Photo Credit: Ian Villanueva
Kibleg Boundary, 2016
Upi,Sultan Kudarat

Impact Evaluation

Awang-Upi-Lebak-Kalamansig-Palimbang-Sarangani Road

December 2019

This report was commissioned by the:

National Economic and Development Authority – Region 12
Regional Government Center, Carpenter Hill
9506 Koronadal City

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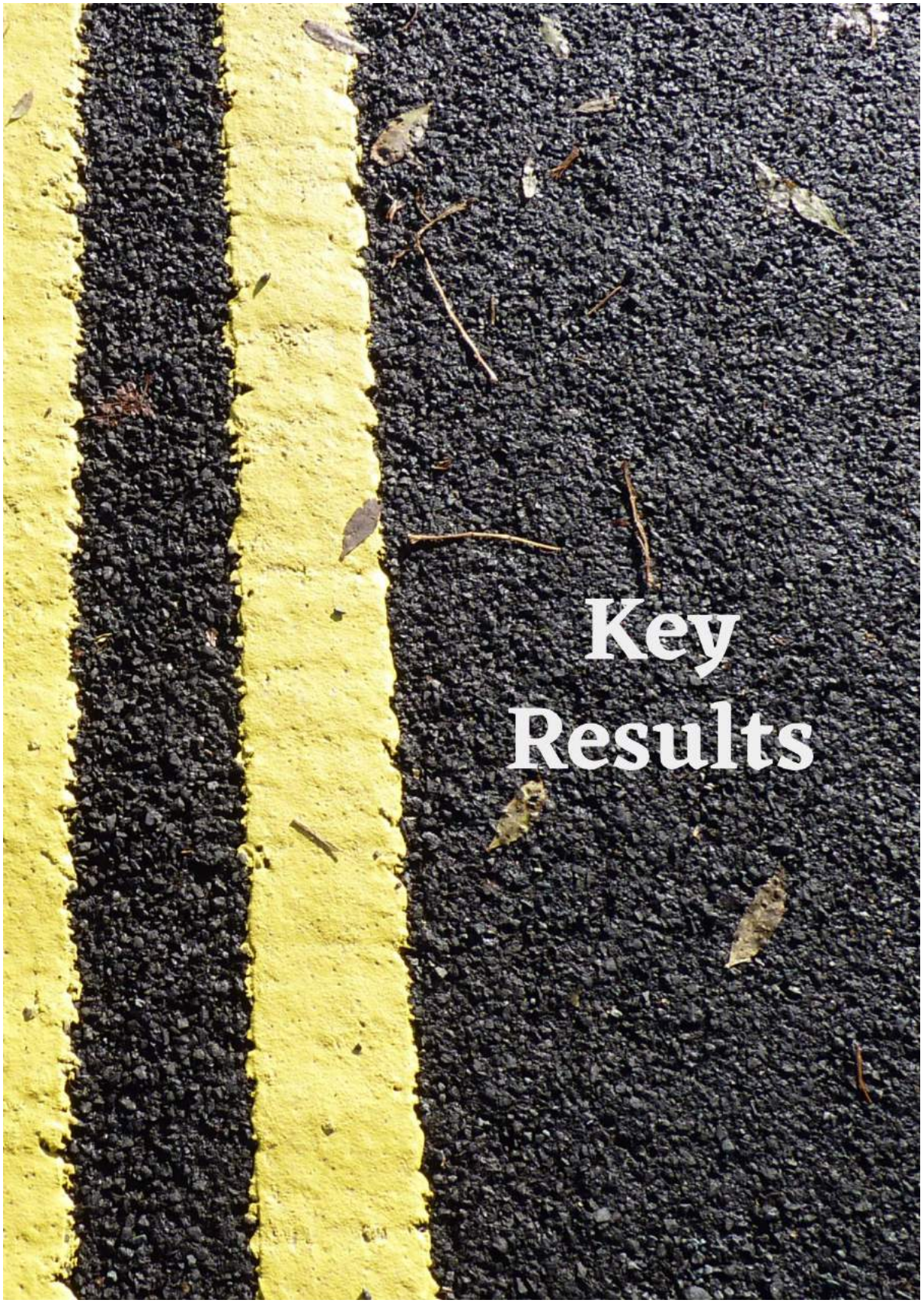
Acronyms

AADT	Annual Average Daily Traffic
AGR	Annual Growth Rate
ARMM	Autonomous Region of Muslim Mindanao
ATE	Average Treatment Effect
BARMM	Bangsamoro Autonomous Region of Muslim Mindanao
BCA	Benefit-Cost Analysis
BCR	Benefit-Cost Ration
CLUP	Comprehensive Land Use Plans
DEO	District Engineering Office
DOS	Datu Odin Sinsuat
DPWH	Department of Public Works and Highways
EIRR	Economic Internal Rate of Return
FGD	Focus Group Discussion
FOI	Freedom of Information
GAA	General Appropriations Act
GOP	Government of the Philippines
HUD	Housing and Urban Development
IE	Impact Evaluation
IRI	International Roughness Index
ISEDI	Institute for Socio-Economic Development Initiatives
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
KII	Key Informant Interview
LGU	Local Government Unit
LU/LC	Land Use/Land Cover
M&E	Monitoring and Evaluation
MILF	Moro Islamic Liberation Front
NEDA	National Economic and Development Authority
NPCC	National Pollution Control Commission
NPT	Notice to Proceed
NPV	Net Present Value
PCR	Pavement Condition Rating
PSA	Philippine Statistics Authority
PSM	Propensity Score Matching
RDP	Regional Development Plan
TOC	Theory of Change
VOCS	Vehicle Operating Cost Savings
WHO	World Health Organization

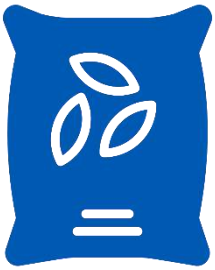

Key
Results

Key Results

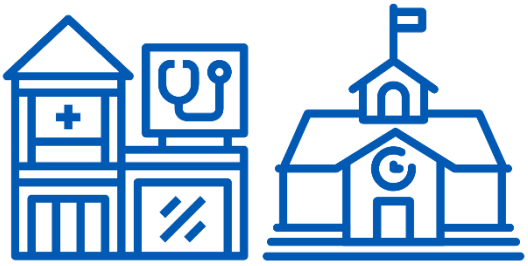
16.66 minutes per kilometer
Travel time savings per destination, normalized by common mode of transportation (motorcycle)

12.53 minutes
Amount of waiting time reduced to hail a ride, as more transport services became available to riding public

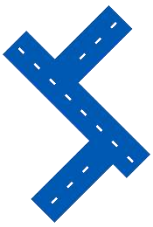
Php 62 million annually
Amount of vehicle operating cost reduced/saved per year due to the presence of the road



Php 14.81 per sack
Amount of transport cost per sack lessened, comparing before the cost before the road (2008) and now (2018)

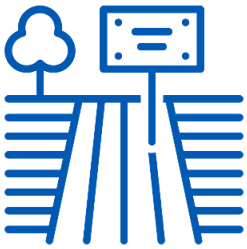


Improved access
Households in the treatment areas have higher percentage of access to basic social services and facilities, as government built such facilities near the



54 of 70 barangays
are now connected to the main road

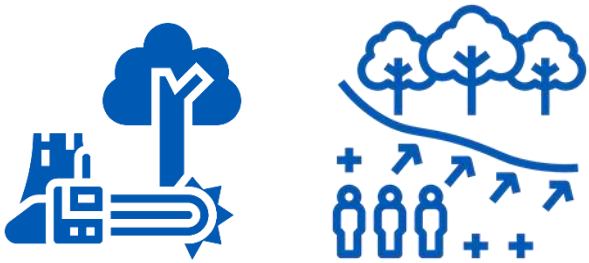
Php 9,655 per year
Average investment on farm of households in treatment area, which is lower compared to comparison area



Php 290.37 per square meter
Amount of increase in the value of land in the treatment area, comparing before the road project and now

29.4% of households
In the treatment area sourced additional income from **employment** in eateries, agri-supply, transport services, bakeries,

37.6% of households
In the treatment area experienced increase (although slight) in the level of income



5x increase in agricultural area
Natural ecosystem (forest, mangrove, shrubs, grasslands) has decreased in area– to accommodate agricultural activities.

96% of barangays

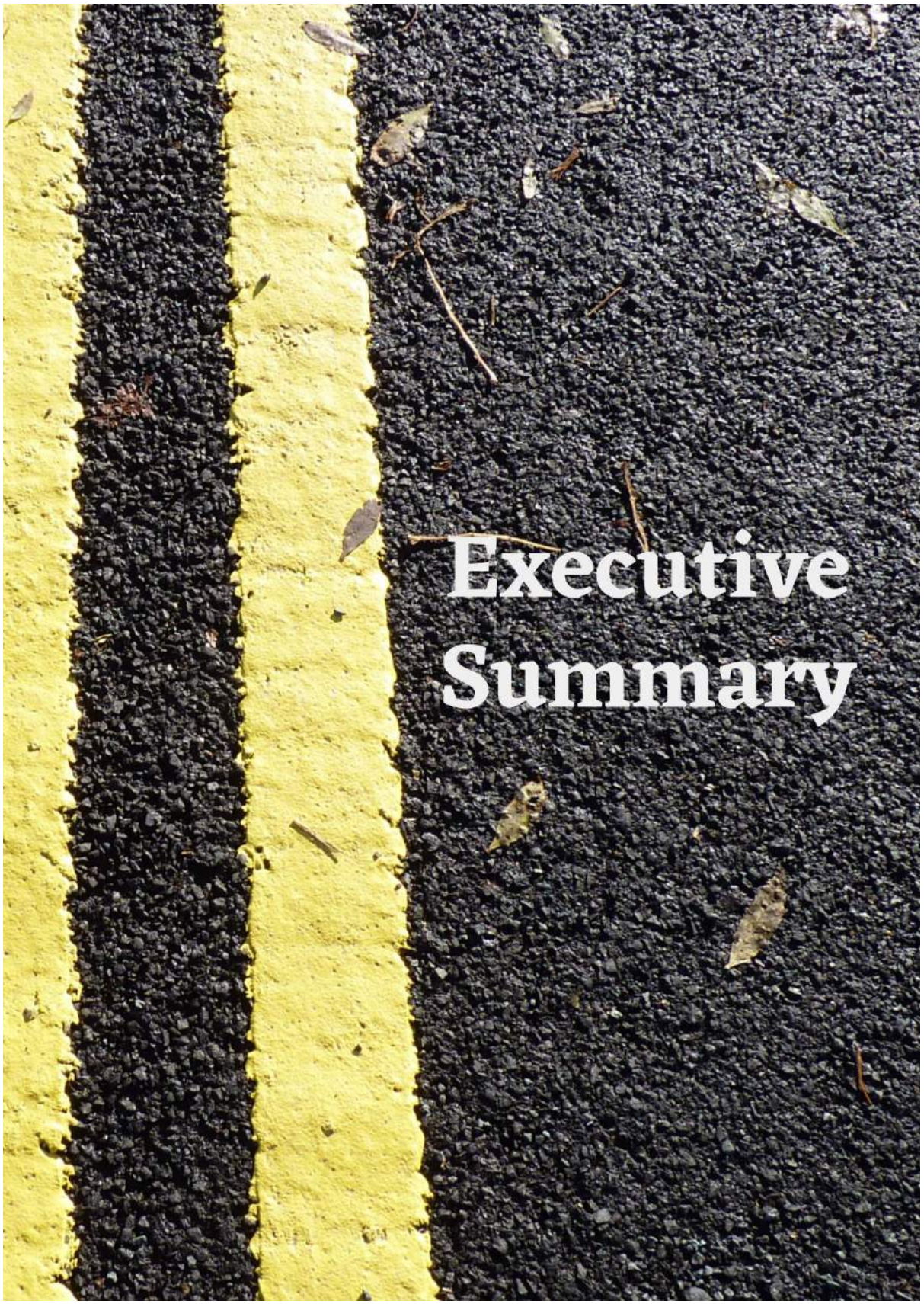
Said they now have joint activities with other barangays and municipalities. The residents now frequently travel outside of their municipality/province.

Fewer households in poverty

Perception of barangay officials as to the number of households in poverty, before the road and now.

93% of barangays

Barangay officials in the treatment area claimed that their communities are relatively peaceful now (e.g. fewer murder yet more robbery/hold-up cases).


Executive
Summary

1 Executive Summary

The Awang-Upi-Lebak-Kalamansig-Palimbang-Sarangani Road is a priority project of the national government through the Department of Public Works and Highways (DPWH). It connects key municipalities in Sultan Kudarat to Cotabato City on one end and, consequently, to Sarangani Province on the other end, which is still being completed. The focus of this impact evaluation (IE) study is the paved and completed section starting from the boundary of Brgy. Awang in Datu Odin Sinsuat of Maguindanao, which connects to Upi and South Upi municipalities also of Maguindanao and to Lebak and Kalamansig municipalities of Sultan Kudarat.

This IE study is commissioned by the National Economic and Development Authority (NEDA) Regional Office 12. The study was approved in May 2018 and was supposed to be completed in October of the same year. Apart from the additional process of seeking approval from the Philippine Statistics Authority (PSA) for the data collection tools to be used, there were also other unexpected delays due to conflict of schedule. The actual data gathering happened between February to April 2019, in three (3) occasions. The Institute for Socio-Economic Development Initiatives (ISEDI) of the Ateneo de Davao University conducted the study.

This IE study is based on the experience and observations of 529 household respondents, 193 business owners, 174 vehicle owners, 101 passengers, 15 key informants, 77 barangay officials, and 90 focus group participants. Available secondary information shared by the municipal governments were also used in the impact estimation and in triangulation to substantiate the data gathered from the households. Finally, actual physical assessment of the road condition was also undertaken. The primary sources of information came from the five (5) municipalities of Upi, South Upi, Lebak, Kalamansig, and Datu Odin Sinsuat (DOS). To provide a perspective had these municipalities were not exposed to a national road project, the Municipality of Esperanza; also part of Sultan Kudarat, was chosen as the comparison area.

The key findings of the IE on the following outcomes that were identified in the conceptual framework and Theory of Change (TOC) are the following:

1. **Reduced travel time** – The road project resulted in an overall time (time index) reduction of an average of 16.66 minutes per kilometer. This is the difference of the time index in the comparison group of 23.70 minutes and the treatment group of 7.04 minutes; it is measured as the average travel time of all destinations regardless of mode of transportation. Travel time savings per destination normalized by the common mode of transportation in both areas (which is the motorcycle) ranges from 58 seconds to 7.22 minutes per kilometer.

2. **Improved road connectivity** – The municipalities of Upi, Lebak, and Datu Odin Sinsuat have completed, on-going, proposed road projects that connect to the main road at the time of the data gathering. According to the local officials in 77 barangays interviewed, 54 (70%) of these barangays are already connected to the road.

3. **Reduced vehicle operating costs** –The findings show that the road has a computed vehicle operating cost of Php 62 million annually (average for 20 years)[1].

4. **Improved access to markets** – From on the observation of key informants and the local barangay officials, the presence of the road has improved access to farm inputs from suppliers located outside barangays or those located in the center of the municipalities. The road is also believed to have contributed to the reduction of physical damage to agricultural goods while on transit to the local markets. The road itself and the availability of transport services have also contributed to the reduction of transport cost per sack, to as much as Php 14.81 per sack, when compared before and after the road construction. Further, on any given day of the week, farmers can transport their produce from their farms to the market.

5. **Improved access to social and commercial services** – The road has contributed to giving better access to basic social services and facilities. The households in the treatment areas have a higher percentage of access. It is also worth considering that the presence or condition of the road may not necessarily be the sole reason for improved access. The intervention of the government/other entities of putting up these facilities and providing services near the clusters of settlements also improved their access to social and commercial services.

   However, the utilization of these services and facilities are much higher for the households in the comparison areas, even if facilities in the comparison areas are relatively farther from the households and fares are higher. The study did not delve deeper as to the reasons why the utilization rate of these services is higher in comparison area; some plausible reasons may include quality of service provided (for example, availability of medicines or presence of health personnel in barangay health center or rural health unit), level of need/demand of the household, cost of service utilization.

6. Increased vehicular activities – With the road, there are more transport services available to the riding public, to as much as 100 units. With several transport services available, the riding public and those with cargo have experienced an average reduction of waiting time at 12.53 minutes. The waiting time in the comparison area is 20.17 minutes compared to the average waiting time in the treatment area of 7.64 minutes.

   In the official Annual Average Daily Traffic (AADT) by the DPWH, the traffic count for Calendar Year 2008 was 625, and this rose to 2,038 for Calendar Year 2018, an increase of 226% for ten years.

7. **Improved safety of travel** – The information on the safety of travel mainly comes from the experiences and observations of the vehicle owners – not on the official reported cases. The majority of the interviewed owners have claimed to have seen car crashes (94.3%) happening while on the road, with the majority (77%) resulting in light injuries.

[1]The reduction in vehicle operating cost was computed as the average of the differences in the vehicle maintenance cost before and after the project for 10 years multiplied by the traffic count. The before value was adjusted to inflation to make the two periods comparable.

Local government informants say that these accidents were mostly caused by over-speeding.

8. **Increased agricultural investment** – The study finds that the farming households near the road have spent less (Php 9,655.83) on their farms compared to the farming households in the comparison area in Esperanza (Php 16,584). The households in the treatment areas have other sources of income; hence, the smaller investment on-farm activities. Farming households in the comparison area rely heavily on farming; thus, their high investment (e.g., fertilizers and labor). With the presence of the road and availability of transport services, there is also a reduction of post-harvest losses, to the

   The presence of the road and other changes may have contributed to the increase of the land value near the road. The study finds that the value of land has increased by Php 290.37 per square meter comparing before the road and now. The land value, comparing the communities near the road versus in Esperanza, is also higher by Php 401.96 per square meter. The qualitative data has shown that farming households in treatment areas have even increased their land area (by 0.3 hectares average) and have increased their land use utilization (by 4% of the land area).

   The presence of the road may have also accounted for the lesser transport cost of farm inputs and farm produce, given the availability and frequency of transport options.

9. **Increased agricultural production and business transactions** – The study did not have sufficient information on the level of agricultural production of the treatment households before the road project, except for the expanded coverage for agricultural area (based on the land use/land cover map). However, what emerged from the FGD sessions was the observations that the types of small businesses have expanded, particularly in the retailing and services sectors. There were also observations that small store operations before the road project have either upgraded or some becoming wholesalers (from being retailers). The barangay officials have also observed that small enterprises making sufficient profit, a reason for remaining in business.

10. **Increased employment opportunities** – Both treatment and comparison areas have reported an increase in households claiming that there are many income and livelihood opportunities now compared before. The number of households that draw income from employment (opportunities for work opened in small businesses such as eateries, agri-supply, transport services, bakeries, remittance centers, and in agricultural plantations) has increased in the treatment (29.4%) areas compared to the comparison (3.3%) areas.

11. **Increased household income and consumption** – The study finds that the road has expanded the sources of income of the households near the road. These treatment households may have been fully dependent on agricultural income before the road was constructed. After the road, household members may have shifted or added income sources, particularly from the wholesale or retail trade, private employment and professional work.

    However, the study also finds that even with additional sources, the level of income has not significantly increased in the treatment households. Results of the survey conducted

in 37.6% of households in the treatment group and 54% of the households in the comparison group showed that there was a slight increase in the level of income in both groups.

12. **Enhanced social interactions** – The FGD participants and the key informants have agreed that with the road, there has been a change in their travel behavior. They are now traveling outside of their municipality/province to work, to visit relatives, and to avail of health services in more affluent areas (e.g., Cotabato City). Barangay officials have observed the increase in the number of visitors and tourists coming to their barangays. Nearly all (75 or 96.1%) of the barangays surveyed have joint activities/projects with other barangays and municipalities.

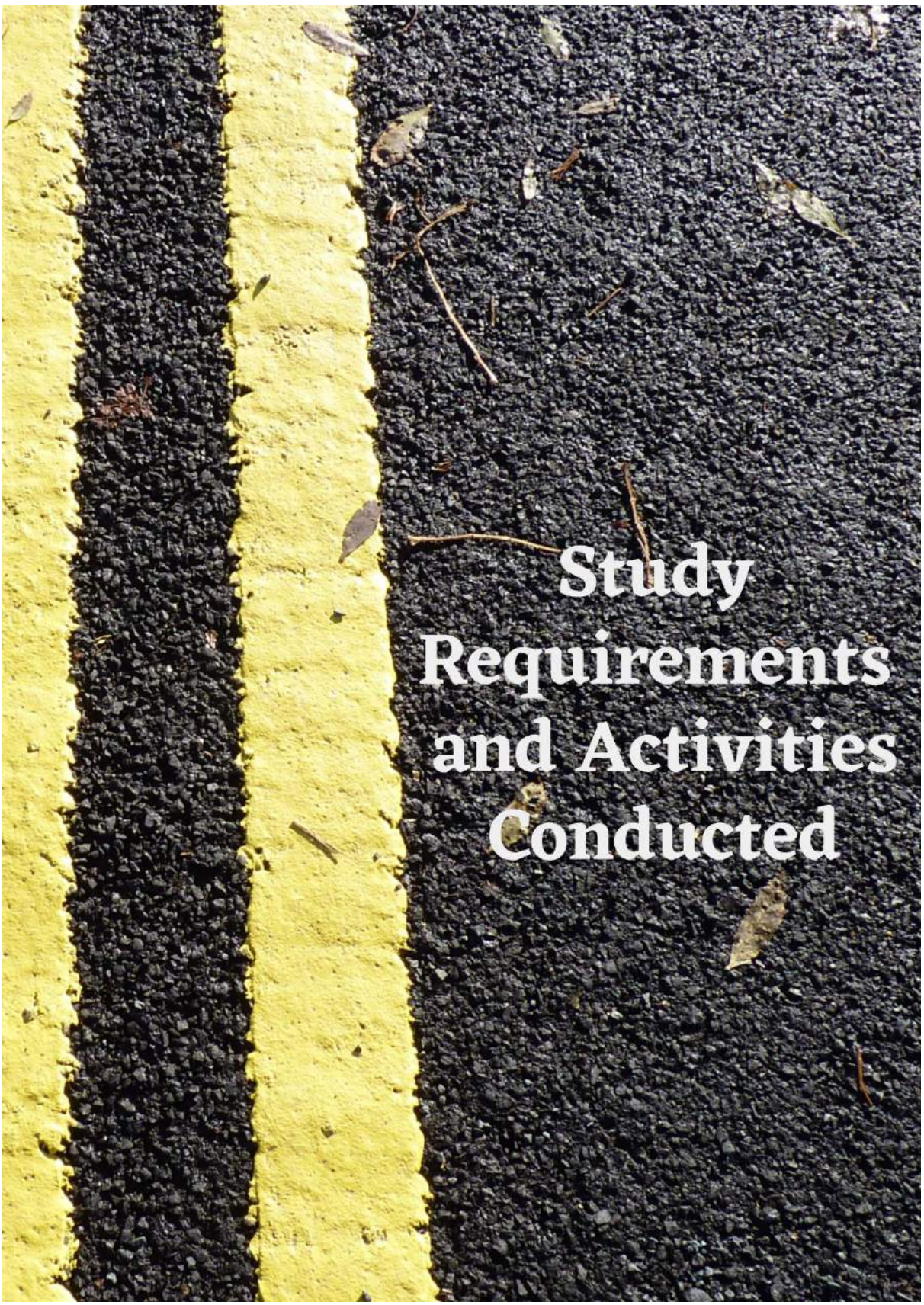
13. **Changes in the environment** – The Land Use/Land Cover (LU/LC) of the treatment barangays have also changed. The road has contributed to the increase in agricultural areas along its landscape to about 5 times in 5 years (time of construction to completion). The built-up land has also increased by 2.5 times during that period. Natural ecosystems (forest, mangrove forests, shrubs and wooded grasslands) have suffered the largest decline comparing before the project (2008) until the road completion.

    The road has increased road traffic, which has also increased the noise levels in areas adjacent to the road. The recorded noise levels in residential and commercial areas are beyond the standards for residential and commercial areas. It is also assumed that such noise level may affect the wildlife in forest areas near the road.

14. **Contribution to poverty reduction** – Relying based on perception of the barangay officials, the majority of the barangays now say that in general, the level of poverty among the households has reduced (from 72.2% of the barangays before the road to 56.6% barangays today).

15. **Contribution to peace and security** – The majority of the barangay officials claim that their barangays have become more peaceful today (93.4%) compared to before the project. The officials also claim that in their respective barangays, there has been a reduction of murder incidence (by at least one incidence per barangay in a year), but an increase in the number of robbery/hold-up and domestic violence with at least two incidences each barangay.

The estimated economic net present values, internal rate of return, and benefit-cost ratios at various discount rates have yielded below the acceptable values and thus points at the road project – at this point –to be economically not viable at 12% discount rate but viable at 6% and 3%. The viability of the project at 6% discount rate is sensitive to changes in costs and benefits. The social gains mentioned above should be taken to balance the expected economic impact of the road.


Study
Requirements
and Activities
Conducted

2 Study Requirements and Activities Conducted

The General Appropriations Act (GAA) of Fiscal Year 2015 and 2016 provided a Monitoring and Evaluation (M&E) Fund, which could be used to finance M&E activities. Such activities aimed to measure the success of development interventions, specifically investigate their contribution to poverty reduction and inclusive growth. Overall, the National Economic and Development Authority (NEDA), which plays a major role in the M&E of the country's policies, major capital programs, and projects, is tasked to assess development programs/projects' gains, identify lessons and recommend policy changes emanating from the programs/project implementation.

The NEDA 12 tapped this M&E Fund and the development project chosen for impact evaluation (IE) was the **Awang-Upi-Lebak-Kalamansig-Palimbang-Sarangani Road**, which links the province of Maguindanao in the Autonomous Region of Muslim Mindanao (ARMM), the provinces of Sultan Kudarat and Sarangani in Region 12[2]. Awang-Upi-Lebak-Kalamansig road sections have been paved. There is on-going concreting for the remaining sections from Poblacion Kalamansig-Palimbang-Maitum.

