SEEDS Social Impact Study:

Final report

Just Economics

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1. About SEEDS and AI for Good

The Sustainable Environment and Ecological Development Society (SEEDS) works to protect lives and improve the livelihoods of people exposed to disasters across Asia. SEEDS support families affected by earthquakes, floods and cyclones to rebuild homes, schools and health facilities, and to build resilience to future disasters by investing in education and skills development.

Microsoft Philanthropies India (MPI) has been working with SEEDS for several years on disaster reconstruction. The most recent investment in SEEDS is MPI's flagship AI for Good project. It was born out of a concern - held by SEEDS and shared by Microsoft - that the investments to date had not led to sustainable or structural changes within the communities they were supporting.

The AI for Good project aims to make lasting, far-reaching changes to the lives of communities in flood-prone regions of India (and potentially beyond). It involves the development of a web application which charts the flooding risk model for different clusters/neighbourhoods within a defined region. The project aims to add value in the following ways:

- Providing hyper-local prediction of flood risk and expected outcomes for the infrastructure involved (houses, schools, toilets etc.). This will take account of the materials the structures are built with as well as localise flood warnings, such that far more targeted prediction for households can be provided. As well as information on the risk of flooding, households will be informed as to the scale of likely destruction. This will enable households to plan around the rainy season, to protect their valuables, inform their employers and prepare themselves psychologically.

- The model will also inform the kinds of materials/locations that will be more flood resistant in the future. This will enable households to build back better and minimize their exposure to flooding in the future. This also applies to schools and WASH facilities, reducing the risk of education disruption and the emergence of water-borne diseases.

The project is being piloted during the monsoon of 2020 among coastal communities living in poor quality slum conditions in Puri and Mumbai. Due to Covid-19 restrictions, this evaluation has focused solely on the Pentha Kota district of Puri, as Mumbai was under lockdown at the time of data collection[1].

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[1] According to SEEDS staff, the communities where the intervention is being piloted are very similar socially and economically and it is expected therefore that the findings can be generalised beyond the sample community.

2. Aims and methodology

SEEDS was selected for a 'deep dive' evaluation as part of a larger study examining the Microsoft India Philanthropies portfolio for 2019/20.

The primary research for the 'deep dive' evaluation started with two semi-structured interviews (May/JUne 2020) with SEEDS staff to develop the programme's Theory of Change (ToC).

What is a Theory of Change (ToC)?

A ToC sets out the relationship between delivered activities and short, medium and long-term changes for key stakeholder groups. ToCs also consider the mechanisms by which an intervention works (or not) and how context enables or limits the success of a programme (Pawson et al. 2005). In this way, they assist with supporting continuous improvement. ToC approaches are widely considered best practice in evaluation. They are often carried out as the first step on the journey to developing a measurement framework as they are vital to identifying the correct outcomes and indicators for evidencing effectiveness.

The development of the ToC enabled the key outcome areas to be identified for the primary beneficiaries (i.e. households in the affected areas). This was supported by a review of the literature on the social and economic impacts of flooding. An online survey was developed in the Survey Monkey platform to collect data on a) prior experiences of flooding and the social and economic implications of this and b) baseline information on a range of outcomes that can be returned to in the future to measure ongoing changes from the AI for Good intervention. We would recommend that a follow-up survey to compare ex-post responses takes place in 2021 and at regular intervals in the future as the software develops and improves.

The survey was designed for completion by the female head of the household and disseminated within the Pentha Kota district over the week of the 20th of July 2020. As Covid-19 restrictions had increased by this time, many of the surveys were conducted by volunteers over the telephone. This introduces a potential bias in the sample as it excludes households without a telephone. However, mobile phone penetration in India is high, even within low income communities, therefore reducing the risk of bias.

All data analysis was undertaken by Just Economics.

3. Theory of change

Pentha Kota is largely a fishing community of about 5000 households, mostly from Andhra Pradesh, who have lived without tenure on a strip of Puri's beach for about 60 years. The Microsoft software enables SEEDS to inform Puri residents of:

- Exact timing and location of floods
- Likelihood that their house will collapse
- How long the flood will last and whether they need to move.

This has wide-ranging impacts relating to:

- Economic conditions
- Employment
- Housing
- Mental and physical health, and
- Children's outcomes

