significantly higher composite index value of 74.01 compared to Group II. This suggests a much greater prevalence and perception of gynaecological issues among these women.
- The financial impact of health issues on Group I households is significant, with the total cost for hospitalisation, lab tests, medical consultations and medication amounting to ₹5,333.75. In contrast, Group II incurs a substantially lower cost of ₹20.59.

Tangible–intrinsic loss and damage index

1. Loss of organs index

- There was a higher rate of hysterectomies in Group I (55.73%) compared to Group II (17.06%). Group I's average age at hysterectomy was significantly lower (34.64 years).
- A significant proportion of these women are undergoing the procedure at a very young age, with 4.26% of them being under 25 years old. The percentage of women in Group I who have a hysterectomy between the ages of 26 and 30 is also notably high at 31.21%. This is a disturbing statistic, as it implies major surgery with lifelong consequences being performed on women who are quite possibly in their early reproductive years.

2. Medical expenses due to loss of organs index

- The economic burden of the procedure is also considerably higher for Group I, with the total cost of hysterectomy averaging ₹63,374.70, compared to ₹18,305.88 for Group II. This disparity is likely exacerbated by the higher rates of surgery performed in private hospitals for Group I (95.04%) as opposed to government hospitals.
- Group I also faces a substantial cost for hospitalisation, medical consultations, and medication, totalling an average of ₹2,068.38 for workplace accidents.

Intangible–intrinsic loss and damage index

1. Health effects of hysterectomy index

- Group I faces substantial costs from the health effects of hysterectomy, with total expenses since the surgery reaching ₹90,028.46, compared to Group II's ₹25,037.65.
- This financial strain is compounded by lost income, with Group I losing an average of 7.07 employment days per month, leading to an annual income loss of ₹16,970.75 and a cumulative loss of ₹214,842.69 since the surgery. In contrast, Group II's total lost income is ₹70,785.88.
- Additionally, 1.19% of Group I households experienced a death due to workplace accidents, resulting in a loss of productive income of ₹18,498.02.

2. Mental health problem index

- Group I's economic burden from mental health issues is significant. On average, they lose 1.67 days of employment per month due to these problems, resulting in an annual income loss of ₹10,424.90. Additionally, they incur an annual treatment cost of ₹5,554.15 for mental health issues.

Overall, the total quantified loss and damage for Group I is a considerable ₹155,455.29, disproportionately high at 164.25% of their household income. This suggests that the losses exceed their total annual income, pushing them further into a cycle of intergenerational debt and vulnerability. Group II's total loss and damage stand at ₹79,737.08, which is a lower but still substantial 52.78% of their household income.

The findings from Beed district clearly illustrates the complex interplay between climate change and socioeconomic vulnerabilities. Communities with fewer economic assets, such as Group I, suffer disproportionately from both economic and invisible non-economic loss and damage. This necessitates an urgent and nuanced policy response that not only addresses immediate economic losses but also acknowledges and addresses the intangible yet profound impacts on health, mental wellbeing, and social structures. Adequate climate finance, coupled with a comprehensive social protection cover, must address these multifaceted challenges, ensuring that the most vulnerable are not left to bear the brunt of climate change alone. The case of Beed district serves as a crucial reminder of the far-reaching consequences of climate change, extending beyond environmental degradation to reshape lives and livelihoods in profound and often invisible ways.

1

The need for capturing multi-dimensional impacts of climate change

Climate change is a global phenomenon with localised, often devastating impacts, which are particularly pronounced in socially marginalised communities. The economic and non-economic losses and damages stemming from these impacts are multifaceted and disproportionately affect vulnerable groups such as women, girls and children.

In 2021, the global financial cost of climate-related disasters was US$343 billion, making it the third-costliest year on record for weather-related disasters (Masters, 25 January 2022). These economic losses manifest most acutely in agricultural sectors, where altered weather patterns, droughts and floods lead to reduced crop yields and livestock productivity. These economic strains often precipitate distress migration, with the World Bank predicting that climate change could displace as many as 216 million people by 2050 (Clement et al., 2021).

However, it is the non-economic losses and damages, which often go unrecognised, that are profoundly impactful. Health and wellbeing issues extend beyond physical impacts to include psychological stress and trauma, particularly following extreme weather events. For instance, in the Beed district of Maharashtra, India, the harrowing fact of female sugarcane labourers being forced to undergo hysterectomies is intrinsically linked to the broader narrative of climate change and its cascading effects. The root cause of this distressing phenomenon lies not merely in the harsh working conditions in the areas to which they migrate but fundamentally in the deep-seated impacts of climate change on agriculture and livelihoods. The stress of debt, economic instability and distress migration, compounded by life-altering physical and mental health impacts on female labourers, illustrates the dire consequences of climate change for individual and community wellbeing.

The interplay between climate change and economic pressures leading to non-economic loss and damage in the context of distress migration is a critical aspect of climate change's impact that needs to be urgently addressed.

1.1 Challenges with capturing economic and non-economic impacts

Addressing the economic and non-economic impacts of climate change requires an integrated approach that considers the unique vulnerabilities and adaptive capacities of marginalised groups. However, one of the most significant challenges in addressing these impacts is the difficulty of capturing both economic and non-economic losses and damages. A significant barrier to this is the absence of standardised methodologies for quantifying non-economic loss and damage. While economic impacts, such as infrastructure damage,

agricultural loss and loss of income, can often be measured in monetary terms, non-economic loss and damage involves intangible and often subjective aspects like psychological distress, loss of social support networks, social displacement, human rights violations and intergenerational poverty. These impacts, due to their intangible nature, often remain 'invisible' in policy frameworks and climate adaptation planning. The lack of visibility and quantification means that non-economic loss and damage often remains 'invisible' in policy and planning. This invisibility, in turn, hinders the development of effective policy responses and the allocation of climate finance, as these impacts are not adequately represented or understood in decision-making processes. This leads to a situation where affected communities continue to suffer without adequate recognition or support mechanisms. The lack of recognition and support is more pronounced in the case of marginalised groups such as women, girls and children. Furthermore, the challenge also lies in ensuring that finance is not only allocated efficiently but also reaches the most vulnerable groups. This requires innovative financing mechanisms that recognise the value of addressing non-economic loss and damage and participatory approaches in policy development to ensure that the voices of all affected groups are heard and their needs adequately met.

Only through a comprehensive and inclusive approach that accounts for the range of climate impacts that communities face can we hope to mitigate the impacts of climate change effectively and provide adequate support to the most vulnerable communities, such as those in the Beed district.

1.2 Taking a methodological approach to quantifying economic and non-economic loss and damage in Beed

To analyse the drivers and quantify the range of economic and non-economic loss and damage affecting vulnerable households, particularly women, girls and children, in Beed, we used two approaches:

I. Examining underlying vulnerabilities and how they interact with climate change to cause economic and non-economic loss and damage

Climate change does not occur in isolation and often intensifies pre-existing vulnerabilities, including poverty, inequality and social exclusion. It is, therefore, necessary to understand clearly what forms loss and damage impacts are likely to take, who is likely to be impacted, and how, so that responses can be designed to address the specific vulnerabilities of the different regions, communities and households that are most at risk.

We have used our **'3P framework'** of 'predisposing factors', 'precipitating factors' and 'protective factors' to systematically unpack the interconnections and dynamics between vulnerability, climate-attributable economic and non-economic loss and damage, and policy and programme responses. The **predisposing factors** within our framework encompass elements that make certain areas, communities or sectors inherently more susceptible to loss and damage from climate change. These factors include demographic context, geographical location, socioeconomic conditions, political factors and pre-existing vulnerabilities such as poverty or lack of access to resources. By identifying these predisposing factors, interventions can be designed to mitigate the inherent risks they pose.

The **precipitating factors** focus on the triggers that cause loss and damage. These range from acute events like floods and heatwaves to more gradual events such as drought or desertification. Understanding these factors is crucial for real-time response and recovery efforts. For example, knowing the precipitating factors for a water crisis in a particular region can inform emergency preparedness for immediate and future strategies for ensuring water security.

Lastly, **protective factors** include those elements that contribute to resilience against climate change impacts. These include assessment of current social protection and disaster risk reduction mechanisms such as food security programmes, community preparedness programmes or healthcare systems. Protective factors typically enhance the coping capacities of vulnerable groups and reduce losses and damages when a climate crisis occurs, while the lack of the same pushes communities to adopt negative coping strategies.

Together, the 3P framework provides a holistic framework for assessing and addressing climate change-related loss and damage. The 3P framework can enable policymakers and development practitioners to better understand the complexity of how different factors interact to either exacerbate or address loss and damage. This is especially important in diverse settings where generic solutions may not be effective. By categorising factors into these domains, we intend to provide policymakers, researchers and practitioners with a more systematic assessment of risks to help them develop tailored interventions that account for a full spectrum of vulnerabilities and coping capacities.

II. Quantifying economic and non-economic loss and damage

Quantifying the full extent of economic and non-economic loss and damage due to climate change is crucial for crafting effective responses to this global challenge. Recognising this, we have developed the 'Comprehensive Economic and Non-Economic Climate

Impact Quantification (C-CIQ)' toolkit. This innovative framework utilises a blend of methodologies to assess the multifaceted consequences of climate change in diverse contexts.

The C-CIQ toolkit integrates economic valuation, multi-criteria decision-making analysis, composite risk indices, and semi-qualitative analysis to holistically measure the impacts of climate change. It enables an understanding of how climate impacts are felt by individuals, households, societies and nature. This toolkit is particularly useful in analysing and quantifying how the tangible and intangible, intrinsic and functional dimensions of climate impacts interact across various spatial and temporal scales.

We used the C-CIQ toolkit to analyse the impacts of climate change and the consequent losses and damages experienced by rural communities in the Beed district of Maharashtra state in western central India, focusing especially on women, girls and children. This practical application has not only quantified the immediate losses but has also provided insights on the increased vulnerability of certain groups to climate disasters. By employing the C-CIQ toolkit, we have developed several composite indices, such as the Labour Rights Violation Index, the Human Rights Violation Index and the Mental Health Impact Index. These indices provide quantifiable metrics to evaluate the specific and compound impacts of climate change on different groups.

The usefulness of the C-CIQ toolkit extends beyond academic research: it is a vital resource for policymakers, practitioners and stakeholders. For policymakers, the toolkit offers a structured and data-driven approach for understanding and prioritising areas of intervention. By quantifying non-economic loss and damage alongside economic loss and damages, it provides a more complete picture of climate change's impact, ensuring that policies are responsive not only to immediate financial needs but also to the broader spectrum of human wellbeing and societal stability, for instance, by developing social protection programmes that address not only economic recovery but also health and psychological support for communities affected by climate disasters.

Furthermore, the C-CIQ toolkit's ability to break down the complexity of climate impacts into quantifiable indices means that it can play a crucial role in the allocation of climate finance. By clearly demonstrating where and how climate funds can be most effectively used, the C-CIQ can ensure that investments are made where they can have the greatest impact on reducing vulnerability and enhancing resilience.

Sampling approach

The research used purposive sampling to select the Dharur and Ambajogai blocks[1] in the Beed district of Maharashtra. Systematic sampling was then employed to select households within these blocks. This method ensured that every household had an equal chance of being included, thereby reducing selection bias and enhancing the reliability of our data. Following initial data collection, households were post-stratified into two distinct groups to enable comparative analysis:

- Group I: Households that migrate for sugarcane cutting work
- Group II: Households that do not migrate.

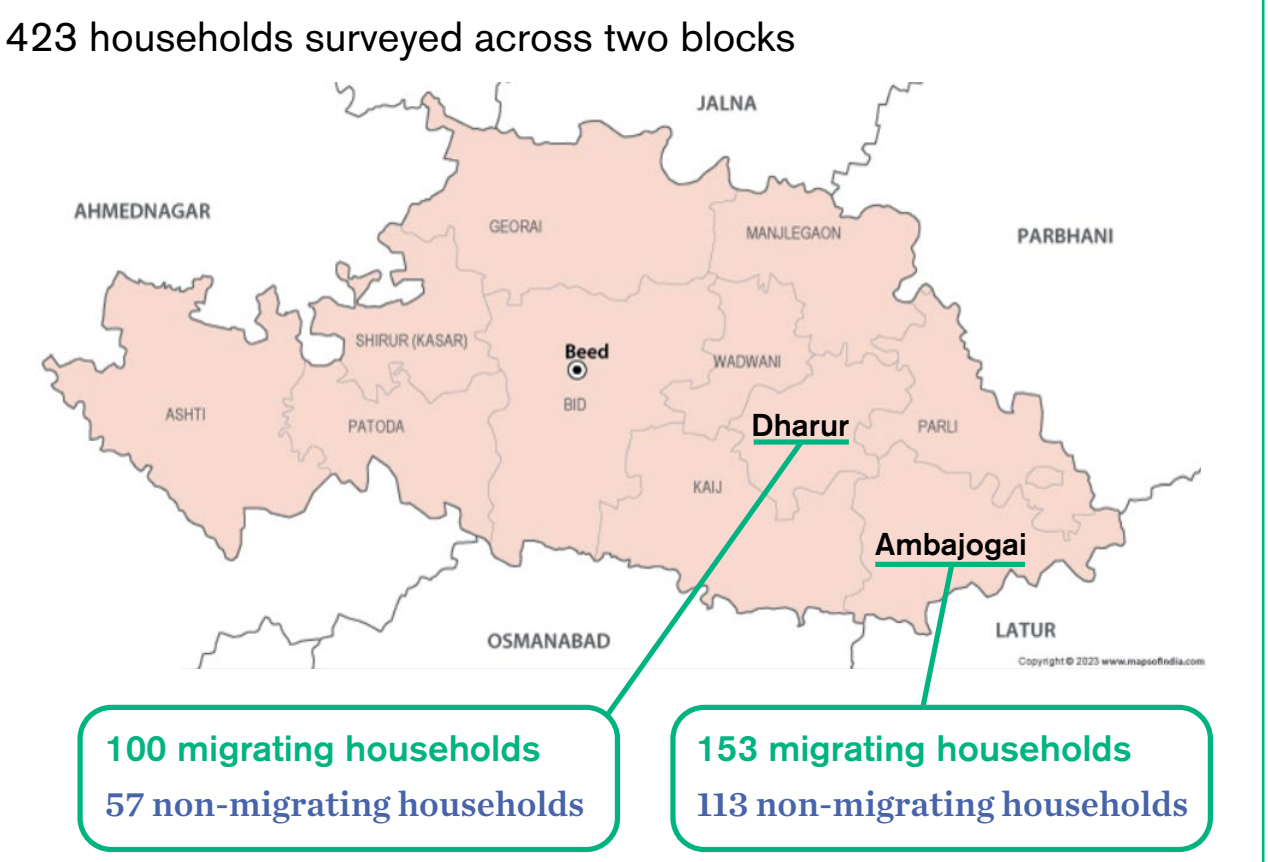
Our sampling methodology categorised households into these two groups with the view to capture and analyse the specific vulnerabilities and profiles of these distinct groups. The rationale behind this categorisation is to gain a clear understanding of the broader conditions that compel one group to embark on distress migration but not the other. It also aims to find the factors that specifically push women toward drastic medical procedures such as hysterectomies. This comparison allowed us to understand the profile and particular vulnerabilities of migrant families, as well as the socioeconomic and health disparities between the two groups. Understanding these specific vulnerabilities is crucial for designing targeted interventions that can address the root causes of distress migration and the health crises (such as high rates of hysterectomy) that arise from it.

A total of 423 households were surveyed across the two blocks — 266 households from Ambajogai and 157 from Dharur, with the former comprising 153 migrating and 113 non-migrating households, and the latter including 100 migrating and 57 non-migrating households. More details on the sampling approach and the age distribution of the sample households can be found in Annex 1.

Our research on the ground used a mix of quantitative and qualitative techniques to ensure a comprehensive understanding of the impacts of climate change on local populations. Household surveys were carried out with sample households representing both groups. This allowed us to capture a wide range of data points that reflect the economic and non-economic loss and damage experienced by these communities. In addition to the household surveys, we conducted focus group discussions with women in the sample villages. These discussions were useful in getting insights into the personal and communal challenges faced by women, especially in relation to migration and the decision-making processes around healthcare practices, including the prevalent issue of hysterectomies. Data collection at the village level was augmented by key informant interviews with a diverse set of stakeholders, including journalists, human rights activists, local nongovernmental organisation (NGO) leaders, and gynaecologists, to get an understanding of the socioeconomic dynamics and health implications of climate change.

[1] A block is an administrative sub-division of a district for which plans are prepared and implemented by district administration.

Figure 1. Sampling profile for the research



2

Underlying vulnerabilities and their interaction with climate change

2.1 Predisposing factors creating vulnerability for communities in Beed

We considered the analysis of predisposing factors as the foundation for understanding the underlying drivers of vulnerability. The analysis helped us to identify the various predisposing factors, how deeply they are entrenched within households, and the socio-political dynamics of a society that make certain communities or groups more vulnerable than others. This understanding is important for developing targeted strategies to bolster the resilience of households and groups against climate impacts.

We identified and categorised predisposing factors by considering four distinct domains — demographic, social, economic and political, as follows:

2.1.1 Demographic factors

Understanding demographic factors such as population growth, age distribution, sex ratio, education level and family size permits an assessment of the scale and complexity of climate-induced loss and damage. For instance, low education levels or skills could constrain an individual's ability to explore alternate livelihoods in the event of crop loss. By understanding these factors, we can develop interventions that are more demographic-sensitive, ensuring that the most vulnerable population segments, such as women, girls and children, are adequately protected.

To unpack the demographic aspects of vulnerability, we analysed the household data collected for the two groups of households and also analysed the latest census data of 2011 (Directorate of Census Operations, n.d.) for the two study areas (Ambajogai and Dharur) in Beed district in comparison with 2001 census data. The key findings are summarised as follows:

Literacy rates: Based on the data provided on the educational qualifications of respondents from two groups in the household survey (see Figure 2), we found that:

Group I — Households migrating for sugar-cane cutting work

- A significantly high percentage of respondents in Group I are illiterate (66.4%). This is more than 1.5 times higher than the national average of 29.7%, according to the National Family Health Survey 5 (IIPS, n.d.).
- Only a small fraction (3.16%) of respondents have education up to the 11th or 12th grade, and virtually none have an undergraduate degree or higher.
- The percentage of respondents with education up to 5th grade and those with 6th to 10th grade education

are 11.07% and 18.97%, respectively, indicating that the majority of this group's educational attainment does not exceed primary education.

Group II — Households not migrating

- The level of illiteracy in Group II is lower (41.18%) than Group I but still considerably higher than the national average.
- There is a relatively higher percentage of respondents with education from the 11th to 12th grade (15.29%) and with undergraduate degrees (4.12%), suggesting better educational attainment in this group.
- Similar to Group I, a small segment (1.18%) of the population has a diploma.

Our analysis shows that Group II has a better overall educational profile compared to Group I, with lower rates of illiteracy and higher rates of secondary and higher education. However, despite the better educational statistics in Group II, both groups fall behind the national average in terms of literacy and advanced education levels.

This shows that a higher illiteracy rate among Group I may be a factor contributing to their economic vulnerability, limiting their employment opportunities to labour-intensive and low-paying jobs such as sugarcane cutting. The lack of advanced education in both groups may limit their ability to access better employment opportunities, potentially trapping them in cycles of poverty and increasing their susceptibility to exploitation.

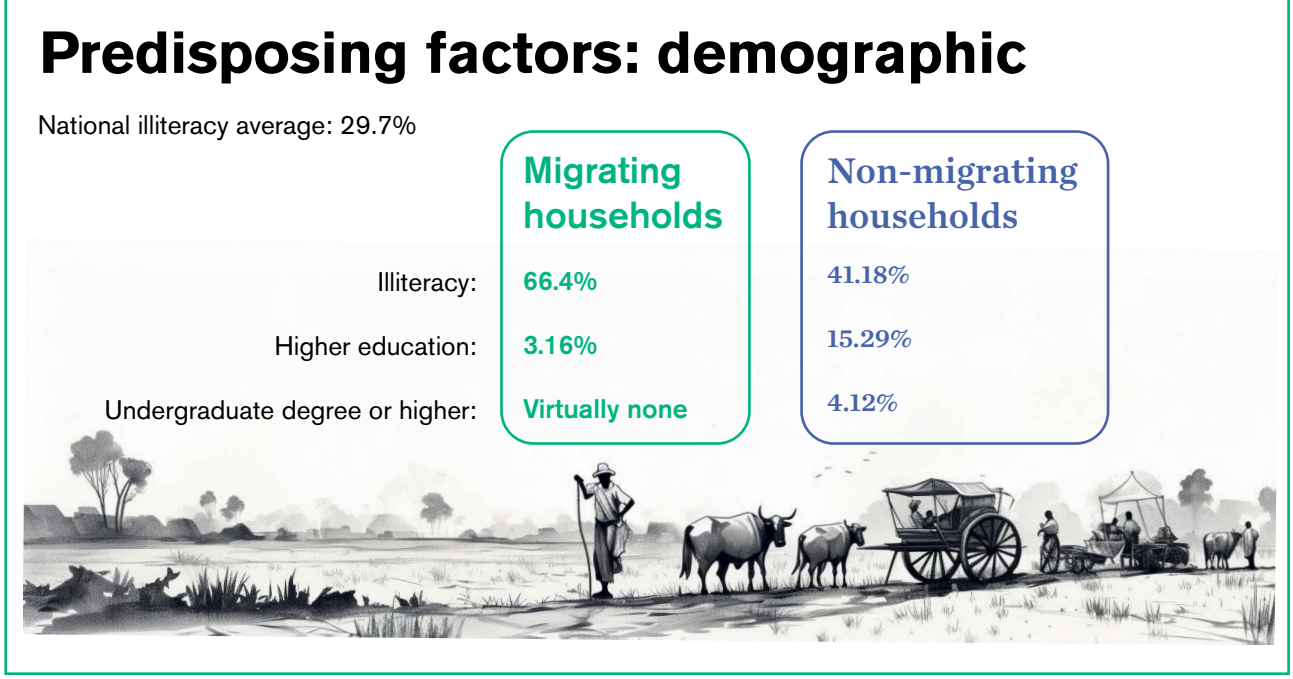
For women and girls, especially from Group I, the high illiteracy rates could compound existing gender inequalities, limiting their empowerment and increasing their dependency on male members of the household or the household's primary income earner.

The data also highlights a clear link between educational levels and migration for labour, suggesting that improving education levels could be a key strategy in reducing the need for distress migration. For policymakers and stakeholders, this underscores the need to prioritise education, particularly focusing on groups with high migration rates, to provide them with alternative livelihood options that can break the cycle of poverty and reduce their vulnerability to the impacts of climate change.

Sex of household head: The information provided by households during the survey shows that in Group I (made up of migrating households), male-led households were significant at 92.09%. Conversely, females headed only 7.91% of households. In Group II (non-migrating households) the distribution is slightly more balanced, with males leading 90% of households and females 10%. The average percentage of female-headed households in rural India is 10%. Group II aligns more with this average in household leadership.

The data suggests that women who head households are less likely to migrate due to factors such as the responsibility of caring for children or the elderly, lack of support in the destination areas, and the gendered

Figure 2. Educational qualification (% of respondents)



nature of employment opportunities in the sugarcane cutting industry. The lower percentage of female-headed households in Group I also raises questions about the social and economic vulnerabilities these women face, particularly in the context of migration. Female-headed households may have limited access to resources and face more significant obstacles in securing stable, remunerative employment, which could deter migration as a viable option.

Sex ratio and child sex ratio: Both Ambajogai and Dharur witnessed a decline in the sex ratio[2] and the child sex ratio[3] from 2001 to 2011 (Directorate of Census Operations, n.d.). In Ambajogai, the sex ratio in rural areas decreased from 940 to 907, and in Dharur, it went from 928 to 922. These figures are concerning indicators of gender bias, which may be reflective of a broader societal preference for male children. This imbalance could be due to a range of factors, including gender-based prenatal selection, higher mortality rates for female infants, or neglect of girl children leading to higher mortality in early childhood. A skewed sex ratio often translates into increased vulnerabilities for women and girls, including increased trafficking and other forms of exploitation.

2.1.2 Economic factors

Our analysis of the economic factors focused on variables like land ownership, land holding size, irrigated area and income. These aspects significantly influence a community's resilience to climate impacts. For example, households heavily reliant on rainfed agriculture are particularly susceptible to climate-induced loss and damage. Moreover, high levels of poverty and low savings can make it almost impossible for communities to invest in climate adaptation and resilience measures. Identifying these economic vulnerabilities can help with the design of more effective resource allocation and financial assistance programmes.

House type: Analysis of the data collected via the household survey on the types of houses owned by the two groups provides a snapshot of the living conditions and, by extension, the economic status of these groups. Group I, consisting of households that migrate for sugarcane cutting, predominantly live in tile sheet-roofed (temporary roofs made of clay tiles) houses, with 92.89% falling under this category. A very small percentage (1.98%) live in houses with reinforced cement concrete (RCC) roofing, which is generally considered more durable and indicative of a higher economic status. The presence of thatched roofs, though minimal (5.14%), suggests that a segment of this group lives in temporary and less secure homes. Group II, comprising households that do not migrate, shows a lower percentage of tile sheet-roofed houses (83.53%) and a significantly higher percentage of RCC-roofed houses (16.47%) compared to Group I. The absence of thatched roofs in this group could indicate that non-migrating households have better economic means to invest in more stable and permanent structures.

The almost universal use of tile sheet roofing among Group I could also imply that their financial resources are primarily directed towards basic sustenance and immediate needs rather than long-term investments in their homes. This aligns with the transient nature of their work, where investing in a more permanent structure may not be feasible or a priority. Furthermore, the minimal use of RCC roofs in this group underscores the potential lack of access to more substantial financial resources required for such construction. The higher prevalence of RCC-roofed houses in Group II could be reflective of more stable economic conditions, which may be associated with the ability to remain in one place and invest in permanent and sturdy housing.

Land ownership, size of land holding and access to irrigation: The household survey provided a clear perspective on the land ownership status, landholding, size, and access to irrigation of two household groups, which are important indicators of their economic status and agricultural stability.

We found that Group I (migrating households) has a significantly lower percentage of landowners (45.45%) compared to Group II (non-migrating households), which stands at 62.94%. This suggests that Group II households are more likely to have a stable agricultural base.

A majority of Group I households (54.55%) do not own land, which correlates with their higher migration rate, as these households may depend on seasonal labour for income during the agricultural lean period. Conversely, a smaller proportion of Group II households (37.06%) lack land, pointing to a more secure agrarian base (see Table 1).

The average landholding size for Group I is 0.74 acres, just under half of Group II's average of 1.45 acres. This difference further emphasises the economic disparity between the two groups, with Group II likely having greater agricultural productivity and stability due to their larger landholdings. The percentage of households with larger landholdings (greater than 2.5 acres) is significantly higher in Group II (24.17%) than in Group I (5.14%). This indicates that Group II not only has a higher likelihood of land ownership but also owns larger parcels of land, which could mean a better economic status.

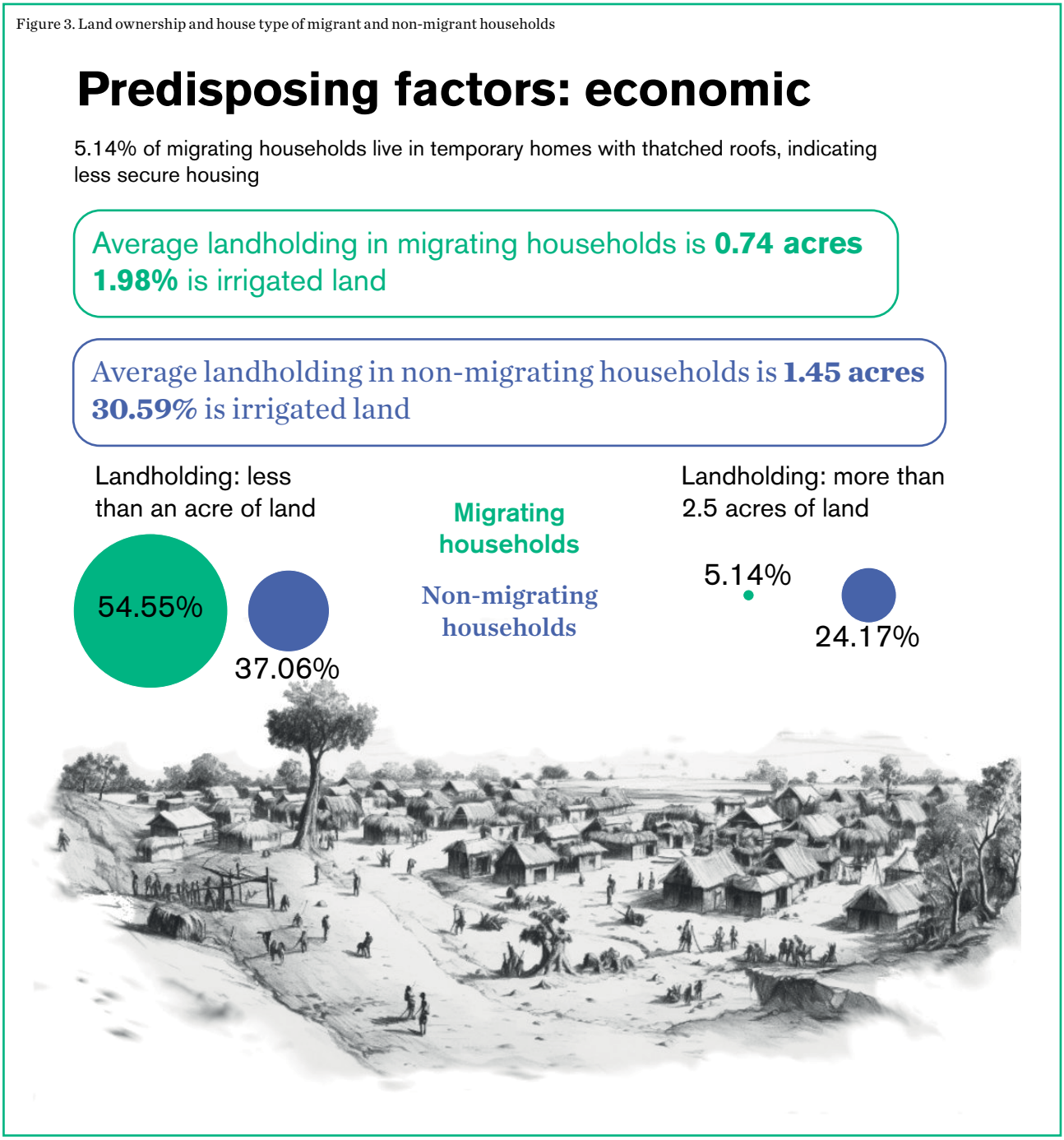
[2] Sex ratio is defined as the number of females per 1000 males in a given population.