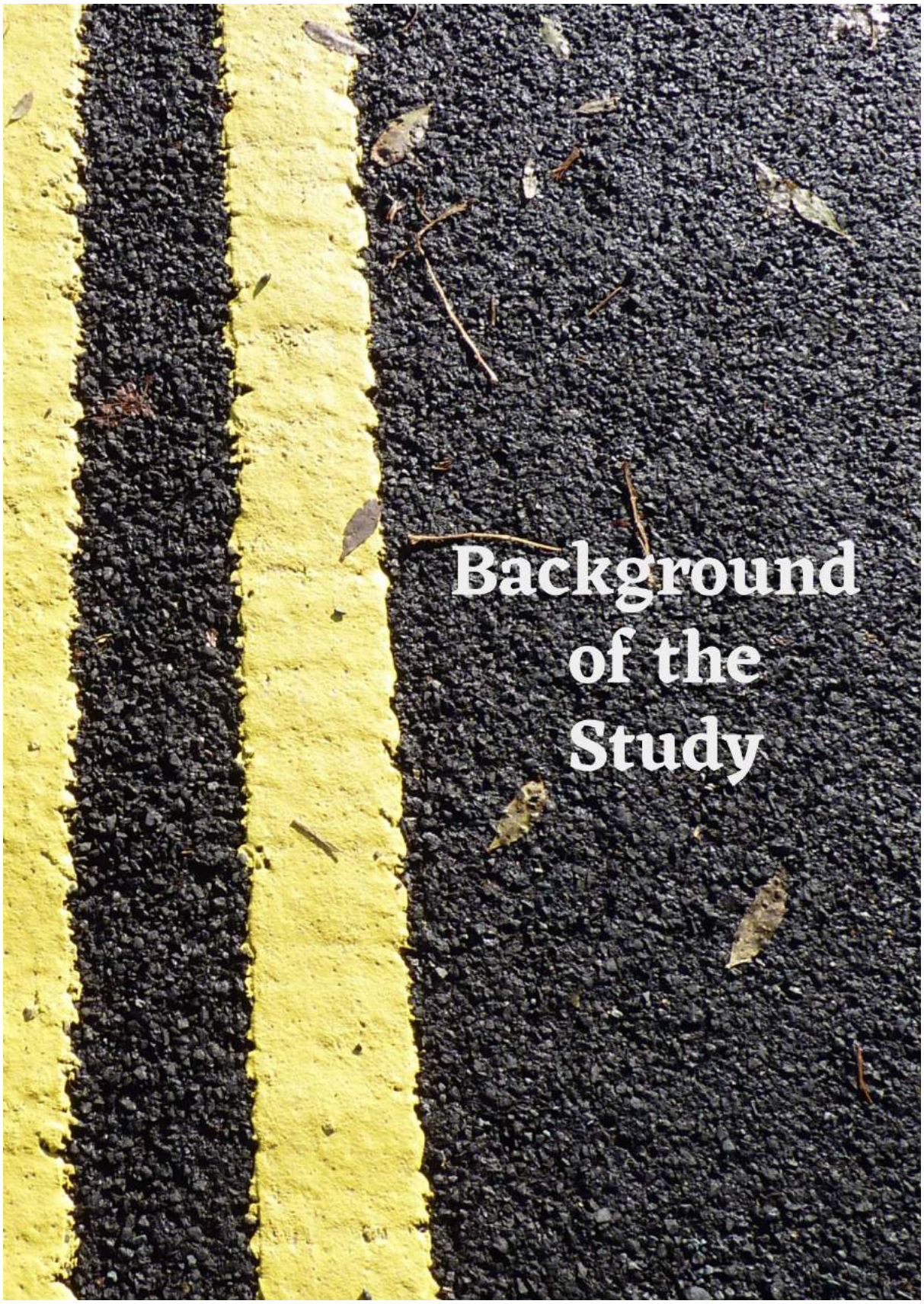
The IE study has been commissioned to the Institute for Socio-Economic Development Initiatives (ISEDI) of the Ateneo de Davao University (AdDU). The effectivity of the contract was on May 1, 2018, and was expected to complete in October 2018. However, an extension was granted to complete the project by the end of April 2019 with the agreement to include securing the PSA approval of questionnaires, which was not part of the original contract and TOR. After the acceptance of the Notice to Proceed (NTP), the following activities were undertaken:

TABLE 1: TIMETABLE OF ACTIVITIES CONDUCTED

Activity	Date
NEDA12 and ISEDI – Project Contract Signing	April 16, 2018
ISEDI Director signed Notice to Proceed (NTP)	April 24, 2018
Effectivity of NTP	May 01, 2018
Requested the DPWH12 and DPWH-National for a copy of the Feasibility Study	May 02, 2018
Letter to NEDA12 for extension of submission of Inception Report	May 14, 2018
Submitted Inception Report(supposedly due June 1 but NEDA granted the extension of submission)	June 13, 2018
Received comments of NEDA12 on the submitted Inception Report	July 09, 2018
Submitted the 2nd draft of Inception Report based on NEDA 12 July 9 comments	July 19, 2019

[2]Also known as the South Cotabato, Cotabato, Sultan Kudarat, Sarangani, and General Santos or SOCCSKSARGEN Region.

Activity	Date
Meeting with NEDA12 and ISEDI Team (discussion on the 2nd draft of Inception Report)	August 16, 2018
Received consolidated comments on 2nd Draft of Inception Report	August 22, 2018
Initial consultation with the local DPWH engineer (Engr. Delfin Villoria) involved in some sections of the road project	September 13, 2018
Reconnaissance of the entire stretch of the road project from Awang to Kalamansig, Sultan Kudarat with the Team Leader, Survey Specialist and Project Coordinator	September 23 – 25, 2018
Submission of Final Inception Report	September 28, 2018
Acceptance of Final Inception Report	October 09, 2018
Pre-testing of the survey questionnaires (Household Survey, Business Owner Survey, Passenger Survey, and Vehicle Owner Survey)	October 8 – 12, 2018
Submission of Tools to PSA – Marbel Office	October 15, 2018
ISEDI submitted request Letter for project extension	October 28, 2018
Received email from PSA Region – requesting to fill-up Form 1	October 29, 2018
Approved Project Extension – November 30 to April 30, 2019	October 30, 2018
Submitted to PSA12 Form1 and Annex A to H (Tools)	November 15, 2018
Received email from PSA12 instructing ISEDI that the SSRCS Form 1 should be filled out by NEDA 12, as the requesting agency	November 23, 2018
Forwarded to NEDA12 documents – Form1 and Annex A to H for submission to PSA12	November 23, 2018
Received email from NEDA12 regarding PSA additional requirements	December 27, 2018
Compliance of PSA additional requirements	January 8, 2019
Resubmission of Form 3 and 4 to NEDA	January 11, 2019
Meeting with NEDA12 and ISEDI	January 24, 2019
Enumerators' Training	February 08, 2019
Field Activities - Primary and Second Data Gathering	February 11 – 28, 2019
Submission of First Progress Report	February 11, 2019
Submission of the Second Progress Report	March 04, 2019
Data Review and Cleaning and Analysis	Started March 11 to April 15, 2019
Submission of Midterm Report	March 20, 2019
Submission of Draft Final Report	April 29, 2019
Proposed Presentation of Draft Final Report	June 6, 2019
Submission of Final Report	December 10, 2019


Background
of the
Study

3 Background of the Study

3.1 About the Road Project

The Philippine Government, through the Department of Public Works and Highways (DPWH) and the Japan Bank for International Cooperation (JBIC) funded the Awang-Upi-Lebak-Kalamansig-Palimbang-Sarangani Road. The portion **Awang-Upi-Lebak-Kalamansig** has already been paved and open for traffic, valued at Php 2.75 billion[3] , and has a length of 105 kilometers[4]. There is on-going concreting for the remaining sections from Poblacion Kalamansig-Palimbang-Maitum[5].

In an ex-post evaluation document[6], the project was intended to "*improve intra-regional links, particularly the access of farming villages to the regional road network, increase human and freight movement, and increase efficiency of as well as cut costs of transport in Cotabato and surrounding areas, thereby contributing to a stable regional security situation*." The same report also stated that this particular road project was undertaken in three sections and completed by different main contractors:

TABLE 2: ROAD SECTIONS AND MAIN CONTRACTORS

Section	Main Contractor
Section 1: Junction Awang – North Upi Road	R.D. Interior, Jr. Construction (Philippines)
Section 2: North Upi – Maguindanao/Sultan Kudarat Boundary Road	Hanjin Heavy Industries and Construction Co. Ltd. (Korea)
Section 3: Maguindanao/Sultan Kudarat Boundary – Lebak – Kalamansig	P.L. Sebastian Construction (Philippines) and Wee Eng Construction (China) (Joint Venture)

3.2 About the Road Influence Areas: The Municipalities

The focus of this IE is the portion of the road that traverses at least five (5) municipalities, with the starting point from the edge of Brgy. Awang, (1) Datu Odin Sinsuat near Cotabato City, goes to (2) Upi and (3) South Upi municipalities of Maguindanao Province, proceed to (4) Lebak and stops at the boundary of (5) Kalamansig, the last two are municipalities of Sultan Kudarat.

[3]In a document by Keiko Watanabe, the loan amount from the Japan Government for the Central Mindanao Road Project was JPY 3.165 billion, with repayment period of 30 years, retrieved from https://www2.jica.go.jp/en/evaluation/pdf/2013_PH-P237_4.pdf

[4] JICA Lauds DPWH for Early Completion of Central Mindanao Road Project, retrieved from https://www.officialgazette.gov.ph/2012/01/09/jica-lauds-dpwh-for-early-completion-of-central-mindanao-road-project/

[5]As of the release of the Terms of Reference for this study, hence, its exclusion.

[6]Ex-Post Evaluation on Central Mindanao Road Project, written by Keiko Watanabe retrieved from https://www2.jica.go.jp/en/evaluation/pdf/2013_PH-P237_4.pdf

Four of the five (5) municipalities are classified as 1st income class municipalities, referring to local government units (LGUs) that have reached an average annual income of Php 90 million or more. Lebak is the most populous among the five municipalities while Datu Odin Sinsuat is the most densely populated. The household size is biggest in South Upi, with an average members of 5.3 people.

Among the two municipalities in Sultan Kudarat covered by this IE, Lebak has the most number of complete government elementary school and complete government secondary schools. In terms of student to teacher ratio, the municipality of Kalamansig has the highest number for both elementary and secondary pupils.

A good number of households in Kalamansig has access to water supply for drinking, delivered through Level 2 and Level 3 distribution system, while the lowest proportion is in Lebak with only 19%. However, for this particular study, the Municipality of Datu Odin Sinsuat (DOS) in Maguindanao ranked highest (81%), followed by Lebak (64%) and Kalamansig (54%) in terms of access of households to electricity.

Kalamansig has the highest proportion of households with durable walling and roofing materials, at 63% and 49% respectively. House and lot ownership proportion of households, on the other hand, is highest in South Upi.

The 6th column in Table 3 is added, which features Esperanza municipality, chosen as the comparison area. In impact evaluation activities, the comparison area/group provides information on "what would have happened to the area had they not been exposed to an intervention[7]". Please note that Esperanza is not connected to the road project. While Esperanza lies east of Lebak, a mountain range separates the two municipalities; hence reducing the possibility of road project's impact to Esperanza. More on Esperanza as the comparison area is explained in Section 5.1 of this report.

To provide more information on the five (5) road influence areas and the comparison area, please refer to the table below:

[7] "Counterfactual impact evaluation", retrieved from https://ec.europa.eu/jrc/en/research-topic/counterfactual-impact-evaluation

TABLE 3: KEY STATISTICS ON FIVE MUNICIPALITIES

	Maguindanao			Sultan Kudarat		
	Datu Odin Sinsuat	**Upi**	**South Upi**	**Lebak**	**Kalamansig**	**Esperanza**
Income Class [8]	2nd	1st	4th	1st	1st	1st
Population (2015)	99,210	53,583	40,178	88,868	49,059	66,095
Land Area (sq. km)	461.80	742.95	317.95	470.86	699.20	324.29
Population Density (No. of person/Sq. m) (2007)	215	72	126	189	70	204
HH Size[9]	5.8	4.9	5.3	4.3	4.5	4.2
Sex Ratio (2015)				108	109	106
Age Dependency (2015)				65.76	65.89	56.71
Number of Complete Elementary Schools government (2017)				38	23	35
Number of Complete Secondary Schools, government (2017)				9	6	8
Elem (Pupil-Teacher Ratio) (2014)				49.37	56.68	38.27
Secondary (Pupil-Teacher Ratio) (2014)				41.43	47.00	39.03
% of household with access to water supply for drinking, Level 1 and 2[10], (2015)	34%	21%	23%	19%	40%	14%
% of households with access to electricity (2015)	81%	42%	15%	63%	54%	76%
House Outer Wall: % of houses made of concrete, brick, stone, and wood (full and combination, 2015)	79%	36%	33%	49%	57%	54%
Roof: % of house with galvanized Iron, tile, concrete (full or combination, 2015)	64%	33%	27%	43%	51%	49%
House and lot Ownership (%), 2015	98%	48%	70%	48%	43%	62%
Ratio of Brgy Health Workers to Population (2017)[11]			624			581
Midwives to Population (2017)			7612			3926

[8]2018 Philippine Standard Geographic Code at https://psa.gov.ph/classification/psgc/?q=psgc/barangays/126505000.
[9]2015 Census of Population at http://rsso11.psa.gov.ph/sites/default/files/attachments/Household%2C%20Number%20of%20Household%2C%20avarage%20size%2C%20by%20mun.pdf
[10]2015 Philippine Housing Tables by City, Municipality retrieved from https://psa.gov.ph/content/housing-characteristics-philippines-results-2015-census-population
[11]Field Health Services Information System, 2015 retrieved from https://www.doh.gov.ph/sites/default/files/publications/2015_Final_FHSIS_AnnualReport-min_0.pdf

	Maguindanao			Sultan Kudarat		
	Datu Odin Sinsuat	**Upi**	**South Upi**	**Lebak**	**Kalamansig**	**Esperanza**
Poverty Threshold[12]	Php 21,423			Php 20,620		
Poverty Incidence[3]	57.2%			48.0%		
Food Threshold[3]	Php 14,982			Php 14,403		
Subsistence[3] Incidence	28.8%			32.6%		

[12]Official Poverty Statistics of the Philippines, Full Year 2015, retrieved from https://psa.gov.ph/sites/default/files/2015%20Full%20Year%20Official%20Poverty%20Statistics%20of%20the%20Philippines%20Publication_0.pdf

3.3 Objectives of the IE Study

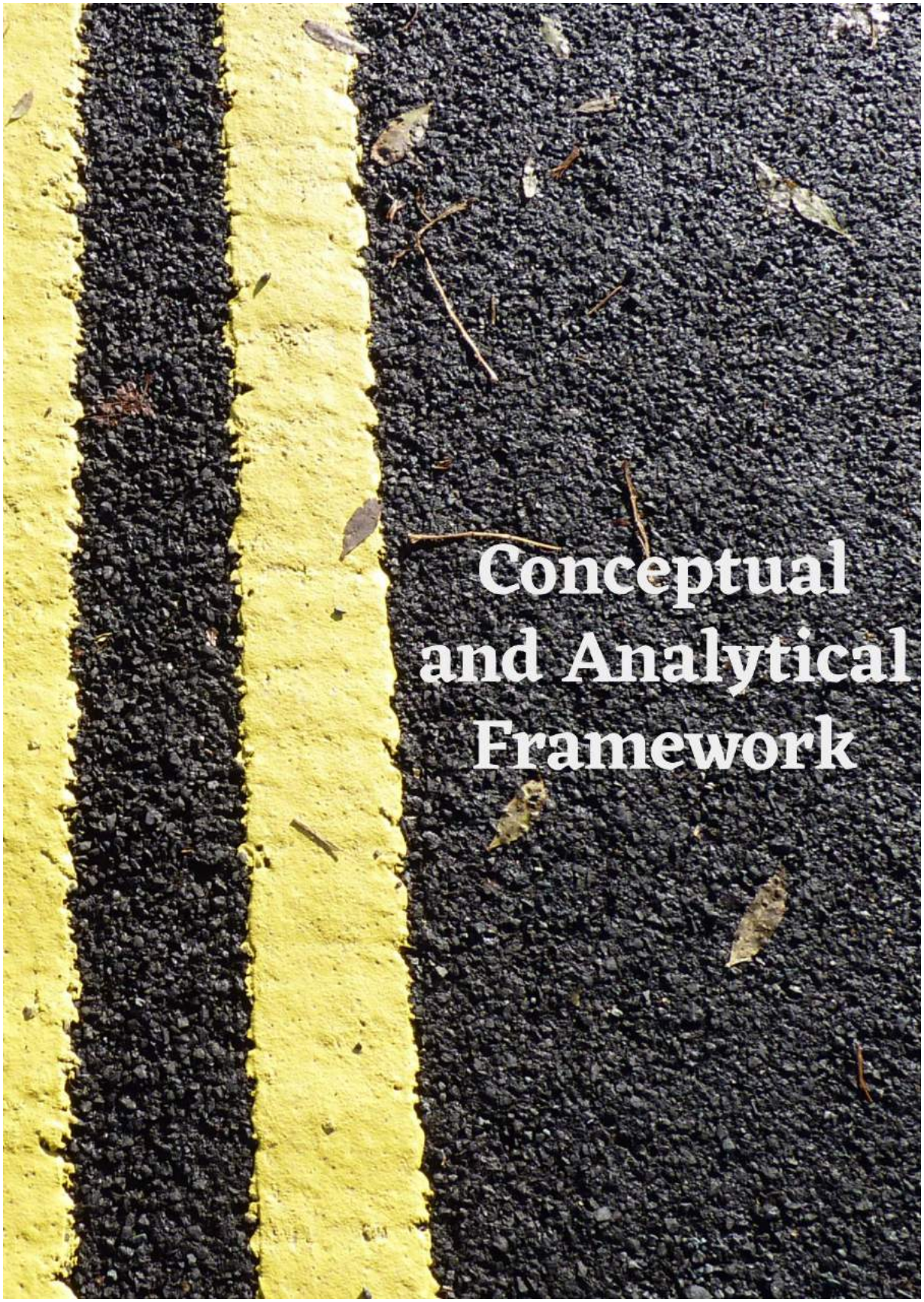
This IE study was conducted[13] to:

1. Evaluate achievement of the project's development objectives
2. Evaluate the benefits and gains (both planned and unplanned) and impact (intended and unintended) of the project to its identified beneficiaries on (but not limited to) the following:
   2.1. Transportation sector (e.g., through available modes of transportation, including modal shift; transport volume; changes in travel patterns; and facilitation of safe access to other infrastructure facilities like school, hospital, church, and other economic centers)
   2.2. Agriculture, industries and other economic activities in the influence areas (e.g., through transport of goods, promotion of existing/creation of new production/processing activities and services)
   2.3. Environment sector
   2.4. Activity and mobility of the populace (trends in migration) in the influence areas.
3. Evaluate the effectiveness of the road's sustainability mechanism that was put in place.
4. Identify and validate the innovative and effective approaches and strategies including lessons learned in the implementation of the project that could be adopted in the design or implementation of similar or related interventions in the future; and
5. Facilitate knowledge transfer to NEDA XII personnel on the design and conduct of impact evaluation for continued capacity development.

The results of the IE Study will be used as a reference for policy and decision-making in the appraisal and approval of future similar development projects.

The IE Study was undertaken by the Institute for Socio-Economic Development Initiatives (ISEDI) of the Ateneo de Davao University.

[13]From the Terms of Reference.



Conceptual and Analytical Framework

4 Conceptual and Analytical Framework

4.1 Importance of Roads to Spur Development

The construction and rehabilitation of roads, particularly in the countryside, remains one of the key strategies of the national and local government in spurring local development. As roads are built and sustained, these connect the peripheral communities to hubs of economic activities and social services. As connectivity improves, businesses look for locations where they can source raw materials or serve new markets; where opportunities for work are emerging, people with skills naturally gravitate to these sources of workforce demand. With improved accessibility, the decision and the act to seek health services may come easy for families with sick members; the pattern of going to school is not disrupted, even on rainy days; farmers and other producers can transport inputs as well as their products at competitive rates. Better roads can also lead to more options for consumer goods and other services.

Thus, the task of building and maintaining roads is spread across the different levels of the government. The national roads (and its three classes) are under DPWH, the provincial roads under the Provincial Government, municipal and city roads under the Municipal and City government, respectively, and the barangay roads under the barangay government. Please refer to **Annex 1** for the latest road classification (adopted 2014).

As of October 2018, the country has a total paved length of 31,622.78 km (concrete and asphalt, all conditions), while the unpaved length is 1,309 km (gravel and earth)14. In the same reporting period, Region 12 has a total of 1,388.09 km paved road15, which represents 4.38% of the country's total paved length. The paved portion of the Awang-Upi-Lebak-Kalamansig, based on the SOCCSKSARGEN Regional Development Plan 2017-2022, is 109.738 km16, and thus represents 7.9% of the region's total paved road. This portion is classified as a secondary road by the DPWH, which connects to "major ports, major ferry terminals, major airports, tourist service centers, major government infrastructure to national primary roads, and lastly, directly connects provincial capitals within the same region" (DPWH).

Presently, this road project connects the municipalities of Kalamansig, Lebak, South Upi, and Upi to the Cotabato (Awang) Airport, which serves the general area of Cotabato City, Cotabato Province and Maguindanao. The road also connects to Cotabato Wharf to one end and the Port of Kalamansig to the other end. Further, the road connects to the Sarangani Province, which is approximately 218 km from Kalamansig. Finally, it connects to the Asian Highway 26, which is the Cotabato-Allah Valley-Marbel Road (connecting Cotabato, Shariff Aguak, Isulan, Koronadal and General Santos).

[14]National Road Length by Classification, Surface Type and Condition (Nationwide Summary), as of 15 October 2018, retrieved from http://www.dpwh.gov.ph/dpwh/2018%20DPWH%20ATLAS/Tables%20&%20Graphs%20(Roads)/Road%20Data%202016/ATLAS%202016/Table%201.1a.htm

[15]National Road Length by Surface Type and Functional Classification per Region, as of 15 October, retrieved from http://www.dpwh.gov.ph/dpwh/2018%20DPWH%20ATLAS/Tables%20&%20Graphs%20(Roads)/Road%20Data%202016/ATLAS%202016/Table%201.1b.htm

[16]Status of Kilos Abante Programs/Projects (KAPP), as of December 2016, SOCCSKSARGEN Regional Development Plan 2017-2022, retrieved from http://nro12.neda.gov.ph/wp-content/uploads/2018/08/RDP-Chapter-19.pdf

Once the remaining concreting work is completed along the Kalamansig-Palimbang-Maitum, the entire road length would increase by an additional 22 kilometers 17. Thus, the Awang-Upi-Lebak-Kalamansig road is expected to further enhance the connectivity between provinces in Region 12 and Bangsamoro Autonomous Region of Muslim Mindanao.

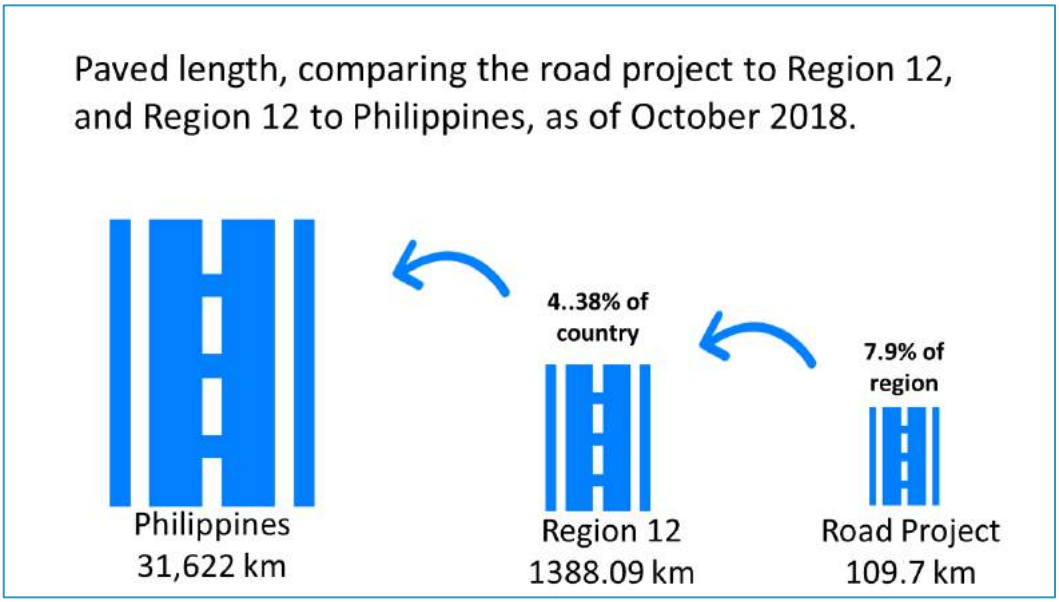


FIGURE 1: PAVED LENGTH OF THE ROAD PROJECT COMPARED TO REGION 12, AND REGION 12 COMPARED TO THE PHILIPPINES, IN KM, 2018

In its Regional Development Plan (RDP) 2017-2022, the region recognizes the inefficiency of its transport system due to several factors. These include the following[18]:

- Deteriorating road networks and the absence of roads leading to productive and critical areas, especially in the interior areas.
- Increasing the flow of people and products has started traffic flow in some parts of the region's road networks.
- Increasing the use of energy-efficient and cheaper modes of transportation that compete with the increasing larger vehicle traffic along the region's major thoroughfares.
- Lack of road signage and road safety structure in the required section of roads, particularly along accident-prone areas.

The region considers roads as important to support its "rapid and inclusive economic growth" and has seen to it that "road projects enhanced the accessibility to production areas, major tourism destination and basic service facilities like schools, hospital and attracted investments

[17]Ibid.

[18]Challenges, Accelerating Infrastructure Development, SOCCSKSARGEN Regional Development Plan 2017-2022, retrieved from http://nro12.neda.gov.ph/wp-content/uploads/2018/08/RDP-Chapter-19.pdf

to the region" (RDP, NEDA 12). Overall, the region aims to provide an "*integrated and effective transport system to improve mobility and accessibility*[19]."

The region is aligned with the Philippine Development Plan (PDP) 2017-2022's subsector outcome, where it says "*the efficiency of the transport sector will be enhanced to sustain economic growth and increase competitiveness by providing adequate, accessible, reliable and safe access for people and goods across the country, neighboring regions, and the world*[20]."

4.2 Use of Theory of Change to Evaluate Projects

Theory of change (TOC) explains how activities are understood to produce a series of results that contribute to achieving the final intended impacts (Rogers, 2014). It is useful in a strategic planning exercise, where a group/organization aims to accomplish something. It is also handy during program/project implementation, where a group/organization can assess the progress of its programs and projects. Finally, it provides a valuable lens in identifying what data to be collected and analyzed to determine if the project's interventions achieved change.

Available documents on the Awang-Upi-Lebak-Kalamansig-(Palimbang-Sarangani) road project would not be sufficient to provide a comprehensive analysis of the TOC. This prompted the study team to reconstruct a typical road project TOC. It is assumed that the immediate outcomes would be **improved road connectivity**, which in turn would result in **reduced vehicle operating costs** and **reduced travel time**. These outcomes would be most beneficial to the owners of vehicles plying the road and to all residents and visitors in the area.

For the short-to-medium term outcomes, these would include **improved access to markets** to benefit farmers with marketable surplus and **improved access to social and commercial services** to benefit families and consumers in the influence areas. With paved roads, there would be **increased in vehicular activities** and **improved safety of travel**. These would also lead to **increased agricultural investment**, such as smallholder farmers deciding to purchase inputs to improve their yield or other farmers deciding to graduate from food crops to cash crops. By following the recommended agricultural practices, farmers would be able to increase their yield. **Employment opportunities** would also be created, such as farms looking for hired hands to work during planting and harvesting seasons, or small businesses looking for workers.

In the long-term, roads are expected to contribute to **increasing household income and consumption** and possibly to an extent, **reducing the number of families living below the poverty threshold**. The ease of being able to travel more out and into the influence areas would **increase interactions among people** – be it for official or personal purposes.

However, it is important to note that the presence of the road does not generate all these outcomes or impacts on its own – the road has to interact with other government and private

[19] Priority Strategy, ibid.

[20] Strategies, Accelerating Infrastructure Development, Philippine Development Plan 2017-2022, retrieved from https://www.neda.gov.ph/wp-content/uploads/2018/01/Abridged-PDP-2017-2022_Updated-as-of-01052018.pdf

sector investments, infrastructure, as well as the other characteristics of the communities/households where it is located.

