DFID Nepal Rural Access Programme 3 (RAP-3)
Monitoring, Evaluation and Learning (MEL) Component

Endline Impact Assessment Annex 2019

Date: 7 January 2020

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Itad in association with Statistics for Sustainable Development (Stats4SD)

Results in development

Acknowledgements

This report was made possible thanks to support from the team at Statistics for Sustainable Development (Stats4SD), who carried out the design and analysis of the quantitative element of the impact assessment. Special thanks also go to Hiranya Baral and his team of enumerators for consistently and diligently collecting the survey data successfully in a geographically challenging environment over three rounds in the past five years.

The team at DFID Nepal have played a valuable role throughout the duration of the project in providing advice and support to the team.

Finally, particular thanks are owed to the many families in the western Nepal for taking the time to participate in the survey and study over the past five years. We hope that the findings of this report help others better understand their environment and lives for the future betterment of the people in that region and across Nepal.

Currency exchange rate

1000 Nepalese rupees = £6.88 pounds sterling / $8.98 US dollars (May 2019)

Contents

Acronyms

DFID	UK Department for International Development
FCS	Food Consumption Score
GIS	Geographic Information System
MEL	Monitoring, Evaluation and Learning Component of RAP
NeKSAP	Nepal Food Security Monitoring System
NGIIP	National Geographic Information Infrastructure Programme
NLSS	Nepal Living Standard Survey
NPR	Nepali Rupee
ODK	Open Data Kit
PMT	Proxy Means Test
PPI	Progress out of Poverty Index
PSU	Primary Sample Unit
RAP	Rural Access Programme
RBG	Road Building Group
RCA	Reality Check Approach
RMG	Road Maintenance Group
SED	Social and Economic Development
SOLI	Standard of Living Index
TLU	Tropical Livestock Unit
ToC	Theory of Change
UK	United Kingdom
VDC	Village Development Committee
WFP	World Food Programme

Section A: Introduction

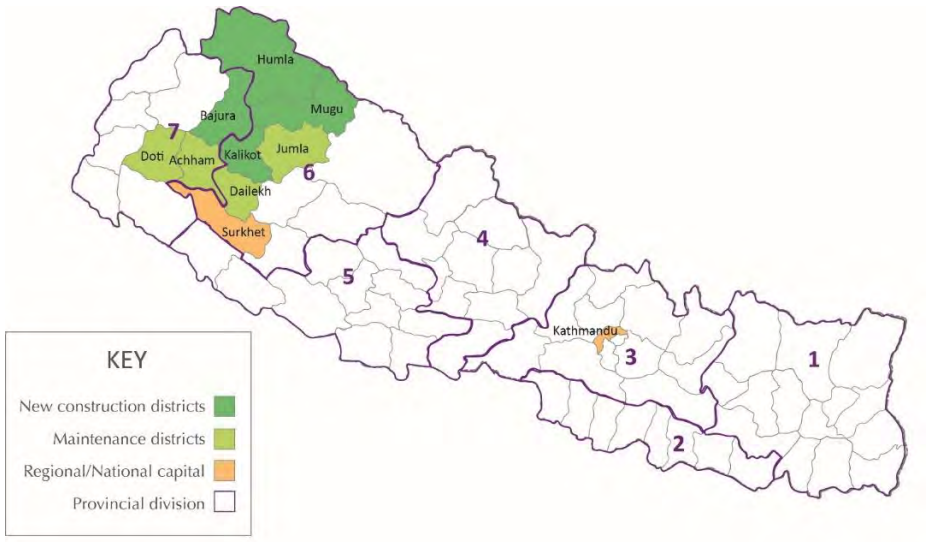
A1. Background to the impact assessment of RAP-3

The independent Monitoring, Evaluation and Learning (MEL) component of the third phase of the UK Department for International Development (DFID) Nepal Rural Access Programme (RAP-3) generated knowledge and facilitated learning for the programme and its partners. A significant part of its work was a mixed-methods longitudinal impact assessment of RAP-3, which ran from 2014 to 2019. The main quantitative element of the impact assessment included a panel survey of around 3,000 households across the 8 districts in western Nepal. This constitutes the largest household survey ever undertaken in this understudied region of the country and as such includes a detailed dataset on the drivers of poverty specific to western Nepal. The qualitative element included participatory interviews and discussions with communities to provide an interpretive lens to the quantitative findings. This report presents the results of the endline impact assessment, undertaken in 2019.

DFID has been funding RAP for the past 15 years. The third phase of implementation – RAP-3 – ended in June 2019. It was designed to contribute to DFID Nepal's twin objectives of delivering local economic growth and ensuring no-one is left behind – mainly through building and maintaining local roads and creating employment in poor and disadvantaged communities in the most remote parts of Nepal.

The programme delivered the construction of 97 km of new rural roads and the maintenance of several thousand kilometres of existing rural roads. It employed a labour-based approach to roadwork and construction activities by targeting poor and vulnerable households for short-term employment in groups called Road Building Groups (RBGs) and Road Maintenance Groups (RMGs).[1] This approach of improving road access via the use of pro-poor targeted labour employment aimed to maximise benefits accrued to one of the poorest regions of Nepal – eight districts covering Karnali Province and Sudurpashchim Province (Provinces 6 and 7 in Figure 1).[2]

Figure 1: Map of RAP intervention areas under MEL assessment



[1] RAP-3 acknowledged that it would allow the use of '*appropriate equipment where this can overcome localised difficulties and accelerate access to other income generation opportunities*', especially to drill and break hard and massive rock (RAP-3 Information Leaflet, May 2013).
[2] RAP-3 worked in a total of 14 districts across Nepal, with 9 districts covering Provinces 6 and 7 (Karnali and Sudurpashchim Provinces, respectively). The original 'main' districts are the eight covered by the independent MEL since 2014.

A2. What are we assessing?

As Table 1 and Figure 2 shows, three main groups (populations) of households were tracked over time. Two of these groups – the 'non-beneficiary inner' and 'beneficiary inner (RBG/RMG)' groups – were clustered in the inner domain, representing households living within a 1.5 hour walk from the planned or existing road. The 'non-beneficiary outer' groups were made up of households clustered in the outer domain representing households living 1.5–3 hours' walk from the road.

Figure 2: RAP groups

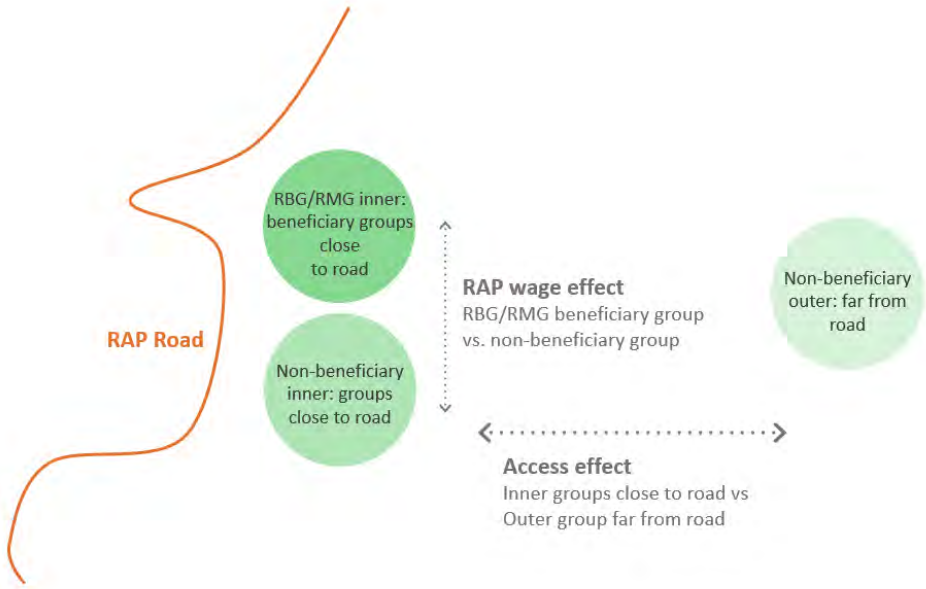


Table 1: Characteristics of different groups

Group	Proximity to road	Beneficiary of direct RAP employment (waged work)?
RBG/ RMG	Living within 1.5-hour walk from RAP road	Yes
Inner (close to road)	Living within 1.5-hour walk from RAP road	No
Outer (far from road)	Living 1.5–3 hours' walk from RAP road	No

Tracking households across these three groups enabled MEL to detect:

1. Whether poverty had reduced over time among households in the areas covered by RAP-3.
2. Whether poverty had reduced more for direct beneficiaries (RBGs/RMGs) than for non-beneficiaries in the inner domain.
3. Whether poverty had reduced more for those living nearer to the road (both inner domain groups) than those living further from the road (outer domain).

In short, the impact assessment has been designed to track the difference-in-difference between groups over three points in time: baseline (2014), midline (2016) and endline (2019).[3] This sampling strategy allows us to compare the differential impact of wage labour and of improved road access between remote and non-remote populations.

[3] Each of the three rounds of surveys was enumerated in the same seasonal window, between early May and mid-June, in each respective year. This was done to neutralise seasonality distortions between the survey rounds.

The impact assessment is focused on the impact on poverty in this region of Nepal. It therefore assesses achievement of RAP-3's two main objectives: (i) improved rural access through new road construction and road maintenance; and (ii) the employment of poor communities to carry out these road-based activities.

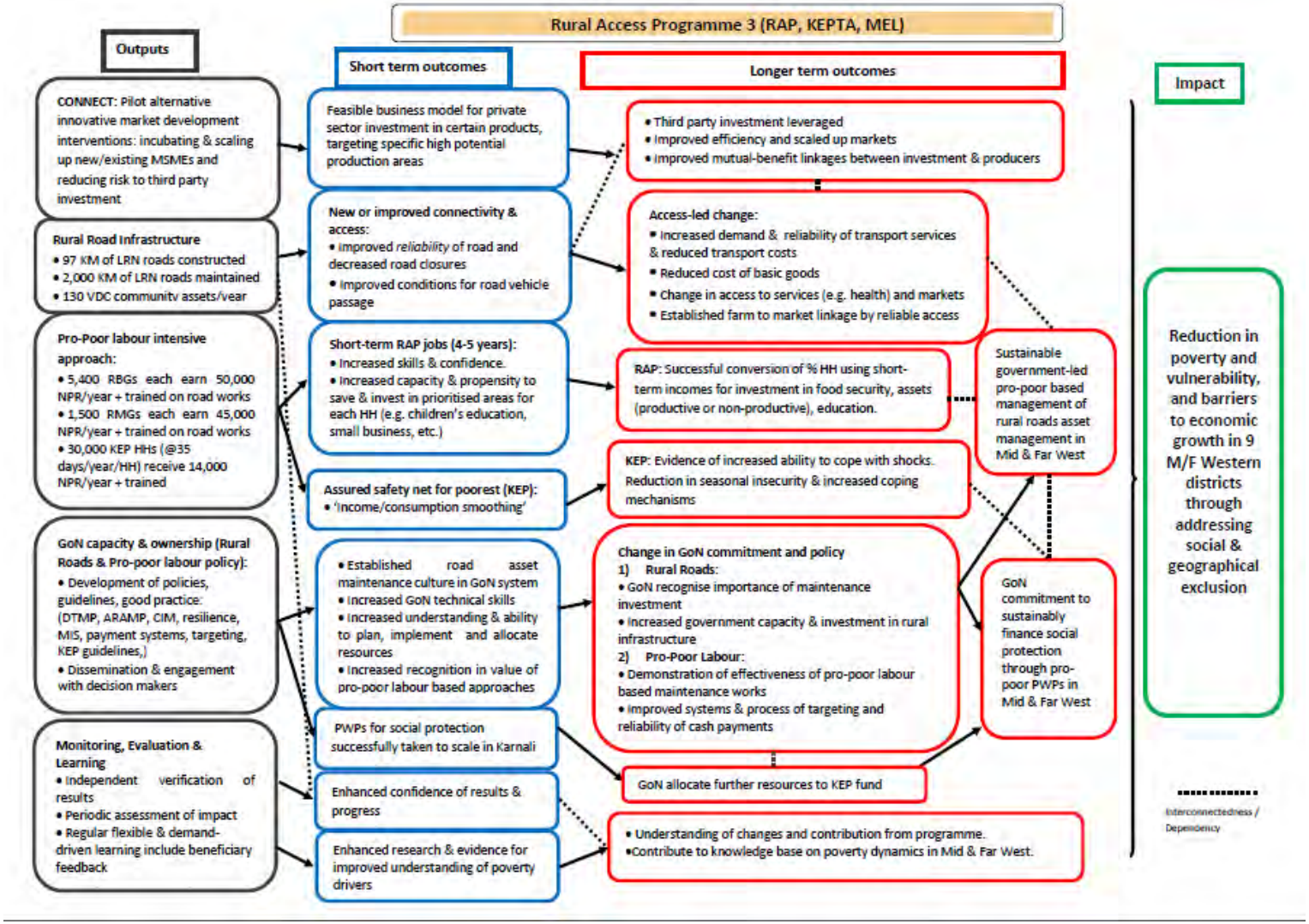
RAP-3 also engaged in providing technical support to the Government of Nepal (GoN) as well as other direct market-based interventions. The impact assessment was not designed to assess RAP-3's technical assistance in these areas.

A3. How to read this report

The main Endline Impact Assessment Report provides a synthesised top headline summary across the most important indicators from both the quantitative and qualitative components of the endline assessments. This document is the annex to the main Endline Impact Assessment Report. Given the sheer number of indicators in the main questionnaire of the quantitative component, this annex provides a full list of the graphs and tables that were analysed across the panel dataset. Additionally, this annex presents the full qualitative findings.

The full methodology for the impact assessment is presented – the quantitative component in Section B and the qualitative component in Section D. Furthermore, Section F provides further breakdown on the statistical design of the quantitative component. Section C presents the quantitative findings and the qualitative findings are presented in Section E.

A4. RAP3 theory of change



Section B: Quantitative household survey design and methods[4]

B1. Questionnaire design

The survey questionnaire was designed with a view to capturing a wide range of hypothesised results of RAP-3, including those noted in Table 2, which are derived from the RAP-3 Theory of Change (ToC) (see Section B). The survey was also designed to ensure adequate coverage of RAP-3's logframe indicators.

The household panel surveys were conducted in three major rounds over the lifetime of the programme:

1. Baseline in 2014;[5]
2. Midline in 2016;
3. Endline in 2019.

Each of the three rounds of surveys was enumerated in the same seasonal window between early May and mid-June of each of their respective years. This was done to neutralise seasonality distortions between the survey rounds. The midline and endline surveys were functionally very similar to the baseline survey conducted in May 2014. Some additional sections were added to the questionnaire over the two rounds although the vast majority of questions were kept the same to enable trend analysis over time. Additional questions included during the midline in May 2016 questions covering the economic blockade and drought during that period; and during the endline in May 2019 questions covering local elections.

Table 2: Hypothesised effects of RAP-3 intervention

- Reduced transport cost for passengers
- Increased household income (both short and longer term)
- Increased household income diversity
- Increased added value from primary producers' income
- Improved nutritional status/food diversity
- Increased school enrolment and attendance
- Improved immunisation rates
- Increased utilisation of health facilities and other government services
- Reduced distress migration
- Increased non-distress migration
- Reduced cost of credit/greater diversity of institutions offering credit resulting in lower interest rates
- Increased female and excluded group participation in the labour force and household decision-making
- Increased household spending on asset creation activities
- Increased non-farm employment activities
- Increased utilisation of improved agricultural technology and agriculture and livestock service centres

The household survey design used the Nepal Living Standards Survey 3 (NLSS-III 2010–2011) as a starting point, ensuring a large degree of consistency of definitions with national statistics, while stripping out some of the detailed sections of the NLSS that were not of interest in this case. This should ensure comparability of RAP-3's indicators with existing and future rounds of the NLSS.

As well as the above considerations, the survey sought to capture any potential negative impacts that road construction and maintenance might bring to a region. The inclusion of this module was motivated by the findings of the pilot qualitative study Reality Check Approach (RCA), conducted in November 2013,

[4] Further detail on the household survey methodology is provided in Section F.

[5] An additional rolling baseline cohort was surveyed in 2015 – the RMG survey as it was not possible during 2014 to undertake a baseline of possible RMG beneficiaries, as these had not been selected at the time by the RAP team.

which highlighted perceptions of the socio-economic strain relating to increasing modernisation and migration brought about by improved road networks.

B2. Measuring poverty

Given the difficulties of gathering accurate estimates of income from household surveys (owing to multiple income sources, inaccuracies in recollection of past income, sensitivities around sharing income information and so forth), the survey goes beyond income estimates to construct a composite indicator of consumption using a **proxy means test (PMT)** approach. This uses information from NLSS-III to model household consumption on a range of explanatory variables, including health, education, demography, housing and assets. Through the development of a composite indicator under the PMT approach, we are able to gather a **multidimensional understanding** of the drivers of household consumption that goes beyond our income estimates, and provides a more nuanced perspective on household poverty.

The team considered developing a separate Standard of Living Index (SOLI) in addition to the above, but has decided not to do so at this point, owing to technical complications in determining the weightings of such an index. A more complete discussion around the PMT and the SOLI is provided in Section F.

B3. Sampling

The baseline survey was conducted in RAP's four road construction districts (Humla, Mugu, Bajura and Kalikot) and four road maintenance districts (Doti, Achham, Dailekh and Jumla). In general, the maintenance districts currently have far less road infrastructure than the build districts, which is a useful basis for comparison at baseline, as well as being of value in assessing change over time as RAP and others invest in road construction in the construction districts.

Four 'direct beneficiary' groups were surveyed at the both the baseline and midline surveys – the beneficiaries of the social and economic development (SED) interventions in both the building and maintenance districts, and the RBGs and the RMGs.

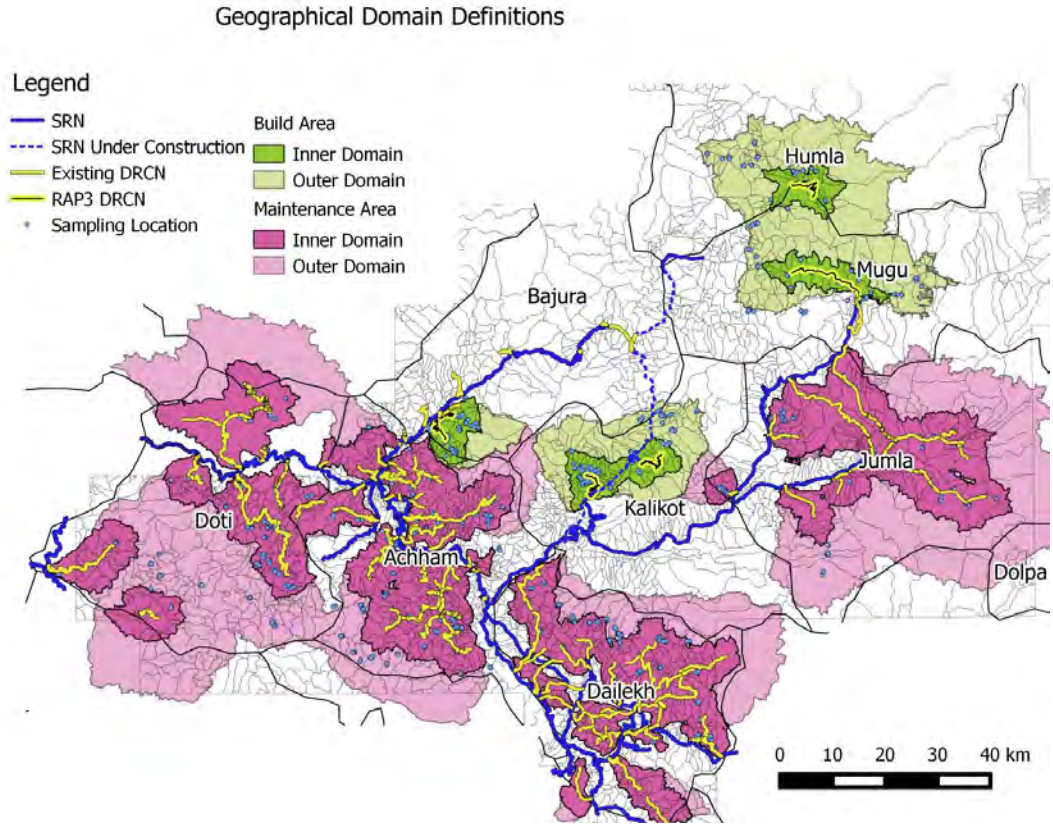
Furthermore, in order to give a richer picture of the different impacts of RAP, and help place this within broader change, 'buffer zones' were drawn up around the relevant roads, with sampling of households in 'inner buffers' containing 'indirect beneficiaries' living within 1.5 hours' walking distance of a RAP road. These households are not benefiting directly from road building or SED activities but one may see change over time through increased access and ripple/spin-off benefits such as better access to markets and services and opportunities from these stimulating the local economy. Households living in 'outer buffer zones' – those living up to five hours' walk from the road – were also sampled. This was done so that a further comparison group in these more remote areas could be studied to determine if any change was taking place for them as a result of activities in the inner zones. Given the relative extent of the maintained RAP road network, this provides a sample frame that covers the majority (but not all) of the population in Doti, Achham, Dailekh and Jumla but only subsets of the population within the build districts of Bajura, Kalikot, Mugu and Humla. The geographic extent of these domains is seen in Figure 2.

Table 3: Sampling over the three rounds (2014,2016, 2019)

Stratum	Baseline	Midline	Endline	Attrition since baseline
RBG	447	414	415	7%
Build inner	462	420	422	9%
Build outer	498	476	467	6%
RMG	423[6]	385	370	13%
Maintain inner	543	501	483	11%
Maintain outer	407	349	339	17%
Overall	**2,780**	**2,545**[7]	**2,496**	**10%**

At baseline, sampling from these geographic domains was carried out randomly across the entire population within these regions. As a result, the inner and outer domains do include direct beneficiaries of the RAP project (RBG and RMG members). The proportion of RBG and RMG members within these sampling domains will reflect the proportion of RBG and RMG members within these wider areas. Given the size of the road building project relative to the population within the four build districts, a large proportion of the inner build buffer households contain RBG members: just under half of inner build domain households contained an RBG member. This was particularly the case in Humla, where 83% of households within the inner buffer domain also contained RBG members at the midline survey, and Mugu (50% of inner buffer households in RBG). In Bajura, only 11% of households in the build inner contained an RBG member, while in Kalikot it was 22%.

Figure 3: Detailed geographical domain definitions in build (green) and maintenance (purple) areas



[6] Survey conducted in 2015. RMGs had not been formed in 2014 at time of main baseline survey.
[7] Total sample sizes for the six strata included in endline. Baseline and midline surveys also included interviews with SED households.

This gives a total of eight sampling domains – the inner, outer and SED cohorts of both the road building and the road maintenance districts (six domains in total), plus the RBGs and RMGs. At the time of the baseline survey, the process of identifying households to participate in the RMGs had not been completed. This means that the RMG baseline was conducted one year later than the baseline for the other seven domains, in May 2015 rather than May 2014. This means care needs to be taken when comparing the differences between the RMG groups and the corresponding inner buffer households, as there is an element of time involved as well as a potential group effect.

Including the RMG group, a total of 3,622 households were surveyed at baseline. Of these, 3,255 (90%) were successfully located and re-interviewed for the midline survey. No replacements of households were conducted for those who could not be located. The hypothesised panel attrition rate in the sample size calculations was 13% (reduced from 20% owing to constraints) – so this is within the range that was expected. Full details of the sampling methodology, and sample size calculations, are provided in Section F.

The survey specifically included SED groups based on data received from RAP. The total membership of RAP SED groups was given as 1,500 in build areas and 6,500 in maintenance areas. A total of 55% of the sample of maintenance SED members were former RBG members compared with 18% in the inner buffer.

B4. Analysis methods

Estimates presented at the domain level are weighted according to the sampling probabilities of each household, estimated from approximations of the population size within the buffer domains and from member listings in the SED, RBG and RMG domains. Error bars presented on graphs represent 95% confidence intervals around estimates. A variety of different statistical methods is used in the analysis of this data. Unless otherwise specified in the text of the report, the methods used are summarised Table 4. **A 'p value' of less than 0.05 is used to define statistical significance**.

Table 4: Methods of statistical analysis

Comparison	Numeric variable	Binary variable
Within group **Baseline vs Midline**	Linear mixed effects regression determining whether change in variable is significantly different from zero. Nested random effects included for 'cluster' and 'district'.	McNemar's test
Between group **Midline vs Midline** **Baseline vs Baseline**	Linear mixed effects regression determining whether variable in groups is significantly different from each other. Nested random effects included for 'cluster' and 'district'.	Chi-square test

Comparison	Numeric variable	Binary variable
Between-within 'Difference-in-difference' (Interaction effect)	Longitudinal linear mixed effects regression determining whether the interaction between group and time is significantly different from zero (i.e. whether the change over time is different between the groups). Nested random effects for 'household' 'cluster' and 'district'.	Longitudinal generalised linear mixed effects regression using probit transformation of outcome to determine whether the interaction between group and time is significantly different from zero (i.e. whether the change over time is different between the groups). Nested random effects for 'household' 'cluster' and 'district'.

Statistical hypothesis tests of the differences over time, and the key difference-in-difference comparisons, from baseline to endline are shown Tables 5 and 6 below. These confirm the highly significant reduction in estimated poverty compared with the baseline in all groups, as well as providing strong evidence of an increased reduction in poverty for the inner build compared with the outer build. Although estimated poverty fell by more in the RBG and RMG groups compared with the corresponding Inner group, these difference-in-differences were not statistically significant.

Table 5: Baseline and endline comparisons – build area

PMT estimates – baseline vs endline comparisons Build area	p-value
RBG: Difference over time	<0.001 ***
Build – Inner: Difference over time	<0.001 ***
Build – Outer: Difference over time	<0.001 ***
RBG vs Build – Inner: Difference-in-difference	0.768
Build – Inner vs Outer: Difference-in-difference	0.002 **

Table 6: Baseline and endline comparisons – maintenance area

PMT estimates – baseline vs endline comparisons Maintenance area	p-value
RMG: Difference over time	<0.001 ***
Maintenance – Inner: Difference over time	<0.001 ***
Maintenance – Outer: Difference over time	<0.001 ***
RMG vs Maintenance – Inner: Difference-in-difference	0.332
Maintenance – Inner vs Outer: Difference-in-difference	0.448

B5. Digital data collection

Smart phones/tablets were used by enumerators to record survey data and Open Data Kit (ODK) was used as the digital data collection platform for the household survey. As the midline and endline surveys returned to the same households, the recording of individual household geo-references along with

photographs has helped in identifying household structures and household members and was an important component of ensuring accurate household re-identification.

Section C: Quantitative findings

This section of the report unpacks important and relevant emerging changes in the eight districts of Karnali and Sudurpashchim Provinces in western Nepal.

C1. Demographic change

The demographic breakdown of respondents from the build and maintenance districts is provided below. Changes in demographic make-up of the region are linked with migration patterns. Hence, rather than seeing demography as a static picture, it is important to see it in the context of social change.

Figure 4: Demographic make-up of build domains between baseline (2014) and endline (2019)

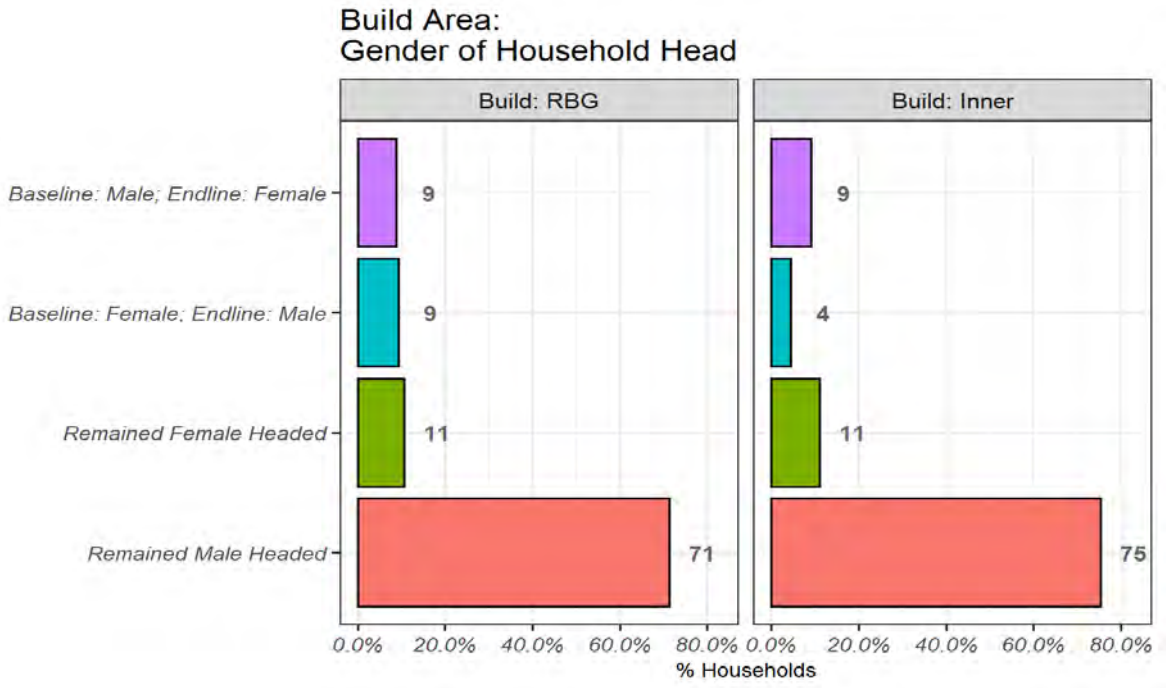


Table 7: Demographic make-up of build domains at endline

Variable	Value	Build: RBG	Build: Inner	Build: Outer
Caste	Dalit: Kami	8.9%	8.8%	13.9%
Caste	Dalit: Other	3.6%	9.0%	10.5%
Caste	Ethnic group	2.4%	0.9%	0.9%
Caste	Other caste	0.7%	0.9%	0.2%
Caste	Upper caste: Brahman (Hill)	10.4%	8.1%	9.4%
Caste	Upper caste: Chhetri	49.2%	57.8%	42.0%
Caste	Upper caste: Thakuri	24.8%	14.5%	23.1%
Gender of household head	Female	19.5%	19.9%	12.8%
Gender of household head	Male	80.5%	80.1%	87.2%
Age of household head	<25	1.0%	2.4%	2.4%
Age of household head	25-34	15.9%	17.1%	15.6%
Age of household head	35-44	24.8%	22.5%	22.9%
Age of household head	45-54	26.5%	24.4%	25.7%

Variable	Value	Build: RBG	Build: Inner	Build: Outer
Age of household head	55-64	21.2%	19.2%	21.0%
Age of household head	>65	10.6%	14.5%	12.4%
Household size	1-2	6.7%	6.9%	8.6%
Household size	3-4	22.9%	26.1%	21.8%
Household size	5-6	41.9%	37.7%	39.6%
Household size	7-8	22.2%	24.2%	21.0%
Household size	>8	6.3%	5.2%	9.0%

Table 8: Demographic make-up of maintenance domains at endline

Variable	Value	Maintain: RMG	Maintain: Inner	Maintain: Outer
Caste	Dalit: Kami	15.1%	11.0%	9.4%
Caste	Dalit: Other	15.9%	3.5%	4.4%
Caste	Ethnic group	2.2%	8.3%	6.5%
Caste	Other caste	0.3%	0.2%	0.6%
Caste	Upper caste: Brahman (Hill)	7.6%	7.0%	8.0%
Caste	Upper caste: Chhetri	52.4%	59.2%	61.4%
Caste	Upper caste: Thakuri	6.5%	10.8%	9.7%
Gender of household head	Female	36.2%	28.4%	21.2%
Gender of household head	Male	63.8%	71.6%	78.8%
Age of household head	<25	1.9%	1.2%	1.2%
Age of household head	25-34	14.3%	11.2%	10.9%
Age of household head	35-44	30.8%	23.0%	21.5%
Age of household head	45-54	28.9%	27.7%	25.7%
Age of household head	55-64	18.1%	20.3%	20.6%
Age of household head	>65	5.9%	16.6%	20.1%
Household size	1-2	8.9%	12.8%	11.5%
Household size	3-4	32.2%	26.1%	25.7%
Household size	5-6	34.6%	38.1%	33.6%
Household size	7-8	15.7%	16.4%	20.1%
Household size	>8	8.6%	6.6%	9.1%

The migration patterns related to an increase in the percentage of female-headed households within certain areas of the study. This indicates that the cumulative effect of deaths and outward migration is larger than the cumulative effect of births and inward/return migration.