[3] Child sex ratio is defined as the number of females per thousand males in the age group 0–6 years in a population.

Table 1. Total land holding size (% of households)

TOTAL LANDHOLDING SIZE (ACRES)	GROUP I	GROUP II
0	54.55	37.06
<1	2.37	1.76
1–2.5	37.94	36.47
>2.5	5.14	24.17
Average landholding (acre)	0.74	1.45

Figure 3. Land ownership and house type of migrant and non-migrant households



Irrigation is a critical factor in land productivity. A staggering 98.02% of Group I households do not have any irrigated land, which severely limits agricultural productivity and could be a driving force behind their migration for labour. In comparison, 69.41% of Group II households lack irrigated land, which, while still a significant percentage, is much lower, with the rest of the households having access to irrigation and therefore potentially more stable and productive agricultural operations. Only 1.98% of Group I households have landholdings between 1 and 2.5 acres that are irrigated, compared to 24.12% in Group II.

The economic implications of these findings are significant. Group I's lack of land ownership, smaller average landholding size, and negligible access to irrigation suggest a precarious economic situation where agricultural viability is limited, making migration for labour a necessary means of livelihood. The absence of irrigation underscores their vulnerability to climate variability and the inability to secure a stable, year-round agricultural income.

Group II's relatively higher land ownership, larger average landholding, and better access to irrigation paint a picture of greater economic security. These households are likely to have a more stable agricultural base, reducing the necessity to seek alternative sources of income through migration. Their ability to invest in and utilise irrigation also indicates a capacity to mitigate some of the risks associated with climate change, such as irregular rainfall.

Income from different sources: The analysis of household survey data (Table 2) shows the difference in the income and economic status of the two groups of households.

Group I (migrating for sugarcane cutting work), primarily depends on agricultural wages, averaging ₹3,367.88 (₹1 is equal to US$0.012, as per the average 2024 conversion rate). This reliance on seasonal agricultural labour points to the precarious nature of their income, marked by vulnerability to climate impacts and the unpredictability of agricultural yields. Their additional sources of income include modest returns from agriculture (₹1,724.14) and non-farm economic activities (₹878.33), indicating a limited scope for livelihood diversification. Livestock and non-farm wage labour in the unorganised sector add meagre amounts to their earnings (₹185.76 and ₹1,731.13, respectively). The absence of income from the organised salaried sector underscores their exclusion from formal employment opportunities. The total monthly income for Group I households averages ₹7,887.23, which is likely to limit their ability to make significant savings or investments, especially when considering this group's larger family sizes (Group I reported having average family size of 6.08, compared to the national average of 5.4 and the additional costs associated with migratory life.

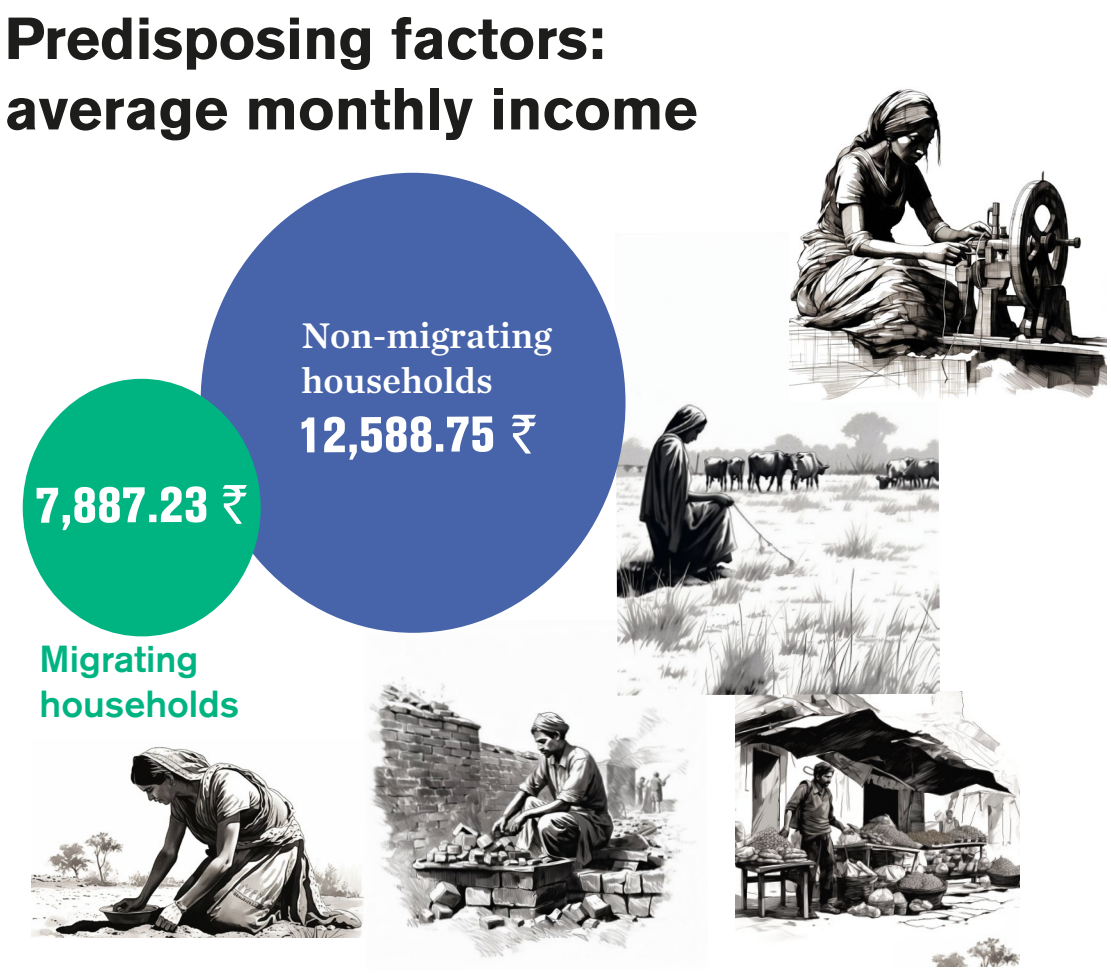
In contrast, Group II households, which do not migrate, show a stronger economic position with a significantly higher income from agriculture at ₹4,311.71. This indicates more productive landholdings and access to resources, allowing for more profitable cultivation. Their income from livestock and non-farm economic activities is on par with Group I, suggesting some diversification in their livelihoods. Moreover, they have an additional source of income in salaried employment in the organised sector (₹323.42). This income diversity contributes to their higher average monthly income of ₹12,588.75.

The economic profiles of these groups paint a picture of disparity, with Group I facing more pronounced vulnerabilities due to a lack of secure, diverse income sources. In contrast, Group II's stability is underpinned by their more diverse and substantial income sources, reflecting the advantages of non-migratory lifestyles and access to a wider range of economic opportunities.

Table 2. Average monthly income breakup by sources (₹)

SOURCES OF INCOME	GROUP I	GROUP II
Agriculture	1,724.14	4,311.71
Livestock	185.76	429.79
Non-farm economic activity	878.33	883.78
Agricultural wage	3,367.88	4,262.1
Non-farm wage — unorganised sector	1,731.13	2,377.93
Non-farm salaried — organised sector	–	323.42

Figure 4. Average monthly income of migrant and non-migrant households



2.1.3 Social factors

The analysis of factors in the social domain focused on the vulnerabilities of specific groups such as women, children and elderly people. Issues such as social discrimination and historical marginalisation can directly influence these groups' capacity to prepare for and recover from climate disasters. Understanding these social realities can allow for the development of inclusive, targeted interventions that address the needs of these specific vulnerable groups.

Social category: The analysis of household survey data on the social composition of Group I and Group II shows the social stratification[4] and corresponding vulnerabilities within these populations. In Group I (migrating households), the majority of households (79.84%) belong to Scheduled Tribes, which are communities recognised as socially disadvantaged. This high percentage is indicative of the social marginalisation and economic challenges Group I faces, with limited access to resources, which can drive them to migrate in search of labour opportunities. A smaller proportion of Group I is composed of Scheduled Castes (12.65%), who also face historical disadvantage and discrimination, further exacerbating their vulnerability and potential for economic instability. Only 7.11% belong to the Other Backward Classes (OBCs), and a negligible 0.4% are from the General Caste. This distribution suggests that Group I's migrating households are predominantly from the most socially vulnerable communities, which may lack the social capital and resources necessary to secure stable, local employment and consequently have less capacity to cope with climate impacts.

[4] Scheduled Castes is a term used to classify certain social groups that have historically faced social disadvantage, discrimination and exclusion in India due to the prevailing caste system. The Constitution of India provides for positive discrimination in favour of the Scheduled Castes to help them overcome social inequalities. Scheduled Tribe is a term used to identify Indigenous communities in India that have been socially and economically marginalised. These tribes are often geographically isolated with limited access to mainstream economic and social activities. Other Backward Class is a collective term used by the Government of India to classify castes which are educationally or socially disadvantaged. It is one of several official classifications of the population of India, along with Scheduled Castes and Scheduled Tribes.

In contrast, Group II has a more diverse social composition with a significant presence of Scheduled Castes (28.24%), OBCs (31.18%), and General Caste members (32.35%). The presence of a higher proportion of General Caste members in Group II suggests that these households may have better access to social resources and opportunities. The relatively lower percentage of Scheduled Tribes (8.24%) in Group II compared to Group I may reflect differing access to land, resources and opportunities, which influences migration decisions. The higher representation of OBCs in Group II also suggests that this group may experience slightly less social marginalisation compared to Scheduled Tribes, potentially providing them with more opportunities to engage in local economic activities.

The data draws a stark contrast between the two groups, with Group I's socioeconomic profile being shaped significantly by social marginalisation. The high representation of Scheduled Tribes within Group I is indicative of a broader socio-historical narrative where marginalised communities often find themselves at the lower end of the economic spectrum and consequently have less adaptive capacity to deal with climate impacts. Group II data implies a contrasting scenario, where the presence of a significant number of General Caste members suggests a more diverse and potentially more resilient socioeconomic fabric. This diversity, indicative of higher socioeconomic status, often translates into better access to resources, information and support systems. Consequently, Group II may possess a broader array of strategies to cope with climate variability and change. The ability to diversify income sources, invest in more climate-resilient agricultural practices, or even leverage social capital to buffer against economic shocks are advantages that stem from their relatively higher socioeconomic position.

Household amenities and water sources: We analysed the data on drinking water sources and sanitation facilities provided by the households. We found that Group I (migrating households) has a significant reliance on less reliable water sources such as common dug wells (31.62%) and tube wells (23.72%). Their access to piped water (33.6%) is lower compared to Group II. This suggests that Group I may face more challenges in accessing clean and safe drinking water, which can lead to health issues and increased time spent on water collection, disproportionately affecting women and children. Group II (non-migrating households) shows a higher dependency on piped water (47.65%), which is often associated with better infrastructure and more stable living conditions. The lower reliance on common dug wells (17.06%) and higher use of tube wells (32.35%) indicates improved water access. The absence of surface water usage suggests that Group II might have better protection against waterborne diseases commonly associated with untreated surface water.

In regard to sanitation facilities, in Group I, a vast majority of households use pit latrines (80.24%), and a concerning number still practice open defecation (19.76%). This high rate of open defecation points to significant health risks and may contribute to the spread of disease, environmental contamination, and heightened vulnerability for women and girls, who may face safety and privacy issues. Group II exhibits better sanitation conditions, with 94.12% using pit latrines and a small percentage (1.76%) having access to flushing toilets. The reduced practice of open defecation (4.12%) aligns with a more advanced sanitation infrastructure and suggests a higher standard of living.

Group II's improved access to drinking water sources and sanitation facilities not only signifies a higher living standard but also indicates a greater capacity to withstand the impacts of climate variability and change. On the other hand, Group I's reliance on dug wells and tube wells places them at higher risk in the context of climate change. Fluctuating rainfall patterns, extended periods of drought, and lower groundwater tables can severely limit their water access. These conditions, exacerbated by inadequate sanitation infrastructure, compound the vulnerability of these communities, making them more susceptible to the health and social implications of water scarcity.

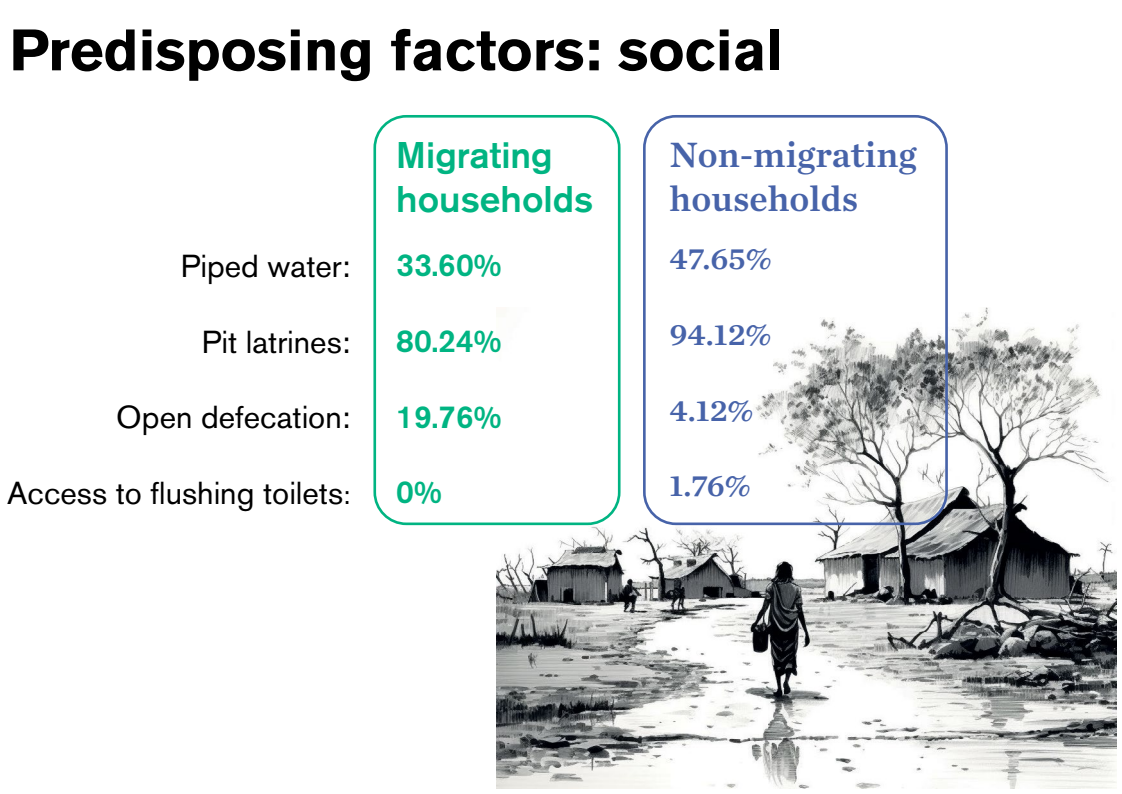
The burden of these challenges often falls on women and girls, who are traditionally responsible for managing household water needs. In times of scarcity, they are forced to travel greater distances to fetch water, further exposing them to safety risks and taking time away from education or income-generating activities. The strain of these additional responsibilities, coupled with their role as caregivers, places women in a position where the indirect effects of climate change significantly impact their wellbeing and socioeconomic status.

2.1.4 Political factors

Governance structures at village level, representation of marginalised groups and administrative capacities play a vital role in a community's ability to manage climate-related risks. Issues like corruption, ineffective delivery of social protection entitlements and limited representation for marginalised communities can compound vulnerabilities (we cover these issues in more detail in section 2.3).

Under political factors, we discuss sugar cooperatives the sugar cooperatives in Maharashtra in more detail as they are significant political entities within the rural dynamics of the state. These cooperatives are deeply woven into Maharashtra's agrarian economy, often under the control of powerful local politicians who use them as a base to wield influence and secure loyalty from farming communities. The cooperatives act as crucial nodes in the political landscape, where control over sugar cooperatives can translate into political capital,

Figure 5. Household amenities of migrant and non-migrant households



helping leaders to mobilise support during elections and manage rural governance. The centrality of sugar cooperatives in Maharashtra's politics is also linked to their role in providing employment and facilitating credit access to farmers, thus positioning them as vital institutions for rural development and political leverage.

The cooperative movement: In 2021–22, Maharashtra emerged as India's leading sugar producer, surpassing the northern state of Uttar Pradesh. Maharashtra achieved a production of 13.8 million tonnes, outperforming Uttar Pradesh's production of 10.5 million tonnes (Biswas and Damodaran, 2022). The Maharashtra sugar industry relies heavily on informal migrant labour from drought-prone regions like Marathwada for cane cutting. The social and economic challenges in this industry include water scarcity, poverty, indebtedness, gender inequality among migrant workers, and various rights violations.

The cooperative movement in Maharashtra's sugar sector (see Box 1), initiated with the aim of empowering farmers and rural communities, has faced criticism due to the persistently poor working conditions of cane cutters. This movement, deeply entwined with state politics, has seen significant influence from political figures, particularly from parties like the Congress and Nationalist Congress Party. This political entanglement has led to allegations of mismanagement and inefficiency within the cooperatives, impacting the welfare of workers, including cane cutters (Lalvani, 2008; Wikipedia contributors, 1 June 2023).

The economic model of these cooperatives, though designed to provide fairer returns to farmers and labourers, has been plagued by inefficiencies. The volatile global sugar market has exacerbated these issues, resulting in financial strains that often translate into delayed or reduced payments to workers. Such economic challenges directly affect the livelihoods of cane cutters, who are already grappling with harsh working conditions, long hours and low wages (Wikipedia contributors, 1 June 2023).

The working conditions of cane cutters further highlight critical issues within the cooperative movement. These workers face discrimination, diminished bargaining power and severe health risks (Pooja and Shree, 2020).

Addressing these issues requires a comprehensive approach, including better cooperative management, stronger regulatory oversight, and the development of alternative livelihoods for vulnerable populations, to ensure that the original goals of the cooperative movement — empowerment and improved livelihoods — are truly realised.

BOX 1: THE COOPERATIVE MOVEMENT IN THE SUGAR SECTOR IN MAHARASHTRA

The cooperative movement in the sugar sector of Maharashtra has a rich and complex history that dates back to the 1950s. It began as a response to challenges faced by cane-growing peasants, including issues with landlessness, exploitation by moneylenders, and unfair practices at private sugar mills. The movement was initially focused on opposing these adversities and was characterised by the broad-based involvement of farmers with diverse land holdings, which was a key strength (Chithelen, 1980).

In 1950, Asia's first cooperative sugar factory, Pravara Sahakari Sakhar Karkhana Ltd, was established at Pravaranagar in the Ahmednagar District of the then Bombay state. This factory was unique in that it was majority owned by local farmers, a significant departure from the norm at the time. The cooperative movement for the sugar industry gained momentum in the 1960s, with the then Bombay state government identifying 12 potential locations for establishing sugar factories and providing capital support (Wikipedia contributors, 1 June 2023).

Over the years, these cooperative sugar factories have played a crucial role in the socioeconomic fabric of Maharashtra. They have been instrumental in encouraging rural political participation and have served as a stepping stone for aspiring politicians, particularly those belonging to the Congress or NCP parties (Lalvani, 2008). Unfortunately, mismanagement and manipulation of cooperative principles have led to inefficiencies in some operations (Das et al., 2006).

As of 2016–17, there were 141 cooperative sugar factories in Maharashtra (Satyanarayana, 2018). The cooperative sugar mills contribute 30.6% of India's total sugar production as of 2016–17 (Satyanarayana, 2018). The presence of this industry has led to the development of rural areas, improving infrastructure such as roads, transportation, medical facilities, education facilities and banking. However, the global glut in sugar production and the subsequent price crash have created financial challenges for these factories.

Workers' unions: In Maharashtra, there are workers' unions representing the rights of cane cutters. For instance, the Sugarcane Cutters and Transport Workers Union, affiliated with the Centre of India Trade Unions, actively advocates for the rights of these workers (ChiniMandi.com, 26 December 2023). This union has been involved in demanding wage hikes for cane workers, reflecting the concerns of labourers. They also sought the renewal of a tripartite agreement to ensure better wages and working conditions for the workers, particularly in light of challenges such as the COVID-19 pandemic (Kulkarni, 20 April 2020). The unions play a crucial role in voicing the needs and challenges of cane workers, striving to improve their working conditions and livelihoods. These trade unions have been able to negotiate some benefits for factory migrant workers in Maharashtra, for example, the appointment of worker representatives on various committees to review problems of sugarcane workers (including increases in minimum wages) (Pooja and Shree, 2020). While unions such as the Sugarcane Cutters and Transport Workers Union have been active in advocating for higher wages and better working conditions, the specific impact on women workers' issues is less clear. Women continue to face unique challenges, including discrimination, health risks and lack of access to facilities.

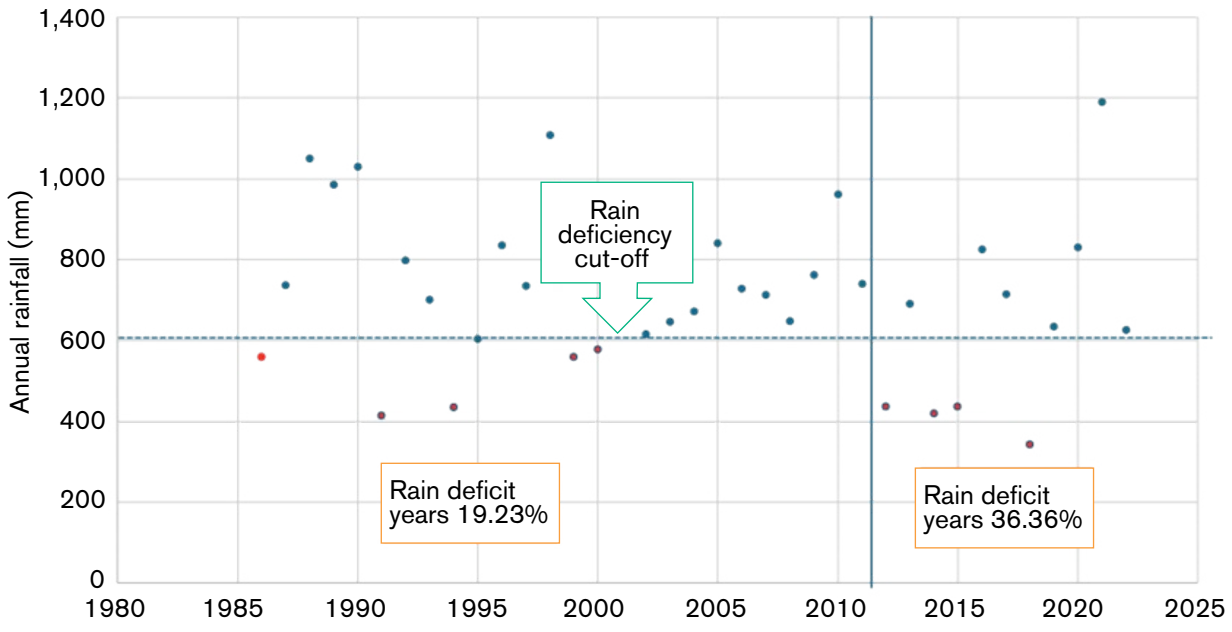
2.2 Precipitating factor — climate change acting as stress multiplier

The analysis of precipitating factors is crucial in understanding the triggers that result in loss and damage, particularly when placed in the context of pre-existing vulnerabilities (predisposing factors) among different groups. Precipitating factors can range from sudden extreme weather events like cyclones and floods to slow-onset processes such as drought and desertification.

In this research, we have considered rainfall variation from normal and the frequency and intensity of drought as the precipitating factors. We analysed the rainfall data for the last 36 years (1986–2022) for the Beed district. Our analysis of rainfall trends and deficiencies is presented in Figure 6.

The analysis of rainfall data from Beed district reveals a complex pattern of variability in annual precipitation. For example, in 2018, the recorded rainfall was 342.03mm, less than half the normal amount of 743.5mm. Years with rain shortfalls of this magnitude (–54% departure from the norm) are indicative of drought. The data over the last two and half decades portrays similarly inconsistent rainfall patterns, with some years witnessing significantly higher than average

Figure 6. Rainfall trends in Beed district



Data source: Government of Maharashtra (2022), District Survey Report, Beed for Sand Mining and other Minor Minerals, Retrieved from https://environmentclearance.nic.in on 11 January 2024; Indian Meteorological Department, Pune. Met Glossary, Retrieved from https://www.imdpune.gov.in/Reports/glossary.pdf on 11 January 2024; and Central Ground Water Board (2020), Aquifer Maps and Ground Water Management Plan, Beed District, Maharashtra. Published by Central Ground Water Board, Department of Water Resources, Ministry of Jal Shakti, Government of India.

rainfall, and others experiencing rainfall well below the expected levels. This erratic distribution contributes to the unpredictability and severity of drought conditions, posing a considerable challenge for agricultural planning and water management. For the purposes of our analysis, we considered the **rainfall deficiency cut-off** as –19% from the normal rainfall, as per the Indian Meteorological Department's benchmark. This means that any year where the rainfall is 19% less than the normal expected rainfall is considered a deficit year. Our analysis showed the following trends:

- **Frequency of rainfall deficit years, 1986–2011**: During this period, the frequency of deficit years was 19.23%. This indicates that about one in every five years experienced significant rainfall deficiency, according to the set cut-off.
- **Increased deficiency in recent years, 2012–2022**: There is a noticeable increase in rainfall deficit years between 2012 and 2022, with the frequency rising to 36.36%. This suggests that more than one-third of the years in this period faced a significant shortfall in rainfall, which is nearly double the frequency of the previous period.

The year-on-year fluctuations in rainfall are indicative of an increasing trend in the frequency and intensity of droughts, potentially linked to broader climate change dynamics. The increased frequency and intensity of rainfall deficiency have significantly impacted agricultural cycles and water availability. This has led to harsher drought conditions and greater economic stress within the agrarian community in Beed, given that the majority of farmers are dependent on rainfed agriculture.

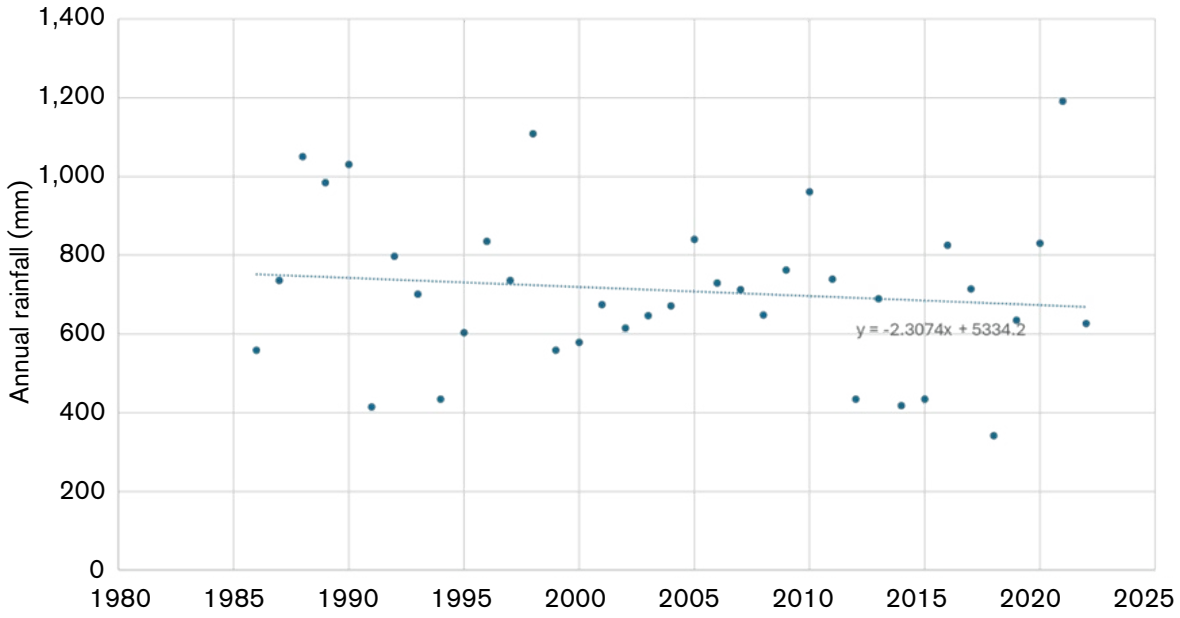
We also carried out a regression analysis of annual rainfall data over a period from early 1986 to 2022 (see Figure 7).

The analysis shows the following trend:

1. **Downward trend**: The regression line has a negative slope ($y = -2.3074x + 5{,}334.2$), indicating that annual rainfall has been decreasing over the years. This implies that there is a long-term trend of declining rainfall in the region.
2. **Rate of decline**: The slope of the regression line (–2.3074) quantifies the rate of decline in rainfall. This means that, on average, annual rainfall has decreased by approximately 2.31mm per year over the period 1986–2022.
3. **Variability**: The data points show variability around the regression line, which suggests that while there is a general trend of decline, individual years may experience significantly more or less rainfall than the trend suggests.

This climatic variability places communities in Beed at a heightened risk, compounding pre-existing vulnerabilities leading to economic and non-economic loss and damage.