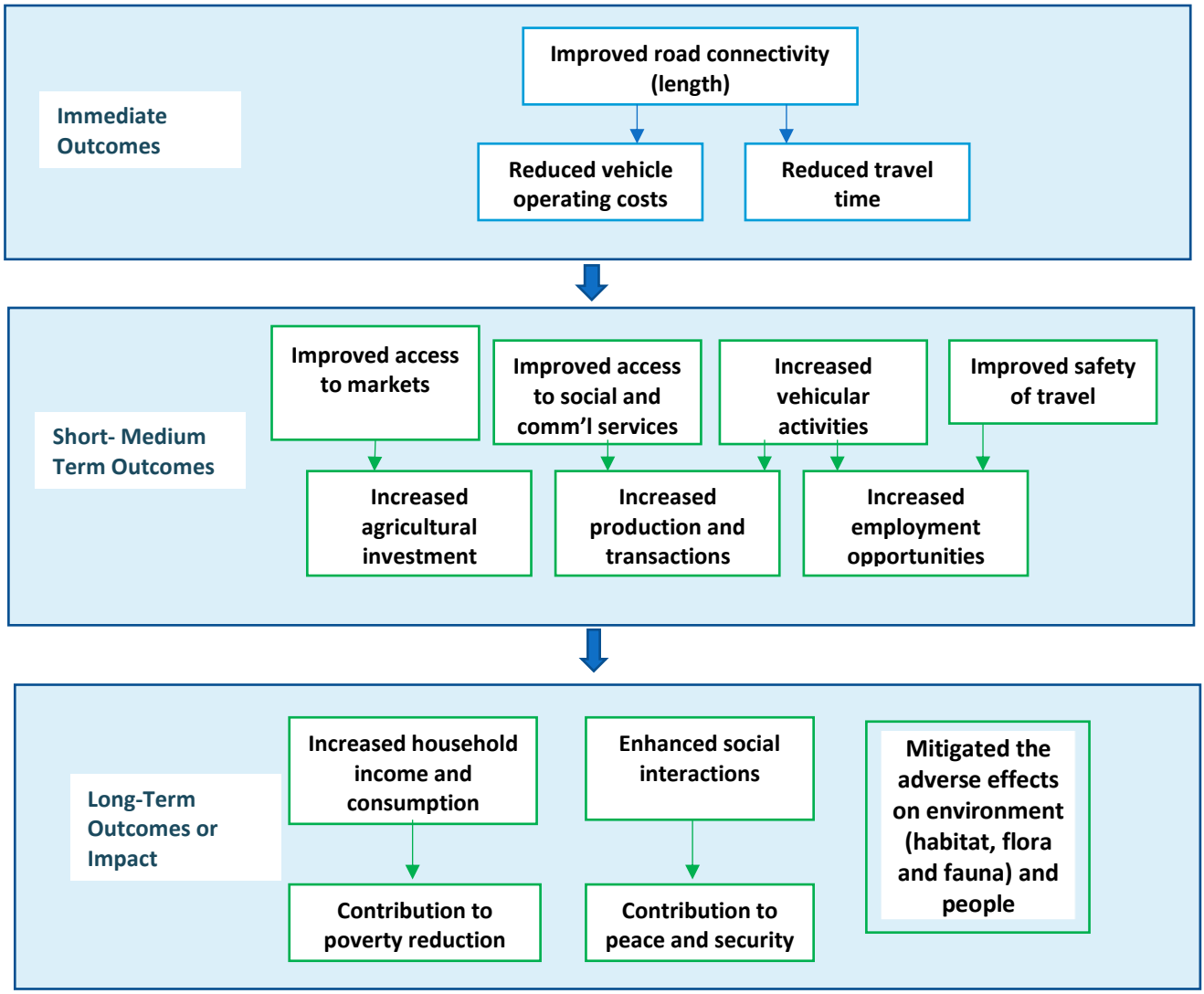


FIGURE 2: THEORY OF CHANGE OF A ROAD PROJECT

4.3 Impact Estimation Using Propensity Score Matching (PSM)

Impact evaluation of road construction/improvement or rehabilitation programs rarely use experimental design to evaluate program impacts. In an experimental design, road improvement project should be randomly assigned to either a treatment group (selected for road improvement) or to a comparison group (not selected for road improvement). This kind of design is not preferred because the selection of areas for road projects is typically based on several factors such as economic rate of return, political factors, social factors, environmental factors, among others. Thus, when random assignment methods are not possible, researchers generally turn to quasi-experimental methods.

There are several techniques under the quasi-experimental methods; the selection of method is usually based on the required data versus what are available and what can still be collected considering the time dimension of the project life. Impact estimation for the Awang-Upi-Lebak-Kalamansig road portion was carried out using the quasi-experimental design, particularly single difference matched using propensity score. This methodology could be undertaken ex-post even without baseline data.

The IE study on the road project focused on answering how the implementation of the program affected beneficiaries. In principle, to be able to account for this correctly, we would like to be able to record the outcome of interest (Y) from each individual in two situations:

1) when they received the intervention (treatment group, Y_{1i}); and
2) when they did not receive the intervention (comparison group, Y_{0i}).

To ensure accurate results in a quasi-experimental evaluation, the comparison group chosen had to be as similar as possible to the program/treatment group in characteristics that might affect the outcomes.

The propensity score is the estimated probability of being in the treatment group, given the observable characteristics from a regression model of participation (Rosenbaum and Rubin 1983). This method requires matched comparison and treatment observations. Perfect matching would require matching each individual or unit in the treatment group with a person or unit in the comparison group that is identical on all relevant observable characteristics, such as age, education, religion, occupation, wealth, attitudes to risk, and so on (ADB, 2017). In PSM, matching is not done by every single characteristic but on a single number, which is the propensity score.

The propensity score is a conditional probability obtained from the participation equation. For this evaluation, the participation equation took the following form and was estimated using the probit regression.

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 \dots\dots\dots + \beta_n X_n + e \qquad (1)$$

Y is a binary variable that takes the value of 1 for those sample households in the treatment group and 0 for those households in the untreated group. The explanatory variables (Xs) include all observed variables that may affect participation in the project, but that are not affected by the intervention. In the road project, participation was mimicked since participation was not an option. Since baseline data was not available to the study team, matching was done using variables that were time-invariant characteristics and recalled on pre-intervention characteristics that could be reliably remembered.

The explanatory variables include community, household, and individual characteristics. The following variables included in the participation equation were the following: household size, occupation of the head, sex of household head, household head marital status, household head education, educational attainment, landholding size, utilization of landholdings used for cultivation, ownership of transport vehicles (car, multicab, jeepney, etc.), household assets,

ownership of livestock, nature of house, condition of house, rooms in house, and access to electricity. The $\beta_s$were the model parameters and $e$was the error term.

An individual's propensity score was the fitted value from the participation equation. Having calculated the propensity scores for all observations, the region of common support was identified. Observations in the untreated group with a propensity score lower than the lowest observed value in the treatment group were outside of common support and were unused. Similarly, observations in the treatment group with a propensity score higher than the highest observed value in the untreated group will also be dropped. Those observations that were retained from the untreated group formed the comparison group (counterfactual observations).

Once the matching was done, a balanced test was performed by comparing the mean characteristics of the treatment and comparison groups. After matching, the differences between the two groups were reduced. Ideally, there should be no significant differences in the average characteristics of the two groups. A difference lower than the effect size was acceptable.

Finally, the impact estimate carried out using **single difference** in the absence of the baseline information. Single difference was carried out using the nearest five neighbors matching (equation 2).

$$Impact = \frac{1}{n}\sum_{i=1}^{n}(Y_{1,t+1,i} - \frac{1}{5}\sum_{j=1}^{n} Y_{0,t+1,i,j}) \qquad (2)$$

The value of the outcome variable for individual i in the treated group was matched by the average value of the same outcome variable from the nearest five neighbors from the comparison group. The impact would be the average in the value of the outcome between the two groups.

4.4 Benefit-Cost Analysis (BCA)

Roads, like other transport infrastructures, require large investments. As such, they compete with the limited resources available for such public good. The Philippines is still in the cusp of achieving economic development and its communities so dispersed due to geography. It has a total of 31,622.78 km paved nationwide[21]in 2018, and the most recent annual growth rate computed was at 5.4% between 2016 to 2018. For Region XII, where the road is located, the cost of unit as of 2018 for every kilometer of concrete road surface was Php 27,482,086.95[22] (new road construction, PCC 230 mm) while for the same length with slope protection, it is

[21]National Road Length by Surface Type and Functional Classification per Region, as of 15 October, retrieved from http://www.dpwh.gov.ph/dpwh/2018%20DPWH%20ATLAS/Tables%20&%20Graphs%20(Roads)/Road%20Data%202016/ATLAS%202016/Table%201.1b.htm

[22]Cost Estimates for Work Item of Projects, as of December 2018, retrieved from http://www.dpwh.gov.ph/dpwh/2018%20DPWH%20ATLAS/Tables%20&%20Graphs%20(Roads)/Road%20Data%202016/ATLAS%202016/Table%201.4.htm

Php 34,750,437.66 (new road construction, PCC 230 mm). To support the analysis, the annual growth rate (AGR) of the total length of roads paved in the said region would also be considered.

With the increasing demand for more paved roads in the country, it is important to allocate the available resources most favorably. The primary questions here are, "Is the road project justified? Are the benefits greater than costs?" Therefore, to ensure that the projects are well-selected in areas where they are implemented, it is vital to evaluate the economic and social benefits of the project.

For major roads such as the Awang-Upi-Lebak-Kalamansig-Palimbang-Sarangani, the evaluation framework was based on Benefit-Cost Analysis (BCA).

The BCA was used to examine the economic viability of the road project. It is an analytical process used to determine the value of a project in relative terms. Project justification is measured as economic worth to the community. A BCA compares the benefit with the overall cost to deliver and sustain the project. If the overall benefits are demonstrated to exceed the costs, the project is considered viable.

Net Present Value (NPV), Benefit-Cost Ratio (BCR), and Economic Internal Rate of Return (EIRR) were estimated to demonstrate the comparison of the overall cost and benefits of the road project. NPV is simply the present value of the future economic benefits minus the costs associated with the implementation and maintenance of a project or investment. It makes use of a discount rate in getting the present value of the stream of benefits and costs.

NPV is commonly employed since financial returns and costs, such as those reflected in the financial analyses do not fully mirror the corresponding costs and benefits to the community as a whole. Public goods such as roads, bridges, and ports are evaluated based on their impact on the community as a whole and not only to be based on the benefits accrued to selected individuals or groups. The general rule is that the higher the value of the NPV, the more desirable or, the greater the impact of a project or investment. A positive NPV indicates that the benefits outweigh the costs, indicating that the project or investment was economically good for the community. On the other hand, a negative NPV indicates that the costs outweigh the benefits, indicating that the project or investment should have never been pursued and implemented in the first place.

The accepted norm is that higher values are desired for NPV, BCR, and IRR. The three (3) economic measures require data on the income stream generated by the project. In this study, the income stream was measured annually, i.e., the annual revenue (benefits) generated by the project. Similarly, the total costs included the cost of construction and annual maintenance of the project.

The net present value of an income stream is the sum of the present values of the individual amounts in the income stream at a given discount rate. In this study, three discount rates were used:

1) 12% discount rate which is typically used by the World Bank, the Asian Development Bank, and commercial bank to assess economic viability

2) 6% discount rate commonly used by the government to assess project viability using public funds, and
3) 3% discount rate often used by governments interested in larger and shorter-term economic measures. It was assumed that the road project would have a beneficial use of up to 20 years.

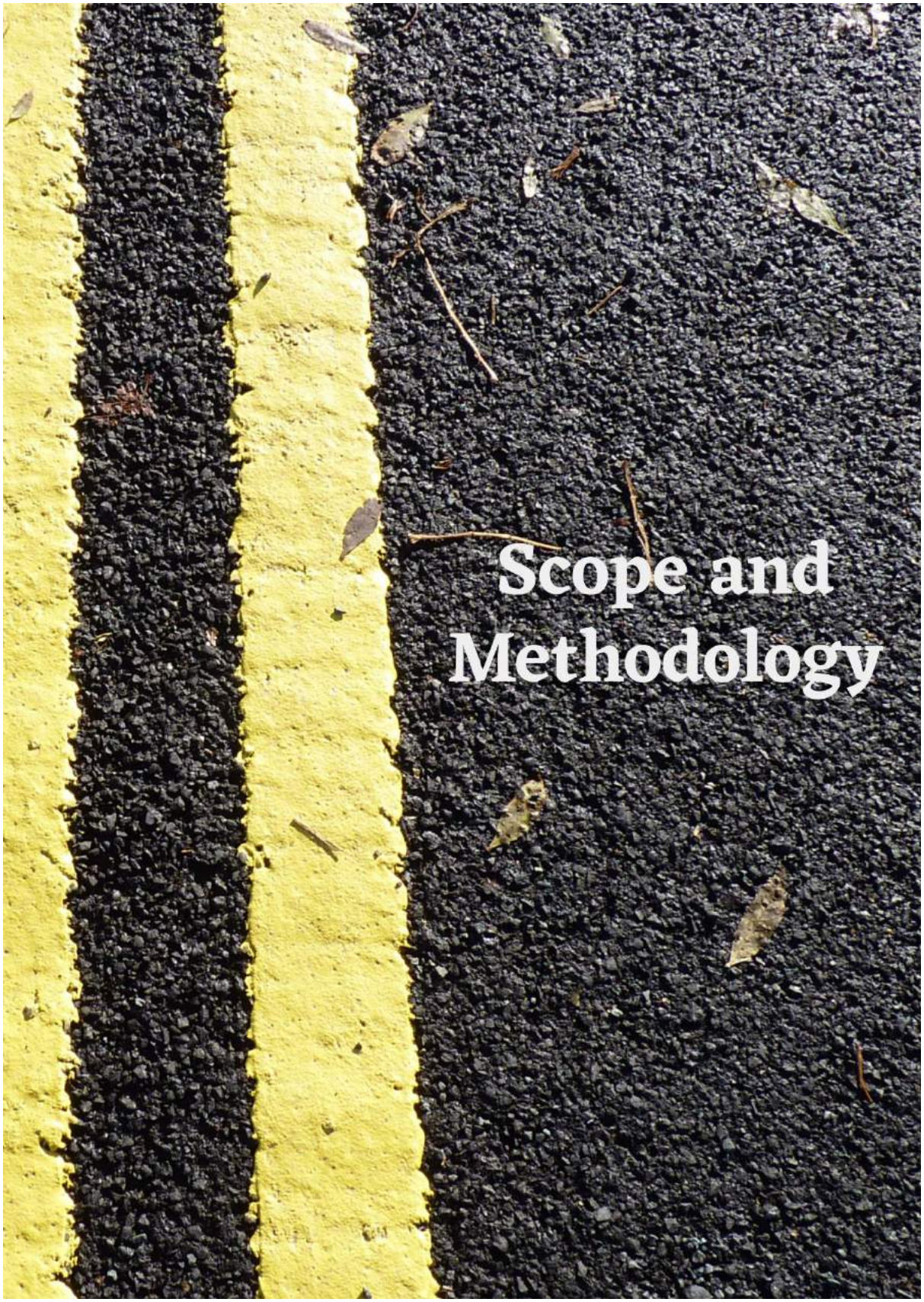
Each future income amount in the stream is discounted until the year when the income is received or is spent. The calculation of the NPV includes the initial costs as well as the subsequent profits. The net present value of an investment indicates how the investment compares with an alternative investment. A positive net present value means that the benefits outweigh the cost; thus, the investment is considered profitable.

In contrast to the estimation of the NPV where a discount rate is specified exogenously, the discount rate in the Economic Internal Rate of Return (EIRR) is internally generated. This is done by equating the NPV to zero or by having the sum of discounted benefits minus the sum of the discounted cost equal to zero with the discounted rate as an unknown. The problem, therefore, is to find the discount rate that will make the sum of discounted benefits equal to the sum of the discounted cost. The resulting discount rate, which is the EIRR, is then compared to the minimum interest rate specified by the government on the acceptability of a project. It may be noted that the EIRR discount rate corresponds to a Benefit-Cost ratio equal to 1 at that given discount rate for that project.

Finally, we also tested the sensitivity of the economic analysis, using two scenarios:

- A 10% reduction of the benefits of the project
- A 10% increase in the cost of the project

The combination of a 10% reduction of the benefits and a 10% increase in the cost of the project.


Scope and
Methodology

5 Scope and Methodology

5.1 Identification of the Treatment and Comparison Groups

The IE study for the road project required the comparison of outcomes between the treatment and comparison groups. The Awang-Upi-Lebak-Kalamansig road portion was divided into three packages. The household-respondents under the treatment group were chosen along the Lebak-Kalamansig section (package 3, see **Error! Reference source not found.**), specifically, the households living within the 30-minute walking distance from the national road (see **Error! Reference source not found.)**.

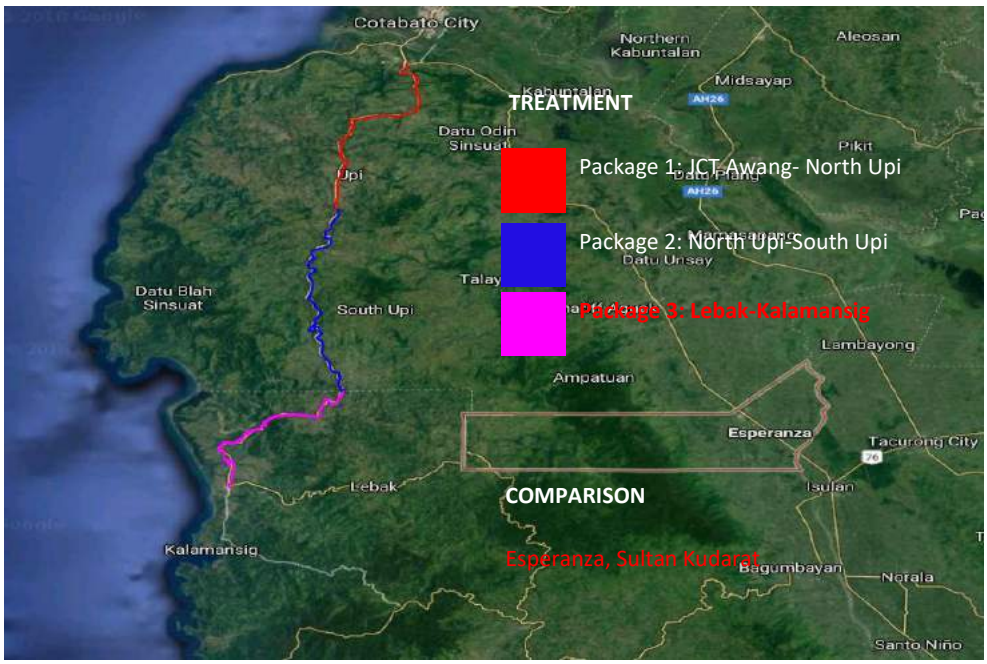


FIGURE 3: LOCATION OF THE TREATMENT AND COMPARISON GROUPS

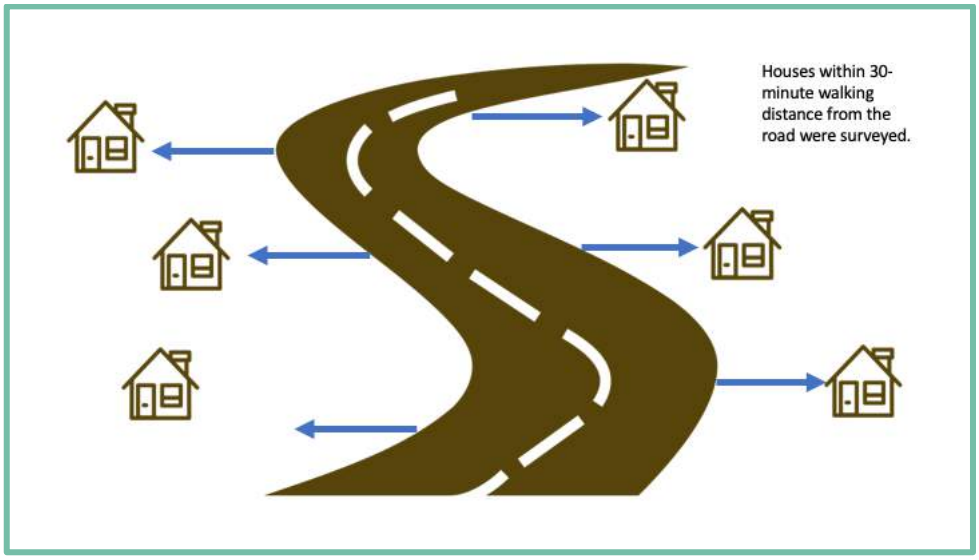


FIGURE 4: HOUSEHOLDS WITHIN 30-MINUTE WALK FROM ROAD CHOSEN AS RESPONDENTS

For this IE study, the comparison group has to have the same characteristics as the treatment group at baseline. For this project, the baseline period was 2008 (before the construction of the road). Thus, to ensure that the treatment and comparison groups were comparable, the pre-intervention community-level characteristics were examined during a reconnaissance activity. The following community-level characteristics were examined to ensure homogeneity of the two groups before the intervention:

1. Level of development/municipality classification/Income level
2. Distance to the major market/growth leader/capitol
3. Number of registered businesses
4. Existence of market
5. Access to services (existence of services and service provider to client ratios for daycare center, health center, primary school, and secondary school)
6. Access roads/municipal and barangay roads
7. Modes of transportation
8. Main sources of livelihood
9. Past and ongoing development interventions

In this evaluation, the primary sampling unit (PSU) of the treatment areas was the road project funded by the Philippine national government through the DPWH and loan from Japan Government (Package III) in Lebak, Sultan Kudarat. This segment of the road project was selected since other segments of the road were located in different provinces and regions with different conditions. Kalamansig was also not selected due to the recall problem of the road project being evaluated. The time variation of the completion of each package was also considered. Sample households (treatment group) were taken from this PSU.

The comparison group would be near a similar road that was not scheduled to be constructed, rehabilitated, or improved (to be similar to that of the treated areas) soon. There are three (3) areas that arose upon consultations conducted with NEDA 12 for the control group. These were Isulan, Sen. Ninoy Aquino (SNA), and Bagumbayan, also within the province of Sultan

Kudarat. However, Isulan and SNA were adjacent municipalities to the selected treatment group. This was problematic since the road project in the treatment area was likely to affect the outcomes of the two adjacent municipalities. Furthermore, upon examining the pre-intervention indicators, it showed that Isulan was more developed than the treatment areas, while SNA was relatively less developed (classified as 3rd class municipality) as compared to Lebak. Initially, the Municipality of Bagumbayan was considered; however, it was not selected since all roads in this municipality were already paved.

Upon consultation with DPWH, they suggested that the Municipality of Esperanza would be suitable as a comparison area. The municipality was adjacent to the Municipality of Lebak, however, separated by mountain (Figure 5: Illustration showing Treatment and Comparison Groups, separated by a mountain (Figure 5), which would ensure that contamination would not be a problem for the causal inference. In the reconnaissance, Esperanza was described by stakeholders and experts as similar in many respect to the treatment area. It was also far enough not likely to be influenced by the road construction/improvement in the treatment area.

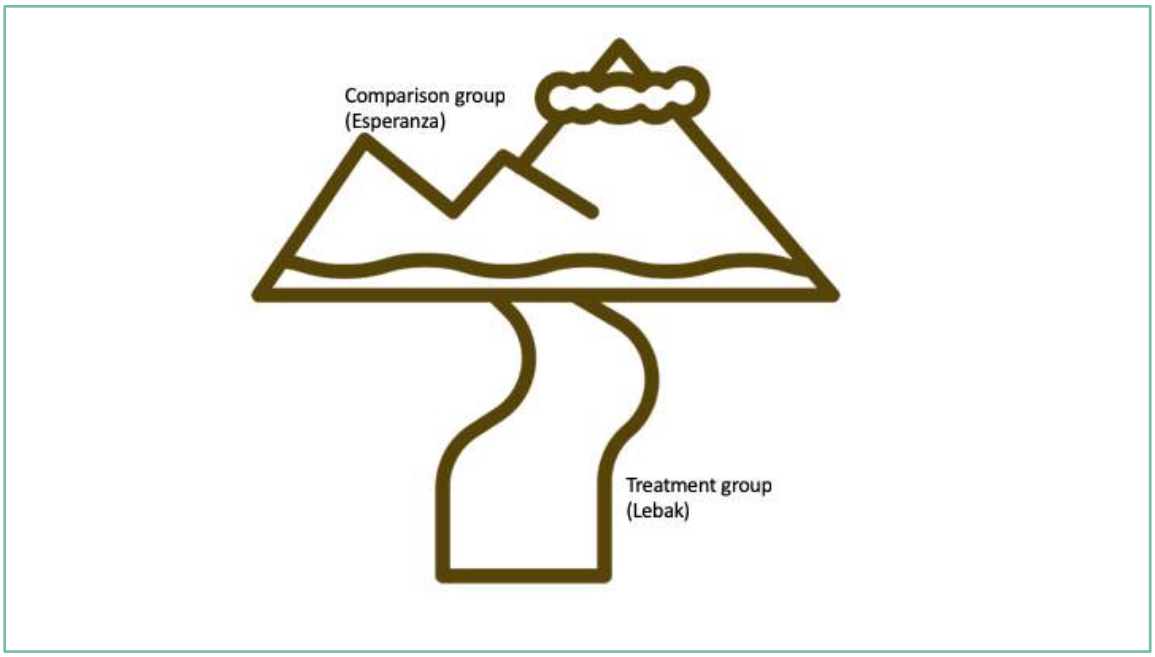


FIGURE 5: ILLUSTRATION SHOWING TREATMENT AND COMPARISON GROUPS, SEPARATED BY A MOUNTAIN

Based on the discussion with the experts and stakeholders, a consensus was developed that a segment of the road in Esperanza connecting Lebak particularly the **road segment between Barangay Salumping and Barangay Legodon** (this was a newly created barangay; thus not much information is available) **was similar to the treatment group 10 years ago**. Stakeholders agreed that the level of road degradation of this segment and the economic activity and population along this road segment were similar to those of the treatment road segment. As a result of these similarities and based on indicators generated between the two areas, a consensus was reached to use the road segments from Salumping to Legodon in the Municipality of Esperanza as the source of the comparison group to identify the

counterfactual. The selection of comparison survey participants was done among households within the 30 minutes walking distance from the identified road segment.

5.2 Survey Sampling Calculation

Power calculations were employed in determining the sample size required to detect the effect of a given size. Statistical power was defined as the probability of correctly rejecting the null hypothesis. The sample size calculation was based on the null hypothesis (Ho) **that the Awang-Upi-Lebak-Kalamansig road portion did not affect household income.** Identifying an appropriate sample size for the impact evaluation study depended on various factors, including the desired effect size, target power, and significance level.

The effect size can be defined as the mean difference in the outcome (household income) between the treatment and comparison groups. The power of a statistical test is the probability of detecting a true effect when it exists. The commonly used powers in social science are 80%, 90%, and 95%. The significance level is the probability of falsely detecting an effect when it does not exist. The most commonly used significance levels are 10%, 5%, and 1%. The calculated sample size will be allocated using a 1:1 ratio of treatment group sample to comparison group sample.

In this evaluation, sample size determination utilized the following parameters: 80% power, 5% significance level, and an ***n***ratio of 1. The PhP17,066 per capita income of Sultan Kudarat in 2007 (PSA) was the starting point of the assumptions for the effect size in the absence of income statistics. This per capita income would be the proxy income for the comparison group (no road improvement); it would be further assumed that without the intervention, annual income growth would be at 3%.

Rural infrastructure projects, including road, are expected to generate an average of 12% increase in income (ADB, 2008). However, for this project, we assumed a conservative estimate of 5% (effect size) growth annually attributable to the road project, which was validated with DPWH. The growth rate of per capita income in the treatment group is 8%. A common standard deviation was assumed at 20% of the annual per capita income. Using these parameters, STATA calculated the required sample size of 320. The computed sample was adjusted for a clustering sampling design by multiplying it by 1.5 (design effect) adopted from the design of PSA. A 10% buffer sample would be added to the computed sample to ensure sufficient observation after the consideration of the common support. The total sample for the household survey for this evaluation is 528 which will be equally distributed to the treatment (n_2=264) and comparison (n_1=264) groups.

5.3 Data Gathering Instruments and Procedures for Selecting Respondents

For this IE study, we utilized different tools for gathering primary data.

5.3.1 Household Survey

The main tool used for this study was the household survey. This tool was administered by an enumerator using the mobile data collection application Kobo Toolbox[23]. We asked the respondents to share information about their household, assets, income, expenditures and savings, access to basic social infrastructure and services, peace and security, agricultural production, and perception/assessment on the road project.

As illustrated in **Error! Reference source not found.**, we randomly selected households along the road, guided by the number of target respondents per barangay. The respondents were preferably the household head, but the spouse and any other family member more than 40 years could serve as the replacement. The replacements must be knowledgeable about the household activities, and they were already living in the area before the road was constructed.

We targeted 264 households in treatment and comparison areas, bringing to a total of 528 household-respondents.

5.3.2 Business Owner Survey

The second survey tool used was designed for business owners. These were individuals who had put up their businesses along or near the road. The business respondents shared information about their enterprise activities and their own perception/assessment on the road project.

Initially, three (3) business owner-respondents per barangay was proposed by ISEDI, but the Philippine Statistics Authority recommended to increase this number. The target business owner-respondents were 10 for 26 barangays or a total of 260 respondents. We attempted to find ten business owners who had been there before the road project. However, we were not able to find a sufficient number that qualified for the criteria during the data gathering period.