The social and economic conditions of Puri residents that will benefit from the project are highly precarious. People are living in poor quality slum housing and are predominantly from migrant communities with few social networks. They are also often financially excluded and, in some cases, don't have bank accounts. Valuables and official documents are kept in the family home. Residents are mainly employed in the tourism sector or fishing. When the floods hit, employment is disrupted (e.g. men can't go fishing) leading to loss of income and, in some instances, loss of employment. Assets, valuables, and official documents can therefore be destroyed. These circumstances not only lead to greater poverty but can force residents to turn to costly money lenders. This increases their indebtedness, reduces their ability to service debts and entrenches their poverty further. The intervention aims to do the following:
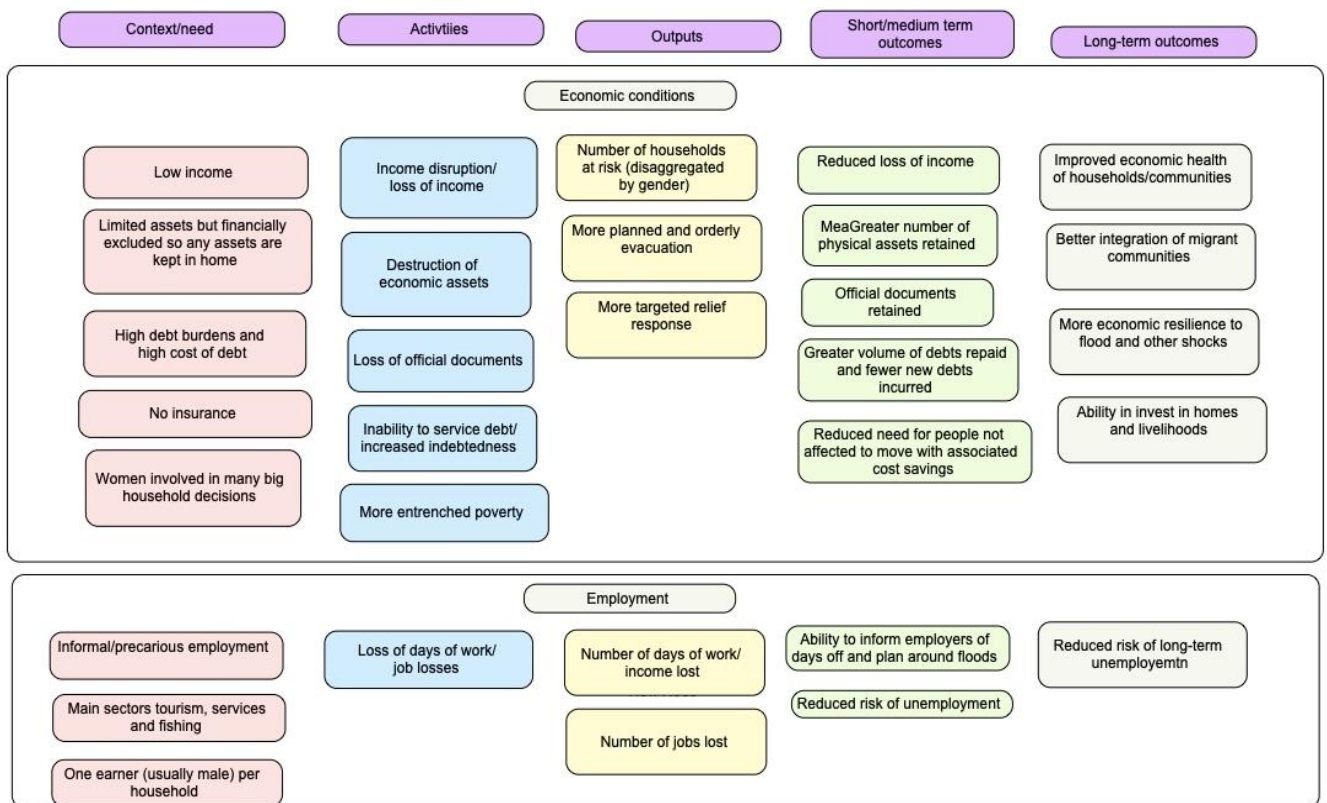
1. Enable them to plan better with employers/fishing schedules and so on around flooding. Disrupted employment can also reduce long-term employment prospects and ability to progress in employment,
2. Save assets, valuables and official documents,
3. Build back better-quality housing to a more flood resistant standard, and
4. Reduce the disruption for those who move needlessly because of inaccurate warnings.

The mental health impacts from regular flooding are potentially far-reaching. People can suffer from high levels of stress and anxiety due to the trauma of flooding, not least living with water-logged homes for months in some cases. They are unable to put down roots due to the impermanence of their circumstances, or to invest psychologically in homes and belongings. The intervention should lead to an increased sense of hope and optimism, and ability to plan for the future and expectation that cycle of poverty can be broken. Longer-term it should lead to higher general well-being, fewer severe and enduring mental health conditions and few deaths by suicide. Finally, community cohesion should be enhanced due to a lack of tension over water scarcity.

In terms of physical health, WASH facilities should be improved over time leading to fewer disease risks from poor WASH practices. There should also be fewer lives lost directly due to flooding and improved maternal health in particular, as women rely heavily on WASH facilities,

For children, the main benefit is the lack of disruption to education. Currently schools take 5-7 years to rebuild. However, the build back better approach should lead to greater resilience and fewer children not being able to attend. Finally, there are risks around child exploitation that emerge as a response to floods. As a result of flooding and school closures, children sometimes drift into (or are forced into) sexual exploitation to earn money with negative long-term consequences for their health and well-being.