Figure 7. Regression analysis between year and amount of rainfall received (mm)



Demographically, the already limited water infrastructure is leading to acute water scarcity, impacting both domestic and agricultural needs. Socially, the burden of water scarcity falls disproportionately on women and marginalised communities, exacerbating existing inequalities and leading to social strain. Economically, reliance on rainfed agriculture means that inadequate rainfall results in crop failures, financial instability, increasing debt and forced migration. Politically, inadequate government responses to these challenges further heighten vulnerability, compelling communities to migrate in search of better opportunities. This complex interplay of factors results in a range of economic and non-economic loss and damage, emphasising the need for holistic interventions that address these varied vulnerabilities and strengthen resilience against environmental challenges.

How sugarcane politics is driving the region further into water scarcity. In Maharashtra, the pattern of sugarcane cultivation offers a stark illustration of agricultural paradoxes and political influence. While sugarcane is cultivated on only 4% of the total cropped area, it consumes 71.5% of the state's irrigated water (Pooja and Shree, 2020). This disproportionate usage becomes even more glaring considering that 79% of the state's sugarcane is produced in drought-prone areas (Pooja and Shree, 2020), highlighting a severe mismatch between crop selection and environmental conditions.

Marathwada region within Maharashtra, known for its recurrent droughts and acute water shortages, serves as a prime example of this imbalance. Despite water scarcity, the region has a high concentration of sugar mills; of the 195 sugar mills in Maharashtra in 2018–19, 54 were situated in Marathwada (Pooja and Shree, 2020). This proliferation continued even as the region grappled with severe droughts, relying on tanker-supplied water for basic needs while simultaneously expanding sugarcane cultivation.

The paradox deepens when considering the rainfall data — which, as per our analysis, shows that the annual rainfall has decreased by approximately 2.31mm per year over the period 1986–2022.

This situation is a direct consequence of 'sugar politics' — the intertwining of the sugarcane industry with political interests. The political backing of sugarcane cooperatives has not only facilitated the growth of sugar mills but also influenced policies and resource allocation in favour of sugarcane cultivation, often overlooking environmental sustainability. The result is acute water scarcity, forcing dependence on tanker-supplied water, triggering forced migration, and in extreme cases, leading to farmer suicides.

The water consumption of sugarcane further underscores the issue — it takes 22.5 million litres and 14 months to produce one crop of cane, while it takes only 4 million litres and 4 months to produce one crop of chickpeas (Pooja and Shree, 2020). Considering Marathwada's arid conditions, the cultivation of drought-resistant crops such as Jowar, pulses and oilseeds would be more suitable (Pooja and Shree, 2020). However, the lower labour requirements and assured returns of sugarcane often sway farmer preferences.

The disparity in development and political influence between different regions within Maharashtra state exacerbates the issue. Western Maharashtra, with

its political clout and better-developed infrastructure, contrasts sharply with the less developed regions like Vidarbha and Marathwada. This uneven development drives annual migration from drought-prone areas to more prosperous regions, underscoring the urgent need for a balanced and environmentally sustainable approach to agriculture and regional development in Maharashtra.

2.3 Status of protective factors offering a safety net during times of crisis

Understanding the state of protective factors is important as it serves to identify how existing social protection programmes provide support to vulnerable communities during times of crisis. These safety nets can be critical in helping communities deal with both the economic and non-economic impacts of climate change.

India has been progressively establishing a rights-based framework for social protection, aiming to secure food and livelihoods and to mitigate the impacts of crop damage, among other welfare objectives. Key programmes like the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), the Public Distribution System (PDS), and the Pradhan Mantri Kisan Samman Nidhi (PM-KISAN) programme exemplify this approach. For areas like Beed, grappling with recurring droughts, access to these programmes is important.

We analysed the access to social protection programmes in Beed by collecting household data for the two categories of household (see Figure 8) and conducting focus group discussions with vulnerable groups. The information collected was analysed for programmes offering food security, livelihood security and access to basic services like education, health and cash transfers.

Our analysis showed the following trends:

Food security: The PDS is a national food security programme that distributes subsidised food and non-food items to India's poor. Major commodities like wheat, rice, sugar and essential fuels are made available to eligible households at subsidised rates to ensure food security and support nutritional intake. Our analysis showed that Group II has greater access to food from PDS (75.88%) compared to Group I (60.08%). This could reflect the operational issues (such as problems of targeting, diversion of food grains and corruption) associated with access to PDS entitlement for the migrating families of Group I, despite recent changes that introduced portability benefits for migrant populations. Under the 'One Nation One Card Plan', migrant beneficiaries can get their food grain entitlements through any PDS shop of their choice. However, in the focus group discussions, Group I beneficiaries said PDS shops at their destinations only offer rations to local beneficiaries.

Livelihood security: MGNREGS guarantees 100 days of wage employment in a financial year to every household in India. MGNREGS has a provision for an additional 50 days of employment to beneficiaries in the event of severe drought or other natural calamity. This can act as a livelihood safety net for rural households, particularly during the agricultural lean season or a climate crisis, helping prevent distress migration. However, we found that both groups had low participation in MGNREGS, with Group II slightly higher at 1.76% compared to Group I at 1.19%. Community representatives from the two groups said that even though they have job cards and requested work, they were not provided with wage employment. We also found that there was a lack of awareness within the community about their rights and entitlement, especially their eligibility for an unemployment allowance if they are not provided with work when they ask for it.

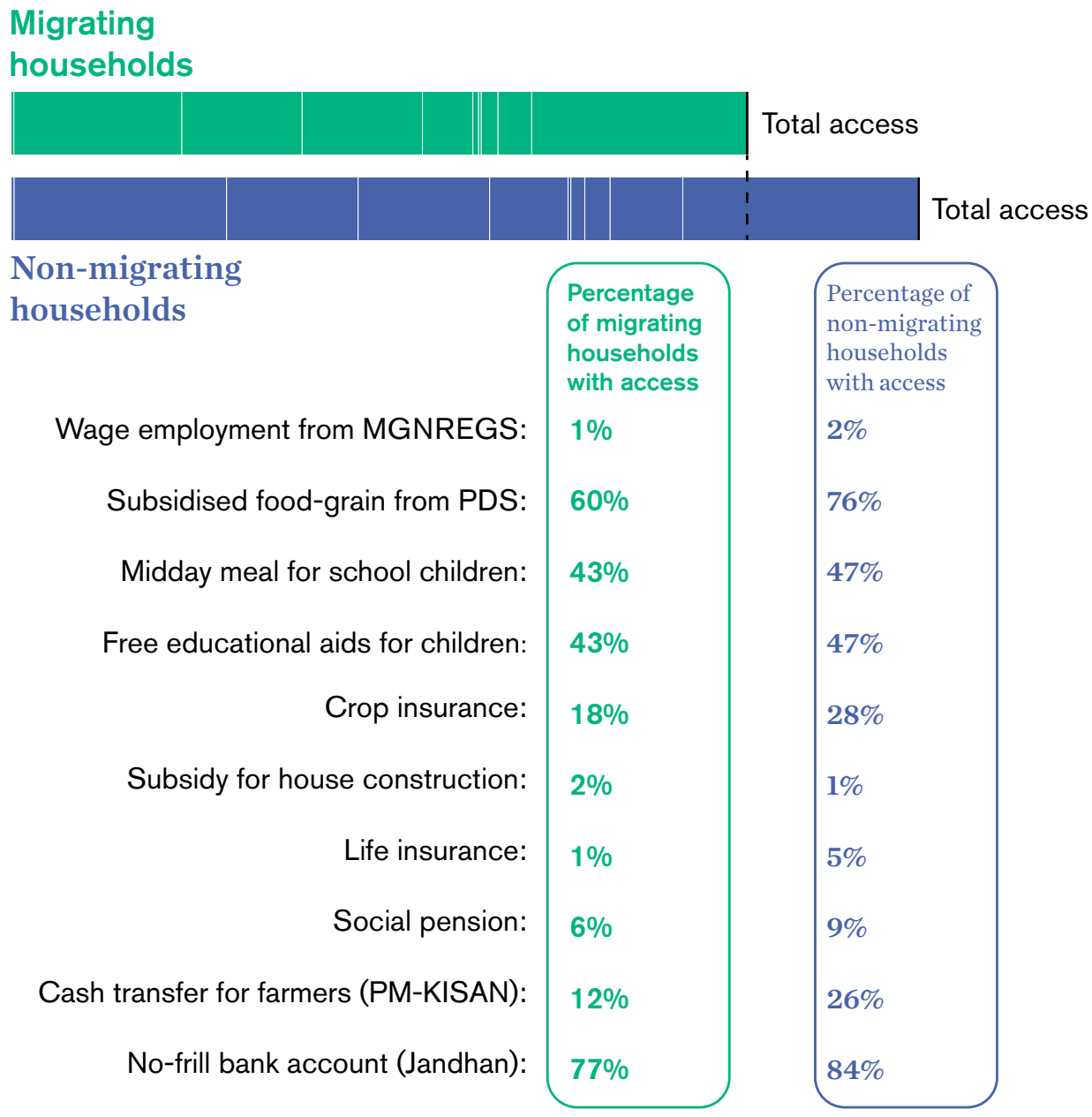
Health and education: Ayushman Bharat Yojana, also known as Pradhan Mantri Jan Arogya Yojana (PMJAY), is a flagship health insurance scheme initiated by the Government of India in 2018. It aims to provide free access to healthcare for over 500 million beneficiaries, making it one of the world's largest health insurance schemes. However, we found that households in neither group were aware of, or had access to, no-cost health insurance under PMJAY, indicating a gap in health coverage.

The Mid-Day Meal Scheme is an initiative to improve the nutritional status of school-age children nationwide. It provides free lunches on working days for children in primary and upper primary classes in government and government-aided schools. It serves as both a health and educational safety net, ensuring that children from disadvantaged backgrounds receive at least one nutritious meal per day, which can significantly improve their ability to concentrate and learn during school hours. In our assessment on the ground, we found that the access to mid-day meals and free educational aids for children is higher in Group II (both 47.06%) compared to Group I (43.48% and 43.08%, respectively), suggesting that children in non-migrating households may have better educational support.

Insurance and financial safety nets: Crop insurance is more prevalent among Group II (28.24%) compared to Group I (18.18%), indicating low financial protection in the event of drought-related crop loss. Our discussions with community members highlighted a low level of awareness about such schemes and operational difficulties in getting access to government subsidies for insurance premiums.

Figure 8. Household access to social protection programmes (%)

Protective factors: household access to social protection programmes



Pradhan Mantri Awas Yojana (PMAY) is another flagship programme initiated in 2015 with the aim of providing affordable housing to the urban and rural poor. PMAY provides financial assistance for house construction, and is directly transferred to the bank accounts of beneficiaries. Our survey showed that access to finance for house construction is low for both groups, but notably more accessible to Group I (2.37%) than Group II (0.59%), perhaps reflecting eligibility criteria that prioritise income levels and other socioeconomic indicators.

PM-KISAN provides income support to all landholding farmer families across the country to help them purchase agricultural inputs and domestic items. There is a significant difference in access to PM-KISAN cash transfers for farmers, with Group II having almost double the access (25.88%) compared to Group I (12.25%). This disparity appears to have arisen because of challenges highlighted by Group I in maintaining consistent documentation or land records required for access to such schemes. Similarly, social pension access was found to be higher in Group II (8.82%)

compared to Group I (5.53%), because Group II households are better able to navigate government systems to get access.

The no-frills Jandhan bank accounts are a significant government initiative aiming to create inclusive financial empowerment, offering basic banking services to the underserved and marginalised communities and integrating them into the mainstream financial system. Access to Jandhan accounts was found to be fairly high in both groups, but higher in Group II (84.12%) than Group I (77.47%), indicating a slightly better integration into the formal banking system by the non-migrating households.

Overall, the data shows that Group I has significantly less access to crucial programmes such as PDS, employment under MGNREGS, and PM-KISAN. This is indicative of institutional barriers that prevent migrant workers from accessing the benefits designed to act as safety nets. Their migratory patterns inhibit their ability to enrol in and maintain the continuity necessary to benefit from these schemes. This is especially a problem for the children that migrate with their families, as they are not able to continue education and access the Mid-Day Meal scheme. This institutional exclusion is exacerbated by political marginalisation because social marginalisation often translates into less political representation and lesser awareness of entitlements. Without this knowledge and representation, migrant families are less likely to benefit from schemes intended for their welfare.

The impact of this exclusion is multifaceted. Economically, it means these households are more likely to incur debt during downturns, with no social insurance to fall back on. Socially, it leads to increased stress and strain on familial and community structures as they struggle to cope with the compounded hardships without external support. With regard to health, the lack of insurance and assistance can lead to untreated illnesses and chronic health conditions, further limiting migrating households' ability to work and earn. For children, the absence of educational aid and mid-day meals impacts their learning opportunities and nutritional status, potentially perpetuating the cycle of poverty.

The data underscores an urgent need for targeted policy interventions that account for the mobility and unique circumstances of these communities ensuring that social protection programmes are accessible to migrant families, especially during climate crises.

3

How climate-induced distress migration pushes women towards hysterectomy

3.1 Drought and indebtedness push communities to migrate

The failure of crops due to drought and the mounting financial pressures often leave migration as the only viable option for communities in Beed. Consequently, many find themselves compelled to undertake seasonal migration to work as sugarcane cutters in adjacent areas, where sugarcane farms offer some employment opportunities. A significant portion of families from Group I (80.24%) migrated for work during the last 12 months, compared to a minimal percentage from Group II (1.18%), indicating a stark contrast in the reliance on migratory labour between the two groups. The majority of Group I migrants move to other districts within their state (56.16%) or to other states (38.42%) as cane cutters.

In Figure 9, we have presented how migration has increased during the last three decades. The data in Figure 9 underscores a significant shift in migration patterns among Group I households. A majority of 55.67% have started migrating only within the last decade, a trend likely exacerbated by the intensifying frequency and severity of drought conditions, a manifestation of climate change. As traditional farming becomes less reliable due to climatic challenges, these households are compelled to seek alternative sources of income.

This trend towards increased migration in Group I can be seen as a direct consequence of climate change, which has heightened the vulnerability of already marginalised communities. The precarious nature of their livelihoods, characterised by small landholdings and limited access to irrigation and other resources, renders them particularly susceptible to increasingly unpredictable weather patterns.

This trend is also corroborated by the data collected from households on the reasons that drive communities' decision to migrate in Figure 10.

Our analysis shows that the main reasons for families deciding to leave their homes, scoring 77.83, is drought, which brings about severe financial strain. Close behind, with a score of 69.81, is the challenge of accessing social protection programmes offered by the government. The access problems stem from several issues, such as a lack of awareness about these programmes, complicated processes and documentation that discourages applications and inability to navigate government systems to get access to their entitlements.

Education and vocational training, or rather the lack of it, also pushes people towards migration, scoring 65.38. Without proper education or skills, many find themselves with few options for earning a living, driving them to seek unskilled labour work elsewhere.

Figure 9. Percentage of families undertaking migration

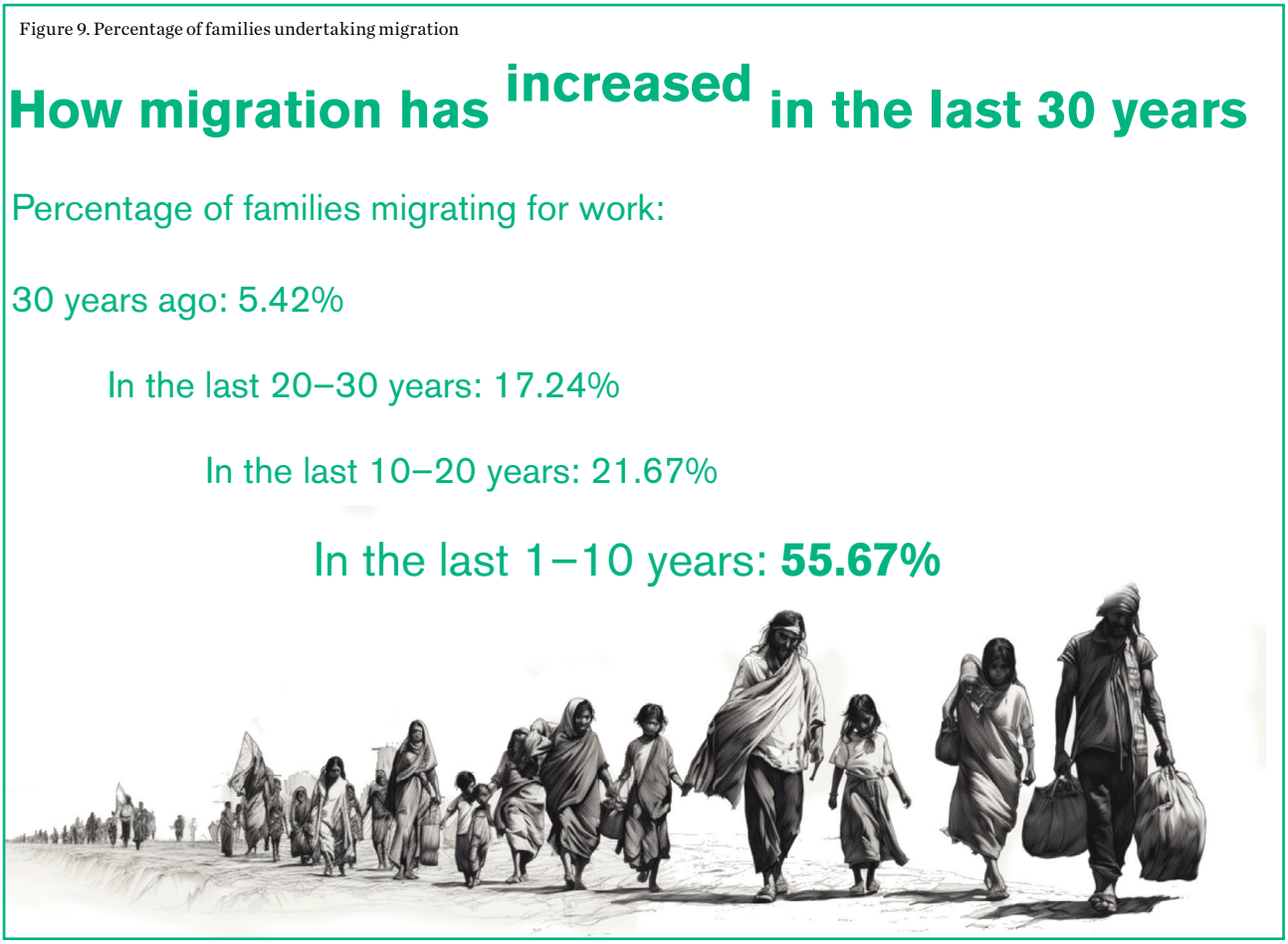
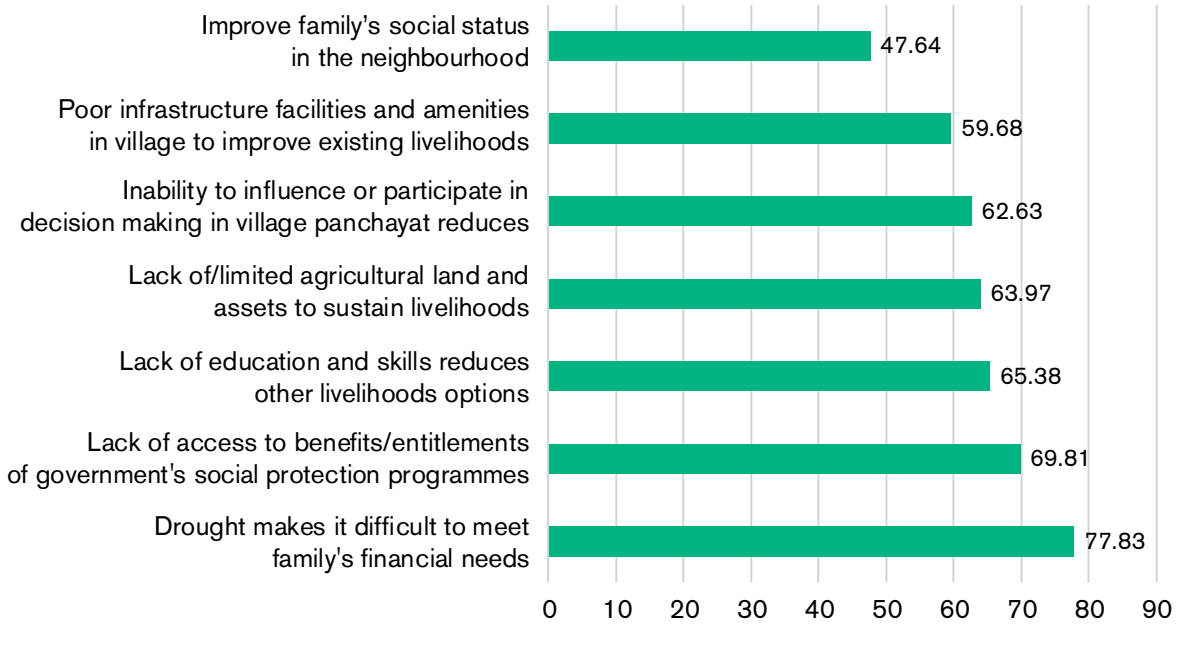


Figure 10. Reasons impacting the decision to migrate among families in Beed district



Another significant factor is the scarcity or insufficiency of agricultural land and assets, which scored 63.97. This reflects the situation in which small or fragmented landholdings fail to sustain the livelihoods of farming families, compelling them to look for work in other places.

A sense of disenfranchisement within local governance systems, evidenced by a score of 62.63, also influences migration decisions. This is when individuals feel that they cannot contribute to or influence decisions in the Gram Sabhas (village assemblies). Inadequate infrastructure

and amenities, scoring 59.68, underline the development challenges in rural areas. Lastly, improving one's social status in the community, with a score of 47.64, is the least impactful but still a significant factor driving migration. This desire for a better standing also motivates families to move, hoping to earn better livelihoods, gain respect and break free from the constraints of local limitations.

Collectively, these factors paint a picture of a community driven to migrate not just by the immediate economic fallout of climate adversities but also by the structural shortcomings in social support, education, land holding and governance. Addressing these concerns calls for comprehensive development strategies that ensure economic stability and social welfare.

3.2 The mukkadam system of recruiting migrant workers

In the Marathwada region of Maharashtra, the recruitment of labour for sugarcane harvesting is a process deeply rooted in the region's agricultural cycle and social fabric. As the monsoon retreats in July–August, sugar mills carry out crop surveys and determine their labour needs for the upcoming harvest season. They communicate these requirements to local labour contractors known as 'mukkadams',

Mukkadams then initiate the process of hiring labourers to cut the sugarcane, not through formal written contracts but via informal agreements. Workers are hired as pairs known as 'jodis' — typically husband and wife teams. The jodis join other pairs to form a 'toli' or harvesting group. These arrangements are usually verbal, with details about wages and work conditions relayed personally by the mukkadams. Once they secure the necessary number of jodis, the mukkadams formalise their agreements with the sugar mills through written contracts, securing an advance against this commitment. Here it is important to note that while the contract between mukkadams and sugar mills is written and formal, the one between mukkadams and jodis is verbal and informal.

The mukkaddams often give advance payment to jodis, which also serves as a security deposit. It is typical for the man within the jodi to receive the advance. This advance is crucial for the jodis, enabling them to migrate to the sugarcane farms for work. The amount varies, often depending on the jodis' bargaining skills. The jodis use this advance to meet their immediate financial needs such as repayment of debts, weddings, surgery or medical treatments. The advance is adjusted at the time of the final payment, which is calculated based on the total cane harvested after the end of the harvesting season. Our survey showed that migrants spent an average of 5.22 months at their work destination, with a majority (59.61%) staying for the full six months of the sugarcane harvesting season.

As harvest time approaches, the mukkadams inform each jodi of their start date and the location where they will be working. The jodis then migrate, taking their families, household belongings, and sometimes even livestock to the new location. Our survey showed that 67.98% of the families migrated as pairs, leaving the rest of their family behind, whereas others migrated with their families. The journey can take days, often facilitated by the mukkadams through various means of transport such as trucks or bullock carts. While the mukkadams provide some necessities on credit, the workers prefer to carry as much as possible to reduce spending their advance payment.

The data collected from the household survey and focus group discussions present a clear picture of the crucial role played by mukkadams in the migration and employment of sugarcane workers from Beed district. In our survey, 97.54% migrants mentioned that they relied on middlemen to identify their destination for work, indicating a high dependence on the mukkadams for employment opportunities, demonstrating the control of the middlemen over labour mobility and job allocation.

3.3 Wage structure and labour dynamics in sugarcane harvesting

The sugarcane harvest involves a rigorous and time-intensive process, where workers, organised in groups or 'tolis', operate under the guidance of deputy mukkadams. These deputy mukkadams, who may enjoy a favoured status or are often related to the main mukkadams, oversee the tolis' daily activities, which can last from dawn until dusk, and sometimes well into the night.

A typical workday for these labourers involves long hours, with shifts ranging from 12 to 16 hours. This can extend up to 18 hours in cases where loading may need to be done after dark. The timing of the work is dictated by the availability of transport for the harvested cane, such as trolleys or trucks.

In each toli, specific tasks are allocated, such as cutting lines of sugarcane that must be completed within the day. The division of labour is gender-specific: male workers are usually responsible for cutting through the sugarcane stalk and stripping the leaves, while female workers handle the cleaning, tying the cut cane into bundles weighing approximately 40–50kg (depending on the size of the cane) and the physically demanding task of loading these bundles onto trolleys, often under challenging conditions and without adequate lighting.

This efficient sequence of cutting, loading and transporting cane to the mills contributes to the high sugar recovery rate in the region. Workers move from one farm to another within the sugar mill's catchment area with the potential to work across up to 25 such farms in a single harvesting season.

The mukkadams assemble the work groups, or tolis, with jodis from different villages, often strangers to one another, to diminish their collective bargaining power. This means the workers do not have a social support network around them. A jodi can cut and load about 2 tonnes (sometimes more, depending on the target set by mukkadams) of cane per day, together earning around ₹250 per tonne working for 12–16 hours. For comparison, as per the Ministry of Agriculture & Farmers Welfare (2021), the agricultural wage rate for an eight hour shift in Maharashtra in 2019–2020 was ₹328 for men (the all-India average is ₹348), and ₹225 for women (the all-India average is ₹278). So, the wage rate paid to cane cutter jodis is much less than the average agricultural wage rate. As a result, sugarcane cutters must work twice as long to earn what is essentially an eight-hour wage, highlighting the discrepancy between agriculture wage policies and the realities on the ground. It is also important to note that if these workers had been provided with employment under MGNREGS in their own village, they could have earned ₹273 per day for an eight-hour shift, with wage parity between men and women and decent working conditions.

The sugar mills, which contract the cane harvesters, do not typically oversee the payment of wages. This responsibility falls on the contractors, or mukkadams. Unfortunately, the contractors are known to engage in wage deductions without clear explanation, leaving workers with less than their due. Opportunities for workers to improve their financial situation are scarce, with the only option being to shift to another contractor, which often does not change their financial predicament or break the cycle of debt in which they are trapped.

Middlemen play a dominant role in the negotiation of employment terms and wages, with 98.52% of the migrants indicating that mukkadams handled these discussions with the mill owners. This suggests that the workers have very little engagement or bargaining power with their employers. The arrangement perpetuates a system where the labourers' efforts to escape indebtedness are hindered by a lack of transparency and fair practice in wage distribution. Consequently, sugarcane cutters find themselves trapped in a relentless cycle of hard labour, reflecting a broader issue of labour exploitation.

This dynamic also has implications for jodis' working conditions (see Box 2), as they are removed from direct negotiations with mill owners and do not have the leverage to advocate for better terms or address grievances; migrants are entrenched in a system that leaves them vulnerable to exploitation.

BOX 2. ACCIDENTS AND SAFETY CONCERNS AMONG MIGRANT WORKERS

The labour-intensive process of cane cutting and loading poses significant risks, particularly for women and children. Women, often tasked with the head-loading of heavy cane bundles onto trucks and trolleys, work under precarious conditions. Their work involves climbing ladders up to truck loading beds while carrying bundles of cane weighing 40–50kg. They often have to work late into the evening without proper lighting, increasing the risk of accidents, which are unfortunately common. These accidents range from minor injuries to severe fractures and, in some instances have been fatal. The lack of insurance or compensation for such incidents further exacerbates the vulnerability of workers. In the event of an injury, contractors may extend loans to the affected workers, which then become another debt to be repaid from future wages, perpetuating the cycle of indebtedness.

3.4 Challenges in living and working conditions

The living conditions for sugarcane cutters at their destination workplaces are makeshift. Upon arriving at their work sites, workers set up shelters near the sugar mills or directly within the sugarcane fields. These shelters offer scant protection and space, hardly sufficient for individual workers, let alone entire families. The absence of basic amenities such as electricity and clean drinking water is the norm.

In relation to sanitary facilities, the situation is dire. The sites are typically devoid of toilets, compelling both men and women to resort to open defecation, a practice that is particularly unsafe and demeaning for female workers. Women and girls face the added burden of fetching water from distant communal sources and are forced to bathe without privacy, often under the cover of darkness to maintain some semblance of dignity.

The difficulties for women are exacerbated during their menstrual cycles. The lack of awareness and access to proper menstrual hygiene products leads them to use unsanitary materials, increasing the risk of infections. Symptoms of *Leucorrhoea*, a condition exacerbated by poor hygiene, are common and often force women to self-medicate just to continue working.

The daily routine in the work camps begins well before dawn, with women rising earlier than men to complete domestic chores and prepare meals before heading out to the fields. Their day starts in the darkness of the early hours, with the added challenge of managing their

personal hygiene and health in the absence of facilities. The early start is necessary to ensure that they can meet the demands of their long workdays, which often stretch from sunrise to sunset.

The cumulative effect of these conditions is a life of significant hardship for the migrant sugarcane harvesters, with women shouldering a disproportionate share of the burden. The provision of basic amenities such as proper shelter, clean water and sanitary facilities is not just a matter of comfort but of health and safety, particularly for female workers.

3.5 Fear of wage cuts pushing women to have hysterectomies

The system of hiring workers in pairs places additional financial and physical burdens on women. The jodis are often subjected to penalties for missed work. Wage deductions can range from ₹500 to ₹1,000 for a day's absence, which is twice what a jodi earns working 12–16 hours a day.