Table 9: Share of female-headed households by domain in build

Area	Time	Build: RBG	Build: Inner	Build: Outer
Build	2014	19.8%	15.5%	7.5%
Build	2016	17.8%	20.4%	15.6%
Build	2019	19.3%	20.2%	12.9%

Figure 5: Share of female-headed households by domain in build

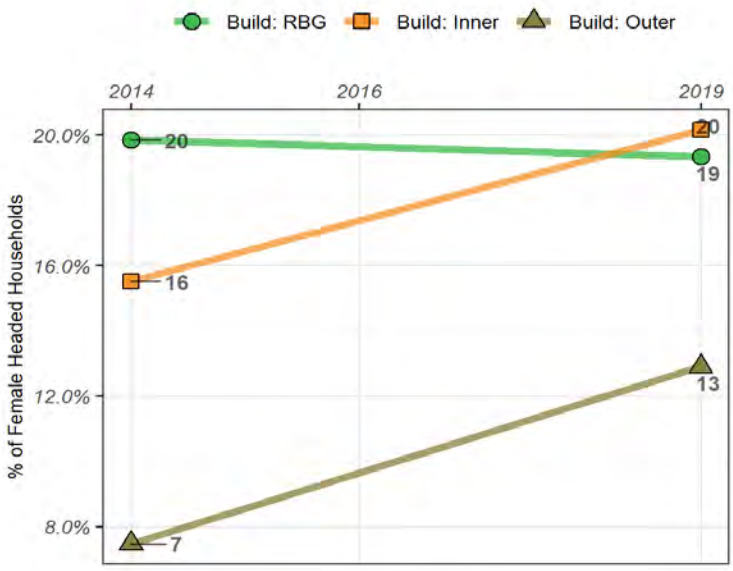


Table 10: Share of female-headed households by domain in build

Area	Time	Maintain: RMG	Maintain: Inner	Maintain: Outer
Maintenance	2014	NA	18.8%	12.3%
Maintenance	2015	31.0%	NA	NA
Maintenance	2016	32.8%	29.9%	18.4%
Maintenance	2019	34.6%	28.4%	20.4%

Table 11: Average household size between baseline and endline by domain in build area

Area	Time	Build: RBG	Build: Inner	Build: Outer
Build	2014	5.9	5.8	6.2
Build	2016	6.0	5.7	5.8
Build	2019	5.6	5.4	5.6

Figure 6: Average household size over survey rounds in build areas

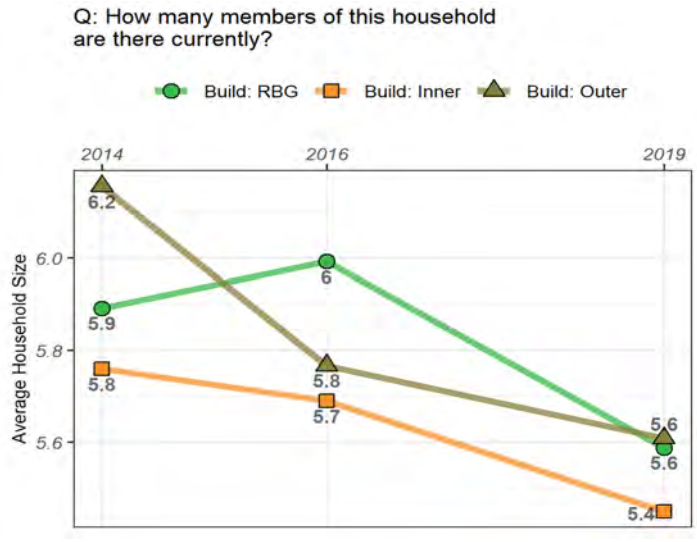


Figure 7: : Average household size over survey rounds in maintenance area

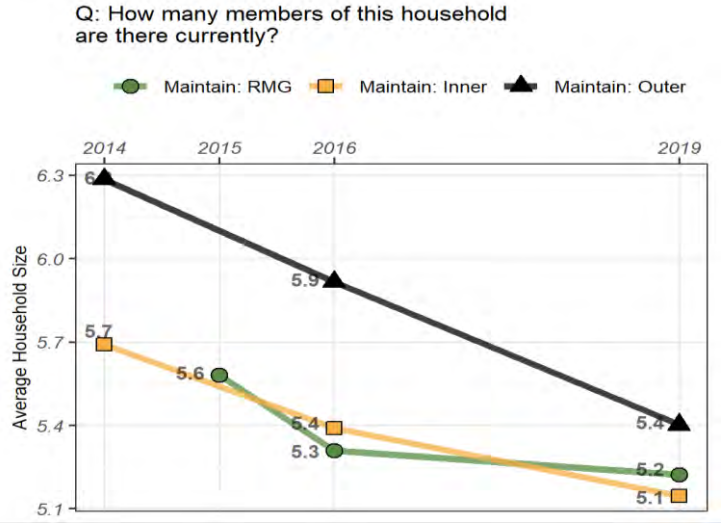


Figure 8: Change in household size from baseline in build areas

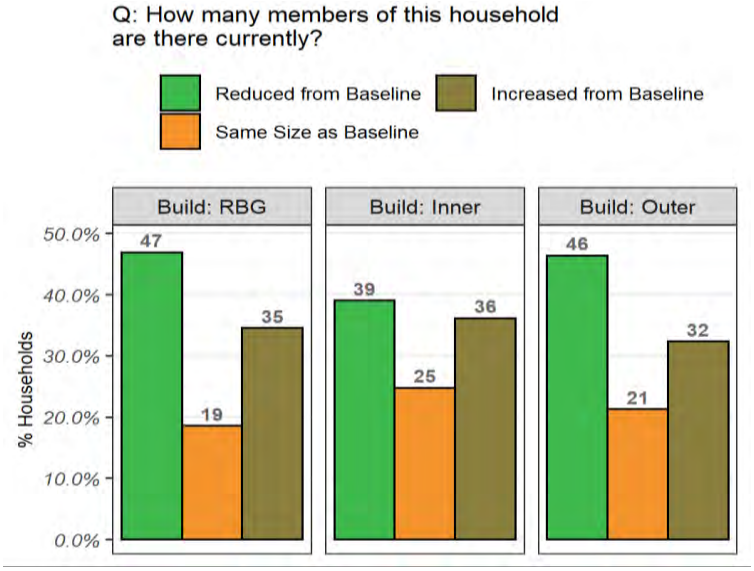


Table 12: Average household size between baseline and endline by domain in maintenance area

Area	Time	Maintain: RMG	Maintain: Inner	Maintain: Outer
Maintenance	2014	NA	5.7	6.3
Maintenance	2015	5.6	NA	NA
Maintenance	2016	5.3	5.4	5.9
Maintenance	2019	5.2	5.1	5.4

Figure 9: Change in household size from baseline in maintenance areas

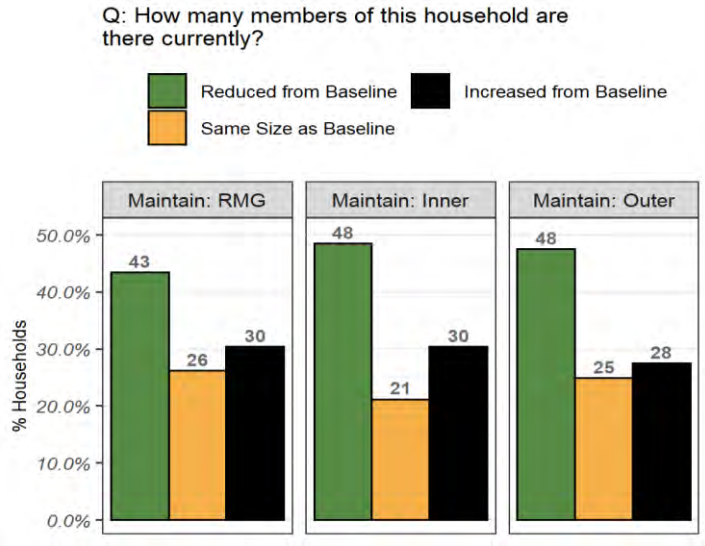


Table 13 summarises the changes in household size and level of migration of household members by the genders of the household heads at baseline and endline, which shows a clear migration effect – with outward migration of male heads from the region outpacing the return migration of these heads.

Table 13: Change in household head, size of household and migrant households between baseline and midline

Gender of household head (baseline:endline)	Share	Baseline household size	End	Baseline % migrants	Endline
Female:Female	11.7%	4.7	4.0	44.3%	42.4%
Female:Male	5.5%	5.2	5.1	46.5%	33.1%
Male:Female	10.7%	6.0	4.9	18.1%	56.9%
Male:Male	72.1%	6.1	5.7	18.8%	27.3%

Table 14: Average age of household between baseline, midline and endline by domain in build and maintenance area

Area	Strata	Baseline	Midline	Endline
Build	Build: RBG	41.9	44.8	47.4
Build	Build: Inner	43.2	46.1	48.1
Build	Build: Outer	43.9	47.3	47.8
Maintenance	Maintain: RMG	43.8	43.1	45.9
Maintenance	Maintain: Inner	44.9	48.4	49.8
Maintenance	Maintain: Outer	46.7	49.4	51.7

Table 15: Share of households with head aged 65 or older

Area	Strata	Baseline	Midline	Endline
Build	Build: RBG	3.35%	7.22%	9.02%
Build	Build: Inner	5.17%	9.04%	11.9%
Build	Build: Outer	4.98%	9.28%	9.95%
Maintenance	Maintain: RMG	4.26%	3.23%	4.69%
Maintenance	Maintain: Inner	7.21%	12.7%	14.4%
Maintenance	Maintain: Outer	8.41%	12.9%	16.8%

C2. Migration trends

Migration is an important factor in changing trends in western Nepal, without which there is an incomplete understanding of the region in broader cultural, social and economic terms. Migration is generally thought of as people moving for economic reasons (primarily, although not exclusively, to India), with many men seeking work. Many people move not just for work, but to buy and sell land, relocate (usually to the Terai) or move for education purposes.

Figure 10: Share of households with at least one migrant member in build areas

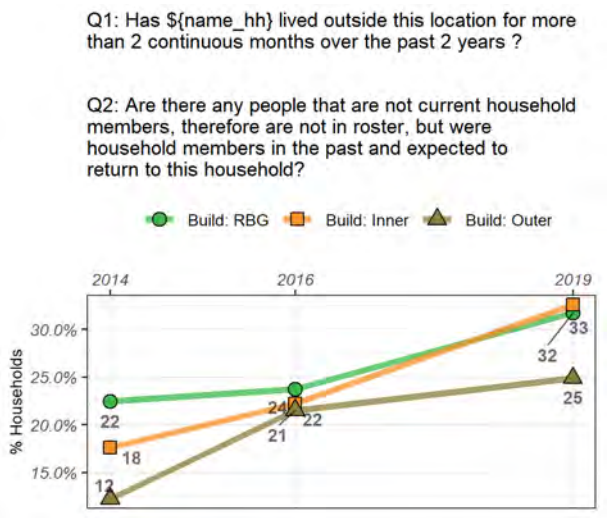


Figure 11: Share of households with at least one migrant member in maintenance areas

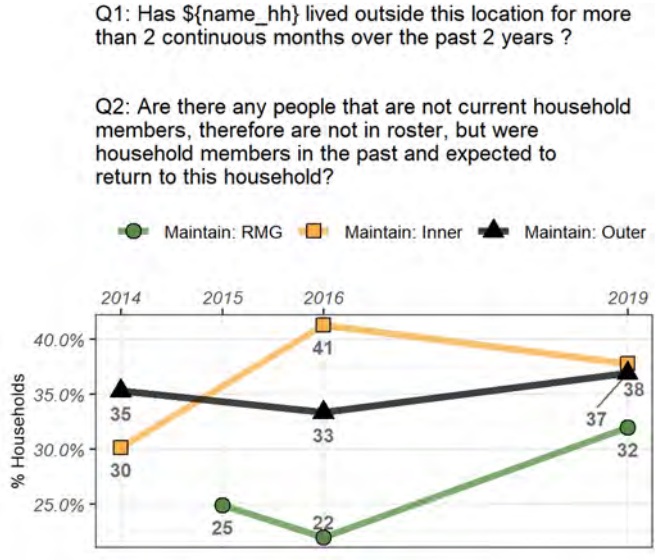


Table 16: Share of households with any migrants by domain in build and maintenance area

Area	Strata	2014	2015	2016	2019
Build	Build: RBG	22.4%	NA	23.7%	31.7%
Build	Build: Inner	17.6%	NA	22.2%	32.6%
Build	Build: Outer	12.2%	NA	21.5%	24.9%
Maintenance	Maintain: RMG	NA	24.9%	22.0%	32.0%
Maintenance	Maintain: Inner	30.1%	NA	41.3%	37.8%
Maintenance	Maintain: Outer	35.3%	NA	33.3%	36.9%

Table 17: Share of households with any migrants in each RAP district

Area	District	2014	2016	2019
Build	Bajura	20.5%	23.6%	44.4%
Build	Humla	3.2%	25.5%	28.0%
Build	Kalikot	26.6%	27.9%	35.9%
Build	Mugu	17.2%	13.5%	11.0%
Maintenance	Achham	26.1%	36.0%	37.7%
Maintenance	Dailekh	23.7%	30.7%	42.2%
Maintenance	Doti	45.2%	36.9%	41.4%
Maintenance	Jumla	26.9%	29.0%	20.4%

Table 18: Endline share of households with returned migrants (in past 2 years) or current migrants

Strata	Returned	Current
Build: RBG	7.7%	30.8%
Build: Inner	10.2%	32.5%
Build: Outer	10.9%	25.1%
Maintain: RMG	11.1%	33.2%
Maintain: Inner	15.7%	38.5%
Maintain: Outer	15.3%	36.9%

Figure 12: Destination of migrants by domain in build and maintenance area

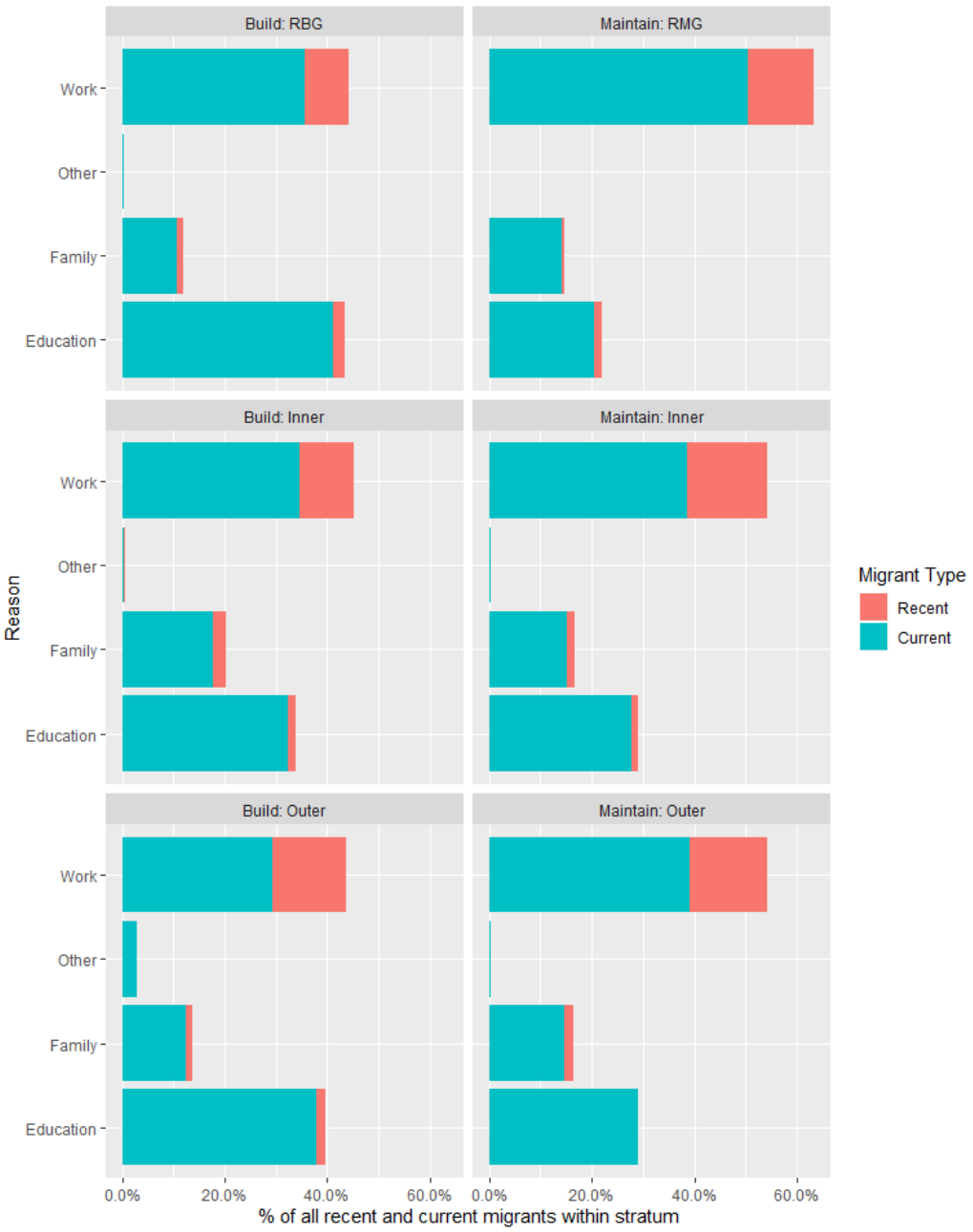


Figure 13: Destination of migrants (excluding for education reason) by domain in build and maintenance area

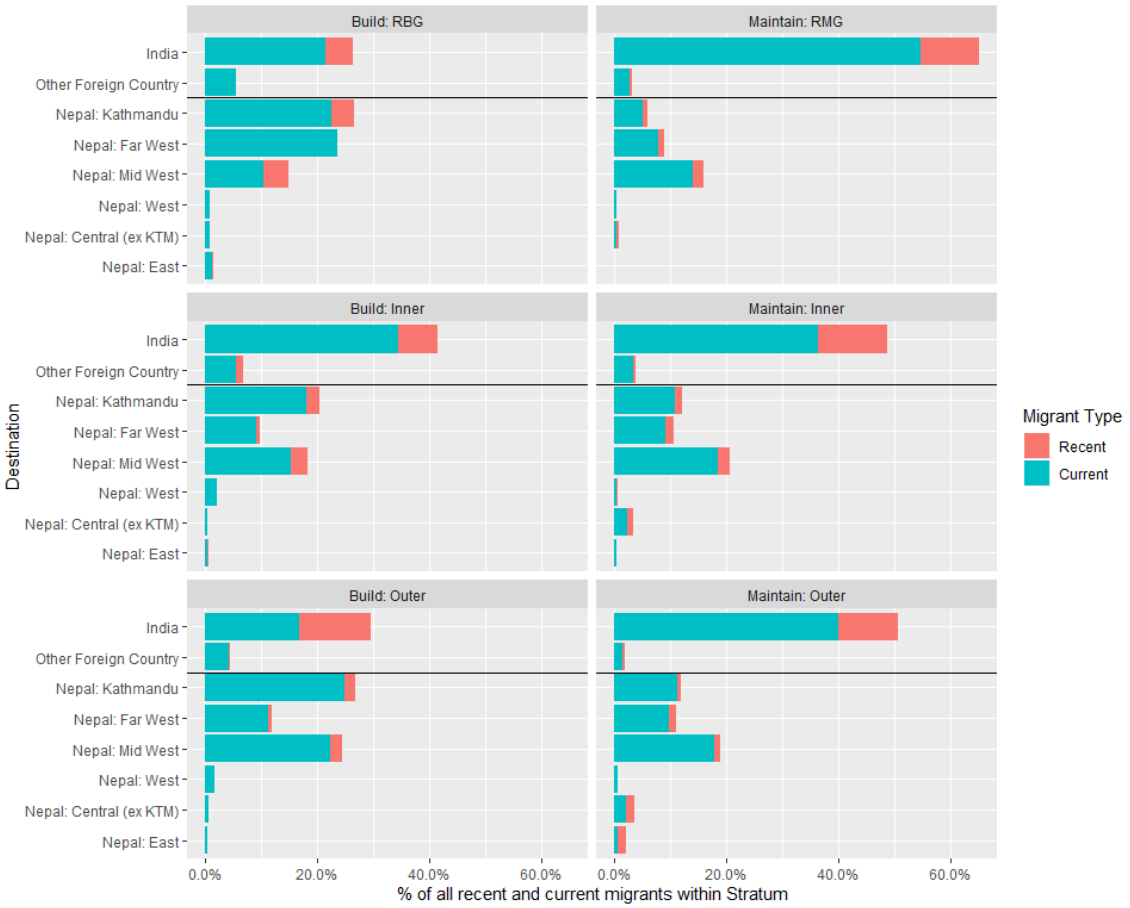


Table 19: Share of households with two or more non-education current migrants by domain in build and maintenance area

Domain	Baseline	Midline	Endline
Build: RBG	3%	3%	5%
Build: Inner	3%	4%	9%
Build: Outer	3%	4%	7%
Maintain: RMG	7%	7%	11%
Maintain: Inner	7%	12%	10%
Maintain: Outer	10%	8%	13%

Figure 14: Reason for migration by domain in build and maintenance area

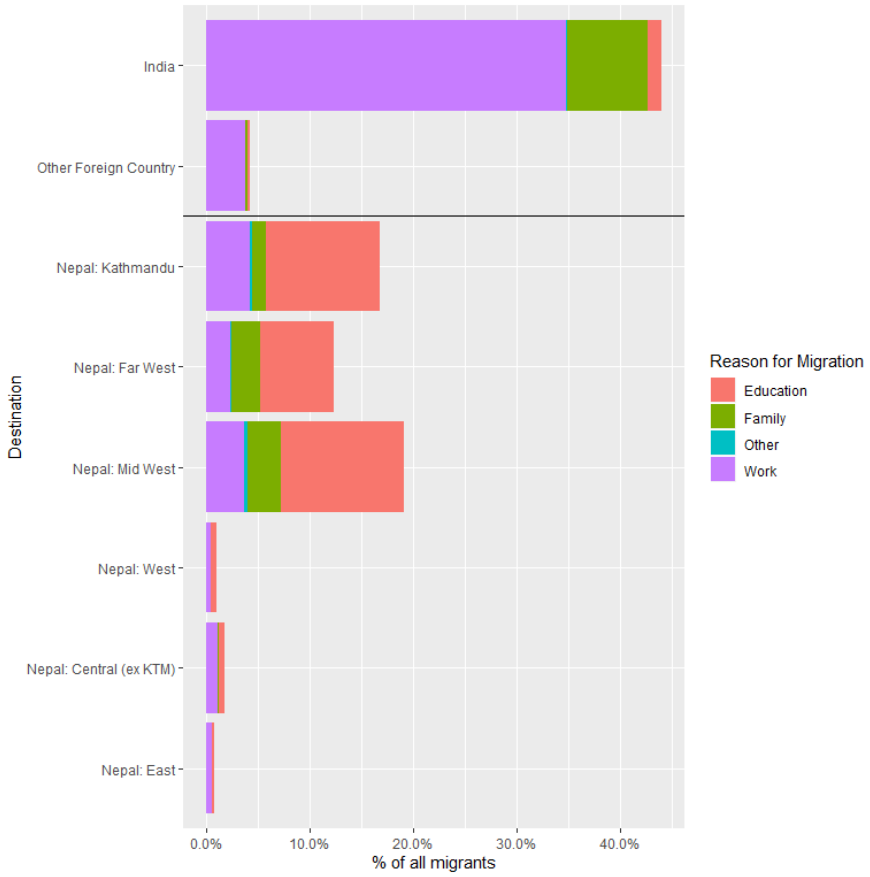


Table 20: Share of households with any members leaving for education at endline

District	Education
Achham	12.2%
Bajura	18.3%
Dailekh	17.1%
Doti	8.7%
Humla	25.1%
Jumla	15.5%
Kalikot	11.8%
Mugu	6.9%

C3. Poverty

C3.1. Defining poverty

Three overlapping yet distinct factors that affect wellbeing in rural Nepal underpin the rationale for RAP-3 and the overall intended impact as stated in the programme's ToC:[8] poverty, vulnerability and exclusion:

[8] This version added the element of '*reduction in vulnerability*' to the original ToC, which stated the intended impact as *'reduction in poverty and exclusion in the RAP 3 Road Transport Infrastructure Area'* (RAP-3 Inception Milestone 3, August 2013).

1. **Poverty** in the context of western Nepal is linked to a number of factors related to food security, lack of employment and income, assets and remoteness. Over the life of the programme, there have been several attempts to define this intention more clearly and to identify appropriate metrics.[9]
2. **Vulnerability** refers to the likelihood (actual and perceived) that individuals, households or communities will be in a situation in which they are no longer able to cope.[10] Vulnerability combines exposure to external risk and shocks (e.g. drought, earthquakes, conflict, national economic and market crises) with people's own sense of insecurity and powerlessness. Reducing vulnerability or strengthening resilience ('coping strategies') can often include (i) diversification of income, (ii) asset accumulation and savings and (iii) building social capital.
3. **Exclusion** in the RAP-3 context was framed primarily in terms of geographic exclusion and a purposeful focus on western Nepal, where communities are remote and where road networks are sparse or non-existent. However, there were other efforts to address exclusion by RAP-3, which used pro-poor selection criteria in forming RBGs and RMGs. DFID Nepal (2012)[11] noted that Dalits in western Nepal are significantly more likely to be poor than others and consequently RAP-3 took affirmative action to include Dalits in RBGs and RMGs. As per government guidelines, it also pledged to employ women as one third of the workforce.

The impact assessment used the following metrics to examine poverty reduction, vulnerability and exclusion (Table 21).

Table 21: Measures used by MEL to examine the multi-dimensions of poverty expressed in the overall impact statement – 'reduction in poverty, vulnerability and exclusion in western Nepal'

Element of impact statement	Metric or index used
Poverty	• Proxy means testing (PMT) • Progress out of poverty (PPI)
Vulnerability	• Income diversification • Asset and savings accumulation • Food consumption score (part of PMT)
Exclusion	• Gender and caste-disaggregated household survey data

The poverty line and food poverty line are poverty thresholds defined for western Nepal from NLSS-III. In short, the poverty line provides the minimum consumption level per person per year for essentials (i.e. clothing, housing, etc.) and the food poverty line is the minimum annual monetary value of approximately 2,100 calories food intake per person per day.

Nevertheless, the PMT and PPI approaches provide two distinct methods of measuring multidimensional (that is, not solely income-related) poverty. Though by no means perfect, these approaches give rich insights into short- and longer-term aspects of poverty trends in the region.

C3.2. Analysis of poverty change

Table 22 indicates the percentage of households classified below the poverty line at each of the surveys (baseline, midline and endline) in each of the domains, while Table 23 indicates the same by each district in the build and maintenance domains. This is an analysis of poverty change using the PMT measurement of poverty.

[9] The original impact indicator used was '*number of people lifted out of short-term poverty by 2017*' where a target of 20,000 was set (DFID RAP-3 Business Case, 2013).
[10] DFID Nepal: An Inclusive Growth Strategy for the Mid-West and Far-West Regions of Nepal that Delivers on Poverty, Vulnerability, Food Security and Nutritional Outcomes, September 2012
[11] DFID Nepal An Inclusive Growth Strategy for the Mid-West and Far-West Regions of Nepal that Delivers on Poverty, Vulnerability, Food Security and Nutritional Outcomes, September 2012

Table 22: Share of households classified below the poverty line by domain in the build and maintenance districts (PMT change)

Strata	Baseline	Midline	Endline	Change from baseline
Build: RBG	57.2%	51.0%	25.8%	**-31.4%**
Build: Inner	59.9%	58.7%	31.0%	**-28.9%**
Build: Outer	56.2%	57.5%	42.7%	**-13.4%**
Maintain: RMG	62.3%	64.5%	39.3%	**-23.0%**
Maintain: Inner	65.7%	58.7%	43.0%	**-22.7%**
Maintain: Outer	**69.6%**	**70.2%**	**54.4%**	**-15.2%**

Figure 15: Share of households under the poverty line in build districts (PMT)

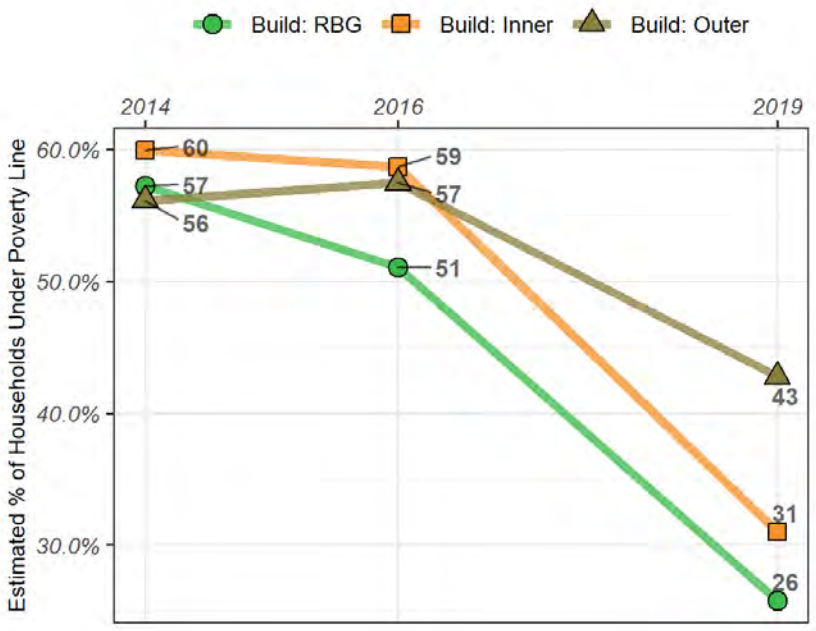


Figure 16: Share of households under the poverty line in maintenance districts (PMT)

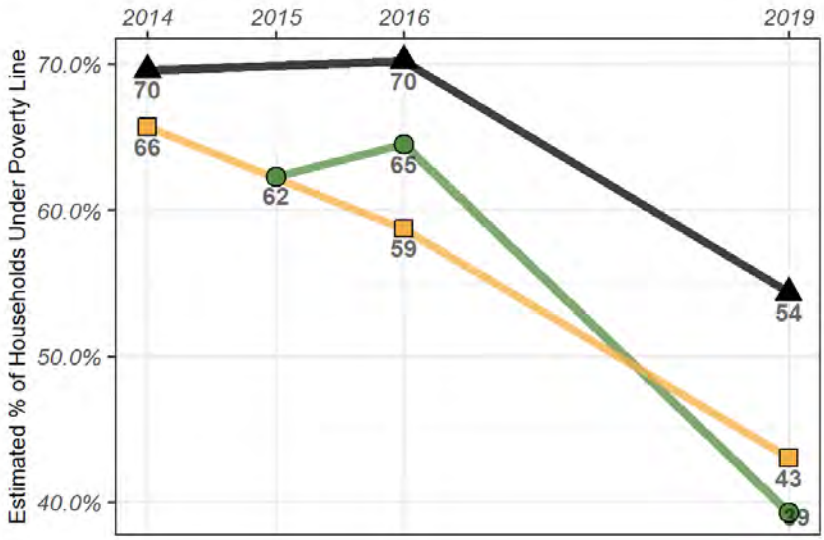


Table 23: Share of households below the poverty line by district (PMT change)

Area	District	Baseline	Midline	Endline	Change from Baseline
Build	Bajura	61.3%	65.0%	37.7%	**-23.6%**
Build	Humla	58.9%	51.1%	39.0%	**-19.9%**
Build	Kalikot	63.5%	66.3%	24.7%	**-38.8%**
Build	Mugu	47.9%	41.4%	33.7%	**-14.1%**
Maintenance	Achham	59.1%	66.7%	47.7%	**-11.4%**
Maintenance	Dailekh	78.8%	69.7%	48.4%	**-30.5%**
Maintenance	Doti	73.8%	69.5%	39.8%	**-34.0%**
Maintenance	Jumla	52.1%	46.9%	42.9%	**-9.21%**

Figure 17: Share of households under the poverty line in build districts (PMT)

Figure 18: Share of households under the poverty line in maintenance districts (PMT)

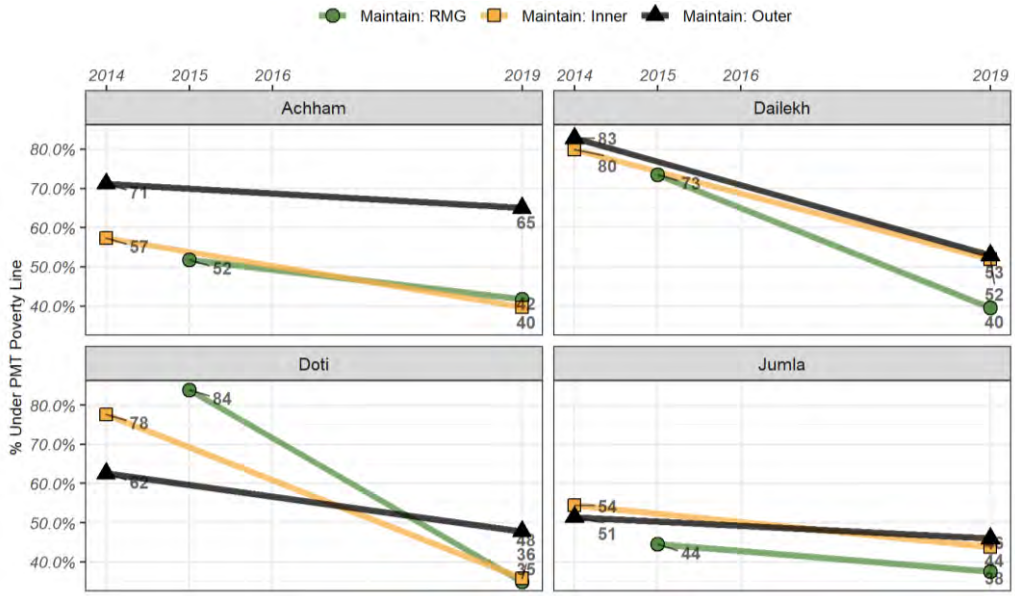


Table 24: Share of households that rose above, fell below or remained above or below the poverty line by domains in the build districts (PMT change)

Change since baseline	Build: RBG	Build: Inner	Build: Outer
Stayed below poverty line	17.8%	20.7%	28.6%
Stayed above poverty line	34.8%	29.7%	29.8%
Rose above poverty line	39.4%	39.3%	27.5%
Fell below poverty line	8.0%	10.3%	14.1%

Table 25: Share of households that rose above, fell below or remained above or below the poverty line by domains in the maintenance districts (PMT change)

Change since baseline	Maintain: RMG	Maintain: Inner	Maintain: Outer
Stayed below poverty line	28.6%	35.2%	44.7%
Stayed above poverty line	26.4%	26.4%	20.7%
Rose above poverty line	33.7%	30.6%	24.9%
Fell below poverty line	11.2%	7.9%	9.7%

Table 26: Share of households that rose above, fell below or remained above or below the poverty line by build districts (PMT change)

Change since baseline	Bajura	Humla	Kalikot	Mugu
Stayed below poverty line	26.9%	28.7%	17.0%	18.7%
Stayed above poverty line	27.9%	30.9%	28.8%	37.1%
Rose above poverty line	34.3%	30.1%	46.5%	29.1%
Fell below poverty line	10.8%	10.3%	7.7%	15.0%

Table 27: Share of households that rose above, fell below or remained above or below the poverty line by maintenance districts (PMT change)

Change since baseline	Achham	Dailekh	Doti	Jumla
Stayed below poverty line	34.1%	44.2%	34.3%	30.6%
Stayed above poverty line	27.3%	16.4%	20.6%	35.5%
Rose above poverty line	24.9%	34.7%	39.5%	21.5%
Fell below poverty line	13.6%	4.7%	5.6%	12.4%

Figure 19: Share of households under the poverty line by gender of household head in build districts (PMT)

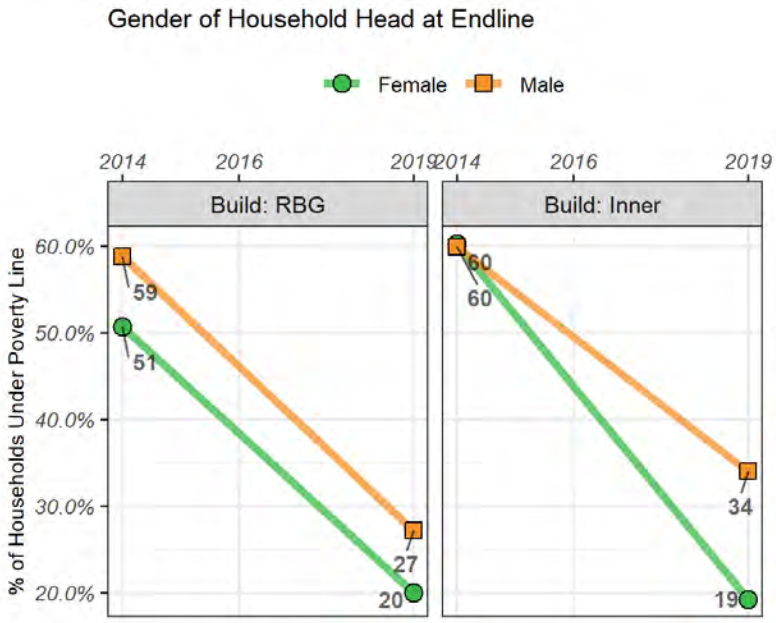
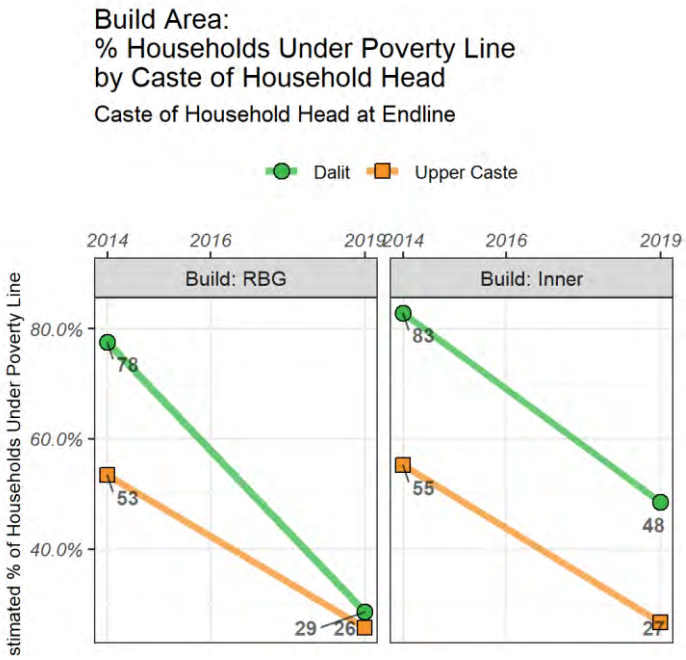


Figure 20: Caste (upper caste and Dalit) disaggregated PMR estimated consumption per domain in build and maintenance area



C3.3. The proxy means test approach

The PMT approach sought to model household consumption on a range of explanatory variables to provide a multidimensional assessment of poverty, compared with the more straightforward and less useful income-only measure of poverty. In order to construct the PMT model, NLSS-III was used as the starting point, drawing on analysis conducted by the World Bank/Nepal Central Bureau of Statistics in 2013 that sought to calculate small area estimates of poverty across Nepal based on NLSS-III data.[12] Based on these criteria, a range of possible indicators was identified and the selected variables are summarised below in Table 28.