5.3.3 Vehicle Owner Survey

The third survey tool was developed with the vehicle owners in mind. The survey tool was also programmed in the Kobo Toolbox application. We asked the vehicle owners about their enterprise if they were in the business of providing transport service. We included private vehicle owners in the survey since the relevant information expected from them would be on travel time and vehicle maintenance costs.

We had a target of 260 for this survey.

[23]Refer to http://kobotoolbox.org

5.3.4 Passenger Survey

The passengers plying the road represented the fourth group of respondents. These were the individuals who regularly use the road to go to their places of work and other destinations. We asked them about their access to work, access to schools for their children, access to health facilities/services, and the overall observation/perception on the road effect on their daily lives.

We attempted to cover 260 people.

5.3.5 Community Level Survey

The last type of survey was for the local barangay officials of the 77 barangays covered in the five municipalities. We asked the barangay representatives their "before and after the road project" observations.

5.3.6 Key Informant Interview

The second method of soliciting primary data was through the conduct of the key informant interviews (KIIs). The KIIs were designed to seek information from people of authority. The target informants were the Municipal Mayors (5), Planning and Development Officers (5), Municipal Engineer (5), and representative of the District Engineer's Office of the DPWH (3).

The Project Engineer for Package 2 of the road was not interviewed because he was transferred to Bacolod. The MPDC of Lebak and the MEO of Kalamansig were also on travel during the times they were visited. Thus, from the target of 18 key informants and only 15 were covered.

5.3.7 Focus Group Discussion

The last data gathering method was the Focus Group Discussion (FGD). We gathered a small group of barangay representatives (farmers, women, youth, and other sectors), who had lived in their barangay way before the road was constructed. We targeted 2 FGD sessions per municipality, bringing a total of 10 FGD sessions.

The summary of the respondents, key informants, and FGD participants is shown below:

TABLE 4: TARGET VS. ACTUAL RESPONDENTS, KEY INFORMANTS, AND FGD PARTICIPANTS

Method	Target	Actual	Difference
Household Survey	528	529	-1
Business Owner Survey	260	193	67
Vehicle Owner Survey	260	174	86
Passenger Survey	260	101	159
Community-level Survey	77	77	0
Key Informant Interviews	18	15	3
Focus Group Discussion	80	90	-10
Total	**1483**	**1179**	**304**

5.4 Pavement Condition Survey

One of the key components of an effective pavement management system is an accurate assessment of the condition of the existing pavement network. Pavement Condition Rating (PCR) is an indicator that rates the surface condition of the pavement[24]. It is based on visual inspection of the road section and is used to quantify the road condition.

However, the complete condition and performance of a pavement is broader than just an assessment of the surface distress. Other factors, such as ride quality, structure capacity, and friction, are also important components. Ride quality has emerged to be the primary element of pavement performance and customer satisfaction. Ride quality can be measured through roughness expressed as International Roughness Index (IRI) which is directly related to pavement condition.

For this IE, we used the visual evaluation using the point estimation technique of Portland Cement Concrete Pavement to determine the physical condition of the road. It is simple, inexpensive, and provides a great deal of valuable information about pavement conditions.

5.4.1 Pavement Condition Rating

A three-point category was used, using the description below:

TABLE 5: SUBJECTIVE ROAD CONDITION RATING

Road Condition	Category
Good	Paved roads substantially free of defects, requiring only routine maintenance
Fair	Paved roads having significant defects, requiring spot repair and re-blocking
Bad	Paved roads with extensive defects, requiring immediate rehabilitation or reconstruction

The subjective condition rating data were converted into a numerical scale so that an appropriate comparison of the condition rating categories with published roughness benchmarks could be performed. A point estimation technique exercise (see figure below) was applied for the conversion of the subjective category scales used during the field survey on a scale of 0 to 10[25].

[24] Federal Highway Administration, 1998.

[25] F. M. Montenegro and K. C. Sinha. Development of a Procedure for Assessing Routine Maintenance Needs of Highways. In Transportation Research Record 1109, TRB, National Research Council, Washington, D.C., 1987.

Good	Smooth surface, minor cracking, pavement in good condition, allowing running speeds at design speed.
Fair	Some cracking and joint damage, vehicle running speeds close to design speed.
Bad	Vehicle running speeds are constrained by poor pavement condition. Pavement has failed and in need of immediate rehabilitation/reconstruction.

5.4.2 Roughness Index

The roughness index is directly correlated to the road condition. The relationship between pavement condition and roughness at the rougher end of the scale depends on varying and subjective conceptions of pavement condition and failure. For example, the roughness of fair gravel surface depends on many factors (such as type of material, its maximum grain size, and grading, the time of year, the level of maintenance, the time since the last blading, etc.), and there is no direct way to fix an accurate benchmark for this condition. It is here that the point estimation technique has been useful[26]. The following table below shows the pavement condition benchmark of DPWH for roughness.

TABLE 6: DPWH PAVEMENT CONDITION BENCHMARKS

		Description	Roughness (in/km)
A. Flexible Pavements (AC/BI)			
1	Very Good	No cracks, as new	<70
2	Good	No cracks, low roughness	70 – 120
3	Fair	Some cracks but no developed pattern, slight surface deformation	120 – 170
4	Poor	Developed continuous cracking pattern, no loss of material,	170 – 220

[26] F. M. Montenegro and Marcelo J. Mine. Road Condition and Maintenance Inputs for Feasibility Studies in Developing Countries.

		Description	Roughness (in/km)
		moderate surface deformations, few potholes.	
5	Bad	Extensive cracking pattern with loss of material, large surface deformations, some potholes.	220 – 270
6	Very Bad	Highly deformed pavement, extensive potholing, complete failure	> 270
B. Rigid Pavements (PCC)			
1	Very Good	No cracks, as new.	<80
2	Good	Low roughness, cracks < 100m/100m.	80 – 110
3	Fair	Slight surface deformation, cracks 100-200m/100m.	110 – 140
4	Poor	Developed cracking, no loss of material, cracks 200 – 300m/100m.	140 – 180
5	Bad	Extensive cracking with loss of material, deformed pavement, cracks 300 – 400 m/100m.	180 – 230
6	Very Bad	Highly deformed pavement, complete failure, high loss of material, cracks > 400m/100m.	> 230
C. Unpaved Surfaces (G, E)			
1	Very Good	Surface not restrictive to speed	<200
2	Good	Surface slightly restrictive to speed.	200 – 250
3	Fair	Slight surface deformations, a few potholes.	250 – 300
4	Poor	Deformed surface, frequent potholes.	300 – 360
5	Bad	Highly deformed surface, continuous potholes, passable only at low speed.	360 – 450
6	Very Bad	Passable, only by jeep.	> 450

NOTE: To convert Philippine Roughness (RP in/km) to Roughness in IRI in in/km, the following equation has been used: Roughness IRI = 0.7 + 0.0215 * Rp

5.5 Methods Used on Environmental Impacts

To complete the evaluation of the road section, the team also compared the changes brought about by the road project on the environment. The methods used were:

5.5.1 Detection of Land Use/Land Cover (LU/LC) Change

The LU/LC change on the adjacent landscape of the road project was determined and analyzed, specifically the areas extending one (1) km perpendicular to both sides of the road. The procedure for the LU/LC classification of the adjacent landscape is shown in **Figure 6.**

The generated LU/LC maps were produced through remote sensing processes with the aid of established satellite data from the USGS Earth Explorer. These satellite data were then further processed with the use of ArcGIS for post-classification refinement. Landsat images with a spatial resolution of 30m x 30m from year 2008, 2013, and 2018 were used to determine the previous and current LU/LC. Consequently, LU/LC changes from 2008 to 2013 were considered as changes that took place before the road was completed. The LU/LC changes from 2013 to 2018 were considered as changes that took place after the construction stage (or while the project was in its operational phase).

Remote sensing software (eCognition) was used and applied with multi-resolution segmentation to separate the distinct color texture in the image. Furthermore, post-classification refinement was applied during ArcGIS to reduce misclassification. Finally, validation was done using Google Earth software to check the classified LU/LC maps. The LU/LC classes used in this particular analysis were the following: Annual Crops, Built-up Land, Fishpond, Forest, Mangrove Forest, Perennial Crops, Shrubs, Water, Wooded Grassland, Open/Barren Land, and Grassland.

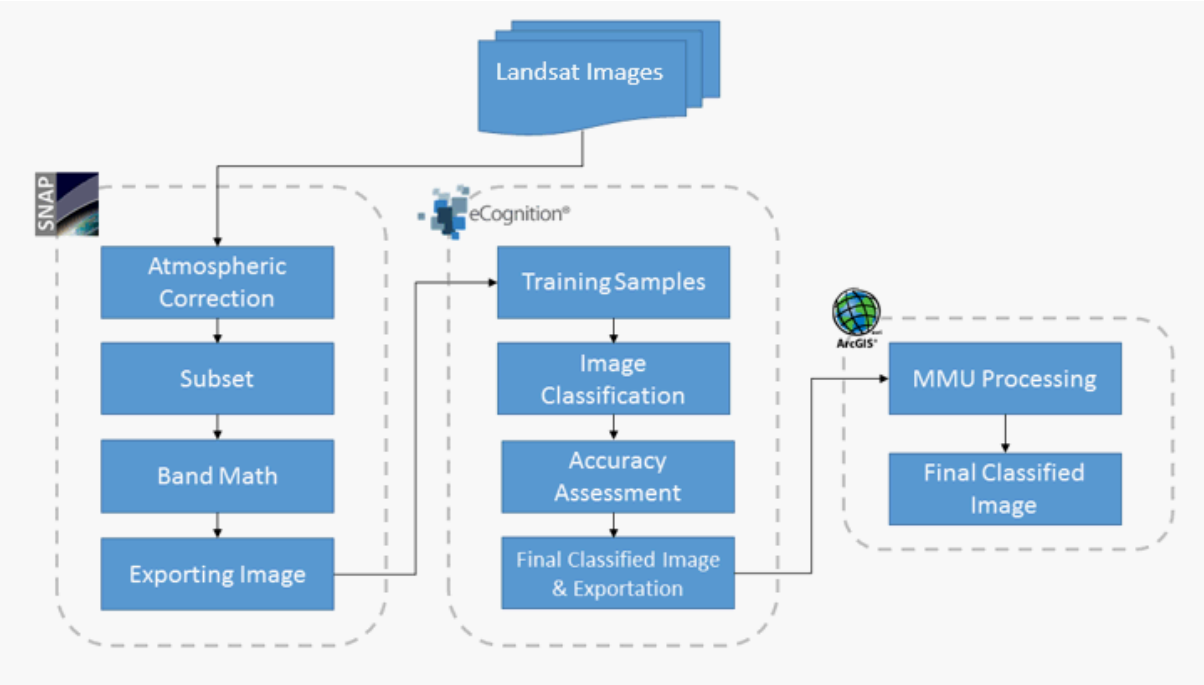


FIGURE 6: PROCEDURAL FRAMEWORK USED IN GENERATING LU/LC CLASSIFICATION

5.5.2 Measurement of Road Traffic Noise Level

Road traffic noise level was measured in a total of 12 sites along the Awang-Upi-Lebak-Kalamansig road section (see **Figure 7**). Further, **Table 7** shows the locations of these particular sites, time of sampling, and other descriptions. Due to time constraints, only one (1) sample was taken from each site. Each area was chosen to represent the different segments of the road that could be affected by the noise coming from the road traffic (e.g. forest areas, residential areas, commercial areas). Please refer to **Figure 8.**

FIGURE 7: LOCATION OF SITES MEASURED WITH NOISE LEVEL

TABLE 7: CHARACTERISTICS OF THE SAMPLING SITES (FOR NOISE LEVEL)

Location	Latitude	Longitude	Category/ Description of Area Adjacent to Road	Time of Sampling	Traffic Count (vehicle/min)
Awang Datu Odin Sinsuat, Maguindanao	7.147853	124.219289	Residential	10:31	4
Awang, Datu Odin Sinsuat, Maguindanao	7.129224	124.232706	Forest	10:43	6
Labungan, Datu Odin Sinsuat, Maguindanao	7.114966	124.233701	Residential	10:50	5
Kibleg, Upi, Maguindanao	7.078785	124.178334	Forest	11:07	5
Nuro Poblacion, Upi, Maguindanao	7.020598	124.164311	Residential	11:42	6
Ganasi, Upi, Maguindanao	6.956373	124.157658	Forest	11:58	7
Tubuan, South Upi, Maguindanao	6.893798	124.138415	Forest	12:14	5
Romangaob, South Upi, Maguindanao	6.858378	124.142907	Commercial	12:28	6
Christiannuevo, Lebak, Sultan Kudarat	6.789782	124.155167	Residential	12:45	3
Basak, Lebak, Sultan Kudarat	6.719924	124.145796	Commercial	1:20	5
Poblacion, Lebak, Sultan Kudarat	6.632788	124.066140	Commercial	2:20	10
Poblacion, Kalamansig, Sultan Kudarat	6.565330	124.060121	Commercial	2:56	8

FIGURE 8: CATEGORIES OF SAMPLING SITES. (A) RESIDENTIAL (BRGY. LABUNGAN, DOS), (B) COMMERCIAL (BRGY. POBLACION, LEBAK), (C) FOREST (BRGY. KIBLEG, UPI)

The noise level was measured using a digital sound level meter (see **Figure 9**). This tool measured the changes in noise level through sound pressure. The main noise index used was the LAeg, the A-weighted equivalent continuous sound level in decibel measured over a stated period. The majority of community and industrial noise measurements were A-weighted, so the LAegwas widely used. For this IE, LAeq is measured directly using the sound meter in 5-minute time intervals. Noise measurements were taken at least 3.5 meters from buildings, and the microphone was set 1.5 meters above the ground. The unit of measurement used for LAeq was in decibels (dBA).

Furthermore, a simultaneous traffic count was also done with a one-minute interval. Types of vehicles observed in the different sites included motorcycles, pickup trucks, cars, cargo trucks, and tricycles. These field measurements were done on April 28, 2019.

TABLE 8: SITE ACCEPTABILITY STANDARDS BASED ON NOISE LEVEL (US HUD)

Day – Night Average Sound Level (LAeq in dB)	Acceptability
LAeq ≤ 49 dBA	clearly acceptable
49 <LAeq ≤ 62 dBA	normally acceptable
62 <LAeq ≤ 76 dBA	normally unacceptable
LAeq> 76 dBA	clearly unacceptable

FIGURE 9: DIGITAL SOUND LEVEL METER USED IN THIS IE

Table 9 shows the noise level standards used in this exercise based on the standards[27] set by the now-defunct National Pollution Control Commission (NPCC). Considering that measurement was done during the day, the daytime standards were used in evaluating the noise levels in the study sites. Further evaluation, specifically on the acceptability of noise levels to the population, was done using the US Department of Housing and Urban Development (HUD) standards for noise acceptability [28] in residential neighborhoods, measured outdoors (HUD, 1985).

TABLE 9: NOISE STANDARDS IN AREAS DIRECTLY FRONTING/FACING A FOUR-LANE ROAD (NPCC, MC 002-1980)

Category of Area	Daytime	Morning and Evening	Nighttime
AA – section or area which requires quietness, such as an area within 100m from school sites, nursery schools, hospitals, and special homes for the aged	55 dB	50 dB	45 dB
A – residential	60 dB	55 dB	50 dB
B – commercial area	70 dB	65 dB	60 dB
C – light industrial area	75 dB	70 dB	65 dB
D – heavy industrial area	80 dB	75 dB	70 dB

[27]National Pollution Control Commission, 1980. Memorandum Circular No. 002 Series of 1980: Amendments to Article 1 (Noise Control Regulations), Chapter IV (Miscellaneous Regulations, Rules and Regulations of the NPCC.

[28]US Department of Housing and Urban Development, 1985. The Noise Guidebook. Noise Policy and Environmental Planning Division, Office of Environment and Energy, HUD 953-CPD.

5.6 Limitations of the Study

This impact evaluation is limited to the Awang-Upi-Lebak-Kalamansig portion of the road and during the 10-year period (2008-2018). However, the study team did not have sufficient access to the project feasibility study of the road, baseline study, and other relevant documents from the regional office ofDPWH 12– since this road project was largely under the auspices of the DPWH National. NEDA 12 provided the study team a copy of the "Feasibility Study Report on the Cotabato City Diversion Road/Cotabato-Upi-Lebak-Palimbang-Maitum Road." NEDA 12 used to have documents on the road project, but these files were lost due to computer glitch and during physical transfer of office. An online copy of the Impact Evaluation Study made by Keiko Watanabe, meanwhile, provided some of the baseline information.

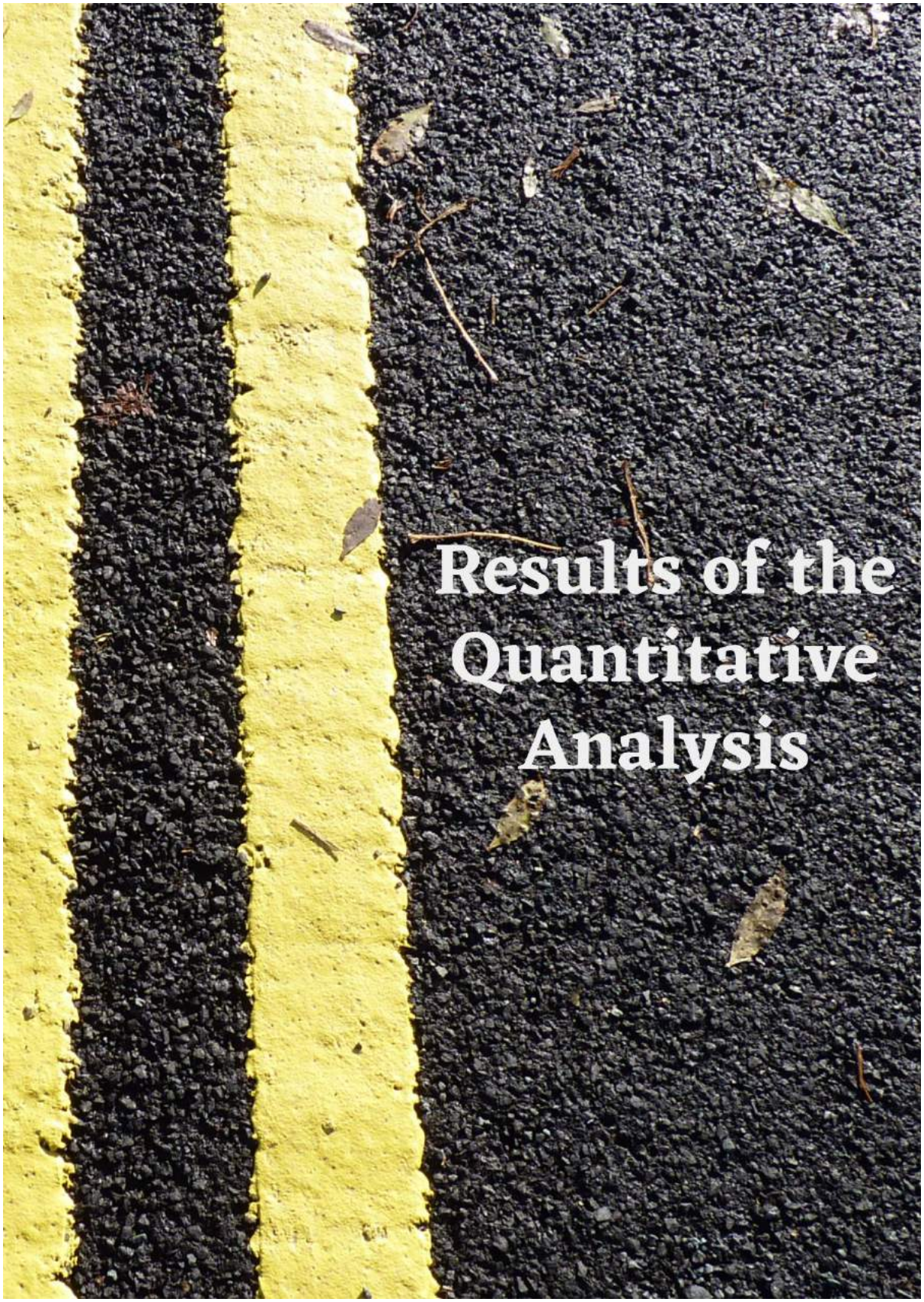
Thus, in the instance of using the Theory of Change (as stipulated in the Terms of Reference for this study), we mimicked Theory of Change of other road projects and used the indicators therein as the basis for data gathering.

Another limitation is the self-reported data has been used rather extensively in this study, particularly on the qualitative information that served to capture the experience of the road beneficiaries and stakeholders. For instance, the data on crime incidents was available at the regional level. The study team tried to obtain information from the eFOIportal, to cull the municipal data but as of 24 June 2019, there was a notice that said: "The Philippine National Police is temporarily delisted in the eFOI portal for them to complete the requirements and satisfy the provisions of the law." The team was not successful in getting such data (as well as car crashes incidents) at the local PNP office. Moreover, the poverty estimates available at the municipal level were dated 2012 and 2009, which were still before the completion of the road.

As such, we have accepted what the households, key informants, and other respondents shared at face value. Some of the data could be verified using official sources (although these are not updated frequently). Triangulation has been done by getting the perspectives of several information sources.

5.7 Constraints in Data Gathering

The field activities were done in three (3) batches: the first week was done on the week of February 18 to 23; second week was undertaken between on the week of March 4 to 8, due to the limitation of resources; and the last batch was done on the last week of April (due to conflict of schedule and subsequent changes in the team composition). Other constraints were the difficulty of finding respondents who were qualified under the conditions set by the study – such as those who have been in the business before the road and still in the business until today, and those who maintained the same type of vehicles then and now. We also replaced some of the treatment barangays, which we initially believed were within the 30-minute distance from the road but more than a 1-hour ride. Internally, we also had to change our subject matter specialists in Engineering and Environment because of the conflict in schedule.


Results of the
Quantitative
Analysis

6 Results of the Quantitative Analysis (Impact Estimation)

The impact estimation of the Awang-Upi-Lebak-Kalamansig portion of the road is carried out using the nearest five (5) neighbor matching. This is one of the most straightforward matching procedures. The value of the outcome variable for an individual in the treatment group is matched by the average value of the same outcome variable from the nearest five (5) neighbors in terms of the five (5) closest propensity score from the comparison group. The impact is the average value of the outcome between the two (2) groups.

The impact estimation is carried out for the following outcome indicators:

- Differences in travel time by destination and overall travel time index (measured as the average travel time difference of all destinations)
- Availability of transport services
- Difference in waiting time
- Land value
- Expansion in agricultural capitalization
- Changes in post-harvest losses
- Household income (with source disaggregation)

6.1 Impact of the Road Project on Travel Time

Analysis of the impact of the road project on travel time savings is conducted per destination and mode of transport. The time savings are normalized as minutes per kilometer. Results of the estimated average treatment effect (ATE) show that the road project has brought about significant time savings to access social services and facilities for health, education, agriculture, and others. For example, the time to access services of the barangay health center is significantly lower by 7.22 minutes per kilometer in the treatment group compared to the comparison group.

More discussion on this on the qualitative information gathered from the other surveys and interviews.

TABLE 10: AVERAGE TREATMENT EFFECT (ATE) ESTIMATE OF THE ROAD PROJECT TRAVEL TIME (MIN/KM), BY DESTINATION

Destinations	Mode of Transport	Coefficient[a]	z statistic	Sig(significant)
A. Health				
Barangay health canter	Motorcycle	-7.22***	-5.84	0.000
Rural health unit	Motorcycle	-1.051***	-3.38	0.001
District hospital	Motorcycle	-1.053***	-5.73	0.000
Private clinic or hospital	Motorcycle	-1.14***	-3.83	0.000
Pharmacy	Motorcycle	-0.34[ns]	-0.47	0.636
B. Education				

Destinations	Mode of Transport	Coefficient[a]	z statistic	Sig(significant)
Elementary school	Motorcycle	0.53 [ns]	0.41	0.681
Secondary school	Motorcycle	-5.56 [ns]	-0.85	0.398
College/university	Motorcycle	-1.87***	-3.15	0.002
C. Agricultural				
Retailer of farm inputs	Motorcycle	-5.85*	-1.65	0.098
D. Other Facilities				
Banks/micro-finance institutions	Motorcycle	-2.59 [ns]	-1.42	0.155
Municipal market	Motorcycle	-0.58**	-2.22	0.026
Municipal capitol	Motorcycle	-1.39***	-4.61	0.000
Places of worship	Motorcycle	-2.06 [ns]	-1.30	0.195
Overall Time Index[b]		-16.66***	-12.12	0.000

Note: *** significant at 1% level, ** significant at 5% and *significant at 10% level, [ns] denotes not significant, [a]treatment versus comparison. Estimation is conducted for the common mode of transportation per destination between the two groups. [b]Measured as the average travel time of all destinations regardless of mode of transportation.

6.2 Impact of the Road Project on the Availability of Transportation Services and Waiting Time

With better paved and widened roads, the vehicle owners are encouraged to increase the number and the type of vehicles available to the riding public, agricultural, and other sectors. For this road, we found that there is a significantly higher number of transport services (in this case, motorcycle as the common transport services in both treatment and comparison groups) in the treatment group compared to the comparison group.

There is also a highly significant difference in waiting time – for instance, the waiting time to hail a ride in the treatment group: to the comparison group.

TABLE 11: AVERAGE TREATMENT EFFECT (ATE) ESTIMATE OF THE ROAD PROJECT ON AVAILABILITY AND WAITING TIME OF TRANSPORT SERVICES

Items	Coefficient[a]	z statistic	Sig (significant)
A. Availability			
Number of Motorcycle	100.71***	9.48	0.000
B. Waiting Time			
Waiting time of motorcycle (in Minutes)	-12.53***	-12.85	0.000

Note: *** significant at 1% level, ** significant at 5% and *significant at 10% level, [ns] denotes not significant, [a]treatment versus comparison. Among the types of transport services, only the motorcycle has enough observations required for the test.

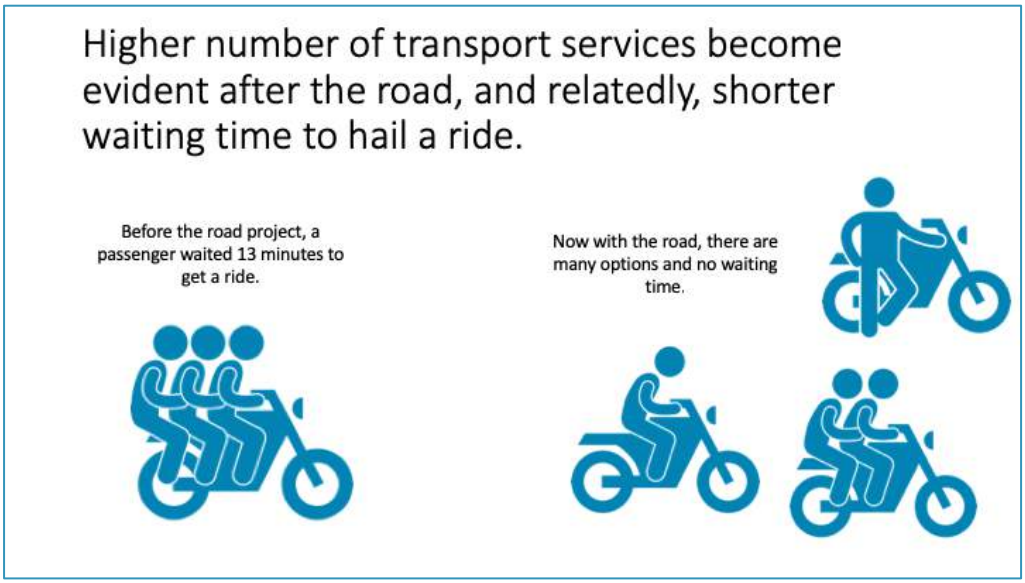


FIGURE 10: DIFFERENCES OBSERVED ON AVAILABILITY OF TRANSPORT SERVICES AND WAITING TIME

6.3 Impact of the Road Project on Land Value (Php/square meter)

The land value is designed as the monetary cost of the land measured in Philippine peso (Php) per square meter. This is a self-assessment of the respondent on the value/price of their land. The estimated ATE shows that a farmer's assessed value is significantly higher in the road influence area by Php 401.96/square member compared to the land in the comparison area. There is also a significant difference in the land value before and after the project; the treatment group has significantly higher valuation by Php 290.37/square meter as compared to the valuation of the comparison group.