The mukkadams enforce a rigorous work regime, with long hours and no allowances for leave, even for health reasons. The fear of wage cuts for missed workdays creates a situation where women feel compelled to choose between their health and their livelihood. Since the pay structure is often based on the quantity of sugarcane cut and loaded, any reduction in work capacity, including effects of menstruation or pregnancy, can lead to significant financial penalties. Many women continue to work through their pregnancies, sometimes giving birth in the fields without adequate medical care — with many returning to work within one or two weeks of giving birth (see Case study 1).

The role of the mukkadams is central to the creation of an environment where female workers face a stark choice between their reproductive health and their economic survival. Mukkadams often provide advances to workers, which are then deducted from their wages. This system creates a cycle of indebtedness, where workers are constantly trying to clear their dues. When health issues arise, including those related to menstrual cycles or pregnancy, women are faced with the choice of taking leave and incurring wage deductions or continuing to work under physically demanding conditions. Their fears are further compounded by frequent and unexplained wage adjustments, leaving workers in a perpetual state of debt, with many reporting outstanding dues from previous seasons despite their exhausting labour.

Mukkadams typically do not provide access to healthcare or information about health rights. Women labourers, already in a vulnerable position due to their lack of education and awareness, are left to rely on informal and often exploitative medical advice. This lack of support and information perpetuates misconceptions about health and leads to poor health choices.

While mukkadams may not directly force women to undergo hysterectomies (see Case study 1), the conditions they create: the constant fear of losing wages, heavy financial penalties, and lack of medical

CASE STUDY 1: LATA WAGHMARE'S TALE OF LOSING HER CHILD AND WOMB


Lata Waghmare

Lata Waghmare, a 34-year-old cane cutter, says: "I delivered my second baby when I was on the sugar cane field. I was so scared for taking the leave post-delivery because of the khada (leave) charges. The penalty for skipping one day's work is in the range of ₹500–₹1,000. I got back to work five days after the delivery.

"To feed the baby I carried her to the field with me. While carrying the cane bundles, I kept her on the floor in one corner.

"The tractor ran over my baby. I lost my child."

Lata belongs to Scheduled Caste Mang. She has four children. She says: "Even when my child died, I couldn't afford to mourn. I got back to work the next day after the death."

"After the delivery, though, I bled for a month. I used to roll on the floor. I cramped a lot," Lata recalls. "In March 2010, after coming back from the field, I went to Beed and got my pishvi (uterus) removed. (The) Doctor told me, it was because of the heavy bundles lifting and not taking rest post-delivery that I was bleeding for a month."

Lata's home village is Kathawada in Beed district. And every year, she and her husband migrate to Karnataka to work as cane cutters.

BOX 3: WHAT IS A HYSTERECTOMY?

A hysterectomy is a significant surgical procedure where a woman's uterus, the organ where a baby develops during pregnancy, is removed. This operation results in the woman losing her ability to become pregnant and also brings an end to her menstrual cycles. The surgery can vary in scope: a total hysterectomy removes the entire uterus including the cervix, while a partial, also known as a subtotal hysterectomy, leaves the cervix intact. In more severe cases, such as when cancer is involved, a radical hysterectomy may be performed, which includes the removal of the uterus, adjacent tissues, and part of the vagina.

The implications of undergoing a hysterectomy are profound. Women who have had a hysterectomy will experience an immediate end to menstruation and their ability to bear children is lost. When the ovaries are also removed — a decision often made based on the patient's age or the underlying condition necessitating the surgery — it can prompt menopause, regardless of the patient's age, leading to symptoms like hot flashes and changes in sexual function.

Recovery from a hysterectomy requires a period of rest and limited physical activity. Doctors advise the patients undergoing hysterectomy to avoid heavy lifting and strenuous exercise for several weeks to prevent complications and promote healing. Patients are advised to carefully follow their healthcare provider's instructions for incision care to avoid infection, and regular follow-up visits are crucial to ensure that the body is healing properly.

Moreover, the surgery can have emotional and psychological effects. The condition of no longer being able to conceive can be emotionally challenging, and some women might experience a period of grief or a shift in their sense of self. Support from healthcare professionals, close friends and family are needed to navigate this transition.

Sources: Cleveland Clinic (n.d.), Bharadwaj (2024)

support, indirectly push women towards this drastic decision. In some cases, mukkadams might even facilitate the process by providing loans for the surgery, further indebting the labourers. The situation is exploited by predatory medical practitioners who recommend hysterectomies as a solution for a range of reproductive health issues. Women, desperate to avoid loss of wages and unaware of the long-term consequences, often consent to these surgeries.

Local healthcare professionals and social organisations highlight a critical lack of awareness regarding menstrual hygiene and reproductive health as the root cause of many issues faced by the migrant women. Public health facilities in their home villages are ill-equipped to handle their medical needs, and the lack of medical services near the sugarcane fields means that diseases go untreated, leading to prolonged suffering.

In this environment, private healthcare practitioners often exploit the workers' fears of infection and cancer, recommending hysterectomies even when they may not be medically necessary. This practice is particularly prevalent when women have had more than two children, at which point the family believe that the uterus has served its purpose. Thus, a significant number of these surgeries take place in private hospitals, often during the lean period between sugarcane cutting seasons.

Local NGO representatives also say that the links between some healthcare providers and private hospitals deceive workers into undergoing unnecessary surgeries, with the costs often covered by wage advances from contractors. This system traps women in a cycle of debt and health issues.

On a global scale, the rate of women undergoing hysterectomies is variable, often depending on the availability of healthcare, the prevalence of the conditions it may be used to treat, and cultural attitudes toward gynaecological surgery. In India, the National Family Health Survey conducted in 2015–2016 suggested that, on average, 3.2% of women in the country undergo hysterectomies, with the median age for the procedure being 42 years.

However, recent data collected from the field presents a starkly different reality for migrant women labourers from Beed. Here, an astonishing 55.73% of these women have undergone a hysterectomy, a figure that far exceeds both the national average in India and global rates. This alarming statistic not only highlights a significant overuse of the procedure but also points toward systemic issues within the labour and healthcare sectors which these women must navigate.

For female sugarcane cutters in Beed, the reality is a relentless cycle of physical labour, health risks and financial constraints. Their situation is exacerbated by the lack of accessible healthcare, the exploitative practices of some medical practitioners, and the pressure to maintain productivity at all costs. This often leads to the drastic choice of undergoing hysterectomies, a decision influenced by a combination of misinformation, financial desperation and the fear of wage cuts.

3.6 Do hysterectomies improve or worsen health issues for migrant women?

The rationale behind female sugarcane cutters opting for hysterectomies is often linked to a belief that having the operation will increase their work productivity. With the cost of the surgery roughly equating to a season's earnings for a jodi, this procedure is seen as an investment that will facilitate uninterrupted labour, free from the complications of menstrual cycles and potential pregnancies. However, this assumption fails to account for the significant post-operative health issues that many women report experiencing.

Common complaints following the surgery include physical discomfort, mental anguish, sleeping difficulties, depression and musculoskeletal pain (see Case study 2). Our field survey shows the long-term health repercussions of hysterectomy being faced by

CASE STUDY 2: ENDURING DROUGHT, DEBT AND RELENTLESS PAIN: THE STRUGGLES OF JAYASHREE OWHAL


Jayashree Owhal

"From last six to seven years, we have had no water for drinking, forget about water for farm," says 45-year-old, Jayashree Owhal, a cane cutter, from Kathawada village in Beed district. Kathawada has been one of the worst drought-affected areas in the Marathwada region of Maharashtra.

Jayashree recalls, "Ever since the severe drought of 2016, I walk half a kilometre every day to fetch some drinking water from the nearest bore well. This continues from March until September, every year."

Jayashree belongs to the *Mahar* caste which comes under the socioeconomically marginalised category of Scheduled Caste. "People belonging to Mahar and Mang caste cluster own smaller pieces of land in the village," Jayashree says.

Jayashree and her husband, Asaram, own four acres of land on the outskirts of Kathawada. Their land is completely rainfed. "We couldn't sow at all in 2016, as there was almost no rain that year. It is because of such situations here we started migrating to the Sangli-Kolhapur belt of Maharashtra for the cane-cutting work." Every year Jayashree, along with her family, travels to different villages in Sangli-Kolhapur belt for cane cutting. This is a seasonal migration from the period of October to March. "This year (2023) we returned from the field on 10 March," says Jayashree.

Jayashree says: "In the sugarcane field my work is to tie the cut cane into the bundles and carry them on the head till the point where tractors are parked. The bundles I carry each time weigh almost 50kg.

"I make around 100 such trips, with the bundles, every day to stack up the bundles into the tractor."

She says: "I started bleeding very heavily while carrying the bundles in 2017. Ever since then, every month, my bleeding flow increased. This became a routine. While working on the field, we have no clean cloth or sanitary napkin with us. We use *chumbal* (a cloth kept on the head on which the cane bundles are carried) during periods. *Chumbal* is an unclean cloth. As sugarcane bundles are kept on it, it gets all the pesticides and chemicals stuck on it. It also gets tiny cane particles stuck on it. Using such a cloth during periods and walking for hours with heavy bundles is so painful."

Jayashree says, "I used to always stain my saree during periods. It was so embarrassing to walk with stains. I cramped so severely. But my husband never paid attention to this issue. He said that it is a women's problem.

"My cramping became unbearable after a point. I went to see a gynaecologist in Beed. He suggested I should stop lifting the heavy bundles — but that was the only source of income for us. So, I decided to get the hysterectomy done and get rid of this every month 'pain and stain'."

Jayashree adds: "But little did I know back then, that, in fact, this was the beginning of health crises."

Jayashree wasn't informed about side-effects or post-hysterectomy problems. She wasn't even told to rest after her hysterectomy. She returned to work in the fields soon after the operation and began lifting the heavy bundles of cane again.

Jayashree says: "I have severe back pain. My legs hurt. I take painkillers almost every day to work."

women extend far beyond the immediate post-operative period. Women who have undergone the procedure reported facing menopause symptoms, urinary incontinence, diminished sexual drive, and a variety of other health complications.

These findings show that rather than providing a one-time fix, the surgery introduces a spectrum of new health concerns that can significantly impact a woman's overall wellbeing and ability to work. The decision to undergo a hysterectomy, often made under economic duress and fuelled by misinformation, can lead to a decline in the quality of life, contradicting the very rationale that led to its consideration.

3.7 Children and the intergenerational issues of climate injustice

The children of the migrant workers often accompany their parents, resulting in a significant number of minors missing out on their education during the harvest season. According to Oxfam India (Pooja and Shree, 2020), an alarming number of children under fourteen, estimated at around 200,000, accompany their parents during the migratory harvest season. They are active participants in the labour force, engaging in unpaid tasks that significantly disrupt their development. The precariousness of their living and working conditions also raises concerns about the safety and security of these children, particularly the girls.

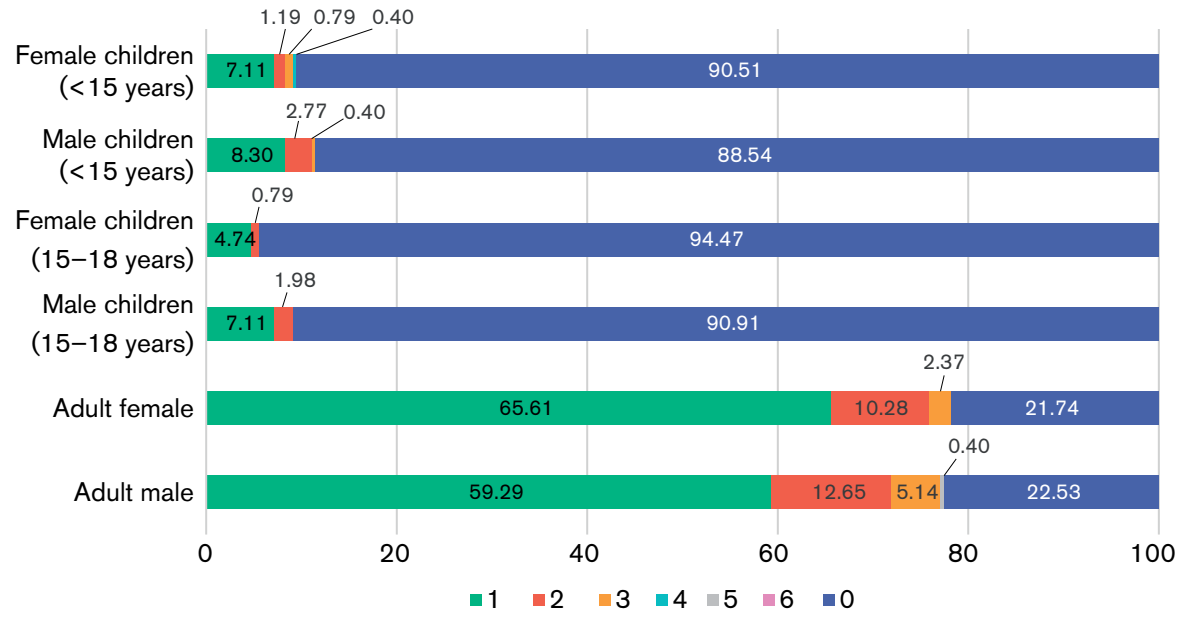
Our household survey data corroborates this troubling trend: 8.30% of households have one male child under 15 who migrates and 7.11% have one female child under 15 who migrates with the parents (see Figure 11). These children are inducted into a cycle of labour and responsibility at a young age, with older girls often burdened with caretaking roles and young boys assisting in the fields, activities that detract from their potential schooling.

This migration pattern perpetuates a cycle of labour that often leads children to follow in their parents' footsteps, becoming sugarcane cutters themselves. It is a cycle further reinforced by inadequate efforts to provide educational support during these crucial months.

The impact of this migratory lifestyle is especially pronounced for girls, who, apart from their labour in the fields, must manage additional household chores, fetch water, and care for younger siblings. This added burden contributes to a higher dropout rate from schools and the perpetuation of poverty within these communities.

To break this cycle, there is an urgent need for targeted educational initiatives and support systems that are cognisant of migrant children's unique challenges. Only through concerted efforts to maintain consistent schooling and provide supportive infrastructure can the rights of these children be safeguarded, allowing them an opportunity to escape the cycle of poverty and labour that currently defines their lives. This need includes not only the provision of effective schooling during the migration season but also addressing the factors that necessitate distress migration in the first place, for example, by providing cash transfer or public works-based employment in their village through social protection programmes during a climate crisis. Tackling these issues would offer the hope that these children might pursue different paths and break the intergenerational cycle of injustice which currently entraps them.

Figure 11. Age breakdown of family members migrating



3.8 Girls pushed into early marriage

In Beed district, the practice of early child marriage is deeply intertwined with the socioeconomic vulnerabilities of the sugarcane cutting communities, which are exacerbated by climate impacts. The cycle of bonded labour perpetuates itself through generations, as girls are often married-off at the onset of adolescence (see Case study 3) and transition from playing in the fields to working in them.

Sugarcane cutting, being the primary source of employment that hires couples, perpetuates this pattern. This systemic issue not only affects the cycle of child labour but also leads to early child marriages becoming a societal norm. Girls are commonly married at a young age, often between 12 and 16 years of age. Following marriage, these young women join their husbands in the fields as part of a jodi. This early entry into matrimony and work sets in motion a lifestyle that severely limits their access to education and other opportunities. Alcoholism among men and the resulting domestic violence add another layer of hardship for them.

Women and girls in these communities often lack agency and control over finances or property, leading to societal biases and a skewed sex ratio that reflects a deep-seated preference for male children.

In this context, the children of migrant cane cutters endure hardships that go beyond the fields — struggling with access to education, shouldering heavy domestic responsibilities, and facing health risks. To truly address the injustice that spans generations and to prevent the perpetuation of poverty among these families, targeted and functional educational initiatives are essential, along with improved support systems that recognise the unique challenges of these children.

CASE STUDY 3: DWARKABAI WAGHMARE: ENDURING GENERATIONS OF STRUGGLE


Dwarkabai Waghmare

"I got married the month I got my periods, when I was 12. Now I am a great-grandmother of eight children," says 40-year-old Dwarkabai Waghmare.

Dwarkabai belongs to the Mang caste (a Scheduled Caste). She is from Kathawada village in the Beed district and travels to the Akluj belt of Maharashtra every year for sugarcane cutting work.

She says: "My eldest daughter was born when I was 13. At the age of 25, I became grandmother. Now I am a great-grandmother. My grandchildren work as cane cutters too."

"What will they do in Beed, where there is no water?" she asks.

Dwarkabai points out the harsh reality of the vicious cycle of intergenerational cane-cutting work. Living in the sugarcane fields for six months implies the children not attending school for that period, as schools are not accessible. So, all the children of cane cutters automatically start helping their parents as they grow up. They are married off in their pre-teens or early teens. This cycle continues because of a lack of education, and so does the negligence of women's health. It is a classic example of modern slavery.

Dwarkabai says: "The temporary sheds we live in are made of cloth. They are so small that if we lie down, half of our legs are outside the tents."

Having bathrooms is a distant dream for Dwarkabai. She says: "Women wake up around 2–3 in the night and take a bath in the dark in one of the corners of the field so that nobody can see us in the dark."

Dwarkabai says: "Using chumbal (a cloth kept on the head on which the cane bundles are carried) during menses has given me severe rashes on the inner side of the thighs. I still have those marks on my thighs. Chumbal is prickly — as it has tiny particles of canes stuck on it. It is not possible to remove all the tiny particles before wearing it. Some are still left on it."

Because of heavy lifting and strenuous work on the sugarcane field, Dwarkabai bled for a month in 2016. That was the year of drought, and she couldn't afford to not work.

She says: "I was already a grandmother then, why did I need a pishvi (uterus), my husband questioned me. I got the hysterotomy done in 2016."

Figure 12. The mukkadam system: how migrants get caught in a cycle of drought migration and debt bondage

The mukkadam system

How migrants get caught in a cycle of drought, migration and debt bondage

1. Drought and debts push rural households into migrating for seasonal work

2. Labour contractors known as mukkadams recruit husband and wife teams. Migrants move to sugarcane fields to cut and load cane

3. They face harsh conditions without basic amenities, and work long days earning little. Women load bundles of cane weighing 40–50 kg

4. Mukkadams impose heavy fines on women who miss work because of menstruation or pregnancy

5. The fear of losing income pushes many women into having hysterectomies. After this, they face significant health problems, high medical costs and loss of income

6. As their debts grow, the migrant families are pushed into a cycle of debt and growing vulnerability and exploitation

4

Quantifying the invisible cost of non-economic loss and damage suffered in Beed

4.1 Why quantifying the economic and non-economic loss and damage faced by a community is important

The economic pressure exerted by climate change has led to an environment where every day of work is crucial for survival, and has led to a disturbing trend among women labourers — the choice to undergo hysterectomies. These hysterectomies, while providing a temporary respite from the immediate financial consequences of missing work, carry profound long-term health implications and compound the non-economic losses and damages experienced by these communities. The example of Beed's households lays bare the broader ramifications of climate change that extend beyond the field of agriculture into the very bodies and wellbeing of individuals, particularly women, who bear the brunt of these complex and layered challenges. The impacts of climate change have manifested in both economic and non-economic loss and damage, altering the lives of women, girls and children in Beed in fundamental ways.

This underscores the urgent need to quantify both economic and non-economic loss and damage to create responsive policies that address the multifaceted impacts of climate change. These policies must account for the vulnerabilities of marginalised groups and aim to provide sustainable alternatives that preserve health, dignity and community cohesion, thereby ensuring that the measures taken to adapt to climate change do not perpetuate cycles of hardship and inequality.

4.2 The C-CIQ assessment framework for quantifying economic and non-economic loss and damage

The C-CIQ toolkit is an advanced methodological approach designed to analyse and quantify the multi-dimensional impacts of climate change, particularly focusing on non-economic loss and damage, which is often overshadowed by economic analyses. It aims to capture the full range of climate impacts, which includes not only the direct, measurable economic losses but also the more diffuse, indirect and often non-quantifiable effects that climate change can have on individuals and communities.

In the context of the current research, a unique categorisation has been developed, aligning closely with the frameworks proposed by Serdeczny et al. (2016) and the UNFCCC (2013) technical paper. The conceptual framework of C-CIQ, as applied to Beed district, involves four key dimensions: tangible, intangible, intrinsic and functional, overlaid by spatial and temporal considerations.

The C-CIQ toolkit's integration of economic valuation, multi-criteria decision-making analysis, composite risk indices, and semi-qualitative analysis allows for a comprehensive assessment of these impacts. It facilitates an understanding of how climate change affects not only the physical and economic aspects of life but also the social, cultural and psychological wellbeing of individuals and communities. This is particularly important for developing interventions that are sensitive to all dimensions of loss and damage, especially for groups that are often marginalised in climate policy discussions, such as women, girls and children.

In essence, the C-CIQ framework, with its attention to both tangible and intangible, intrinsic and functional impacts, provides a more complete picture of the true cost of climate change. The domains of analysis used in C-CIQ are explained as follows.

4.2.1 Tangible

The tangible domain of loss and damage in Beed district encompasses the direct, measurable impacts of climate change that residents can readily observe and quantify. This includes the stark reality of crop failures due to inadequate rainfall or drought conditions. This is a loss that can be calculated based on the reduced quantity of crop production.

Further compounding these impacts is the mortality or reduced productivity of livestock due to climate extremes, water scarcity and limited availability of fodder. This not only affects farmers' immediate food supply but also diminishes their long-term earning capacity, both of which are quantifiable losses.

These agricultural setbacks inevitably lead to a tangible reduction in income for families dependent on farming. The financial ramifications are immediate and evident as households struggle to maintain their consumption levels and living standards amidst dwindling earnings.

Healthcare costs present another tangible burden. As the incidence of diseases rises, or as physical ailments from labour-intensive jobs like sugarcane cutting become more prevalent, families must bear mounting medical bills. These costs are a direct outflow from their limited financial resources, representing a measurable financial strain.

Lastly, the spiral into debt is a tangible consequence of the economic pressures exerted by climate change. To cope with lost income and increased healthcare expenses, families often resort to borrowing, leading to a quantifiable increase in household debt. These debts are not abstract figures but are real numbers that reflect the financial distress of the community.

In essence, the tangible domain for Beed's residents is a concrete measure of the losses incurred due to climate change, affecting their land, their animals, their health and their finances, all accounting for measurable deficits.

4.2.2 Intangible

The intangible domain of non-economic loss and damage in Beed district captures those losses that one cannot touch or count, but which deeply affect the community's wellbeing and way of life. These are the kinds of impacts that people feel emotionally or socially rather than directly in their wallets or on their property.

In Beed, for instance, intangible losses include the emotional distress and anxiety that come with living through drought after drought, not knowing whether the rains will come in time to nourish the crops that families depend on. It is the sense of helplessness that farmers feel when they cannot provide for their families and the grief they feel when they lose, not just their livelihoods, but a way of life that has defined their community for generations.

This domain also includes the mental health issues that arise from the stress of financial instability and the strain of migration. When families have to leave their homes and move to unfamiliar places in search of work, the psychological toll can be heavy. There is also a loss of community cohesion when people disperse in search of livelihoods, weakening the social networks that once offered emotional support in difficult times.

For women in Beed, the intangible losses include the personal loss associated with undergoing a hysterectomy, which can have deep psychological impacts. Furthermore, the erosion of cultural identity is a significant intangible loss, as traditional festivals, rituals, and agricultural practices are abandoned or forgotten amidst the upheaval caused by climate change.

In short, the intangible domain in Beed district covers the losses that affect the minds and souls of people — stress, social disruption, erosion of culture and mental anguish — which cannot be quantified but are just as real and impactful as any financial loss.

4.2.3 Intrinsic

The intrinsic domain of non-economic loss and damage in Beed district refers to the inherent value that certain elements of life and the environment hold, independent of their economic or utilitarian benefits. This domain is about the losses that affect aspects of life and nature that are valued for their own sake, for what they intrinsically bring to the human experience or the health of ecosystems.

In Beed district, intrinsic losses include the diminishing sense of place and identity that comes with the disruption of age-old farming practices, which are not just a way to earn a living but are integral to cultural identity and community coherence. For many in Beed, farming is not just a job — it is part of who they are, and its loss is deeply felt.

Moreover, the intrinsic domain encompasses the emotional and psychological wellbeing that comes from stable, supportive communities and healthy environments. In Beed, the dissolution of tight-knit social structures due to migration and climate pressures is not just a logistical challenge, it represents a profound loss of the security and belonging that these communities provide.

In summary, the intrinsic domain in Beed district encompasses the value of things that define the quality and richness of life beyond any price tag — the loss of which signifies a deeper erosion of wellbeing and cultural depth that is irreplaceable and invaluable.

4.2.4 Functional

The functional domain of non-economic loss and damage in Beed district refers to the practical and utilitarian aspects of life that climate change disrupts. This domain is focused on the roles and functions that various elements of society and the environment play in maintaining the livelihoods, wellbeing and social structure of a community.

In Beed, functional losses could involve the deterioration of the agricultural systems that not only provide food and income but also sustain the social and economic fabric of the area. It is about how the loss of reliable water sources does not just mean less water to drink or crops that fail — it also means women and girls spending more time fetching water, thus affecting their ability to attend school or engage in other productive activities.

This domain also considers the roles that community institutions and networks play. In Beed, when families migrate in search of work due to failing crops, the functions of community support, shared knowledge and collective resilience are eroded. This can result in weakened local governance, loss of voice in village Gram Sabhas and Village Panchayats, the breakdown of social support systems, and loss of cultural continuity.

In simple terms, the functional domain in the Beed district speaks to the practical aspects of life and nature that are compromised by climate change. It is about the loss of the roles that people, practices, institutions and the natural environment play in keeping day-to-day life running smoothly and sustaining the community both economically and socially.

4.3 Understanding the interaction between different domains of economic and non-economic loss and damage impacts

The interaction between the domains (see Figure 13) captured through C-CIQ is explained as follows.

4.3.1 The tangibility spectrum

In Beed district, there are effects of climate change that can be seen and felt. When the weather patterns shift and rainfall becomes unreliable, crops don't grow as they should, and farmers lose their main source of income. The animals they rely on for their livelihoods may not survive the harsh conditions. These are the tangible impacts — things you can see and count.

But there is more to it than just what meets the eye. These visible changes have a ripple effect that goes deeper, affecting the lives of the people in ways that are not as easy to measure. For example, when families can't make enough from their farms, they might have to accept difficult and exploitative work conditions, which we call forced labour. Women then face health issues like gynaecological problems due to the stress and strain of their work and environment. And the mental toll of dealing with all these challenges can lead to mental health problems.

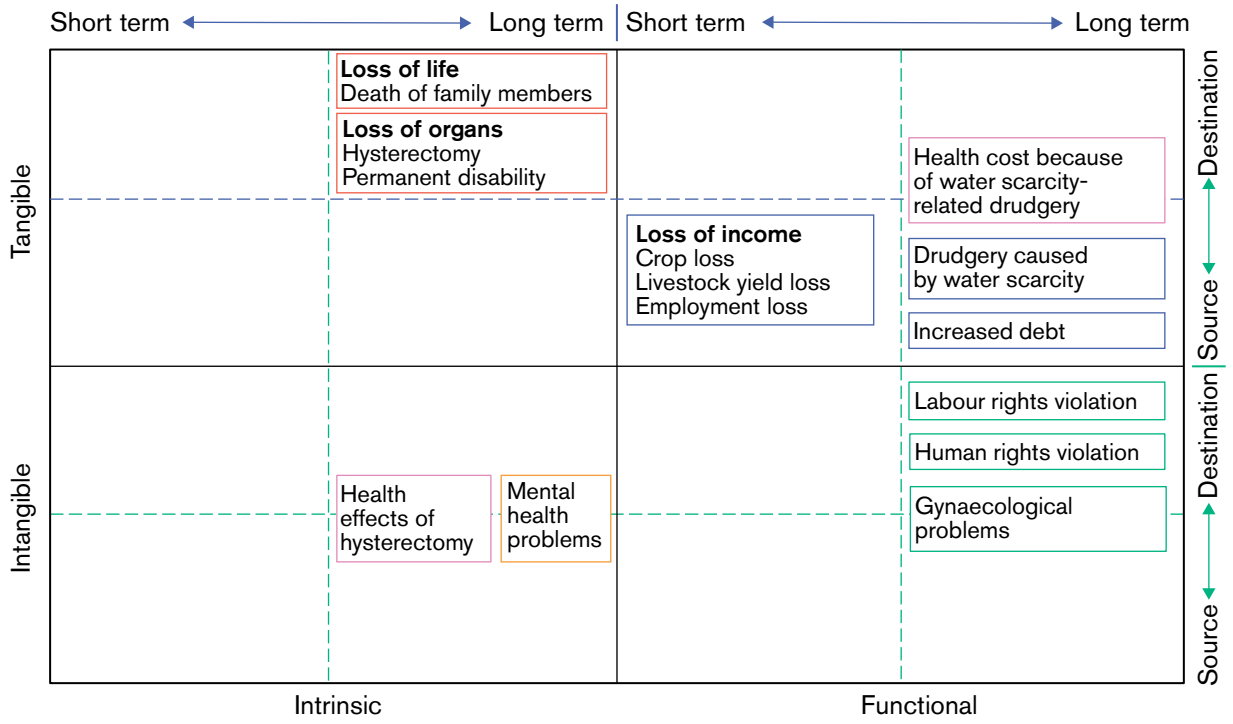
Therefore, these visible (tangible) and less visible (intangible) impacts are connected. The stress and health problems would not happen without the failed crops and loss of livestock productivity. It is a chain reaction: climate change affects the land, which then affects the people both physically and mentally. So, when we talk about the damage climate change does, we have to think about both the things we can see and count, and the things we feel and experience, because they're all part of the same big problem.

4.3.2 Intrinsic–functional spectrum

The concept of non-economic loss and damage includes values that can be seen on a spectrum, ranging from intrinsic to functional. This spectrum helps us understand the different ways in which losses due to climate change are valued and perceived.