[12] Central Bureau of Statistics/World Bank (2013) Small Area Estimation of Poverty, 2011

Table 28: PMT explanatory variables

Domains	Variable
Constant	
Demography	Caste of head = Dalit
	% of house aged <=6
	% of house aged 7–15
	Household size
Education and employment	Tutor used for children
	Income from employment or sales
	Income from remittances
Housing	Number of rooms in house
	Roof is galvanised iron or concrete
	Firewood or dung as cooking fuel
Physical assets	Number of assets owned
	Phone owned = Yes
	Land owned
Productive assets	Use of any improved crop varieties
Health	Food consumption score
	Perception of healthcare facilities
Education and employment	Complete secondary education
Health	Unsafe birth deliveries
	Children under 24 months vaccinated against measles

Taking Inflation into account

The poverty lines determined as part of NLSS were based according to the value of goods in 2010. The monetary values have been adjusted from previous surveys to 2019 values based on consumer price index rates from Nepal Rastra Bank.[13] Inflation is calculated over 2014–2019 for the baseline (+39.8%), 2015–2019 for RMG baseline (+28.2%) and 2016–2019 for midline (+19.6%). Given that the definition of poverty is set at 2010 levels from the PMT, and that inflation may not have uniformly impacted all of the goods accounted for in the consumption aggregate, these figures should only be taken as a rough approximation and should not be taken as a reliable estimate of the current poverty line within Nepal or the current average cash values of the household consumption.

Changes in PMT variables between baseline and endline

The changes in the PMT estimates between the baseline and endline were largely driven by changes in a small number of the variables that make up the PMT. Table 29 illustrates the impact that changes within each PMT variable had on the predicted estimate of consumption. These effects show the overall shift in the PMT score as a result of each variable.

[13] https://www.nrb.org.np/ofg/macroeconomic.php?tp=current_macroeconomic&vw=15

Table 29: Overall change in PMT variables from baseline (2014) to endline (2019)

Average change from baseline to endline	Effect on PMT	Variable
-8%	5.70%	Household size
10%	4.26%	Food consumption score
43%	3.11%	Phone ownership
-32%	2.53%	Children (0–6)
88%	1.83%	Remittances
27%	1.45%	Assets
-17%	1.41%	Land owned
-11%	0.99%	Measles vaccination (VDC)
162%	0.72%	Improved crops
10%	0.68%	Education (VDC)
116%	0.49%	Roof material
-7%	0.38%	Children (7–15)
-1%	0.12%	Fuel
8%	0.03%	Household tutor
2%	-0.03%	Dalit
-6%	-0.82%	Non-wage income
-11%	-0.90%	Rooms in household
-29%	-1.03%	Healthcare quality
-25%	-3.07%	Safe births

A change of '0' could be either the result of negligible changes in the variables or the result of the same number of households seeing increases as are seeing decreases. Four variables in particular are showing net positive gains in the PMT estimate (accounting for increases of greater than 1%) – increased mobile phone ownership, reductions in household size, increases in households with at least one member with complete education, and smaller percentages of the household being made up of young children. Mobile phone ownership is particularly dominant in the increases being produced. The only variable showing a negative effect on the PMT of more than 1% is the food consumption score.

C3.4. Poverty Probability Index

The PPI is a measurement used to assess the likelihood of a household being classified as below the poverty line. The 2010 Nepal customised version of this measurement was used in the household survey comprising 10 indicators, summarised in Table 30, with a maximum score of 100.

Table 30: PPI indicators and weighted scores (out of 100)

Indicator	Max. value
Household size	34
Employment of male head	8
Number of bedrooms	11
Wall material	6
Roof material	7
Separate kitchen	5
Type of stove	3
Type of toilet	6
Phone ownership	14
Land ownership	6

The higher the PPI score the less likely a household is to be below the poverty line, as indicated by the estimated probabilities of a household being below the poverty line and food poverty line in Table 31.

Table 31: Estimated probability of household being below the poverty or food poverty line based on PPI score

PPI Score	Estimated probability of household being below:	
	Food poverty line	Poverty line
0	100%	100%
10	32%	78%
20	15%	59%
30	7%	39%
40	2%	18%
50	0%	5%
60	0%	2%
70	0%	0%

Figure 21: Average PPI score across domains in build area

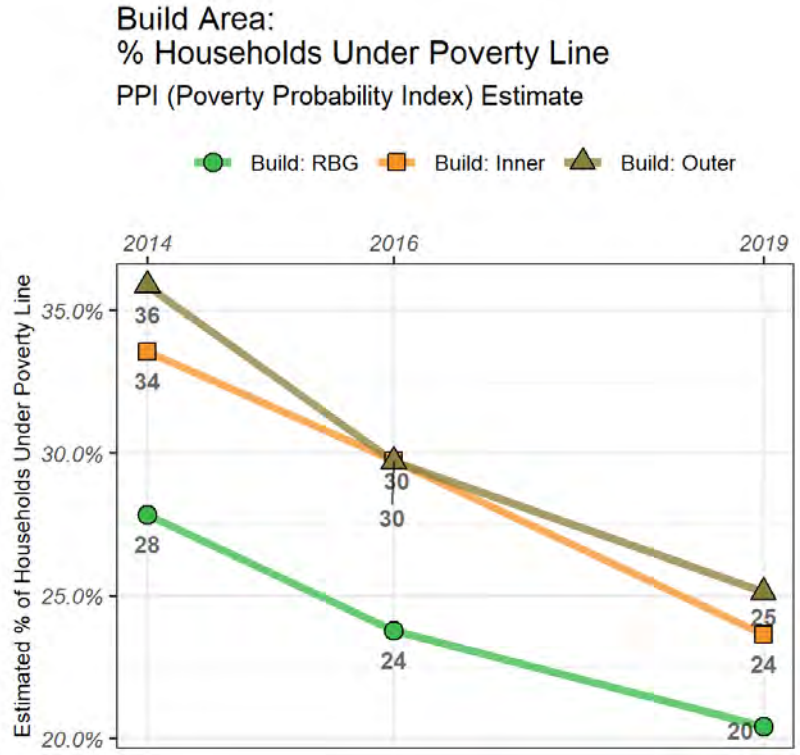


Figure 22: **PPI score across domains in maintenance area**

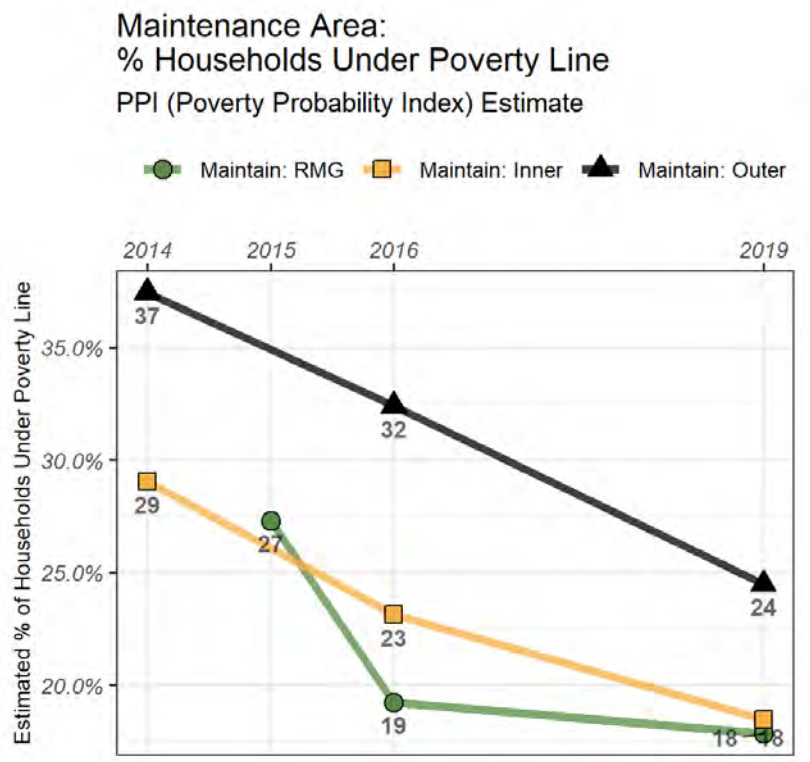


Table 32: Overall net effect of change in PPI indicators at endline since baseline

PPI	Variable	Net impact of changes on composite score
1	Household size	6.2%
2	Job	-0.9%
3	No. of bedrooms	1.2%
4	Wall material	0.0%
5	Roof material	1.2%
6	Kitchen	1.2%
7	Stove	0.1%
8	Toilet	-1.9%
9	Telephone	10.8%
10	Land	-0.8%

C4. Food consumption

The food consumption score (FCS), measured by assessing the frequency with which various food groups were eaten across a even-day recall period, showed highly significant reductions on average in all domains, with the exception of the inner maintenance domain (non-direct RAP beneficiaries) where there was no significant change in the outcome. Generally, a score of 35 or above is considered to be 'acceptable', in terms of obtaining a sufficient quantity and diversity of food intake.

Figure 23: Food consumption score per domain in build area

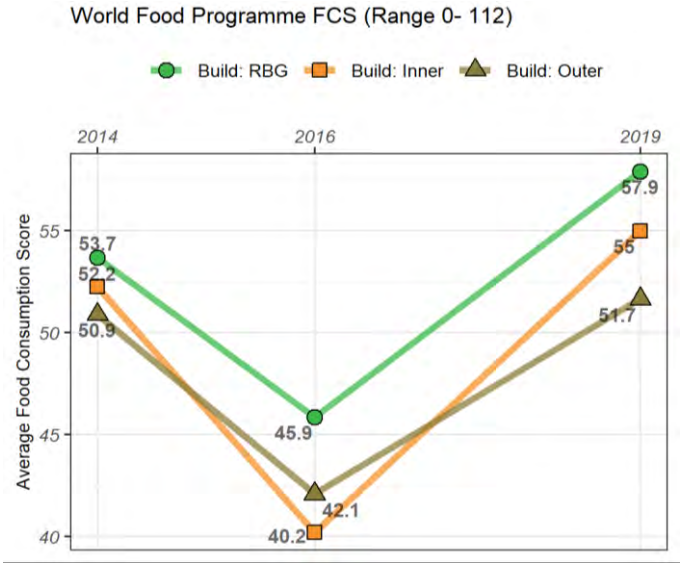


Figure 24: Food consumption score per domain in maintenance area

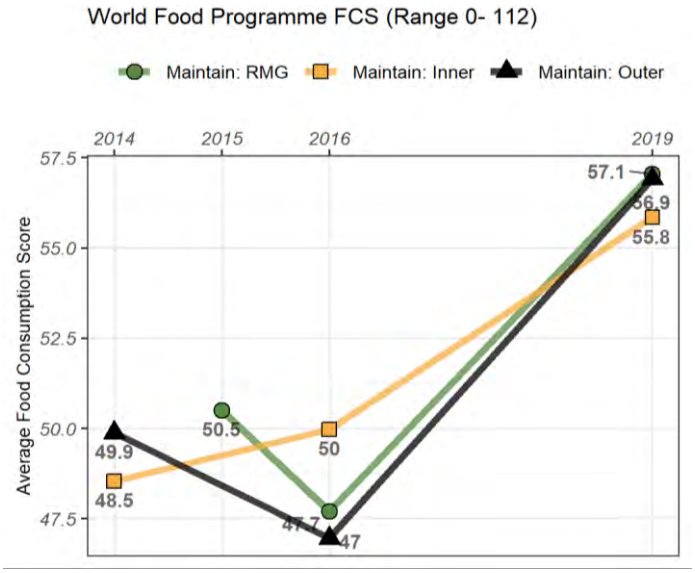


Figure 25: Acceptable food consumption score by domain in build area

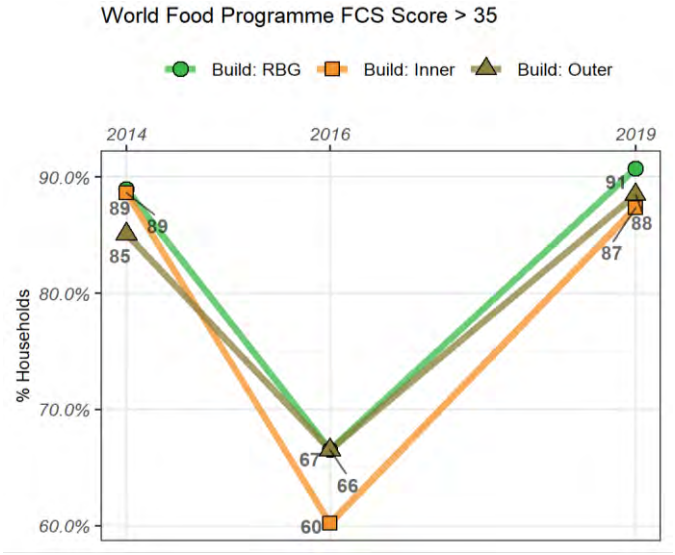


Figure 26: Acceptable food consumption score by domain in maintenance area

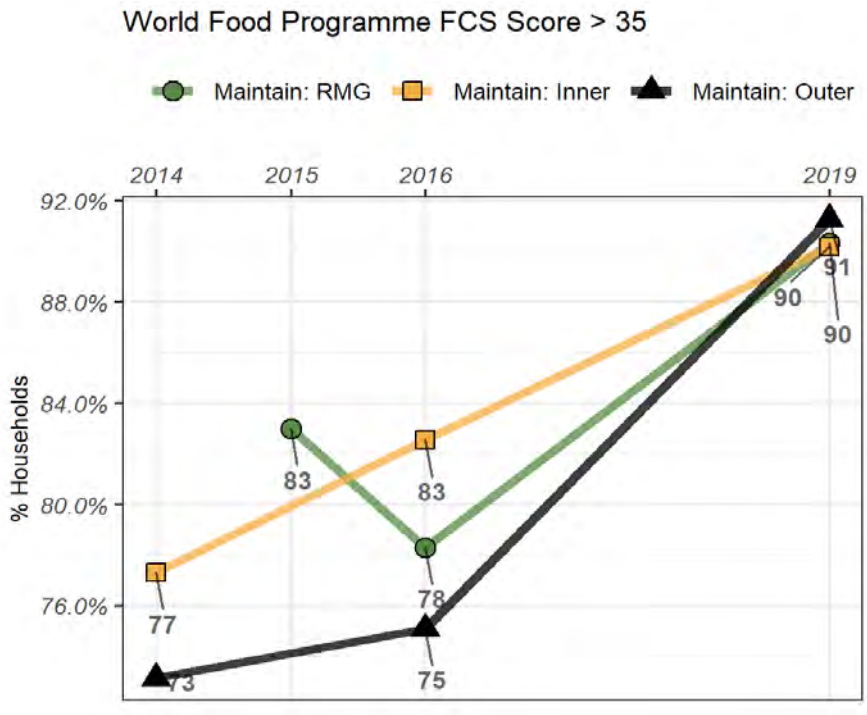


Figure 27: Consumption of different food types by domain in build area

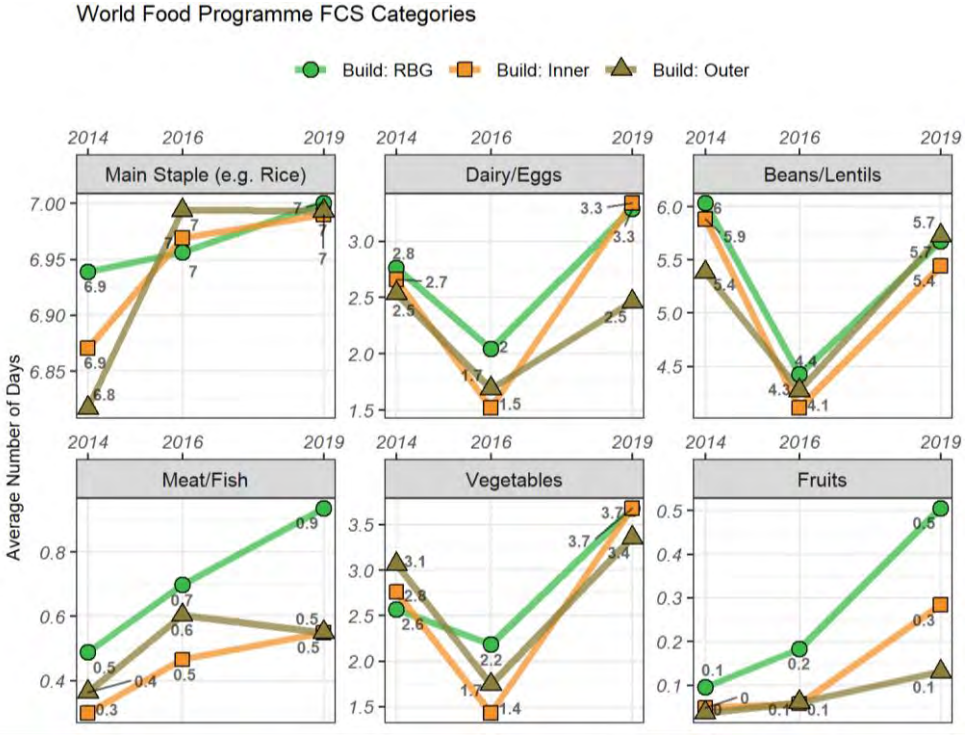


Figure 28: Average days type of food consumed by domain in build area

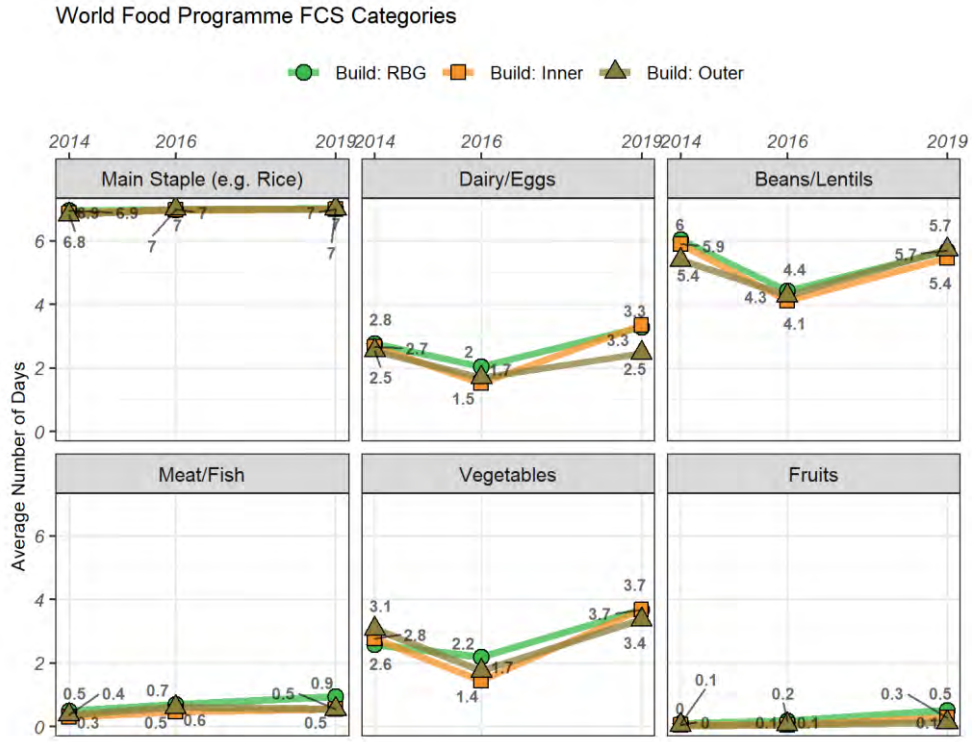


Figure 29: Consumption of different food types by domain in maintenance area

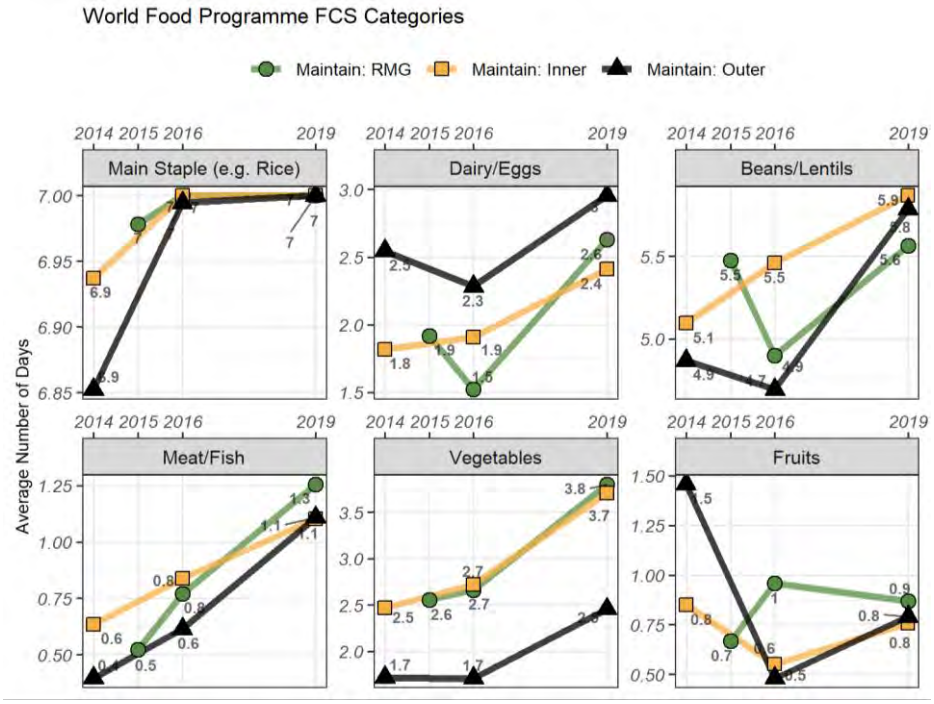


Figure 30: Average days type of food consumed by domain in maintenance area

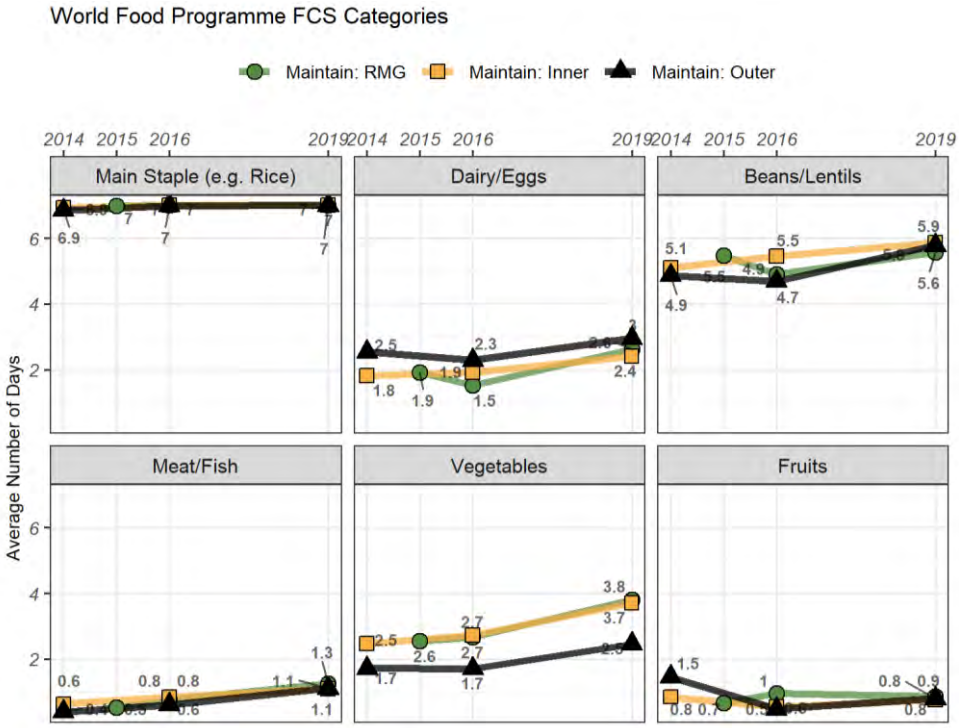


Figure 31: Caste-based difference in average food consumption score across the region – build area

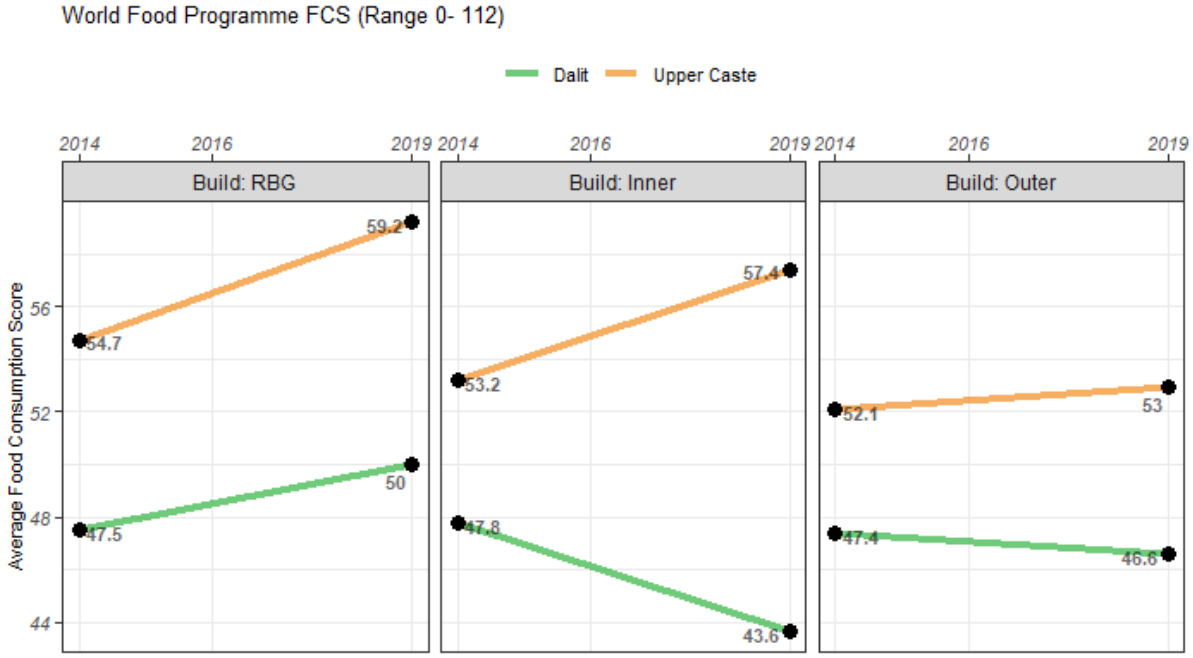


Figure 32: Caste-based difference in average food consumption score across the region – maintenance area

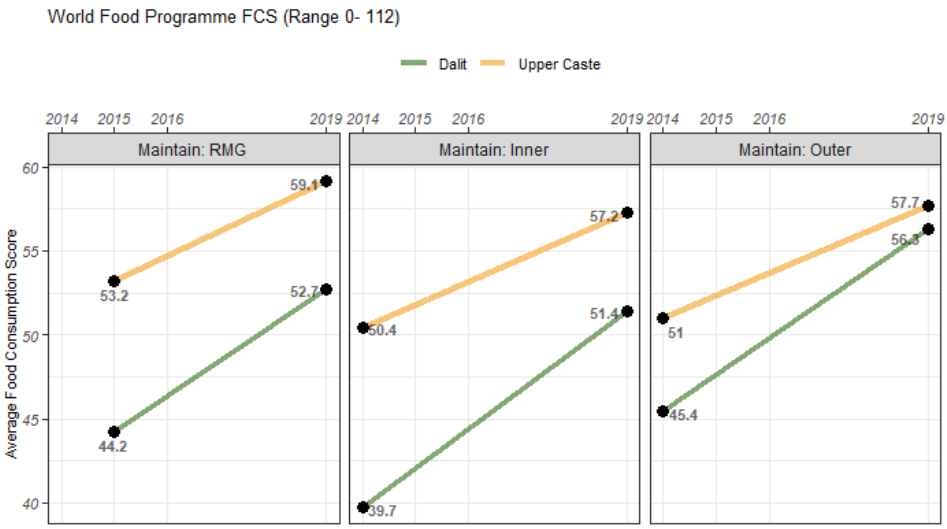


Table 33: Share of households with at least one day in the past 30 days without sufficient food

Strata	Baseline	Endline
Build: RBG	18.9%	7.47%
Build: Inner	23.0%	9.24%
Build: Outer	28.1%	7.07%
Maintain: RMG	6.0%	5.14%
Maintain: Inner	8.7%	4.76%
Maintain: Outer	4.3%	1.47%

C5. Household finances (income)

Table 34 outlines the different income sources accounted for in the questionnaire, which include a mixture of cash and in-kind income. Respondents were asked to recall income over the past 12 months for all of these sources and provide an approximate valuation for goods in kind.