TABLE 12: AVERAGE TREATMENT EFFECT (ATE) ESTIMATE OF THE ROAD PROJECT LAND VALUE (PHP/SQM)

Items	Coefficient[a]	z statistic	Sig (significant)
Land Value (Treatment Vs. Comparison)	401.96***	9.67	0.000
Difference in Land Value Before and After (2018-2008)	290.37***	9.26	0.000

Note: *** significant at 1% level, ** significant at 5% and *significant at 10% level, [ns] denotes not significant

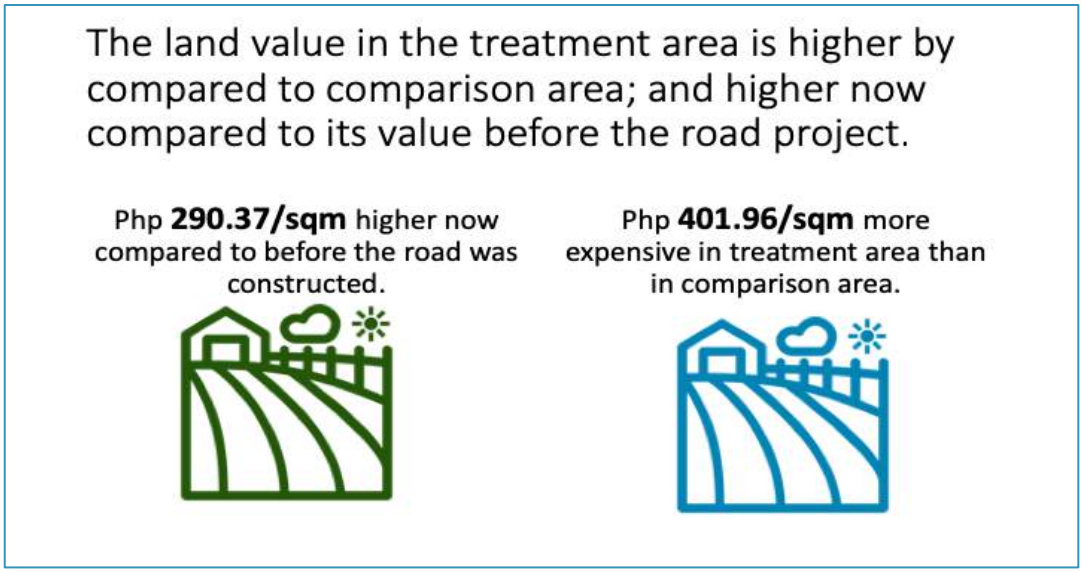


FIGURE 11: DIFFERENCE IN LAND VALUE BEFORE THE ROAD AND COMPARING THE TREATMENT AND COMPARISON AREAS.

6.4 Impact of the Road Project on Agricultural Activities

We look at the indicators related to agricultural activities. First, the results of this study show that an increase in agricultural capitalization is more evident in the comparison area rather than in the treatment area. Essentially, the farming-household in the comparison area are investing in their main source of income (i.e., buying fertilizers and other inputs, or expanding their land area).

However, we also found out that the post-harvest losses are significantly lower in the treatment area compared to the comparison area. This can be partly explained by the road allowing for immediate transport to the market or paved road, allowing for smooth transport -- hence, likely indicates less spoilage. It can also mean access to appropriate cargo trucks to carry the agricultural produce to the market.

TABLE 13: AVERAGE TREATMENT EFFECT (ATE) ESTIMATE OF THE ROAD PROJECT ON AGRICULTURAL CAPITALIZATION AND POST-HARVEST LOSSES

Items	Coefficient[a]	z statistic	Sig (significant)
A. Expansion on Agricultural Capitalization			
Agricultural Capitalization (in PhP)-2018	-9655.83***	-7.48	0.000
Difference in Agricultural Capitalization Before and After (2018-2008)	-4081.17***	-9.09	0.000
B. Changes in Post-harvest losses (%)			
Post-harvest losses	-39.01***	-10.02	0.000
Difference in post-harvest losses, before and after(2018-2008)	-33.42***	-13.34	0.000

Note: *** significant at 1% level, ** significant at 5% and *significant at 10% level, [ns] denotes not significant, [a]treatment versus comparison areas.

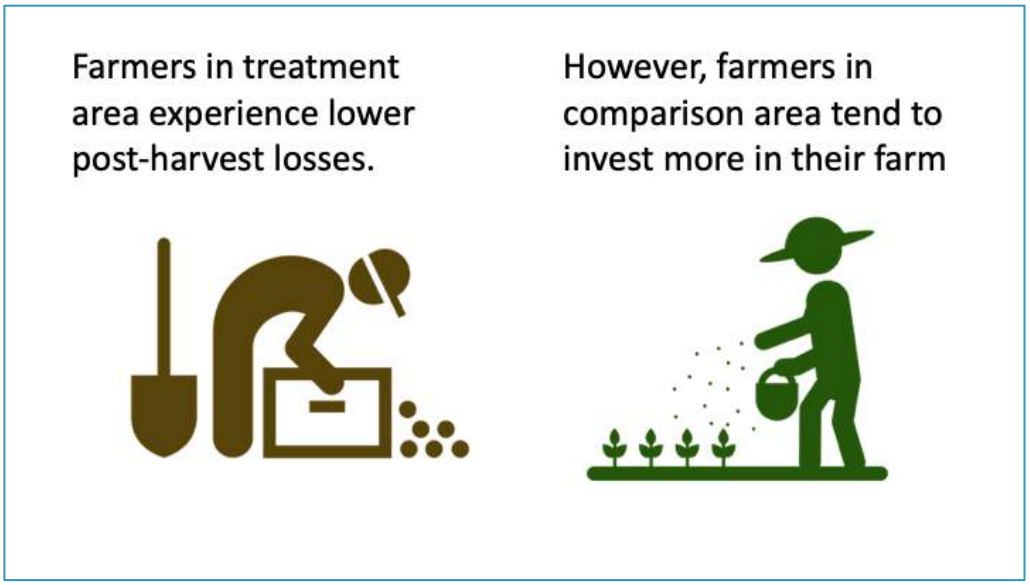


FIGURE 12: DIFFERENCE IN POST-HARVEST LOSSES AND INVESTMENT.

6.5 Impact of the Road Project on Household Income

Road construction affects the household income of the beneficiary population through different mechanisms. Household income is disaggregated by sources to determine the types of income that are affected by the road project after ten years from its construction. One of the common mechanisms is the reduction in transport and transaction cost triggered by the road project. These reductions in costs associated with agricultural production may lead to an increase in the supply of agricultural products, further increasing agricultural income. Moreover, road construction also generates more income opportunities and varieties of income from non-agricultural sources.

To illustrate, a farmer is prevailed to produce more because he can transport his products at a lesser cost per unit (say cheaper per kilo or sack) compared to a farmer who has to pay more because the road from production site to the market is unpaved and even risky during rainy days. With higher volume to sell, ideally, the farmer with lower transport costs may experience an increase in his income after the road construction.

Further, road construction may also generate more income opportunities and varieties of income from non-agricultural sources. The beneficiary household or economic agent can substitute agricultural employment/self-employment income for other income sources that have greater profitability, or those that emerge after the road construction. For example, a household used to depend solely on farming before the road was constructed. However, with the road completed, an educated or skilled family member can find other non-farm work and go to work daily because of the road, and thus shifted the source of primary income (or augment farm income).

The result of the estimated average treatment effect (ATE) of income reveals that the treatment group substituted agricultural income for non-agricultural sources that became available after the road project. Agricultural-related incomes are statistically higher in the

comparison group compared to the treatment group. Noting that, still, non-agricultural incomes are significantly higher in the treatment group compared to the comparison group.

Incomes from wholesale or retail trade (including market vending, sidewalk vending, peddling, small shop), private employment, and professional work are the main sources of income in the road-proximate communities. The transformation from subsistence agriculture to non-agricultural activities is evident in the households in treatment group, as shown by the diversified household income sources. The insignificant ATE of average annual income may suggest substitution of agriculture income through diversification of non-agricultural activities creates an off-setting effect, leading to stationary income.

Based on the data we have gathered, comes an interesting revelation for this particular road. The treatment group may have diversified their income sources after the road has been built – but, the level of increase of their diversified income appears to have compensated what they used to obtain from their previous farming source.

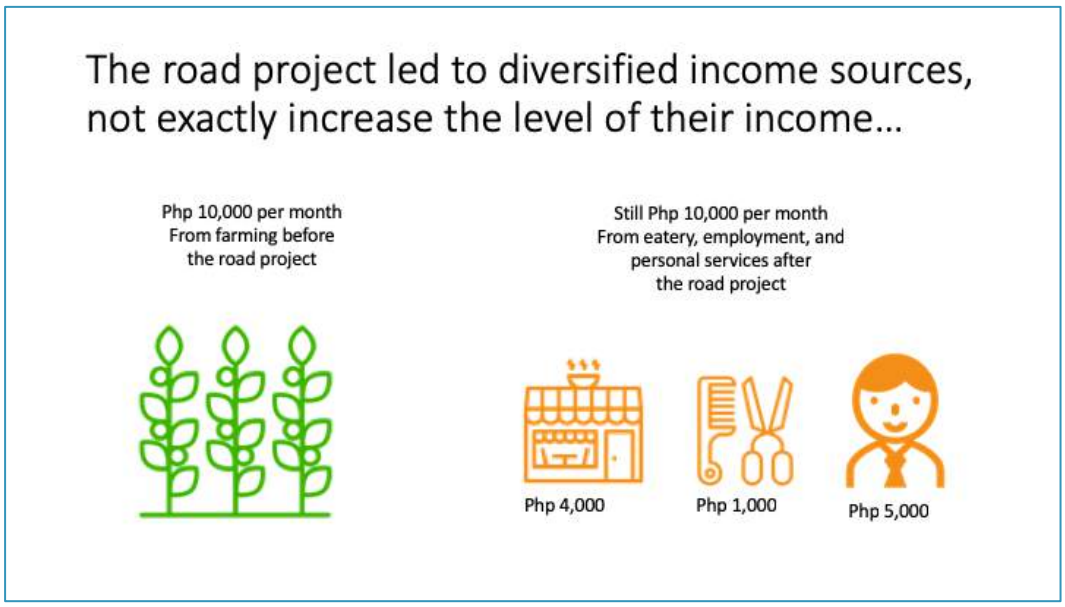


FIGURE 13: CHANGES IN INCOME AND LEVEL OF CHANGE

TABLE 14: AVERAGE TREATMENT EFFECT (ATE) ESTIMATE ON THE ROAD PROJECT ON INCOME (PHP), BY SOURCE

Items	Coefficient[a]	z statistic	Sig (significant)
Products from crop farming/production and/or processing	-1,387.89**	-2.27	0.023
Livestock, poultry raising and Fishing	-1,021.43ns	-0.39	0.697
Whole or retail trade (including market vending, sidewalk vending, peddling, small shop)	5,230.43***	3.84	0.000
Skilled labour (carpentry or masonry, driver, mechanic, etc.)	1,309.83**	1.97	0.048
Transportation, storage and communication services (jeepneys or motorcycles, storage, warehousing, messenger services, etc.)	2,433.33*	1.82	0.069
Barangay/LGU or national government employee	3,251.29**	2.02	0.043
Private employment	8,205.16***	5.96	0.000
Professionals (doctor, teacher, lawyer, accountant, engineer, etc.)	9,233.33**	2.24	0.025
Remittances	-4,853.02*	-1.73	0.084
Pension/retirement, worker's compensation, relief (assistance from government, including 4Ps)	-161.47[ns]	-0.81	0.418
Other Income	5,246.43[ns]	1.21	0.225
Average Annual Farm Income	-29,398.81***	-5.99	0.000
Average Annual Off-Farm Income	-3,992.79***	-4.18	0.000
Average Annual Non-Farm Income	28,952.80***	3.4	0.000
Average Annual Household Total Income	-4,438.80[ns]	-0.46	0.644

Note: *** significant at 1% level, ** significant at 5% and *significant at 10% level, [ns] denotes not significant, [a]treatment versus comparison. Test for incomes from manufacturing and unskilled salary employment were not conducted due to lack of observations.

6.6 Benefit-Cost Analysis

In this IE study, the costs were mainly the investment costs as reflected in the project documents. The total capital outlay (investment cost) of the entire road projects is PhP2.6 Billion, in which 63% of the funding is from the Japan International Cooperation Agency (JICA), while 37% is funded by the Government of the Philippines (GOP). Annual operational/maintenance and depreciation costs were assumed to be 10% of the project cost.

The study utilized standard benefits measurement for road projects; these include savings in vehicle operating cost savings (VOCS), travel time savings and fare cost savings. The multiplier of the vehicle operating cost was generated to random survey among vehicle owners and transport operators in the road influenced areas (five municipalities) operating/existing for the last ten years. The estimated monthly VOCS is P1,453.33, and this was calculated using the maintenance cost of 2008 and 2018. The value of 2018 was adjusted to inflation using the consumer price index to make it comparable with the 2008 values.

The average travel time savings and fare cost savings were generated using a random survey of passengers traveling the route for the last ten years. Annual traffic count per type of vehicles of the Department of Public Works and Highways (DPWH) were utilized to aggregate these values. The average wage rate in Region 12 from 1995 to 2016 was used to monetize travel time savings. The average travel time savings per kilometer is estimated to be 4.45 minutes, average kilometers traveled is 76 kilometers, and the average frequency of travel is five times per month. Thus, the average travel time savings per day per person is 57.39 minutes.

TABLE 15: ESTIMATED ECONOMIC NPVS, IRRS AND BCRS AT VARIOUS DISCOUNT RATES

Discount Rate	NPV	BCR	IRR
r=12%	-1.189	0.701	6.25
r=6%	0.081	1.026	6.25
r=3%	1.339	1.229	6.25

Note: NPV is in Million Pesos, BCR is in pesos, IRR is in %.

The result of the analysis shows that the road project is not viable at a 12% discount rate but viable at 6% and 3% discount rate. However, these are sensitive to changes in cost and benefits. The positive NPV at a 6% discount rate becomes negative when there is a 10% reduction in benefits, as well as a 10% increase in cost.

The result of the BCA analysis revealed that the road project is economically viable at a 6% discount rate; this means that the project is economically viable (not necessarily the best choice) if the GOP fully funds the project. However, its viability is highly sensitive to changes in cost, benefits or both. Sensitivity analysis revealed that at 3%, a 10% reduction of the benefits of the project would yield an NPV of -429 Million Pesos; a 10% increase in the cost of the project would yield -175 millions pesos NPV, while combining both project risk would yield -686 million pesos NPV from originally estimated 81 million net present value.

TABLE 16: SENSITIVITY ANALYSIS

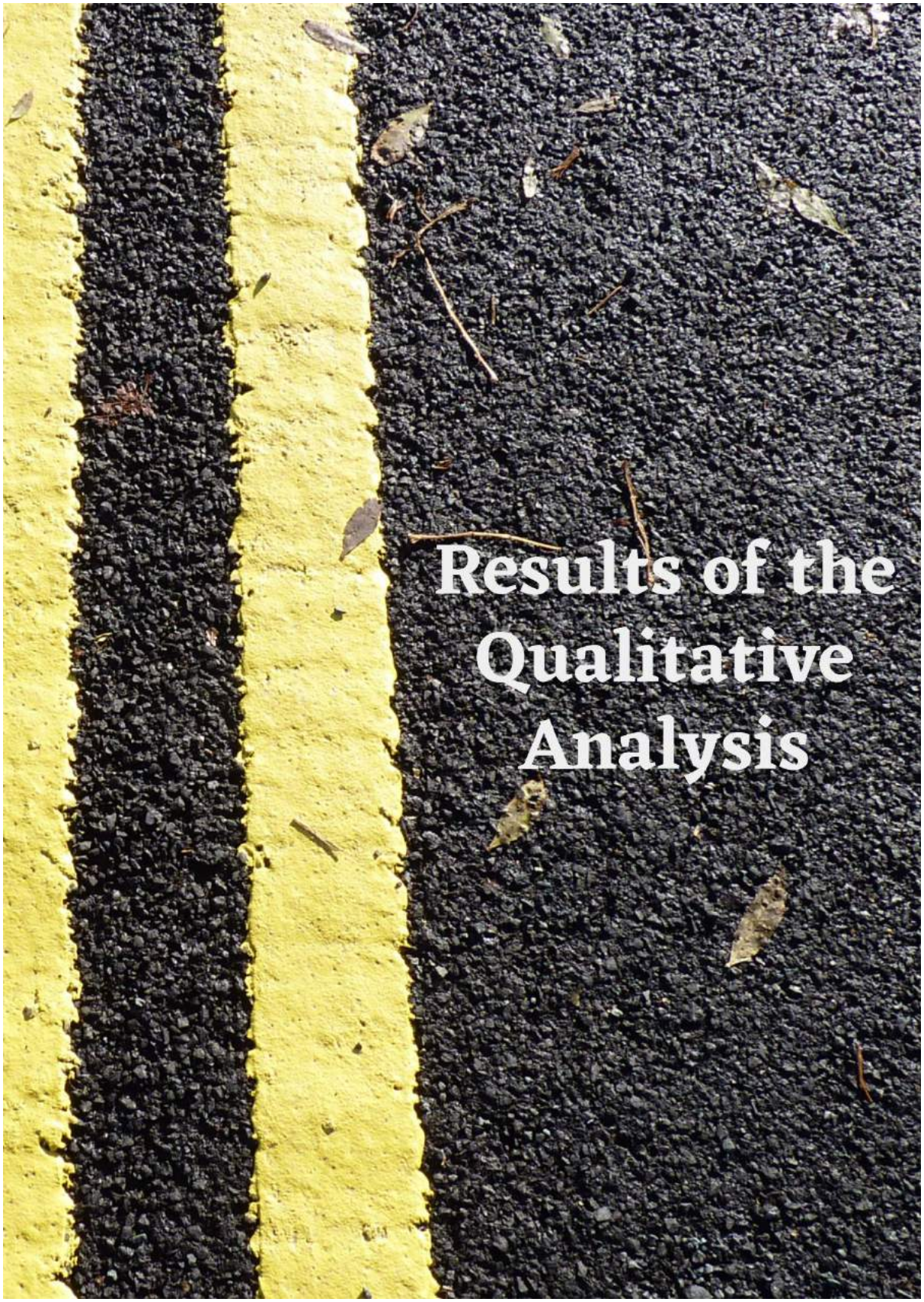
Type of Analysis	*r=12%*			*r=6%*			*r=3%*		
	NPV	**BCR**	**IRR**	**NPV**	**BCR**	**IRR**	**NPV**	**BCR**	**IRR**
Sensitivity Analysis: 10% reduction of benefits	-1.468	0.631	4.59	-0.429	0.915	4.591	0.620	1.106	4.591
Sensitivity Analysis: 10% increase in cost	-1.354	0.673	5.45	-0.175	0.967	5.45	1.006	1.163	5.45
Both: 10% reduction of benefits and 10% increase in cost	-1.633	0.606	3.74	-0.686	0.870	3.74	0.287	1.047	3.74

Note: NPV is in Billion Pesos, BCR is in pesos, IRR is in %.

This implies that the Awang-Upi-Lebak-Kalamansig-Palimbang-Sarangani road project turns out to be economically viable at 6%, however sensitive to changes cost and benefits (increase in cost and reduction of benefits). The benefit is not enough to outweigh the cost of 12%. This result can be attributed to the following:

- The targeted average annual operating cost estimate in the feasibility of the project is too high at PhP372,390,000.00 per year compared to the actual estimated VOCS of 62 million (average for 20 years)

- The forecasted travel savings are also too high at 2.5 hours compared to the estimated actual travel time savings per day at 57.39 minutes per person.


Results of the
Qualitative
Analysis

7 Results of the Qualitative Analysis

7.1 Profile of the Respondents

7.1.1 Household Respondents

SEX, YEARS IN THE PRESENT ADDRESS, AGE, AND YEARS OF EDUCATION. We have interviewed a total of 255 (48%) households in the treatment area and 274 (52%) in the comparison area, the total for both groups is 529. There are more female respondents in the treatment area (192 or 75.3%), while there are more male respondents in the comparison area (182 or 66.4%). The average years the respondents have lived in their present address is 30.6 years in the treatment area, while it is 29.9 years in the comparison area. The average age of respondents in the treatment area is 50 years old, while it is four years younger (46.1 years) in comparison areas. As for the educational attainment, respondents in the treatment area (8.2 years) have spent more than two years more informal schools compared to respondents in the comparison area (6.1 years).

Overall, there are more female household members at home during the day (time of the interviews) in the treatment area, they tend to be older, and have spent more years in school compared to respondents in the comparison areas.

TABLE 17: DISTRIBUTION OF RESPONDENTS BY SEX, YEARS IN THE PRESENT ADDRESS, AND AGE, BY GROUP

Items	Sex				Average No. of years on the present address	Average Age of resp.	Average years of education
	Female		Male				
	Frequency	%	Frequency	%			
Treatment	192	75.3	63	24.7	30.6	50.0	8.2
Control/Comparison	92	33.6	182	66.4	29.9	46.1	6.1

MARITAL STATUS AND ETHNICITY. Nearly all of the respondents interviewed for both groups are married (81.6% for treatment area and 93.4% in comparison). There is a higher percentage of respondents who are widows/widowers in the treatment area (13.7%) compared to the comparison areas (4.7%).

The dominant ethnic group in treatment areas is Ilonggo (their ancestors originated from the Visayas and have settled in Mindanao), which represents 48.2% of the respondents. In the comparison area, it is the ethnic group Tiduray[29]which nearly half of the respondents belong (128 or 46.7%). For full tables, please refer to **Reference Table 1** and **Reference Table 2.**

[29]Also known as "Tiruray", which is a combination of "tiru" meaning place of origin and "ray" meaning upper part of a stream river. They are known to live in Maguindanao, Sultan Kudarat and North Cotabato. Retrieved from http://nlpdl.nlp.gov.ph:81/CC01/NLP00VM052mcd/v1/v49.pdf

TABLE 18: DOMINANT MARITAL STATUS AND ETHNICITY, BY GROUP

	Marital Status		Dominant Ethnic Group	
	Frequency	%	Frequency	%
Treatment	208	81.6	123	48.2 (Ilonggo)
Control/comparison	256	93.4	128	46.7 (Tiduray)

HOUSEHOLD INFORMATION AND MEMBERSHIP TO ORGANIZATION. The average household size is five members for the two groups. The average number of schooling age members of the household is 2 for both groups. They differ in the number of household members currently in school and currently working – only 1 in school and 1 with work in the treatment area while 2 respectively in the comparison area.

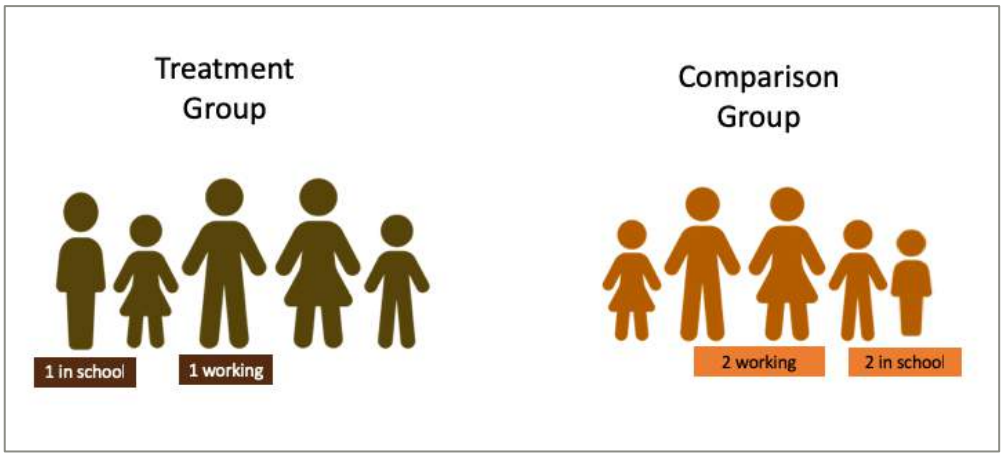


FIGURE 14: DIFFERENCE IN THE NUMBER OF HOUSEHOLD MEMBERS WORKING AND IN SCHOOL

In the treatment area, there are more households with members belonging to organizations (106 or 62.7%), with the most common is an affiliation with a women's group (70 or 27.5%). In the comparison area, there are very few households with members belonging to an organization (28 or 10.2%). Please refer to **Reference Table 3** for the full details on the memberships to organizations.

TABLE 19: HOUSEHOLD SIZE, SCHOOL-AGE MEMBERS, WORKING MEMBERS AND MEMBERSHIP TO ORGANIZATION

Items	Treatment	Control/Comparison
Average household size	5	5
Average number of schooling age household members	2	2
Average number of schooling age members attending school	1	2
Average number of members of the household who are working/earning	1	2
Percentage of households with members affiliated with organizations	62.7%	10.2%

HOUSEHOLD CHARACTERISTICS AND ASSETS. All the household respondents in both treatment and comparison areas are living in a single house[30]. Dominant walling materials in treatment areas are made of permanent materials such as tile, concrete, and brick stone (32.5%) while it is light materials such as that of the roof, *sawali,* or salvaged materials (51.8%) in the comparison area. For both areas, though, permanent materials such as galvanized iron prevail as roofing materials (62% of households in treatment and 48.9% of households in comparison areas). Please refer to **Reference Table 4,**

Reference Table 5**,** and **Reference Table 6** for the full tables.

Household-respondents in the treatment area (76.5%) and comparison area (92.7%) own the house and lot where they live (please refer to **Reference Table 7**).

The households also have electrical appliances for entertainment, learning, storage of food, washing of laundry, cooking, and cooling. Please refer to the table below, showing the number and percentage of household asset ownership. The full table is

[30]Single house is defined as a complete structure intended for a single family or household, i.e. bungalow, 2-storey house, nipa hut, retrieved from http://rsso11.psa.gov.ph/construction-statistics

Reference Table 8**.**

TABLE 20: HOUSEHOLD OWNERSHIP OF ASSETS, BY GROUP

	Treatment		Control/Comparison	
	Frequency	%	Frequency	%
Television	210	82.4	138	50.4
Radio/cassette	53	20.8	127	46.4
Mobile phone/ telephone	217	85	189	69
Computer/ laptop	20	7.9	6	2.2
Refrigerator	66	25.9	30	10.9
Washing machine	48	18.8	10	3.6
Stove, cooking range	32	12.5	13	4.8
Electric fan or airconditioner	127	49.8	12	4.4

Few households had transportation assets. For instance, four-wheel type of vehicles (such as a car, jeep, or van) are owned only by 9 respondents in the treatment area (9 or 3.5%) and fewer still in comparison area (6 or 2.2%). Motorcycles or tricycles are owned by 126 households (49.4%) in treatment areas and by 112 households (40.9%) in comparison areas. Please refer to **Reference Table 9** for the full table.

ACCESS TO ELECTRICITY AND WATER FOR DOMESTIC USE. Nearly all household respondents in the treatment area (97.3%) have access to electricity while it is only 7 in every 10 households in the comparison area (70.4%).

The household respondents in the treatment area have better access to water for domestic use and drinking, at the proportion of 34.1% for "own use, faucet, community water system." In comparison area, a large part of the household respondents still rely on "spring, river, stream" (58.5%), which may not be safe for their domestic use and drinking (please refer to **Reference Table 10 and**

Reference Table 11 for the full tables.

In the treatment area, 4 in every 10 households interviewed have their water faucets inside their house, while in comparison group/area, all households interviewed have water faucets outside their house.

A hundred households (100 or 39.1%) in the treatment area have to walk about 2 minutes to get water for drinking, while there are about 149 households (54.9%) in the comparison area that have to walk more than 10 minutes to get their water. Please refer to **Reference Table 12** for the full table.