Figure 1 summarises these impacts and pathways in the theory of change for the SEEDS AI for Good project.
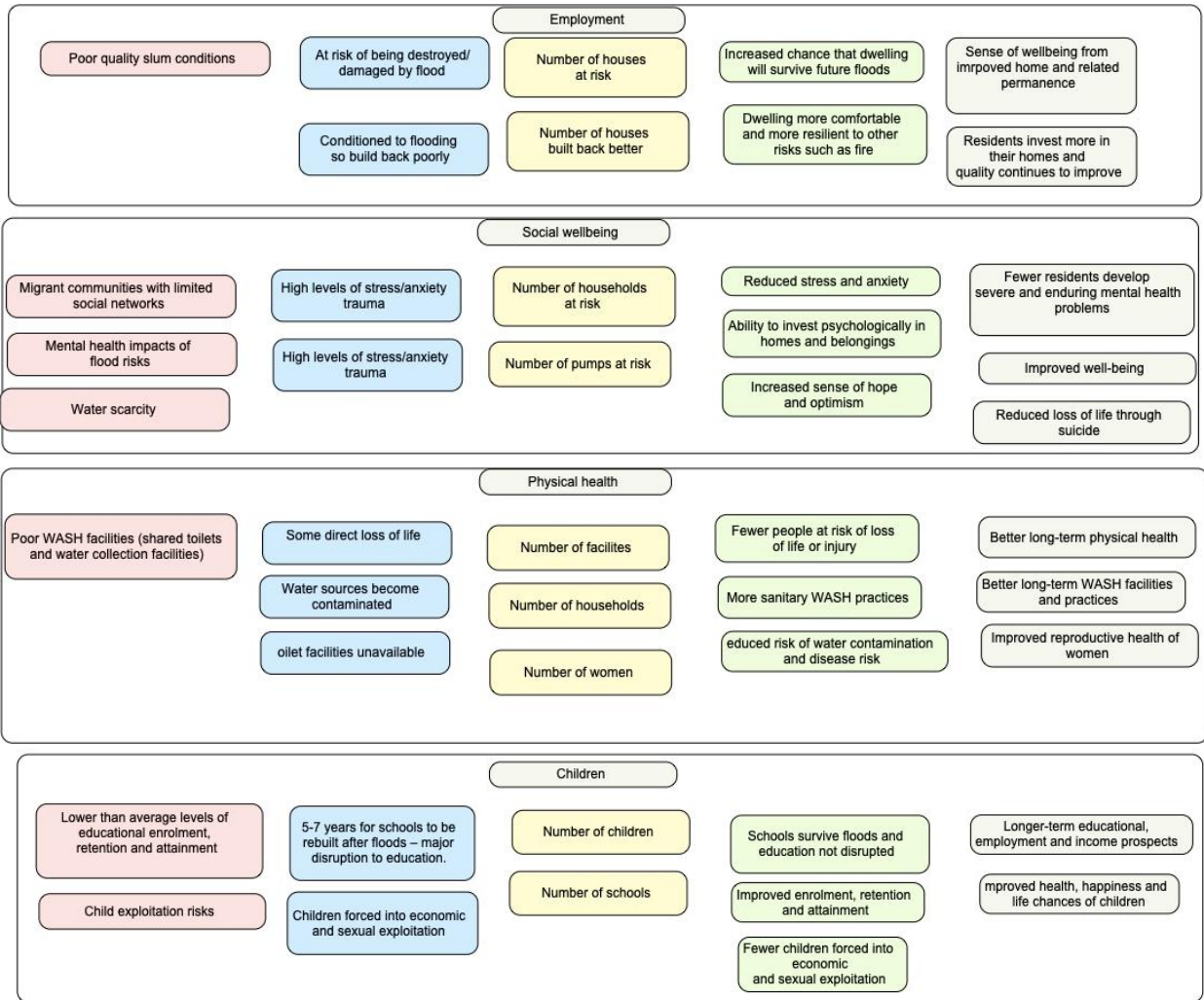
Employment

Poor quality slum conditions

At risk of being destroyed/ damaged by flood

Conditioned to flooding so build back poorly

Number of houses at risk

Number of houses built back better

Increased chance that dwelling will survive future floods

Dwelling more comfortable and more resilient to other risks such as fire

Sense of wellbeing from imrpoved home and related permanence

Residents invest more in their homes and quality continues to improve

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Social wellbeing

Migrant communities with limited social networks

Mental health impacts of flood risks

Water scarcity

High levels of stress/anxiety trauma

High levels of stress/anxiety trauma

Number of households at risk

Number of pumps at risk

Reduced stress and anxiety

Ability to invest psychologically in homes and belongings

Increased sense of hope and optimism

Fewer residents develop severe and enduring mental health problems

Improved well-being

Reduced loss of life through suicide

Physical health

Poor WASH facilities (shared toilets and water collection facilities)

Some direct loss of life

Water sources become contaminated

oilet facilities unavailable

Number of facilites

Number of households

Number of women

Fewer people at risk of loss of life or injury

More sanitary WASH practices

educed risk of water contamination and disease risk

Better long-term physical health

Better long-term WASH facilities and practices

Improved reproductive health of women

Children

Lower than average levels of educational enrolment, retention and attainment

Child exploitation risks

5-7 years for schools to be rebuilt after floods – major disruption to education.

Children forced into economic and sexual exploitation

Number of children

Number of schools

Schools survive floods and education not disrupted

Improved enrolment, retention and attainment

Fewer children forced into economic and sexual exploitation

Longer-term educational, employment and income prospects

mproved health, happiness and life chances of children

Figure 1: Theory of change for SEEDS AI for Good project

4. Survey findings

This section sets out the findings from the survey. It is structured as follows:

- Descriptive statistics
- Past experiences of flooding
- Baseline outcomes analysis

3.1 Descriptive statistics

About the sample

A total of 104 women responded to the survey in July 2020. Analysis of measures of central tendency suggest that the sample is generally normally distributed, and this increases the likelihood that the sample is representative of the wider community of Puri residents. Measures of central tendency were analysed for key demographic variables such as income, household size and flooding experiences. As we can see from Table 1, there is a high degree of similarity between the values of the mean, median and mode.

Table 1: Measures of central tendency

	Number of floods	Number of evacuations	Number of children	Other members of household	Income
Mean	10	4	3	6	7353
Median	6	5	3	6	7500
Mode	10	4	3	7	8000

Flooding and household composition

As we can see from the data, the respondents all had substantial experiences of flooding. The average number of flooding experiences was 10 with range of between 4 and 20. In addition, 97% had been forced to evacuate their homes at least once, and the average number of evacuations was 4.

Households were also reasonably large. Only one respondent did not have children and the average number of children per household was 3 (ranging from 0-5). Respondents also had an average of six extended family members living in the home, and this ranged from 3-9. The average total household size is therefore11, ranging from 7-16. If these data can be generalised to the wider community, this suggests that the intervention could be reaching 55,000 people just in this district.