Table 34: Definition of different types of income sources

Category	Income sources accounted for
Remittances	Either money or goods (valued in kind) obtained from: i) Migrant household members ii) Household members returning to the household iii) Gifts from non-household members
Wages	Paid employment through informal contract, short-term contracts or longer-term contracts. Includes benefits in kind
Sales	Sales of livestock or livestock-related products (milk, ghee, eggs, animal hides, manure etc.) Sales (or rentals) of draft animals, tractors, grinders, threshers, seeds, fodder, wood, charcoal, herbal plants
Enterprise	Income from any non-agricultural enterprises run by household
Crop sales	Sales of any harvested crops
Benefits	Value of benefits received (cash or in-kind) from nutritional supplementation for mothers, elderly persons' allowance, disability allowance, maternal incentive scheme, single women's allowance, food for work programme

Figure 33: Median value of annual household income between baseline and endline by domain in build area

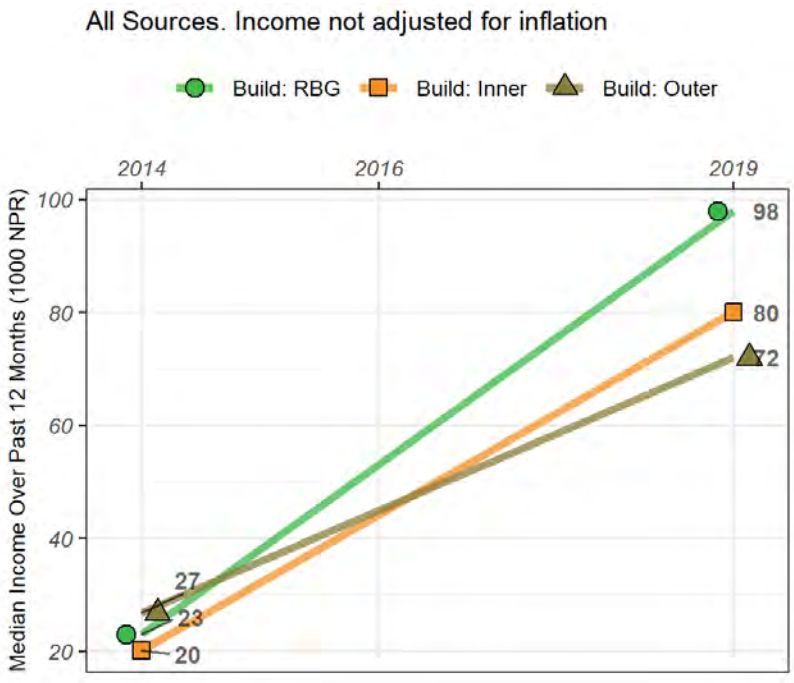


Figure 34: Median value of annual household income between baseline and endline by domain in maintenance area

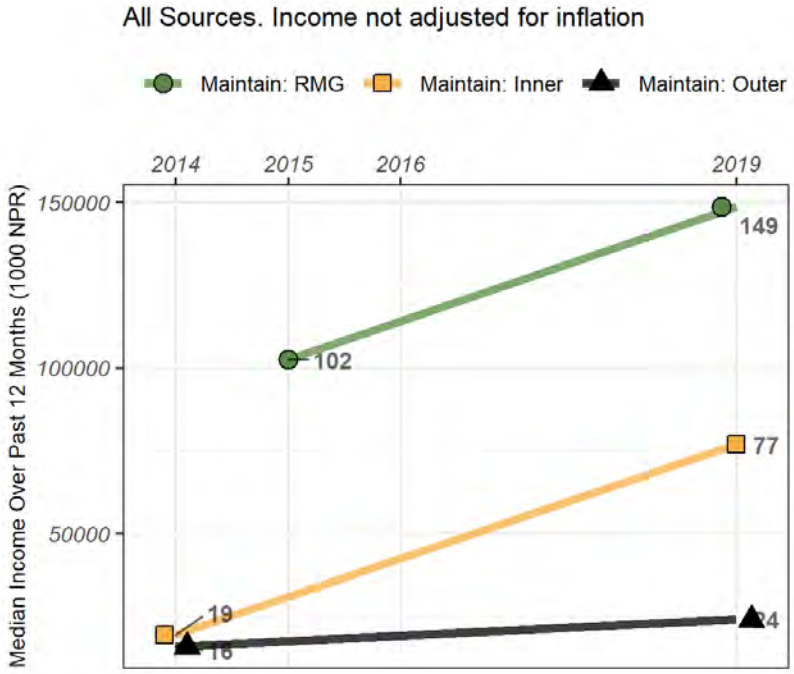


Figure 35: Number of income sources – build area

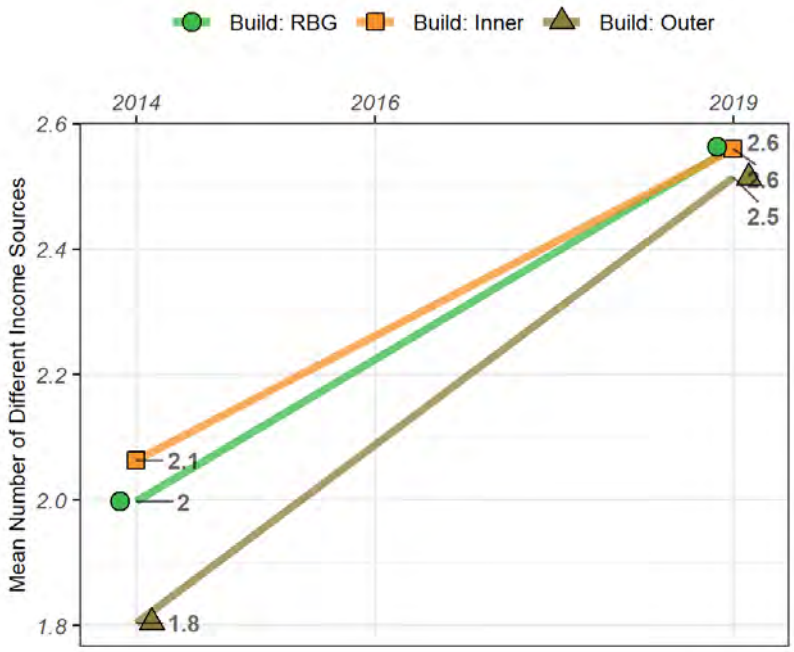


Figure 36: Mean number of income sources – maintenance area

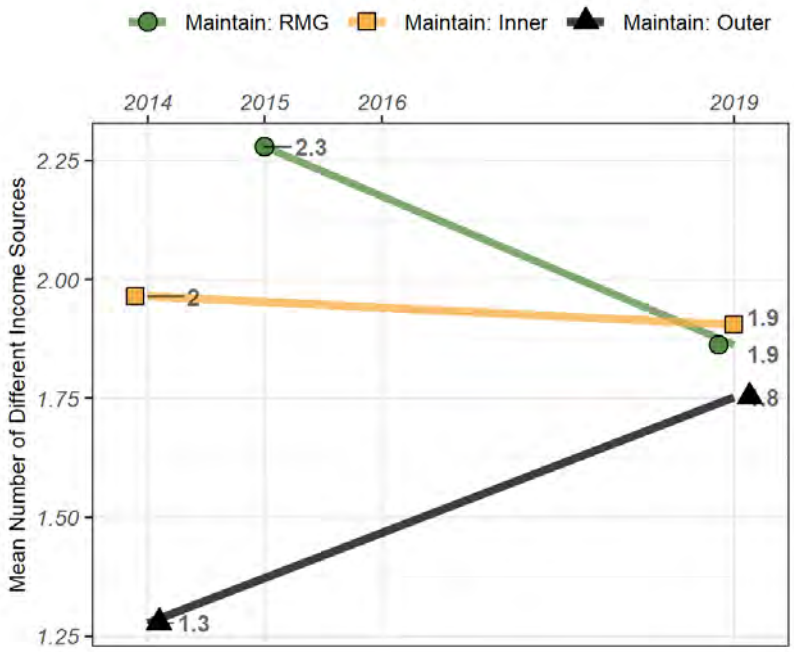


Figure 37: Share of households receiving income from any source by domain in build area

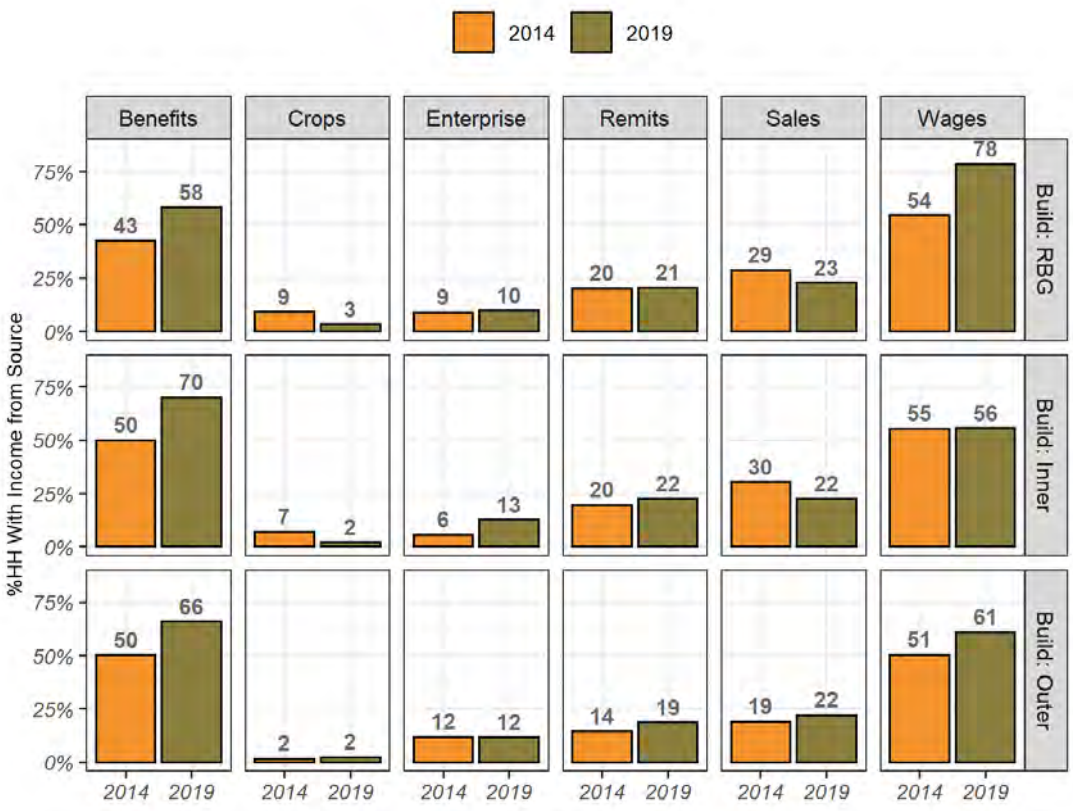


Figure 38: Share of households receiving any income from different categories

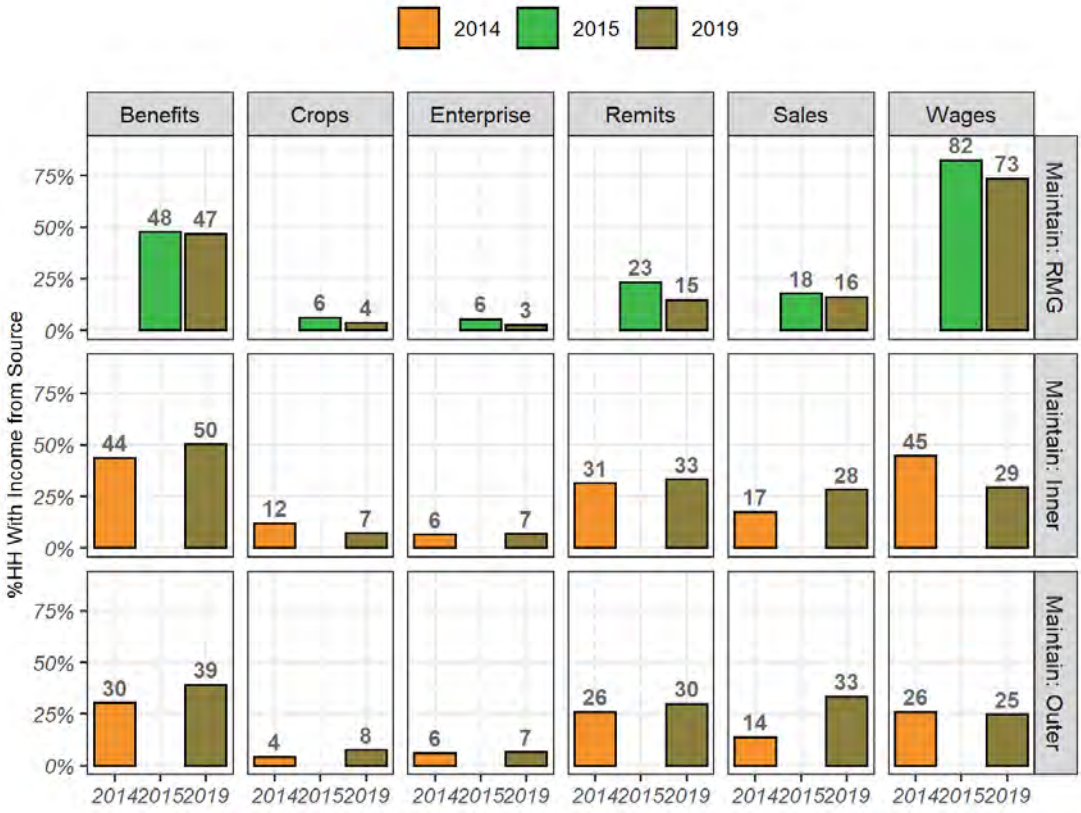


Figure 39: Share of total income – maintenance domains

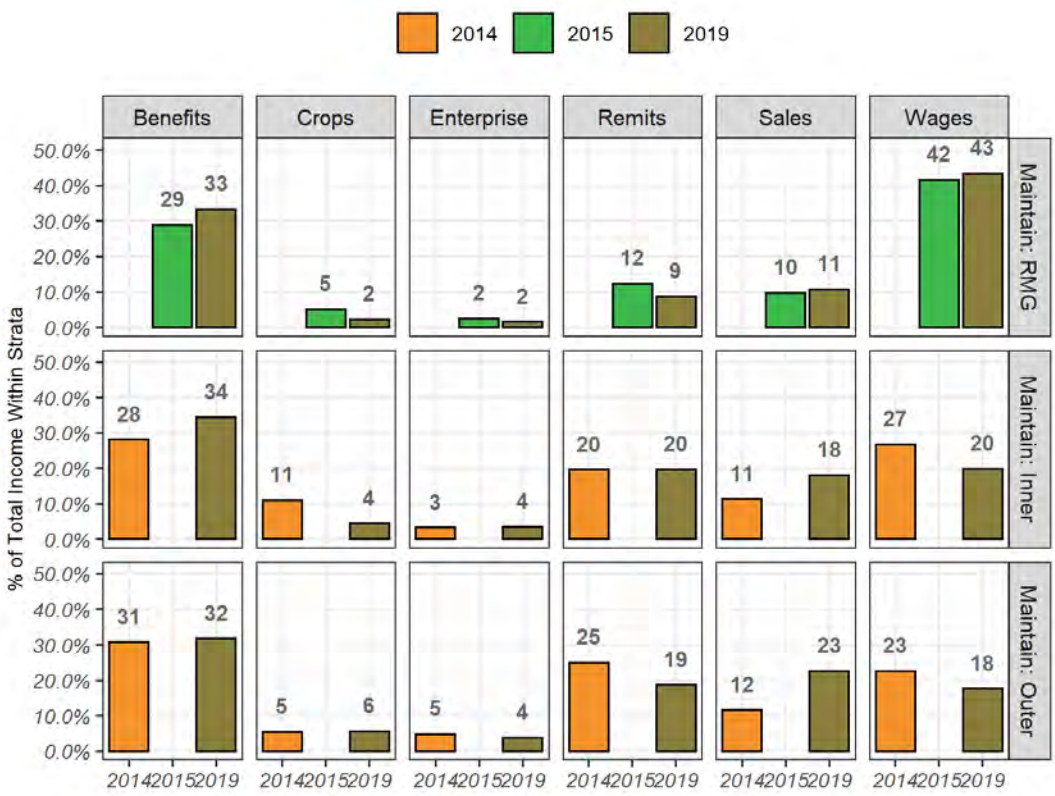
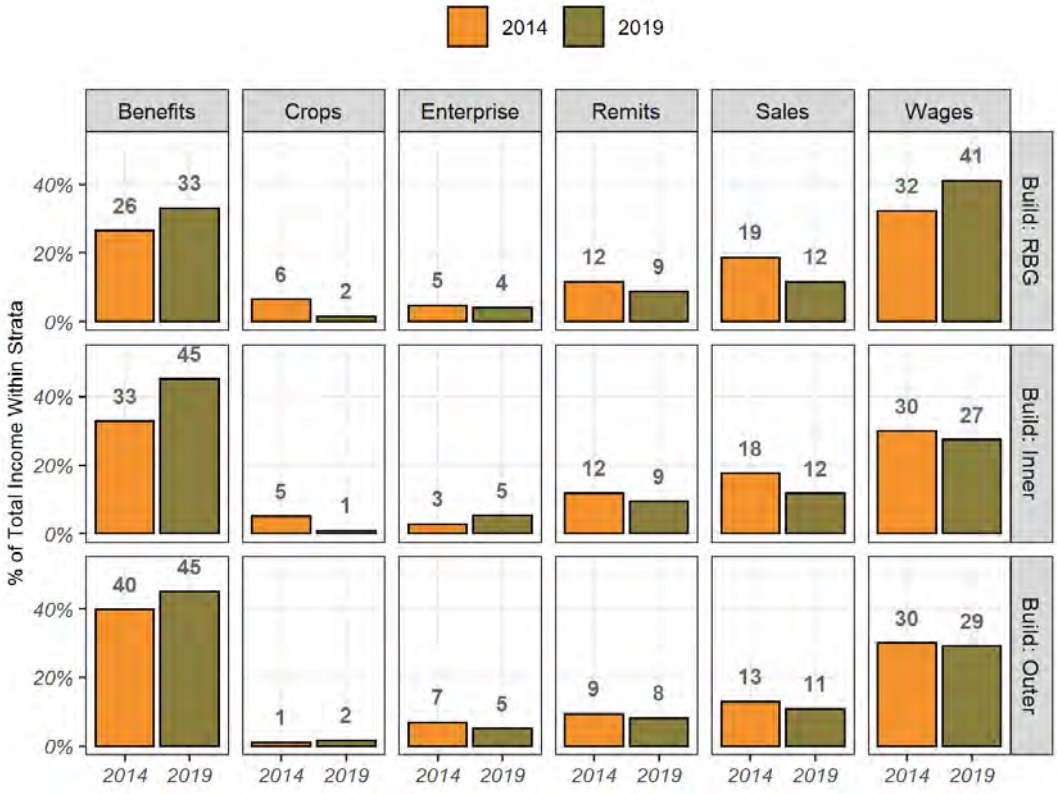


Figure 40: Share of contribution to total income from each category – build area



C6. Savings

Figure 41: Median amount in savings account – build area

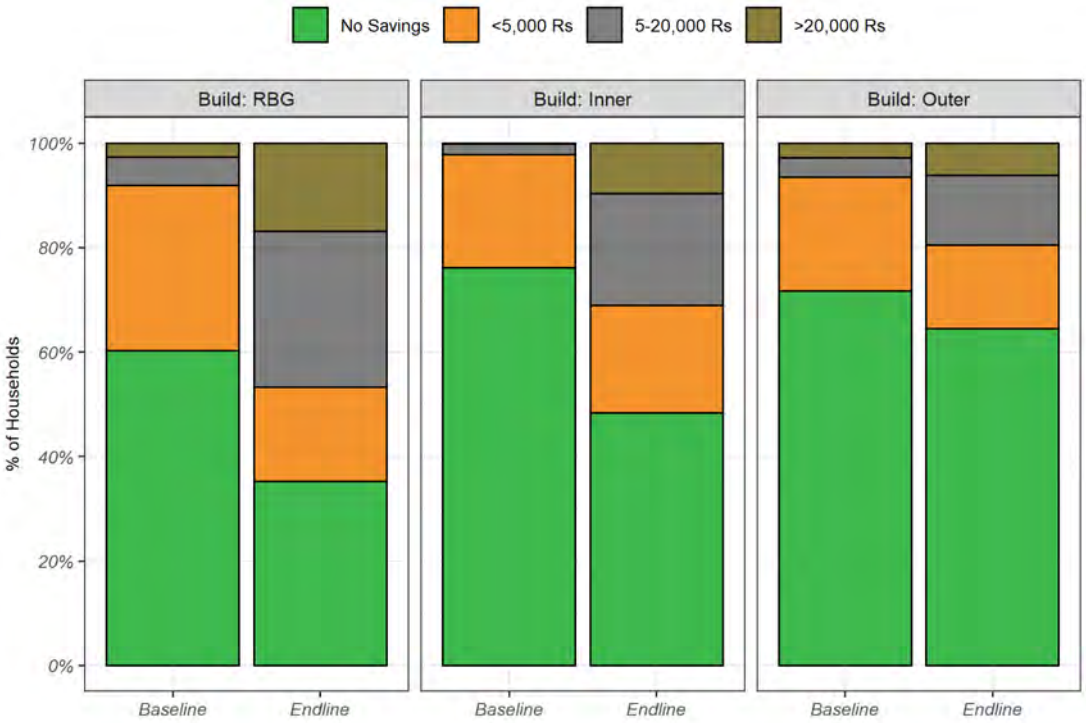


Figure 42: Median amount in savings account – maintenance area

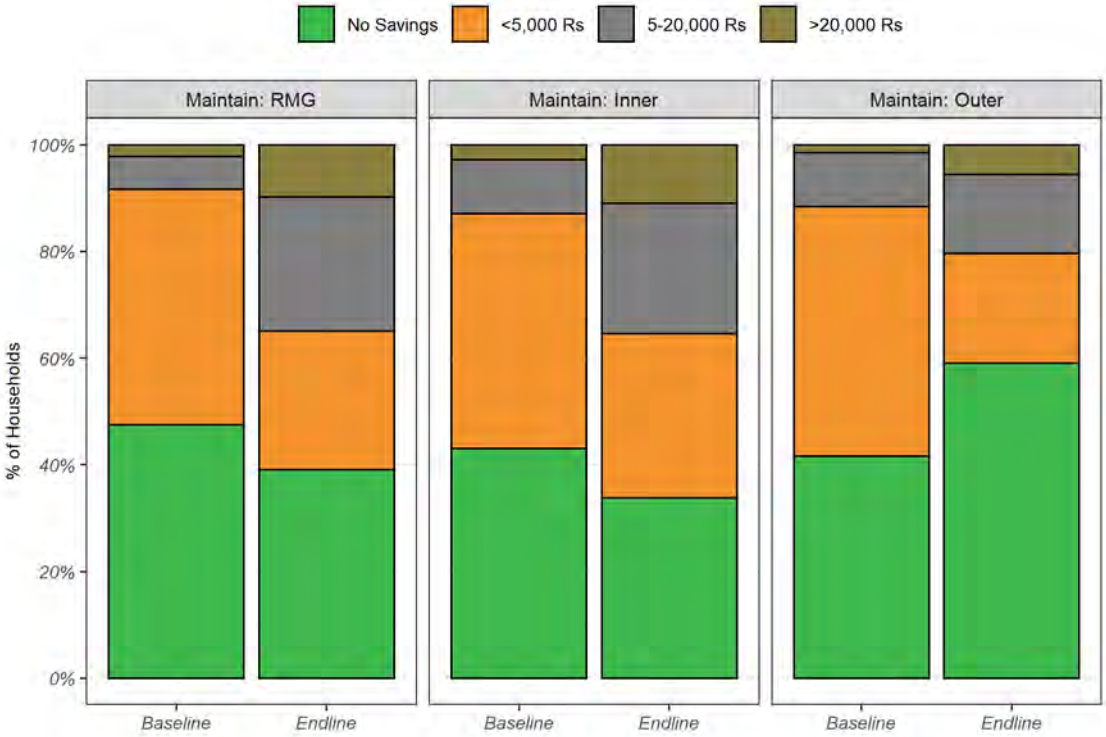


Figure 43: Where savings are held – build area

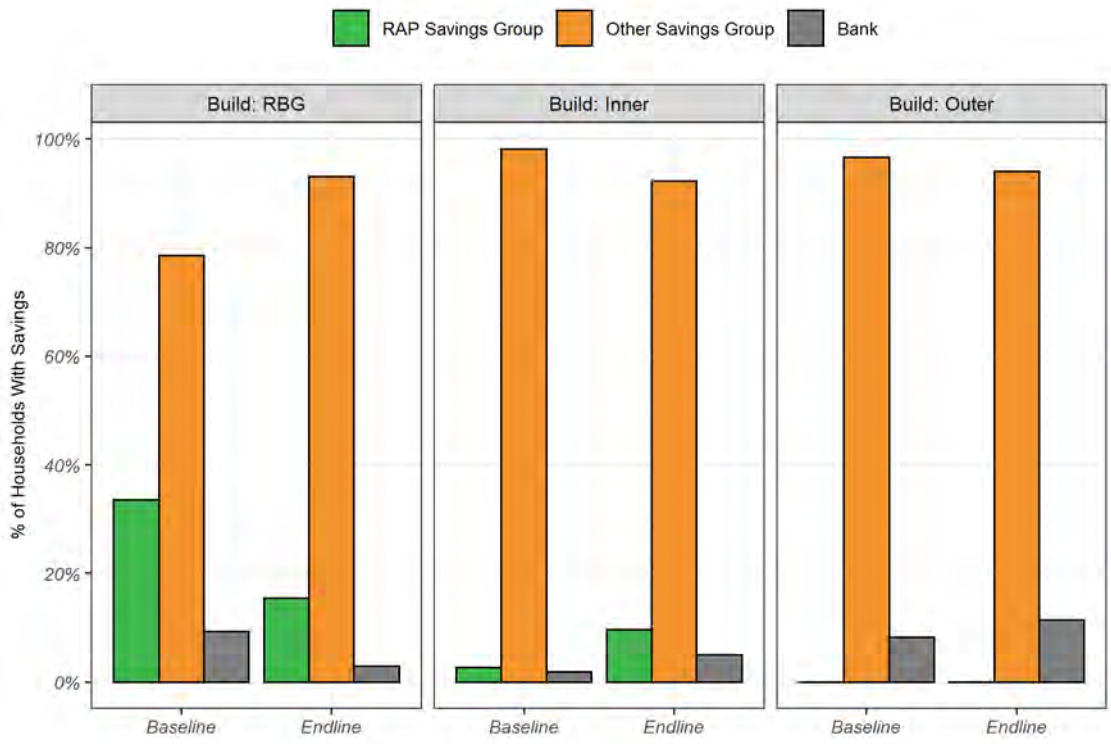
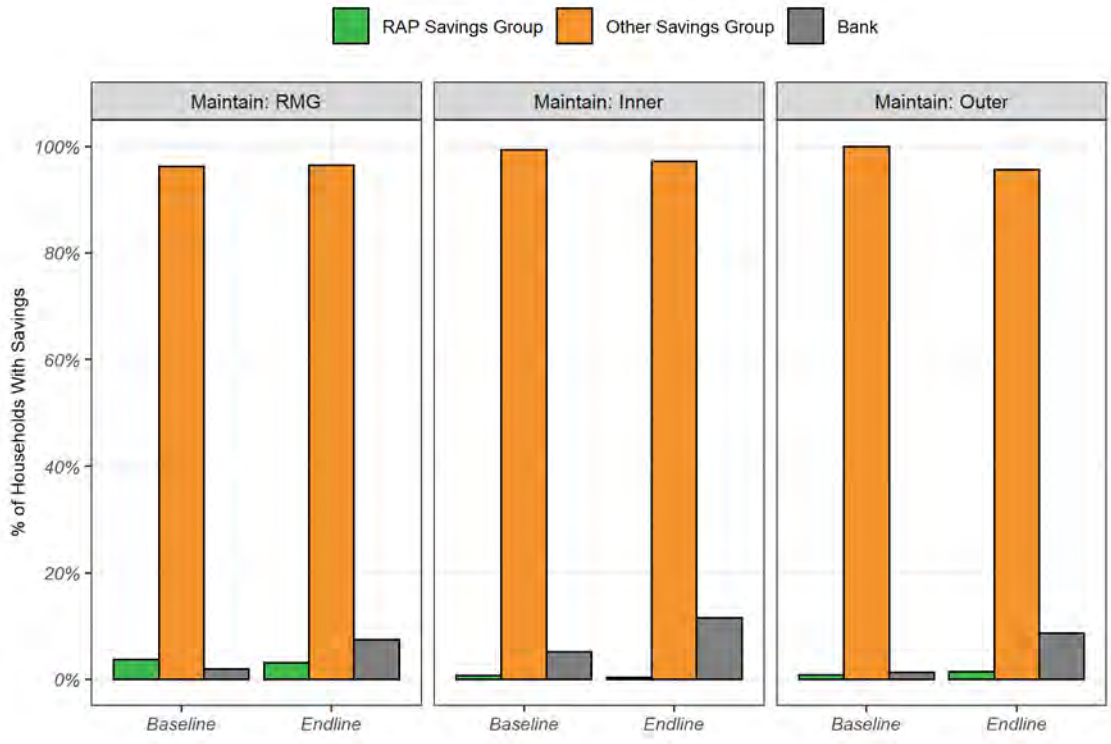


Figure 44: Where savings are held – maintenance area



C7. Mobile phone ownership

Mobile phone ownership increased substantially in all areas, particularly in the new build areas. Increases were fairly consistent across all domains with around 90% ownership at endline.

Figure 45: Share of households owning at least one mobile phone by domain in build area

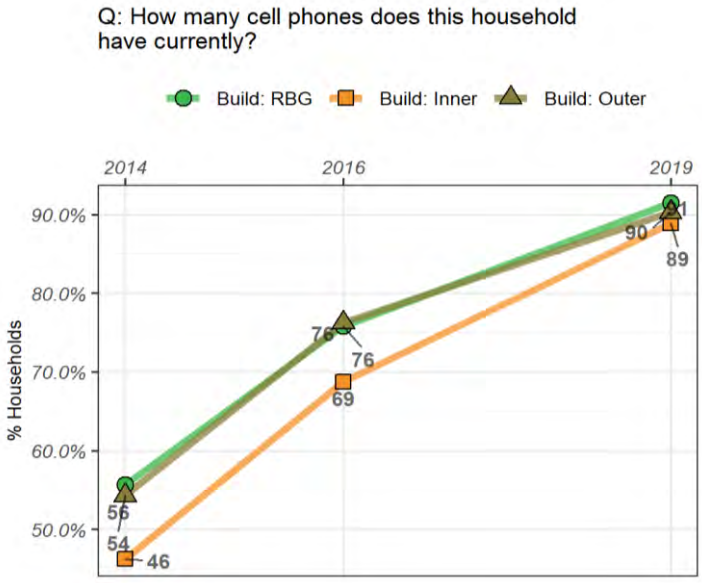
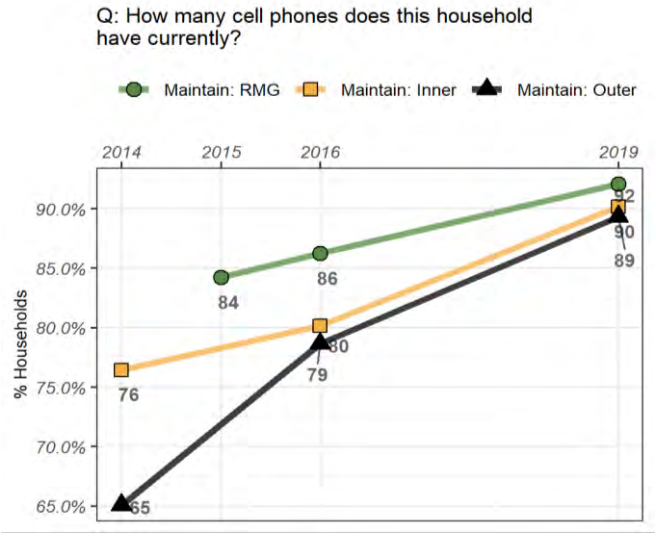


Figure 46: Share of households owning at least one mobile phone by domain in maintenance area



C8. Health

Households were asked about any minor illnesses or injuries that had occurred within the previous 30 days. Table 35 illustrates the percentage of minor illnesses within each domain that incurred monetary costs, through the purchase of medicine, transport or treatment/consultation fees.

Table 35: Share of minor illnesses incurring treatment/medicine costs

Domain	% of minor illness incurring treatment/medicine costs		
	Baseline	Midline	Endline
Build: RBG	67%	77%	62%
Build: Inner	59%	63%	45%
Build: Outer	66%	63%	58%
Maintenance: RMG	72%	83%	87%
Maintenance: Inner	57%	65%	69%
Maintenance: Outer	66%	63%	68%

Table 36: Median spend on minor illness/injury and share of households obtaining medicine from shop

Domain	Median spend on a minor illness injury (NPR)		
	Baseline	Midline	Endline
Build: RBG	825	600	1,600
Build: Inner	500	600	1,200
Build: Outer	675	1700	1,000
Maintenance: RMG	650	500	1,000
Maintenance Inner	500	600	1,100
Maintenance Outer	700	1,200	1,550

Table 37: Share of three and four year olds with complete course of vaccination

Domain	% of 3 and 4 year olds with complete course of vaccination		
	Baseline	Midline	Endline
Build: RBG	84%	76%	80%
Build: Inner	76%	61%	79%
Build: Outer	71%	58%	80%
Maintenance: RMG	78%	55%	76%
Maintenance Inner	76%	55%	85%
Maintenance Outer	71%	85%	73%

Table 38: Endline vaccination rates of three- and four-year-old children

	BCG	Dpt/hep 1	Dpt/hep 2	Dpt/hep 3	Measles	Polio 1	Polio 2	Polio 3
Build: RBG	86.1%	86.1%	86.1%	84.2%	86.1%	87.1%	85.1%	**86.1%**
Build: Inner	86.4%	85.5%	84.5%	81.8%	86.4%	85.5%	82.7%	**81.8%**
Build: Outer	89.6%	88.9%	87.4%	83.7%	91.9%	92.6%	88.9%	**87.4%**
Maintenance: RMG	96.1%	96.1%	94.7%	82.9%	96.1%	97.4%	97.4%	**78.9%**
Maintenance Inner	96.8%	96.8%	94.7%	88.3%	94.7%	97.9%	97.9%	**87.2%**
Maintenance Outer	**94.2%**	**91.9%**	**88.4%**	**76.7%**	**95.3%**	**90.7%**	**88.4%**	**79.1%**

C9. Education

Table 39: Average annual expenditure per child per year on education (NPR) – maintenance

	Baseline (2014)	Endline (2019)	Change from baseline (before inflation)
Maintain: RMG	3,413	7,341	+115%
Maintain: Inner	3,651	7,007	+92%
Maintain: Outer	2,889	5,551	+92%

Table 40: Average annual expenditure per child per year on education (NPR) – build

	Baseline (2014)	Endline (2019)	Change from baseline (before inflation)
Build: RBG	3842	6172	+61%
Build: Inner	3288	4843	+47%
Build: Outer	4383	4561	+4%

Figure 47: Households with any members with complete education – build area

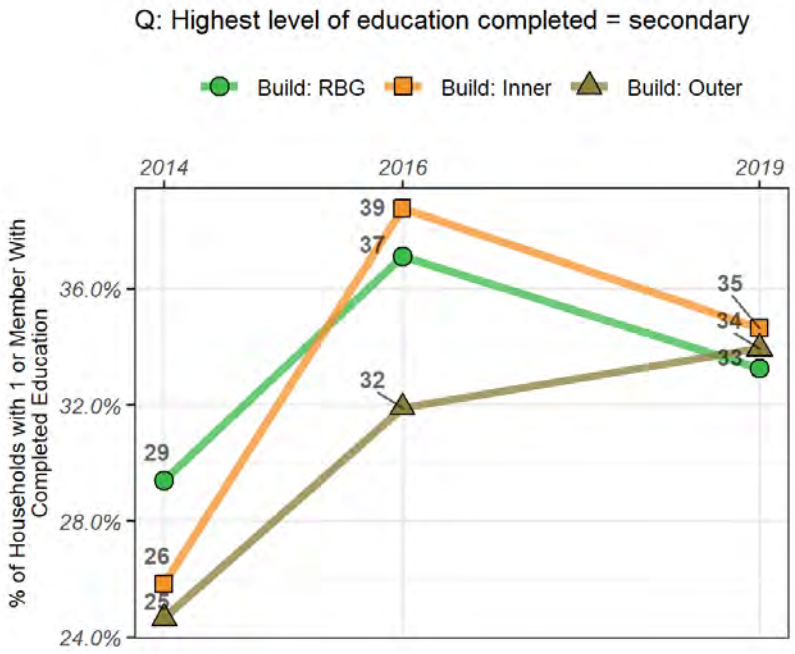


Figure 48: Households with any members with complete education – maintenance area

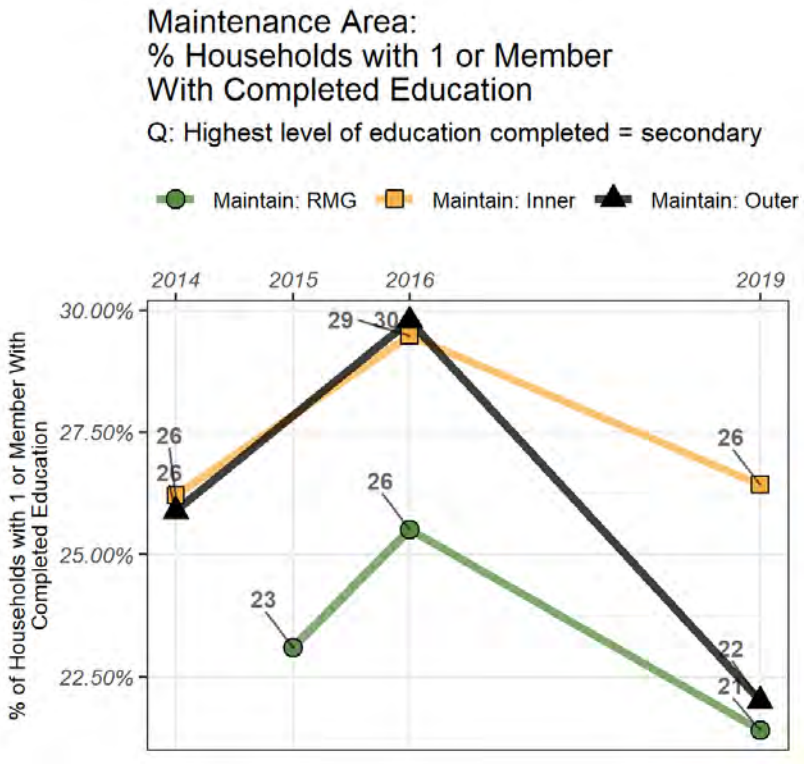


Figure 49: Households with all school-age children attending school – build area

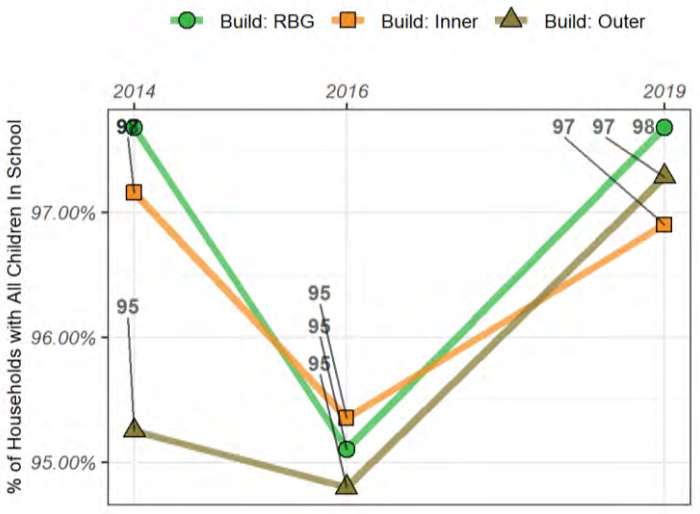
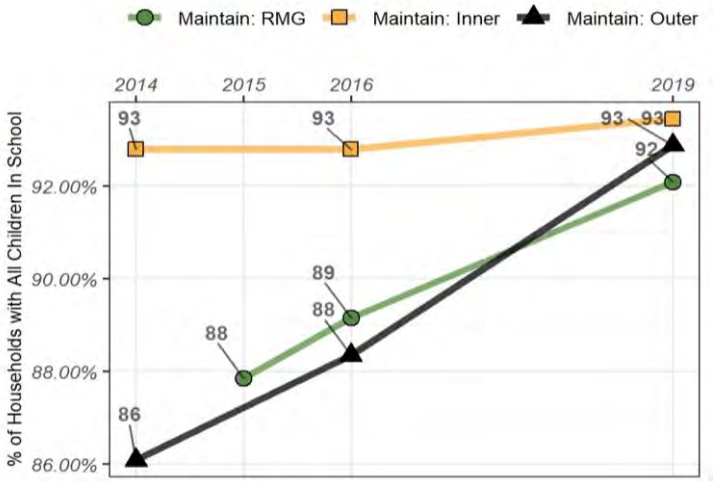