7.1.2 Business Owner Respondents

We have interviewed a total of 193 respondents (74%) out of the target 260. These respondents represent 19 barangays in the 5 municipalities covered. The average number of residency in years is 31 years in their barangay. The majority are females (154 or 79.8%) and are married (156 or 80.8%).

Single proprietorship (190 or 98.5%) is the leading classification of the enterprises. The nature of business is largely on retailing (consumer goods, medicines, etc.) comprising of 155 owner-respondents or 80.3%. Other secondary businesses are related to food service (i.e., restaurants, *carenderia* and bakeries), which represents 12.4% (24 respondents) and buy-and-sell of agricultural products (18 or 9.3%). The majority started their enterprise with less than Php 20,000 in capital (145 or 75.1%) and by the end of December 2018, those who declared the latest capitalization at such level of investment have gone down (72 or 37.3%), and many have moved up the scale.

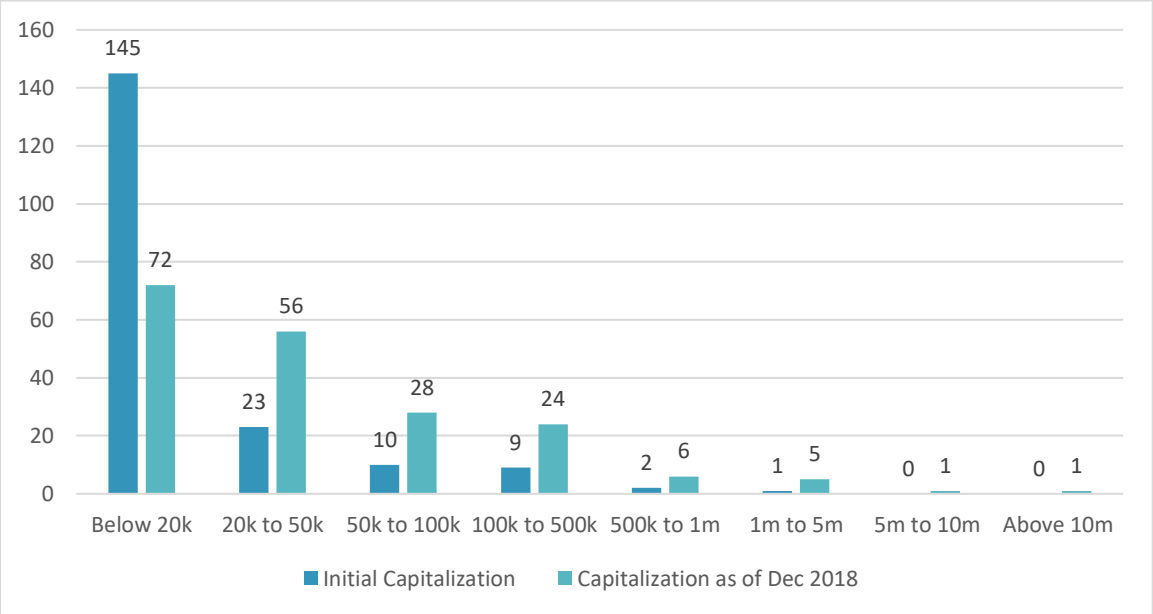


FIGURE 15: CHANGES IN THE LEVEL OF CAPITALIZATION OF BUSINESS OWNERS, BEFORE PROJECT AND NOW, IN PHP 000

The average estimated monthly sales before the road was constructed was around Php 23,568, while after the road, it has increased to Php 53,416. Many credit that the leading effects of the road project on their business include an increase in sales (142 or 73.6%) and an increase in the number of customers (94 or 48.7%). The business owner respondents say they put up their business in their present location because it is along/near the road, with many people/consumers passing, at the center of the town, or it is also near their house.

The majority of the business owner respondents have observed the increase of business establishments or activities in their areas (190 or 98.5%). With more businesses, many are also concerned about the competition. Thus, only about half (101 or 52.3%) are thinking of expanding their current operations.

The road project has encouraged the business owner respondents to travel more outside their municipality/province (165 or 85.5%). They have also felt some improvement in the peace and order situation (175 or 93.7%), contributed in part by the presence of military forces (visibility or checkpoints). Please refer to **Reference Table 13**.

7.1.3 Vehicle Owner Respondents

We have interviewed a total of 174 (67%) vehicle owner respondents from the target of 260, which represent 20 barangays in 5 municipalities. Many of the vehicle owners are residents of Lebak (77 or 44.3%) and Kalamansig (47 or 27%). The average age is 44 years old. Males are the dominant sex (155 or 89.1%), and the majority of respondents are married (159 or 91.4%).

The majority of respondents are the owners of the vehicles (166 or 95.4) and are using their vehicle/s for livelihood (115 or 66.1%). Nearly half of the vehicle owners have established their transport service between the years of 2001 to 2010 (56 or 48.7% of 115). Nearly all funded their livelihood with as little as Php 20,000 in capital (93 or 81.7%), but as of last December 2018, only 47 (40.9% of the vehicle owner respondents) remained at the level of Php 20,000 capitalization.

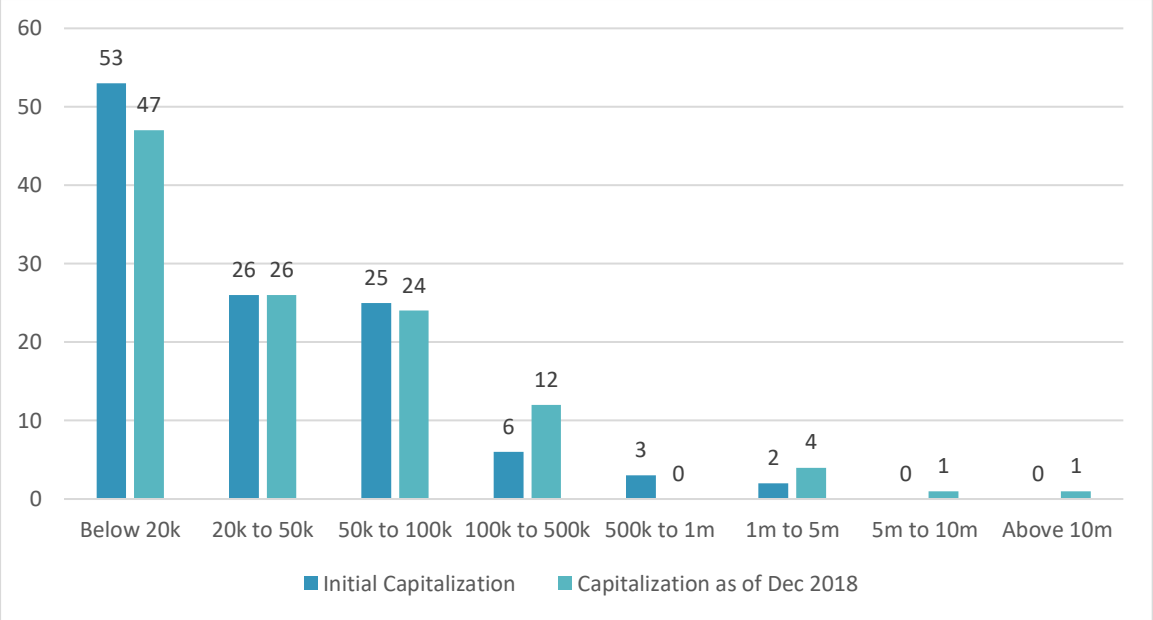


FIGURE 16: CHANGES IN THE LEVEL OF CAPITALIZATION, VEHICLE OWNER RESPONDENTS, INITIAL CAPITALIZATION AND AS OF DECEMBER 2018, IN PHP

All vehicles for livelihood are operated under a single proprietorship structure (100%). The interview with the vehicle owners has focused on respondents who utilize the same type of vehicle before the road project and until now for a better comparison of the costs of operation and maintenance. Before the project, 45 (25.8%) used their vehicles to transport goods, essentially agricultural raw products (31 or 71.1%). Today, more vehicle owners transport crops (38 or 84.4%). The average weight of goods transported per trip was 250 kilos before the road project, while today the average is 761 kilos per trip.

Ninety-one (91 or 79%) of the vehicle owner respondents use their transport to move people. The average daily passengers before the project was 8 people, and now this has increased to 14. Please refer to **Reference Table 14.**

7.1.4 Passenger Respondents

We have interviewed a total of 101 respondents (38.8%) of the target 260 passenger respondents. These passengers hail from Sultan Kudarat, Maguindanao, Cotabato, and other provinces. More than half of the passenger respondents are based in Sultan Kudarat (57 or 56.4% of 101), and most of them are females (59 or 48.4%). Before the road project, most of them have used jeepneys, multi-cabs, and similar transport (34 or 33.7%) as the main mode of transport, and these options have expanded now, with the majority of them using vans (77 or 76.2%). Take note that before the road, there were also people who used pump boats (these were people who lived in or traveled to Poblacion, Nalilidan, Pag-asa, Sta. Clara, Dumangas, Sangay and Paril in Kalamansig; Poblacion 3, Purikay and Salaman in Lebak; and Kipungit in Palimbang)or similar vessels (27 or 26.7%) for travel, while today people (11 respondents who lived in Awang, Kalamansig and North Upi) have added buses such as the Tacurong Bus Line(13 or 12.9%) and private cars (8 or 7.9%) as additional transport options.

The main purpose of the travel (on the day of the interview) is leisure/visiting friends or relatives (62 or 61.4%). The frequency of travel is at least five (5) times a month, and the average distance of such travel is 81 km. The majority have commented that transport from origin to destination is now available several times a day (71 or 70.3%). For the particular travel on the day of the interview, they had used a van (53 or 52.5%) compared to before the road they frequently had to travel by jeepney, multicab, or similar transport vehicle (40 or 39.6%). The passengers reveal that there are other alternatives to the road project as the route (67 or 66.3%), but they use the road because it saves them time (61 or 91% of 67 who say there are other routes). Please refer to **Reference Table 15.**

7.1.5 Community Representative Respondents

We have interviewed the 77 barangays within the road portion's influence areas. More than half of the respondents are currently serving as the Punong Barangay, and the rest are Barangay *Kawagad*, Secretary, and Indigenous representatives.

TABLE 21: DISTRIBUTION OF COMMUNITY LEVEL SURVEY RESPONDENTS

Respondent	Frequency	%
Barangay Captain (Punong Barangay)	45	58.4%
Barangay Kagawad	28	36.4%
Barangay Secretary	3	3.9%
Indigenous Representative	1	1.3%

Most of the barangays included in the community level survey come from Lebak (27 barangays) and Upi (23 barangays). The average years of residency of the community respondents in their present address is 45 years old. Please refer to **Reference Table 16.**

7.1.6 Focus Group Discussion Participants

There were 10 FGD sessions conducted, 2 each for each municipality.

TABLE 22: DISTRIBUTION OF FGD PARTICIPANTS

Municipality	Barangays	Number of Participants
Datu Odin Sinsuat	Awang and Lubangon	24
Upi	Ngani and Nuro	24
South Upi	Romanganob and Looy	24
Lebak	Kinodolan and Paril	10
Kalamansig	Poblacion and Cadiz	8
Total		90

7.1.8 Key Informants

The study team has interviewed the following key informants:

TABLE 23: LIST OF KEY INFORMANTS

	Key Informant and Position
A. LGU	
Datu Odin Sinsuat	1. Datu Ombra Quesada Sinsuat, Sr., Municipal Mayor 2. Manan UmalMandaragan, MPDO 3. Datu Reymund Laban Rusam, MEO
Upi	4. Ramon Alejandro Piang, Sr., Municipal Mayor 5. Paul Cagara, MPDO 6. Gerardo BoncosiaCariño, MEO
South Upi	7. RenalbertOca Insular, Municipal Mayor 8. Renato Motao Sirikit, MPDO 9. Danilo Toriales Mayordomo, MEO Staff
Lebak	10. Dionesio B. Besana, Municipal Mayor 11. Engr. Jimmy V. Torres, MEO
Kalamansig	12. Ronan Eugene Garcia, Municipal Mayor 13. Engr. Bernardino A. Billedo
B. DPWH	14. Engr. Delfin B. Viloria, Engineer IV, Chief of Construction Division 15. Engr. Joe Roland Barino, Engineer Project Assistant

7.2 Before the Project

CHALLENGES RELATED TO TRANSPORT BEFORE THE ROAD PROJECT. The Municipal Mayor of DOS, Mayor Datu Ombra Quesada Sinsuat Jr., recalls that before the road was constructed, the travel for the commuters from their municipality going to Upi, South Upi, Lebak, and Kalamansig was inconvenient, long, and costly. Municipal Mayor of Upi, Mayor Ramon Alejandro Piang, Sr., looks back how tough it was for the farmers then – that without paved and widened road, the farmers were burdened with high cost of transportation, long travel time and the unreliability of available transport for agricultural products. Municipal Mayor of South Upi, Mayor Reynalbert Oca Insular, echoes the same predicament experienced by the farmers in Upi. He adds that back then, because of the difficulty in travel, they were not able to provide a reasonable level of health services in far-flung barangays.

Municipal Mayor of Lebak, Mayor Dionesio Besana, talks about the old rainy days when it took about 24 hours before they could reach Cotabato City. He also remembered that farmers experienced high post-harvest losses. Municipal Mayor of Kalamansig, Mayor Ronan Garcia, recalls at those times when the rain would make the road not passable, and thus, they had to travel by boat from Kalamansig to Cotabato City. When it was not raining, the travel time would last as long as 12 hours. They had no other options then, and there were even instances when patients dying on the road before availing of medical help in Cotabato City.

Engineer Delfin Viloria, Asst. Chief of the Construction Division of DPWH XII, who was the project engineer when the road was constructed, relates the following challenges they had encountered when they built the road:

- **Peace and order**. There were threats from people affiliated with the Moro Islamic Liberation Front (MILF) who were asking money, or otherwise, they would burn the construction equipment assigned at the road project. To secure the safety of the construction team and the equipment, the DPWH sought the assistance from the 6th Infantry Battalion for one platoon of military personnel.
- **Road Right of Way**. While the legitimate affected households were paid for their relocation, other people also asked for payment for demolished properties.
- **Permit to cut standing trees**. The permit to cut was not released immediately because the DENR required payment for the permit.

INVOLVEMENT OF THE LGUS IN THE PROJECT. According to the Project Engineers of DPWH, the Brgy. Awang and DOS were involved only in the identification and planning of the proposed road, in the negotiation with the affected households for relocation. The LGU representatives were invited in meeting/updating sessions on various construction activities. They were not involved in the implementation, monitoring, and maintenance of the road project. The DPWH only coordinated with them on matters that require the LGU's permission or that involve their personnel.

7.3 Results of the Qualitative Analysis

7.3.1 Improved Road Connectivity

BARANGAY ROADS CONNECTED ROAD. The main road connects the four provinces (Upi, South Upi, Lebak, and Kalamansig) to Cotabato City, which is the seat of the regional government of the Bangsamoro Autonomous Region of Muslim Mindanao (BARMM). The municipal government units along this road have also planned or constructed barangay roads to connect to the main road. For instance, the MLGU-North Upi, they have built a road from Eco-Park to Crossing National Highway, which is 3.6 km long, concreting of the road from Nuro Poblacion to the highway which is 5 km long, and concreting of the Kibleg road (now ongoing).

MLGU-Upi also funded the concreting of roads from Pandan, Biarong, and Lamud to connect to the national highway, which they expect to be completed this year (2019). On the other hand, the MLGU-Datu Odin Sinsuat said they only had proposed barangay projects to connect to the national highway, but these are still on the pipeline (only one road construction, which connects Sitio Maman in Brgy. Labungan to the national highway).

The Municipal Mayor of Lebak confirmed that they are connected to the main road, although there are still some barangay roads not yet cemented. There are a few barangay roads under construction, funded by the provincial government. On the other hand, the Municipal Mayor of Kalamansig discloses that most of the roads in their barangay are paved, except for the barangays located at the upper side.

COMMUNITY SURVEY ON THE BARANGAYS CONNECTED TO THE ROAD. From the perspective of the 77 barangay representatives, the average percentage of barangays connected to the road then was 62.3%, and this has increased to 70% by December 2018. The increase in connected barangays are in Lebak (from 59.3% to 74% of barangays) and Upi (from 47.8% to 57% of barangays). Please refer to **Reference Table 17**.

7.3.2 Reduced Travel Time

For DPWH, the achievement of the outcome "reduced travel time" measures the percent of hours reduced in traveling the priority corridors[31]. This can be achieved by increasing road network capacity through road widening, thus increasing mobility of vehicles and reducing travel time.

Table 24 compares the average time it takes for a respondent to travel from residence to providers of basic social services and infrastructures. The use of motorcycles for traveling is the most preferred by (or since vastly available to) the household respondents. Where comparison is possible between the two groups, the general result is that it is faster for the treatment households to reach their destination[32]. A family in the treatment area has to travel 4.1 minutes to get to the barangay health center, while it is 10.8 minutes for a family in the comparison area. A daycare center in the treatment area is relatively closer, which can

[31]Department Order No. 82, series of 2017, "Adoption of DPWH Performance Government System Strategy Map and Enterprise Scorecard 2017-2022", retrieved from http://www.dpwh.gov.ph/dpwh/sites/default/files/issuances/DO_082_s2017.pdf

[32]We put aside the fact that location of these basic social services and infrastructures varies greatly among municipalities.

be reached in a matter of 4.1 minutes. In the comparison area, the average time for travel to reach daycare is about 55 minutes (the distance may also explain the length of time).

SUPPORTING SURVEYS ON REDUCED TRAVEL TIME. Business owners (184 or 95.3%) identify "shorter travel time" as the top positive change brought about by the road project. The same sentiment is echoed by the passengers, with "shorter travel time" (100 or 99%) voted as the top positive change by the project.

FGD DISCUSSION ON REDUCED TRAVEL TIME. Upi FGD participants recall that travel from their barangays to Cotabato City would take 6 hours, and when night time, the roads were dark because there were no street lights yet. Today, the travel takes between 45 minutes to 1 hour, with rides available 24-hours a day if without curfew being imposed (related to the imposition of Martial Law after the Marawi siege in May 2017).

South Upi FGD participants say it used to take them 6 hours to travel from Brgy. Romangaob to Cotabato City, now it is only 1 hour. In Brgy. Looy, traveling to Poblacion Nuro (Upi) would take one day and was expensive because very few people traveled and had to share the cost of the entire trip.

Residents in DOS recall that it used to take them 4 hours to travel to Upi, a day to travel to South Upi, and more than a day going to Kalamansig. If there was a landslide in the area, they had to take the boat via Cotabato, and it took them not less than 2 to 3 days. After the road project, the travel time has been shortened to an hour. More people would also like to travel to these municipalities because of the availability of transport, convenience, and comfort.

Lebak and Kalamansig FGD participants say that it was difficult to travel back then; after the road, the travel outside of their municipalities has become convenient and fast.

COMMUNITY SURVEY RESULT ON REDUCED TRAVEL TIME. Barangay officials say that the road has greatly reduced the travel time from their barangays to their respective municipal hall. The average difference in travel time reduction using a 2-wheel motorized vehicle is 41.7 minutes, comparing before the road and now. Datu Odin Sinsuat experiences the greatest reduction (73.5 minutes shorter), followed by Upi (56.3 minutes shorter).

These barangay officials frequently report to their municipal hall for various purposes; thus, it helps that they can cut the travel time. Please refer to **Reference Table 18.**

SUPPORTING SURVEYS ON MODES OF TRANSPORT. Vehicle owners have observed that there are more vehicles (174 or 100%) now than before. Passengers have used pump boats and similar vessels before if traveling to Cotabato City; now they are using land transport options, and these have expanded to commuter vans, buses and even private cars.

FGD DISCUSSION ON MODES OF TRANSPORT. DOS FGD participants remember well that the types of vehicles plying the route were jeepneys, padyak (bicycle with mounted sidecar), tricycles, public utility vehicles (models like Lawin, Ford Fierra and Tamarraw) and hauling trucks (6- and 10-wheelers). Today, the road is also used by people driving vans (passenger, meat, and winged), sports utility vehicles, and multi-cabs.

Meanwhile, the Upi FGD participants share the types of transport back then were single motors, tricycles, jeeps, and “sadam”(surplus military truck, 6 x6). Today, they see vehicles such as vans, multicab, pick-ups, “bongo” (light cargo trucks), and hauling trucks 6- and 10-wheelers).

Lebak FGD participants recall that they used jeeps with double tires and even horses to travel; today, they have more options such as vans, buses, and tricycles. In Kalamansig, they see more of motorcycles and private vehicles.

TABLE 24: AVERAGE TRAVEL TIME (IN MINUTES) PER KILOMETER TO ACCESS SOCIAL SERVICES AND INFRASTRUCTURES, BY GROUP

Social Services and Infrastructures	Treatment							Comparison							*diff (Motorcycle)*
	Bus or minibus	Jeepney, multicab	Motor-cycle	Tricycles, pedicabs	Truck	Van	Walking	Bus or minibus	Jeepney, multicab	Motor-cycle	Tricycles, pedicabs	Truck	Van	Walking	
Barangay health center			4.1	6.0			14.1			10.8				29.9	-6.7
Rural health unit			3.0	6.8	4.0		18.8			3.9				140.0	-0.9
District hospital			2.8	5.6			10.3			3.7				3.3	-0.9
Private clinic/ hospital				2.4	6.6					3.7	1.3	2.0			-1.3
Pharmacy			3.5	6.8					1.3	3.8					-0.3
Daycare center			4.1	5.4			14.2			55.0				45.5	-50.9
Elementary school			5.0	6.8		16.7	14.3			4.8				37.7	0.2
Secondary school			6.1	6.9			16.2			9.9	52.5			28.7	-3.8
College/University		4.3	2.5	6.5					4.6	6.0			2.7	4.3	-3.6
Training/vocational center			2.2	8.4			7.0								
Irrigation services			6.8	5.8			12.7								
Solar drier			25.0	8.2			14.2			10.2		35.0		35.6	14.8
Warehouse			5.0	5.8			13.1							73.8	
Retailer of farm inputs		1.0	3.3	5.2			14.5		2.2	10.0		2.5		33.4	-6.8
Banks/microfinance institutions (MFIs)			2.6	5.6			23.3			5.6				26.3	-3.0
Municipal market		3.0	6.0			16.3			1.3	3.7	5.1	1.2			2.2
Talipapa		2.5	4.5	4.2			15.9								
Mini-grocery			3.3	5.3			13.9		1.3	3.4					-0.1
Municipal hall	3.8	4.2	2.9	5.7			5.0		0.7	3.9				3.9	-1.0
Places of worship (church, mosque, etc.)			4.4	8.4			14.5			7.8				43.4	-3.4
Public terminal			5.7	10.1		6.7				10.4					-4.7

7.3.3 Improved Access to Markets

KEY INFORMANT INTERVIEWS ON AGRICULTURAL ACTIVITIES. The Planning Officers of the target municipalities believe that access to agricultural inputs has somewhat contributed to the improved production of the farmers. The road provides them access to input suppliers and allows them to purchase plant protection and soil conditioning products. The presence of the road also provides them an incentive to improve their yield, since they can transport surplus to the market. The road allows for a "smooth" ride for the fresh produce, reducing the possibility of physical damage or expands the transport options, reducing the waiting time.

COMMUNITY-LEVEL SURVEY ON THE AVERAGE COST OF TRANSPORT. After the harvest of their agricultural products, the farmers have to bring these to the market. In most cases, farmers bear the cost of bringing their products to the market. When asked on the average cost before the project, the barangay officials estimate that the cost back then was an average of Php 56.70; today, they estimate it to be within the range of Php 41.98 per sack, an average reduction of Php of 14.71 per sack. The majority of the barangay official-respondents say that the overall cost has reduced (45 barangays or 58.4%), while the remaining barangay says the cost has increased (32 barangays or 41.6%), attributing to the rising cost of fuel. Please refer to **Reference Table 19.**

COMMUNITY-LEVEL SURVEY ON THE FREQUENCY OF DELIVERY TO MARKET. While cost per sack is a major concern for the farmers, it is also important that they be able to transport their produce to the market on any given day of the week. Agricultural products have different ripening/maturing periods, and once these have to be harvested, most need to be delivered to the market before the farmers experience spoilage and other post-harvest losses. Thus, at any given day or time, the farmers must be able to transport their goods to the buyers. In the community-level survey, there are 11 barangays (15.6%) where farmers can transport their products any day of the week. Please refer to **Reference Table 20.**

7.3.4 Improved Access to Social and Commercial Services

HOUSEHOLD ACCESS TO SERVICES. In a document titled "Impact Evaluation of Rural Road Projects[33]," it is highlighted that "one does not obtain utility directly from a road, but indirectly via the access to the opportunities for extra consumption that it allows." Thus, for the road to make an impact on social services, the health and educational facilities within the road's immediate surroundings must be **functioning** (one proxy indicator for functioning can be "utilization"). What matters is the people are utilizing not only the facilities' presence in a specific area, but these facilities/infrastructures. Conversely, the road that leads to a school does not bring benefit if the school does not have teachers; the road does not help the farmers bring their product if there is no available vehicle that will transport their goods; the road does not improve health services if the clinic near it does not have medicines or health workers.

In the household survey, we have asked the respondents which services/infrastructure they have access to via the road (please refer to **Table 25)**. In the treatment group, the top answers are barangay health centers (99.2%), municipal hall (98%), and places of worship (98%). In

[33]Written by Dominique van de Walle, World Bank, 2008.

the comparison group, the top answers are places of worship (97.4%), barangay health centers (96.4%), and elementary school (70.8%).

The treatment group's proximity to the road contributes their access to services/facilities, which may not be as easy for the comparison group, which is far from a national road. For instance, in column 4 of **Table 25**, there is a big gap between treatment and comparison groups on access to the district hospital, private clinic/hospital, pharmacy, vocation center, university, bank, municipal market, mini-grocery and public terminal.

In terms of utilization, the most patronized services/facilities in the treatment group are places of worship (99.2%), barangay health center (99.2%), and mini-grocery (96.8%). In the comparison group, all households that have access to district hospitals, privates clinics, pharmacy, warehouse and banks/micro-finance have utilized them. What is interesting in utilization is that while access is relatively lower in comparison areas, they have a higher percentage of utilization (see column 7 of **Table 25**). Barring other influencing factors, the households in comparison group tend to use/maximize a service/facility if they have access to it. While the study did not delve deeper at the household level into the reasons for the low utilization of services and facilities, this may be partly attributed to the quality of service provided to the level of need of the households and cost of utilization.

TABLE 25: HOUSEHOLD ACCESS TO BASIC SOCIAL SERVICES AND FACILITIES, AFTER THE ROAD PROJECT, BY GROUP

Social Services and Facilities	Percentage with access			Percentage among those with access who utilized the services		
	Treatment	Comparison	Diff (T-C)	Treatment	Comparison	Diff (T-C)
Barangay health center	99.2	96.4	2.9	99.2	97.7	1.5
Rural health unit	74.5	53.3	21.2	83.7	94.5	-10.8
District hospital	94.1	29.9	64.2	71.3	100.0	-28.8
Private clinic/ hospital	69.0	9.5	59.5	80.7	100.0	-19.3
Pharmacy	83.9	6.2	77.7	92.5	100.0	-7.5
Day care center	82.4	38.0	44.4	47.6	65.4	-17.8
Elementary school	91.4	70.8	20.6	67.0	88.1	-21.2
Secondary school	85.5	58.0	27.5	72.5	84.9	-12.4
College/University	67.5	5.1	62.3	35.5	92.9	-57.4
Training/vocational center	30.6	0.0	30.6	61.5		61.5
Irrigation services	23.5	0.0	23.5	76.7		76.7
Solar drier	31.8	35.8	-4.0	79.0	95.9	-16.9
Warehouse	13.3	3.3	10.0	73.5	100.0	-26.5
Retailer of farm inputs	45.5	48.5	-3.0			
Banks/microfinance institutions (MFIs)	62.7	4.7	58.0	61.9	100.0	-38.1
Municipal market	98.0	13.9	84.2	96.4	97.4	-1.0
Talipapa	20.8	0.0	20.8	96.2		96.2
Mini-grocery	86.7	1.1	85.6	96.8	100.0	-3.2
Municipal hall	98.0	47.1	51.0	94.4	96.1	-1.7
Places of worship (church, mosque, etc.,)	98.0	97.4	0.6	99.2	99.3	-0.1
Public terminal	72.5	1.1	71.5	92.4	100.0	-7.6

COMMUNITY-LEVEL SURVEY ON ACCESS TO BASIC SOCIAL SERVICES. Taking into consideration all barangays (77, not only those within 30-minute walking distance) in the four (4) municipalities, the municipality of Kalamansig and Lebak have experienced the most number of increase in regular access to social services and facilities (please refer to **Table 26** below).