Household income came predominantly from fishing, followed by tourism and retail. These three sectors accounted for 90% of household earnings (see Figure 2). Men were the primary earners in 90% of cases.
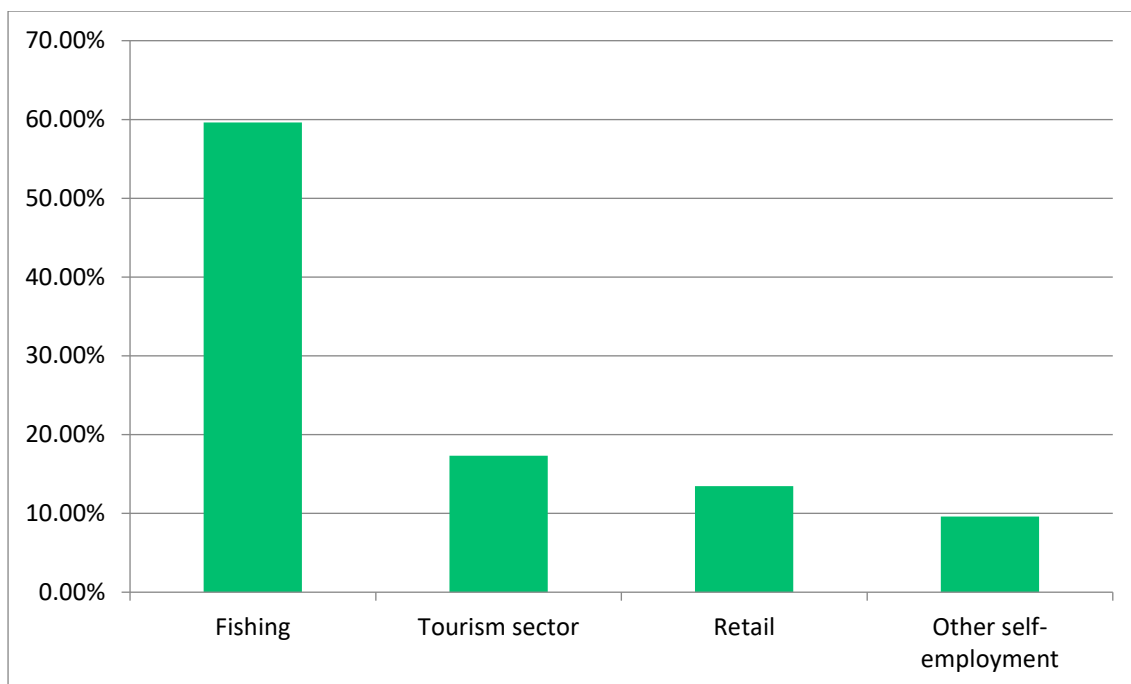
Figure 2: Sectors from which household income is derived

Economic circumstances

The average monthly income in the sample is ₹7,257 ($97 USD). This ranges from ₹3,500 ($46) to ₹11,700 ($156 USD).

Indebtedness is common amongst the residents of Pentha Kota. In our survey, only one respondent was not in debt. Of the other 103 respondents, all but 9 were struggling to make repayments on their loans (91%). Figure 3 provides some further information on the economic circumstances of households. Although virtually everyone has a bank account, only one respondent has household insurance. Most people keep valuables in their home, and a sizeable majority also have someone they could borrow from in a crisis (84%). Water facilities are generally shared within the community. Whilst 20% report that they use a shared toilet facility, the remaining 80% most likely practice open defecation. Staff told us that this was the case, even where there was access to shared toilet facilities. Only 12% of respondents were able to save regularly.
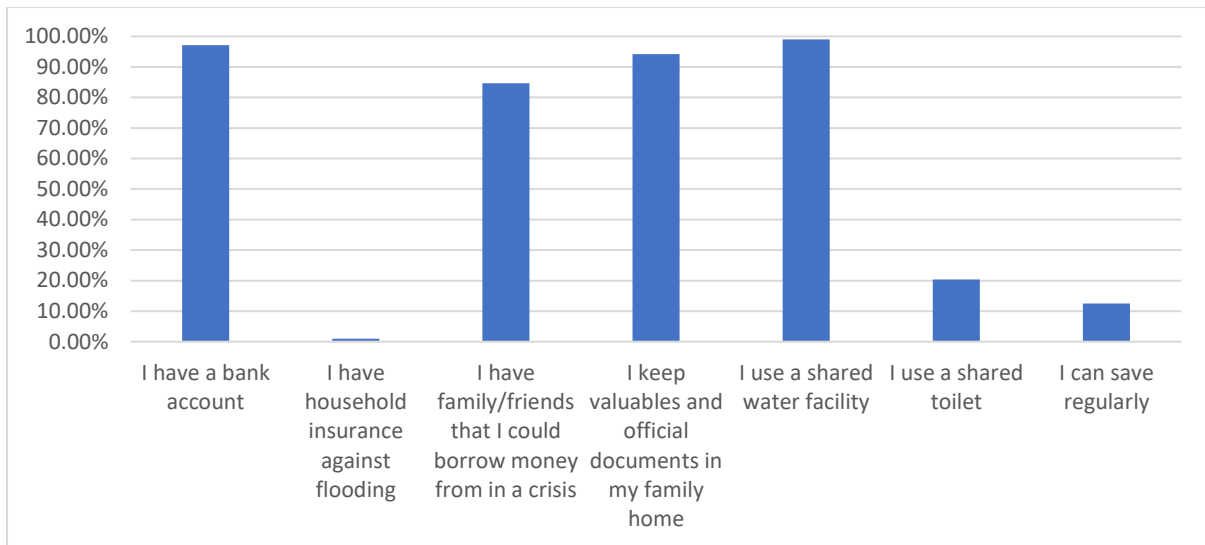
Figure 3: Economic circumstances of respondents

