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Building resilience to climate change

MGNREGS and cyclones in Andhra Pradesh

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Issue paper
November 2017

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Produced by IIED's Climate Change Group

Working in collaboration with partner organisations and individuals in developing countries, the Climate Change Group has been leading the field on adaptation to climate change issues.

Acknowledgements

The Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) is one of India's flagship social protection programmes. This paper is part of a series of briefings that analyse how MGNREGS builds the resilience of rural households to different climate shocks. The goal of this series is to identify options for Indian policymakers to integrate climate risk management into MGNREGS. These findings can also provide global policymakers with evidence on how to mainstream climate risk management into social protection programmes, or combine and layer social protection instruments with climate risk management instruments to address poverty in the context of climate change.

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Summary

Despite progress in reducing poverty across the globe, the rising challenge of climate change could reverse development gains, reinforce structural barriers to development and push people back into poverty. To create more lasting development solutions for the rural poor, policymakers need to address the multifaceted risks posed by social and economic exclusion and climate change.

Social protection and climate change instruments aim to support inclusive and climate-resilient development, respectively. The Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) is one of India's flagship social protection programmes and its beneficiaries are among the most climate-vulnerable people in India. But as well as helping poor households cope with poverty and marginalisation, such schemes can help poor and vulnerable households build resilience to the impacts of climate change (Agrawal *et al.* 2017).

This paper is one in a series of briefings that analyse how MGNREGS builds rural households' resilience to different climate shocks. In this paper, we examine how MGNREGS is helping households in Srikakulam District, Andhra Pradesh build resilience to cyclones.

The goal of the series is to identify options for Indian policymakers to integrate climate risk management into MGNREGS. More broadly, the series also aims to provide evidence for global policymakers on how to mainstream climate risk management into social protection programmes, or converge and layer social protection instruments with climate risk management instruments to address poverty in the context of climate change.

Analytical framework

Our analysis is based on a theory of change that identifies how MGNREGS interventions can lead to changes in five livelihood capitals which in turn can help build household resilience to climate change at three levels, enabling them to address complex risks and take advantage of new opportunities.

What are livelihood capitals?

Poverty is not just a lack of income. People rely on a combination of capitals to build sustainable livelihoods:

- **Natural capital**: value in natural resources to produce goods and services

- **Physical capital**: value from infrastructure that contributes to the production process

- **Human capital**: value from skills training, good health, knowledge and motivation

- **Social capital**: value from social networks and institutions that help people improve their social status, maintain and develop human capital, and

- **Financial capital**: value from income sources, assets and consumption patterns.

What are resilience outcomes?

Resilience outcomes are the changes in a households' ability to respond to climate hazards as a result of changes in the livelihood capitals described above. Our analysis is based on three types of resilience:

- **Absorptive** resilience: a system's ability to maintain its original structure by absorbing infrequent and low-magnitude risks

- **Adaptive** resilience: a system's ability to improve its original structure to manage future risks and bounce back better when shocks occur, and

- **Transformative** resilience: a system's ability to fundamentally change its structure to move beyond vulnerability thresholds.

Main findings

Pathways to household resilience

MGNREGS can improve the capacity of households in Srikakulam to absorb, adapt or transform in the face of increasing climate risk. Our analysis and policy recommendations are based on a triangulation of evidence from: a review of global and national literature on social protection and climate resilience; secondary data on MGNREGS and climate trends; and primary data from focus group discussions, key person interviews and a survey of 150 households in three communities.

Role of MGNREGS instruments

A combination of MGNREGS instruments was important in helping households build absorptive or adaptive resilience. Respondents indicated that infrastructure and guaranteed wages were predominantly responsible for supporting changes in livelihood capitals that led to absorptive resilience. The income from wages and increased farm productivity helped households maintain their levels of wellbeing despite the hazard of cyclones, while climate-resilient infrastructure helped boost the absorptive function of ecosystems to provide a buffer against the impact of cyclones. In some cases, MGNREGS infrastructure and wages improved households' wellbeing beyond a threshold, enabling them to build adaptive resilience.

But many households in our survey did not benefit from investment in MGNREGS productive assets. Landless households predominantly benefited from guaranteed wages, which were sufficient to help them absorb the impact of cyclones but not build adaptive resilience.

Livelihood capital contribution to resilience outcomes

We found that a **combination of livelihood capitals** was important in delivering absorptive and adaptive resilience. MGNREGS' investment in physical capital (infrastructure to improve agricultural production) has increased the availability of natural capital – such as agricultural land and water – for households. This, in turn, has helped boost their financial capital, improving their income through increased productivity. The guaranteed MGNREGS wages for building these assets has also helped increase households' financial capital, which they have spent on food, clothing, education and health services, leading to improvements in human capital.

Overall improvements in financial capital have helped the majority of our surveyed households maintain their wellbeing in the face of cyclones, building absorptive resilience. A smaller number of households have improved their consumption, income, assets and/or capabilities despite the impact of cyclones, building adaptive resilience. But in some cases, households have not gained enough financial capital from guaranteed wages and MGNREGS infrastructure investment and have experienced a decline in resilience.

Resilience outcomes

Our study found that MGNREGS has significantly contributed to the ability of Srikakulam's households to manage cyclone risk.

Absorptive resilience: Sixty five per cent of our respondents have built absorptive resilience as a result of MGNREGS, with medium and low-wellbeing households significantly more likely to have done so than high-wellbeing households. Infrastructure and guaranteed wages are the most important MGNREGS instruments responsible for households achieving absorptive resilience. For some households, the combination of income from wages and increased farm productivity (as a result of MGNREGS investment in productive assets) helped them maintain wellbeing despite the hazard of cyclones. In other cases, households only benefited from guaranteed wages, which were enough to help them absorb the impact of cyclones. Climate-resilient infrastructure also helps boost the absorptive function of ecosystems to provide a buffer against the impact of cyclones.

Adaptive resilience: Seven per cent of our survey respondents have built adaptive resilience. For this small number of households, a combination of MGNREGS infrastructure investment and guaranteed wages was important in improving multiple capitals, which in turn improved household wellbeing despite the impacts of cyclones.

Transformative resilience: MGNREGS is not helping households in Srikakulam transform their livelihoods to activities that are not exposed to climate hazards.

Decline in resilience: Ten per cent of respondents have experienced a decline in resilience. Our data suggest that MGNREGS is not delivering enough benefits – in paid working days or investment in productive assets – for certain households to build resilience in the face of high-intensity climate shocks.

Local economy

The impact of MGNREGS extends beyond the household into the local economy through improved wages, skills, jobs and public infrastructure. These gains reflect the fact that financial, physical, human and social capitals have all increased in Srikakulam as a result of MGNREGS. But we also found that the majority of surveyed households have not experienced a change in the local economy, suggesting room for significant improvement if MGNREGS is to link household-level resilience to gains in the wider community.

Ecosystem services

Our survey respondents also said that MGNREGS has led to improvements in ecosystems services in Srikakulam, including increased agricultural productivity, crop diversity, irrigation infrastructure and agricultural land. These findings highlight the fact that MGNREGS has led to important improvements in natural capital, which has helped households maintain or improve their wellbeing, despite the increasing risk from cyclones. But, as with the local economy, more than half of the MGNREGS beneficiaries we surveyed have not experienced improved ecosystems services, despite MGNREGS efforts to improve agricultural productivity in Srikakulam. Further efforts are needed to improve the delivery of ecosystems services and increase their capacity to absorb the impacts of cyclones.

POLICY RECOMMENDATIONS

1. **Delivering a combination of MGNREGS interventions** will build and sustain the resilience of households over time. Further efforts are needed to extend the benefits of MGNREGS productive infrastructure to a wider number of households in Srikakulam.

2. **Integrating climate risk management into MGNREGS** through climate-resilient wages, infrastructure, institutions and skills will climate-proof MGNREGS and ensure the scheme can help households build absorptive, adaptive and transformative resilience. In particular, policymakers should focus on delivering MGNREGS infrastructure that boosts the absorptive function of ecosystems and contributes to improved agricultural productivity and helping beneficiaries transform their livelihoods to activities that are less exposed and sensitive to cyclone impacts.

3. **Converging MGNREGS with other initiatives and programmes that support climate risk management** can help programme implementers spread the financial and delivery costs of resilience activities and build more resilient households and communities. In particular, MGNREGS could promote convergence with initiatives that help build the absorptive function of ecosystems, increase the productivity of agricultural livelihoods and support households to transform into new livelihoods through skills training or investment in new types of infrastructure. In areas that are highly exposed to cyclones, MGNREGS should also sanction building material-intensive assets that increase community resilience, such as cyclone shelters and flood protection infrastructure, with additional material budget covered through convergence with other schemes.

4. **Ensuring that MGNREGS interventions at household level promote spillover benefits to the local economy and improved ecosystems services** will help create more resilient communities.

Introduction

1

The Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) is one of India's flagship social protection programmes. Under the scheme, all rural households are entitled to 100 days' guaranteed wage employment as unskilled labourers building different types of rural infrastructure. More than a decade has passed since MGNREGS was launched. Since its inception, the scheme's objectives have expanded to include improving the durability and sustainability of rural infrastructure, strengthening rural institutions and skilling the rural labour force.