Figure 50: Households with all school-age children attending school – maintenance area



C10. Physical assets (assets and land)

Figure 51: Number of different consumer assets owned – build area

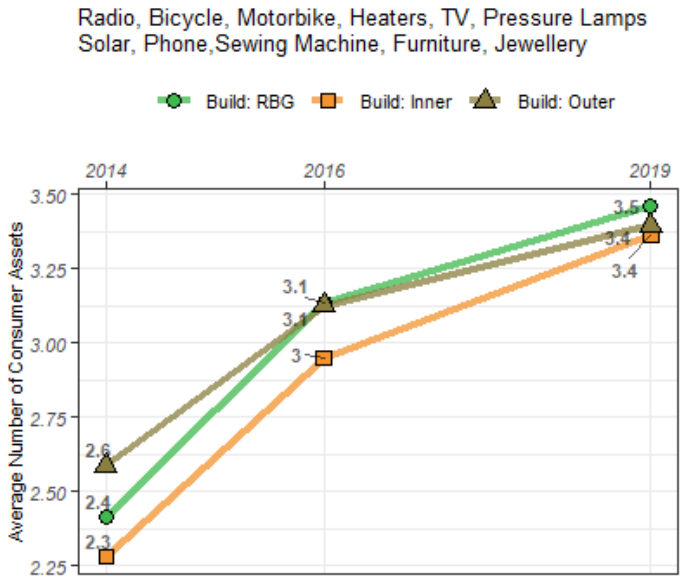


Figure 52: Number of different consumer assets owned – maintenance area

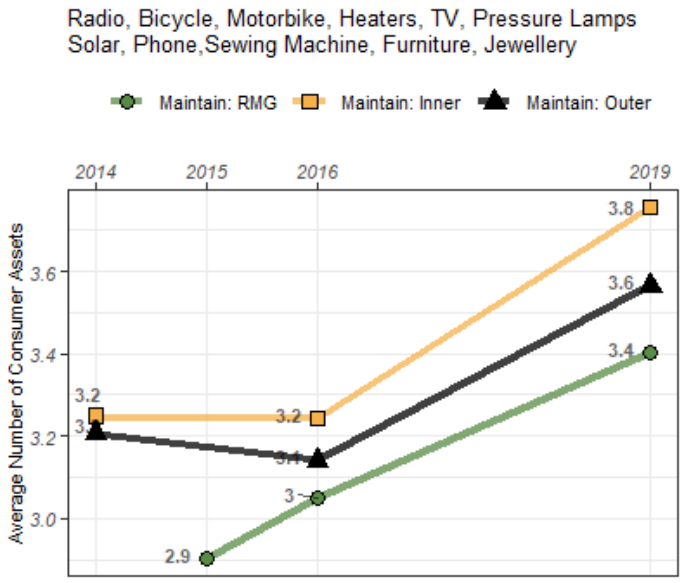


Table 41: Change in common consumer asset ownership (build districts)

Asset	RBG			Build Inner			Build Outer		
	Base	Mid	End	Base	Mid	End	Base	Mid	End
Radio	31%	33%	28%	26%	22%	24%	31%	23%	21%
TV	6%	7%	13%	2%	2%	4%	3%	4%	4%
Solar	38%	46%	48%	47%	56%	56%	50%	61%	61%
Mobile phone	56%	76%	92%	46%	68%	88%	54%	76%	90%
Sewing machine	1%	2%	3%	1%	3%	3%	3%	3%	5%
Furniture	36%	63%	66%	31%	58%	70%	41%	62%	67%
Jewellery	74%	84%	92%	68%	83%	88%	75%	81%	88%

Table 42: Change in consumer asset ownership (maintenance districts)

Asset	RMG			Maintenance Inner			Maintenance Outer		
	Base	Mid	End	Base	Mid	End	Base	Mid	End
Radio	23%	27%	26%	35%	36%	31%	40%	38%	33%
TV	5%	5%	8%	8%	10%	1%	2%	2%	1%
Solar	36%	42%	48%	49%	55%	62%	64%	72%	79%
Mobile phone	84%	85%	93%	76%	80%	90%	65%	78%	89%
Sewing machine	3%	3%	3%	3%	3%	2%	1%	4%	3%
Furniture	58%	56%	71%	62%	56%	77%	59%	41%	54%
Jewellery	76%	81%	89%	89%	81%	93%	91%	77%	91%

Figure 53: Average quantity of livestock owned – build area

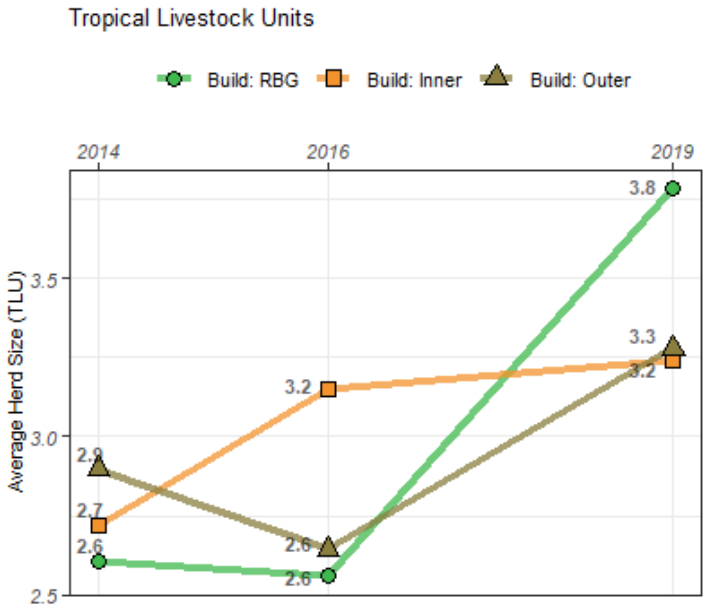


Figure 54: Average quantity of livestock owned – maintenance area

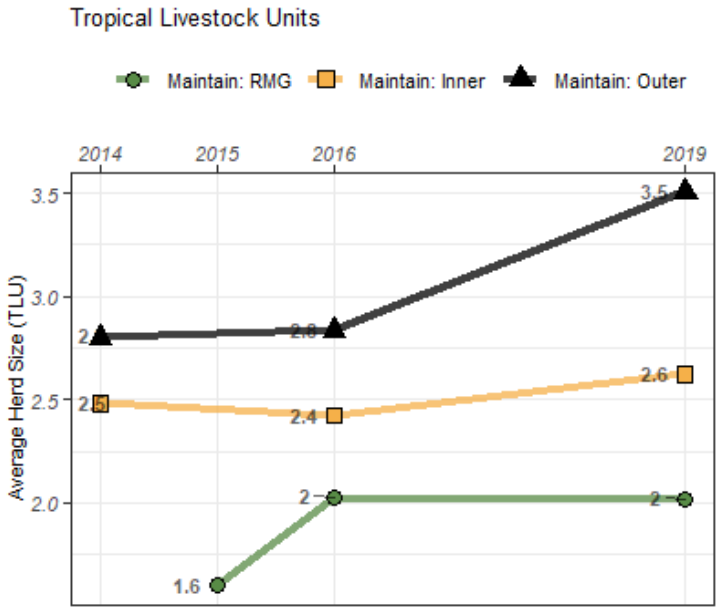


Table 43: Table 1: Change in ownership of livestock (build districts)

		% households owning animal			Average size of herd among owners		
	Animal	**Base**	**Mid**	**End**	**Base**	**Mid**	**End**
Build – RBG	Cows	75%	78%	84%	2.5	2.9	4.2
	Goats	53%	59%	47%	4.3	5.2	7.5
	Poultry	20%	27%	21%	4.6	7.1	5.0
Build – Inner Buffer	Cows	88%	83%	85%	3.1	3.2	3.5
	Goats	54%	57%	51%	5.3	5.4	8.4
	Poultry	36%	44%	27%	5.0	5.0	5.3
Build – Outer Buffer	Cows	86%	84%	89%	3.5	3.5	3.6
	Goats	70%	68%	37%	7.6	7.9	9.6
	Poultry	42%	55%	24%	4.3	4.8	3.5

Table 44: Change in ownership of livestock (maintenance districts)

		% households owning animals			Average size of herd among owners		
	Animal	Base	Mid	End	Base	Mid	End
Maintenance – RMG	Cows	75%	78%	71%	2.5	2.9	2.5
	Goats	53%	59%	55%	4.3	5.2	4.8
	Poultry	20%	27%	23%	4.6	7.1	4.5
Maintenance – Inner Buffer	Cows	88%	83%	77%	3.1	3.2	3.2
	Goats	54%	57%	54%	5.3	5.4	5.4
	Poultry	36%	44%	23%	5.0	5.0	5.3
Maintenance – Outer Buffer	Cows	86%	84%	76%	3.5	3.5	3.8
	Goats	70%	68%	62%	7.6	7.9	7.9
	Poultry	42%	55%	35%	4.3	4.8	4.4

Figure 55: Land owned – build area (hectares)

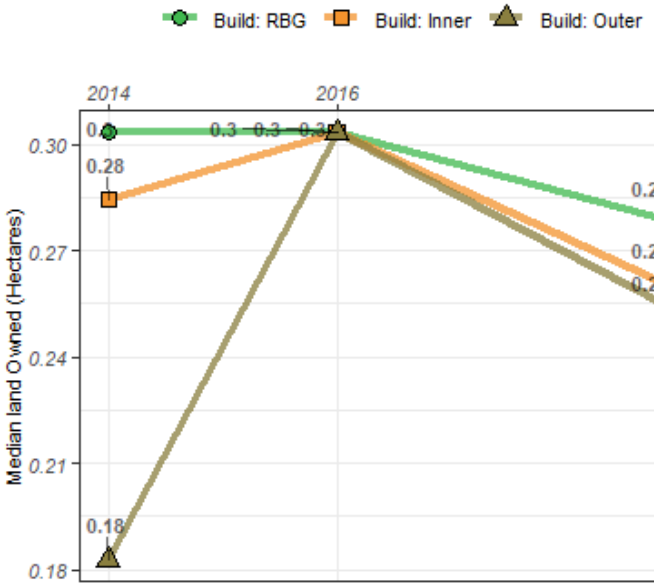
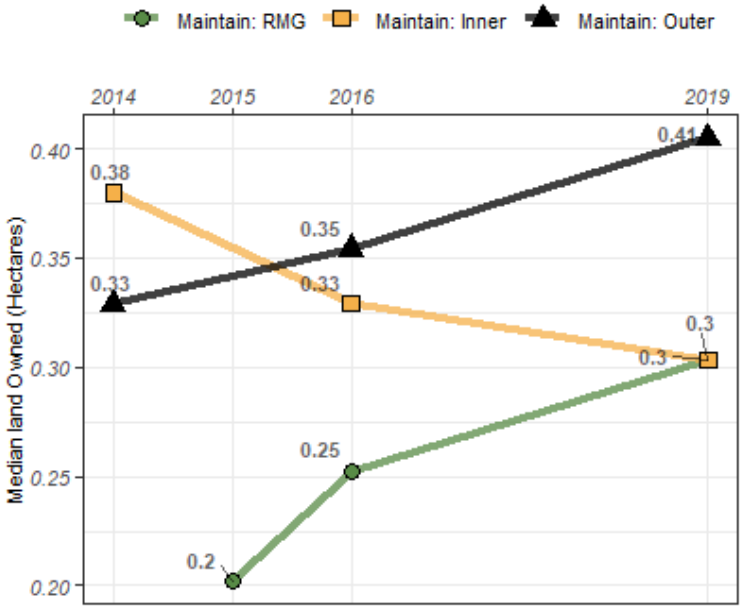


Figure 56: Land owned – maintenance area (hectares)



C11. Housing

Figure 57: Households with iron or concrete roof – build area

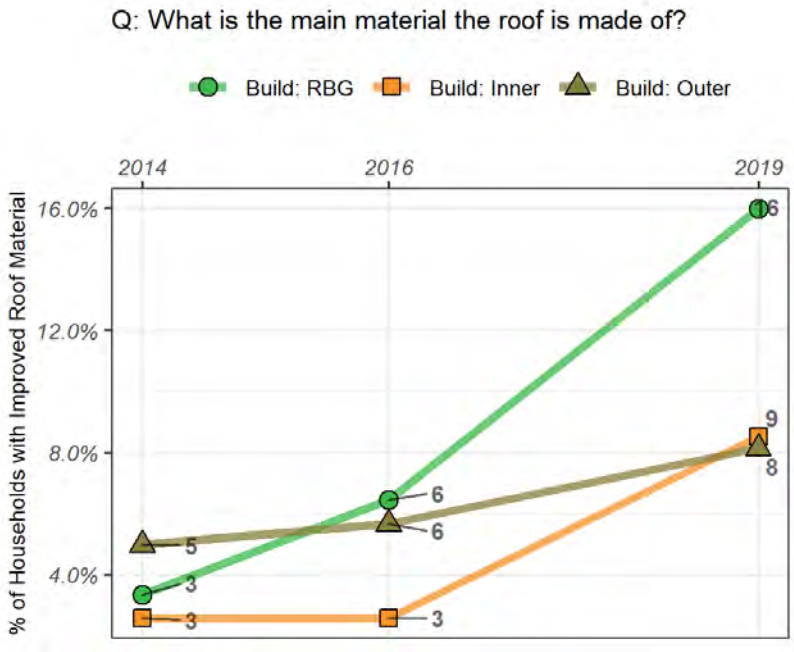


Figure 58: Households with iron or concrete roof – maintenance area

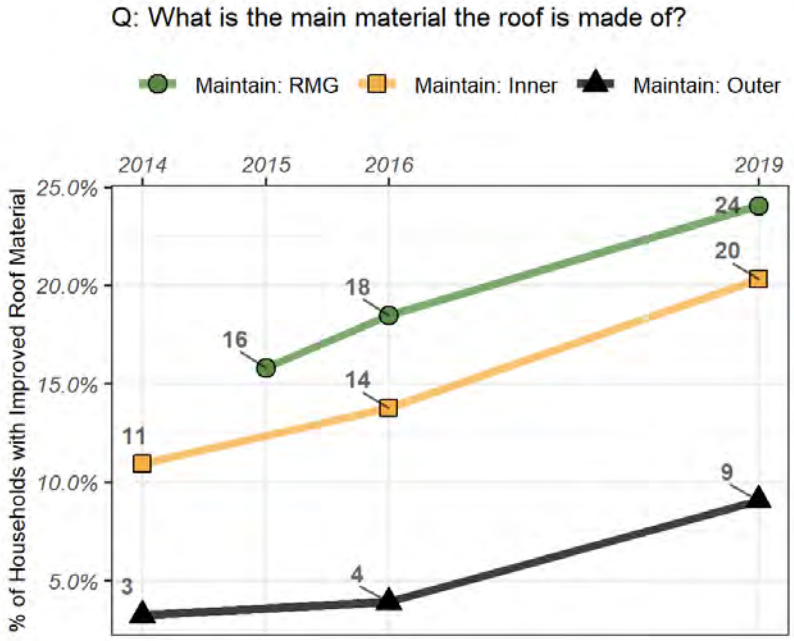


Figure 59: Households with permanent household toilet – build area

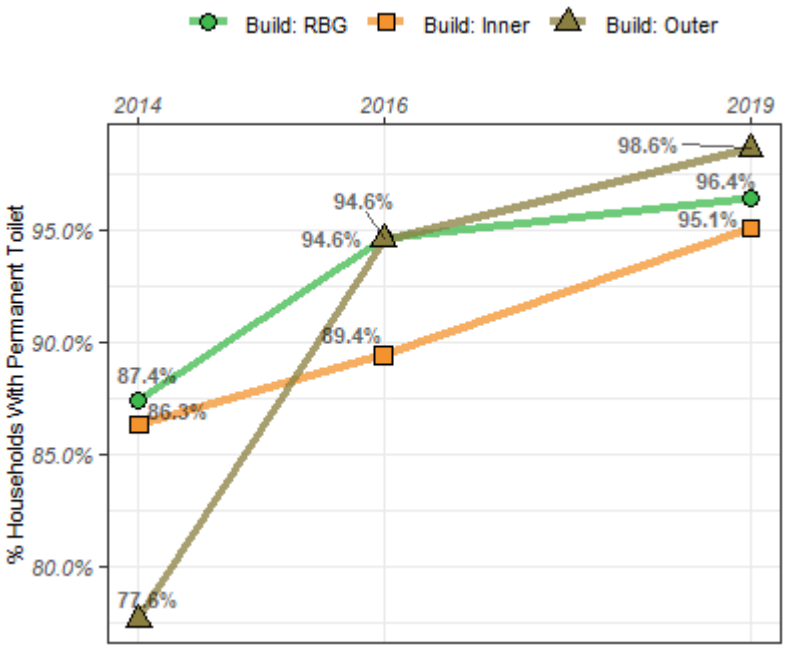
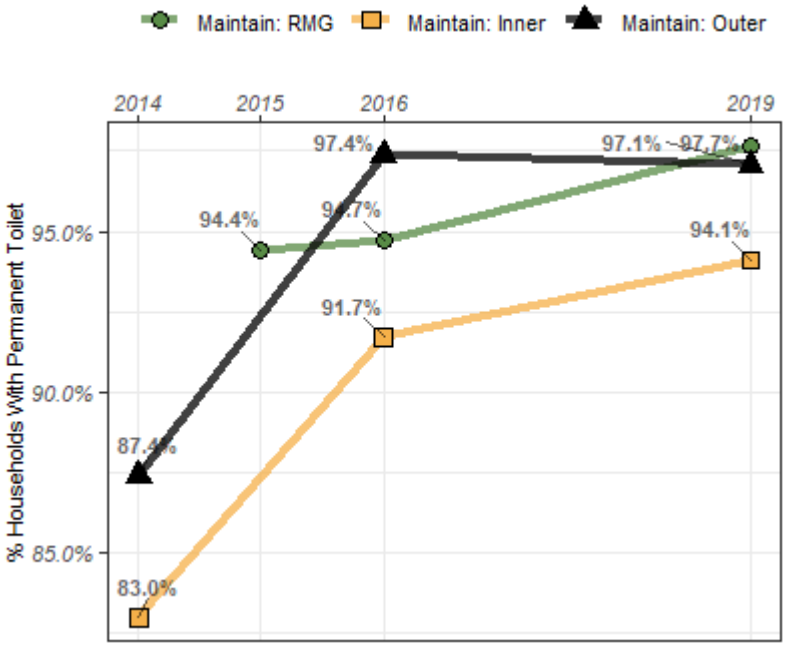


Figure 60: Households with permanent household toilet – maintenance area



C12. Roads and transport use

Road use increased substantially in the maintenance region between the 2014 baseline and the 2019 endline, particularly among those living within the areas closest to the roads.

Figure 61: Share of household journeys involving motorised transport

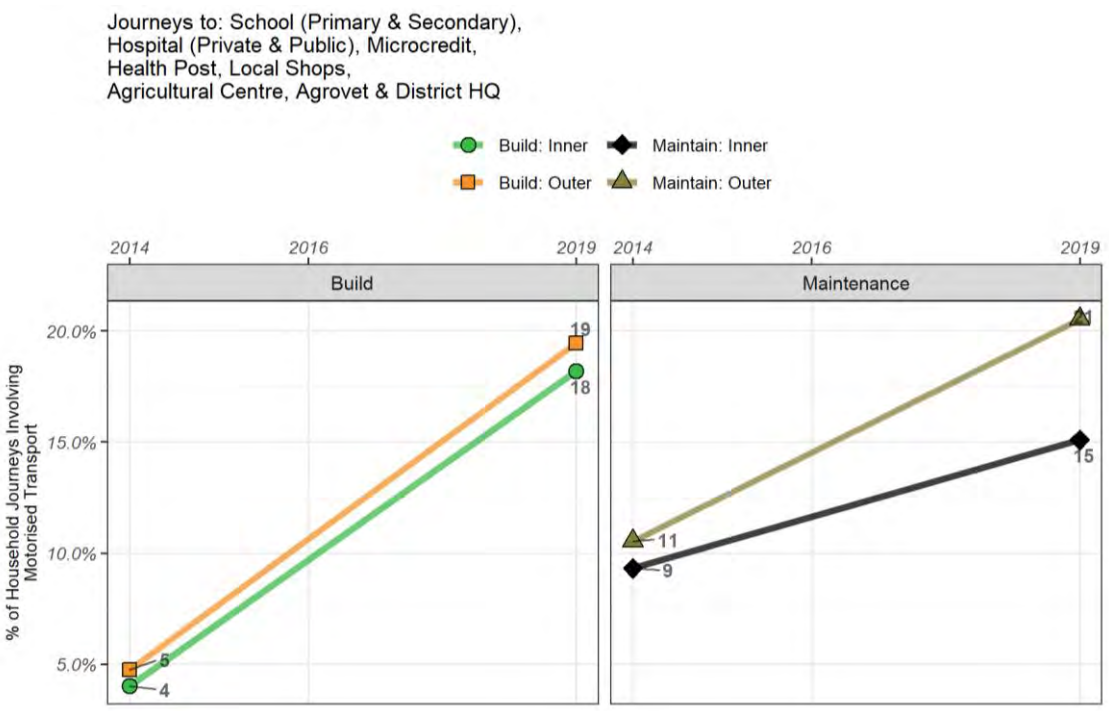


Figure 62: Share of all journeys made involving motorised transport

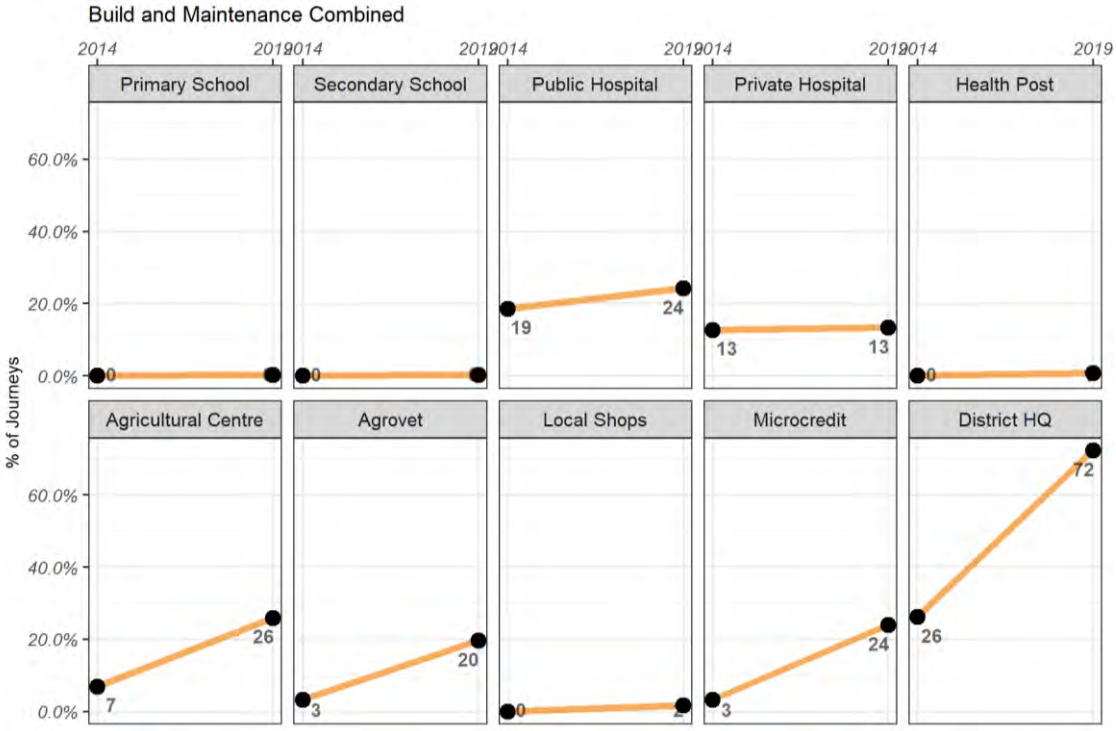


Figure 63: Households able to access any hospital in less than two hours – build area

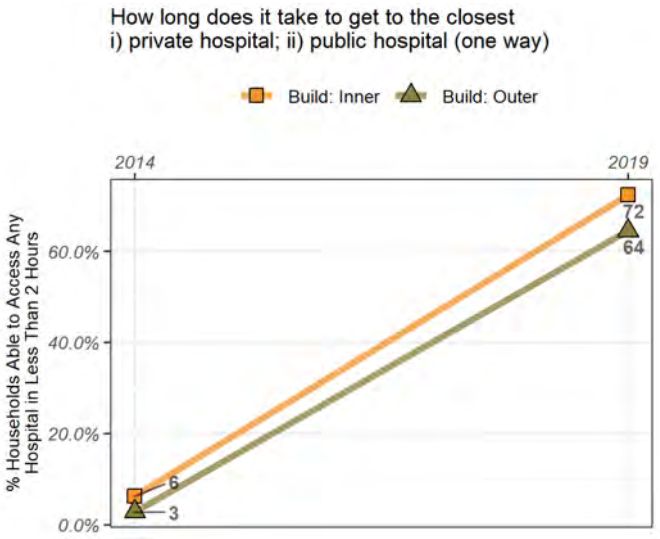


Figure 64: Households able to access any hospital in less than two hours – maintenance area

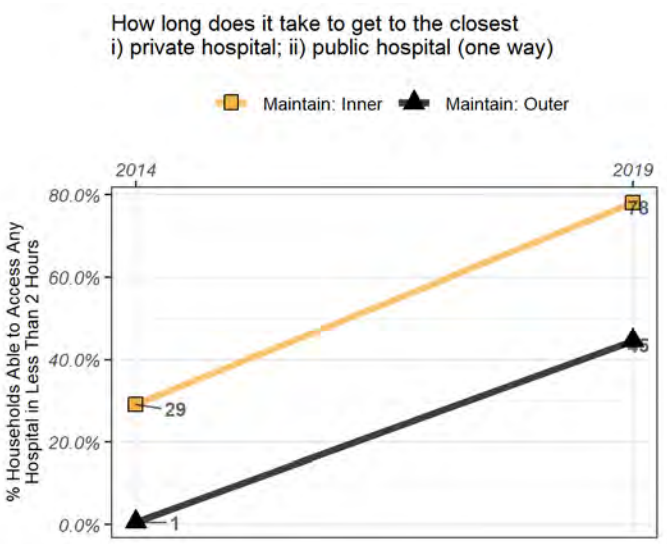


Figure 65: Access to shops – build area

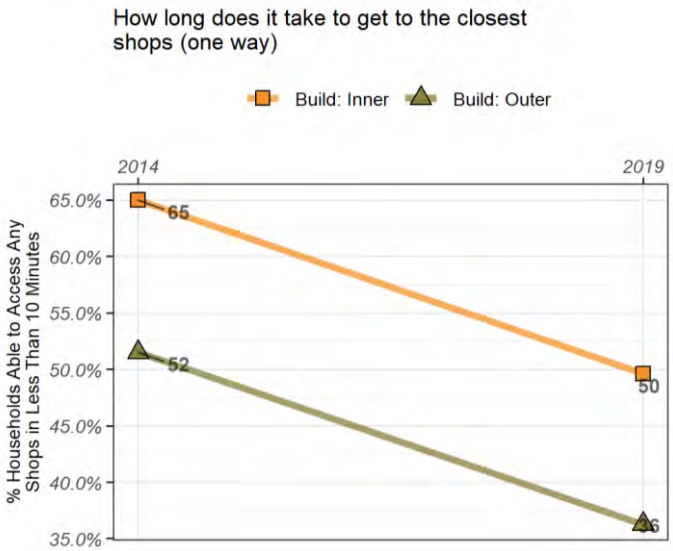


Figure 66: Access to shops – maintenance area

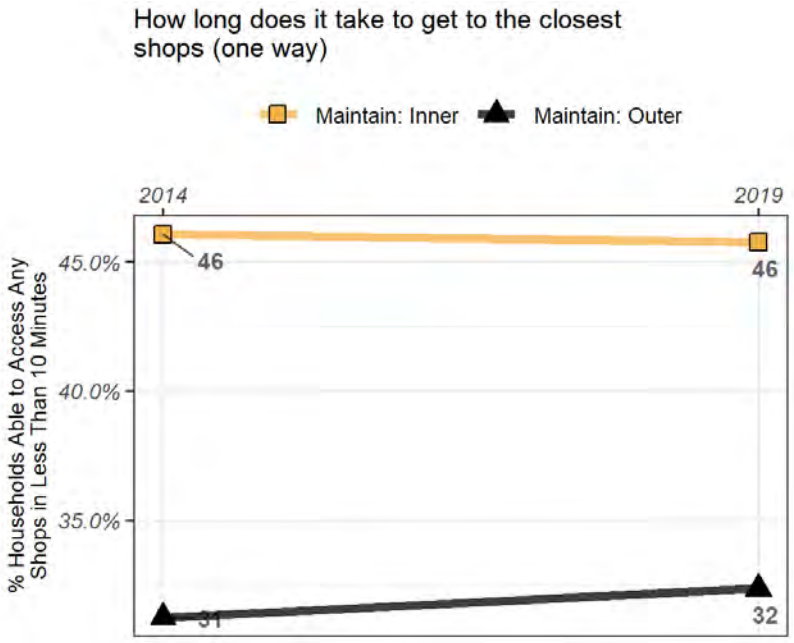


Figure 67: Who has benefited from roads – build domain

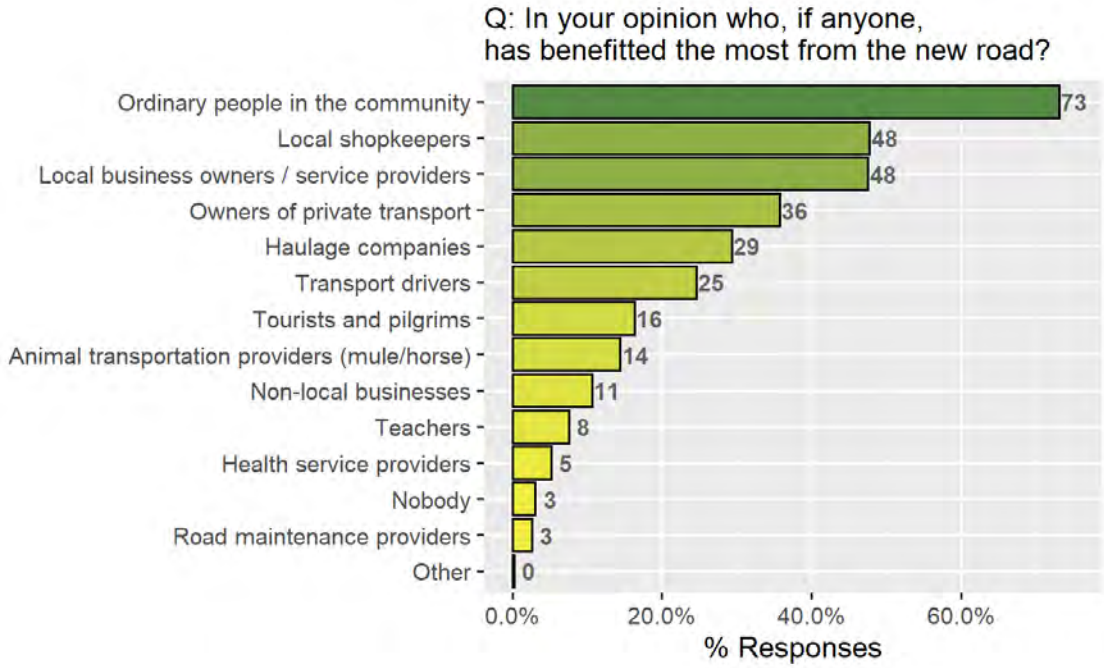


Table 45: Households indicating using any motorised transport in travel to the any of the list of 14 key locations

Group	Baseline	Midline	Endline
Build: Inner	49%	36%	73%
Build: Outer	42%	32%	67%
Maintenance: Inner	47%	58%	80%
Maintenance: Outer	52%	45%	88%
Overall	**47%**	**43%**	**76%**

Table 46: Households able to access hospital in two hours or less

Group	Baseline	Midline	Endline
Build: Inner	6%	69%	72%
Build: Outer	3%	53%	65%
Maintenance: Inner	30%	86%	78%
Maintenance: Outer	1%	45%	45%

Table 47: Households able to access local shops in less than 10 minutes (i.e. local shops exist within their community)

Group	Baseline	Midline	Endline
Build: Inner	65%	57%	50%
Build: Outer	51%	50%	36%
Maintenance: Inner	45%	49%	46%
Maintenance: Outer	30%	51%	32%

Table 48: Households able to access secondary school in less than 2 hours

Group	Baseline	Midline	Endline
Build: Inner	78%	76%	61%
Build: Outer	66%	71%	45%
Maintenance: Inner	88%	89%	45%
Maintenance: Outer	72%	70%	31%