3.3 Prior experiences of flooding

Respondents were asked to reflect on their last experience of flooding and to agree or disagree about the impacts of that flood. All respondents told us that their house was destroyed or damaged and for over half it was waterlogged for a period of weeks or months (n=104). All respondents had assets such as furniture and personal effects destroyed, and almost half lost official documents.
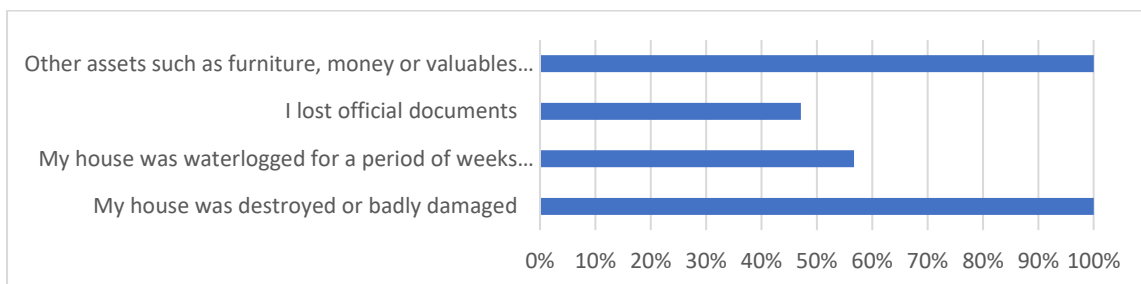

Figure 4: Experience of last flood

Respondents also described dramatic economic impacts. All respondents lost their jobs and 78% were out of work for an extended period. All respondents therefore experienced a loss of income, and almost all respondents took on more debt (96%).
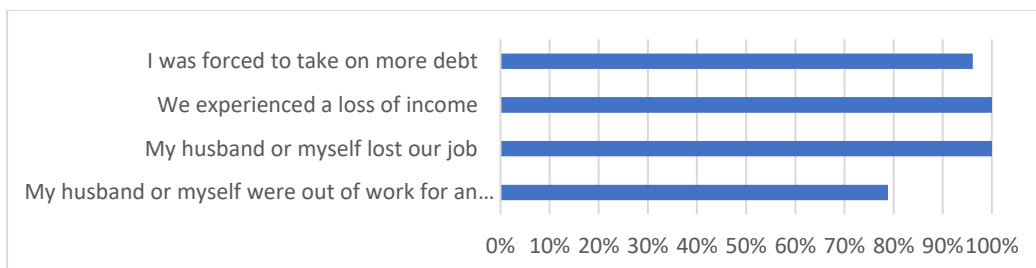
Figure 5: Economic impact of last flood

Socially, respondents told us that their own personal relationships were under more strain than usual (87%) (Figure 6). For all households with children, their children's schools were damaged or destroyed. All households either had their water supply interrupted or contaminated and, for over half, the toilet facilities were unusable (however, the previous point about open defecation also applies here). Staff told us that tensions sometimes arose within the community over water shortages, and 96% of survey respondents told us that they experienced community tension.
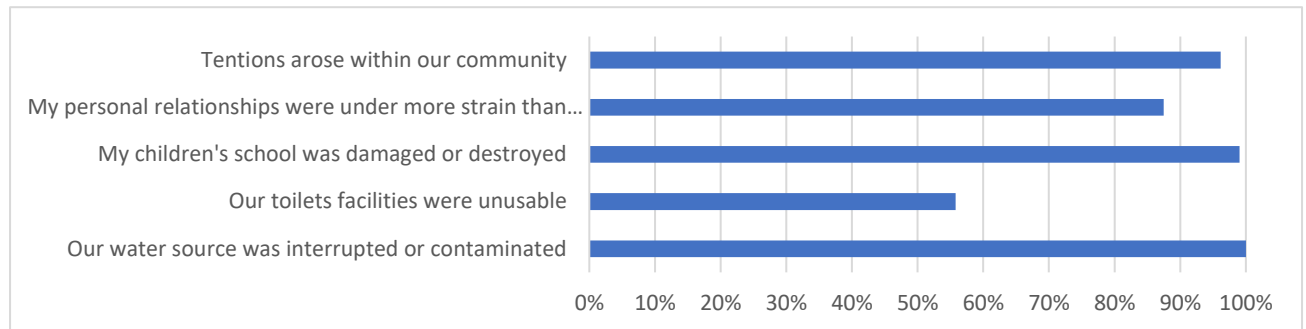
Figure 6: Community and social impacts of last flood

Respondents were also asked if they could estimate the value of the economic loss from assets, income, indebtedness and evacuation. For both assets and incomes, respondents were unwilling/unable to provide an estimate of the value of the loss but for indebtedness – perhaps a reasonable proxy value for the economic loss - the average value provided was ₹65,704 ($878 USD). To put this in context, this represents 75% of the average annual income in the community. This demonstrates how flooding can create a vicious cycle for residents who cannot save and invest in their homes, communities and livelihoods. There was generally no cost associated with evacuation.

On average, children lost on average of 3.34 months of school as a result of the previous flood (n=104). For some children, this break in schooling would be a regular occurrence with households experiencing up to 20 floods in their lifetime. Most households experienced sickness in the family following the previous flood. In total 179 people were sick, or 1.82 per household. If we scale this to the whole community, this would be over 9,000 individuals experiencing physical health impacts.

Parents were also asked to describe, in their own words, the main impacts the floods had on their children. The most frequently mentioned impacts related to mental health with 'fear/being scared/nightmares' mentioned 65 times and 'depression/trauma/mental/emotional health' mentioned 40 times. The second biggest impact was in relation to basic needs/hunger and poverty, which received 16 mentions. There were also mentions of education/health impacts (15 mentions) and harassment/abuse (9 mentions). The former may reflect anecdotal evidence from staff of children drifting into sexual exploitation due to poverty caused by flooding.