During this same period, climate change has risen up the global development agenda as the evidence base has made it increasingly clear that the rural poor in developing countries will be most adversely affected by climate change (IPCC 2014; Sen 1999). Although there have been significant achievements in reducing poverty across the globe, the increased frequency and intensity of extreme weather events and long-term changes in weather patterns associated with climate change will exacerbate the shocks already faced by poor households in developing countries and reinforce the underlying drivers of poverty (IPCC 2014; Reddy *et al.* 2014; Hallegatte et al. 2016). When exposed to increasingly frequent and high-magnitude risks, social, economic and ecological systems will therefore need to absorb, adapt and transform to successfully deal with change.

Social protection programmes like MGNREGS are already helping households and communities cope with poverty and marginalisation. But they can also help households absorb the effects of climate risks, adapt to climate impacts and transform their ability to address escalating and future climate stresses (Agrawal *et al.* 2017). With high rates of poverty and livelihoods that are based predominantly on changing natural systems, MGNREGS beneficiaries are among the most climate-vulnerable people in India. But to date, there has been no systematic attempt to understand the scheme's

contribution to building of rural Indian households to address climate change risks and impacts.

This paper is part of a series of research briefings that, along with a meta-analysis of social protection and climate resilience in India, aim to fill this evidence gap. The goals of the series are to analyse how MGNREGS builds the resilience of vulnerable women and men to different climate shocks and identify options for Indian policymakers to integrate climate risk management into MGNREGS. More broadly, these briefings also aim to document options for a global policymaking audience on how to mainstream climate risk management into the provision of social protection, or combine and layer social protection instruments with climate risk management instruments to address poverty in the context of increasing climate risk.

The papers draw on field research into MGNREGS and specific climate-related shocks in different states: cyclones in Andhra Pradesh, drought in Jharkhand, flooding and drought in Odisha and winter drought in Sikkim. This paper documents how MGNREGS is helping households in Srikakulam – a coastal district in Andhra Pradesh – build resilience to cyclones.

Using an analytical framework, we collected data to understand which resilience pathways were responsible for delivering specific resilience outcomes in a particular context in each state. In this paper, all the evidence we present is relevant to cyclones in Srikakulam only. We used a mixed methodology approach, triangulating primary evidence from: primary data collection in the form of focus group discussions, key person interviews with MGNREGS officials and beneficiaries and a household survey of 150 beneficiary families; secondary data analysis of MGNREGS and climate data; and a review of global and national literature on MGNREGS, social protection and climate resilience. For a more detailed overview of our methodology, see Kaur *et al.* (2017a).

Analytical framework

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This paper focuses on how four MGNREGS interventions – guaranteed wages, rural infrastructure, institutional strengthening and skills development – enable households to change their livelihood capitals to absorb, adapt and transform to address climate-induced hazards and opportunities.

2.1 Theory of change model

To understand MGNREGS contribution to resilience, we used a theory of change model to identify the multiple pathways associated with absorptive, adaptive and transformative resilience. Figure 1 presents an overview of the analytical framework we used to assess how MGNREGS builds resilience to climate change. Our theory of change is based on the 'context, mechanism and outcome' framework, derived from realist evaluation methods (Pawson and Tilley 2004), which we discuss below.

2.1.1 Context

'Context' refers to the contextual factors that shape responses to MGNREGS interventions. In this framework, the key contextual factors are a household's exposure and sensitivity to slow and rapid-onset hazards: winter droughts in Sikkim, Jharkhand and Odisha; floods in Odisha and cyclones in Andhra Pradesh. In this study, we focus on the exposure and sensitivity of households in Srikakulam District, Andhra Pradesh to cyclones.

2.1.2 Mechanism

'Mechanism' refers to the **four MGNREGS programme instruments** discussed below that enable households to change their **five livelihood capitals** to absorb, adapt and transform to address climate-induced hazards and opportunities. These are delivered through MGNREGS alone or in convergence with other government schemes and programmes.

100 days' guaranteed wages: MGNREGS guarantees the provision of up to 100 days' work in rural areas to every household whose adult members volunteer to do unskilled work. In drought-hit states, households can demand 150 days of work. Job card holders can demand wage labour when other sources of income are undermined by climate hazards, making it an implicitly climate-responsive instrument. Households often use income from MGNREGS wages to supplement other sources of income and smooth consumption gaps.

Figure 1: Analytical framework on how MGNREGS contributes to resilience

PATHWAY TO RESILIENCE: USING SOCIAL PROTECTION TO DEAL WITH CLIMATE VULNERABILITY
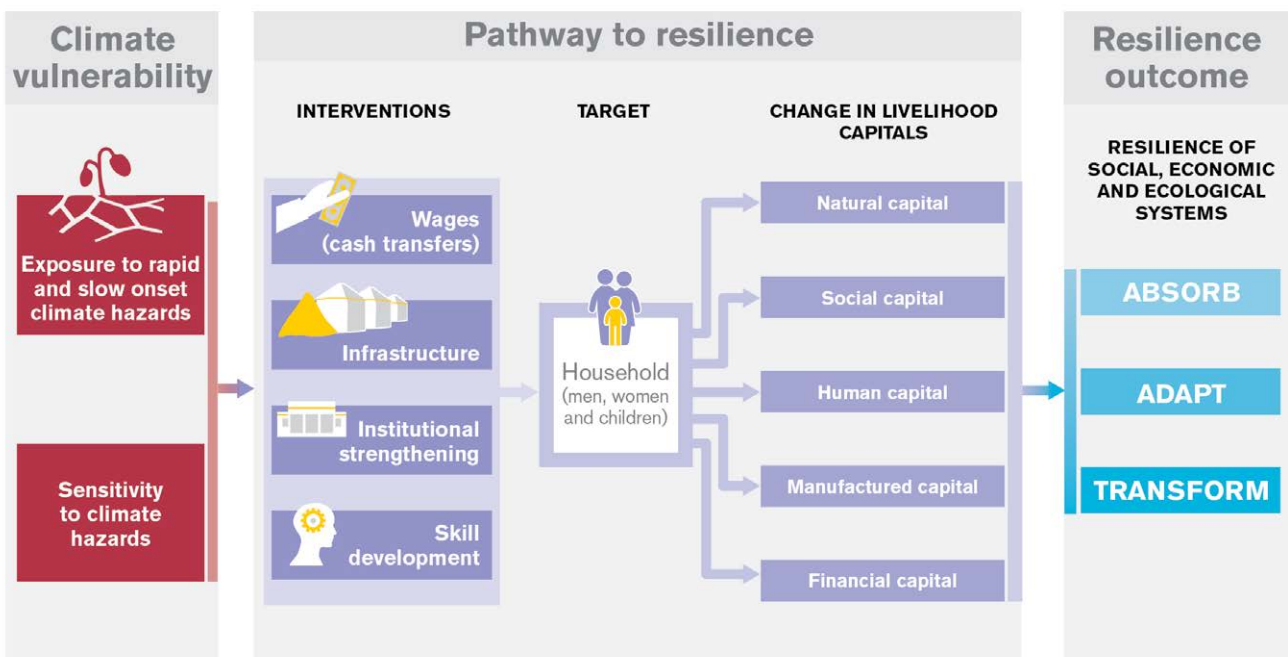
Creation of individual or public assets: MGNREGS builds public and private rural infrastructure to support long-term livelihood strategies and strengthen the local economy (GoI 2017). This includes infrastructure for:

- Natural resource management: building new flood control structures, planting trees to rehabilitate canal or stream banks and degraded common lands and check-dams to reduce floods and improve water retention

- Agriculture-based livelihoods: irrigation channels, livestock shelters and water and grain storage structures, and

- Non-agriculture-based livelihood activities: sanitation facilities, roads, footpaths and buildings for community use.

Institutional strengthening: MGNREGS strengthens rural institutions to empower rural households and improve programme delivery by:

- Enabling rural households to participate in local governance bodies – such as the village-level *gram sabah* – particularly to make decisions around the allocation of MGNREGS labour and selection of MGNREGS infrastructure

- Improving rural access to formal banking by linking MGNREGS job card holders to banks and digitising all payments

- Strengthening community institutions such as producer groups build collective action, and

- Creating market linkages by converging with other programmes.

Skills upgrading: MGNREGS aims to contribute to the transformation of the rural labour market by providing training for unskilled wage labourers, self-employment and upgrading livelihoods. This is a new component under MGNREGS and is being implemented under the Project for Livelihoods in Full Employment (Project LIFE).

In our study, we assessed whether the four MGNREGS instruments enabled households to positively change their **livelihood capitals** to absorb, adapt or transform to address the impacts of climate change. We focus on how changes in five livelihood capitals – natural, physical, human, social and financial (see Box 1 below) – serve to link a household's wellbeing with their climate response strategies (Porritt 2007).

BOX 1. WHAT ARE LIVELIHOOD CAPITALS?

Poverty is not just a lack of income. People rely on a combination of capital assets to build sustainable livelihoods, particularly:

- **Natural capital**: value that resides in natural resources to produce goods and services

- **Physical capital**: value derived from durable and non-durable infrastructure, which contributes to the production process

- **Human capital**: value derived from skills training, consisting of people's health, skills, knowledge and motivation

- **Social capital**: value derived from social networks and institutions that improve people's social status and help them maintain and develop human capital in partnership with others, and

- **Financial capital**: value derived from income sources, assets and consumption patterns, which enables households to own or trade other capitals.