Functional values are essentially practical: they are the means to an end. They relate to things that serve a purpose or facilitate achieving certain outcomes. For example, consider the ability to work and earn a living. When families in Beed are forced into exploitative labour due to climate-induced distress migration, the impact on their health — such as serious health issues or the

Figure 13. C-CIQ's conceptual framework for categorising non-economic loss and damage for Beed



drastic step of undergoing a hysterectomy due to the fear of losing wages — is a loss of functional value. This is because their health directly influences their ability to work and provide for their families, and when that is compromised, it has an effect on their livelihoods.

On the other end of the spectrum are intrinsic values. These are values that are important in and of themselves, regardless of any external purpose or outcome. They are inherently valuable. The health effects of a hysterectomy or the loss of organs are considered intrinsic values. They are not valued because they lead to some other outcome — they are valued for their own sake, for the impact they have on a person's life and wellbeing.

The way these values are perceived can vary from one culture to another. Different cultures might attribute different levels of inherent worth or usefulness to certain things. So, when we categorise non-economic loss and damage items, we are not saying that they absolutely belong in one category or another. Instead, we assign them based on whether they serve a specific purpose (functional) or are valuable in their own right (intrinsic), keeping in mind that these perceptions can vary greatly across different cultural contexts.

4.3.3 The temporal dimension

The temporal dimension of non-economic losses and damages is a critical aspect of understanding the full impact of climate change on vulnerable communities. This dimension is intrinsically dynamic, reflecting the changes and evolution of losses over time. It encompasses the immediate aftermath and the long-term consequences of climate-induced events. By examining the temporal characteristics of non-economic loss and damage, we gain insight into the duration, frequency, and progression of the losses experienced by the community.

In the context of Beed, the temporal aspect is exemplified by the cyclical nature of droughts and their immediate and recurring impacts. Short-term events such as the sudden loss of employment or reduced crop yields during drought periods are acute in nature, disrupting the daily lives and economic stability of households. These events are sporadic yet have the potential to cause significant immediate hardship. On the other hand, long-term or recurring events such as escalating debts and enduring mental health issues emerge over extended periods. These chronic issues can be traced back to repeated exposure to climatic stressors, reflecting the cumulative burden that climate change imposes on communities.

The temporal dimension also involves the interplay between past experiences and future uncertainties. Historical patterns of climate variability inform the current coping strategies and future preparedness of communities. For families in Beed, the memory of past droughts and the anticipation of future ones shape their decision-making processes, from migration patterns to health choices like having hysterectomies.

The interconnection between the temporal dimension and other aspects of non-economic loss and damage, such as spatial (see below) and tangible losses, is evident. The migration of families for sugarcane cutting work, for instance, is not only a spatial shift but also a temporal adaptation to seasonal employment opportunities. Similarly, the decision to undergo medical procedures to maintain the ability to work reflects a complex vulnerability that balances the immediate need for income against potential long-term health complications.

Understanding the temporal dimension of non-economic loss and damage is essential for devising comprehensive strategies that address both the immediate and extended needs of affected populations. It is important to recognise that while some impacts of climate change are felt immediately, others unravel over time, necessitating a response that is both immediate and sustained. Policies must, therefore, be designed with a view towards resilience, ensuring that communities can not only withstand current challenges but also adapt to future conditions. This forward-looking approach is crucial in mitigating the long-term repercussions of climate change and supporting the sustainable development of vulnerable regions like Beed.

4.3.4 The spatial dimension

The spatial dimension of non-economic loss and damage is critical to understanding the importance of geographic location and the differences in how communities experience the consequences of climate change. This dimension captures both the geographical spread of climate impacts and the diverse experiences of communities based on their specific locations, recognising that climate change does not impact all areas uniformly. For instance, certain effects of climate change might be widespread, influencing large regions, while others can be highly localised, affecting particular communities or districts with great intensity. For example, the high incidence of women undergoing hysterectomies is not common in other parts of Maharashtra state or in the country as a whole.

Similarly, the community in Beed face direct impacts like the loss of employment due to crop failures and increased water scarcity, compelling residents to migrate for work. This migration takes them to a different location where they experience different types of impacts, such as exploitative labour conditions and health risks in sugarcane fields. The contrast between the arid versus heavily irrigated belt highlights the spatial disparities in non-economic loss and damage.

Acknowledging the spatial dimension in the assessment of non-economic loss and damage is vital for targeted intervention. It is imperative to address not only the loss of traditional livelihoods at the source but also to ensure the safety and dignity of migrants in their new, temporary settings. Spatially targeted strategies might include the development of local water management solutions to alleviate the need for migration, the establishment of safer and more equitable working conditions in sugarcane fields, and the provision of comprehensive healthcare services that address both the physical and mental health needs of the workers.

Addressing the spatial dimension requires an understanding that climate change adaptation and mitigation efforts must be tailored to specific locations and populations. Strategies must account for the unique environmental conditions, cultural contexts and socioeconomic statuses of each area. By recognising the spatial nuances of non-economic loss and damage, policymakers and stakeholders can craft more effective, equitable, and sustainable solutions that cater to the specific needs of communities impacted by climate change.

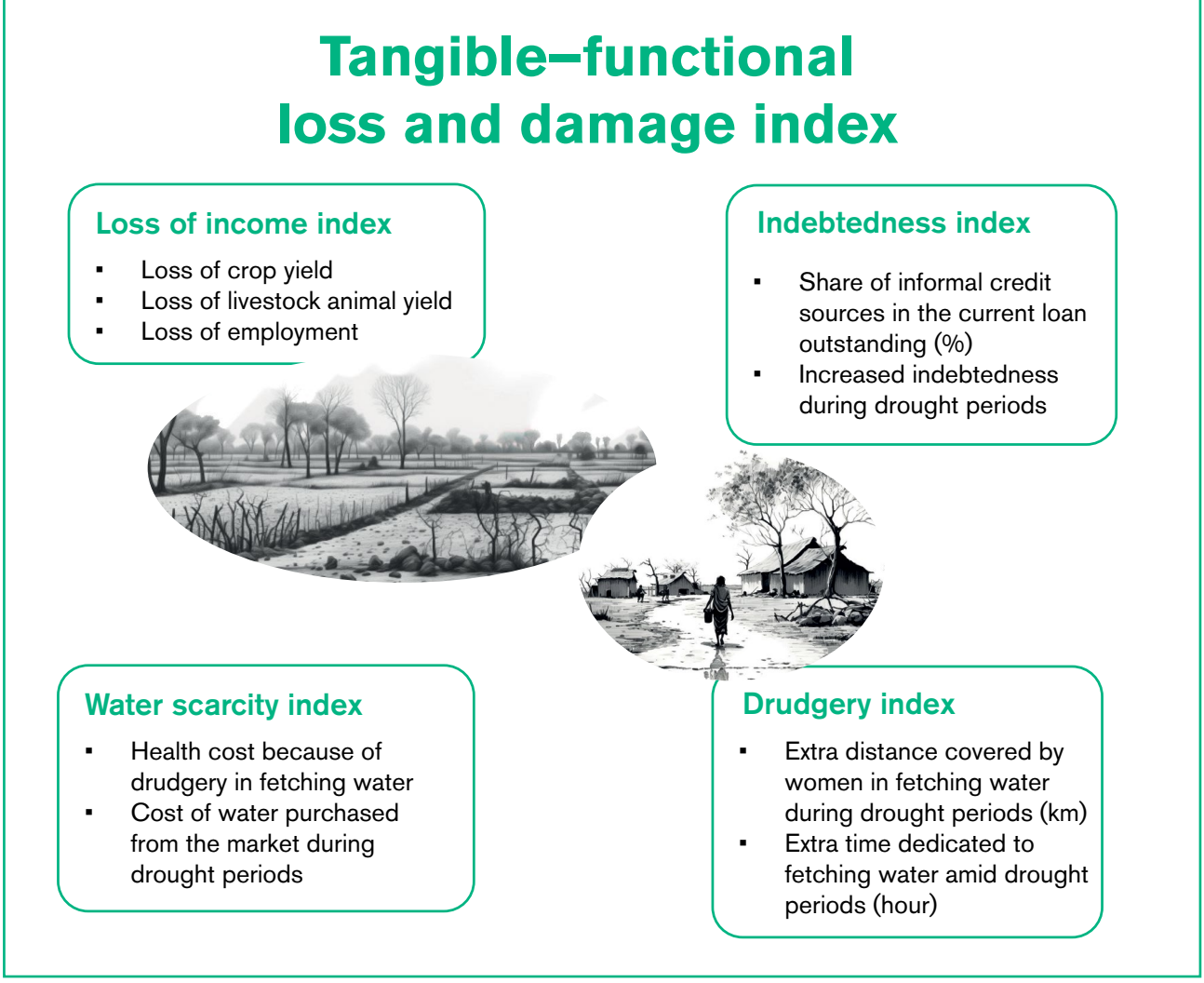
4.4 Quantifying the economic and non-economic loss and damage suffered by communities in Beed

In the development of the C-CIQ methodology, a key focus was on creating a framework for quantifying non-economic loss and damage through the use of composite indices. These indices are designed with three primary principles in mind — simplicity, replicability and clarity. The goal is to make the indices easy to compute and understand, ensuring they can be effectively used by practitioners and policymakers alike.

Our approach emphasises straightforward calculations to allow for ease of use. This simplicity is crucial for ensuring that the methodology can be consistently replicated in diverse contexts, making it a versatile tool for assessing non-economic loss and damage. At the same time, it is important that these indices are clear and intuitive, enabling users to easily grasp their meanings and implications, thereby enhancing their utility in decision-making processes.

In this study, we are particularly focused on measuring the intensity of non-ecnomic loss and damage across various domains. To streamline this process, we focused on two key aspects: tangibility and the intrinsic–functionality spectrum. The indices we constructed based on these aspects act as concrete indicators of the intensity of non-ecnomic loss and damage, providing quantifiable measures of its impact. Additionally, we integrated the temporal and spatial dimensions into our methodology. These dimensions serve as critical reference points that aid in interpreting the data provided by the indices. By including these aspects, our aim is to capture the more nuanced elements of

Figure 14. Formulation of the tangible–functional loss and damage index



non-economic loss and damage, ensuring a thorough understanding of its impact over time and across different geographic locations.

Overall, the construction of these composite indices within the C-CIQ methodology represents a significant step forward in quantifying non-economic loss and damage. The C-CIQ framework offers a comprehensive and accessible tool for analysing and understanding the multifaceted impacts of climate change, particularly in contexts as complex and varied as those encountered in Beed district.

4.4.1 Tangible–functional loss and damage index

The tangible–functional loss and damage index is a metric designed to provide a comprehensive picture of the impacts of climate change on a community. This composite index is constructed by combining several sub-indices, each representing a different aspect of loss and damage experienced by individuals and households. The sub-indices include the loss of income index, the water scarcity index, the drudgery index and the indebtedness index. Figure 14 shows individual variables leading to sub-indices and the overall index. Together, these sub-indices form the tangible–functional loss and damage index.

By integrating diverse yet related dimensions, this index provides an understanding of the range of tangible and functional challenges faced by the community. It not only captures the immediate financial costs but also the broader socioeconomic strain that can persist in the long term. The approach ensures that the various facets of tangible and functional losses — from economic impacts to the burden of additional labour — are combined into a single, coherent framework. This allows for a more nuanced understanding of the complex nature of loss and damage and supports targeted intervention strategies aimed at mitigation and adaptation.

1. Quantification of loss of income index

This index takes into account variables such as the loss of crop yield, livestock yield, and employment, all valued

in monetary terms (₹). It reflects the direct economic loss suffered by households due to climate events such as droughts that lead to diminished agricultural output and job opportunities. We analysed the two groups of households in Beed to assess the different experiences of those migrating (Group I) and those who were able to remain in situ (Group II).

Crop loss due to drought:

- Households in Group I reported that 22.53% of households experienced crop loss due to the drought, while a higher percentage of Group II households experienced crop loss at 32.94%.
- The average crop loss value was significantly higher for Group II (₹20,735.29) compared to Group I (₹9,150.20), suggesting that Group II, which presumably has larger land holdings, faced more severe financial impacts from crop damage.
- Here it is important to note that Group I households have limited land holdings, and 55% of them are landless.

Livestock yield loss due to drought:

- Both groups had a similar percentage of households reporting livestock yield loss (Group I at 6.72% and Group II at 6.47%).
- However, the average financial loss was higher for Group II (₹1,523.53) than for Group I (₹1,019.76), indicating a higher economic cost per household.

Employment days lost due to drought (Figure 15):

- Group I lost more employment days on average (72.69 days) than Group II (37.95 days), reflecting the more substantial effect of drought on employment opportunities for the migrating population.
- The higher average value of income lost due to lost employment days for Group I (₹15,613.64) compared to Group II (₹9,637.65) demonstrates a greater financial vulnerability for Group I.

Loss of income due to death or sale of livestock:

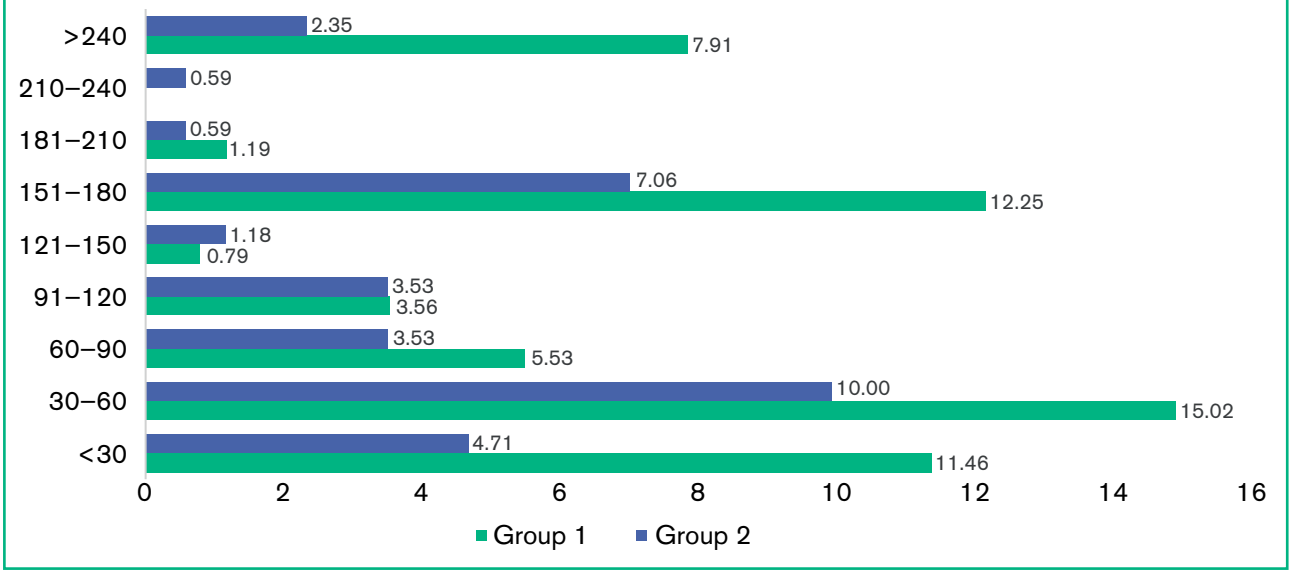
- The income loss due to the death of animals was also higher in Group I (₹3,851.38) compared to Group II (₹1,623.53).
- Similarly, the loss of income because of the sale of animals was greater for Group I (₹2,086.96) than for Group II (₹614.12), which may reflect the necessity to sell livestock at lower prices during drought conditions, especially for households that rely on migration for income.

The data indicates that both groups suffer from the economic impacts of drought, but the migrating Group I, characterised by Indigenous tribal populations with small landholdings and lower education levels, faces a more pronounced loss of income. This suggests that migrating for work is a coping mechanism due to the lack of viable economic opportunities at home, further exacerbated by drought conditions. Despite potentially having smaller landholdings and livestock assets, the relative impact on Group I's financial stability is greater, highlighting their increased susceptibility to climate-induced economic stress.

2. Cost due to water scarcity index

This index accounts for the additional health costs incurred due to the physical strain of fetching water and the financial cost of purchasing water during drought periods. It measures the economic burden on households arising from the need to allocate more resources to secure water for daily use.

Figure 15. Number of days of employment lost because of the latest drought (% of households)



Both groups, those who migrate (Group I) and those who do not migrate (Group II), report high levels of water scarcity, with 83% of Group I and 82.35% of Group II households experiencing water scarcity during the most recent drought. This similarity in percentages indicates that water scarcity is a widespread issue across different demographics in the region, affecting nearly all households regardless of their migratory status.

Moreover, a significant majority of households in both groups are compelled to purchase water during drought periods, with 80.63% of Group I and 80% of Group II households reporting this need. This high percentage underscores the severity of water scarcity and the lack of access to natural or communal water sources, forcing households to incur additional expenses to secure water for their basic needs.

The financial burden of purchasing water is further highlighted by the average amount spent per month on water. Households in Group I, which are characterised by a majority of Indigenous tribal people, smaller landholdings, poor irrigation infrastructure, and lower education and skill levels, spend an average of ₹3,820.55 per month. In contrast, Group II households spend slightly less, with an average of ₹3,517.06 per month. This difference in expenditure may reflect the slightly better economic standing of Group II households, with better piped water connection facilities (see section 2.1.3) which may allow them to better manage the costs associated with water scarcity.

The data thus paints a picture of a district where the struggle for water during droughts is nearly universal, with the additional economic burden of purchasing water weighing heavily on all households. While the difference in spending between the two groups is not stark, the impact of bearing such costs can be harder for poor households of Group I to manage compared to households in Group II who have better economic assets and capacity to manage and mitigate the effects of water scarcity. It's also indicative of the broader non-economic losses experienced by these communities, such as the stress of securing water and the potential for conflict over water resources.

3. Drudgery index linked to collecting water

This index measures the extra distance covered by women and the additional time spent fetching water during droughts. It quantifies the non-monetary yet significant burden placed on individuals, particularly women, who are often responsible for water collection.

Families engaged in collecting drinking water

- During non-drought periods, a majority of Group I households (65.22%) did not have to travel to fetch water, indicating relatively better access to water. This percentage drastically drops in drought conditions, where only 8.30% did not have to travel, showing the severe impact of drought on water accessibility
- For Group II, the pattern is similar, with 64.12% not travelling in non-drought periods versus 14.12% during droughts, highlighting that drought conditions significantly increase the distance travelled for water for both groups.

Average distance and time spent fetching water

- Both groups, on average, travel approximately the same short distance (0.41km) during non-drought periods, suggesting that both groups have equal proximity to water sources.
- In drought periods, Group I travels further (2.66km) compared to Group II (2.02km), indicating that Group I generally has less access to water sources during drought.
- Time spent (Figure 16) fetching water increases during drought periods, with Group I spending nearly 3 hours and Group II spending approximately 2 hours and 40 minutes.

Illness and economic cost due to water collecting

- A significant percentage of Group I households (62.45%) reported illness due to long-distance water collection during drought periods, with a lower percentage of Group II (47.65%) reporting that the physical burden of water scarcity is leading to health issues.
- The average treatment cost for illnesses due to water collection in Group I is ₹1,643.88, which is nearly double that of Group II (₹880.59), suggesting that the health impacts are not only more prevalent but also more costly for Group I.

The analysis of the data under the drudgery index for Beed district reveals a considerable burden on households, particularly on those who migrate for labour (Group I), in terms of distance travelled, time spent, health impacts and economic cost associated with water collection during drought periods. The data underscores the heightened vulnerability of these communities to water scarcity and the compounding effects of drought, which exacerbate existing disparities in access to water and health outcomes.

4. Assessing the elevated indebtedness index

This index reflects the share of informal credit sources in current loans outstanding and the increase in household debt during drought periods. It indicates the financial strain on households as they cope with immediate losses and attempt to recover in the aftermath of climate events.

Analysing the data for the elevated indebtedness index, we can compare the average current loan outstanding from various sources for Group I (migrating households) and Group II (non-migrating households) (see Figure 17). This analysis provides an understanding of the financial burdens these groups face, particularly during drought periods.

Figure 16. Time spent on collecting drinking water (% households)

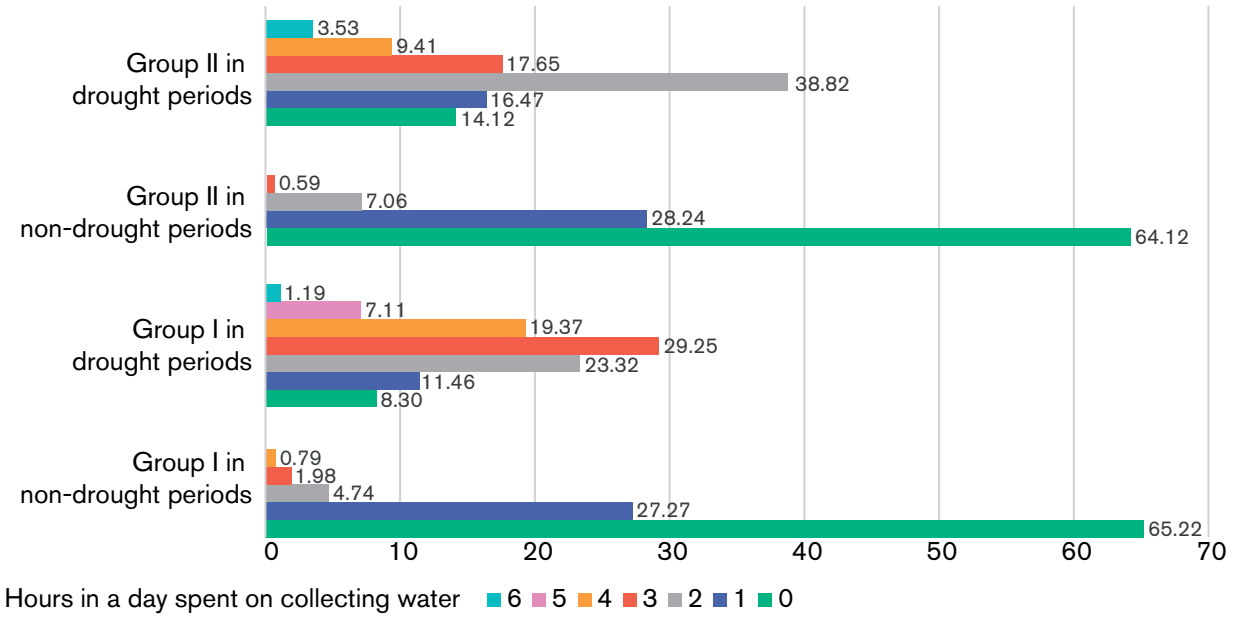
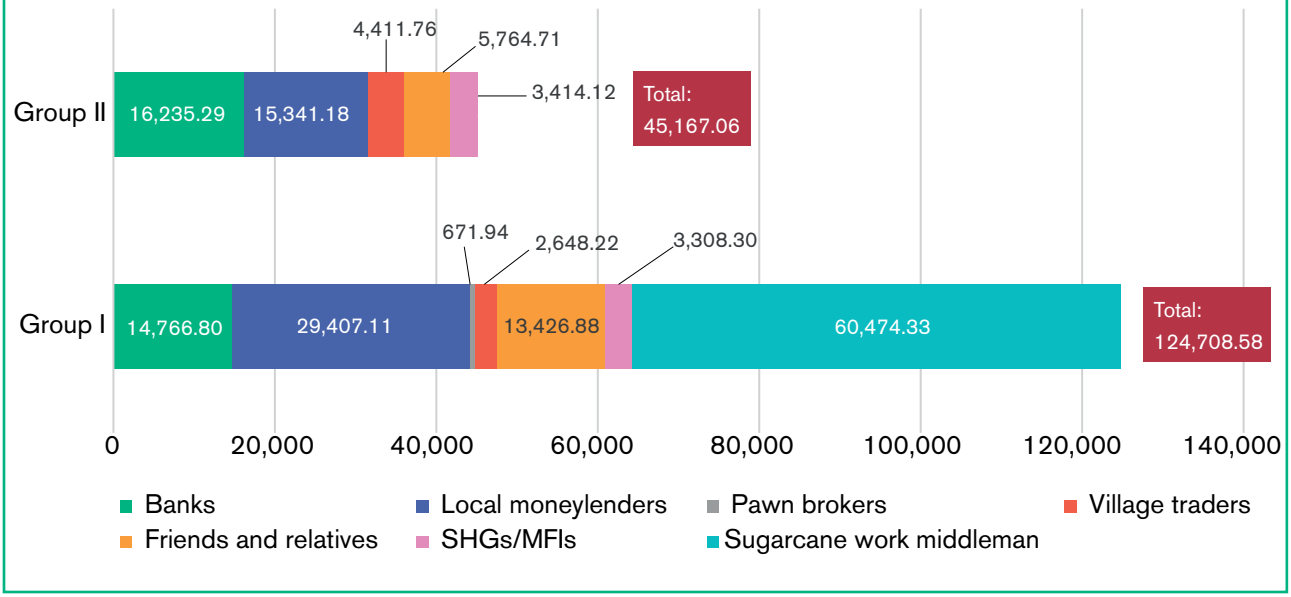


Figure 17. Average current loan outstanding from different sources (₹)



For Group I, the data shows significant indebtedness to local moneylenders (₹29,407.11), however, the highest loan amounts are owed to sugarcane middlemen — the mukkadams (₹60,474.33). This suggests a heavy reliance on informal and potentially exploitative lending sources, likely due to limited access to formal banking and financial services. Loans from banks are considerably lower (₹14,766.80), and there's also a notable amount borrowed from friends and relatives (₹13,426.88), indicating reliance on personal networks for financial support.

In contrast, Group II has a higher proportion of loans from banks (₹16,235.29), suggesting better access to formal lending institutions. However, loans from local moneylenders, while still substantial (₹15,341.18), are just over half of what Group I owes, indicating less reliance on informal lending. This group also shows lesser indebtedness to friends and relatives (₹5,764.71) and self-help groups/microfinance institutions (₹3,414.12), which may reflect a more stable economic status that does not necessitate borrowing from personal networks as frequently.

Looking at indebtedness during drought compared to non-drought periods (Figure 18), a significant portion of Group I reported a high (38.74%) to very high (26.48%) increase in debt during droughts. This indicates that drought significantly exacerbates their financial vulnerability. Group II also reported an increase

Figure 18. Indebtedness during drought periods compared to non-drought periods

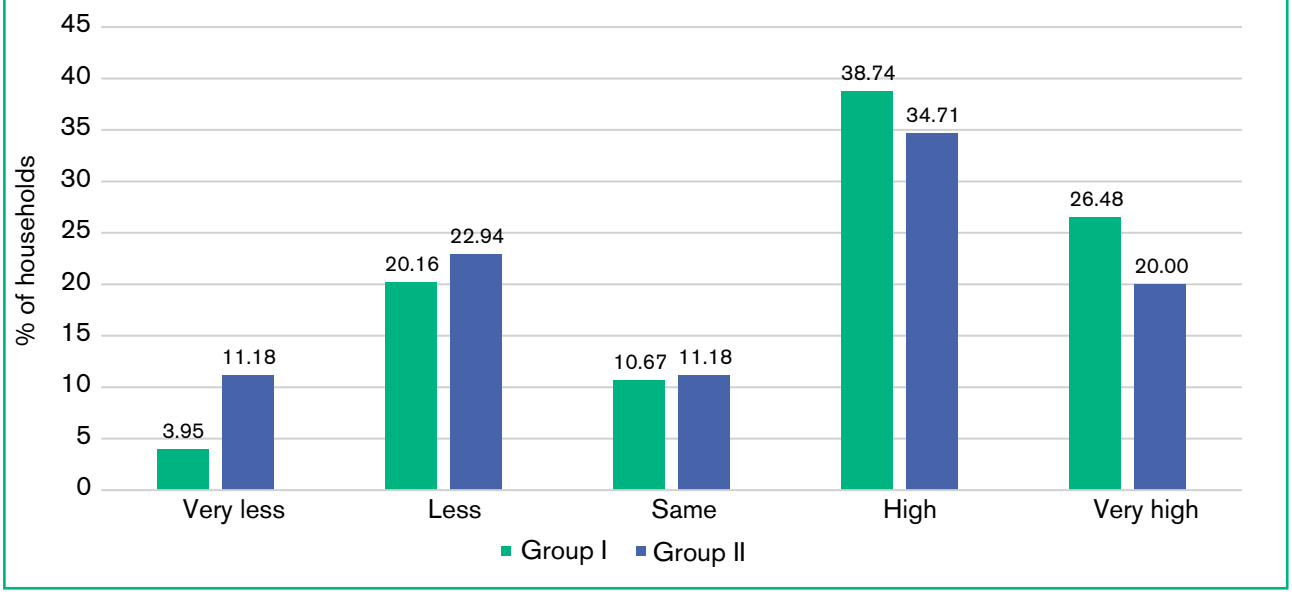
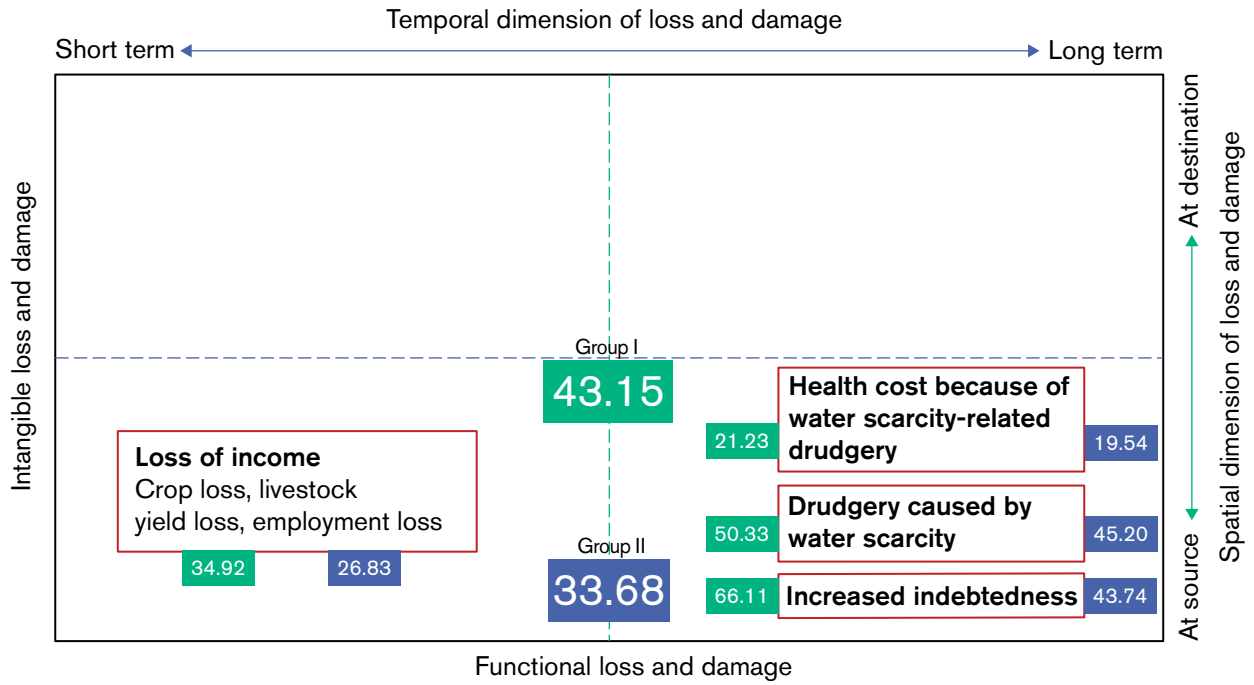


Figure 19. Tangible–functional loss and damage index for Group I and II



in indebtedness during droughts, with 34.71% reporting high and 20.00% very high increases, but the proportion of those reporting less or the same level of indebtedness during droughts is greater than Group I. This suggests that while both groups are affected by drought, Group I, with its characteristics of being predominantly Indigenous, tribal, with smaller landholdings and lower education levels, is more severely impacted.