Mental health

In the previous discussion, parents identified mental health impacts as the most significant concern that they had for their children. The survey also sought to assess the mental health of the women themselves during the rainy season. Figure 7 shows the responses to self-reports on their own mental health and that of their children (n=104). As we can see, there are clear concerns with regard to mental health amongst the community, especially feelings of depression and anxiety amongst both mothers and their children. Women are also reporting common symptoms of depression such as pessimism, lack of energy, unsettled sleep and feeling like they cannot cope.
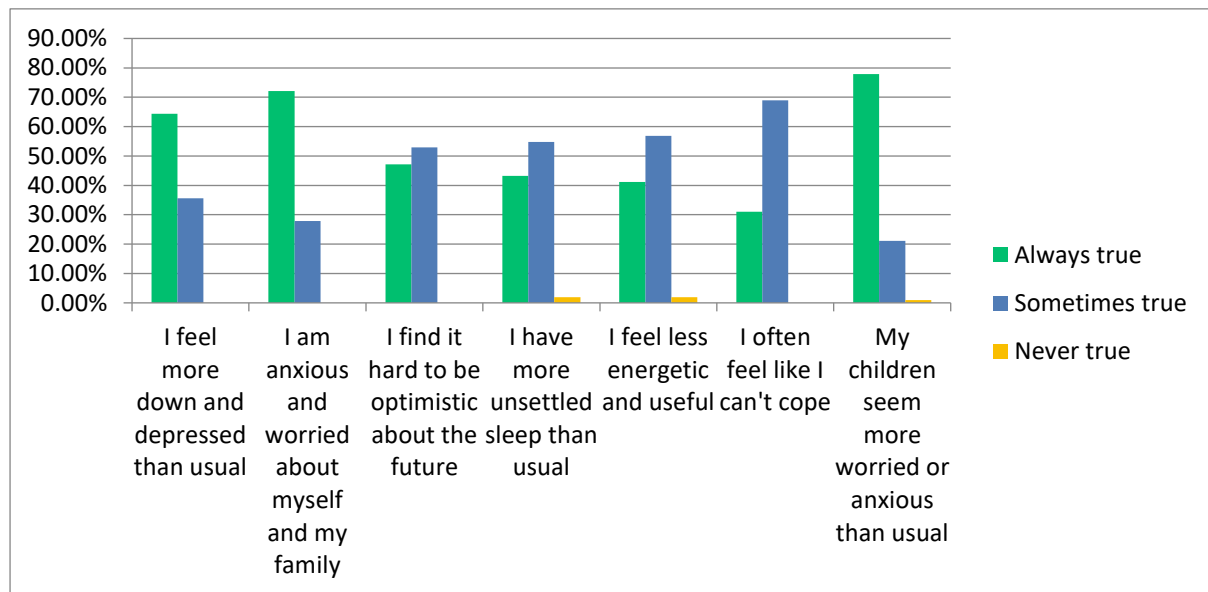

Figure 7: Self-reports from women on own/children's mental health

3.4 Baseline analysis

The previous section described the experiences of flooding in general, and the negative impacts that it has on the social and economic development of the community. This has established clear needs within the community that the software is well-placed to address. This survey also sought to establish a baseline of outcomes for the community. The purpose of this is to provide a snapshot of the circumstances of beneficiaries before the software is piloted. A second version of the survey will be developed to enable a follow-up to be carried out in the future so that changes in outcomes can be observed over time.

The set of questions asked respondents to reflect on their life at the moment and the extent to which they agreed or disagreed with different statements (see Figure 8). As we can see, all of the women are worried about their children's safety, health and education. Almost all struggle to get by financially and very few invest in their homes due to the insecurity they experience. Tensions in the community are also common. Only 20% describe their relationships as free from physical, emotional, sexual or financial exploitation and none of the respondents feel safe in their homes, or satisfied with their homes (n=101).
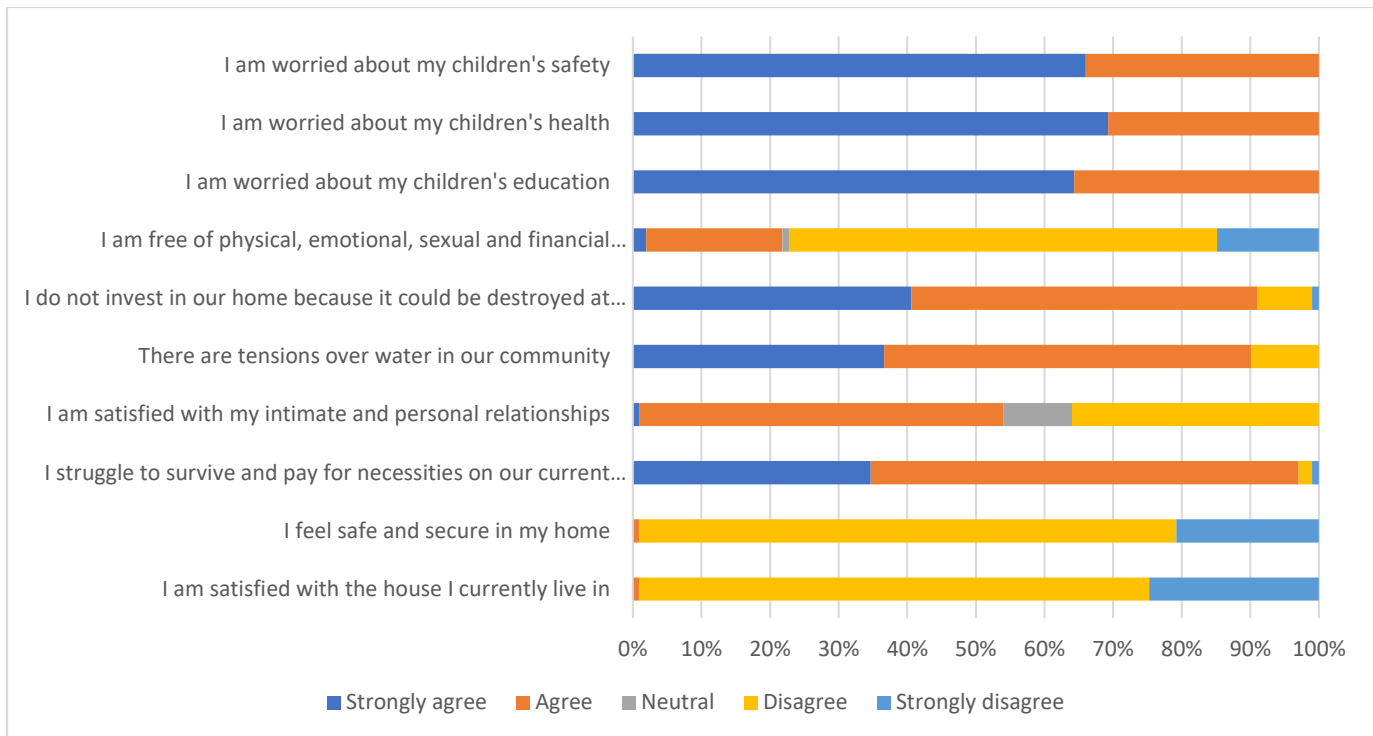
Figure 8: Proportion agreeing or strongly agreeing with statements regarding their life at the moment