2.1.3 Resilience outcomes

'Resilience outcome' refers to the ability of social, economic and ecological systems to successfully deal with change by absorbing, adapting and transforming to address complex risks and new opportunities.

Resilience outcome refers to changes in households' ability to respond to climate hazards as a result of changes in the five capitals. Three aspects of resilience outcomes are central to our analysis:

- **Absorptive resilience**: the ability of social, economic and ecological systems to maintain their original structure by absorbing infrequent and low-magnitude risks.

- **Adaptive resilience**: the ability of social, economic and ecological systems to improve their original structure to manage future risks and bounce back better when shocks occur, and

- **Transformative resilience**: the ability of social, economic and ecological systems to fundamentally change their structure to move beyond vulnerability thresholds.

Climate vulnerability in Andhra Pradesh

3

3.1 Exposure to climate-induced hazards

Andhra Pradesh is a coastal state in southeastern India. It is one of the most exposed states in India to cyclones (Rama Rao *et al.* 2013). Its proximity to the Bay of Bengal and its low-lying topography are compounded by high population density, poorly maintained flood protection and drainage systems and a lack of coastal zone management planning, making coastal Andhra Pradesh highly vulnerable to the impacts of cyclones. According to the State Action Plan on Climate Change, an estimated 2.9 million people living in the state's nine coastal districts are vulnerable to cyclones (EPTRI 2012).

Fieldwork for our study on MGNREGS and resilience in Andhra Pradesh took place in Srikakulam District, the northernmost district in the state. Srikakulam has 193 km of coastline, with 237 villages exposed to cyclones across 11 *mandals* (sub-districts). Over the past 30 years, the district has suffered from 17 cyclones, including Cyclones Nilam (2012), Phailin (2013) and Hud Hud (2014), which caused serious economic damage and loss of life. Cyclone Hud Hud alone is estimated to have caused 15 billion rupees (US$228 million) in damage, affecting 132,000 people, including 68,575 who were evacuated in Srikakulam (GOI and UNDP 2015; GOI 2014).[1]

3.2 Sensitivity to climate hazards

Households in Srikakulam are highly sensitive to climate impacts, with the majority of people relying on natural systems (agriculture, fisheries and forestry) as their main economic activity. Sensitivity to climate change is the degree to which a community, ecosystem or economy is affected by climate hazards.[2] Climate sensitivity can be shaped by underlying conditions such as: household income, assets or capabilities; the strength of governance and institutions; economic conditions; or issues of social inclusion based on, for example, gender, caste, religion or ethnicity. All these factors can enable or constrain responses to climate hazards.

To understand how sensitive households are to climate exposure, we conducted a household survey among MGNREGS job card holders in our three sample

gram panchayats (a village-level governance body) in Srikakulam in February 2017 (see Annex 1 for an overview of the three *gram panchayats)*.

We collected data on:

- Household income

- Consumption

- Asset ownership

- Capabilities, including the ability to make informed decisions (based on education and technical knowledge) and the ability to participate effectively in local decision making.

Box 2 shows our main observations from the data we collected from survey respondent households in Andhra Pradesh.

BOX 2. HOUSEHOLD WELLBEING IN SRIKAKULAM DISTRICT, ANDHRA PRADESH

- 99 per cent have a per capita daily income below the official poverty line

- 89 per cent are active job card holders

- 11 per cent have family members who migrate seasonally for work

- 18 per cent did not have enough food to eat for a period of time during the previous year (70 per cent of these for 15 to 30 days)

- 69 per cent are landless

- 5 per cent have formal schooling

- 67 per cent report high or medium participation in local governance bodies, such as the village-level *gram sabah* meetings and so influence decisions around MGNREGS resource allocation and delivery, and

- 98 per cent have technical knowledge – for example, they know how to select and maintain MGNREGS infrastructure, operate a bank account and agricultural production techniques.

Source: Household survey, Srikakulam (February 2017)

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[1] Private communication with district officials.

[2] CARE, Community-based adaptation toolkit www.careclimatechange.org/tk/cba/en/cba_basics/key_concepts.html

Figure 2: Household wellbeing categories in Srikakulam

Source: Household survey, Srikakulam (February 2017)
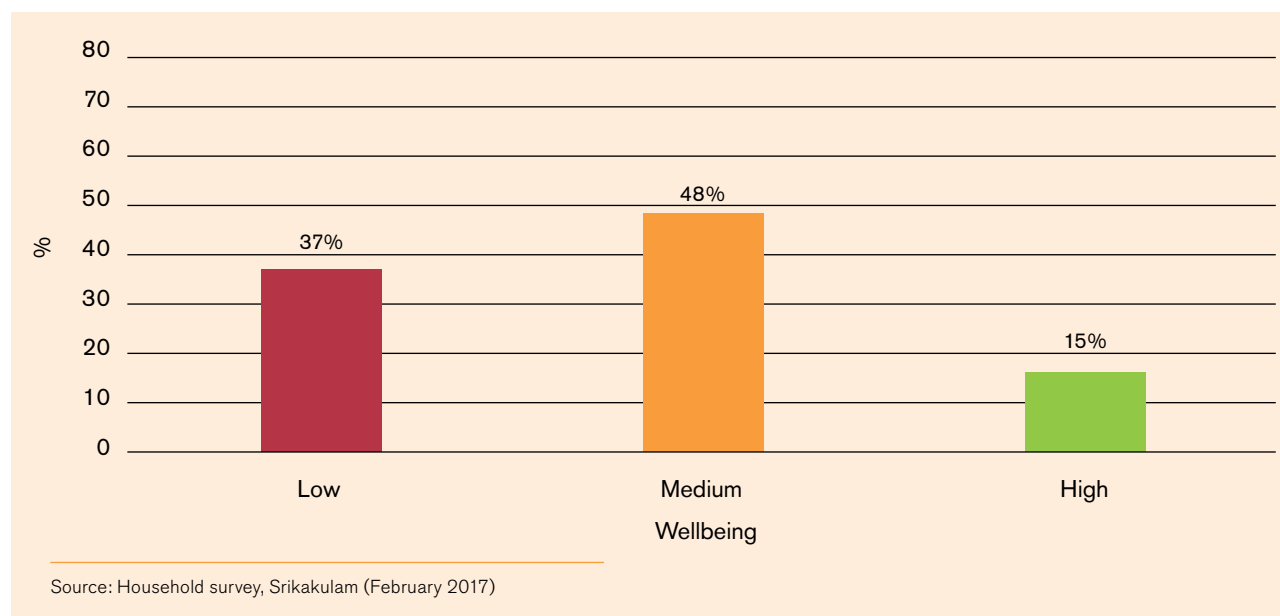
Based on the survey responses, we constructed a composite household wellbeing index that classified sampled households into low, medium and high wellbeing categories (see Kaur *et al.* 2017a for more details on this process). We found that 37 per of sampled households cent had low levels of wellbeing, 48 per cent were in the medium wellbeing category and 15 per cent had high wellbeing. Since participation in MGNREGS is self-targeting for those who need income support at some period of the year, all households within this sample are likely to have lower incomes, assets, education, skills and capabilities than the general population. So, with most households below the poverty line, our aim was to differentiate our findings (where possible) on MGNREGS contribution to resilience by household wellbeing category.

3.3 Climate change impacts

Our household survey also aimed to understand how climate change has impacted various elements of households' wellbeing (including income, assets, education, skills, capabilities and decision-making power), public infrastructure in their community and ecosystem services.

Despite having experienced three cyclones since 2012, 92 per cent of households in our three study sites reported no change to their wellbeing as a result of cyclones in the last climate impact year (Cyclone Hud Hud in 2014) (see Figure 3). Only a small number of respondent households – nearly five per cent – said they had experienced a decline in wellbeing as a result of cyclones. There was no significant difference in the answers of respondents according to sex or level of household wellbeing.

Our survey respondents indicated that cyclones have damaged public infrastructure in our three study areas. As Figure 4 outlines, nearly 40 per cent of households reported damage to road infrastructure during cyclone Hud Hud in 2014 and 15 per cent reported damage to schools. Quantitative estimates of economic damage caused by Hud Hud are not available below district level, but interviews during our field visits indicated that Cyclone Hud Hud caused damage to – or loss of – fishing equipment (boats and nets); inundation of fields that led to crop damage and flooding; and wind damage to village buildings.

Respondents in all three study areas also indicated that cyclones have damaged ecosystems services. The majority of respondent households rely on these natural systems to support their livelihoods. Nearly 44 per cent reported a decline in forestry products as a result of Cyclone Hud Hud in 2014; 20 per cent reported a decline in water availability and a similar number reported lower fishery outputs. Eleven per cent also reported damage to agricultural land (see Figure 5).