Figure 68: Median time to travel to location (minutes) – build area

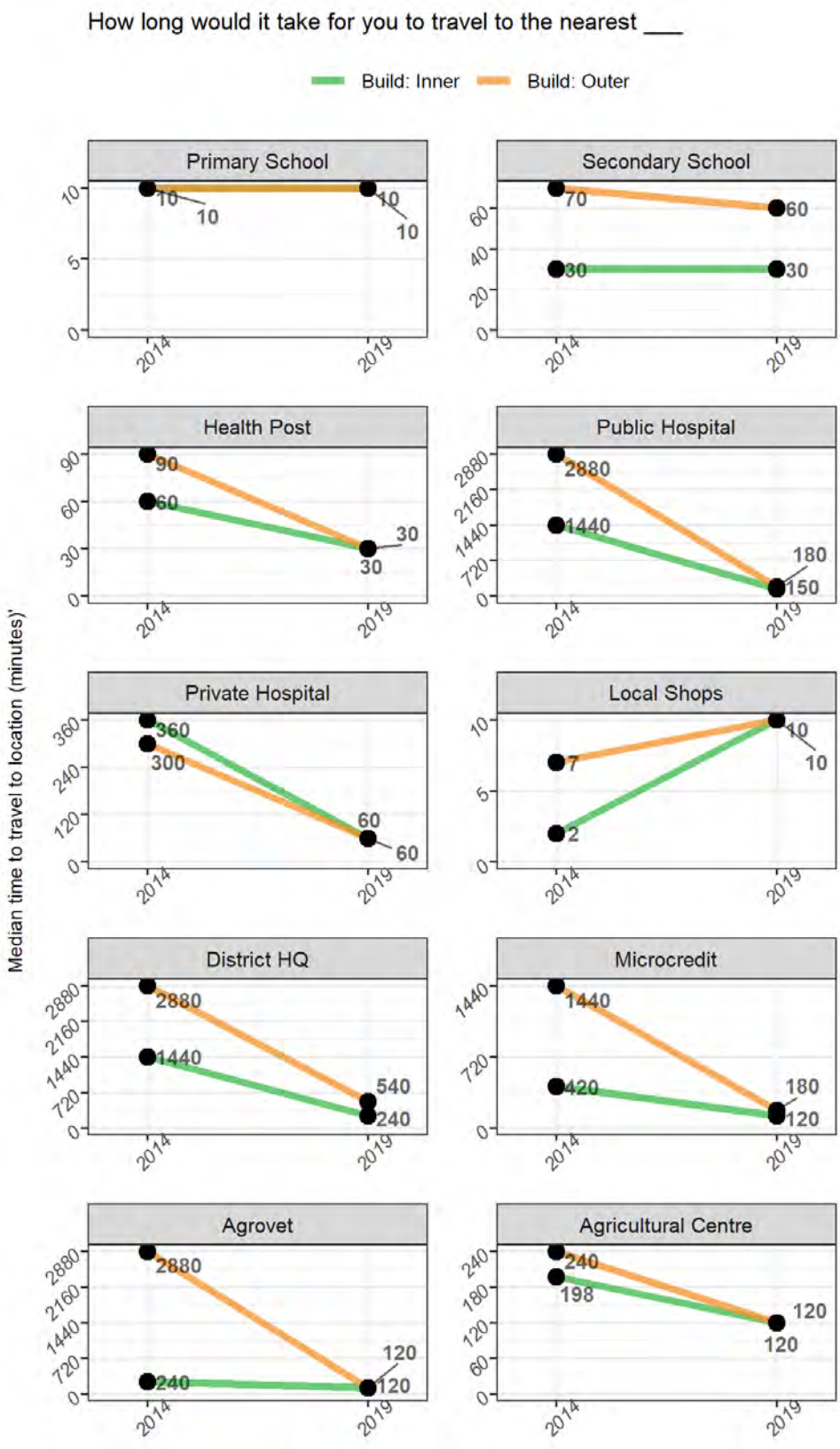
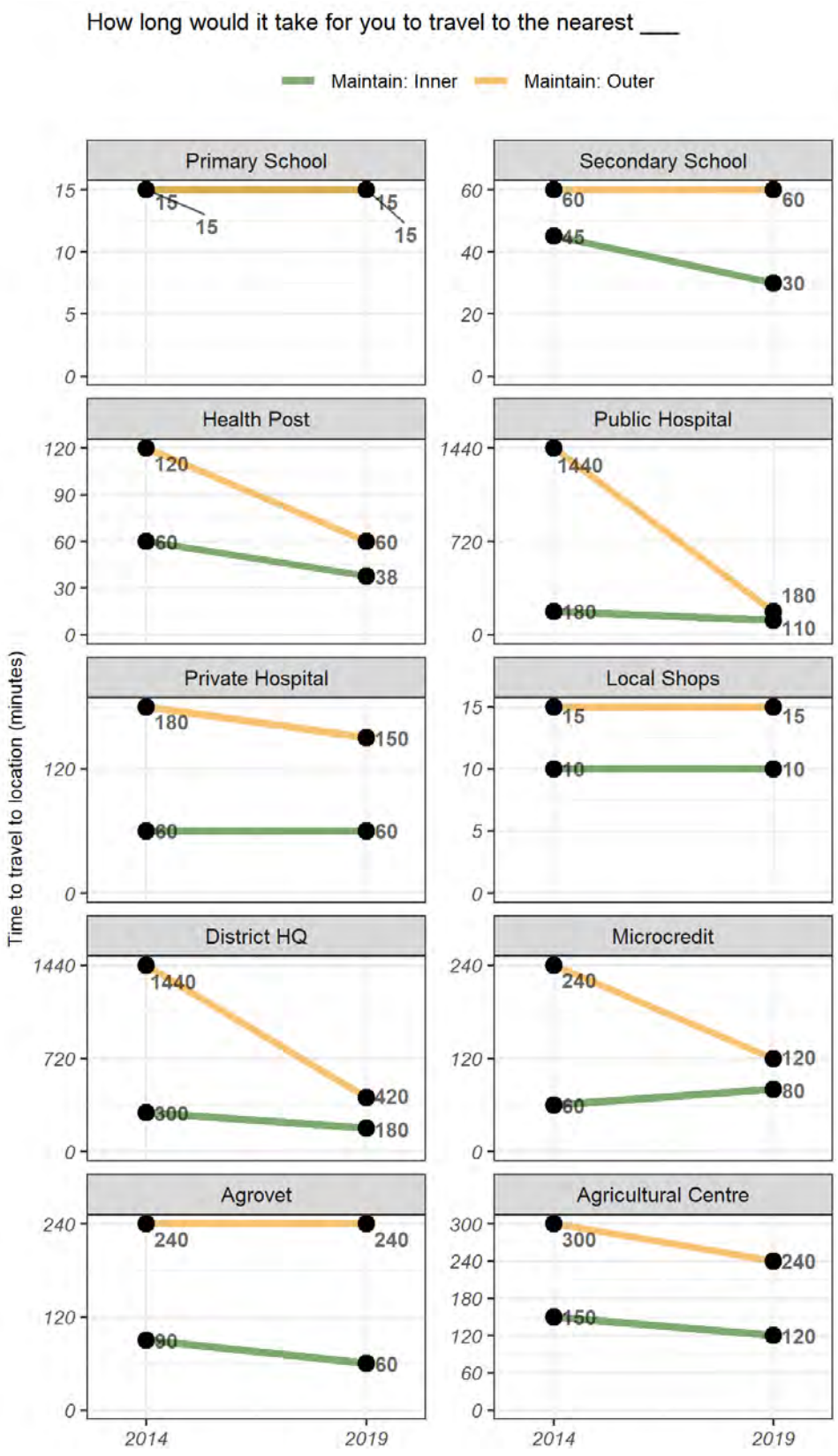


Figure 69: Median time to travel to location (minutes) – maintenance area



C13. Perception of road quality

Figure 70: Share confident to access nearest hospital in emergency – build

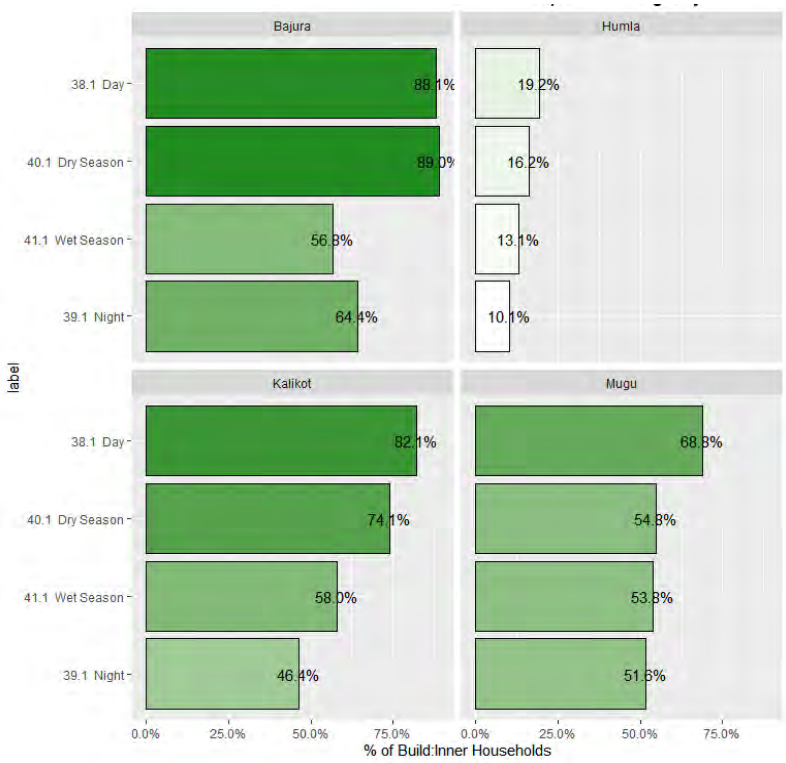


Figure 71: Share with increased confidence to access nearest hospital in emergency since 2 years ago – build

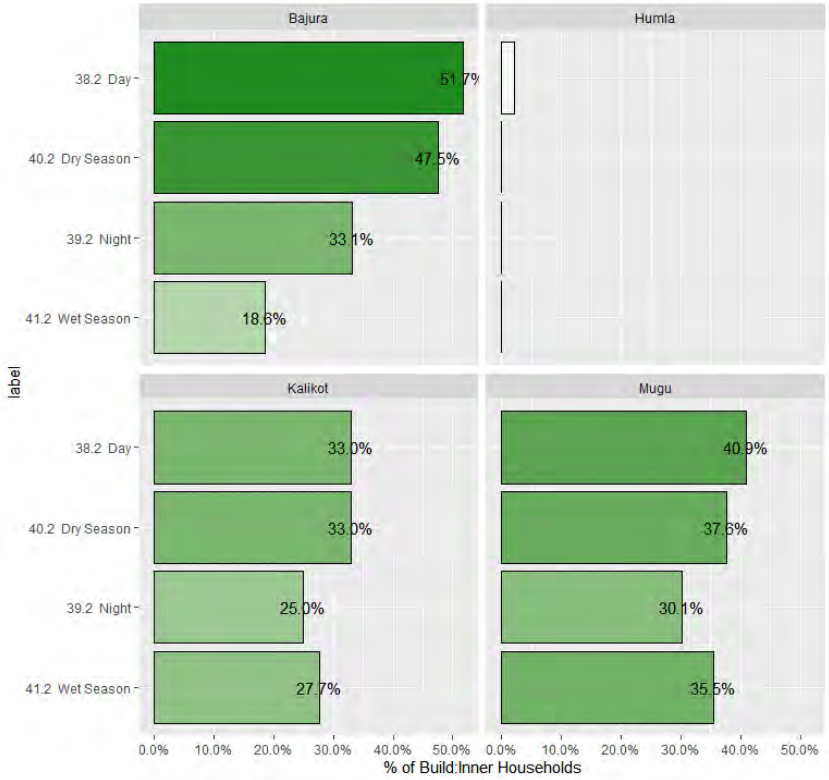


Figure 72: Reasons for increased confidence – build

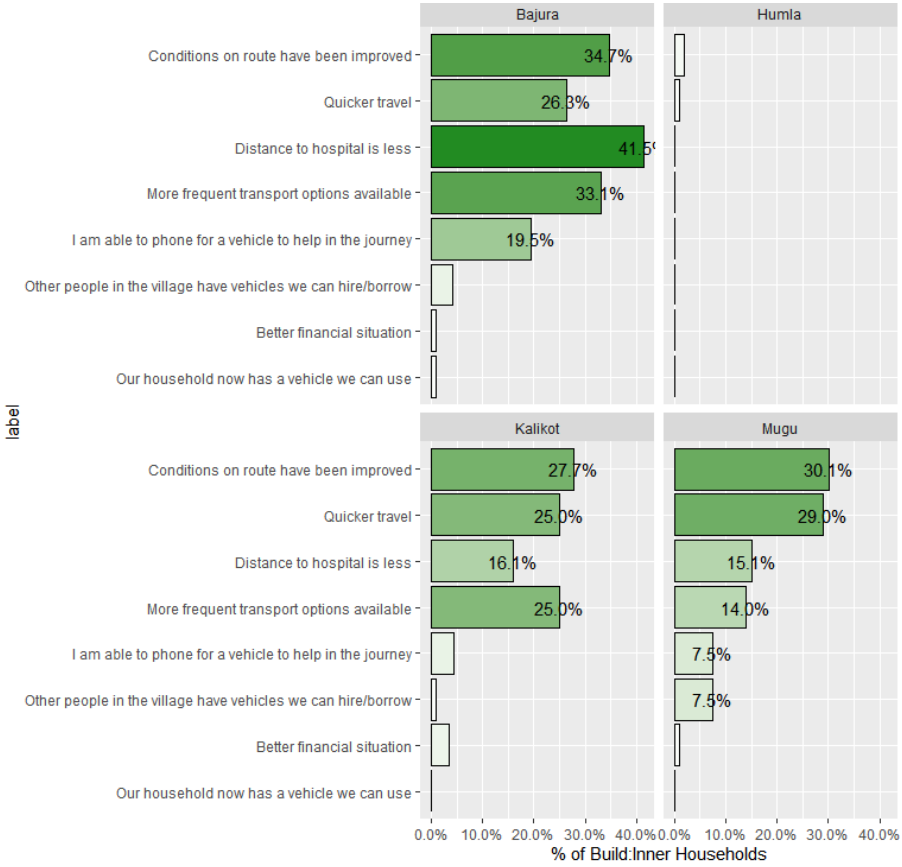


Figure 73: Reasons for decreased confidence – build

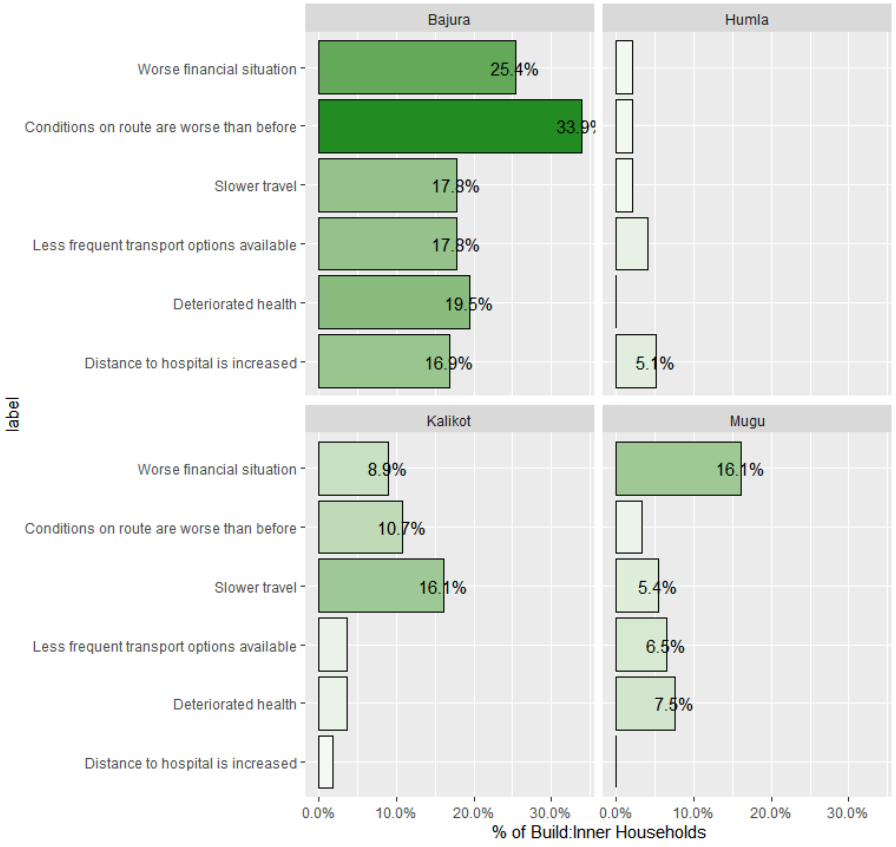


Figure 74: Share confident to access nearest hospital in emergency – maintenance

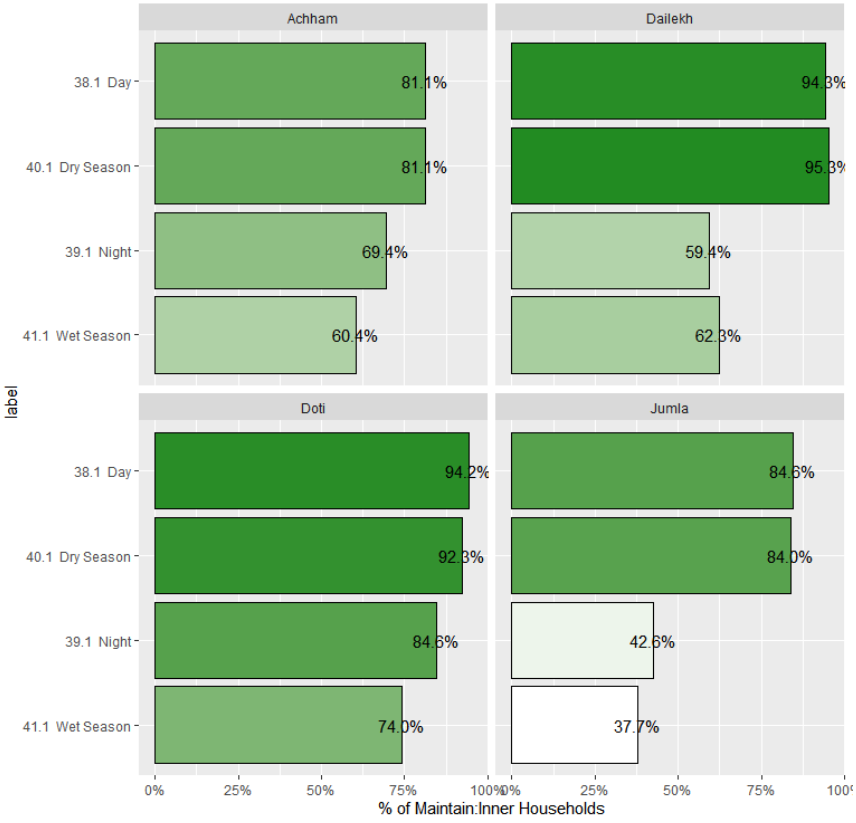


Figure 75: Share with increased confidence to access nearest hospital in emergency since 2 years ago – maintenance

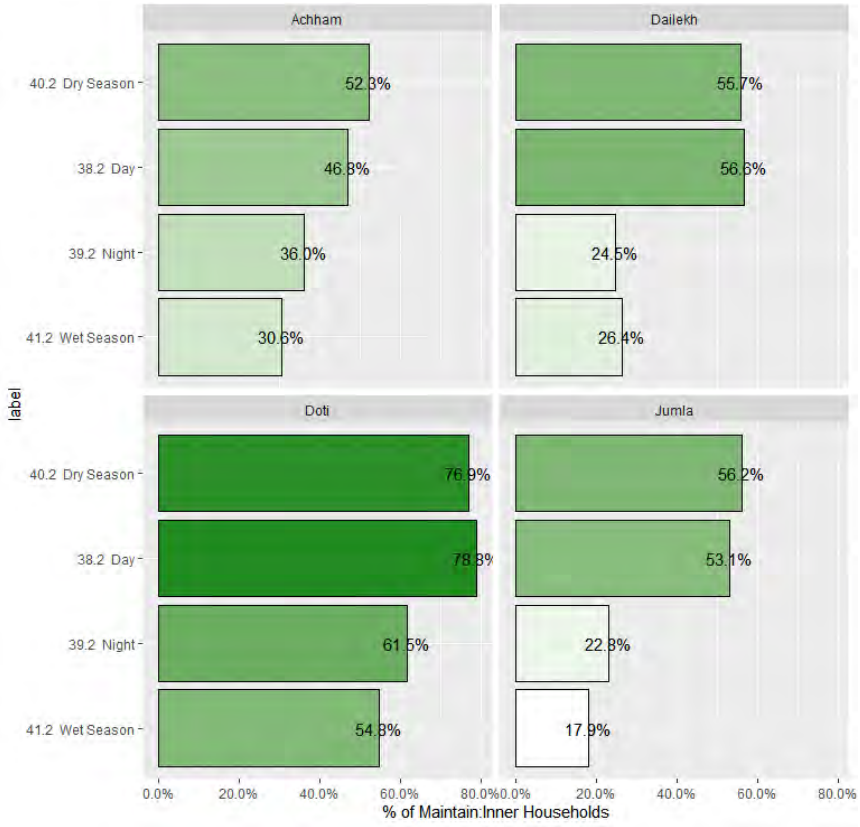


Figure 76: Reasons for increased confidence – maintenance

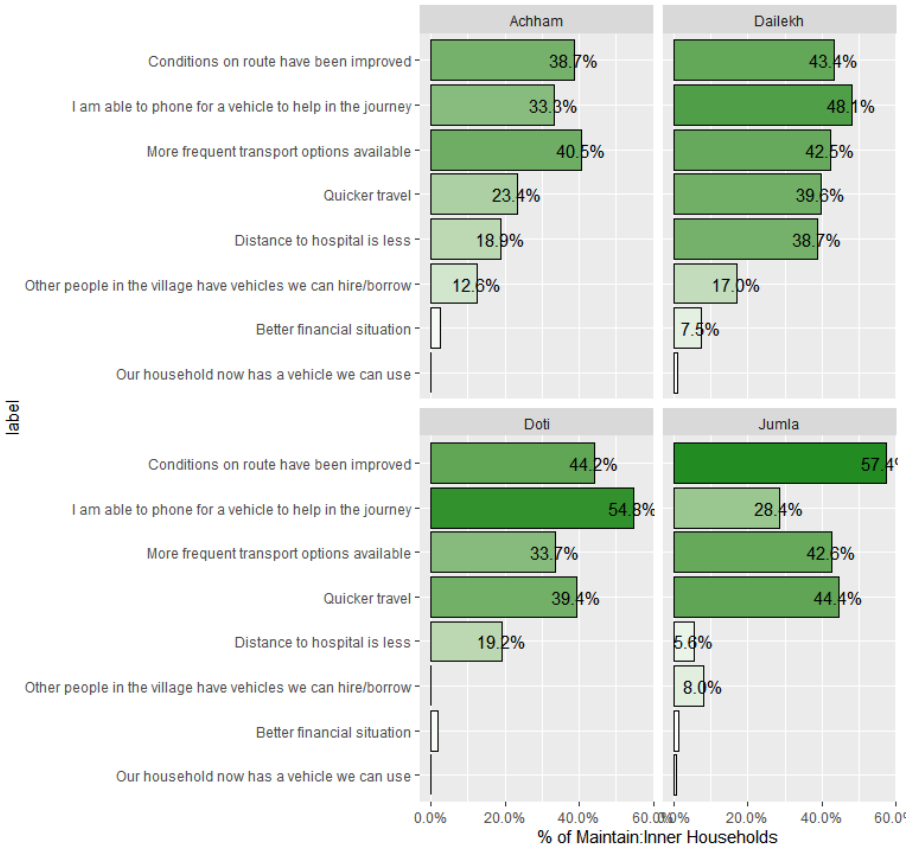


Figure 77: Reasons for decreased confidence – maintenance

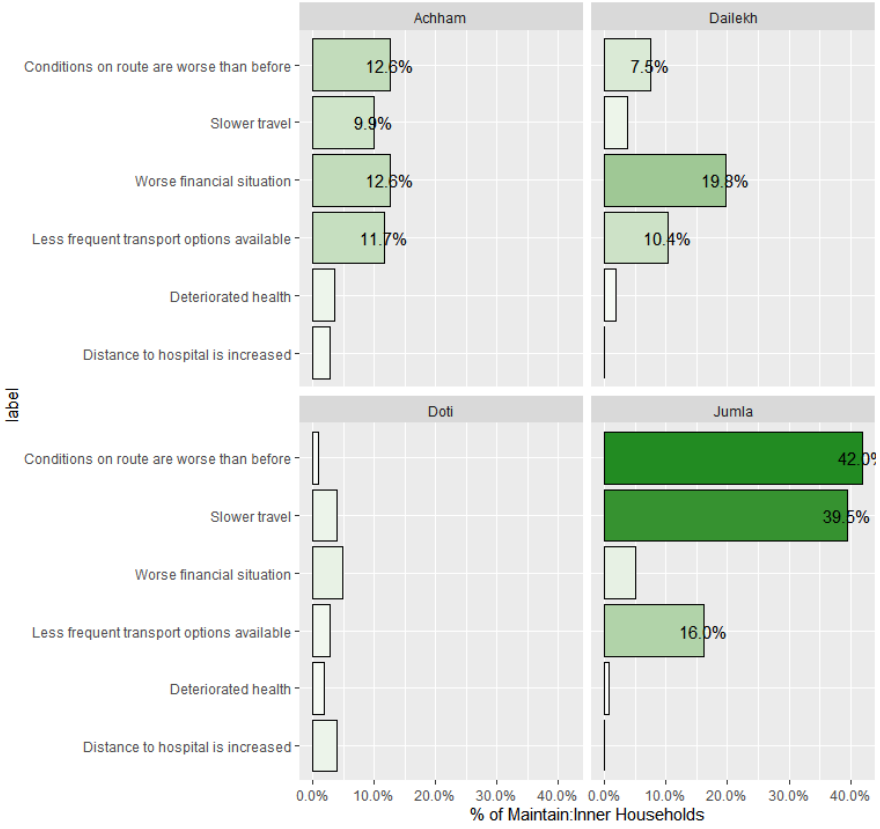


Figure 78: Who has benefited in build areas

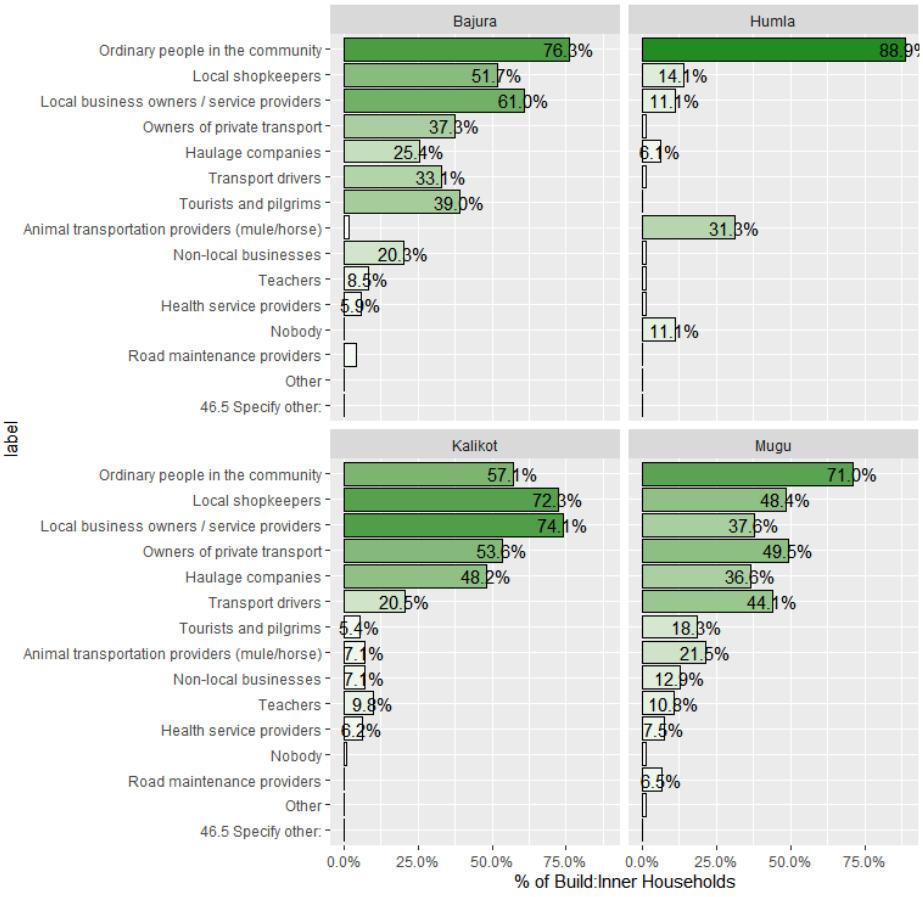
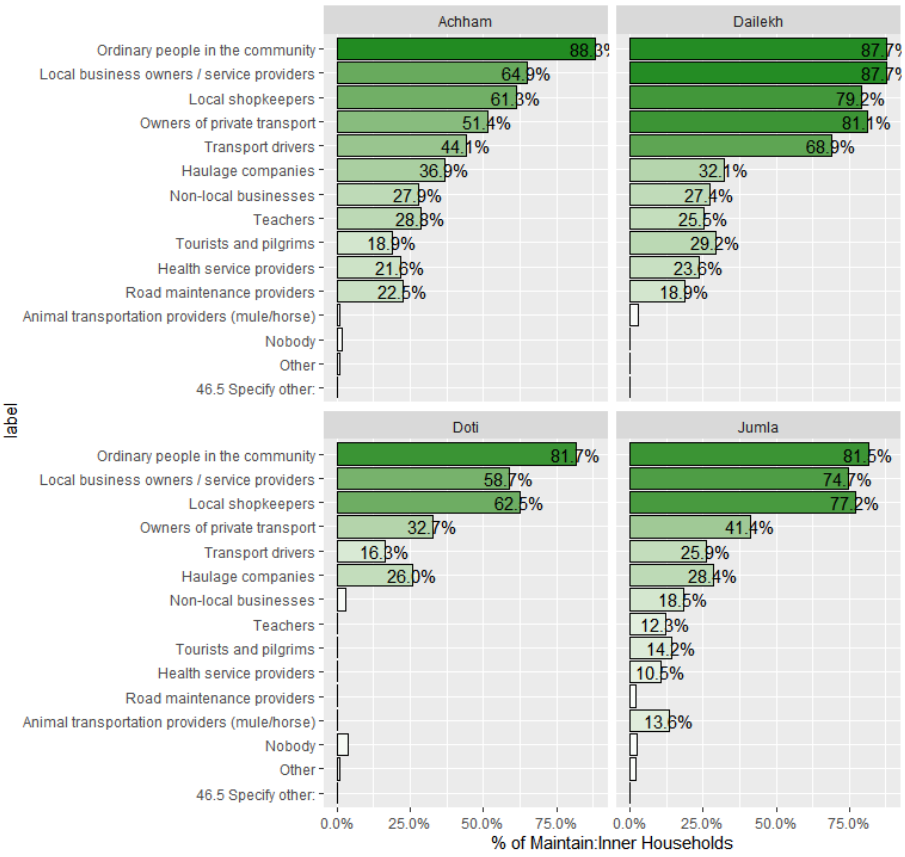


Figure 79: Who has benefited in maintenance areas



C14. Access to social services

Figure 80: Quality of services in build areas

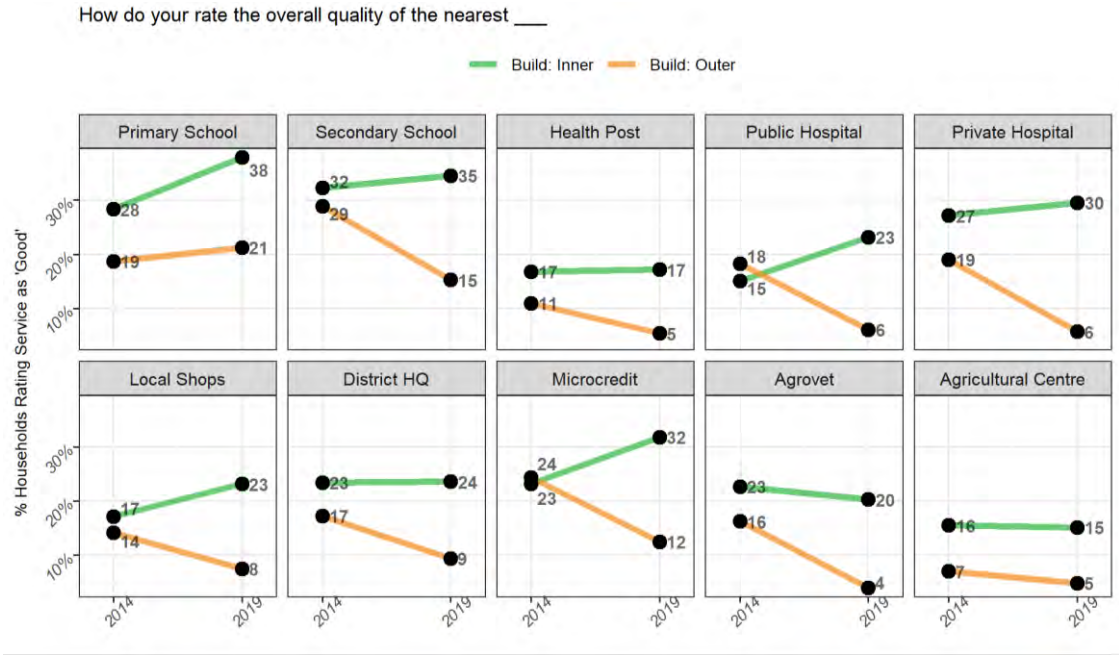
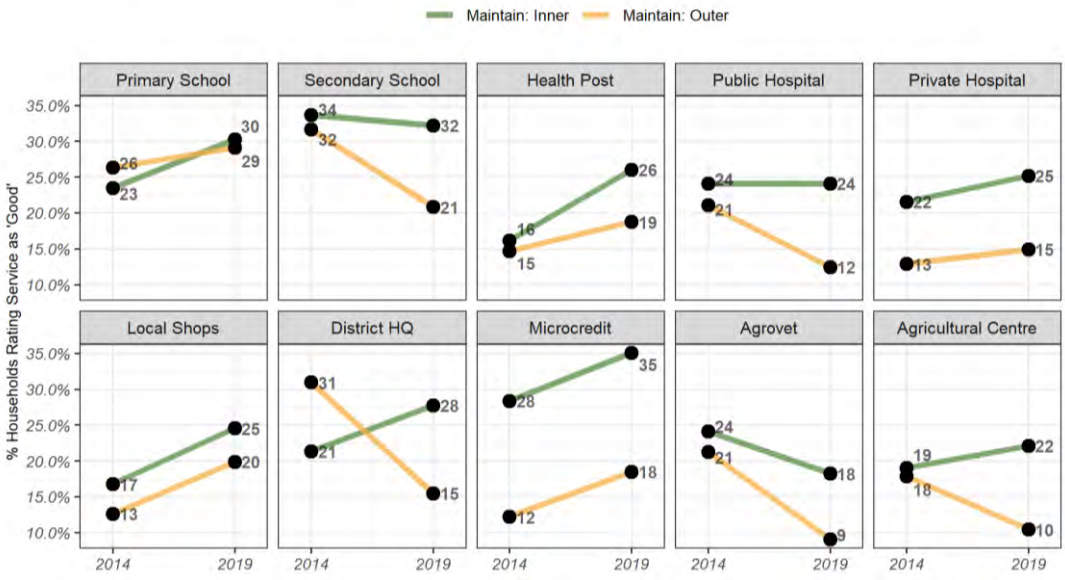