TABLE 26: PERCENTAGE OF BARANGAYS WITH CONSTITUENTS HAVING REGULAR ACCESS TO SOCIAL SERVICES AND FACILITIES, BY MUNICIPALITY

Items		Rural health unit	Hospital	Secondary schools	Colleges universities	Groceries Consumer stores	Banks	Eateries restaurants	Places of worship
Datu Odin Sinsuat	2008	100.0	100.0	100.0	100.0	100.0	50.0	50.0	50.0
	2018	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	diff	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***50.0***	***50.0***	***50.0***
Kalamansig	2008	0.0	6.7	20.0	13.3	86.7	0.0	33.3	13.3
	2018	100.0	93.3	100.0	100.0	100.0	86.7	100.0	53.3
	diff	***100.0***	***86.7***	***80.0***	***86.7***	***13.3***	***86.7***	***66.7***	***40.0***
Lebak	2008	22.2	11.1	44.4	18.5	63.0	22.2	37.0	63.0
	2018	100.0	100.0	96.3	96.3	96.3	100.0	100.0	96.3
	diff	***77.8***	***88.9***	***51.9***	***77.8***	***33.3***	***77.8***	***63.0***	***33.3***
South Upi	2008	90.0	100.0	90.0	40.0	100.0	0.0	90.0	70.0
	2018	100.0	100.0	80.0	40.0	100.0	0.0	100.0	70.0
	diff	***10.0***	***0.0***	***-10.0***	***0.0***	***0.0***	***0.0***	***10.0***	***0.0***
Upi	2008	85.2	85.2	85.2	85.2	85.2	0.0	81.5	70.4
	2018	95.7	100.0	100.0	100.0	100.0	95.7	100.0	91.3
	diff	***10.5***	***14.8***	***14.8***	***14.8***	***14.8***	***95.7***	***18.5***	***20.9***

On the type of service/facility before the road project, the most accessible were groceries/consumer stores (84.4% of the 77 barangays), secondary schools (63.6%), and eateries/restaurants (61%). Now with the project, the barangays have access to eateries/restaurants (100%), rural health unit (98.7%), hospital (98.7%), and groceries/consumer stores (98/7%). Please refer to **Reference Table 21**.

HOUSEHOLDS' AVERAGE DISTANCE TO ACCESS SOCIAL SERVICES AND FACILITIES. The households in the treatment group are located closer to the social services/facilities, compared to households in the comparison group (please refer to

Table 27). The households in the treatment group are within a 1-km radius to a barangay health center, daycare center, elementary school, irrigation services, solar drier and warehouse, which is not the case for the comparison group.

TABLE 27: AVERAGE DISTANCE TO ACCESS SOCIAL SERVICES AND FACILITIES, BY GROUP, IN KM

Social Services and Infrastructures	Average distance (in Km)		
	Treatment	Comparison	Diff (T-C)
Barangay health center	0.9	9.1	(8.2)
Rural health unit	8.9	38.3	(29.5)
District hospital	15.8	47.2	(31.5)
Private clinic/ hospital	8.5	54.5	(45.9)
Pharmacy	9.5	47.2	(37.7)
Daycare center	1.1	7.3	(6.1)
Elementary school	1.1	14.6	(13.6)
Secondary school	2.0	7.2	(5.2)
College/University	7.0	56.4	(49.4)
Training/vocational center	6.3		6.3
Irrigation services	1.0		1.0
Solar drier	0.4	3.7	(3.3)
Warehouse	0.6	0.1	0.5
Retailer of farm inputs		59.6	(51.2)
Banks/microfinance institutions (MFIs)		14.8	(7.3)
Municipal market		49.9	(42.6)
Talipapa			1.6
Mini-grocery		88.3	(85.7)
Municipal hall		42.2	(22.9
Places of worship (church, mosque, etc.)		9.8	(8.4)
Public terminal		34.0	(28.5)

CONSTRUCTION OF STRUCTURES AFTER THE ROAD PROJECT. We have asked each one of the Municipal Engineers on what were the types of structures that were constructed after the road project was completed in their respective areas. The Municipal Engineer of DOS says there have been construction of bridges and additional school buildings by the national government and a public market by the Municipal LGU. Private individuals in DOS also constructed buildings for business activities.

In Upi, the facilities that were constructed after the road project were bridges, school buildings, and birthing clinics. The wooden posts that carried power lines were replaced with steel. Telecommunications companies Globe and Smart have put up communication towers in the area. The municipal government also constructed a potable water system (Level III). The same facilities were also evident in South Upi after the road was completed – additional school building, more power lines, health centers and water systems. The private individuals in South Upi also constructed buildings used for business.

In Lebak and Kalamansig, schools, health centers, power lines, district hospitals, communication towers, money remittance centers and banks were established. The Lebak Municipal Engineer also reported that there have been roads constructed in their municipality under the budget of the provincial government.

FGD DISCUSSIONS ON THE STRUCTURES AFTER THE ROAD PROJECT. In Upi FGD barangays, the type of structures that were already up before the road were mostly government buildings such as the barangay hall, daycare center, health center, GAD and senior citizen building, and SK building. After the road projects, additional government buildings were constructed, such as additional daycare centers, rehabilitation centers, TB patient building, waiting sheds, multi-purpose building, an integrated terminal and a new municipal hall. More schools are also added, such as senior high schools and a technical school.

In South Upi FGD barangays, additional buildings have sprouted after the road was completed – fire station, health centers, single-motor terminal, gymnasium, women-friendly space, National Irrigation Building, and additional 4 elementary schools, 1 senior high school and 1 junior high school.

In Lebak FGD barangays, school buildings have been added. In Kalamansig, the municipality hosts more small businesses after the road. They have also increased the number of health centers. Before, their place was rather "boring" because of difficult access, but it is upbeat with more economic activities.

AVERAGE FARE PER KILOMETER TO ACCESS SOCIAL SERVICES/FACILITIES. Based on the household-respondents' experience, the average fare per kilometer is relatively lower for the treatment group compared to the comparison group (please refer to **Table 28)**. The presence of the road may explain the lower fare, but also other factors such as the availability of transport and distance.

TABLE 28: AVERAGE FARE (IN PHP)/KILOMETER TO ACCESS SOCIAL SERVICES AND INFRASTRUCTURE, BY GROUP

Social Services and Infrastructures	Treatment							Comparison							diff (for motorcycle mode only)
	Bus or minibus	Jeepney, multicab	Motorcycle	Tricycles, pedicabs	Truck	Van	Walking*	Bus or minibus	Jeepney, multicab	Motorcycle	Tricycles, pedicabs	Truck	Van	Walking*	
Barangay health center			11.18	14.46						13.33					(2.14)
Rural health unit			3.64	11.93	8.00					8.58					(4.94)
District hospital			3.66	12.26						7.37					(3.72)
Private clinic/ hospital			3.25	11.54						8.10		0.28			(4.85)
Pharmacy			4.58	12.35						9.10					(4.52)
Daycare center			9.41	13.84						26.67					(17.26)
Elementary school			11.20	13.92						11.14					0.06
Secondary school			10.29	13.57						18.59	42.00				(8.30)
College/ University		5.71	3.32	10.21					5.71	7.21			5.83		(3.90)
Training/vocational center			3.72	12.67											
Irrigation services			8.21	9.86											
Solar drier			50.00	11.11						19.70		355.00			30.30
Warehouse			5.00	8.33											
Retailer of farm inputs		1.56	5.17	7.82					1.25	22.52		1.68			(17.35)
Banks/microfinance institutions (MFIs)			3.40	9.64						10.74					(7.34)
Municipal market			4.21	11.96						8.40	10.00		3.89		(4.19)
Talipapa			11.03	13.81											11.03
Mini-grocery			7.98	11.89						8.44					(0.47)
Municipal hall	6.25		4.09	11.05			4.79			8.70				6.88	(4.61)
Places of worship (church, mosque, etc.)			10.79	21.90						140.00					(129.21)
Public terminal			5.78	10.07		6.67				10.37					(4.59)

*Walking: The respondents walk part of the distance and then take a ride; thus, there is fare involved for the related riding pa

7.3.5 Increased Vehicular Activities

DAILY AVAILABILITY PER MODE OF TRANSPORT FOR HOUSEHOLDS. With their proximity to the road, the treatment group has at its disposal quite several vehicles as well as options after the road project. Take for instance, the availability of motorcycles – back then – respondents recall having an average of 27 motorcycles plying their road in a day; but this has increased tremendously after 10 years, to as much as 260 available in their barangays in a day (an increase of 892%). Another impressive increase is the number of available trucks, from only 5 available daily before the project, it has increased to 32 (or 540%).

The jeepney/multicab or similar transport, on the other hand, has decreased, though this can be explained by owners of such transport upgrading their vehicles to other modes or that these are no longer serviceable.

For the comparison group, there is an increasing number of available motorcycles per day and none for the jeepney/multicab or similar public transport. The lack of distance from the road does not encourage vehicle owners to invest in additional or new transport. Please refer to **Table 29** below.

TABLE 29: AVERAGE DAILY AVAILABILITY PER MODE OF TRANSPORT BY GROUP

Transport	Treatment			Comparison		
	Daily No.		diff	Daily No.		diff
	2008	2018		2008	2018	
Motorcycle	27	260	233	6	33	26
Tricycles, pedicabs or similar conveyances	10	195	185			
Jeepney, multicab or similar public transport vehicle	4	2	-2	2	2	0
Bus or minibus	2	1	0			
Truck	5	37	32			

The majority of the vehicle owners have also observed that there are now more large vehicles plying the road (162 or 93.1%). Noting this, some have observed portions of the road where traffic can build up (60 or 34.5%).

HOUSEHOLDS' WAITING TIME PER MODE OF TRANSPORT. The type of transport with the shortest waiting time (to take/hail a ride) is a motorcycle. Back then, the treatment group had to wait nearly an hour (53.27 minutes) before a motorcycle became available; today, it takes less than 7 minutes. Back then, people had to wait nearly 4 hours (226.57 minutes) for a jeepney or multicab; now, it is less than 3 hours (173.32 minutes).

Greater improvement of waiting time is experienced by the comparison group, with the waiting time for over 2.5 hours to just 20 minutes for motorcycle and 6 minutes for jeepney/multicab. Please refer to **Table 30.**

TABLE 30: AVERAGE WAITING TIME PER MODE OF TRANSPORT, BY GROUP

Transport	Treatment			Comparison		
	Waiting time (in Minutes)		diff	Waiting time (in Minutes)		Diff
	2008	2018		2008	2018	
Motorcycle	53.27	6.59	-46.68	158.50	20.17	-138.33
Tricycles, pedicabs or similar conveyances	44.45	8.53	-35.92			
Jeepney, multicab or similar public transport vehicle	226.57	173.32	-53.25	160.00	6.67	-153.33
Bus or minibus	122.75	114.83	-7.91			
Truck	75.65	51.12	-24.53			

7.3.6 Improved Safety of Travel

While connectivity may be achieved with the road, it also carries some risk, such as crashes. According to the DPWH Manual, the "likelihood of a crash occurring depends on various factors like driver behavior (inattention, fatigue, risk-taking), the quality of the road (surface, alignment, etc.), and the vehicle (poorly maintained brakes, tires, etc.)[34].

VEHICLE OWNERS ON ROAD SAFETY. The majority of the vehicle owner respondents have either experienced or observed first-hand car crashes while using the road (164 or 94.3%). From these car crashes, they have observed that passengers and drivers obtaining light injuries (134 or 77%) and damage to property/vehicle (118 or 67.8%). Many of the vehicle owner respondents say that their experience of road slips may have been caused by heavy rain (86 or 49.4%) and driving behavior (44 or 25.3%). Despite the threat of possible slips, the majority of the owners comment that they can still drive the road/route even during heavy rain (158 or 90.8%). The majority have seen road signs/markers installed and maintained (161 or 92.5%). Only about a third of the vehicle owners observed any gaps within the road (66 or 37.9%)

[34]Road Safety Design Manual, Part 1, DPWH, May 2012, retrieved from http://www.dpwh.gov.ph/dpwh/references/guidelines_manuals/highway_safety_design_standards_manual

TABLE 31: VEHICLE OWNERS' EXPERIENCE AND OBSERVATION ON ROAD SAFETY

	Frequency	%
A. Experienced or observed car crashes while using the road		
• Yes	164	94.3
• No	10	5.7
B. Observed effects of the car crashes		
• Light injuries of passengers/drivers	134	77.0
• Damage to property/vehicles	118	67.8
• Serious injuries of passengers/drivers	110	63.2
• Fatalities	108	62.1
C. Possible causes of road slips		
• Caused by heavy rain	86	49.4
• Poor maintenance of the road	34	19.5
• Caused by oil spill and other liquids	26	14.9
• Driving behavior	44	25.3
• Others	6	3.4
D. Driving on or taking the road/route even during heavy rain		
• Yes	158	90.8
• No	16	9.2
E. Presence of markers and road signs installed and maintained		
• Yes	161	92.5
• No	13	7.5
F. Observed any gaps on the road		
• No	108	62.1
• Yes	66	37.9

KII ON PRESENCE OF ROAD SIGNS. Road signs help road users (drivers) navigate the roads more safely and efficiently. The signs inform the drivers of the hazards as well as the "routes, directions, destinations, and places of interest[35]." In our interview with the Municipal Engineers, they reveal that some portions of the road do not have road signs (some were already destroyed in DOS and none at all in South Upi) and absence of signs approaching schools (although the Sangguniang Bayan of North Upi has already passed on ordinance on speed limit).

KII ON OCCURRENCE OF ACCIDENTS. While they have no documents to support their claim, the Municipal Engineers in DOS, North Upi, and South Upi reveal that road accidents along their part of the road were caused by over speeding. Considering their portion of the road, the Municipal Engineer of South Upi has recommended considering the sharp curvature in road design.

[35]Road Signs and Pavement Markets Manual, Part 2, DPWH, May 2012, ibid.

MUNICIPAL ENGINEERS' RECOMMENDATIONS. The municipal engineers have recommended the following to be funded and installed to prevent more crashes:

TABLE 32: MUNICIPAL ENGINEERS' RECOMMENDATIONS

Recommendation	DOS	North Upi	South Upi	Lebak	Kalamansig
Improvement the road maintenance activities	X	X	X		
Installation/Additional permanent road barriers	X	X	X		
Utilization of luminous paint of the signages and barriers	X	X	X		
Installation of street lights	X	X	X		
Coordination with the local government units				X	X

FGD DISCUSSION ON SAFETY OF TRAVEL. Prior to the road construction, the FGD participants from DOS, Upi, and South Upi remember that causes of accidents back then were overloading jeepneys with passengers, landslides, rough road surface, and absence of streets lights. Following heavy downpour, the vehicles would get stuck in the middle of the road. Accidents still happen today and the FGD participants hear that these are caused by lack of road signs and signages (e.g., curve road area, blind curve portions), overtaking, over speeding, and mechanical errors (e.g., faulty brake). They also hear of accidents that are caused by drivers overshooting the road and driving drunk.

Lebak FGD participants recall boulders on the road, which made travel difficult. When it rained, many vehicles would get stuck on the road. Today, if accidents do happen, it is likely caused by the abusive behavior of drivers who do not follow the rules.

To improve safety while traversing this national road, the FGD participants recommended to DPWH and the municipal LGUs to look into:

TABLE 33: RECOMMENDATION FROM THE FGD PARTICIPANTS

	DOS	UPI	SOUTH UPI
Consider road widening/shouldering	X	X	
Add pedestrian lanes near schools		X	
Encourage road maintenance	X	X	X
Put up street lights	X	X	X
Clear road signages	X	X	X
Road reflectors	X	X	
Repair canals		X	
Strict implementations of the traffic rules and regulars, and sanction drivers not following the rules	X		
Paint the barrier in luminous color	X		X
Put traffic lights at the junctions of the road	X	X	

	DOS	UPI	SOUTH UPI
Enforce the municipal ordinance on road safety (speed gun), no license-no driving, drunk driving – with continuous IEC	X		X
Consider putting a fly-over, because Awang is already an urbanizing area	X		
Place coconut coir to landslide-prone areas			X

COMMUNITY-LEVEL SURVEY ON THE DESCRIPTION OF THE BARANGAYS' MAIN ROADS. The 77 road-influence barangays in four municipalities have characterized their main roads back then as unpaved/uneven (60 barangays or 77.9%), but now 43 barangays have even, well-drained and good textured road (55.8%). Thirty-two barangays (41.6%) have an unobstructed view of the road (without trees/houses) and reduced roadside activities (lesser houses/stores near the road. Please refer to **Reference Table 22.**

7.3.7 Increased Agricultural Investment

HOUSEHOLD FARM ACTIVITIES. Farming is the primary income source of the household-respondents in both groups. The level of income is a function of many factors, including the farm size and the percentage of utilization. The treatment area has smaller farm size (1.4 ha) by 2 hectares compared to comparison group (3.4 ha); however, after the road project, the treatment group has somewhat increased their farm area by an average of 0.3 ha while nearly nothing changed for the comparison group (0.1 ha). In terms of utilization, households in both groups generally make use of three-quarters of their farm area. The percentage increase in utilization is slight, at 4% before and after the road project.

TABLE 34: AVERAGE FARM SIZE AND PERCENTAGE UTILIZATION OF AGRICULTURAL PRODUCTION, THEN AND NOW, BY GROUP

Type	Farm Size (Ha)			% of Land use Utilized for Agri Production		
	Before	After	diff	Before	After	diff
Treatment	1.4	1.7	0.3	75.5	79.5	4.0
Comparison	3.4	3.4	0.1	74.4	78.6	4.2

HOUSEHOLD PRODUCTION CAPITAL PER HECTARE. The household-respondents in the treatment group have lower investment capital for each hectare of farm, spending only Php 6,146 per hectare and has increased their spending by 55.7% (Php 9,575) in 10 years. On the other hand, the comparison group spent Php 11,248 back then and has increased their spending by 47.5% (Php 15,585) after 10 years. The capital requirement is a factor of the total size of land, the utilization, the type of crops planted and the availability of capital.

TABLE 35: AVERAGE PRODUCTION CAPITAL PER HECTARE, THEN AND NOW, BY GROUP

Type	Production capital per hectare		
	Before	After	diff
Treatment	6,146.29	9,575.32	3429.0
Comparison	11,248.41	16,584.72	5336.3

From a third (93 or 36.7%) of the household-respondents in treatment area who are into crop production, 44 respondents have increased their investments in farm activities. This number is dwarfed by the comparison group who have a higher proportion engaged in crop production (252 or 91.6%), 222 of them have increased their investment. Please refer to **Reference Table 23**.

Since the treatment group has smaller farmland, they only have 2 farm workers before and after the road project. On the other hand, the comparison group with larger farmland had an average of 3 farm workers in 2008 and this increased twice to 6 farm workers after 10 years. Please refer to **Reference Table 24**.

It is important to note that Esperanza is closer to the province's capital, Isulan, which is just 13 km away, while Kalamansig is 128 km, and Lebak is 118 km. Cotabato City is also about the same distance as 100 to 111 km from Lebak and Kalamansig, respectively.

COMMUNITY SURVEY ON PRESENCE OF LARGE AGRICULTURAL PLANTATIONS OR AGRI-BASED PROCESSING ACTIVITIES, BY MUNICIPALITY. For the five (5) municipalities, eight (8) more barangays (Poblacion 2, Poblacion 3, Tibpuan, and Pansadalan for Lebak, and Romongaob, Looy, Pandan and Kigan for South Upi) have large plantation and processing activities. This is an increase from the previous 6 barangays having large plantation and processing activities, or a total of 14 barangays as of December 2018. The increase is contributed by Lebak (4 new barangays) and South Upi (4 new barangays). Please refer to **Reference Table 25.**

FARMING HOUSEHOLD REGULAR BUYERS. Farmers can make a profit from their marketable surplus if they have access to the road and, more importantly, if there is an external demand for their products. Thus, the road connects the farmers to the buyers. Comparing the period before the road project and now, 38 household-respondents say that the number of regular buyers has increased (14.9%). For the comparison group, using the 10-year period (2008 to 2018), only 21 (7.7%) have experienced an increase in their buyers. Please refer to **Reference Table 26.**

On the manner of bringing the products to the market, back then, more household-respondents in the treatment group had to bring their produce to the market. After the road project, this number has decreased and more respondents have entertained traders coming to their farm to pick up their produce. For details of this table, please refer to **Reference Table 27**.

TABLE 36: CHANGES IN THE MANNER OF TRANSPORTING AGRI-PRODUCTS, THEN AND NOW, TREATMENT ONLY

Reason	**Before the Road Project**	**After the Road Project**
Farmer transports the products on his/her own to the market/s.	54	43
A trader picks the products at the farm.	51	64
A consolidator comes to gather products from different farms.	10	12

For the treatment group, the cost per sack of produce back then was Php 70 per sack, and now it is Php 21.7. For the comparison group, it was Php 73 per sack then and now it is Php 89.6.

COMMUNITY SURVEY ON BARANGAYS WITH FARMERS WHO EXPERIENCE PRODUCTION WITH MARKETABLE SURPLUS, BY MUNICIPALITY. Based on the barangay officials' perception, there are 30 new barangays with farmers enjoying surplus production. Before the road project, only 28 barangays have this type of farmers, and this number has increased to 58 after the road project. The highest increase is in Kalamansig (10 barangays) and Lebak (10 barangays). Please refer to **Reference Table 28.**

HOUSEHOLD EXPERIENCE OF POST-HARVEST LOSSES AND AVERAGE LOSS. For the 93 household-respondents in the treatment group, more than half (50 respondents) have experienced post-harvest losses before the road project (53.8%), further commenting that they lost about 45.3% of their produce. After the road project, there is a slight decrease of respondents (45 respondents) who still experience losses; however, the average loss has truly gone down to 15.2% of their produce. Please refer to **Reference Table 29**.

With respect to the possible causes of losses, the treatment group reported that the lack or absence of post-harvest facility (i.e., warehouse/storage and solar dryer) could have been one of the factors for the losses. However, there are still factors related to the road – although the number of farmers experiencing these factors have gone down after the road project. Please refer to **Reference Table 30** for the full table.

TABLE 37: FACTORS CONTRIBUTING TO POST-HARVEST LOSSES, NUMBER OF FARMERS, THEN AND NOW, TREATMENT ONLY

Reason	**Before the Road Project**	**After the Road Project**
Losses of quantity going to market/during transport	28	18
Spoilage of products going to market/during transport	23	4
Spoilage of products due to lack of transportation option	26	3

7.3.8 Increased Production and Transactions

FGD DISCUSSION ON ECONOMIC ACTIVITIES. Before the road project, barangays in DOS had small stores, but their number has increased after the road, with some of the "small" stores upgraded their operation and turned as wholesalers of consumer goods. The types of businesses being established and operated after the road project has expanded.

TABLE 38: TYPE OF BUSINESSES BEFORE THE ROAD AND NOW, FGD PARTICIPANTS' OBSERVATION

	Types of Businesses Before 2008	Types of Businesses Today
Brgy. Awang, DOS	Bakeries, videoke, billiard halls, motor shops, barbeque stalls, beauty parlors, tailoring, talipapa (wet market)	Old businesses still operating, with additional businesses such as gasoline station, lending, card wash, vulcanizing shop, agri-suppliers, wholesalers, ukay-ukay (used clothing), laundry shops, hotel, resort, water refilling, terminal, car and motorcycle dealers, junk shops, internet shop, pharmacy, lying-in clinic, cellphone dealers, and rice dealers
Brgy. Lubangon, DOS	Vulcanizing shop, native products (basket and mat), transport service	Additional businesses on buy-and-sell of agricultural products, eatery, car wash, water refilling station, hollow-blocks producers, beauty salon, and ukay-ukay (used clothing)
Brgy. Nangi, Upi	Limited small stores	More small sari-sari stores and wholesalers of consumer goods, birthing clinics
Brgy. Nuro, Upi	Limited small stores	More small stores, such as bakeshops, lending, money remittance outlets, gasoline station, computer shops, photocopiers, eateries, restaurants, livestock and poultry raiser, beauty parlors, barbershops, used clothing, lechon places, junkshops, water refilling, hardware, furniture shops, motorcycle outlets, pharmacy, motor spare parts, lodging and inns, soft drink dealers.
Brgy. Romangaob, South Upi	Buy-and-sell of agri products, sari-sari stores, tailoring	Additional businesses like bakeshops, pawnshops, lending,

	Types of Businesses Before 2008	Types of Businesses Today
		money remittance centers, gasoline stations, computer shops, photocopier, eateries, and used clothing.
Brgy. Looy, South Upi	Small stores and buy-and-sell of agricultural products	Additional businesses such as lending, transport services, post-harvest services for rice and corn, rentals of common service facilities and heavy equipment
Brgy. Kinodolan, Lebak	Fishing	Fishing and nipa making
Brgy. Paril, Lebak	Farming	Farming
Brgy. Poblacion, Kalamansig	Farming	Small businesses such as eateries, used clothing shops, beauty parlors, and eateries, money remittance centers
Brgy. Cadiz, Kalamansig	Farming	Small businesses

Upi and South Upi FGD participants say they now have more choices, and with the road, it allows them to seek medical services at the hospitals located in Cotabato City. They also like to shop for clothes, consumables and appliances in Cotabato because of the many choices and prices that are cheaper.

COMMUNITY-LEVEL SURVEY ON ENTERPRISES MAKING REASONABLE PROFIT. Based on their dealings with the residents and entrepreneurs, local officials say that there is an increase of 29 barangays with entrepreneurs now making sufficient profit from their business activities. Before the road project, it was only 41 barangays, and today, this has increased to 72 barangays with commercial activities making reasonable profit. Please refer to **Reference Table 31.**

COMMUNITY-LEVEL SURVEY ON BARANGAYS' ECONOMIC ACTIVITIES. Barangay officials interviewed for this survey have perceived changes related to general economic activities in their areas. These changes include – increase in the number of barangays (from 5 barangays to 11), which now host agricultural plantations; farmers and fishermen able to produce marketable surplus (from 24 barangays to 47); and micro and small entrepreneurs making reasonable profit (35 barangays to 60). Please refer to **Reference Table 32.**

7.3.9 Increased Employment Opportunities

FGD DISCUSSION ON THE EMPLOYMENT. In DOS before the road project, people were employed with the government and with private firms. Some people worked for themselves. After the road project, FGD participants in DOS have said people continued with the employment (i.e.,

teachers, government employee), but the service industries have become more visible, opening up opportunities for work in businesses such as money remittance center, pawnshop, gasoline station, bakeshops, lending business, eateries, car wash, vulcanizing shop, restaurant and transport service. At the wet market, enterprises dealing with agri-supplies, wholesalers, ukay-ukay (used clothing), and fish, meat, and vegetable dealers have multiplied. More professionals such as engineers, midwives and agriculturists joined the workforce.

Naturally, farming was and still is the main source of income in the DOS barangays.

In Upi FGD barangays, they say that most households depend on farming. Those who do not have their lands they offer to work as farm laborers. There are also people drawing their sustenance from their professional skills. In Brgy. Nuro, some households are involved in illegal logging. Nothing has changed much in the type of employment opportunities after the road project in Upi, but they notice there are now agri-based ventures such as organic fertilizer processing in Nuro.

In South Upi FGD barangays, participants say people earned money from farming, owning small businesses, driving habal-habal, doing carpentry, working as domestic helpers, working abroad, or working for the government. After the road and probably because of the passing of time, more people are working as nurses and teachers, working in non-government organizations, as technicians of agri-products, in pawnshops, and money remittance centers. In Looy, more people are also working as domestic helpers and seamen abroad. The municipality has existing rubber and coconut plantations, thus, it employs a lot of people. There are also many corn farmers.