Figure 3: Impact of Cyclone Hud Hud (2014) on household wellbeing in Srikakulam

Source: Household survey, Srikakulam (February 2017)
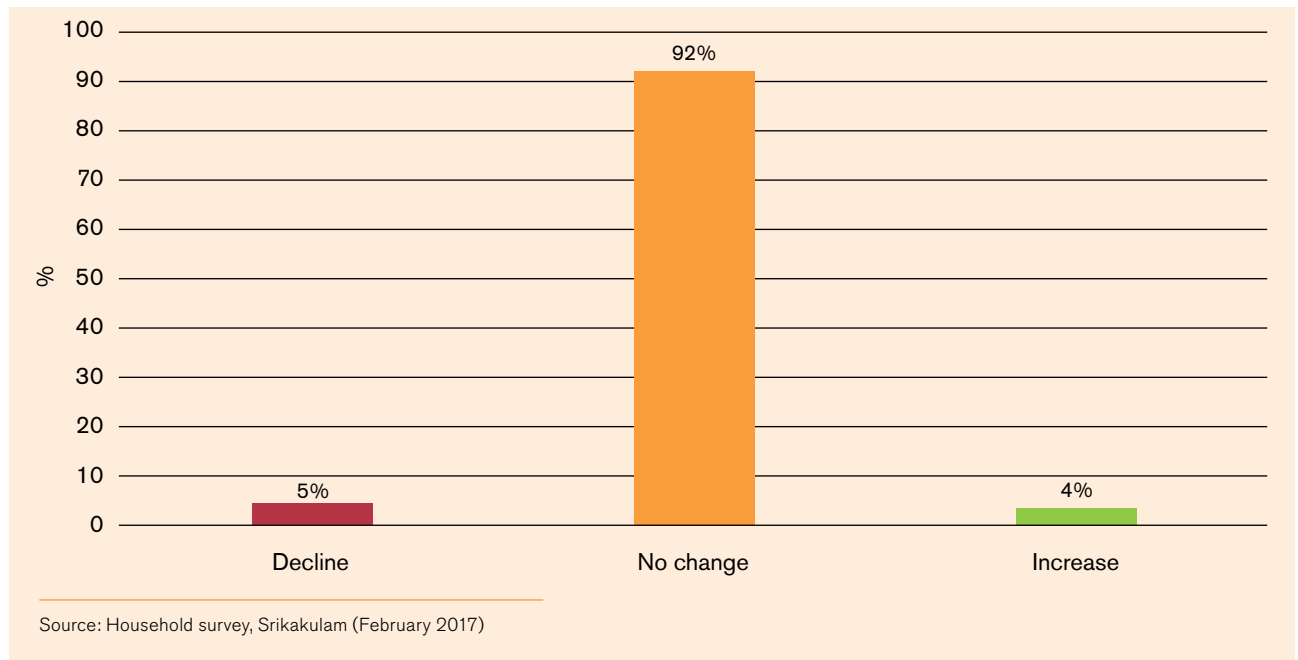
Figure 4: Impact of Cyclone Hud Hud on community infrastructure in Srikakulam in 2014

Source: Household survey, Srikakulam (February 2017)
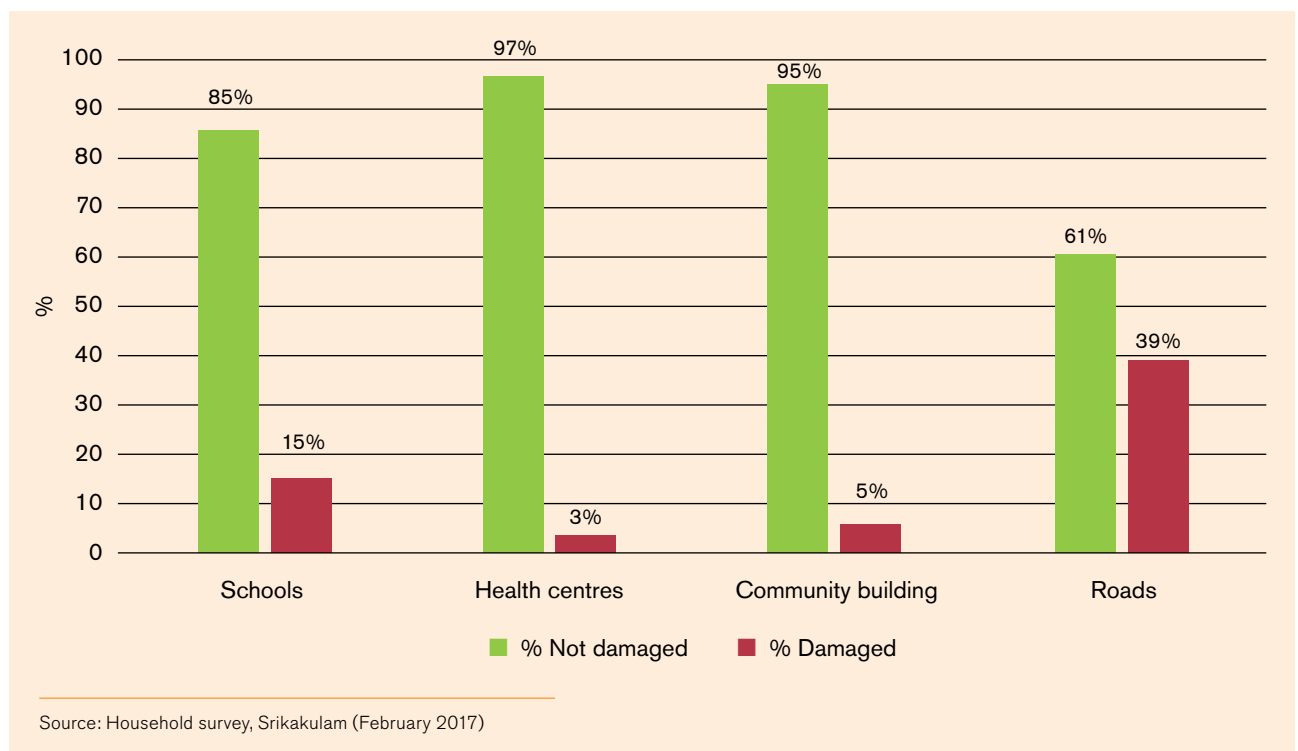
Figure 5: Impact of Cyclone Hud Hud on ecosystems services in 2014

Source: Household survey, Srikakulam (February 2017)
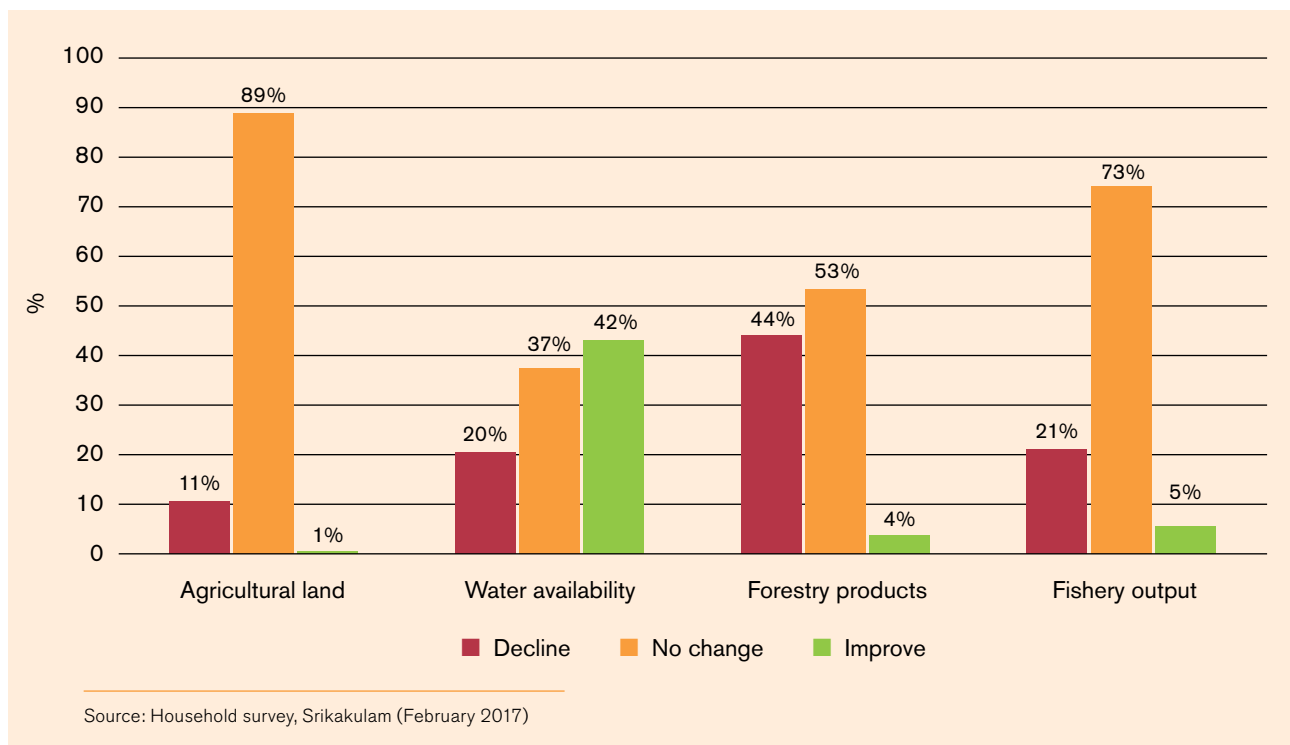
MGNREGS role in building resilience to cyclones in Andhra Pradesh

4

The frequency and magnitude of cyclones in Andhra Pradesh has been increasing over the past decade, with three powerful cyclones hitting the state in 2012, 2013 and 2014. The state's exposure to cyclones is compounded by the sensitivity of its inhabitants – many of whom lack the ability to effectively manage cyclone risk. As a result, cyclones are likely to negatively impact household income, consumption, assets and capabilities and the ecosystem services they rely on, as they increase in frequency and magnitude in the years ahead.