The analysis highlights that households without economic assets and with a profile like Group I suffer greater loss and damage. Their dependence on informal lending and the steep increase in indebtedness during droughts underline the financial strains faced by these households. This indebtedness can lead to a cycle of poverty and vulnerability that is difficult to break, especially when exacerbated by climate events like droughts. The indebtedness index is thus a crucial measure to understand the financial resilience (or lack thereof) of households in drought-prone areas.

What does the tangible functional loss and damage index reveal?

Figure 19 presents a tangible–functional loss and damage index that captures the multifaceted impacts on households from Group I and Group II in the context of drought conditions.

The assessment of the index reveals the following:

1. **Loss of income index:** This reflects direct financial impacts due to crop loss, livestock yield loss and employment loss. Group I, characterised by lower economic assets, appears to suffer more significant income loss, indicated by the higher percentage (43.15%) compared to Group II (33.68%). This suggests that the lack of diversified income sources and reliance on agriculture make Group I more vulnerable to climate-induced economic fluctuations.
2. **Water scarcity index:** This captures the additional financial burden due to the increased cost of obtaining water. The higher figure for Group I (21.23%) compared to Group II (19.54%) underscores the disproportionate impact of water scarcity on economically disadvantaged groups, who may already be struggling to meet their daily needs.
3. **Drudgery index**: This measures the physical and time burden of fetching water, which is more arduous during drought periods. Group I experiences a significant increase in drudgery (50.33%) relative to Group II (45.20%), reflecting the additional strain on households with fewer resources to mitigate the effects of water scarcity, such as the ability to purchase water or invest in infrastructure.
4. **Indebtedness index:** This indicates the level of debt incurred by households as they cope with the financial strains of drought. Again, Group I shows a higher percentage (66.11%) compared to Group II (43.74%), suggesting that households with lower economic assets are more likely to fall into debt traps during drought conditions as they struggle to cover basic expenses and potentially face exploitative lending practices.

The overall analysis highlights that Group I households endure a compounded burden of tangible and functional loss and damage due to their socioeconomic status. These households are not only facing immediate tangible losses but also long-term functional damages that affect their capacity to recover and adapt. Non-economic loss and damage, such as social and psychological impacts, are implicitly higher for Group I due to their increased vulnerability and lack of resources to cope with and recover from drought impacts.

It is crucial to note that non-economic losses often go unnoticed because they are not easily quantifiable, yet they profoundly affect the wellbeing and social fabric of communities. The index presented can help policymakers identify and prioritise interventions to reduce vulnerability and build resilience, especially for disadvantaged or marginalised households.

4.4.2 Intangible–functional loss and damage index

The intangible–functional loss and damage index provides a comprehensive view of the non-physical and operational impacts of climate change and environmental stress on vulnerable populations. This index is crucial for understanding the broader consequences that extend beyond direct economic losses. We have considered the forced labour index, the human rights index and the gynaecological problems index for the construction of this index. Figure 20 shows individual variables leading to sub-indices and the overall index.

Together, these indices highlight the multifaceted nature of intangible and functional losses that communities face. They underscore the importance of considering both immediate and long-term support mechanisms for vulnerable populations, particularly for ensuring access to healthcare, improving living conditions, and protecting individuals from exploitative work conditions. Addressing these issues is critical to fostering sustainable communities that can withstand and recover from the challenges posed by climate change and environmental degradation.

1. Forced labour index

The index reflects the additional work burden placed on individuals, who may face extended work hours, the obligation to work when sick or during menstrual periods, wage deductions for leaves of absence, lack of breaks, and the requirement to undertake harmful tasks without adequate safety equipment. These factors contribute to the deterioration of an individual's wellbeing and can lead to long-term health issues and decreased productivity.

The analysis of household data for the two groups shows a stark contrast regarding the labour conditions experienced by these populations. Nearly all respondents in Group I (96.05%) are engaged in wage labour, with a significant portion reporting extremely long workdays at their destination work sites, averaging 14.36 hours per day. This is in sharp contrast to the 7.49-hour workday reported at their home locations, underscoring the intensified and exploitative labour demands they face when they migrate for seasonal labour. The composite forced labour index further corroborates this hardship, with a high score of 82.41 at the destination site, showing a range of rights violations being imposed on these migrant labourers.

The univariate indices of labour rights violations (see Figure 21) for Group I reveal a troubling trend. A high percentage of both women and men report being compelled to work while ill (17.65% at source, 72.29% at destination) and women are required to work during their menstrual periods (19.89% at source, 69.90% at

Figure 20. Formulation of intangible–functional loss and damage index

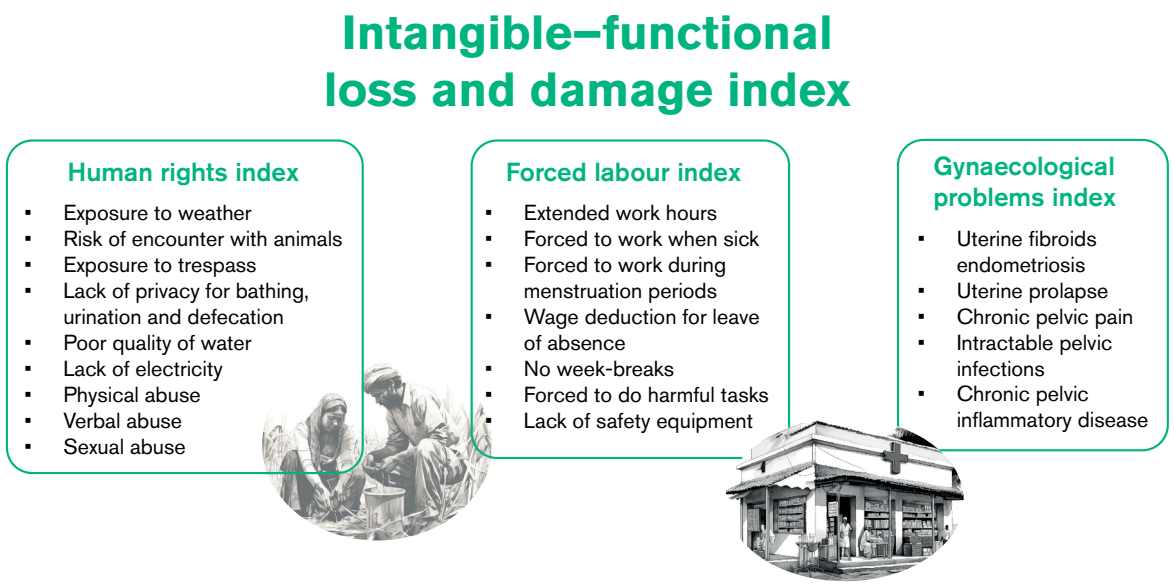
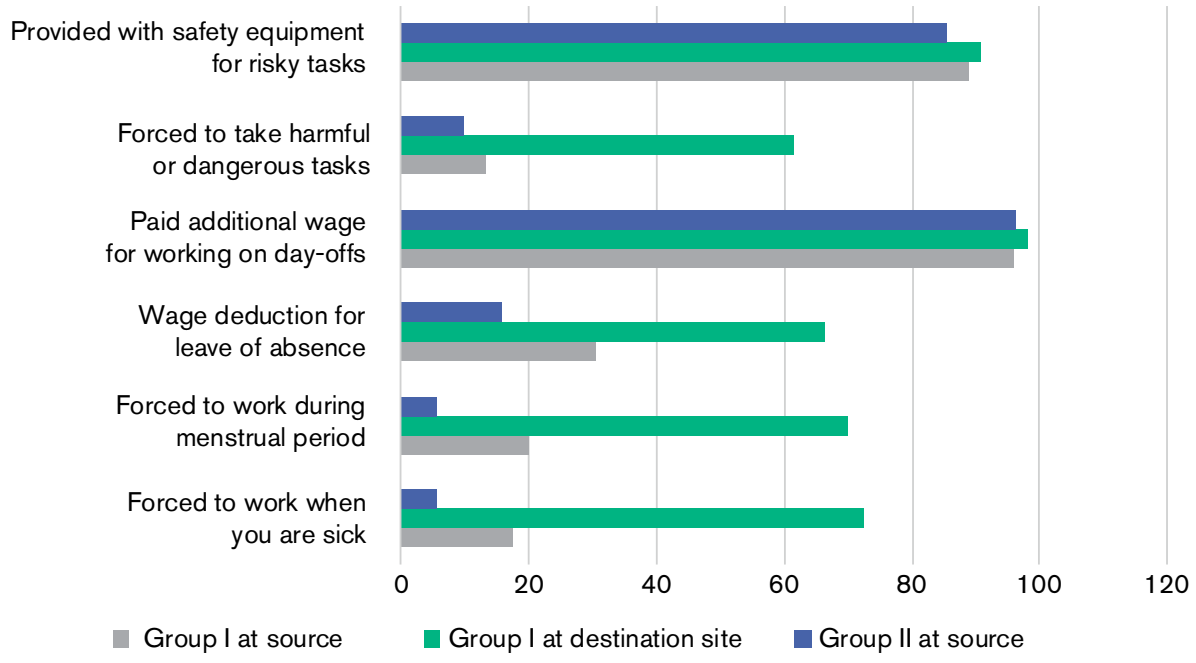


Figure 21. Labour rights violation univariate indices



Note: Index value range 1–100: the higher the value, the higher the labour rights violation perceived by the respondents

destination), suggesting a disregard for workers' health and wellbeing. Wage deductions for absence (30.57% at source, 66.53% at destination) and being forced to undertake dangerous tasks (13.44% at source, 61.46% at destination) highlight the exploitative labour practices that migrant workers must endure. However, it is noteworthy that a high percentage of workers are provided with safety equipment (88.93% at source, 90.58% at destination), hinting at some measures for risk mitigation.

Group II, which does not engage in migration, exhibits a lower proportion of individuals working as wage labourers (72.94%). They report working fewer hours, and their forced labour index score is significantly lower (36.38), indicating fewer perceived labour rights violations compared to Group I. Similarly, labour rights violation univariate indices for Group II point to less forced work during illness and menstruation, lower instances of wage deductions for absence, and less compulsion to engage in dangerous tasks. This suggests a comparatively better labour rights environment for Group II, which aligns with their non-migratory status and potentially more stable economic conditions.

Analysis of the forced labour index presents a concerning picture of heightened vulnerability for Group I, whose lack of economic assets exacerbates their susceptibility to non-economic loss and damage. The evident disparities in working conditions between migrant and non-migrant households indicate that migration for labour, often driven by economic necessity due to climate impacts, results in significant detriments to workers' rights and quality of life. These findings underscore the need for robust policy frameworks that safeguard the rights of migrant labourers, ensure fair working conditions, and address the broader socioeconomic factors that compel such migration in the first place.

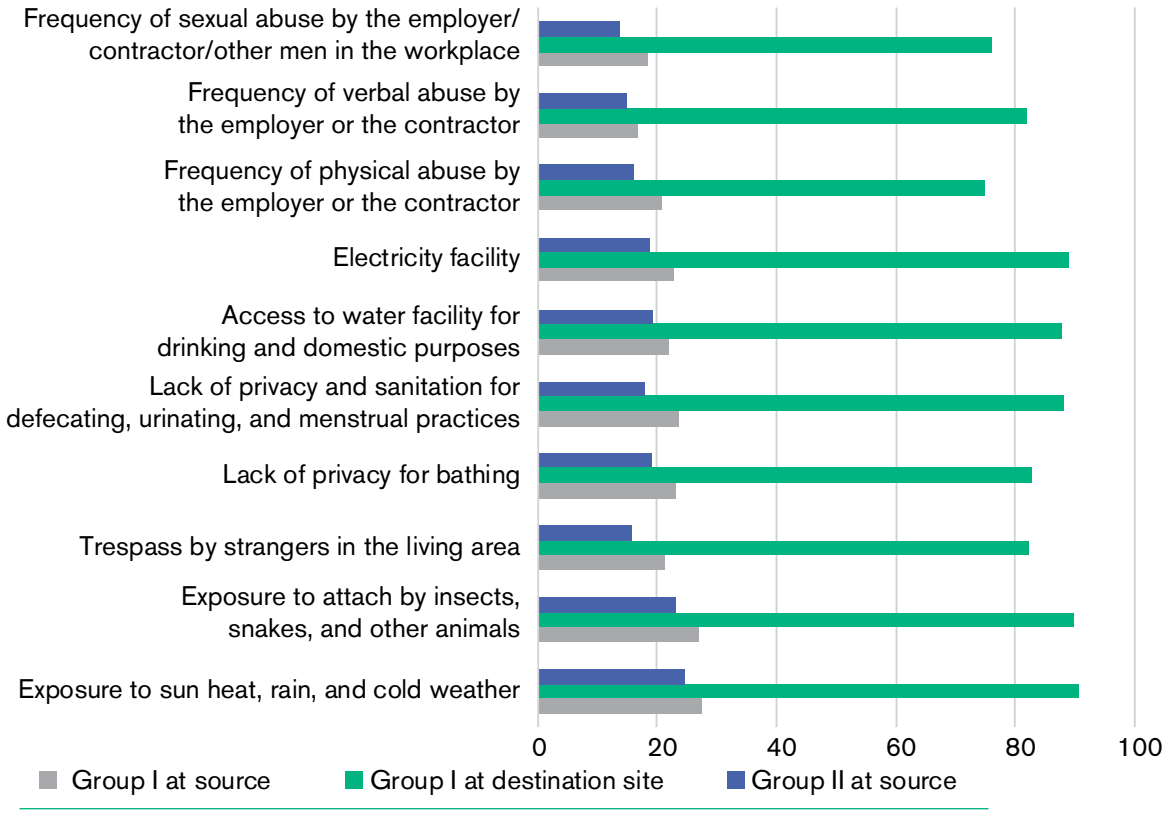
2. Human rights index

This index captures the quality of life and safety concerns within affected communities. It includes variables such as exposure to harsh working conditions, privacy issues related to personal hygiene, inadequate access to clean water and electricity, and various forms of abuse, including physical, verbal and sexual. These conditions can lead to a range of psychological and physical health problems, with women and children often being the most affected.

The human rights composite index and its associated univariate indices offer detailed insights into the living and working conditions of the two distinct groups, which are indicative of their human rights situation. For Group I, consisting of migrating households, the composite index at their destination site is alarmingly high at 84.37, suggesting a severe level of perceived human rights violations. This is a stark contrast to their source location score of 22.3. The univariate indices reveal that at their destination site, these workers face extreme exposure to environmental elements such as sun, heat, rain and cold (90.72) and to potential dangers from insects and animals (89.98). Their privacy is also significantly compromised, with high percentages reporting inadequate privacy for bathing (82.80) and sanitation (88.00). These conditions are further compounded by high rates of physical abuse (74.88), verbal abuse (82.05) and sexual abuse (76.11) by employers or other men in the workplace, painting a grim picture of the exploitative and hazardous environments these labourers must endure.

Group II households, which do not migrate, have lower human rights violation scores (18.37), indicating a better situation in terms of perceived rights violations. Univariate indices reflect relatively lower, but still concerning, exposure to harsh environmental conditions and threats from wildlife. Privacy issues and lack of facilities are less pronounced than in Group I, but they are not absent, showing that even non-migrating populations face human rights challenges.

Figure 22. Human rights violation univariate indices



Note: Index value range 1–100; the higher the value, the higher the human rights violation perceived by the respondents

The analysis highlights the dire human rights conditions faced by Group I, where migration for labour — often the only economic option — leads to severe violations of their rights. The indices not only quantify the immediate tangible losses these populations incur but also capture the intangible, long-lasting impacts on their human dignity and quality of life. This detailed assessment underscores the critical need for interventions that protect the rights of these vulnerable groups, particularly like Group I, whose lack of economic assets leaves them disproportionately affected by non-economic loss and damage. Policies must aim to create safer, more equitable working conditions and address the root causes of forced migration, such as climate impacts compounded by a lack of land resources and insufficient infrastructure, to prevent the cycle of poverty and exploitation.

3. Gynaecological problems index

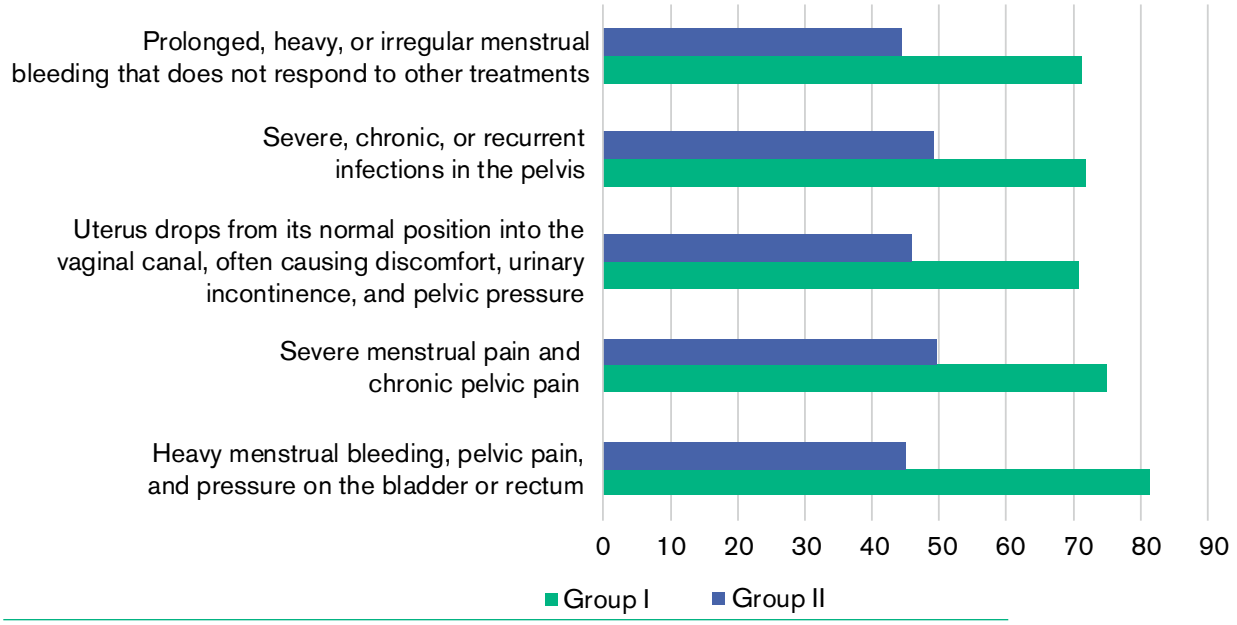
This index focuses on the health issues specifically related to women's reproductive health. These health problems can be exacerbated by forced labour and poor living situations, leading to a cyclical pattern of health deterioration and a reduced ability to work or maintain family care responsibilities.

The analysis of gynaecological problems composite index paints a stark picture of the health challenges faced by women in the two different household groups. Group I shows a significantly higher composite index value of 74.01 compared to Group II. This suggests a much greater prevalence and perception of gynaecological issues among these women. The univariate indices (Figure 23) reveal that women from Group I experience a high incidence of severe gynaecological conditions including heavy menstrual bleeding, pelvic pain (81.32), chronic pelvic pain (75.00), uterine prolapse (70.75) and recurrent infections (71.84). Additionally, a notable 5.93% of households from Group I reported that someone in the family became seriously ill due to their work environment. Group II reported a lower gynaecological problems composite index of 46.82. While still concerning, this index value indicates fewer gynaecological problems in comparison to Group I. The percentages of reported gynaecological issues are less than those of Group I, yet they are not negligible, with reports of heavy menstrual symptoms at 45.00 and chronic conditions at 49.56.

The financial burden of these health issues (Table 3) is considerable for Group I households, with the average total cost of hospitalisation, lab testing, medical consultations and medication reaching ₹5,333.75, which is a significant expense for these households. The cost for medical treatment is drastically lower for Group II, amounting to just ₹20.59, reflecting the lesser degree of medical intervention required in these households.

The analysis of the gynaecological problems composite index and its univariate indices underscores the substantial gynaecological health burden borne by women in Group I. This burden is compounded by their socioeconomic status, characterised by migration for labour, low education levels and poor infrastructure.

Figure 23. Gynaecological problems univariate indices

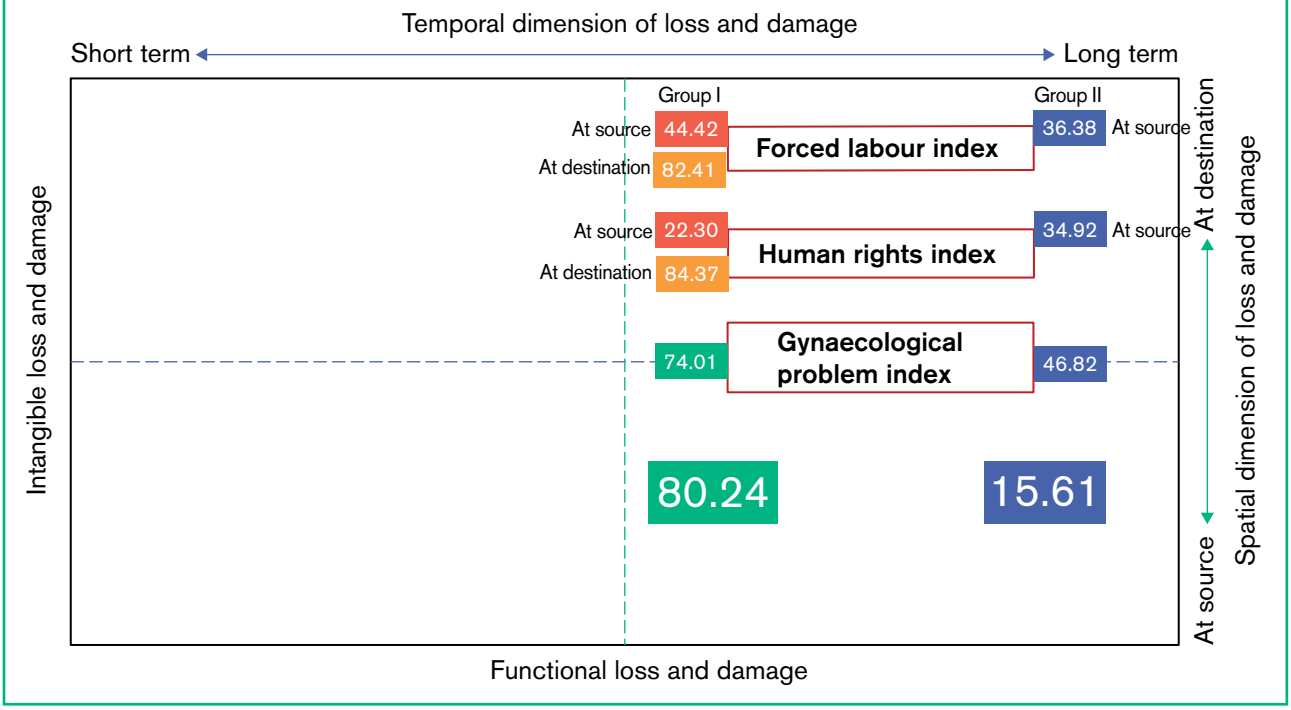


Note: Index value range 1–100; The higher the value, the higher the gynaecological problems perceived by the respondents

Table 3. Cost of treating illness caused by the work environment

TYPE OF COSTS	COST (₹)	
	GROUP I	GROUP II
Cost of hospitalisation	4,596.84	11.76
Cost of lab testing and medical consultations	468.38	2.94
Cost of medication (tablets, post-surgery therapy etc.)	288.54	5.88
Total cost	**5,333.75**	**20.59**

Figure 24. Intangible–functional loss and damage index for Group I and II



The data clearly indicates that the working and living conditions of Group I are directly influencing the high prevalence of gynaecological health issues. These findings highlight the invisible costs of migration for labour and the urgent need for comprehensive healthcare support for these vulnerable groups.

What does the intangible–functional loss and damage index reveal?

The intangible–functional loss and damage index (Figure 24) is important for understanding the broader impacts of labour migration and economic hardship. In this concluding analysis, we focus on the composite measure derived from various sub-indices, such as the forced labour index, human rights index and gynaecological problems index.

The overall analysis of the intangible–functional loss and damage index shows that Group I, consisting of migrating households with fewer economic assets, demonstrates higher values across all sub-indices at their destination. This group's forced labour index is particularly alarming at the destination (82.41), indicating severe labour rights violations and exploitative work conditions away from home. Their human rights index is also extremely high at their destination (84.37), pointing to the dire circumstances in which they live and work, without adequate shelter, privacy or security. The gynaecological problems index score for Group I is significantly higher (74.01) than Group II, showcasing the profound health issues faced by women in these communities, which are exacerbated by their working and living conditions.

On the other hand, Group II, which does not migrate, shows lower indices. The forced labour index (36.38) and human rights index (34.92) suggest that while there are challenges, they are less severe than those faced by Group I. The gynaecological problems index for Group II (46.82) also indicates fewer health issues, which could be attributed to better access to healthcare and more stable living and working conditions.

Analysis of the indices clearly shows that Group I's lack of economic assets leads to greater non-economic losses and damages, a situation often overshadowed by immediate economic concerns but with profound long-term implications. The forced labour conditions, coupled with poor living conditions and significant gynaecological health challenges, reveal a pattern of systemic neglect and the need for urgent intervention. The data underscores the need for targeted policies, to improve the working and living conditions of vulnerable households such as those in Group I, and particularly the conditions being endured by women.

4.4.3 Tangible–intrinsic loss and damage index

The tangible–intrinsic loss and damage index is an important metric that quantifies the concrete and profound impacts of health-related adversities and their associated costs. This composite index is comprised of two critical sub-indices — the loss of organs index and the medical expense due to organ loss index.

Figure 25 shows the relationship between these indices. It shows how specific, quantifiable losses and expenses are integrated into a broader measure that reflects the multifaceted nature of tangible and intrinsic impacts on people's lives.

In essence, the tangible–intrinsic loss and damage index captures both the immediate physical and financial toll of such health setbacks as well as the long-term, often irreversible, damage to a person's fundamental capacity to lead a productive and fulfilling life. This index is especially relevant in contexts where healthcare is inaccessible or unaffordable and where the loss of bodily function significantly hampers one's livelihood and quality of life.

1. Loss of organs (womb, other body parts) index

The loss of organs index measures the direct physical loss experienced by individuals, such as the loss of the womb (hysterectomy) or other vital organs, which can also result in permanent disability. These losses are intrinsic, as they directly affect the individual's body and can have lifelong consequences on their health and wellbeing.

The analysis of data offers a stark comparison between the two groups in terms of the incidence and impact of hysterectomy. Group I exhibits a markedly higher percentage of women who have undergone hysterectomy (55.73%) compared to Group II, which does not migrate and has a lower incidence (17.06%).

Notably, the average age at which women in Group I undergo hysterectomy (see Table 4) is significantly lower (34.64 years) than that of women in Group II (42.93 years). Women in Group I are undergoing this procedure at a younger age, which could have far-reaching implications for their health and social wellbeing.

The data paints a concerning picture regarding the age at which women undergo hysterectomy, especially within Group I.

A significant proportion of these women are undergoing the procedure at a very young age, with 4.26% of them being under 25 years of age. This is a disturbing statistic, as it implies major surgery with lifelong consequences being performed on women who are quite possibly in their early reproductive years. The percentage of women in Group I who have a hysterectomy between the ages of 26 and 30 is also notably high, at 31.21%. This suggests that during what are typically the prime years of an individual's life, women in this group are subjected to a procedure that ends their fertility and which may precipitate early menopause, along with its related physical and psychological effects.