Figure 81: Quality of services in maintenance areas

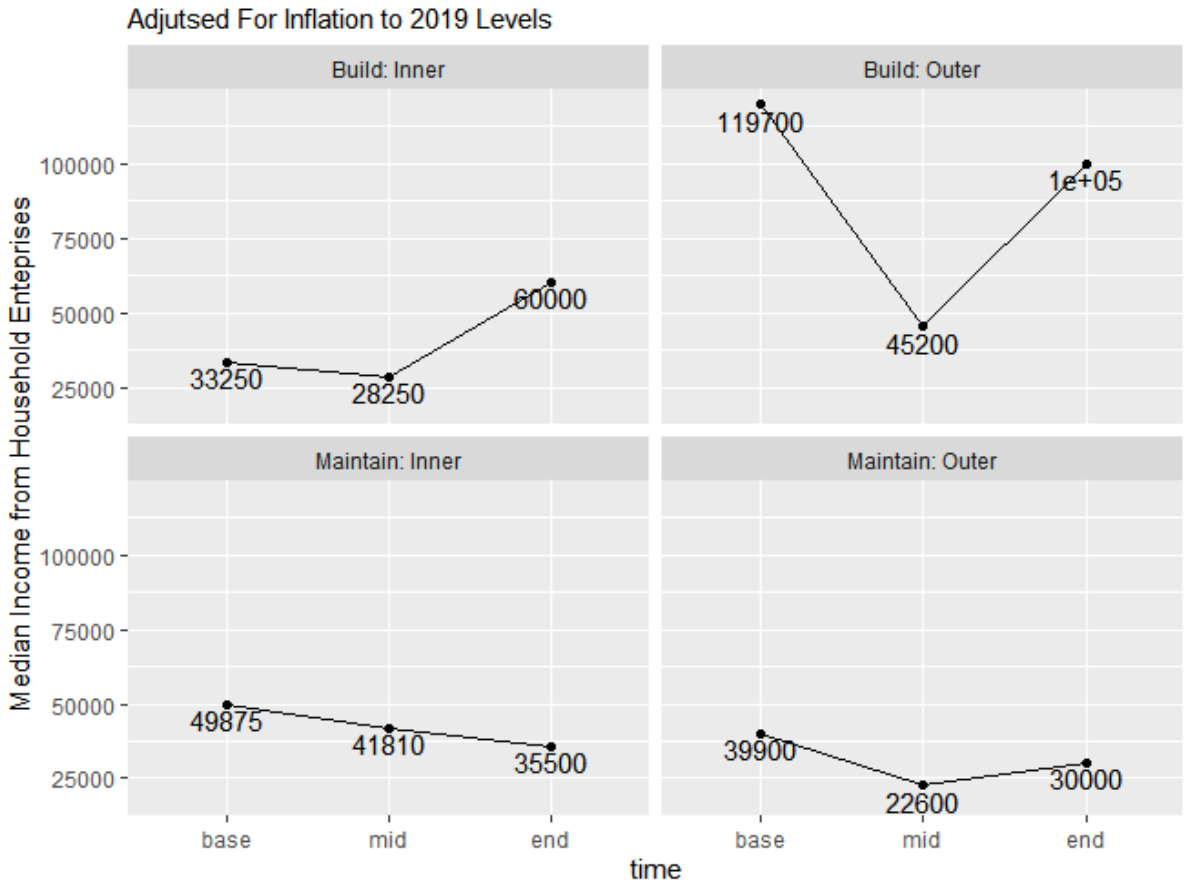


C15. Local enterprises and economic activity

Table 49: Share of households with enterprise

	Baseline	Midline	Endline
Build: Inner	13.6%	5.7%	6.4%
Build: Outer	13.2%	9.0%	13.2%
Maintain: Inner	6.6%	7.0%	7.0%
Maintain: Outer	6.5%	6.0%	7.0%

Figure 82: Median income from households with enterprise



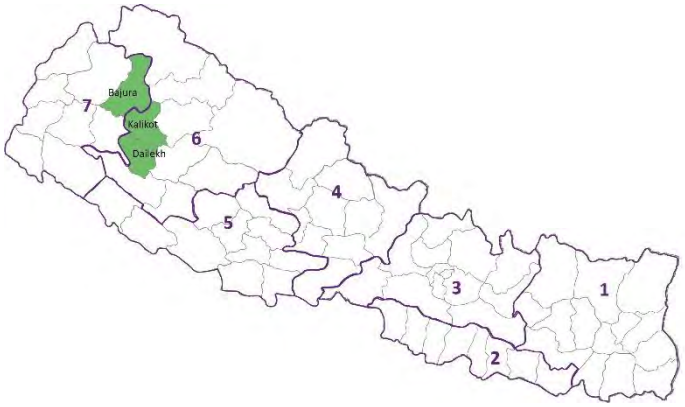
Section D: Qualitative study and methodology

D1. Rationale

The endline qualitative study was undertaken on 19–26 September 2019 in the districts of Bajura, Dailekh and Kalikot. The baseline and midline qualitative study was conducted in close sequence with the quantitative survey[14] while the endline qualitative study followed the quantitative data collection by three months. The rationale for sequencing the qualitative study to follow the survey was for the former to provide an interpretative lens on the quantitative findings, particularly in understanding sustainability issues after programme phase-out, including conundrums related to post-RAP income earning, RAP savings group sustainability, family dynamics and decision-making and post-road building maintenance.

D2. Selection of locations

The study locations for the qualitative study were selected purposively to illustrate both the build and the maintenance aspects of RAP-3. Of the three districts selected for the study, Bajura and Kalikot represented the build districts where new roads were constructed; Dailekh was a maintenance district where roads built in the previous phases of RAP were being maintained.



All three study locations were also focus of previous qualitative studies undertaken by the RAP-3 MEL component. Given this, the study team had contextual knowledge of the locations, further supported by meticulously maintained study archives.

Table 50: Other qualitative work undertaken by RAP-3 MEL

Qualitative work	Year	Bajura	Dailekh	Kalikot
Market and Transport Assessment	2019			√
Beneficiaries Feedback	2017	√	√	√
Reality Check Approach Midline	2016	√		
Direct Beneficiaries Feedback	2016	√		
Study on RAP-3 Beneficiaries using the Reality Check Approach	2015	√	√	√
Reality Check Approach Baseline	2014	√		

The fieldwork in all three districts was centred in settlements along the road corridor and the three sub-teams spent three to four nights close to the settlements.

D3. Methodology

The study team employed a qualitative approach comprising participatory group activities and discussion using visuals like social mapping, road and mobility mapping, informal conversations and immersion to undertake the study. The data collection borrowed elements and principles of the RCA such as informality, using people's own spaces for interaction when possible, building insights iteratively and encouraging smaller voices. The researchers adopted the positionality of study participants and facilitated people's own reflection and sharing of opinions, perspectives and experience.

RMG workers in Bajura drawing a road map

[14] The baseline quantitative survey was conducted in May 2014 and midline and endline between May and June 2016 and 2019, respectively. The baseline RCA was conducted in May 2014 and midline in April 2016.

Each study location had two to three researchers who spent four to five nights in the community.

- Researchers spent time driving/walking along the length of the road corridor having informal conversations with people, observing their daily activities as well as transport use. All study teams made use of local transport in order to experience the road and have conversations with other road users and transport providers to understand their perspectives.
- Researchers had informal, iterative one-on-one or group conversations with community members including service providers like teachers, health workers and shop-owners along the road and in the main market towns, maintenance workers along the road and transport providers and people who used transport.
- During group conversations, researchers introduced participatory activities and visuals that served as 'openers' for in-depth discussions on significant changes and problems in the communities, spending and savings behaviour. Researchers also facilitated visuals such as social maps to understand pre and post-RAP migration trends and livelihood changes, road and mobility maps to understand people's use and perception of the RAP roads and issues around their maintenance and seasonality.

Table 51: List of tools used in each location

Tools	Objectives
Road mapping	To understand people's perception of change related to the road, the significance of the road, facilities added/improved/discontinued, understanding trouble spots on the road
Social mapping	To explore changes in settlements (demographic changes, house additions/upgrades), migration patterns
Most significant changes	To understand what people consider the most significant changes that have happened in the community in the past two to three years
Problem ranking	To understand problems (new or continuing) faced by communities and to rank these according to their severity
Basket of goods	To understand and start discussion on people's purchase patterns now compared with when people were receiving wages from the road work
Savings behaviour	To understand savings patterns and people's preferred ways to save
Conversations	Access to public services Growth of other services Market availability Post-RAP income-earning RBG savings Maintenance post-RAP

All conversations and participatory activities took place in spaces where people felt comfortable, uninhibited and relaxed. These included spaces in people's homes like verandas, open spaces in the village and tea shops as well as on the road, especially when conversing with road maintenance workers. Care was taken to conduct the participatory activities requiring group work in the mornings or late evenings after people returned from work to ensure the research team did not encroach on people's time. Researchers used simple, colloquial language for conversations and all note-taking was done with people's permission and as unobtrusively as possible.

Transport providers in Dailekh explaining the road map they had drawn to a researcher

D4. Study participants

The study team had conversations and participatory focus group discussions with the following list of people:

- Former RBG members
- RMG members
- Jeep drivers
- Vehicle owners
- Road users (people using available transport)
- Shop owners
- Service providers like teachers, health workers, police
- School and college students

Section E: Qualitative findings

E1. Roads: Utility, linkages and connectivity

All road corridors visited provide a more or less regular passenger and goods transport service. The lower end of the Dailekh road that was completed about eight years ago is gravelled and has over 13 tempos (three-wheeler motorised vehicles) providing transport services. There are also three Bolero jeeps plying the length of the 16 km road, making at least two return trips in a day. In contrast, the Kalikot road, which was only completed in 2017, has 21 vehicles, including jeeps, minitrucks and one tempo, serving all or parts of the corridor. Direct motorable access to both the district headquarters and the Karnali highway is still not possible as this requires two vehicular bridge at two points of the road.

Suspension bridge over the big river in Bajura

Similarly, the Bajura location also needs motorable bridges over two rivers in order to link the RAP road to the highway connecting to the district headquarters. Both rivers have suspension bridges only accessible on foot or motorbike. Although vehicular bridges are yet to be built, transport owners and providers have solved this access issue by driving their vehicles (mainly jeeps) across the larger river bed during the dry season (October–June) and keeping some of these jeeps on the RAP road side for the rest of the year. The smaller river too has a wooden bridge, which was completed a month before endline fieldwork (September 2019). This bridge was built with funds allocated by the municipality (NPR 500,000) and jeeps and tractors can now use this to go across. Previously people crossed a suspension bridge before getting on the jeeps parked across the river. At the time of fieldwork in September 2019, the road corridor had two jeeps, which were making three to four round trips a day.

The schedules for transport options in all three locations are generally unpredictable. Even in locations where jeeps are expected to follow a departure schedule,[15] it is the norm to wait for passengers until they reach full capacity.[16] This means passengers often experience long waiting times, which, particularly in times of emergency, makes walking the more practical option. Although reserving jeeps is an option during an emergency, people still have to wait for these to arrive. For example, in Dailekh, a pharmacist at the upper end of the road corridor recommended that sick people be taken down in stretchers in times of emergency. He reasoned that a jeep would usually take about three to four hours to come once called for and in certain cases (like a woman in labour or a sick elderly person) there was no luxury to wait. The slow speed (5–15 km per hour) of vehicles navigating earthen roads is another reason people mentioned walking instead of taking transport.

[15] In Dailekh, the jeeps usually leave from the upper end of the road corridor around 8am. In Bajura, if the jeep is parked in the village at the end of the road corridor at night, it is understood that it will leave with passengers in the morning.

[16] In Kalikot, researchers observed and people told us only 11 people (1 driver, 10 passengers) were allowed to travel in a vehicle. This rule was strictly followed because of two police checkpoints on the road corridor. In Bajura and Dailekh, researchers observed and experienced at least 12–15 people being squeezed into jeeps. In Dailekh, jeep drivers informed each other if there were traffic police stationed ahead on the road.

The municipality-funded wooden bridge in Bajura

Except in Kalikot, where there was evidence of fare regulation, fares are typically not regulated and are considered high by the community. In Kalikot, the jeep fare for full length of the road corridor (~18 km) was NPR 500/trip when the road first opened but this has now reduced to NPR 350/trip because there is more competition. In Bajura and Dailekh, people pay NPR 300/trip for 2 and 1.5 hour journeys, respectively.

It is also possible to reserve vehicles (negotiable, from NPR 3,000 to 10,000 per location) but this is mainly during emergencies. Although fares and reserve costs are considered high, many people told us they '*find ways to get the money, usually borrowing'* (pharmacist, Dailekh), and, except in Bajura, where some people told us that high fares had discouraged them from using the jeeps, researchers in other locations did not meet people complaining about this.

Despite long waiting times, slow speeds and high fares, people in all locations were increasingly using available transport options. People explained their vehicle use in terms of '*saving our energy'* and researchers observed and transport providers told us that the journey time was used as an opportunity to catch up on local gossip and as a time to rest, especially by older men and women, who mentioned taking transport occasionally to make social visits.

In all three locations, researchers did not observe many students using transport. This was mainly because schools are off motorable roads (Bajura), they are accessible through alternate walking trails (Bajura and Dailekh) or students prefer to walk as it gives them more time with friends (Dailekh). Students who go to schools and colleges outside the village use the road more often in comparison but this is only when they come home for the weekend or holidays. Even then, some said they preferred to walk to save money (Dailekh). In contrast, teachers in a primary school in Dailekh commuted using a motorbike or reserved tempo, which had halved their previous journey time of three hours' walk. Two new teachers here implied that one reason they had taken the job was they could take transport to the school instead of walking.

In all three locations, people considered the road important in linking them to health services outside of the village. In Bajura and Kalikot, having motorable road means decreased journey time and more convenience in transporting patients. In Bajura, people could phone to reserve a jeep,[17] which could transport them to their preferred hospital in Achham. People explained this as a convenient option compared with before, when they had to stretcher a sick person three to four hours down to the market hub and then get a vehicle to Achham. In Kalikot, some families bought motorbikes once the road was completed in 2017 and researchers were told *'in an emergency two people can bring a sick person (on a motorbike to the health post)'* (health coordinator for municipality). The road is also a faster means to transport temperature-controlled vaccines from the district headquarters to health centres in the municipality. A few people also described a more effective chain of referral, where patients who went to health centres in the village would be referred to the district hospital in Manma and onto the bigger hospital in Jumla and be transported in a shorter time than before. The municipality here is also planning to buy an ambulance, although the situation of the road means the ambulance can be operated only around the municipality area.

[17] One of the two jeeps in Bajura is owned by a man who has a restaurant business in the village as well as the nearby market hub. People can make a phone call to either of these two locations to reserve the jeep. In Dailekh, owners of teashops along the road have phone numbers of jeep drivers. In cases of emergency, people can ask teashop owners to phone for a jeep.

Road connections have not necessarily improved people's access to local shops. All locations had shops catering to people's needs from before but more shops had opened along the road corridor and in the village while road construction was underway. In Bajura, people told us many of the shops that had opened at the time of road construction had closed now (e.g. a shop selling poultry, a few grocery stores and snack shops). Shop owners described credit arrangements and explained that, at the time of road construction, they had allowed people to buy things on credit with the understanding that they would pay this off once they received payment. Credit was repaid, regularly but in parts, during the road construction period. However, people became unable and/or unwilling to repay once they were out of work, leaving shop owners with large amounts of unpaid credit, because of which many shops had closed. One shop owner here showed researchers his ledger, where he had noted the amounts he was owed by families, with one family owing him NPR 25,000.

Likewise, in Dailekh, shops along the road corridor gave the impression that they were not regularly re-stocked and often had an old stock of goods. Shop owners explained this in terms of competition they faced from other shops, which sold identical goods for the same prices. Most shops here had opened during road construction 11 years ago and, although, unlike in Bajura, they were still operating, the competition was high and turnover low. As one woman shop owner reminisced, '*I opened my small grocery business 10 years ago beside the road as it was being constructed. More shops opened, and we would be out of stock in 15 days. But now the stock lasts five to six months.'*

Former RAP workers in Bajura recalled having better purchasing power during road construction because they received frequent wages and spent less on things like snacks for children. For example, women told us that, while they had given children pocket money (as much as NPR 100/day) every day during road construction, now they did '*only when we have the money (and only NPR 5–10/day)'* and shop owners corroborated this saying fewer children came and less frequently to buy snacks from shops. Some shop owners also shared that consumption had increased during road construction because people had cash and where previously a shop '*sold about 15–20 sacks of 50 kg rice weekly, now I can't sell that many in a month'* (shop owner, Bajura).

In contrast, the local market in Kalikot is burgeoning. The market (on two separate sections of the road corridor) has more shops than before, selling a wide range of goods including groceries, shoes, clothes, electrical goods, cosmetics, poultry and tailoring. Most of these shops are still temporary structures but researchers here observed good footfall in most shops in their time spent at the market.

Construction of new roads coupled with access to mobile phones means local shop owners are able to get stock goods delivered to their shops. In all locations visited, shop owners along the roads told us they phoned their wholesalers in the market hubs and placed orders for goods. These orders are then brought up by jeeps. In Dailekh, researchers also observed retail vans bringing up goods for sale to shops along the road corridor and the village but shop owners mentioned these were not always reliable as they only came when the roads could be accessed easily. A few people also mentioned being able to phone shops in Dailekh bazaar with personal orders for clothes, grocery items, etc., which are then sent up to the village.

People in all locations mentioned access to bigger markets in connection to roads; however, this access is limited to consumer goods that they are now able to buy in the village as a result of the road construction. As of now, all three locations are yet to foster linkages with outside markets when it comes to selling produce. All locations are largely subsistence economies and, except for the Kalikot location, where researchers heard that the local government was promoting commercial apple farming and some people were growing potatoes to sell,[18] people did not mention trying agriculture on a commercial scale. This relates to a number of factors, among which lack of irrigation and high carriage costs are key. For example, in Bajura, farmers told us they could only consider commercial vegetable farming if there was proper irrigation, but even then they were not certain of finding a market for their produce. Although there is a market hub near the village here, this has been getting bulk supplies from Dhangadhi via

[18] Some people in Kalikot told us they had started potato farming the previous year (2018) and their produce had sold in the local market for NPR 50/kg.

Achham and fostering new linkages with this market is a difficult task. Others told us of trying to sell cucumbers and yoghurt in the market but they had given up because the cost of transport was higher than the profit they made.[19]

E2. Most significant changes and problems according to people

Changes

Road

- Distance to markets and health services decreasing in terms of journey times;
- Availability of diverse goods in local shops (Kalikot), but shops that opened during road construction have closed now (Bajura);
- Carriage costs of goods have decreased— earlier porters/mules charged more (NPR 8/kg by mules to NPR 4/kg by jeeps in Bajura; NPR 21/kg by mules/porters to NPR 3/kg by jeeps);
- Others roads in village constructed after completion of RAP roads— every settlement now has a motorable road funded by the municipality that connects to the main RAP road (Kalikot); new motorable roads extending beyond the RAP road (Bajura);
- More variety of vehicles, including a school bus and a number of tempos (Dailekh). Increasing numbers of personal motorbikes.

Other physical infrastructure

- New stadium construction in planning (Kalikot);
- New government village health clinic and planned 'hospital' (Bajura);
- Under construction micro-hydropower plant (Bajura).

Except for the greater variety of vehicles plying the road, people in Dailekh told us there had been no changes in the village. Conversations implied that many development and administrative activities had shifted to Surkhet (the province capital) since the federalisation process in 2017.

Problems

- Lack of employment opportunities in the village so people (mainly men) have to migrate to India. Many men now migrating to South Korea for a fixed time (4 years and 10 months), which pays well (Dailekh);
- More competition between shops selling similar goods, leading to less turnover (Dailekh);
- Landslides caused by excavators and bulldozers to open new roads, which have blocked alternate walking routes (Bajura);
- Lack of irrigation (Bajura);
- Drinking water problem during dry months in some settlements (Bajura);
- Annual hailstorms causing crop failures and municipality not acknowledging the seriousness of the problem (Bajura);
- Increasing mosquitoes because of vehicles (Kalikot and Bajura);
- Road accidents – there have been two serious road accidents in Bajura in the 18 months since the road opened to vehicular traffic; people in Kalikot are concerned about their children chasing after jeeps and getting injured;

[19] We met one woman who had taken eight cucumbers into the market by jeep. She sold the lot for NPR 500 but the return journey cost her NPR 600. Another man makes yoghurt from buffalo milk and sells for NPR 70/litre. But if he uses the jeep to travel he makes only NPR 100.

- Increasing alcohol consumption (Kalikot). People using RAP roads to get out of areas where there are checks on alcohol and gambling (Dailekh);
- Snack consumption (Dailekh).

E3. RAP-3 effect on work opportunities

People in the build districts emphasised that working on the RAP roads had helped them gain new skills in construction and increased their chances of employability. Kalikot, which is now an urban municipality, is witnessing fast growth as the local government is investing in developing physical infrastructure, mainly roads. The municipality envisions a '*ring road'* (municipal engineer, Kalikot) – a network of motorable roads connecting to the RAP road. This has resulted in most walking trails being opened up using bulldozers and excavators as a result of which every settlement in the municipality now has a motorable road. While the tracks have been opened using machines, the finishing (constructing gabion baskets, retention walls, installing culverts) is being done by a '*construction brigade'* – a group of men who are employed by the municipality for NPR 10,000/month and assigned construction activities. Although not all men in the brigade worked on the RAP road, this indicates that there are work opportunities for former construction workers.

Walking trail being constructed by community members in Bajura

In Bajura, where a micro-hydro plant is being constructed, many people we met are employed there. This is a local government initiative where the community has to contribute at least 14 days of labour/family and be paid for additional days of work. Both men and women were employed and told us wages were based on a person's skills, with a skilled mason getting NPR 900/day, a semi-skilled worker NPR 700/day and others, mainly women, NPR 500/day for work like ground clearing and trimming bushes. Another group of people here were building an alternate walking trail after it had been inundated by floods following a landslide. They shared that skills they had gained from working on the RAP road were proving useful as they were now able to *'build a decent* (walking) *road'* as opposed to before when they would just throw some stones together to form a walking trail. Researchers also noted local men working on building retention walls and gabion baskets on the road stretch that had been opened using machinery after the RAP road was constructed. This work was funded by the municipality, which had allocated additional money for the finishing of machine-built roads and mainly employed men who had experience of road building.

E4. Livelihood changes post-RAP

Apart from working on municipality-funded construction projects, people in both build districts have largely returned to the work they did pre-road construction. As before, women are engaged in agricultural work, either reciprocally or as waged labour, and men have returned to migrating for work. This is evident mainly in Bajura, where many men were back in India on either short- or long-term work contracts. People explained that, while some men had stayed in the village for the duration of road construction and worked on the road, others had come for shorter periods, often timing it to correspond with the planting

season[20] and staying longer, and substituted for family members who were part of a RBG. A former facilitator for a Dalit-only RBG recalled the early days of RBG formation and shared that, since most Dalit men were in India, the RBGs had more women than the 33% required by RAP. This had led the facilitator to phone the men working in India and ask them to come home to be part of the RBGs. Many men had returned and most had stayed for the full duration of the project but had returned to India after road construction was complete. Of the 48 Dalit families in the settlement visited by researchers, only 10 families had men who were in the village; others had returned to India for work.

In Kalikot, where most people are farmers, people aspire to have their own small business, like a small shop selling groceries or a teashop. The rapid development of the area is likely providing new economic opportunities[21] for businesses, and conversations with people indicated that migrant workers (in India and abroad) were saving money to start their own small businesses in the future. In Dailekh, where road construction was completed eight years, there was a similar trend of shops opening along the road corridor for the duration of construction. As discussed above, most shops are still doing business but turnover is low. While subsistence agriculture with some selling of surplus is still practised, men are interested in migrating abroad, with South Korea being the destination choice.

E5. Maintenance and improvement of roads

All three locations have RAP-3-instituted RMG, where groups were formed using a pro-poor criteria with specific inclusion of '*single women, Dalit and people from poorer households'* (former RBG facilitator, Bajura). Researchers in all study locations observed RMG workers on the road corridors and had conversations with them regarding the state of roads and the activities they were required to carry out. The wages for RMGs are fixed according to the district wage rate, with the RMG in Bajura supposed to be paid NPR 750/day and the RMG in Dailekh choosing to take payments every two months with an aim of saving money. Likewise, all RMGs were required to work for 11 days a month with the flexibility to work the days they chose together as a group. While RMGs in Bajura work every alternate day, the RMG in Dailekh works on fixed days, focusing on moving from one end of the road corridor to the other. This has been a cause of dissatisfaction for some transport providers and users, who complained to researchers about some stretches of the road that had not seen recent maintenance activity.

While the group of 14 workers in Dailekh has been working together for 5 years (with substitutions from within the family if someone dies or is unable to work) and get paid by the District Physical Infrastructure and Transport Office, the RMGs in Bajura and Kalikot are yet to enter into formal contracts with their respective municipalities. The RMGs in Bajura were formed while the road construction was ongoing and worked for two years under RAP supervision. In an orientation programme before the road was handed over to the government in June–July 2019, workers were informed that they would be employed by the municipality in future. As of September 2019, RMG workers in Bajura have received a standard letter of appointment from the municipality but, despite having worked on the road for two months, they have not been paid. In Kalikot, the RMG had worked for the last one year being supervised by RAP but payments had come through the municipality. They were yet to enter into a contract with the municipality and, although there was budget for road maintenance, it had not been allocated for the fiscal year. In both Dailekh and Bajura, RMGs were working without technical supervision.

Road users in all three locations were aware of and acknowledged the work done by the RMGs. In both Dailekh and Bajura, jeep drivers and other road users told us they often pointed out priority areas to RMG workers, and workers in Bajura explained that they worked on those stretches of road first as '*they [jeep drivers] know which parts of the road are difficult to navigate'* (RMG leader, Bajura). A sense of ownership over the road was also reflected by ordinary road users here, who told us they had helped RMG workers on a few occasions, especially to remove larger stones and rocks, as this was '*a road we have built*

[20] Women in Bajura explained to us that men migrant workers who have short-term jobs working in India often come home for the planting season; while women are able to manage most activities, men are needed for ploughing.

[21] As discussed, many shops have opened in Kalikot since road construction. These sell a variety of goods including electronics. Researchers also noted at least two meat and poultry shops that do business every day, similar to shops in Kathmandu or other bigger cities.

ourselves' (man, Bajura). There were also frequent comparisons (by RMG workers as well as other road users) to the other RAP-3-built road corridor, with people saying their road was the better one and had less water logging compared with the other. One RMG worker here told us that, while there were problems with mud tracks and water logging in the wet season (when researchers were there), '*in the dry season the road is good enough to lick food off'.*

Apart from the regular maintenance work done by the RMGs, all locations also had existing road improvement projects, planned or being done in parts. In Dailekh, the road was being gravelled in parts, with the most recent portion gravelled in 2018. Along with opening up new motorable roads in Bajura and Kalikot, the municipalities also had plans for further road improvement. In Kalikot, one engineer for the municipality informed researchers of their plans to black-top the RAP road in the future and had started a feasibility survey. In Bajura, people had heard that the RAP road was going to be black-topped in intervals of 5 km but there had not been any formal confirmation from the municipality.

E6. Savings and investment

- People mentioned different ways of saving; a few talked of investing in livestock (especially cows, goats or buffalos) but mainly people said that gold ornaments, land, insurance and lending money to relatives/friends were good investments.
- Bajura seems to have a longer culture of keeping savings in savings and cooperatives and microcredit institutions. Many families here have been members of a savings and cooperative for as long as 10 years and save NPR 25–50/month. Others also have savings in a micro-credit institution (more recent), which requires them to save NPR 100/month.
- In both Kalikot and Bajura, parents who had invested in children's higher education considered this part of their savings. Former road workers in both locations told researchers they had invested their RAP wages in sending their children to colleges to train as teachers, health workers, overseers and agro-vets.
- A few families in Kalikot and Bajura also used their RAP wages in paying off debts. Women were more likely than men to pay off debts and three women in Bajura had used their RAP wages to pay off previous debts incurred when building their houses.
- Some others (mainly women) had used parts of their RAP wages to set up/expand shops and buy land plots, livestock and gold.
- People in Bajura stressed they had mostly used their RAP wages on buying food like rice,[22] cooking oil, sugar, salt, meat and snacks for children during road construction. A few people we spoke with recalled the drought in 2015/16 and explained that RAP wages had helped them buy food for their families during that period.

The build districts were required by RAP to form savings group and have mandatory savings throughout the duration of the project. All former RBG workers researchers met in Bajura and Kalikot had been part of their RBG savings groups, which had dissolved after programme phase-out. While some groups in Kalikot have continued to save,[23] the situation in Bajura is more worrying.

Researchers met people from four different RBG savings groups and were told that, once the road work ended, RAP told them that the savings could be continued or split depending on what the group chose.

1. One group (Chettris) had split the savings and some members assumed all other groups had done the same. However, researchers met three women from this savings group who were yet to receive their share of the savings. They explained that only those with clout had been able to get a share of their savings while they (one single woman, one person with a disability and one whose husband is bed-

[22] Although families have paddy fields with thrice a year yields, people explained that this was not enough yield to last a year. As a result, many families have to buy rice.

[23] Some women who were part of the RBG savings in Kalikot explained that they had continued to save NPR 100/month on the 15th of every month. They were, however, not certain about how much the group had in savings.

ridden) had not been able to ask for their share of the money. One of the women was treasurer for the group but told us all money transactions had been done by the group facilitator; she had been made treasurer as *'it would look good to have a woman in position'.* She was also unaware of how much the group had had in savings before the project ended.

2. A second group (made up mostly of Brahmins) had continued to save until two months ago (June 2019). This group had NPR 400,000 in savings and was waiting for the group leader and treasurer, who were both working in India, to come back so they could divide the savings.
3. A third group (Dalit only) had NPR 200,000 in savings, which they had been loaning out since the RBG disbanded. The loans were yet to be repaid and the group facilitator was worried that people would not repay what they had borrowed.
4. A fourth RBG of Brahmins was yet to recover NPR 55,000 they had lent. They had worked out the split and were waiting for this outstanding amount to finally divide the savings among members.

E7. Decision-making and women's empowerment

Women across locations shared that, historically, they are the ones in charge of making family and household decisions. These communities have men who have been migrating to India for generations. In the absence of men, women are the ones making most decisions for the family, including spending decisions: '*They send the money and we spend'* (wives of migrant workers, Bajura). Bigger financial decisions like buying land and livestock are taken jointly by men and women, and women say they depend on other male members of the family to jointly make these decisions when their husbands are away.

For a lot of women, the RAP road construction was the first time they were paid cash for work. Most women traditionally work under reciprocal labour arrangements but this is slowly changing, particularly in Bajura. A few women here explained that they had started asking for wages (usually NPR 300–500/day) when working outside of reciprocal labour arrangements after realising the potential to earn from working on the RAP road. Wives of migrant workers who had worked on road construction when their husbands were away also felt that earning wages was a way to smoothen cash flow as remittances were not regular and usually sent with other returning migrants or when husbands returned home.

Section F: Household survey methodology

RAP-3 baseline questionnaire development

The RAP-3 baseline survey was designed to give a broad estimate of the changes in poverty and wellbeing in the districts where RAP-3 interventions are taking place. Several considerations informed the design of the survey, including the need to observe any hypothesised effects of RAP-3 intervention (particularly those captured in the RAP-3 logframe), and our initial experience working in the relevant districts (i.e. the RCA work).

The starting point for the baseline design, however, was the Government of Nepal's *Nepal Living Standards Survey* (NLSS).

Nepal Living Standards Survey

The official government source of data for estimating per capita consumption and poverty rates is the NLSS. This is a multi-topic household survey containing information on a wide range of topics related to livelihoods and the determinants of living standards in Nepal. A considerable part of the questionnaire is taken up with detailed consumption questions that come together to create a consumption aggregate, which is in turn used to determine official poverty statistics.

The NLSS was conducted for the first time in 1995–1996 (NLSS-I). Since then, two more survey rounds have been implemented – one in 1995–1996 (NLSS-II) and the most recent one in 2010–2011 (NLSS-III). The NLSS sampling covers the RAP-3 implementation districts in the Mid- and Far-West of the country.

In developing the RAP-3 baseline questionnaire, we took the NLSS-III questionnaire as a starting point, before stripping out questions we considered surplus to our requirements and adding additional questions where necessary. This ensures definitional consistency of a good number of indicators between the RAP-3 baseline and the NLSS, allowing cross-comparison between the two, and potentially allowing for additional analysis to be conducted if another NLSS round is conducted in the lifetime of RAP-3.

Questionnaire design considerations

A number of considerations drove the design of RAP3 baseline questionnaire following the NLSS-III starting point:

- **Logframe indicators** – the RAP-3 baseline needs to capture the headline indicators of the logframe, as presented in Table 52.

Table 52: Logframe indicators

Indicator	Description
Impact 1	Number of households directly lifted out of poverty by RAP (indicator to be finalised through RAP/MEL baseline)
Impact 2	Number of households with improved SOLI (indicator to be developed through RAP/MEL baseline)
Outcome 1	Number of people benefiting from improved access (A) travel time and (B) cost of transportation
Outcome 2	Increased local market activity in the RAP road networks corridors (over baseline year)
Outcome 3	Number of households with reduced economic insecurity OR number of households with increased annual income of NRP 10,000 due in Road Transport Impact Area of RAP

- Other **hypothesised effects of RAP3**, as set out in Table 53.

Table 53: Hypothesised effects of RAP-3 intervention

- Reduced transport cost for passengers
- Increased household income
- Increased household income diversity
- Increased added value from primary producers income
- Improved nutritional status/food diversity
- Increased school enrolment and attendance
- Improved immunisation rates
- Increased use of health facilities and other government services
- Reduced distress migration
- Increased non-distress migration
- Reduced cost of credit/greater diversity of institutions offering credit resulting in lower interest rates
- Increased female participation in the labour force and household decision-making
- Increased household spending on asset creation activities
- Increased non-farm employment activities
- Increased use of improved agricultural technology and agriculture and livestock service centres

- An **abbreviated food consumption module**: Because the RAP-3 baseline questionnaire was not attempting to construct a full consumption aggregate (as in the NLSS), the level of detail required on type, weight and cost of food consumed could be reduced. The FCS methodology developed by the World Food Programme (WFP) was used as a framework to guide the construction of the food consumption module, and this module was harmonised with the corresponding module in the Nepal Food Security Monitoring System (NeKSAP) household questionnaire.[24]
- **Lessons learned from the RCA**: The Scoping RCA was conducted in November 2013 in order to allow findings to be reflected in the design of the baseline questionnaire. Two key outcomes emerged:
  - ✓ **The inclusion of a negative impact module in the household questionnaire as a result of the following summarised findings:**
    - Increasing access and purchase of poor quality snack foods (junk food) displacing more traditional and nutritious forms of cooking and consumption, increasing the need for cash;
    - Loss of portering jobs, local skills and livelihoods threatened by cheaper imported goods;
    - Increase in newcomers 'strangers' to the hill and mountain areas, making long-term hill and mountain residents feel more insecure, especially around illegal activities;
    - A breakdown in some of the taboos for the higher castes, e.g. drinking alcohol, which is more common now;
    - Increasing need for cash displacing traditional reciprocal labour arrangements.
  - ✓ **Consideration of alternative approaches to measuring poverty:** The next section discusses these.