MGNREGS can help households reduce their sensitivity to climate hazards like cyclones by helping them to improve their resilience. In this section, we outline our main findings on how the scheme helps build the resilience of households, the local economy and ecosystems to cyclones in Srikakulam District.

4.1 Background

Andhra Pradesh began implementing MGNREGS in 2006/07, and is now considered one of the scheme's high-performing states (Farooquee 2013). Over the past five years, the number of people working on MGNREGS in Andhra Pradesh has slowly increased, reaching 6.52 million people in 2016/17. During this time, there was a downward trend on the average number of

days employed per household, from 59 in 2012/13 to 52 in 2016/17. Female participation rates have been consistently high, at 58 per cent.

Meanwhile, there has been a notable increase in the number of assets created under MGNREGS in the past five years. Government data shows a five-fold increase in the creation of public works related to natural resource management and agriculture production during this time, with a particular focus on water conservation, renovation of traditional water bodies and watershed management. There has also been a shift towards creating individual assets under MGNREGS, which have increased from 16,602 in 2012/13 to 219,529 in 2016/17. The bulk of these are land productivity improvements, horticulture and sericulture plantations and developing fallow lands.[3]

Fieldwork for our MGNREGS and resilience to cyclones study took place in Srikakulam District, Andhra Pradesh. Our research draws on interviews and household surveys conducted in three sites:

• Rushikudda *gram panchayat* in Sompeta *mandal,* where MGNREGS labour has been used to deepen and widen a local river and drainage channel – the Beelabatti Channel. It is now used to increase the flow of water from cyclones and storms back to the ocean so agricultural land and houses are not flooded.

Table 1: MGNREGS implementation in Andhra Pradesh 2012–2017

	2012/13	2013/14	2014/15	2015/16	2016/17
Total expenditure (rupees, billions)	31.38	48.32	28.39	46.36	45.47
Total expenditure (US$, millions*)	565	790	469	723	680
Total households worked (millions)	3.32	3.48	3.30	3.61	3.96
Total individuals worked (millions)	5.92	6.07	5.56	6.06	6.52
Average wage rate per day/person (rupees)	106	111	116	130	145
Average wage rate per day/person (US$*)	1.9	1.8	1.9	2	2.2
Average days employed per household	59.11	52.99	47.25	55.23	51.91
Total number of households completed 100 days of wage employment (millions)	0.69	0.60	0.39	0.65	0.65
Women person days (%)	57.44	58.08	58.65	57.79	58.12
Scheduled caste person days (%)	23.19	22.94	22.77	22.58	22.32
Scheduled tribe person days (%)	11.82	10.82	11.92	12.33	11.19

* Converted to US$ using rate of 1 August of the earlier year in each column

Source: MGNREGA. See http://mnregaweb4.nic.in/netnrega/all_lvl_details_dashboard_new.aspx

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[3] MGNREGA MIS database. See http://mnregaweb4.nic.in/netnrega/all_lvl_details_dashboard_new.aspx

- Isakalapelem *gram panchayat* in Sompeta *mandal,* which neighbours Rushikudda. Few households here have access to agricultural land; most rely on fishing and MGNREGS for their livelihoods. MGNREGS workers tend to work outside of the *gram panchayat*, since the sandy soil in the village means few MGNREGS assets can be built there. So workers in Isakalapelem are more likely to benefit from wage labour than from infrastructure.

- Kammasigadam *gram panchayat* in Ranasthalam *mandal*, where 27 scheduled caste, scheduled tribe and landless households have received individual coconut plantations of 100 trees to help improve their livelihoods.

4.2 Contribution to household resilience

MGNREGS can improve the capacity of households to absorb, adapt or transform in the face of increasing climate risk. This section brings together our analysis from interviews, focus group discussions and our household survey to outline how MGNREGS delivers different pathways to resilience at the household level. We present these findings below in the format outlined in our theory of change – focusing on the role of MGNREGS instruments in delivering resilience outcomes, the role of livelihood capitals in delivering resilience outcomes and finally on the high-level findings of how MGNREGS contributes to specific resilience outcomes in Srikakulam.

4.2.1 Role of MGNREGS instruments

A combination of MGNREGS instruments was important in helping households build absorptive or adaptive resilience. Respondents indicated that infrastructure and guaranteed wages were predominantly responsible for supporting changes in livelihood capitals that led to absorptive resilience. The income from wages and increased farm productivity helped households maintain their levels of wellbeing despite the hazard of cyclones, while climate-resilient infrastructure helped boost the absorptive function of ecosystems to help buffer against the impact of cyclones. In some cases, MGNREGS infrastructure and wages improved households' wellbeing beyond a threshold, enabling households to build adaptive resilience.

However, many households in our survey did not benefit from investment in MGNREGS productive assets (either public or private assets). Landless households predominantly benefited from guaranteed wages, which were enough to help them absorb the impact of cyclones but not build adaptive resilience.

4.2.2 Livelihood capital contribution to resilience outcomes

In Srikakulam, multiple MGNREGS instruments have improved a **combination of capitals,** which were important in delivering both absorptive and adaptive resilience.

BOX 3: HOW A COMBINATION OF MGNREGS INSTRUMENTS IMPROVES MULTIPLE LIVELIHOOD CAPITALS

Guaranteed MGNREGS wages for building public infrastructure built households' **financial capital**, which they spent on food, clothing, education and health services. This, in turn, improved their **human capital**. At the same time, this investment in public infrastructure – deepening and widening the Beelabatti Channel – has built **physical capital**.

For some households in Rushikudda, this investment has also increased the availability of **natural capital** by increasing access to water for irrigation but also reducing flooding in adjacent farmland during and after cyclones. This has reduced the sensitivity of their livelihoods to climate impacts: decreased waterlogging in the paddy fields and increased availability of water for irrigation has improved agricultural production from 15–17 to 25–30 bags

of rice per acre. This, in turn, has helped boost households' income or **financial capital**. With the price per bag ranging from 1,000–1,800 rupees (US$15–27), income from one acre of farmland during *kharif* (monsoon crop) increased by 8,000–27,000 rupees (US$118–US$400). With more water available in the Beelabatti Channel, the amount of land under cultivation for a second paddy crop in the *rabi* (winter) season has doubled or tripled from 50 to 100–150 acres, out of a total of 300 acres, further improving households' financial capital.

In Kammasigadam, MGNREGS investment in **natural capital** in the form of coconut plantations for landless households may similarly give households the **financial capital** they need to withstand climate hazards when they occur.

The increased income households get from selling surplus agricultural and horticultural produce, combined with MGNREGS guaranteed wages can help households build either **absorptive** or **adaptive resilience.** Some households save this income for contingency and use it to cope during cyclones. Access to cash and savings is a prominent pathway to strengthening **absorptive resilience**, since it helps households manage risk and bounce back from climate hazards when they occur (Bahadur *et al.* 2015). This is consistent with the traditional protective role of social protection. Other households may use the increased income to improve their wellbeing despite the impact of cyclones – and therefore allowed them to build **adaptive resilience**.

However, a small number of households have not gained enough financial capital from guaranteed wages and MGNREGS infrastructure investment, and have experienced a decline in resilience.

4.2.3   Resilience outcomes

Absorptive resilience

Sixty-five per cent of all the households we interviewed in Srikakulam are able to absorb the impact of cyclones as a result of MGNREGS. Medium and low-wellbeing households in our survey were significantly more likely to have built absorptive resilience than high-wellbeing households. This finding suggests that for many households, MGNREGS is fulfilling its primary safety net function in helping the poorest cope with shocks to their livelihoods.

Infrastructure and guaranteed wages are the most important MGNREGS instruments responsible for households achieving absorptive resilience. Income from wages and increased farm productivity (as a result of MGNREGS assets) helps households maintain wellbeing despite the hazard of cyclones. Climate-resilient infrastructure also helps boost the absorptive function of ecosystems to help buffer against the impact of cyclones.

MGNREGS investment in natural and physical capital has also improved the absorptive function of ecosystem services in Rushikudda. Deepening and widening the Beelabatti Channel led to downstream benefits for households in Isakalapalem, where buildings were less damaged during Cyclone Hud Hud as water flowed back into the ocean through the channel, rather than into nearby households. This highlights an opportunity for future MGNREGS investments to build assets that help ecosystems absorb the impact of cyclones.

Interviews with the Srikakulam's forestry and disaster management departments identified the possibility of using MGNREGS labour to create shelter belts and mangrove plantations to improve the absorptive capacity of ecosystem services in the face of more frequent and stronger cyclones.

Adaptive resilience

Seven per cent of the households we interviewed in Srikakulam have built their capacity to adapt to cyclones as a result of MGNREGS. This means that they have been able to improve their consumption, income, assets and/or capabilities despite the impact of cyclones.

Interviews from our field visits emphasised that a combination of MGNREGS infrastructure investment and guaranteed wages was important in improving multiple capitals and wellbeing to help households achieve adaptive resilience.

Transformative resilience

No households from our survey built transformative resilience as a result of MGNREGS.