Figure 25. Formulation of tangible–intrinsic loss and damage index

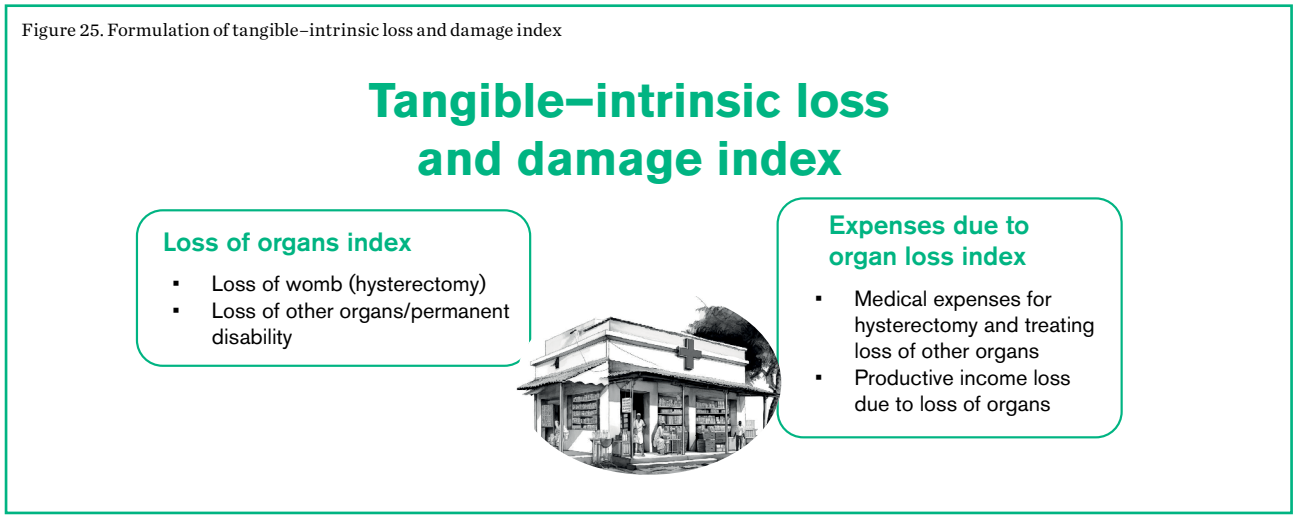
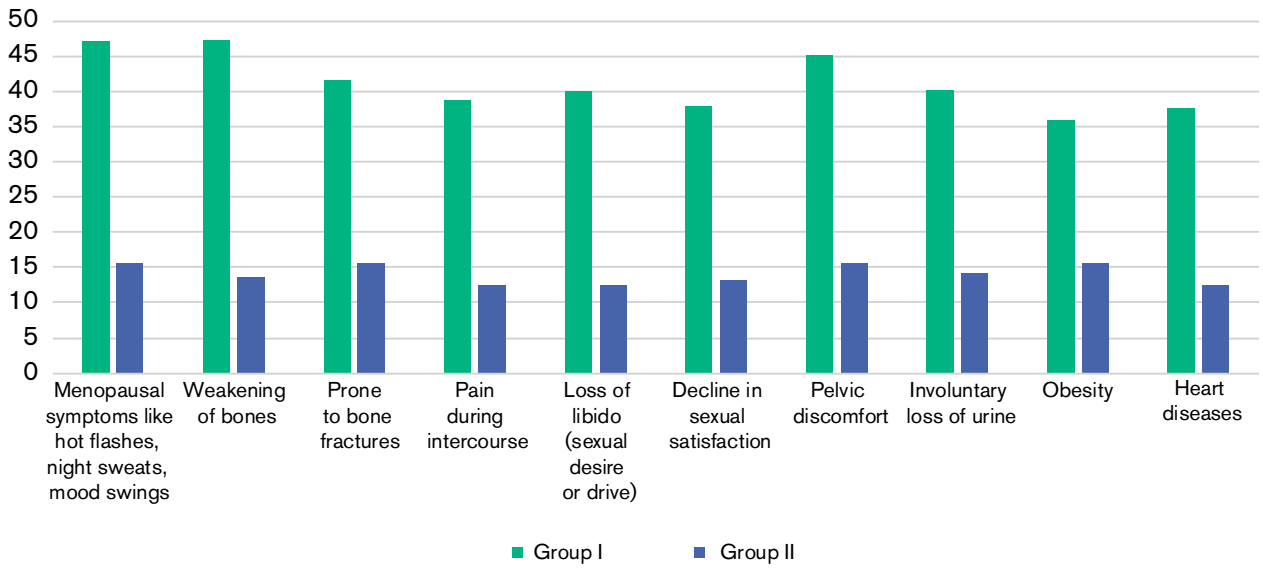


Table 4. Age at which hysterectomy was performed

AGE AT WHICH HYSTERECTOMY PERFORMED	GROUP I (%)	GROUP II (%)
≤25	4.26	3.45
26–30	31.21	6.9
31–35	29.79	13.79
36–40	24.82	20.69
41–45	6.38	20.69
46–50	3.55	13.79
51–55	–	13.79
>55	–	6.9
Average age	**34.64**	**42.93**

Figure 26. Impact of hysterectomy univariate indices



The impact of the hysterectomy composite index further underscores the disparity, with Group I scoring 41.14 against Group II's 14.01, indicating a more profound perceived impact on the health of women in Group I post-hysterectomy. The univariate indices (Figure 26) reveal that women in Group I experience a higher prevalence of adverse health effects such as menopausal symptoms, weakening of bones, pain during intercourse and loss of libido, among others. According to the World Population Review (World Population Review, n.d.), the average age of menopause for women in India is around 46.2 years of age, which is lower than Western countries where the average is approximately 51. Considering the average menopause age, the average age at which Group I women start facing menopause symptoms is concerning.

This analysis highlights the substantial non-economic loss and damage borne by Group I. Their lower economic assets and resources, coupled with their need to migrate for work, contribute to both a higher incidence for medical interventions like hysterectomy at a younger age and a greater incidence of associated health issues.

2. Medical expenses due to loss of organs index

This index accounts for the financial burden placed on individuals and families due to these losses. This includes the costs of medical procedures like hysterectomies, the costs of treating symptoms that arise due to organ loss, and any resulting losses of productive income due to an individual's inability to work as they did prior to the organ loss.

The economic burden of procedures is also considerably higher for Group I, with the total cost of a hysterectomy averaging ₹63,374.70, compared to ₹18,305.88 for Group II (see Table 5). This disparity is due to higher rates of surgery performed in private hospitals for Group I (95.04%) as opposed to government hospitals.

Group I also reported a higher percentage of workplace accidents, with 3.95% of households reporting such events compared to just 0.59% in Group II. In terms of financial burdens incurred due to these accidents, households in Group I face substantial costs for hospitalisation, medical consultations and medication, totalling an average of ₹2,068.38. Although this figure is lower than the average costs borne by Group II (₹1,588.24), it is critical to consider these expenses in relation to the overall economic resources available to each group. For Group I, such medical expenses can represent a significant portion of their annual income, further increasing indebtedness and exacerbating their economic vulnerability.

Moreover, organ loss or disability leads to a significant decline in productive income over a lifetime. For Group I, the loss is estimated at ₹32,015.81, based on the assumption of a productive working age lasting up to 58 years of age and an annual income of ₹60,000 for a physically active person. This figure highlights the severe long-term economic impact on households.

What does the tangible–intrinsic loss and damage index reveal?

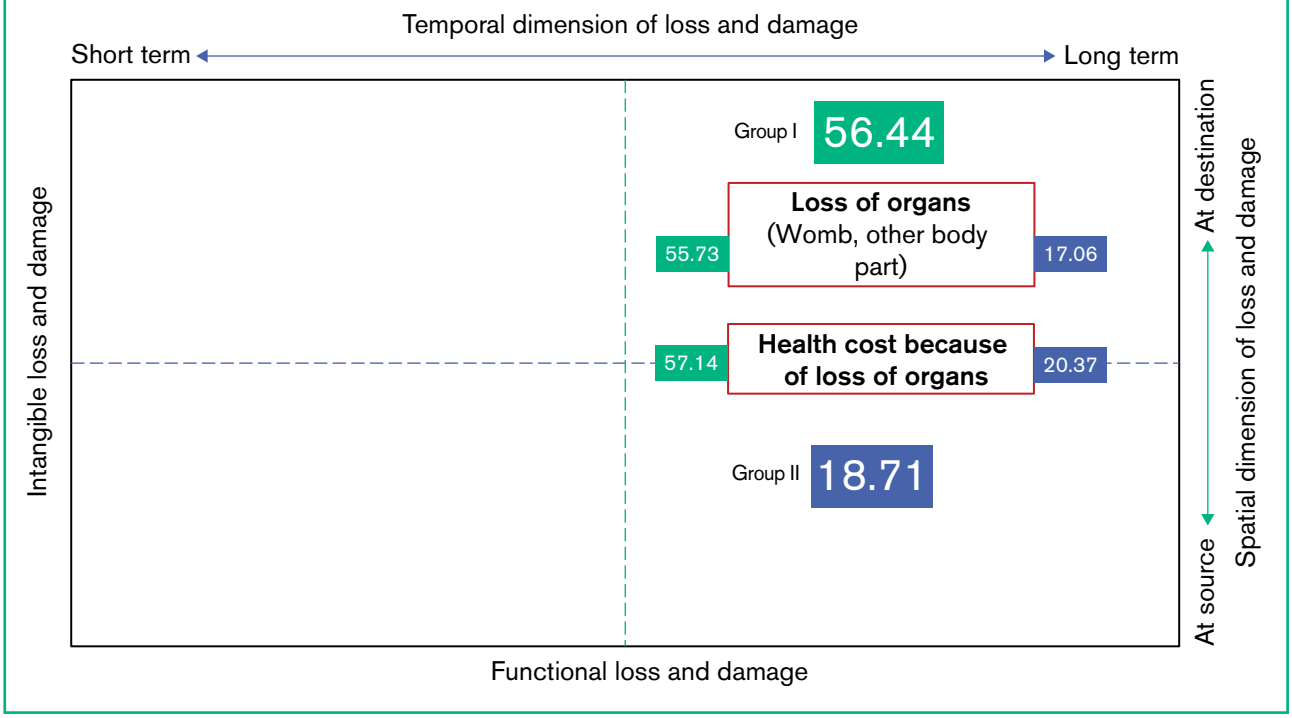
The tangible–intrinsic loss and damage index shown in Figure 27, summarises the substantial and often overlooked non-economic losses that disproportionately affect households with fewer economic assets. The index is a composite measure, integrating sub-indices such as the loss of organs index and the medical expenses due to loss of organs index, which tracks the financial burden of medical treatment associated with such losses.

The overall analysis of the tangible–intrinsic loss and damage index shows higher index values for Group I, with 56.44 for the loss of organs and 57.14 for health costs due to loss of organs, against 17.06 and 20.37 for Group II, respectively. The significant index value for Group I suggests that these households endure more severe health consequences and financial strain due to organ loss, which can be attributed to their socioeconomic conditions: being a majority of Indigenous tribal and Scheduled Caste populations with small landholdings, inadequate infrastructure, and lower levels of education and skills.

Table 5. Cost of hysterectomy

TYPE OF COSTS	COST (₹)	
	GROUP I	GROUP II
Cost of hysterectomy surgery	45,391.30	13,058.82
Cost of laboratory testing and medical consultations	9,964.43	3,264.71
Cost of medication (tablets, post-surgery therapy etc.)	8,018.97	1,982.35
Total cost	**63,374.70**	**18,305.88**

Figure 27. Tangible–intrinsic loss and damage index for Group I and II



The implications of these findings are profound. Group I not only faces immediate health risks and out-of-pocket expenses but also the long-term financial implications of lost income and the potential for intergenerational poverty. The loss of an organ can often result in the inability to continue labour-intensive jobs, leading to unemployment or underemployment, and the associated medical costs can deplete any savings, thrusting families into a cycle of debt and poverty.

In contrast, Group II, while not immune to these issues, shows lower index values, indicating that while they are affected by organ loss and its associated costs, the impact is less severe. This is reflective of their relatively stable economic situation and better access to healthcare and financial resources.

Policymakers and international stakeholders must recognise the hidden and long-term costs of health-related issues due to climate impacts and work towards inclusive policies that mitigate these losses and provide a safety net to those in need. Investment in healthcare, education and sustainable livelihood options can significantly reduce the incidence and impact of such intrinsic losses.

4.4 Intangible–intrinsic loss and damage index

The intangible–intrinsic loss and damage index provides a nuanced perspective on the non-physical and psychological impacts of health conditions and life circumstances that are not often captured by traditional economic assessments. This composite is made up of two sub-indices (Figure 28) — the cost of health effects of hysterectomy index and the mental health problems index.

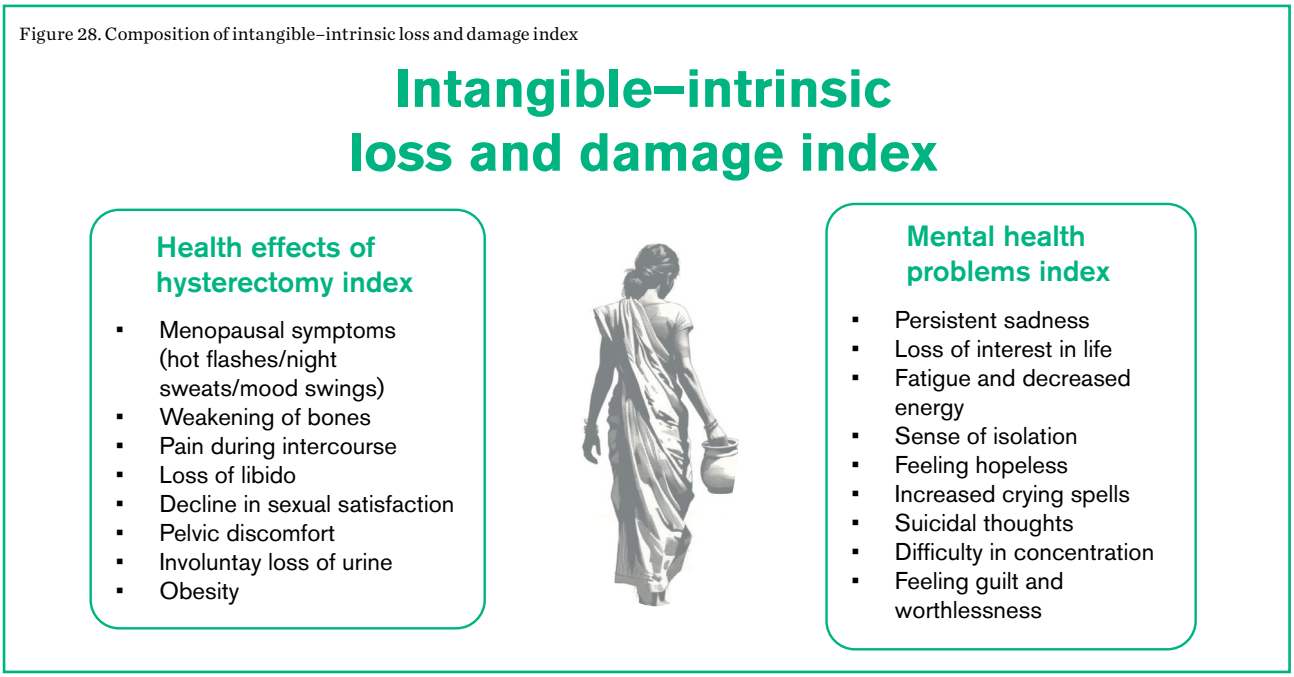
Together, these sub-indices create a comprehensive framework that illustrates the broader impact of health interventions and the cascading effects they have on an individual's mental and emotional state. This index underscores the critical need to address the full scope of consequences stemming from medical procedures such as a hysterectomy: not only the immediate physical ramifications but also the long-term psychological and emotional impacts. It emphasises the importance of holistic care approaches that include mental health support as an integral component of treatment and recovery plans, especially for those who may have limited access to such resources due to economic constraints or social circumstances.

1. Cost of health effects of hysterectomy index

The cost of health effects of hysterectomy index quantifies the diverse range of post-surgical outcomes that women may experience, including physiological changes such as menopausal symptoms, weakening of bones, and pelvic discomfort, as well as alterations in sexual health, like loss of libido and decline in sexual satisfaction. These effects extend beyond immediate medical concerns, potentially influencing long-term quality of life and wellbeing.

This index is a critical measure that highlights the multifaceted impacts that hysterectomies have on women, especially women from economically disadvantaged backgrounds. The data shows that Group I incurs significantly higher costs both annually and cumulatively due to the health effects of hysterectomy. This group's average total expenditure since the surgery stands at a substantial ₹90,028.46, while Group II, likely with better access to healthcare and support systems, spends ₹25,037.65.

Figure 28. Composition of intangible–intrinsic loss and damage index



The loss of income due to the health effects of hysterectomy further accentuates the economic burden on Group I. On average, the households of Group I lost 7.07 days of employment per month, resulting in a total annual loss of income amounting to ₹16,970.75. Their average total productive income lost since hysterectomy is a staggering ₹214,842.69. This is in contrast to Group II's loss of ₹70,785.88, which, while significant, is markedly lower.

Mortality and severe health outcomes due to workplace accidents also contribute to losses. Among Group I households, 1.19% have suffered the death of a family member due to an accident or health hazard at the worksite, with the resultant average loss of income due to these deaths being ₹18,498.02.

Furthermore, the psychological impact of work conditions in Group I is alarming, with 2% of households reporting family members who have committed suicide due to work pressure or torture at the worksite.

Lastly, reproductive health challenges such as abortion, premature delivery or stillbirth at worksites are reported by 1.98% of Group I households. This points to the harsh realities faced by women in Group I, who may lack adequate maternal healthcare or work in environments which are unsuitable for pregnant women.

The index value presents a distressing picture of Group I households, where women endure not only the physical aftermath of undergoing a hysterectomy but also a cascade of financial and emotional distress. These figures reflect the broader socioeconomic disadvantages faced by Group I, where the lack of economic assets and inadequate social support systems exacerbate the non-economic loss and damage following such life-altering medical interventions.

2. Mental health problem index

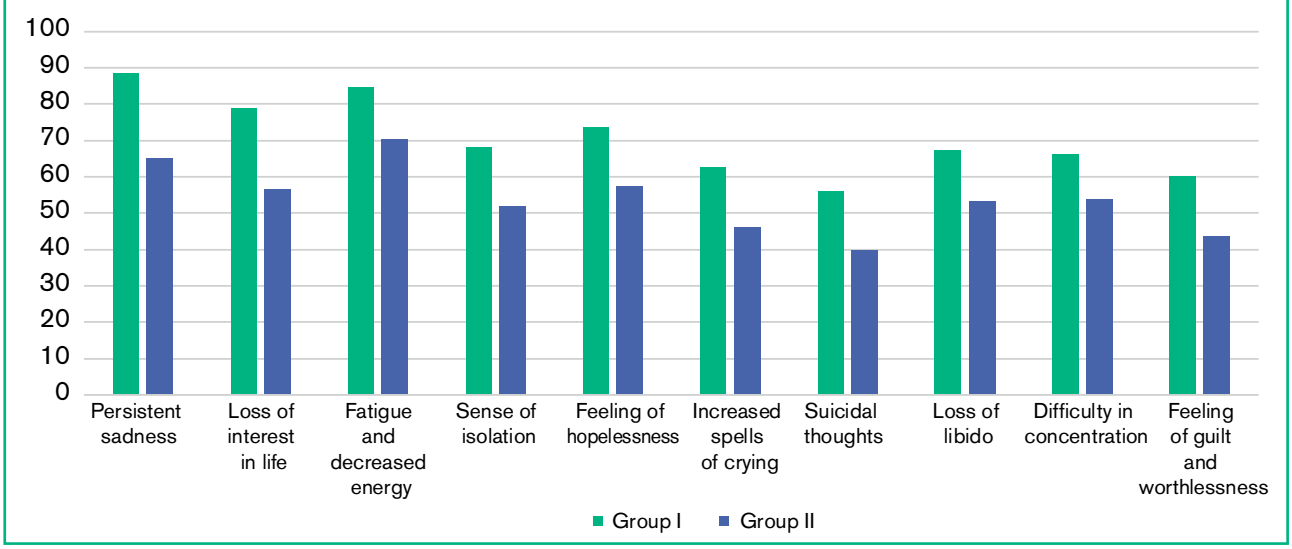
The mental health problem index accounts for the psychological and emotional toll that these health challenges can take on individuals. It encompasses a spectrum of mental health concerns, from persistent sadness and loss of interest in life to more severe conditions such as feelings of hopelessness, suicidal thoughts, and other manifestations of distress. These conditions can profoundly affect one's ability to engage in social, occupational and other important areas of functioning.

The mental health problems composite index provides insights into the psychological wellbeing of the two groups. Group I exhibits a notably higher index value of 70.53 compared to 53.72 for Group II, which comprises non-migrating households. This disparity highlights the more severe mental health challenges faced by Group I, which includes Indigenous tribal populations and Scheduled Castes with limited economic assets.

Looking at the univariate indices of mental health problems, the data shows that Group I report persistent sadness (88.54%), loss of interest in life (78.66%) and fatigue (84.39%. These figures contrast starkly with Group II, suggesting that the migratory lifestyle, coupled with the socioeconomic vulnerabilities of Group I, significantly exacerbates mental health issues.

The sense of isolation and feelings of hopelessness are markedly more prevalent in Group I, reflecting the compounding effects of their marginalised status and the stresses of migratory labour. Suicidal thoughts and increased crying spells are also more common in Group I, indicating severe distress that is likely compounded by the harsh realities of their work and living conditions.

Figure 29. Mental health problem univariate indices



The economic impact of mental health issues is also substantial, with Group I losing an average of 1.67 days of employment per month due to mental health problems, leading to an annual productive income loss of ₹10,424.90. Additionally, the average annual cost of treating mental health problems for Group I is ₹5,554.15, further straining their financial stability.

These figures suggest that the mental health of individuals in Group I is not just a matter of individual wellbeing but is intricately linked to their economic circumstances and the structural conditions of their work. The high index values and related losses underscore the need for targeted mental health services and interventions that address both the psychological and socioeconomic dimensions of health for these populations.

What does the intangible–intrinsic loss and damage index reveal?

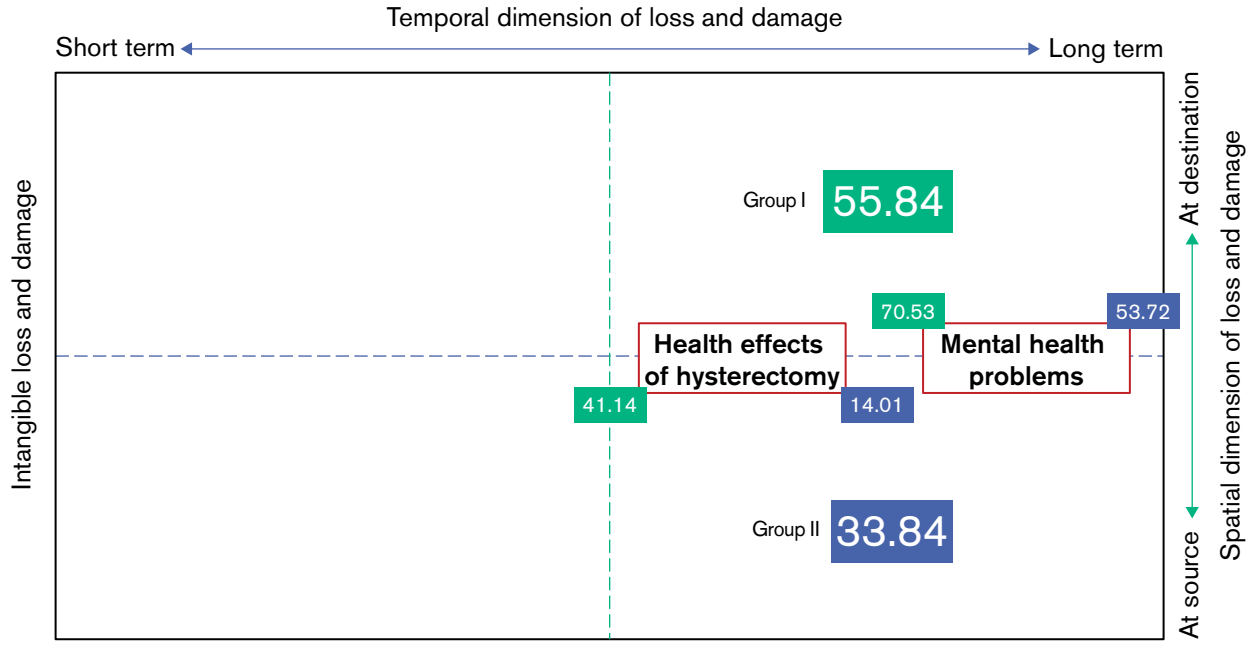
The intangible–intrinsic loss and damage index (Figure 30), incorporating the cost of health effects of hysterectomy index and the mental health problem index, offers a comprehensive view of the non-economic challenges faced by two groups.

The analysis of the cost of health effects of hysterectomy index shows a significantly higher score for Group I (41.14) than for Group II (14.01). This suggests that the women in Group I are experiencing more severe health issues post-hysterectomy. The implications of this are profound, not only affecting their physical health but also their ability to work and support their families, thus exacerbating their economic vulnerabilities.

Furthermore, the mental health problem index presents an even more striking contrast, with Group I scoring 70.53 against Group II's 53.72. This denotes a substantial burden of mental health issues within Group I. Persistent sadness, loss of interest in life, fatigue, and a sense of isolation are all significantly higher in Group I, indicative of the psychological toll that their environmental and social conditions take.

The composite index highlights the deep-seated and often overlooked non-economic loss and damage borne by Group I. These households, with their lower economic assets, are not only more prone to tangible losses like health and income but also to intangible losses manifesting as physical and mental health issues. The data underscores the necessity for targeted intervention and support for these communities, addressing both the immediate healthcare needs and the underlying socioeconomic factors that contribute to these disparities. The fact that these issues are more pronounced in Group I aligns with the understanding that socioeconomic deprivation and climatic factors can significantly affect health outcomes.

Figure 30. Intangible–intrinsic loss and damage index for Group I and II



4.5 The cost of economic and non-economic loss and damage for households

Table 6 sets out the overall cost of the economic and non-economic loss and damage suffered by the two household groups in Beed district, which are emblematic of the broader societal and climatic challenges faced by similar communities in many parts of the world.

The distress migration undertaken by Group I is a direct result of economic pressures that are exacerbated by climate change. As these families migrate to work in sugarcane fields, they encounter a harsh environment shaped by the punitive systems of labour contractors, which perpetuates a cycle of hardship, exploitation and modern slavery. In contrast, Group II households typically have better economic, social, political and educational standing. The differences in the two group profiles significantly impact each group's ability to cope with the frequent and intense droughts attributable to climate change.

The analysis shows that Group I incurs a heavy financial burden due to poor work conditions and the

Table 6. Cost of economic and non-economic loss and damage suffered by the households

CATEGORIES OF ECONOMIC AND NON-ECONOMIC LOSS AND DAMAGE	AMOUNT (₹)	
	GROUP I	GROUP II
Total annual income of the household	94,646.76	151,065.00
Loss of income suffered by the household due to economic and non economic loss and damage		
One-off expenses		
Cost of treating illness due to poor work and living conditions	5,333.75	20.59
Cost of hysterectomy	63,374.70	18,305.88
Cost of treating accident injury	2,068.38	1,588.24
Total	**70,776.83**	**19,914.71**
Expense as percentage of total household income per year	**74.78%**	**13.18%**
Expense immediately after climate event (calculated for the last drought)		
Crop loss because of the latest drought	9,150.20	20,735.29
Loss of yield from livestock because of the latest drought	1,019.76	1,523.53
Income loss because of loss of employment	15,613.64	9,637.65
Income loss because of death of animal	3,851.38	1,623.53
Income loss because of sale of animal	2,086.96	614.12
Health costs: amount spent to treat ill health caused by drudgery caused by water scarcity	1,643.88	880.59
Amount spent on buying water during the last drought year (for 3 months)	11,461.65	10,551.18
Total	**44,827.47**	**45,565.89**
Expense as percentage of total household income per year	**47.36%**	**30.16%**
Long term and recurring expenditure due to loss and damage (per year)		
Amount spent treating health effects of hysterectomy	6,901.19	1,948.24
Loss of income due to health impacts of hysterectomy	16,970.75	3,924.71
Productive income lost because of mental health problems per year	10,424.90	6,470.59
Cost of treating mental health problem per year	5,554.15	1,912.94
Total	**39,850.99**	**14,256.48**
Expense as percentage of total household income per year	**42.10%**	**9.44%**
Total loss and damage suffered at household level	**155,455.29**	**79,737.08**
Share of the loss and damage to the total income of the household (%)	**164.25%**	**52.78%**

consequential need for medical treatments. The cost of treating illness due to poor working conditions, combined with the cost of a hysterectomy and treating accident injuries, totals ₹70,776.83. This amount represents a significant 74.78% of their total annual household income. Meanwhile, Group II faces similar expenses, but at a much lower total of ₹19,914.71, accounting for only 13.18% of their annual income.

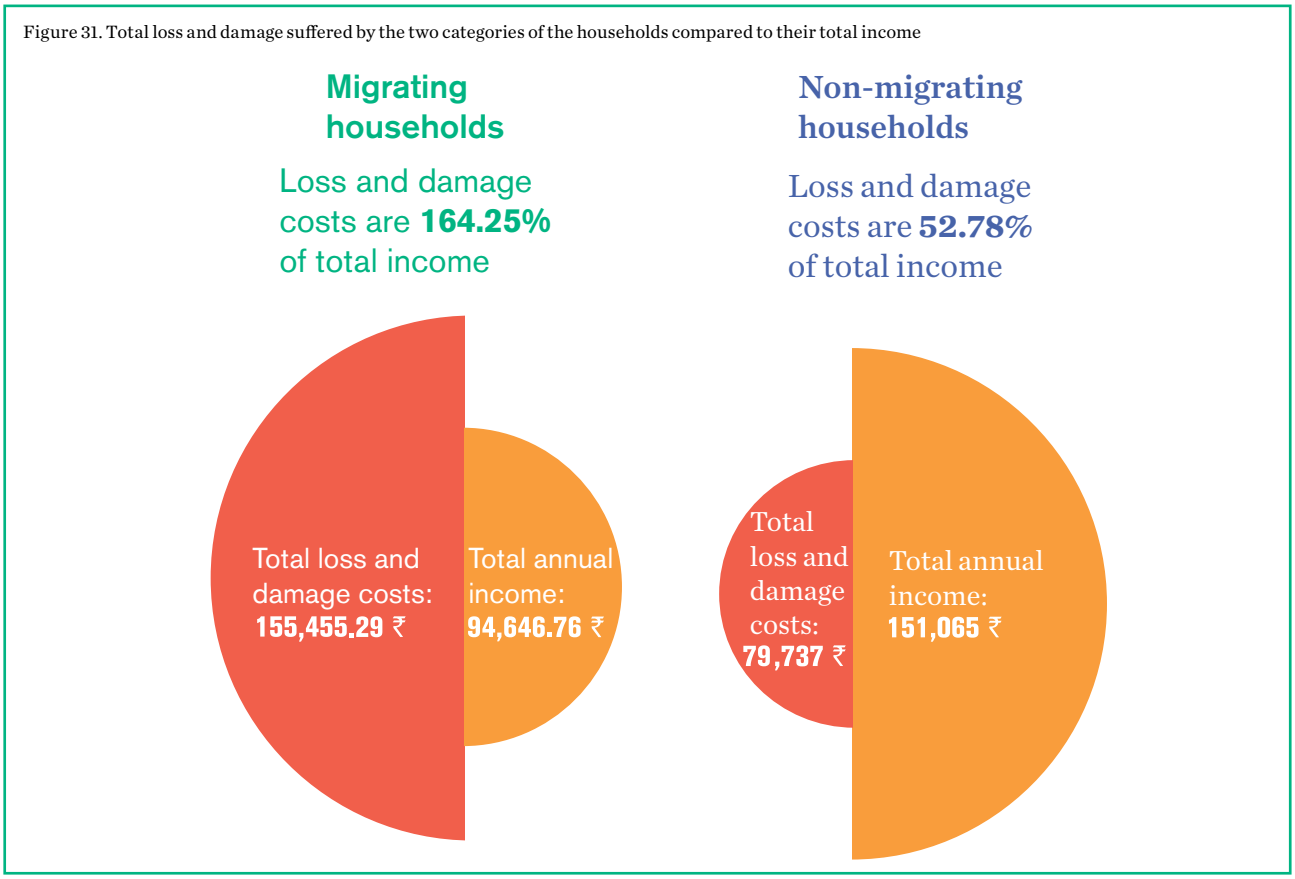
The immediate aftermath of the most recent drought also disproportionately affected Group I, with expenses amounting to ₹44,827.47, which is 47.36% of their annual income. In comparison, Group II has slightly more expenses at ₹45,565.89, but, due to their higher income, this represents a smaller percentage loss of 30.16%.