Just over half of respondents describe their physical health as 'good' or better (Figure 9) (n=101), and over 90% have at least one person in work.
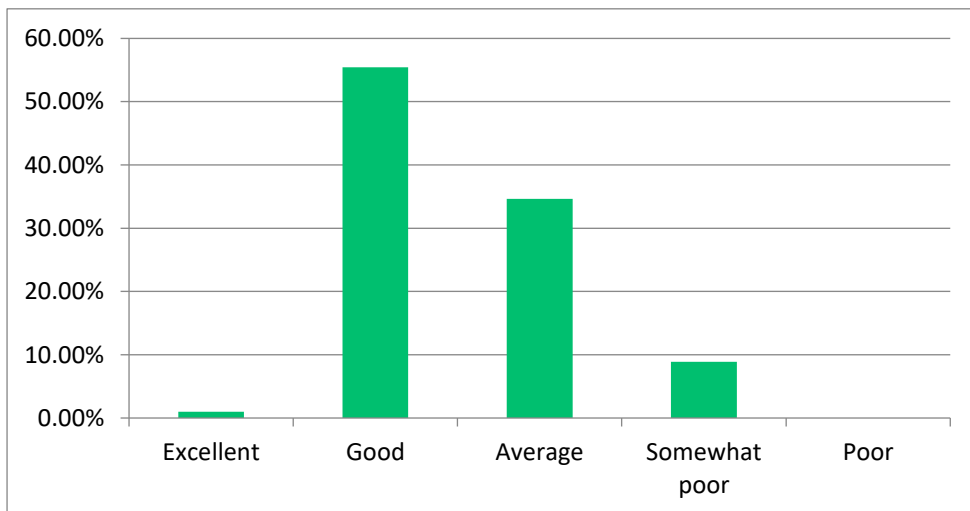

Figure 9: How would you rate your own physical health

Mental health was assessed using questions from the short Warwick-Edinburgh Mental Wellbeing Scale (Figure 10). The findings suggest clear mental health needs within the community (n=101). Only small percentages feel optimistic, relaxed, or useful 'often' and virtually none of the respondents feel like this 'all of the time'. 40% 'rarely or never' feel close to other people and similar proportions have not been thinking clearly or dealing with problems well. Only about half have been able to make up their minds about things some of the time or more often.
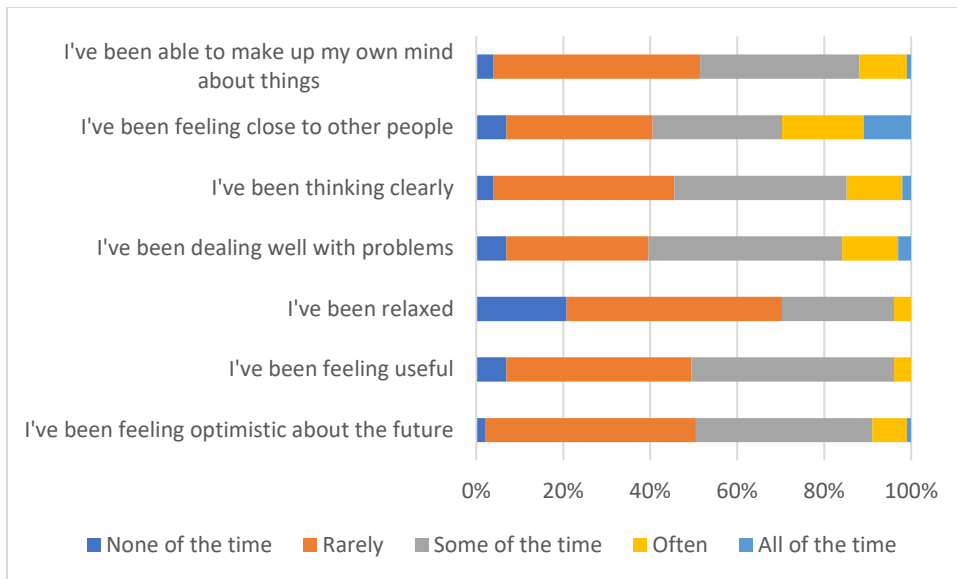
Figure 10: Responses to the Warwick Edinburgh Mental Well-being Scale