Hybrid resilience

Eighteen per cent of the households we interviewed in Srikakulam did not fall into a specific category of building absorptive resilience, adaptive resilience or registered a decline in resilience despite MGNREGS. We have classified these as hybrid households.

Decline in resilience

Ten per cent of the households we interviewed in Srikakulam reported a decline in resilience, despite MGNREGS. Data from our household survey and field interviews suggest that two factors can account for this decline.

First, MGNREGS is not delivering enough benefits – in paid working days or investment in productive assets – for certain households to build resilience in the face of high-intensity climate shocks. Several households in Isakalapalem reported that MGNREGS did not provide enough working days and that investment in natural capital did not improve the financial capital of landless households. MGNREGS benefits did not allow households to meet their basic needs during Cyclone Hud Hud in 2014, when they had to rely on emergency supplies of rice, daal and cooking oil, as well State Disaster Response Fund support to repair their homes and replace or repair fishing boats and equipment. Timing could have been a factor for some households: MGNREGS activity in Srikakulam takes place between

February to June, but the main period of cyclone activity is October to December (NIDM undated). As a result, households may not have saved their MGNREGS wages for long enough to provide a safety net during cyclone shocks.

Second, certain households are more exposed and/or sensitive to climate hazards than others. One of the notable trends from the households that reported a decline in resilience is that over half said it was a result of natural capital not leading to enough income (and to a lesser extent consumption, assets and capabilities) to offset the negative impact of cyclones on their wellbeing. High-wellbeing households and women were twice as likely to report a decline in resilience. These findings, though low in proportion to our overall sample size, suggest that more analysis is needed to understand whether MGNREGS is leaving specific groups behind in Srikakulam – based on factors such as location, income or gender.

4.3 Contribution to resilience in the local economy

Our study found that the impact of MGNREGS in Srikakulam extends beyond the household into the local economy through improved skills, rural infrastructure, enterprise development and wages. Of our survey respondents, 43 per cent reported that MGNREGS led to a change in the local wage rate; 15 per cent reported an increase in skills; 12 per cent reported an increase in agricultural enterprise creation; and 18 per cent reported an increase in non-agricultural enterprises. Respondents also highlighted that MGNREGS helped improve public infrastructure, with 20 per cent reporting improvements in road connectivity and 39 per cent in community infrastructure. Although these gains reflect the fact that financial, physical, human and social capital

Figure 6: Households reporting change in local economy as a result of MGNREGS, despite the impact of Cyclone Hud Hud in 2014
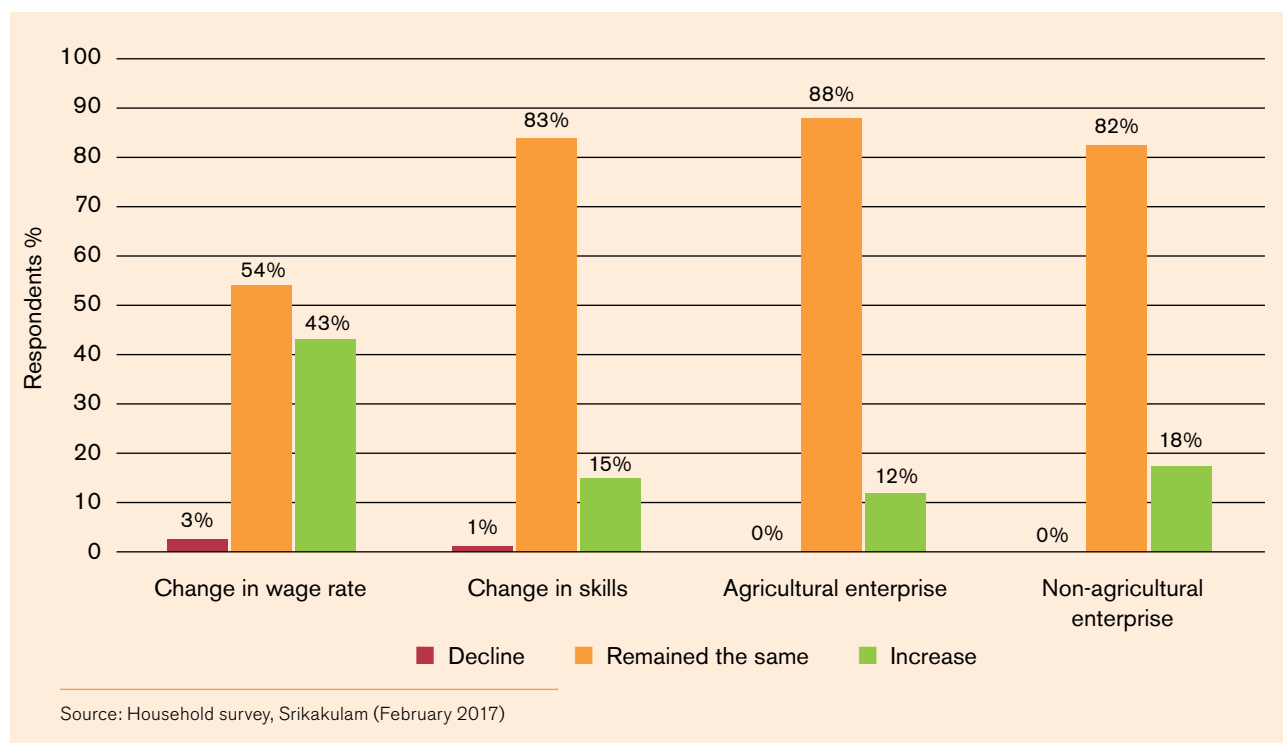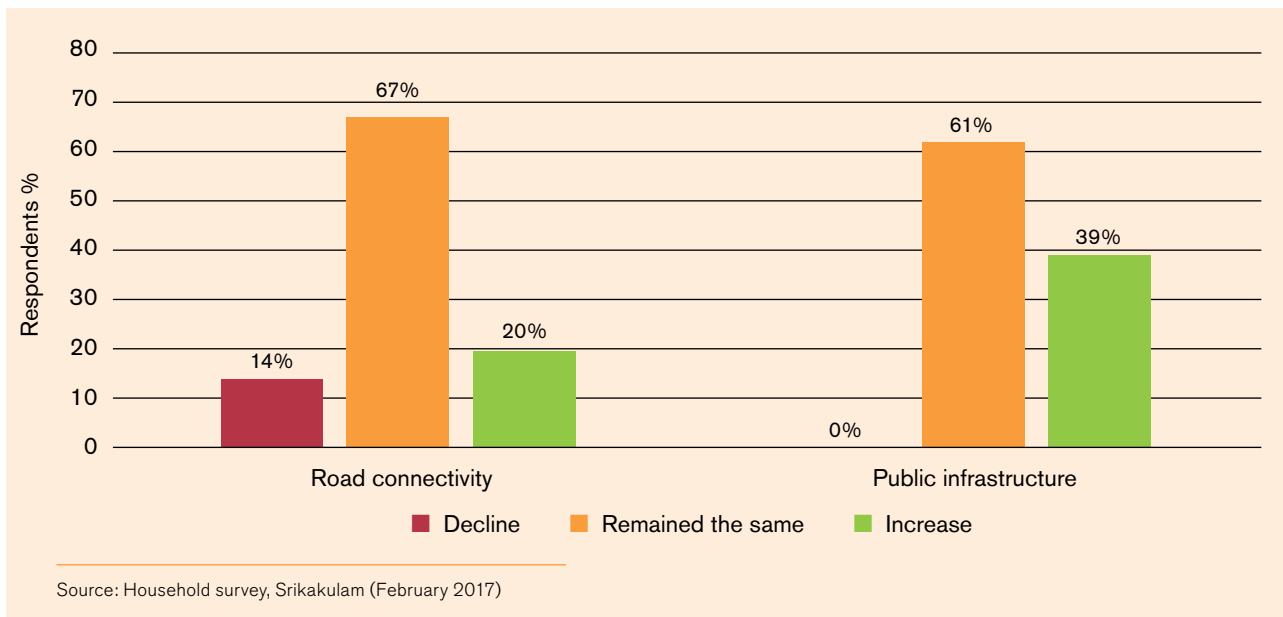

Source: Household survey, Srikakulam (February 2017)

Figure 7: Households reporting change in rural infrastructure as a result of MGNREGS, despite impact of Cyclone Hud Hud in 2014

Source: Household survey, Srikakulam (February 2017)

have all increased in Srikakulam, these findings also indicate that the majority of surveyed households have not experienced these changes in the local economy. This suggests that there is still room for significant improvement if MGNREGS is to link household-level resilience to gains in the wider community.

4.4 Contribution to resilience of ecosystems

Our study also found that MGNREGS has led to improvements in ecosystem services in Srikakulam District, with 48 per cent of respondents reporting that MGNREGS has led to increased agricultural productivity, 49 per cent reporting an increase in crop diversity, 14 per cent reporting an increase in irrigation infrastructure and 9 per cent reporting an increase in agricultural land. The latter responses on irrigation and land seem relatively low, given the high reported impact of the widening of Beelabatti Channel during our field visits. But this may be explained by the fact that 69 per cent of survey respondents were landless and so did not benefit from these changes as much as landholding

households. The high rate of landlessness among survey households may also explain the low number of households in the adaptive resilience category.