The higher level of non-economic loss and damage suffered by Group I has a profound impact in the long term, resulting in recurring expenses. Long-term health impacts of hysterectomy and mental health issues pose a significant annual financial strain on Group I, amounting to ₹39,850.99 or 42.10% of their annual income. Group II's corresponding expenses are ₹14,256.48, constituting only 9.44% of their annual income. The non-economic loss and damage faced by Group I is reflective of the extreme and often irreversible impacts on individuals' wellbeing and health.

Overall, the total quantified loss and damage for Group I is a considerable ₹155,455.29, disproportionately high at 164.25% of their household income. This suggests that the losses exceed their total annual income, pushing them further into a cycle of intergenerational debt and vulnerability. Group II's total loss and damage stands at ₹79,737.08, which is a lower but still substantial 52.78% of their household income.

The analysis not only quantifies the loss and damage but also underscores how the same intensity of climate impact manifests itself differently on different households living in the same community. The households with lower economic assets are not only more prone to tangible losses like health and income but also to intangible losses manifesting as physical and mental health issues. It showcases how the intersection of demographic, social, economic and political factors shapes the severity and type of losses experienced by different groups. For Group I, these predisposing vulnerabilities catalyse a cascade of hardships, locking them into a cycle of indebtedness and modern slavery with little hope for recovery or improvement in their quality of life. It is imperative to recognise these multifaceted vulnerabilities and address them through comprehensive policies and targeted interventions that offer robust social protection, inclusive of gender and marginalisation issues, and provide sustainable alternatives to distress migration. Only through such multidimensional strategies can we hope to mitigate the harsh reality of climate change impacts and foster resilience.

Figure 31. Total loss and damage suffered by the two categories of the households compared to their total income



5 Recommendations

The findings from the Beed study clearly demonstrate that the impacts of climate change extend far beyond visible economic losses. They encompass a range of non-economic losses and damages that profoundly affect the lives, livelihoods and wellbeing of communities. This set of recommendations is primarily directed at policymakers, international stakeholders (particularly those managing climate finance), newly created loss and damage funds and practitioners in the field. Our objective is to provide actionable guidance to create resilience to both the economic and non-economic aspects of climate change-induced loss and damage.

Address inequity, exclusion and marginalisation in the delivery of social protection programmes

The community often views migration as a last-resort option for surviving and sustaining their families. But there are many risks associated with such mobility that create additional vulnerabilities for migrants, such as the risks of forced and exploitative labour, as in the case of migrants from Beed. We need to create a safety net for communities in the face of the climate crisis so that such distress migration can be avoided. To that end, social protection programmes need to complement each other and offer vulnerable communities access to a range of services, such as education, health, nutrition, skills enhancement, and so on. However, despite well-conceived social protection programmes such as PDS, MGNREGS, PM-KISAN, marginalised and socioeconomic vulnerable communities do not get access to these programmes in their time of need (see Case study 4).

The delivery of social protection programmes is quite often marred by targeting, exclusion, gender inequality, marginalisation and lack of transparency. These issues can be tackled by mainstreaming gender considerations and the risks faced by other marginalised groups in the approach to targeting and delivery. Social protection programmes need to factor in the diverse needs of women and men, as well as more vulnerable groups like children, and elderly and disabled people. Eligibility for social assistance programmes should be underpinned by a universal database that also includes exposure to climate or natural hazards (along with socioeconomic vulnerability).

In India, biometric 'Aadhar' cards are available to all residents, which can be used for more effective prioritisation, targeting and unifying the access of any individual or households to a range of social protection programmes. These Aadhar cards have been integrated with the Jandhan bank accounts, which can also be used for direct transfer of entitlements to the beneficiary, without the issues of leakages or operational inefficiencies. In this way, individuals exposed to high climate risks could typically get access to a range of resilience initiatives through a single registry in a timely manner. This could also enhance the effectiveness and complementarity between different social protection programmes. However, despite the portability of food subsidies through Aadhar-based PDS cards, rights holders (see Case study 4) still face issues with access to entitlements. This often happens because the beneficiaries are not aware of their rights and what they can do if they are denied access.

To deal with these issues, there is also a need to complement social protection programmes with better awareness campaigns and empower communities to assert their rights.

To ensure last-mile connectivity or outreach of social protection programmes during times of crisis, governments will need to use the existing network of NGOs, community-based organisations and grassroots women's organisations. To work effectively, governments should co-develop a contingency plan with clearly defined roles and responsibilities and decision making

CASE STUDY 4: SUMAN OWHAL'S HEALTH ORDEAL AND EXCLUSION FROM SOCIAL PROTECTION

"I wish I would have died while getting the hysterectomy done. This post-surgery life is miserable. I sweat a lot in the field. My back and legs always hurt. I feel very weak. I feel dizzy while carrying the bundles of cane," says 42-year-old Suman Owhal, who is a cane cutter from Kathawada village in Beed district.

Suman Owhal

Suman and her husband travel to villages in Kolhapur district every year to work as cane cutters.

All of the women migrating have a ration card, but the ration card can only be used in the village they belong to and not in the village they migrate to. Suman says: "Half of the year, we can't avail our ration. What is the use of this ration card?"

She says that when they migrate to Kolhapur, they buy all their food supplies at a regular price and store it for six months.

Suman talks about the inaccessibility of social protection schemes. She says: "We haven't even received housing from the BPL card.[1] We have demanded in Gram Sabha to give us work through MGNREGS, but till now not even one year we have received work."

Suman says: "Due to the consecutive years of drought and inaccessible government schemes, we are compelled to migrate every year."

Suman was compelled into having a hysterectomy because of lifting heavy loads of cane and getting no rest post deliveries. Her menstrual cycle became irregular and there was an excess of white discharge.

She says: "I spent ₹25,000 on the surgery. But the post-surgery expenses are a lot too. I take painkillers every day in order to work. The back pain gets unbearable."

[1] Below Poverty Line ration card

systems, so that when crisis strikes, everyone knows what their role is and can support the community. This will help to rapidly scale up efforts to respond to crises in an anticipatory and agile manner when early warning systems indicate that a climate crisis is likely to breach certain thresholds, and will ensure cross-government and multistakeholder collaboration to support delivery.

Prepare people for migration-related employment

There are opportunities to engage migrant workers in large construction and infrastructure projects and other economic activities. However, many migrants have little or no education and are working as unskilled workers. There is a need to map out migration hotspots based on an analysis of the layers of climate change, socioeconomic, political and institutional drivers to identify the migration pathways of vulnerable communities in times of crisis. This could be complemented with participatory community-level assessments that identify migration patterns (for example, whether people migrate alone or with their family), migrants' education and skill levels, and where they seek employment at their destinations. Mapping the skills requirements at destination sites and developing a systematic programme for enhancing such skills within vulnerable communities would help prepare migrants for decent employment. The assessment results should be used to prepare workers for migration. Skills training could be accompanied by certification. Lack of certification or documentation of skills is a major reason why many workers, even if they are skilled, are paid unskilled wages. The biometric Aadhar card, which mentions education level and other demographic details, could also record information on skills and training, so that migrants would not be required to carry their skills certificates.

Our research shows that most rural households could not access the skills development opportunities that are offered under the 'Unnati' component of MGNREGS because they could not meet the qualifying requirement. Under the current framework, households are eligible for skills enhancement training only if they have completed 100 days of employment under MGNREGS in the previous financial year. This criterion often excludes many households, not due to a lack of willingness or

demand for work, but because of the unavailability of work. Moreover, migrants who are away from their home village for extended periods and women who head households and are burdened with domestic responsibilities find it difficult to meet this 100-day requirement. To make the scheme more inclusive and effective, there's a need to relax the 100-day work requirement for accessing skills development training. This change would ensure that all household members, particularly women and young people, can benefit from these opportunities, regardless of their migration history or domestic responsibilities. Additionally, updating MGNREGS job cards to record the skills training provided to individuals could offer a more comprehensive understanding of the skills development landscape within the programme.

Facilitating decent employment at destination sites

Distress migrants are at a disadvantage in the labour market at their destination site and are often exploited. Migrants work in places where labour and workplace safety laws are widely disregarded. They are often forced to overwork, are paid less and are exposed to polluting working conditions with inadequate or no safety equipment. So, skills enhancement could be complemented by placement services. These could be offered through mobile phone applications or village institutions or extension services. A mobile app or a village-level registry could list opportunities for workers with different skill types in industry or government construction or infrastructure projects. This would provide migrants with options and a secured job opportunity before leaving their village. This, in turn, would bypass exploitative intermediaries and contractors like mukkadams. Direct placement would remove the informality in the labour market and ensure workers have access to basic work facilities mandated by law. Migrant workers should also be provided with additional services such as training on rights awareness, helplines and remittance services. Such support could be facilitated in convergence with other social protection programmes and in partnership with NGOs. This would help to diminish migrants' exposure to risks and enhance their capacity to protect themselves from exploitative work conditions.

Migration advisory and helpline service

A toll-free helpline number which migrants can call to seek advice and support is needed to help people on the move. This helpline service should be able to guide the migrants on 'dos and don'ts' during transit and at their destination. For example, the service could tell migrant workers how and where to get registered before leaving their native community so they can be tracked. It could also offer extended support during a crisis, including offering guidance on what to ask contractors or employers before taking a job at their destination. It could identify what facilities (such as temporary shelter/hostels) they can use while en route. The service could also advise migrants on what they can do if they feel trapped in trafficking or slavery-like conditions or in the case of an accident. In addition, it could inform them about the social protection programmes they can make use of at their destination site and how they can get registered. Finally, the helpline service could inform migrants about their basic rights and entitlements at the job site (for example, safety equipment, working hours, sick leave, and so on) and whom they can contact in case their rights and entitlements are not met.

For such a helpline to work, there will be a need for the following:

- A mass awareness campaign to reach out to migrants and their families back home through newspapers, posters, radio, social media and word-of-mouth campaigns publicising the helpline number.
- Ownership and support from within the government at the highest level. The success of a similar helpline (Bharadwaj, 1 June 2022) in Jharkhand state in India shows that a major reason for its effectiveness was support from Jharkhand's chief minister and chief secretary. They allowed the helpline to use their offices to issue letters, organise coordination meetings with other state governments and get support from counterpart offices in states that migrants had moved to.
- Institutionalisation of the helpline within the Department of Labour in convergence with welfare schemes for skills training and placement of workers.
- Compassion from the team responding to the calls. People often call in despair: they need to feel they are being heard and will get help. Commitment from helpline staff is important: they should not view their work as routine call centre work.

Establish a network of NGOs to support migrants en route and at destination sites

The government will need to develop an extended network of NGOs and civil society organisations to complement the official support system. The migration resource centres typically run by the government in India have limited outreach. Migrants often find it difficult to approach them due to formal administrative procedures within the offices. Sometimes migrants have to lose a day's wages to reach them. In these contexts, civil

society organisations and NGOs can act as extended arms of such resource centres to reach out to migrants through informal channels. NGOs and civil society organisations near construction sites or industrial hubs can be particularly involved. They can also ensure that worksites respect workers' rights and entitlements. Such a network will also be useful for state/subnational governments to extend support to migrants in other states or regions where they do not have jurisdiction. Such a network can also provide food, immediate counselling and logistical support during transit and at destination sites. It can also rescue and bring migrants home, when needed.

Ensure portability of social assistance for migrants

Social protection programmes have a fundamental flaw: they only provide a safety net to households so long as they are in their native village; they do not acknowledge that climate-induced migration leads to the dispersal of families. Both migrants and the family members left behind must receive entitlements. For example, MGNREGS provides a rights-based job guarantee to all rural households with a minimum wage rate, decent working conditions and worksite facilities. But if the same workers must undertake distress migration or face displacement, they are not covered by these rights. Often, they work in sub-human conditions for survival, devoid of any rights, benefits or entitlements at their destination sites.

The concept of portability in social protection programmes, therefore, becomes crucial in addressing the needs of those affected by distress migration and displacement due to climate change. Most social protection programmes do not recognise migrants within their area of coverage. Nor do they address the implications of migrating, either for migrants or for the families left behind. India's 'One Nation One Ration Card' initiative under the Public Distribution System marks a significant advancement: this scheme allows beneficiaries to access their food entitlements from any fair price shop across the country, which is a boon for migrant workers relocating for employment.

However, operational challenges hinder the effective realisation of portability. Migrants often lack awareness of their rights under this scheme and face technical and administrative hurdles, such as difficulties with biometric authentication, when accessing services in different states. These issues are compounded by the digital divide that affects rural and marginalised communities, who often have limited access to technology and information.

To fully harness the potential of the 'One Nation One Ration Card' initiative and overcome these operational barriers, there is an urgent need for enhanced inter-state coordination, better technical infrastructure, and more robust awareness campaigns targeted at migrant populations.

Further extending the scope of portability to encompass other vital social protection schemes can significantly reinforce the safety net for migrants and their families. Ensuring continuous access to essential services such as healthcare, including Anganwadi services for pregnant and lactating mothers, education for children through initiatives like the Mid-Day Meal Scheme, and basic sanitation facilities is critical. This would mean that, in times of crisis, communities would not be compelled to undertake distress migration and could make more informed decisions about their welfare.

Such an expanded approach to portability would require not only policy changes but also a concerted effort to address the digital divide and improve the accessibility and effectiveness of these programmes. By doing so, India can offer a more comprehensive safety net to its most vulnerable populations, particularly in times of environmental and economic upheaval.

Ensure coordination between social protection programmes and labour market reform

Most countries have social protection and job market regulations, which, if well implemented, can support and protect the rights of migrant workers. But in many cases, the regulations are fragmented and unharmonised. Different parts of government introduce their own programmes at various times. The lack of coordination among the different programmes means workers are not able to get comprehensive cover. There is a need for an integrated system where social protection programmes cover basic needs (shelter, food, health) of migrant workers and labour market reforms protect their rights. This will help ensure that migrants are not exploited because they find themselves in a distress situation. Even if short-term migrants are engaged in short-duration jobs, they should be covered through formal contracts and not treated as invisible workers. They should be registered and given adequate cover under labour laws and policies. These should ensure job security, health and accident insurance, decent working conditions and basic minimum worksite facilities. Labour market reforms can also be geared towards promoting equity in access and opportunity for men and women. In addition, they can help migrants enter the labour market through active labour market programmes. These could include skill certification, job search assistance and supportive labour market policies, particularly for young people. They could also include social care, with a focus on assisting the elderly, women, disabled people and at-risk children.

Leverage climate finance to support climate resilience instruments within social assistance programmes

Climate finance can potentially offer greater quantity and quality of finance to scale up the contribution of social assistance programmes towards climate resilience, protecting communities from both economic and non-economic loss and damage. In this context, the newly created Loss and Damage Fund can consider channelling support through social protection programmes. This approach would ensure that funds are used not only to address immediate economic losses (like crop failure) but also non-economic losses (such as physical or mental health impacts).

Social protection programmes are already part of core development strategies used by governments across the globe to alleviate poverty, achieve social cohesion and sustain economic growth. In 2017, more than US$500 billion was spent in lower- and middle-income countries to support large-scale social protection by governments and international donors. Nearly 45% of the world's population is covered by at least one social protection benefit, while benefits of social assistance programmes reach close to 25% of the vulnerable population. Thus, social protection programmes can provide an effective delivery channel to scale up resilience efforts. By directing climate finance through social protection programmes, support can be more targeted and effective, reaching those who need it most in a structured and sustainable manner.

The Loss and Damage Fund can be used to fund additional benefits via social protection programmes during times of climate crisis. For example, in the event of a drought or flood, social protection programmes could offer increased financial assistance or food aid, funded from climate finance. This approach would ensure that vulnerable communities receive timely and adequate support during emergencies. An example of effective climate finance use is the Green Climate Fund's (GCF) support for Pakistan's Ehsaas Programme, which aims to build climate resilience among the poor. The GCF provided US$35 million to enhance the programme's capacity to respond to climate shocks. Such examples illustrate how climate finance can augment social protection schemes, making them more responsive to climate-related challenges.

Integrating early warning systems into social protection programmes and using climate finance to support anticipatory responses can be highly effective. For instance, if an early warning system predicts a severe drought or flood, climate finance can be used to pre-emptively disburse funds or resources to at-risk populations, helping them prepare for and mitigate the impact of the event. For example, in Bangladesh, the forecast-based financing system triggers the release of funds based on weather forecasts to enable early actions before floods. Climate finance can support the scaling of such systems, allowing for pre-emptive distribution of aid, thus reducing the impact of disasters.

The Loss and Damage Fund can be utilised to incorporate climate risk assessments and planning into social protection programmes. This involves revising existing programmes to consider climate risks and tailoring them to better address the specific vulnerabilities of different regions and communities. Investing in capacity building for local institutions and developing resilient infrastructure are essential for the effective delivery of social protection in the face of climate change. Climate finance can also fund training programmes for local officials and the construction of durable roads and facilities that remain functional during disasters, thereby ensuring uninterrupted delivery of social protection services. Additionally, it can fund the development of resilient infrastructure that supports social protection programme delivery, such as water conservation and land management for longer-term drought-proofing.

Some mechanisms that can be considered by the Loss and Damage Fund for supporting resilience against economic and non-economic loss and damage are:

- Scaling up of existing social assistance programmes to target climate hotspots and climate-vulnerable populations at times of extreme climate events or disasters
- Enhanced entitlements or benefit amounts during a crisis to compensate communities for economic and non-economic loss and damage
- Setting up of early warning systems and geographic information system tools for planning, delivery and monitoring of social assistance programmes
- Developing localised indices for the assessment of economic and a range of non-economic losses and damages to identify hotspots for social assistance programmes
- Systems and support mechanisms for anticipatory delivery of entitlements and benefits based on climate risk assessments
- Integration of climate risk management into decision making through innovative tools and strengthened capabilities
- Capacity building and awareness-generation programmes on climate risk management
- Developing skills for climate-resilient livelihoods and natural resource management.

Table 7 sets out some of the ways in which different social assistance instruments can be strengthened to deliver climate resilience outcomes using climate finance.

Table 7. Potential interventions that could promote resilience against economic and non-economic loss and damage through social protection programmes

ABSORPTIVE CAPACITY	ADAPTIVE CAPACITY	TRANSFORMATIVE CAPACITY
Cash transfers		
Target vulnerable communities and regions during climate stress/ disaster events Increase benefit packages or entitlement during disasters	Financial inclusion (bank accounts, insurance enrolment, etc.) Skills training for beneficiaries Support for asset creation Behavioural change related to climate resilience	Comprehensive cover — facilitate access to other entitlements Market linkages Strengthening local institutions and social cohesion Promote community leadership and decision making Promote collaborations between civil society and community orgnaisations and government
Social pensions		
Provide additional cash support during disasters/ extreme climatic events Target accuracy for vulnerable populations	Financial inclusion (bank accounts, insurance enrolment, etc.) for elderly, disabled people, those on extremely low incomes, etc. Facilitate access to other entitlements from government	Comprehensive cover - facilitate access to other entitlements Involve community organisations, e.g. associations for elderly people, and networks Promote linkages between community-based organisations and government departments
Public works programmes		
Cash or food for work on a regular basis Humanitarian assistance during disasters	Improving natural resource management assets on community and individual land Financial inclusion (bank accounts, insurance enrolments etc.) Vocational skills training in new trades	Comprehensive cover — facilitate access to other entitlements Market linkages Strengthening local institutions and social cohesion Promote community leadership and decision making Promote collaborations between civil society organisations, community-based organisations and government
School feeding programmes		
Financial and non-financial assistance for schoolchildren	Behavioural change related to climate resilience e.g. nutrition, WASH, disaster response Building capacity of schoolchildren to chart disaster preparedness planning for the local community Working with parents to promote desired behaviours	Promoting student clubs that would lead the agenda of climate resilience Nurturing leadership abilities among schoolchildren Facilitating linkage between student clubs and government departments
Food and in-kind programmes		
Food and in-kind support on a regular basis Accurate targeting of humanitarian support during disasters	Linking with other forms of social assistance programmes, like public works, cash transfers, etc.	Working with community organisations and collectives Convergence with other government programmes
Fee waivers		
During disaster conditions: Introduce new waivers Increase subsidy amounts Relax criteria for receiving benefits during disaster conditions	Link with other social assistance programmes Introduce conditions related to climate resilience behaviours for receiving benefits	Involve community organisations in channelling benefits

Bridge the insurance protection gap

Insurance can play a greater role in absorbing shocks and spreading risks for farmers exposed to climate crisis. However, the global insurance protection gap — in other words, the financial loss from disasters not covered by insurance — was US$113 billion in 2020, up from US$87 billion in 2019. In India, the insurance protection gap stands at 92%. This means that when disasters like droughts or floods strike, individuals or households are left to cover the consequent losses, pushing them into hardship and despair. According to the international disaster database EM-DAT (EM-DAT, n.d.), during the major drought of 2015, India suffered economic losses of US$3 billion — and only 13% of these losses had been insured. According to our assessment, if the government had taken out insurance against droughts, the premiums for insuring against the losses incurred would have been between US$0.66 billion and US$0.75 billion.

Intervention is needed to close this gap in insurance protection. In recent years, there has been a shift away from insuring against poor crop yields and towards insuring directly against bad weather. With this arrangement, farmers collect an immediate payout if the index reaches a certain measure or 'trigger', regardless of actual losses. There is evidence of positive benefit–cost ratios for insurance against losses from natural disasters (Linnerooth-Bayer et al., 2011). Experience suggests that index-based crop and livestock insurance can be a cost-effective alternative to humanitarian response. Insurance mechanisms can be used to provide pre-agreed finance in a timely and predictable manner when a pre-agreed trigger point is reached, based on reliable early warning information for the community.

But as the intensity, scale and frequency of disasters increase due to climate change, the premiums for insurance are being pushed up, making insurance unaffordable for many households. Climate events are also being deemed as uninsurable. To deal with this, insurance risk pools have been established in numerous countries. In many cases, these programmes have been established to provide affordable insurance coverage for risks that have been deemed uninsurable through private insurance markets, and in others, programmes have been established to promote solidarity in terms of loss-sharing across regions. The Caribbean islands and the Pacific islands have done this over the last decade through regional risk pools, namely the Caribbean Catastrophe Risk Insurance Facility (CCRIF SPC) and the Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI) insurance programme. In 2015, just seven days after Cyclone Pam devastated Vanuatu — leaving one-third of the island's population homeless and causing damage equivalent to more than 60% of Vanuatu's gross domestic product — the government received an immediate pay-out from the insurance policy purchased through PCRAFI.

Securing access to financial resources through risk pools before a disaster strikes allows countries to respond quickly to disasters, reduce the events' impact on people and their livelihoods, and protect people from hopelessness and despair. The Global Shield initiative announced at COP27 (BMZ, 3 November 2023) opens up opportunities for piloting and scaling up such innovative insurance approaches to close the financial protection gap faced by farmers. The initiative aims to provide prearranged financial support for fast deployment during climate disasters like floods and droughts. Initial contributions to this fund include around US$182 million from Germany and more than €43 million from other countries.

Support farmers to manage production risks due to climate change

Climate change uncertainties create production and market risks for smallholder and marginal farmers. To manage production risks, farmers need support:

- **To prepare** for impending weather fluctuations and other crises (pests, diseases, and so on) through concurrent early warning systems and advisories that are timely and easily understood, and by providing incentives to take up climate-resilient crop varieties that are less water-, energy-, fertiliser- and pesticide-intensive (for example, the better cotton initiative has increased farmers' profitability).
- **To cope** with any crop failure, partial loss or damage. Farmers, and especially smallholders and marginal growers, need a safety net to help protect them from falling into a cycle of debt. The Indian government has been offering loan waivers, but indebtedness still remains high because farmers often seek loans from money lenders, who do not abide by loan waivers. The much talked about PM-KISAN scheme, which gives ₹6,000 to every land-owning farm family, does not reach the most vulnerable, because the majority of families who are facing the worst indebtedness do not own the land they work, but rent it. Thus, this programme also has limited reach among vulnerable farmers

- **To recover better** by building upon the base level of early preparedness and support provided via social safety nets, providing the impacted households with resources and opportunities to develop stronger and more diversified livelihoods and to strengthen value chains for collective small, micro and mini-scale local enterprises, so that when future climate shocks occur, they are able to maintain or improve their living standards without compromising their livelihoods. This will help farmers to recover sustainably.

In conclusion, the study of climate change impacts in Maharashtra is a microcosm of a global crisis. It underscores the need for comprehensive strategies that address both economic and non-economic losses and damages, especially for socially marginalised communities. Recognising and responding to these diverse impacts is crucial for developing effective climate adaptation and resilience policies.

Annex: sampling methodology

For our study of economic and non-economic loss and damage due to climate change, particularly in the context of migration and health outcomes in the Beed district of Maharashtra, a robust sampling strategy was imperative for data collection. Our approach followed the 3P and C-CIQ methodologies, which prioritise precision, purposiveness and pragmatism, alongside comprehensive economic and non-economic climate impact quantification.

Selection of blocks. The research began with purposive sampling to select the Dharur and Ambajogai blocks for the study. These blocks were chosen based on their higher prevalence of migration and hysterectomy, thus providing a focused context for examining the nuanced impacts of climate change on vulnerable populations. This purposive selection ensures that our study areas are representative of the conditions and phenomena we aim to investigate.

BLOCK	TOTAL	GROUP I	GROUP II
Ambejogai	266	153	113
Dharur	157	100	57
Total	**423**	**253**	**170**

Sampling of households. Systematic sampling was employed to select households within the blocks, which helped in achieving a representative and evenly distributed sample. This method ensured that every household within the population had an equal chance of being included, thereby reducing selection bias and enhancing the reliability of our data.

VILLAGE	TOTAL	GROUP I	GROUP II
Chichkhandi	79	52	27
Asola	88	65	23
Jahangir Moha	79	41	38
Limbgaon	83	58	25
Nandgaon	94	37	57
Total	**423**	**253**	**170**

Post-stratification of households. Following the initial data collection, households were post-stratified into two distinct groups to enable comparative analysis:

- Group I: Households that migrate for sugarcane-cutting work.
- Group II: Households that do not migrate.

This stratification was crucial for understanding the differential impacts of climate change on these distinct demographic segments.

Survey data and sample size. A total of 438 households were surveyed across the two blocks. However, during the data quality assurance process, 15 sample units were rejected due to poor data quality, resulting in a final sample size of 423 households. This rigorous approach to data quality underpins the credibility of our findings.

Distribution across blocks and villages. The final sample included 266 households from Ambajogai and 157 from Dharur, with the former comprising 153 migrating and 113 non-migrating households, and the latter including 100 migrating and 57 non-migrating households. Within these blocks, the sample was further broken down across five villages, with Group I and Group II households represented as follows:

- Chichkhandi: 52 migrating, 27 non-migrating.
- Asola: 65 migrating, 23 non-migrating.
- Jahangir Moha: 41 migrating, 38 non-migrating.
- Limbgaon: 58 migrating, 25 non-migrating.
- Nandgaon: 37 migrating, 57 non-migrating.

Age distribution. The age distribution among the surveyed households ranged across six categories from under 18 to over 60, with the majority falling within the 35–60 age range. This distribution allowed us to account for age-related vulnerability and resilience in the context of climate change.

AGE CATEGORY	GROUP I (N=253)	GROUP II (N=170)
<18	0.4	0
18–25	11.07	14.12
25–35	19.76	19.41
35–45	28.85	30.59
45–60	31.62	30.59
>60	8.3	7.65
Average	**43.32**	**42.44**

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As climate change intensifies, it is imperative for policymakers to address the escalating loss and damage it inflicts on vulnerable communities in developing countries. In India's Maharashtra state, these impacts are forcing rural families into life-altering decisions and migrations to work in sugarcane fields, where exploitative practices by contractors, including fines for work absences, are prevalent. The fear of losing income drives many women to have hysterectomies to avoid having to take breaks due to menstrual pain. This paper uses two frameworks to analyse and quantify the economic and non-economic loss and damage faced by these communities, offering insights into the multifaceted nature of climate impacts.

IIED is a policy and action research organisation. We promote sustainable development to improve livelihoods and protect the environments on which these livelihoods are built. We specialise in linking local priorities to global challenges. IIED is based in London and works in Africa, Asia, Latin America, the Middle East and the Pacific, with some of the world's most vulnerable people. We work with them to strengthen their voice in the decision-making arenas that affect them — from village councils to international conventions.

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