Respondents were asked two open-ended questions at the close of the survey about a) additional ways in which they think they would benefit from better flood protection and b) additional supports that would be required. There were three themes which emerged from this. Primarily people wanted a better house, and as this research shows there are a wide range of benefits that would flow from this. The second most common theme was that of safety. This relates to the house and its resistance to floods, but respondents also mentioned the area and a wider sense of safety. This may relate also to the fact that this is a largely migrant community that may be moved on in time in the future. Finally, respondents mentioned a lack of income, and this was especially emphasised in the areas they would like support with. As we have seen above, large households live on low incomes with high levels of indebtedness. They are also regularly having assets destroyed in floods. Respondents expressed demand for support with employment (including for themselves) and with self-employment.

Finally, respondents were asked to rate the support they received from SEEDS. There was a very high level of satisfaction with only one respondent rating the support as 'average' (n=101).
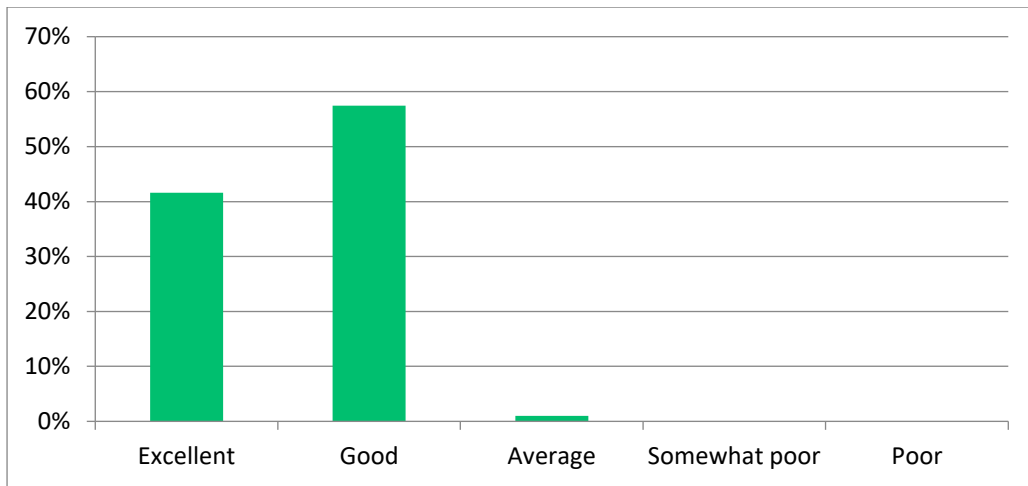
Figure 11: Perception of the work of SEEDS by respondents

4. Conclusion and recommendations

Although floods have significant economic impacts on affected communities, our study suggest that some of the profound impacts may in fact come from the mental health consequences. Key elements of good mental health include optimism, hope and the ability to relax, think clearly and plan (Stewart-Brown and Janmohamed, 2008), and these are strongly undermined by the impacts of floods. This finding is also supported in the literature and previous studies have found large negative impacts from recurrent flooding on mental health outcomes, including serious disorders like post-traumatic stress disorder (Wind et al, 2013; Fernandez et al. 2015; Ashok et al. 2019).

A second strong finding was parental concern over the impacts of flooding on children: their education, their safety and their mental health. The literature would also suggest that this is not misplaced, as research shows that disasters impact children strongly because of their particular stage of psychological and social development. Studies, including from India have found large negative physical and mental health impacts on children affected by recurrent floods (Vranda and Sekar, 2011; Hassan et al. 2018).

The Microsoft AI for Good project aims to increase the stability of the lives of affected communities by supporting SEEDS to provide a better-quality service within the community. Such interventions that can improve housing, incomes and livelihoods are urgently required and significant value will be created for the community if this can be demonstrated in the future.

4.1 Recommendations

Survey respondents did not provide any clear recommendations for SEEDS that can be used to inform their practice. However, there are several observations from the data that yield recommendations.

Recommendation 1: Consider provision of psychological support for parents and children

The Microsoft project is clearly focused on improving the quality of flood alerts to improve the way in which evacuations happen and the way that housing is being rebuilt. This should have positive psychological impacts on the community. However, in addition, there is evidence of significant mental health impacts on parents and children. There is a risk that these will develop into serious mental health disorders and conditions like PTSD may be elevated within the community. This is especially important for children due to their stage of development. The recommendation, therefore, is to provide trauma-informed psychological services in the community. These are secondary to the clear need for housing and material improvements but may be supportive of those improvements as they take place in the future. The findings from this survey could be used to support fundraising for these interventions.

Recommendation 2: Employment, skills and income supports for women in the communities

The most common area that women wanted support with (apart from housing provision) was income generation. This included employment support for themselves or their husbands. Income and skills development could also positively support their mental health and provide children with more opportunities. Our recommendation is to explore ways to provide this support, including ways in which the Digital Skills for Employability strand of Microsoft's work could be utilised. There may also be options for providing digital and employment skills to children as part of this workstream.

Recommendation 3: Implement follow-up data collection

To robustly assess the impact of the Microsoft AI for Good project, we recommend conducting a follow-up survey in 12 months. Repeating the same questions ensures answers can be compared with the baseline presented here. Future surveys could also be refined to identify more fine-grained recommendations. Findings from the technical evaluation of the pilot should be combined with these findings to support better project implementation over time.

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