Overall, these figures highlight the fact that MGNREGS has led to important improvements in natural capital for households, which (as outlined above) have played an important role in their ability to maintain or improve their own wellbeing, despite the increasing risk from cyclones. Improved ecosystem services are likely to lead to wider benefit for households without MGNREGS job cards. On the flip side, these figures also highlight that, despite participating in MGNREGS, more than half of all the scheme's beneficiaries in Srikakulam have not experienced improved ecosystem services. It could be that landless households in Rushikudda and Isakalapalem have benefited from MGNREGS significantly less than landholding households. If this is the case, our analysis may not provide an accurate snapshot of the benefits of MGNREGS on ecosystems services, since we have a higher proportion of landless households in our survey (70 per cent) than the district average.

Figure 8: Households reporting change in ecosystems services as a result of MGNREGS, despite impact of cyclones

Source: Household survey, Srikakulam (February 2017)
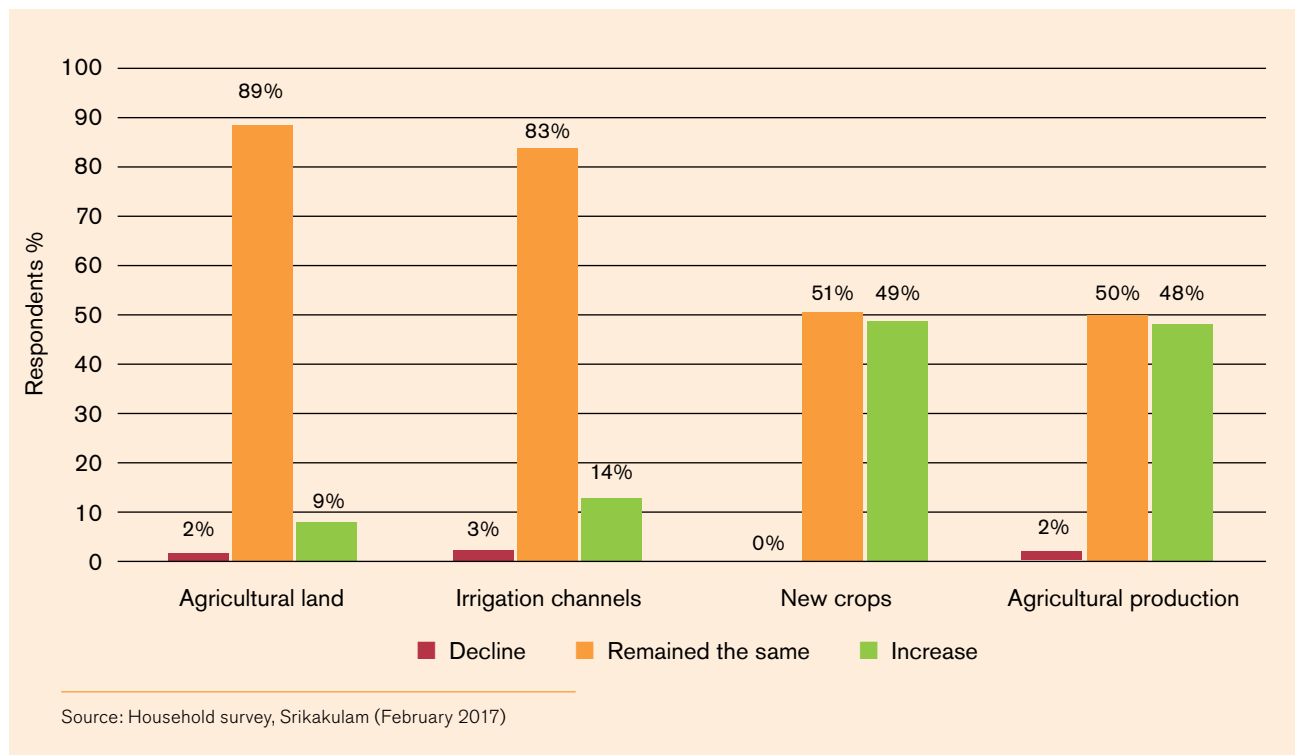
Looking forward

5

Policy Recommendations

Drawing on lessons from our case study in Srikakulam, research from the three state briefings that accompany this report (Steinbach *et al.* 2017a and 2017b; Kaur *et al.* 2017b) as well as a meta-analysis of social protection and climate resilience literature (Agrawal *et al.* 2017), we make the following recommendations for policymakers, to strengthen MGNREGS' contribution to resilience:

1. **Deliver a combination of MGNREGS instruments** to provide a stronger foundation to build resilience.

   Our research suggests that households who have access to multiple MGNREGS instruments could be better equipped to manage climate hazards. While not all households who benefited from multiple MGNREGS instruments were able to build adaptive resilience (some still registered a decline in wellbeing or no change in wellbeing), the majority of households in the adaptive resilience category – in other words, those that were able to increase their wellbeing in the face of drought, flooding or cyclones – benefited from multiple MGNREGS instruments.

   In Andhra Pradesh, the combination of guaranteed wages and public assets that both increase agricultural production and reduce the exposure of ecosystems to cyclones have helped some households build adaptive resilience. According to interviews in Isakalapalem, households where the soil was too sandy to construct MGNREGS assets benefited from guaranteed wages only and were less likely to have built adaptive resilience.

2. **Integrate climate risk management into MGNREGS programming** to strengthen households' ability to build resilience to climate hazards and respond to new opportunities (see Figure 9).

   Our research has found that MGNREGS can build absorptive, adaptive and transformative resilience through its main programme instruments – particularly where a household benefits from a combination of these instruments. But evidence from our four case studies show that resilience outcomes are spread unevenly amongst our sample households, with many households still not experiencing improved resilience outcomes. The following options can help policymakers integrate climate risk management into the delivery of different MGNREGS instruments, to improve their delivery of climate resilience.

a. **Climate-resilient wage labour**:

   – Continue to deliver scaled up MGNREGS labour in response to climate hazards and develop procedures to scale up MGNREGS wages rates and deliver payments before shocks occur. To deliver anticipatory payments, the government will need to invest in climate information systems to recognise rapid and slow-onset climate shocks in their initial stages; develop scenarios with parameters and thresholds that trigger payments; and establish operational guidelines and appropriate delivery structures.

   – Provide clear information to households on changes to MGNREGS daily wage rates and the number of available working days in response to climate hazards. Although MGNREGS already has a process for increasing both these days and wage rates, many beneficiaries feel that decisions to trigger these are unpredictable, non-transparent and unevenly applied. With improved information and communication, households can plan appropriate risk management strategies and decide how best to engage in MGNREGS wage labour when climate hazards occur.

   – Revise the MGNREGS wage rate during climate hazards to ensure households earn enough to meet their consumption needs. While in some cases, MGNREGS offers increased wages to help households cope during climate hazards, many beneficiaries felt these wages were still insufficient for household consumption during this time. To ensure household consumption is not impacted by climate hazards, we recommend the MGNREGS wage rate increases are tied to a consumer price index of basic household goods that is adjusted for inflation caused by the hazard.

b. **Climate resilient infrastructure**:

   – Ensure that the design, selection and construction of MGNREGS assets is flexible and appropriate to localised climate risk. MGNREGS should integrate climate information and spatial planning tools for land use, landscape management and watershed approaches in the identification, design, construction and maintenance of MGNREGS assets.

– Sanction the construction of new labour-intensive assets that boost the capacity of ecosystems to absorb the impact of rapid onset and high intensity climate hazards such as flooding or cyclones. For example, this could include digging run-off channels and planting and maintaining shelter belts or mangrove forests in cyclone-affected areas.

– Sanction the construction of material-intensive assets that build community resilience – such as cyclone shelters, flood protection infrastructure and large water storage infrastructure to manage droughts – in highly exposed areas. Additional material budget could be covered through convergence with other schemes.

– Create infrastructure that helps highly exposed households transition away from agricultural livelihoods into new activities that are less exposed and less sensitive to climate hazards.

– Develop new asset categories that create new livelihood opportunities in low-carbon and climate resilient development. This could include off-grid renewable energy infrastructure or other investments in green technology.

c. **Climate-resilient local institutions**:

– Support local institutions – such as *gram sabahs*, MGNREGS technical engineers and social auditors – to use climate information and spatial planning tools to improve decision making, planning and construction of MGNREGS assets that help manage climate risk.

– Continue to support households to access formal banking institutions.

– Link financial access to investments in climate-resilient livelihoods by training rural banking institutions to promote investment in locally-appropriate, climate resilient activities such as improved access to irrigation; climate-resilient agriculture that increases productivity of farms and reduces the climate sensitivity of households; or renewable energy and other green technologies.

– Create new cooperatives or businesses in sectors that are less exposed or sensitive to climate hazards.

d. **Climate-resilient skills**

– Develop skills training programmes – for example, through Project LIFE or convergence initiatives – to help train households in climate-resilient livelihoods. This could include existing livelihood activities in a community, or introducing new activities such as small-scale renewable energy that help households transition away from climate-sensitive sectors and promote green growth in rural areas.

– Train barefoot engineers and engineering consultants to identify, design and construct climate-resilient and low-carbon infrastructure that reduces households' exposure and/or sensitivity to localised climate risk and is tailored to communities' current livelihood needs and future livelihood opportunities.