Measuring poverty

The first impact indicator of the RAP logframe is the 'number of households directly lifted out of poverty by RAP-3'. This demands a measurement of household wellbeing, and a threshold below which a household is categorised as 'poor'.

[24] Collects, analyses and presents information on household food security, emerging crises, markets and nutrition from across Nepal. The NeKSAP was initially established by WFP but is currently being institutionalised by the Government of Nepal in collaboration with the Ministry of Agriculture and Cooperatives and the National Planning Commission.

As discussed above, the NLSS is the Government of Nepal's official data source for poverty statistics, and we once again intend to be consistent with NLSS definitions here. However, for resource constraint reasons, enumerating a full consumption aggregate for the RAP-3 baseline, midline and endline was not feasible. Therefore, a **proxy means test** approach was adopted in order to model household consumption.

The proxy means test approach

The PMT approach sought to model household consumption upon a range of explanatory variables.

In order to construct the PMT model, NLSS-III was once again used as the starting point, drawing on analysis conducted by the World Bank/Nepal Central Bureau of Statistics in 2013 that sought to calculate small area estimates of poverty across Nepal based on NLSS-III data.[25] The World Bank/Central Bureau of Statistics analysis constructed three poverty models – one for Central and Eastern regions, one for the Western region and one for the Mid- and Far-West regions, with the latter containing 240 villages in the 8 RAP-3 districts.

For our PMT model, the World Bank/ Central Bureau of Statistics Mid- and Far-West model was adapted, removing coverage of the Terai, where the terrain is flatter and more fertile than the hill and mountain districts of RAP-3. This left a sample of 660 villages, of which 240 fall within the RAP-3 districts. Having removed the Terai, it was not believed that the remaining 420 villages outside of the RAP3- districts would create significant bias, as many of these share similar agro-ecological conditions and livelihood profiles with the RAP-3 beneficiaries.

Further refinement of the model required careful selection of explanatory variables to be included in the RAP-3 baseline survey. Selection of indicators was based on the following criteria:

- Good coverage of **multiple dimensions of poverty**, which a recent World Bank paper cites as important in maximising the predictive power of the model.[26] The dimensions that were ultimately incorporated into the model were as follows: (i) demography; (ii) education and employment; (iii) housing; (iv) physical assets; (v) productive assets, (vi) health; and (vii) geography;
- Indicators that are **inexpensive to collect**, **easy to answer** and **simple to verify** – these were the motivations for pursuing a PMT model rather than a comprehensive consumption aggregate, and should seek to ensure greatest value for money to DFID when conducting the survey;
- Indicators that are **strongly correlated with poverty**;
- Indicators that are **liable to change over an appropriate time period**. For example, literacy rates may not vary over the time of RAP-3, but the extent to which children are tutored may well do;
- Indicators that are **not an immediate physical manifestation of improved road access**. For example, the model should not include explanatory variables that quantify time or cost travel to nearest facility or road. If these access indicators dominated the model, simply increasing access would change the consumption estimate of the model without any indirect access outcomes and impacts having been observed.

Based on these criteria, a range of possible indicators were identified, before the model was fitted using the Generalised Linear Latent and Mixed Models procedure in Stata, with random effects used to model each district. The selection of variables to be entered as fixed effects was conducted in a two-stage process. First, stepwise procedures were conducted to identify the variables that had a strong level of statistical significance within an overall model. Second, additional model terms were considered so that the ultimate model would include parameters from a variety of different domains.

The final model is summarised below in Table 54.

[25] Central Bureau of Statistics/World Bank (2013). Small Area Estimation of Poverty, 2011

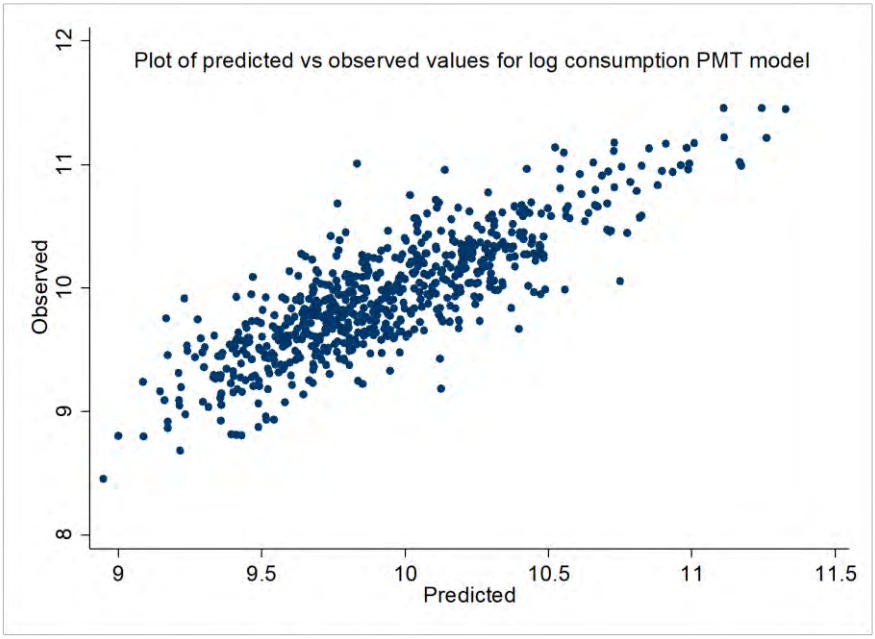
[26] Christiansen, L., Lanjow, P., Luoto, J. and Stifel, D. (2011). Small Area Estimation-Based Prediction Methods to Track Poverty. Policy Research Working Paper 5683, World Bank Development Research Group, June.

Table 54: PMT explanatory variables used in final model with coefficients standard error, Z score and probability

Domains	Variable	Coef.	SE	z	P>z
Constant		10.082	0.117	86.010	<0.001
Household-level variables					
Demography	Caste of head = Dalit	-0.074	0.025	-2.970	0.003
	% of house aged <=6	-0.004	0.001	-6.590	<0.001
	% of house aged 7–15	-0.002	0.001	-3.370	0.001
	Household size	-0.203	0.019	-10.740	<0.001
	Household size squared	0.008	0.001	6.160	<0.001
Education and employment	Tutor used for children	0.070	0.039	1.820	0.068
	Log (income from employment or sales)	0.015	0.005	3.380	0.001
	Income from remittances	3.31×10^{-6}	1.30×10^{-6}	2.550	0.011
Housing	Number of rooms in house	0.021	0.008	2.590	0.010
	Roof is galvanised iron or concrete	0.065	0.030	2.150	0.032
	Firewood or dung as cooking fuel	-0.214	0.043	-4.940	<0.001
Physical assets	Number of assets owned	0.020	0.013	1.480	0.140
	Phone owned = Yes	0.114	0.035	3.210	0.001
	Log (land owned)	0.062	0.025	2.470	0.013
Productive assets	Use any improved crop varieties	0.063	0.020	3.200	0.001
Health	Food Consumption Score	0.009	0.001	12.690	<0.001
	Health facilities is perceived to be less than adequate	0.059	0.035	1.680	0.092
Village-level variables					
Education and employment	Complete secondary education	0.258	0.072	3.590	<0.001
Health	Unsafe deliveries	0.189	0.022	8.560	<0.001
	Children under 24 mongs vaccinated against measles	-0.177	0.046	-3.890	<0.001
District random effects (only RAP sampling districts shown)					
Geography	Achham	0.054			
	Bajura	0.054			
	Dailekh	-0.054			
	Doti	-0.164			
	Jumla	0.054			
	Kalikot	0.164			
	Mugu/Humla	0.164			

Our model has an R^2 (or *coefficient of determination*) of 0.70 – i.e. 70% of the variation in consumption in the Mid- and Far-West regions can explained by the model. This compares with a lower R^2 of 0.55 in the World Bank/Central Bureau of Statistics Mid and Far-West model discussed earlier. We believe this to be a particularly strong goodness of fit, as depicted in Figure 83, below.

Figure 83: Plot of annual per capita normalised household consumption against consumption predicted by PMT model



RAP3 questionnaire topics

In light of the above discussions, Table 55 sets out the finalised baseline questionnaire topics.

Table 55: Survey topics

Topic	Indicators covered
Household type utilities and amenities	Occupation type, number of rooms, construction type, access to key utilities and amenities.
Access to services and facilities	Travel type, time and cost to range of infrastructure and services, frequency of use of these infrastructure and services, reason for occasional or non-use and satisfaction perception with the service.
Road perceptions	Perceptions on the beneficiaries and impacts of the new roads, and changes in costs and availability of goods and services
Food consumption	Number of days that household has consumed a range of 16 food groups.
Household assets	11 household assets enumerated, ranging from radios to jewellery.
Wage labour	Diversity of daily, long-term and contract wage labour by sector.
Non-agricultural enterprises	Diversity of non-agricultural enterprises operated by household members by sector, with length of operation and ownership profile. Includes problems encountered running these businesses.
Agricultural land ownership and use	Number, size and type of agricultural plot including access to irrigation by season. Plot cultivation pattern for dry and wet season, revenues from sharecropping or fixed renting.
Agricultural crop diversity and cultivation in intensity	Diversity of crops cultivated in the past year, indicating where improved varieties have been planted, value of sales, intensity of agricultural fertilisers and manures.
Landholding increase/decrease	Area of land purchases and sales over the past 12 months.
Additional agricultural revenues	Income revenue from renting out draught animals and machinery, sales from wood and charcoal and non-timber forest products.

Topic	Indicators covered
Livestock ownership	Type, value and number of livestock and numbers of sales and purchases in the last 12 months. Income from eggs, milk, meat hides and other livestock-related production.
Credit and savings	Number of loans, source and purpose of loan, principal borrowed, interest rates number, posts.
Household absentees/ migration	Roster of household member absentees, reason for current absence from household, level of remittances sent in cash or in kind.
Remittances from non-members	Value and use of remittances from anybody who is not considered a household member.
Other income and savings	Diversity of receipts from in-kind transfer programmes, social protection payments and public work programmes. Saving group membership (can triangulate information from Credit and Savings section).
Household roster	Enumeration of household members, age sex and relationship to head of household.
Health	Chronic illness, disability and illness or injury in the past 30 days prevalence among household members with associated health-seeking behaviour and costs. Reasons for non-consultation.
Maternity	Every married woman aged 15–49 giving birth over the past 2 years, use of pre- and post-natal services, who assisted in birth and where, with reasons for not using pre-and post-natal services.
Education	Literacy, educational attainment, current attendance, reasons for non-attendance, time commuting to school and education expenses including private tuition.
Migration history of current household	Migration history of current household members over the past 2 years, including where they migrated to and why, reasons for return, and remittance value housing cash in kind.
Household decisions	Occurrence, involvement and final decision-making of a range of decision topics by both male and female head of household/spouse.
Adequacy of consumption and coping strategies	Adequacy of food security, housing, clothing, health care, education; food security experience in past 30 days and coping strategies employed.
Negative influences	Perceptions of increase or decrease in crime and insecurity, type of crime and insecurity and suggested reasons for change. Other negative changes enumerated with suggested causes. Households not aware of government service opening times and other performance factors, concerns or complaints with the services and whether respondent has voiced any complaints or grievances about the services.

Table 56: Progress out of Poverty scorecard for Nepal

To assist with collection, organizations should use the household roster located on the second page.

Entity	Name	ID		Date (DD/MM/YY)
Participant:			Date joined:	
Field agent:			Date scored:	
Service point:			# household members:	

Indicator	Response	Points	Score
1. How many household members are there?	A. Eight or more	0	
	B. Seven	6	
	C. Six	8	
	D. Five	12	
	E. Four	19	
	F. Three	30	
	G. One or two	34	
2. In what type of job did the male head/spouse work the most hours in the past seven days?	A. No male head/spouse	0	
	B. Does not work, or paid wages on a daily basis or contract/piece-rate in agriculture	0	
	C. Paid wages on a daily basis or contract/piece-rate in non-agriculture	4	
	D. Self-employed in agriculture	5	
	E. Self-employed in non-agriculture	7	
	F. Paid wages on a long-term basis in agriculture or non-agriculture	8	
3. How many bedrooms does your residence have?	A. None	0	
	B. One	2	
	C. Two	7	
	D. Three or more	11	
4. Main construction material of outside walls?	A. Bamboo/leaves, unbaked bricks, wood, mud-bonded bricks/stones, or no outside walls	0	
	B. Cement-bonded bricks/stones, or other material	6	
5. Main material roof is made of?	A. Straw/thatch, or earth/mud	0	
	B. Tiles/slate, or other	2	
	C. Wood/planks, or galvanized iron	6	
	D. Concrete/cement	7	
6. Does your residence have a kitchen?	A. No	0	
	B. Yes	5	
7. What type of stove does your household mainly use for cooking?	A. Open fireplace, mud, kerosene stove, or other	0	
	B. Gas stove, or smokeless oven	3	
8. What type of toilet is used by your household?	A. None, household non-flush, or communal latrine	0	
	B. Household flush	6	
9. How many telephone sets/cordless/mobile does your household own?	A. None	0	
	B. One	8	
	C. Two or more	14	
10. Does your household own, sharecrop-in, or mortgage-in any agricultural land? If yes, is any of it irrigated?	A. No	0	
	B. Yes, but none irrigated	3	
	C. Yes, and some irrigated	6	

By Mark Schreiner of Microfinance Risk Management L.L.C., developer of the PPI. Score:

Sampling and analytical domains

Having set out the design of the questionnaire, the following sections deal with the sampling methodology that led to the selection of households to be surveyed.

Panel vs. cross-sectional data

A series of panel surveys (at baseline, midline and endline) are proposed instead of multiple cross-sectional surveys for the following reasons:

- The most efficient sampling for estimating change in wellbeing and other aspects of life and livelihoods over time comes from repeated observations on the same respondents.
- Panel datasets reduce the burden of relisting and selecting households for each repeated survey.

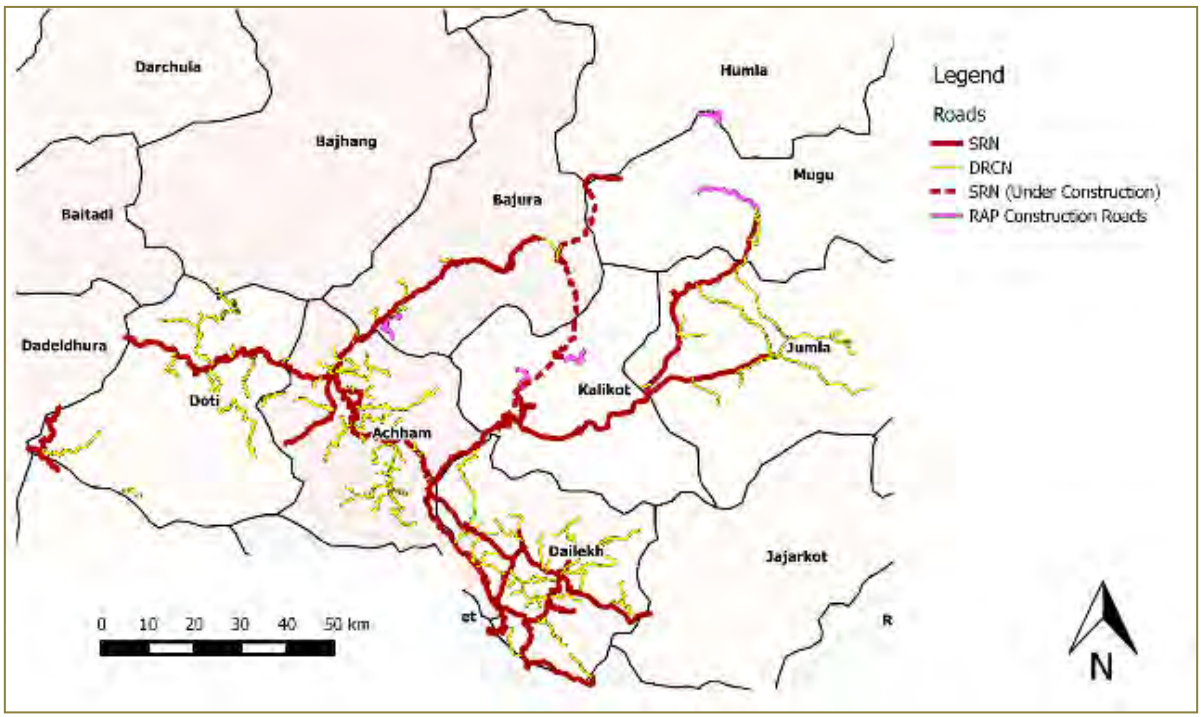
Sampling domains

RAP3 consists of two road engineering components:

1. **Road construction** in four districts (Humla, Mugu, Bajura an Kalikot), (coloured pink in Figure 84);
2. **Road maintenance** in four districts (Doti, Achham, Dailekh and Jumla) (coloured yellow in Figure 84).

Surveys will be conducted in all eight districts.

Figure 84: Map of RAP-3 construction and maintenance roads



Buffers

In order to give a richer picture of the different impacts of RAP-3, 'buffer zones' were drawn up around the relevant roads, with 'inner buffers' containing direct beneficiaries within 1.5 hours' walk of a RAP-3 road, and 'outer buffers' containing beneficiaries up to 5 hours' walk from the road. The latter cohorts are still expected to benefit from the roads, albeit in a more indirect manner.

In order to map these buffers spatially (and identify relevant villages within each), the walking times needed to be translated into distances. In such a mountainous area as the RAP-3 implementation districts, a standard conversion of one hour walking equivalent to 4 km distance is not appropriate. We therefore adjusted our calculations according to the slope of the roads (see box below), which can often slow movement through these districts.

In order to complete the buffer design, spatial data containing the location of existing roads and construction sites was obtained from RAP; the locations of all inhabited villages within the region were obtained from the National Geographic Information Infrastructure Programme (NGIIP),[27] and high-resolution altitude data was obtained from CIAT. Figure 2 (p.2) illustrates the buffer zones within the RAP3 districts.

[27] An error in coding the GIS layers required on the part of NGIIP meant that the GIS layers for northern Doti were not supplied. Unfortunately, there was no time before a sample had to be drawn to acquire these missing shape files to ensure there was full coverage of Doti.

Adjusting walking time for varying gradients

Walking times across the region were estimated using the formula from Aitken 1977/Langmuir 1984 (based on Naismith's rule for walking times):

T= [(a)*(Delta S)] + [(b)*(Delta H uphill)] + [(c)*(Delta H moderate downhill)] + [(d)*(Delta H steep downhill)]

…where:

- T is time of movement in seconds
- Delta S is the distance covered in metres
- Delta H is the altitude difference in metres

The a, b, c, d parameters take into account movement speed in the different conditions and are linked to:

- a: underfoot condition (a=1/walking speed)
- b: underfoot condition and cost associated to movement uphill
- c: underfoot condition and cost associated to movement moderate downhill
- d: underfoot condition and cost associated to movement steep downhill

These adjustments are based on the fact that walking downhill is preferable, but only up to a certain gradient, after which walking actually slows.

This approach is taken purely as a guide for the relative proximities of the villages to the road, rather than an actual estimate of the true walking time. There are two particular assumptions that are unlikely to hold up to scrutiny. First, the default parameters used in the model were not calibrated under the extreme conditions seen in Nepal, so can only be treated as an approximation. Second, this assumes that no factor other than the gradient will affect the walking speed; considerations are not made as to differing underfoot conditions that would slow walking pace (e.g. swamps, dense forest, etc.) or completely prohibit passage and force a diversion (e.g. private land, uncrossable rivers). It was not possible to incorporate this into the model owing to a lack of reliable data on the terrain and how restrictive the differing terrains would be to movement.

RBG and RMG groups

In addition to households located near the roads, the RAP-3 survey also targeted the RBGs and RMGs.

Sampling domains

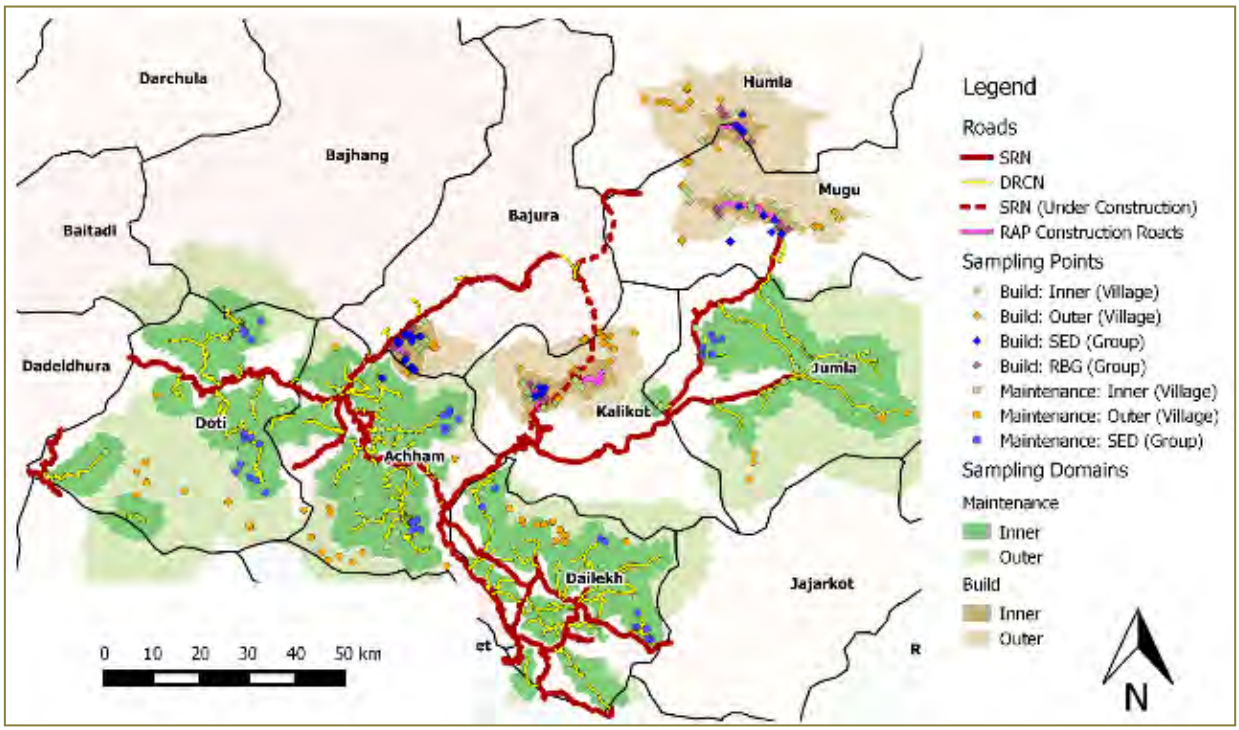
This yields six sampling domains in total:

1. Road building – inner buffer zone
2. Road building – outer buffer zone
3. Road maintenance – inner buffer zone
4. Road maintenance – outer buffer zone
5. RBGs
6. RMGs

The counterfactual

Given the great diversity of results expected across these eight domains, it was decided **not** to select additional control groups. Instead, comparison across the eight existing domains should yield an informative picture of the counterfactual scenario.

Figure 85: RAP3 sampling domains



Sample selection

Road building and maintenance

In the inner and outer buffers of the road building and maintenance districts the primary sample unit (PSU) is the village. For the **build** districts, 199 eligible villages were identified in the inner buffer and 251 in the outer buffer. For the **maintenance** districts, 2,769 eligible villages were identified in the inner buffer and 1,020 in the outer. From these sample frames, villages were sampled to ensure roughly equal coverage of the districts (Table 57).

Table 57: Sampling in the road building and maintenance districts

Road building domains		
District-buffer	# Villages in frame	# Villages in sample
Bajura-inner	54	12
Bajura-outer	15	9
Humla-inner	18	12
Humla-outer	89	13
Kalikot-inner	92	12
Kalikot-outer	77	13
Mugu-inner	31	12
Mugu-outer	74	13
Grand total	**450**	**96**

Road maintenance domains		
District-buffer	# Villages in frame	# Villages in sample
Achham-inner	962	12
Achham-outer	134	12
Dailekh-inner	825	12
Dailekh-outer	31	12
Doti-inner	627	12
Doti-outer	555	12
Jumla-inner	315	12
Jumla-outer	26	12
Grand total	**3789**	**96**

RBG and SED groups

For the RBG and SED groups, the groups themselves were the PSUs. The sample frames were constructed from registration lists of RBG members and SED members.

Table 58: RBG/SED sampling

RBGs		
Domain	Groups	Sample
Bajura-RBG	64	14
Humla-RBG	45	9
Kalikot-RBG	54	10
Mugu-RBG	55	12
Grand total	**218**	**45**

In the case of the RBGs, most consist of around 20 members (with some exceptions). Members of a single RBG or RMG were not always drawn from a single ward, hence the group sampling frame was constructed with RBGs and RMGs as PSUs. From these sample frames, samples were selected proportional to the size of the groups (Table 57).

There was no sampling undertaken in the RMG domain – the baseline survey consisted of a census of all RMG members at the time of the baseline survey. However, the RMG members were not able to be surveyed in 2014 at the same time as the other seven domains, as had been originally planned. At the time of baseline enumeration, RMG activities had not yet started, and the potential members of the RMG had not been fully identified. As a result, the RMG baseline survey took place separately from the other baseline surveys, in April–May 2015. By this time, RMG activities had been running for several months, the exact length of time varied depending on the group, so the survey cannot be seen as a true baseline of the households before the intervention.

Table 59: RMG sampling

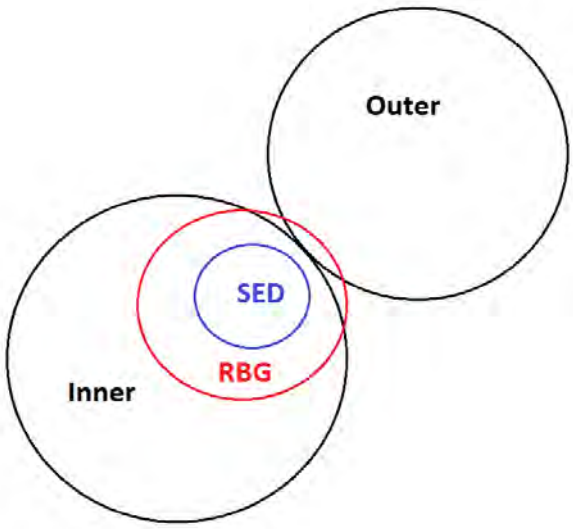
RMGs		
Domain	Groups	Sample
Achham	22	22
Dailekh	14	14
Doti	11	11
Jumla	9	9
Grand total	**56**	**56**

This methodology for the selection of households necessarily meant there would be overlaps where households could be eligible for multiple domains.

Within the build areas:

- The inner and outer sampling domains are completely distinct from each other.
- The RBG households predominantly live within the inner buffer, so would be eligible for selection under this sampling domain. A small number of RBG households live within the outer buffer, or within areas outside of these buffer zones. The population of the inner buffer area is fairly small, and the number of people employed within the RBG relative to this population is large, so the inner buffer sample will contain a reasonably large number of RBG members.

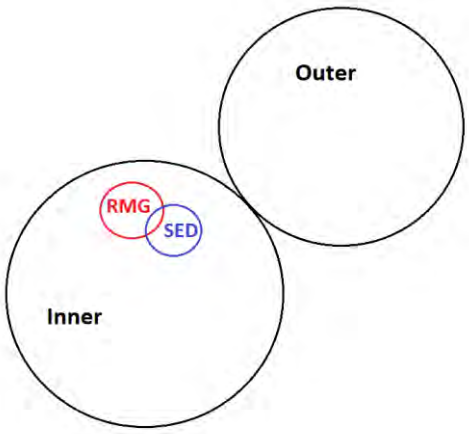
Figure 86: Theoretical overlap between build area domains



Within the maintenance areas:

- The inner and outer sampling domains are completely distinct from each other.
- The RMG households exclusively live within the inner buffer, so would be eligible for selection under the inner buffer. However, the population of the inner buffer relative to the number of people employed within the RMG means there is a much smaller probability of selecting RMG households through the inner buffer.

Figure 87: Theoretical overlap between maintenance area domains



The number of RMG/RBG members appearing within the other domains is summarised in Table 2.

SED activities are not explicitly advertised as such to households participating within them, therefore it is not possible to determine the exact number of SED households appearing within the inner buffers and RBG/RMG domains.

Estimation of number of households per domain

Design effect estimation

The design effect was estimated based on NLSS-III design effects relating to estimates of the poverty headcount rate, depth of poverty and depth of poverty squared in the mountain and hill areas of the Mid-

and Far-West regions. All design effects in NLSS-III were less than 2. However, given the relatively small sample size in the RAP-3 districts under NLSS-III, we assumed a conservative design effect value of 2.

Offsetting the design effect is the correlation between the same unit observed on two occasions. This was estimated at 0.5, owing to the decision to use panel data described above.

Table 60: Design effect

Strata	Observed design effect (baseline PMT)	Observed Design effect (endline PMT)	Observed correlation (PMT: baseline:endline)
Build: RBG	1.9	1.8	0.23
Build: Inner	2.1	1.7	0.29
Build: Outer	2.0	2.2	0.23
Maintenance: RMG	2.4	1.9	0.25
Maintenance: Inner	3.0	3.2	0.38
Maintenance: Outer	2.9	2.1	0.36

Table 60 shows the observed values of correlation and design effect from the survey data for the estimated PMT consumption. This shows that a design effect of approximately 2 was a sensible assumption for five of the six strata, with a slightly higher level of clustering found within the inner maintenance strata than in the other strata. The correlation between the results at baseline and endline was also lower than expectation, with the within strata correlations ranging from between 0.23 to 0.38; all somewhat lower than the expected correlation of 0.5.

Panel household attrition rate

As it is a panel sample and households will be returned to for the midline and endline enumerations, loss of households to the panel must be anticipated. Attrition rates of approximately 20% between survey rounds have been encountered in other surveys, although Nepal-specific attrition rates are not known.

This attrition rate should be anticipated to occur twice, baseline–midline and midline–endline, giving an attrition multiplier of 1/(.8*.8)= 1.56 (this implies that the minimal sample size should be multiplied by 1.56 for the baseline survey in order to arrive at the minimal sample size by the endline, after two rounds of lost households).

Number of households per cluster

NLSS-III used 12 households per PSU. For the enumeration of the RAP baseline, 10 households per PSU were chosen in order to insulate against design effects and ensure a good geographic spread within the sample domains.

Sample size calculation and resource constraints

A minimal sample size per domain of 590 households was estimated based upon the considerations described above, and summarised in Table 61.

Table 61: Minimum sample size calculations

Acceptable margin of error (width of the confidence limits)	+/- 5% points
Required confidence level true value falls within confidence level	95%
Poverty headcount prevalence rate	0.5
Design effect	2
Correlation between two repeated observations	0.5
Sample size required	383
Sample size multiplier to account for panel household attrition rate x2 survey rounds	1.5625
Households per sampling domain	590

However, the resource envelope available for the survey only allowed for the enumeration of an estimated 3,000 households per survey round. These resource constraints were accordingly factored in to the final sampling exercise.

In order to achieve similarly robust results to the original sampling calculations in Table 61, the panel attrition rate would have to fall to 13%, rather than 20%. This is less than ideal, but the use of ODK mobile phone data collection platform enables every household to be easily geo-referenced and photographed and to have their telephone number collected (where the respondent does not object to sharing this). The historical attrition rate used in the sample size calculations above comes from household surveys where geo-referencing of individual households was not undertaken. It is therefore hoped that the extra geographic information collected on households enumerated in the baseline will reduce attrition rates so the core sample is not significantly eroded, and an attrition rate closer to 13% can be achieved.

Endline enumeration

Table 62 shows the actual baseline enumeration rates, compared with the expected number of households based on the earlier calculations. The overall attrition rate in the survey was 10%, below the hypothesised rate of 13%. However, the attrition of households was not uniformly split across the eight domains. The attrition rates were slightly higher than hypothesised within the SED build, outer maintenance and SED maintenance domains but lower than hypothesised within the other five domains.

Table 62: Midline enumeration

Stratum	Baseline	Midline	Endline	Attrition since baseline
RBG	447	414	415	7%
Build inner	462	420	422	9%
Build outer	498	476	467	6%
RMG	423	385	370	13%
Maintain inner	543	501	483	11%
Maintain outer	407	349	339	17%
Overall	2780	2545	2496	10%

* These households are a mixture of those who had migrated and those who could not be located during the time when the enumerators were present in the communities.

A subset of questions focused predominantly on migration was asked over the phone to households that could not be located in person but could be reached.

Construction of weights

Weights were calculated for seven of the eight domains, based on the household sampling probabilities. These estimates are essential for the construction of household weights for the inner and outer sampling domains in the build and maintenance districts. Without them, the un-weighted analysis will include bias arising from the following:

1. The number of households in each of the villages in the sample frame was unknown and therefore selection of villages could not be done proportional to the size of that village. To get an estimate of the selection probability of a household within a given village, it is essential to have the number of households resident in each of the villages sampled.
2. The original sampling of villages across four districts for either the inner or the outer buffers was to be unconstrained in terms of the number of villages to be selected from each district. Once the village sample frame was constructed and initial sampling procedures run, it became apparent that some zones in some districts were under-represented or excluded completely, as some outer buffers have very few villages in them. It was therefore decided to ensure a similar number of households would be

enumerated in each of the zones in each of the districts. To achieve this, different sampling intensities were calculated for each of the buffers within a given district, meaning that the un-weighted analysis reported for the build or maintenance district inner or outer buffer domains will be biased in favour of those buffers in districts that have small numbers of villages.

For the RBG, the sample frame was based on theoretically complete listings of RBG group membership immediately prior to the baseline survey. Therefore, household weights have been calculated, and the selection of groups within strata was proportional to size of the group. There are no weights calculated for the RMG domain because the survey was conducted on a census of member households – therefore the weights are 1 by definition.

Seasonality

The urgency to enumerate the RAP3 baseline before implementation activities started meant that it was not possible to conduct an extended enumeration over a 12-month period, which would have helped neutralise variations in consumption throughout the year.

Therefore, each of the three rounds of surveys (baseline in 2014, midline in 2016 and endline in 2019) has been enumerated in the same seasonal window between early May and mid-June of each of the respective years. This has been done to neutralise seasonality distortions between the survey rounds.

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