3. **Converge MGNREGS with other initiatives and programmes that support climate risk management** to build more resilient households and communities. This can also help programme implementers spread the financial and delivery costs of resilience activities. There will need to be additional dialogue to identify convergence options that build absorptive, adaptive or transformative resilience. Some options for convergence include:

a. Working with Departments of Forestry or Horticulture to build assets such as shelter belts and mangroves to help ecosystems absorb the impact of cyclones.

b. Improving agricultural livelihoods that help households to absorb shocks or adapt to become less sensitive to climate hazards. Interventions could include: increasing access to irrigation; introducing new agricultural practices or crops, such as drought-resistant horticulture; helping farmers develop cooperatives or agricultural businesses by providing them with skills training, infrastructure investment, marketing and distribution support; and building new productive assets that improve agricultural production. In some cases, building more material-intensive assets – such as large water storage tanks for irrigation – may be more effective in delivering resilience. Here, MGNREGS can supply labour and 40 per cent of the material cost, with partnering agencies bearing the additional material cost.

c. Helping households transform their livelihoods away from activities that are exposed or sensitive to climate hazards. This could include skills training for non-agricultural livelihoods through Project-LIFE; partnering with public agencies or private companies to construct new renewable energy or green technology infrastructure; or helping households access financial services to invest in new business ventures.

4. **Ensure that MGNREGS interventions promote spillover benefits to the local economy and the provision of ecosystems services** to create more resilient communities.

    Recommendations 1–3 focus on helping households to build resilience. But these efforts can be strengthened by ensuring that resilience building also creates positive feedback loops to the local economy and natural environment. A stronger local economy and improved ecosystems services will, in turn, lead to more resilient households and by extension, more resilient communities.

Figure 9: Combining and layering climate risk management and social protection instruments
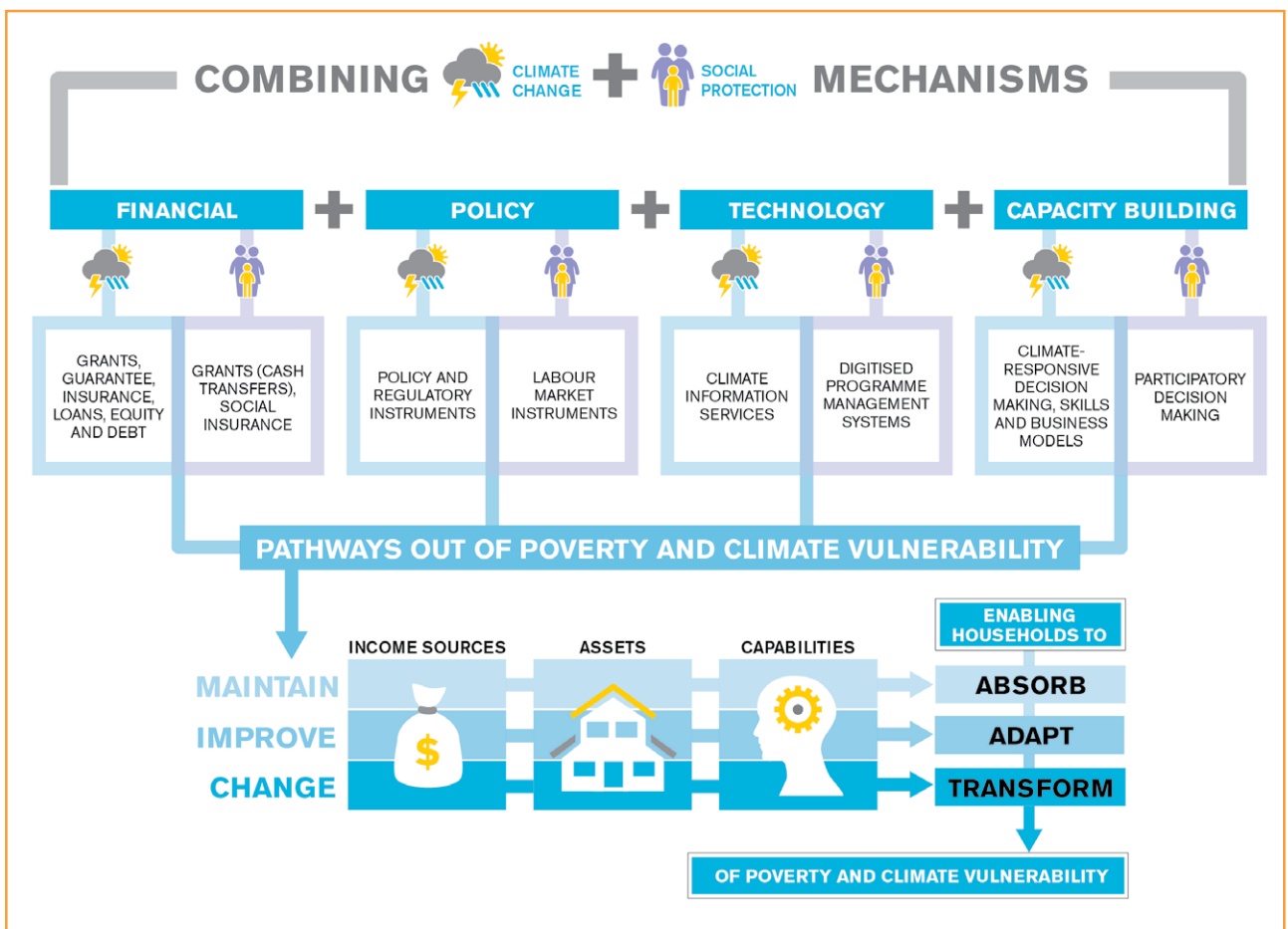
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Annex 1 – Site selection

Fieldwork for our MGNREGS and resilience to cyclones study took place in Srikakulam District, Andhra Pradesh. Our research draws on interviews and household surveys conducted in three sites:

Rushikudda *gram panchayat,* Sompeta *mandal*

Population: 3,530
Active MGNREGS job card holders: 138
Active workers: 173
Type of community: Agricultural
Assets created under MGNREGS: Micro-irrigation tanks, coconut block plantations, flood bunds, rural roads, avenue plantations and renovation of traditional water bodies.

Table 2: MGNREGS employment statistics in Rushikudda 2012–2017

	2012/13	2013/14	2014/15	2015/16	2016/17
Total households worked	140	120	2	131	125
Total individuals worked	183	145	2	156	150
Average days employed per household	53.12	28.86	5	25.56	17.1
Women person days (%)	84.66	88.16	100	87.22	84.71
Scheduled caste person days (%)	1.47	2.89	0	2.06	3.93
Scheduled tribe person days (%)	0	0	0	0	0

Source: MGNREGA MIS database. See http://mnregaweb4.nic.in/netnrega/all_lvl_details_dashboard_new.aspx

Isakalapalem *gram panchayat,* Sompeta *mandal*

Population: 810
Active MGNREGS job card holders: 374
Active workers: 453
Type of community: Predominantly fishing (men often migrate for one to four months a year to Gujarat or the Andaman Islands for fishing activities)

Assets created under MGNREGS*:
Several minor irrigation tanks
15 household latrines
350 household plantations of five fruit-bearing trees

*Convergence with the Department of Fisheries has led to several fish-drying platforms being sanctioned for construction in FY17/18

Table 3: MGNREGS employment statistics in Isakalapalem 2012–2017

	2012/13	2013/14	2014/15	2015/16	2016/17
Total households worked	324	300	335	329	357
Total individuals worked	395	344	398	402	436
Average days employed per household	61.56	17.56	30.56	59.03	51.75
Women person days (%)	87.65	91.29	91.68	91.14	93.46
Scheduled caste person days (%)	0.47	0.99	0.93	0.43	0.51
Scheduled tribe person days (%)	0	0	0	0	0

Source: MGNREGA MIS database. See http://mnregaweb4.nic.in/netnrega/all_lvl_details_dashboard_new.aspx

Kammasigadam *gram panchayat,* Ranasthalam *mandal*

Population: 1,301
Active MGNREGS job card holders: 352
Active workers: 625 (43.2 per cent from scheduled castes)
Type of community: agricultural, some small trade
Assets created under MGNREGS: 27 individual coconut plantations of 100 trees

Table 4: MGNREGS employment statistics in Kammasigadam 2012–2017

	2012/13	2013/14	2014/15	2015/16	2016/17
Total households worked	308	326	310	334	324
Total individuals worked	553	578	547	580	560
Average days employed per household	116.06	104.33	80.37	76.73	80.4
Women person days (%)	57.99	56.6	55.65	57.72	60.96
Scheduled caste person days (%)	47.35	47.92	44.45	44.9	44.94
Scheduled tribe person days (%)	0	0	0	0.19	0.38

Source: MGNREGA MIS database. See http://mnregaweb4.nic.in/netnrega/all_lvl_details_dashboard_new.aspx

The Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) is one of India's flagship social protection programmes. This paper is part of a series of briefings that analyse how MGNREGS builds the resilience of rural households to different climate shocks. The goal of this series is to identify options for Indian policymakers to integrate climate risk management into MGNREGS. These findings can also provide global policymakers with evidence on how to mainstream climate risk management into social protection programmes, or combine and layer social protection instruments with climate risk management instruments to address poverty in the context of climate change.

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