Participants of the Lebak FGD Barangays say the people were and are still doing the same type of work – on and off-farm, employment with private companies and the government, and people working abroad. However, their income is augmented by relief from the government, particularly the 4Ps program of the Department of Social Welfare and Development.

TABLE 39: CHANGES IN THE ACCESS TO WORK AND INCOME, BEFORE AND AFTER THE PROJECT, BY GROUP

Items	Control/Comparison				diff (%)	Treatment				diff (%)	diff(T)-diff(C)
	Before(2008)		Now (2018)			Before(2008)		Now (2018)			
	Frequency	%	Frequency	%		Frequency	%	Frequency	%		
There were many income/livelihood opportunities	4	1.5	49	17.9	16.4	47	18.4	107	42.0	23.5	7.1
There were occasional opportunities	17	6.2	103	37.6	31.4	93	36.5	86	33.7	-2.7	-34.1
There were very limited opportunities	111	40.5	106	38.7	-1.8	89	34.9	48	18.8	-16.1	-14.3
There were no opportunities at all	142	51.8	16	5.8	-46.0	26	10.2	14	5.5	-4.7	41.3

COMMUNITY-LEVEL SURVEY ON 15-YEARS OLD AND ABOVE FINDING WORK EASILY/REGULARLY. Only three (3) additional barangays have commented that it is easier for 15 years old and above to find work easily and regularly. Before the road project, the number of barangay with such opportunity was only 33, and today, this has increased to 36. These barangays are located in South Upi (1 barangay) and Upi (2 barangays). Please refer to **Reference Table 33**.

7.3.10 Increased Household Income and Consumption

PRIMARY SOURCES OF HOUSEHOLD INCOME[36]. Agriculture enterprise/business is the primary source of income in two areas, but it is more pronounced in the comparison area (90.9% of the respondents). While households in the treatment area (38% of households) are also dependent on agriculture, they have other sources of income, such as employment (29.4%) and non-agricultural business (please see **Figure 17).**

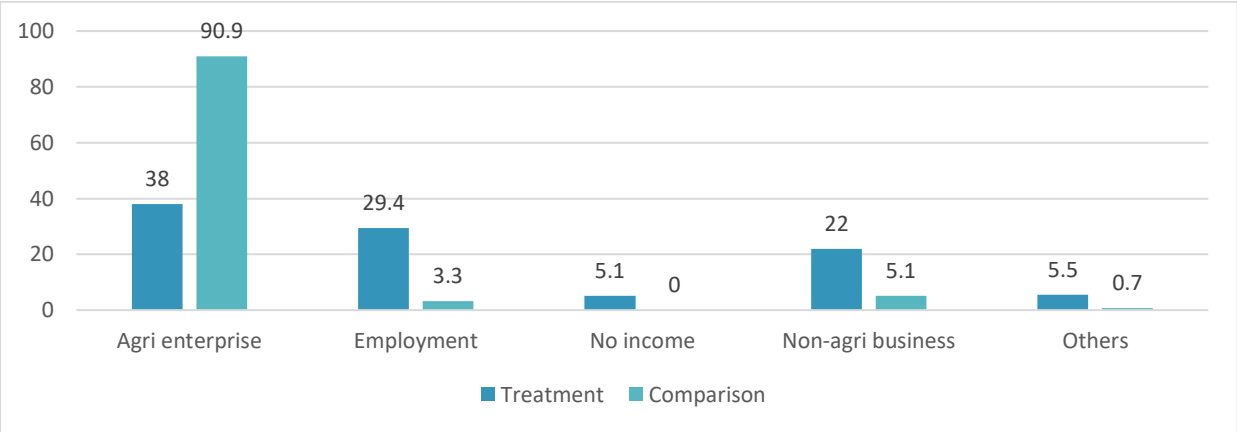


FIGURE 17: PRIMARY SOURCES OF HOUSEHOLD INCOMES, IN PERCENTAGE, BY GROUP

The "Agriculture, Hunting, Forestry and Fishing" is the top category of the main sources of income, which represents 46.7% of the households in the treatment area and 89.8% of the households in the comparison area. For the full table, please refer to **Table 40**.

TABLE 40: PRIMARY SOURCES OF HOUSEHOLD INCOME BY GROUP

Items	Treatment		Control/ Comparison	
	Frequency	%	Frequency	%
Agriculture, hunting, forestry, and fishing	119	46.7	246	89.8
Construction	32	12.5	2	0.7
Hotel and restaurants	2	0.8		0.0
Manufacturing	4	1.6		0.0
Mining and quarrying	2	0.8		0.0
Public service employment	24	9.4	7	2.6

[36]Household income defined as the income and receipts from other sources received by all family members during the reference period, as participants in any economic activity or as recipients of transfers, pensions, grants, interest, food and non-food items received as gifts by the family, retrieved from https://psa.gov.ph/content/family-income-0

Items	Treatment		Control/ Comparison	
	Frequency	%	Frequency	%
Transport, storage and communication	17	6.7	5	1.8
Wholesale and retail trade, repair of motor vehicles, motorcycles, personal and household goods	19	7.5	12	4.4
Others, please specify	36	14.1	2	0.7

HOUSEHOLD ASSESSMENT OF INCOME. We asked the households if they experience any changes in their household income. Most of the households in the treatment area say their income level has remained the same (96 or 37.6%), while in the comparison area, the majority has experienced an increase in income (148 or 54%). Household in the road project area diversified their income from mainly agricultural to services, without substantial change in the total household income after diversification. While there was an observed expansion in agriculture in the comparison area as their main source of household income, which increases their total income. Please refer to **Table 41**.

TABLE 41: HOUSEHOLD ASSESSMENT OF INCOME, BY GROUP

Items	Treatment		Control/Comparison	
	Frequency	%	Frequency	%
Decreased	58	22.7	38	13.9
Increased	96	37.6	148	54.0
Remained the same	101	39.6	88	32.1

COMMUNITY-LEVEL SURVEY ON HOUSEHOLD INCOME. We have asked the barangay representatives on the prevailing household income in their respective barangays. Note that this is not official, but a perception of the barangay officials living in the barangays for more than 10 years.

More than half (40 or 51.9%) of the 77 barangays had a prevailing household income of Php 3,000 per month or below back then, while another 34 barangays had a prevailing household income of Php 3,000 to Php 6,000 per month. After the road project, the majority of the barangays (44 or 57.1%) now have a prevailing income of Php 3,000 to 6,000 per month. Please refer to **Reference Table 34** for the full table. Based on what these barangay officials have shared, nearly half of the barangays experienced an increase in the prevailing income level (please refer to the chart below.

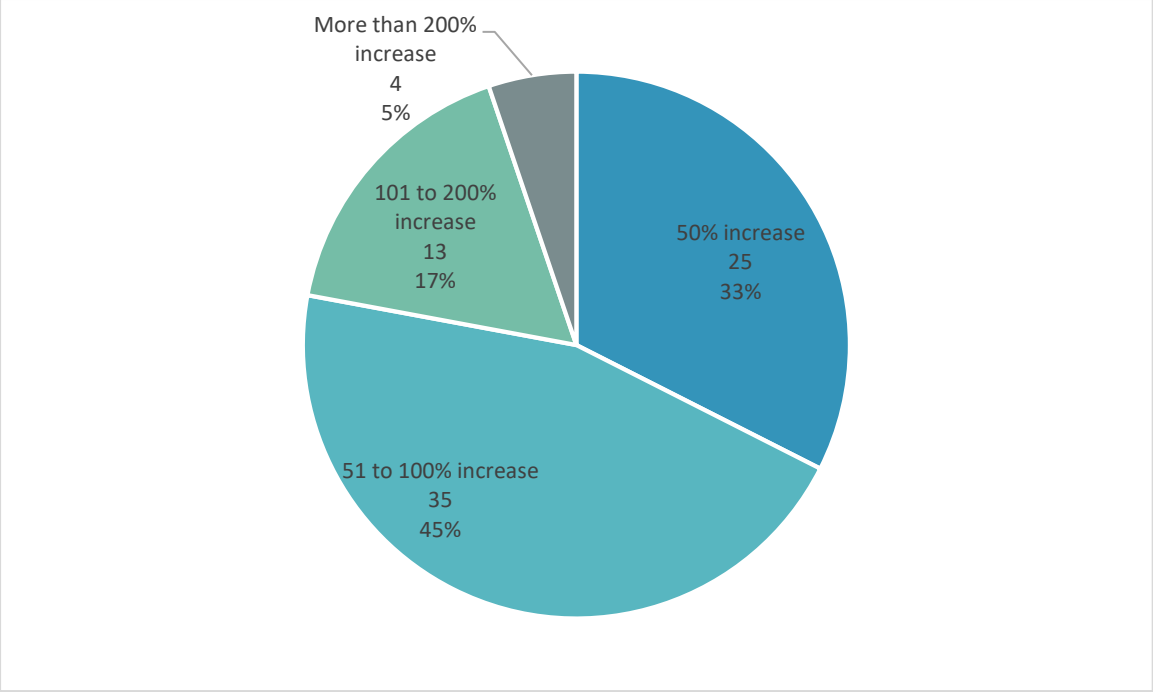


FIGURE 18: DISTRIBUTION OF BARANGAYS ACCORDING TO THE PERCEIVED INCREASE IN PREVAILING HOUSEHOLD INCOME, AFTER THE ROAD PROJECT

7.3.11 Enhanced Social Interactions

The Planning Officer of DOS says there was an increase in enterprises in the municipality. People can move around because of the road. In Upi, more commercial establishments were set-up, there was an increase in tourist arrivals and it appeared that more residents began owning their vehicles.

FGD DISCUSSION ON PEOPLE'S TRAVEL BEHAVIOR. The FGD participants in DOS and Upi say that after the road was constructed, more families have members finding work and going to school outside of their barangays, although college students have found schools only within their municipality. If families were moving out, there are also families coming in to settle into their barangays. Considering their barangays do not yet have complete health facilities, families still opt to seek health services outside the municipality, such as Cotabato City.

Lebak and Kalamansig FGD participants travel more frequently now – to Cotabato City and other places to attend activities and family gatherings – because they know they can return home anytime.

With the road completion, 7 for every 10 household-respondents state that they are now traveling more frequently out of their municipality and province, using the road as their main route. Nine in every 10 of the household-respondents are at least satisfied with the road (49.2% satisfied and 41.1% very satisfied).

TABLE 42: PERCENTAGE OF HOUSEHOLDS WITH INCREASED FREQUENCY OF TRAVEL DUE TO THE ROAD (TREATMENT GROUP ONLY)

Items	No	Yes	% Yes
Households now travel more frequently outside their municipality and province due to the road	61	187	75.4

COMMUNITY-LEVEL SURVEY ON ENHANCED SOCIAL INTERACTIONS. The barangay officials in the road influence areas say there have been more social activities held for its residents after the road projects (61 barangays say so now, compared to only 46 barangays back then). More barangays also report of hosting more visitors and tourists now, from 37 barangays before to 60 barangays. Nearly all barangays (75 or 96.1%) now have joint activities/projects with other barangays and municipalities, compared to less than half before (37 barangays or 48.1%)

7.3.12 Contribution to Poverty Reduction

COMMUNITY-LEVEL PERCEPTION ON THE PERCENTAGE OF HOUSEHOLDS LIVING AS POOR. In the community survey, the barangay official-respondents gave their estimate on the proportion of households in their barangay living as "poor" (please note that this is perception, not based on official figures). Back then, taking the average for all 77 barangays, the proportion of poor households was 72.2%. This has greatly improved 10 years after, where the perceived proportion of poor households is reduced to only 56.6% in a barangay. Still based on their subjective assessment, 71 barangays have somewhat reduced the level of poverty, 5 barangays seem to have not changed at all, and 1 barangay is perceived to have become poorer.

7.3.13 Contribution to Peace and Security

HOUSEHOLD PERCEPTION ON NUMBER OF CONFLICT INCIDENCE. In the treatment area, the household respondents say no incidence of rido/pangayaw happened before and after the project. Comparing the year 2008 and 10 years after, they notice only one incidence of armed encounter in their barangay and no more ambush in 2018. However, there is an increase of robbery/hold-up and domestic violence, from only 3 incidences for 2008 to 5 incidences by 2018. It appears that it is relatively safer in the comparison area based on the fewer number of incidence observed/ experienced by a household. Please refer to **Table 43.**

TABLE 43: HOUSEHOLDS' PERCEIVED NUMBER OF CONFLICT INCIDENCE (AVERAGE), BY GROUP

Items	Average perceived number of incidence					
	Treatment			Comparison		
	2008	2018	*diff*	2008	2018	*diff*
Rido/Pangayaw	0	0	0	2	1	-1
Armed encounter between government forces and rebel/terrorists	1	1	0	0	0	0
Murder	3	2	-1	2	1	-1
Robbery/hold-up	3	5	2	0	0	0
Domestic violence	3	5	2	2	3	1

Items	Average perceived number of incidence					
	Treatment			Comparison		
	2008	2018	*diff*	2008	2018	*diff*
Ambush	1	0	-1	0	0	0

Still, households in the treatment area believe that their barangays now are more peaceful (256 or 93.4%). Slightly lower percentage (72.1%) of households say it is more peaceful now in their areas. Majority of the household respondents in the treatment area say that the road has somewhat contributed to improved peace and order situation. (200 or 78.4%).

TABLE 44: GENERAL ASSESSMENT OF THE PEACE AND ORDER CONDITION NOW (2018) COMPARED TO 2008

Item	Treatment		Comparison		diff (%)
	Frequency	%	Frequency	%	*f*
Less peaceful	10	3.6	30	11.8	-8.2
More peaceful	256	93.4	185	72.5	20.9
No change	8	2.9	40	15.7	-12.8

PASSENGER SURVEY ON PEACE AND ORDER. The majority of the passengers (98 or 97%) say that they feel that the general peace and order situation in their barangay has improved after the road was constructed.

FGD DISCUSSION ON PEACE AND ORDER. Upi FGD participants say that before the road project, there were cases of hold-up/ambush along the road. However, there are occasional incidence of hold-up/ambush based on what they have heard, but these are very minimal compared to after the road project.

COMMUNITY-LEVEL PERCEPTION ON THE PEACE AND ORDER SITUATION. Still relying on the on perception of the barangay official-respondents, 56 barangays (72.7%) were considered peaceful and orderly before the road project. This has increased to 74 barangays (96.1%) after the road project. Please refer to **REFERENCE TABLE** 35 44.

7.3.14 Mitigated Adverse Effects on Environment

IMPACT ON THE ENVIRONMENT. With the road opened, steady influx vehicles passing through the road has increased noise level. To some extent, the exhaust of the passing vehicles (particularly the old ones) affected the air quality along the road. The municipalities have also reported that there was a displacement of households that were right along the road alignment. These households were reported compensated and relocated to other areas.

Participants to the FGD in DOS, Upi and South Upisay they have not observed any considerable impact on the wildlife or plant population, these are still present in the very remote sitios. In Brgy. Nangi, the FGD participants say the road somewhat altered a small creek that passed across the road.

The Planning Officer in Lebak and the FGD participants in Kalamansig report that only big trees were affected due to the construction of the road.

TABLE 45: PERCEIVED NEGATIVE CHANGES THAT HAVE EMERGED AFTER THE ROAD WAS CONSTRUCTED (TREATMENT GROUP ONLY)

Items	Frequency	%
Loss of productive soil	16	6.3
Erosion	35	13.7
Water quality degradation	18	7.1
Habitat loss/ Wildlife disturbance	3	1.2
Cultural disruptions	0	0.0
Displacement of traditional jobs	0	0.0
Chronic noise	43	16.9
Pollution	42	16.5
None	117	45.9

7.4 Pavement Condition Results

7.4.1 Road Condition and Roughness

The study team's Engineer has looked at the three (3) packages of the road – not only Package 3, where the qualitative data was obtained. He assessed the road condition and roughness as well as the safety features through the presence/absence of the markers and signage. Using the techniques discussed in Section 5.4, the team has derived the sectional road condition based on the treatment package shown in **Error! Reference source not found.**. The summary of the condition of the road sections has wielded good to poor condition of the road sections (**Table 46**shown below). For the more detailed results of road distress that determine the road condition rating, please refer to

TABLE 46: ROAD CONDITION AND ROUGHNESS, ALL MAJOR SECTIONS

Road Section as per Treatment Package	Condition Rating	Roughness Index
Package 1: Junction Awang- North Upi	Bad	Poor to Bad
Package 2: North Upi-South Upi	Fair to Bad	Poor to Bad
Package 3: Lebak-Kalamansig	Good to Fair	Good

Based on the DPWH XII 2017 road condition data, it shows that 131.78 km total length of Awang-Upi-Lebak-Kalamansig-Palimbang Road, 86.46 km is good. The distance from Kalamansig to Palimbang is approximately 30kms with still on-going works. In this road condiction that we have conducted, we conclude that Lebak-Kalamansig road has 39.2 km good to fair and sectional good to fair road from Awang to South Upi road. Therefore, the result of the current survey concludes that road condiction has changed slightly from 2017 to 2018 (please refer to Figure 19 and Figure 20).

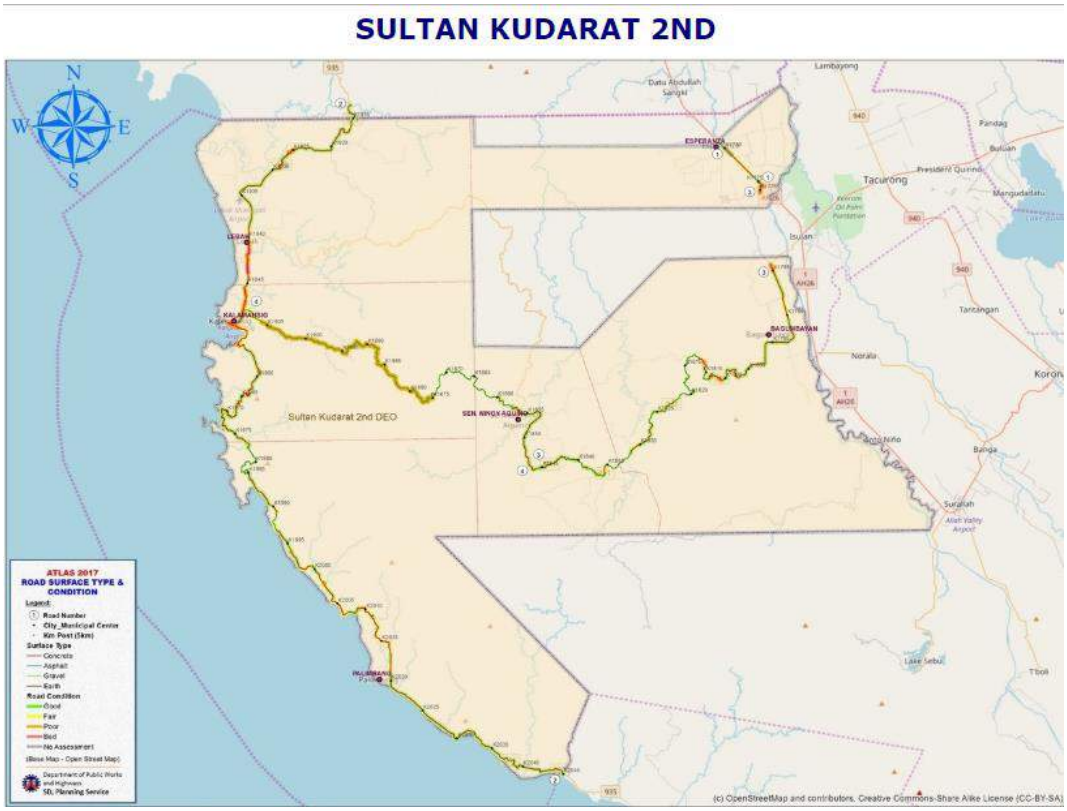


FIGURE 19: MAP SHOWING THE DPWH 2018 ROAD CONDITION SURVEY RESULTS

Functional Classification / Road Name / Road number / Surface Type		Condition Rating					
		Good	Fair	Poor	Bad	No Assessment	Total
	Primary Roads	**0.96**	**4.00**	**1.76**	**-**	**0.04**	**6.75**
1-1	**Marbel-Allah Valley-Cotabato Rd**	**0.96**	**4.00**	**1.76**	**-**	**0.04**	**6.75**
	Concrete	0.44	2.71	-	-	-	3.15
	Asphalt	0.52	1.29	1.76	-	0.04	3.60
	Secondary Roads	**130.89**	**30.52**	**44.98**	**2.87**	**48.71**	**257.97**
2-2	**Awang-Upi-Lebak-Kalamansig-Palimbang-Sarangani Rd**	**86.46**	**21.81**	**10.97**	**1.87**	**10.68**	**131.78**
	Concrete	86.46	18.73	7.49	1.87	1.76	116.31
	Asphalt	-	0.36	2.27	-	-	2.62
	Gravel	-	2.73	1.21	-	8.91	12.85
3-3	**Isulan Jct-Ninoy Aquino Rd**	**33.14**	**6.26**	**2.80**	**1.00**	**21.59**	**64.79**
	Concrete	32.98	5.79	2.63	0.84	0.32	42.56
	Asphalt	0.17	0.47	-	-	-	0.63
	Gravel	-	-	0.17	0.17	21.27	21.60
4-4	**SNA-Lebak-Kalamansig Rd**	**11.28**	**2.45**	**31.21**	**-**	**16.45**	**61.40**
	Concrete	11.28	-	-	-	0.18	11.46
	Gravel	-	2.45	31.21	-	16.27	49.94
TOTAL		**131.84**	**34.52**	**46.74**	**2.87**	**48.75**	**264.72**

FIGURE 20: ROAD CONDITION SURVEY BY DPWH, AS OF NOVEMBER 2017

7.4.2 Safety Features

Some portions of the road have missing signage or no signage at all (see following photos showing distress or damage). Road markings of road sections Package 1 and Package 2 have "sectional no marking to deteriorated marking" that needs to be re-established.

FIGURE 21: CORNERBREAK, LONGITUDINAL AND TRANSVERSE CRACKS AT PACKAGE 1 (AWANG-NORTH UPI ROAD SECTION)

FIGURE 22: SCALING OF CONCRETE SURFACE AT PACKAGE 1 (AWANG-NORTH UPI ROAD SECTION)

FIGURE 23: SEVERE CRACKING AND DEPRESSION AT PACKAGE 2 (NORTH UPI-SOUTH UPI ROAD SECTION)

FIGURE 24: SEVERE SCALING OF CONCRETE AT PACKAGE 2 (NORTH UPI - SOUTH UPI ROAD SECTION)

FIGURE 25: ROAD SLIP AT PACKAGE 3 (LEBAK-KALAMANSIG ROAD SECTION)

FIGURE 26: SECTIONAL PATCHING AND RE-BLOCKING AT PACKAGE 3 (LEBAK-KALAMANSIG ROAD SECTION)

7.5 Evaluation Results of the Environmental Impacts

Figure 27 shows the land use/land cover maps of the adjacent landscape of the road. The adjacent landscape in this study refers to areas found within one (1) km from both sides of the road. These maps show the corresponding LU/LC of the area studied from the three (3) identified years: 2008, 2013, and 2018. As the figure below suggests, the LU/LC of the area studied shows substantial changes.

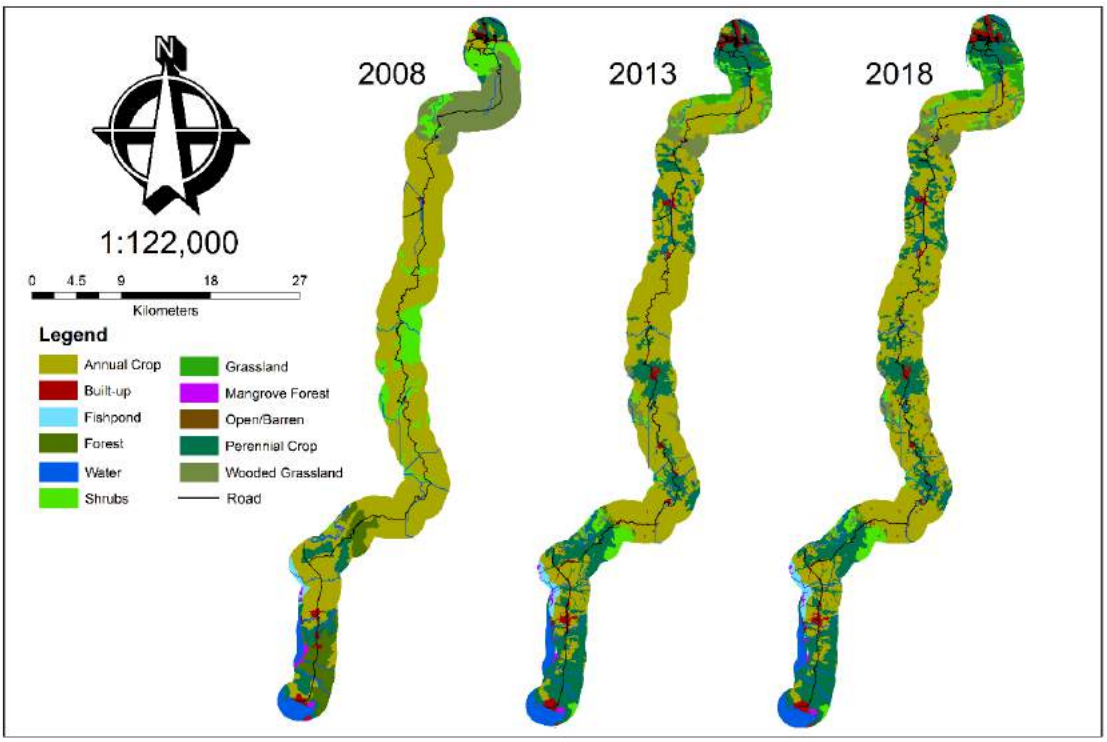


FIGURE 27: LU/LC MAP OF THE STUDY AREA

Table 47 shows the detailed change in the LU/LC in terms of changes in the area of the different LU/LC classes. More than half of the land area is covered with annual crops. The second-largest land cover in terms of land area is perennial crops. This means that the area is the primary agricultural. On the other hand, natural ecosystems (forest, mangrove forest, shrubs, and wooded grassland) in the area in 2008 comprised almost one-third of all the areas combined in the map. However, the substantial decline can be noticed after five (5) years in which natural ecosystems only comprise around 14% of the total area in the map in 2013.

As shown in the LU/LC of 2018 (the most recent), there are no observable changes in the amount of natural ecosystems in the area, signifying an advantageous environmental impact of the road constructed to the natural ecosystems in the area. As per record, the Awang-Upi-Lebak-Kalamansig road section was completed in 2013. Thus, five (5) years after in 2018, the amount of natural cover in the adjacent landscape is practically unchanged, at least in terms

of land area covered. However, during the pre-construction and the construction phase of the road (before 2013), a substantial amount of land area for natural ecosystems declined.

TABLE 47: LAND USE/LAND COVER IN THE ADJACENT LANDSCAPE OF THE ROAD PROJECT

LU/LC	2008		2013		2018	
	Area (ha)	%	Area (ha)	%	Area (ha)	%
Annual Crop	20,991.00	57.48	19,151.87	52.45	18,664.30	51.11
Built-up	490.22	1.34	1,180.15	3.23	1,201.13	3.29
Fishpond	206.34	0.57	359.10	0.98	359.10	0.98
Forest	2,678.04	7.33	144.03	0.39	143.03	0.39
Mangrove Forest	151.80	0.42	134.17	0.37	128.08	0.35
Perennial Crop	2,140.33	5.86	9,923.76	27.18	10,066.62	27.57
Shrubs	3,977.20	10.89	1,751.82	4.80	1,747.41	4.79
Water	1,100.90	3.01	1,266.29	3.47	1,260.50	3.45
Wooded Grassland	3,976.14	10.89	1,807.96	4.95	1,772.51	4.85
Open/Barren	14.07	0.04	15.49	0.04	454.70	1.25
TOTAL	36,517.76	100.00	36,517.76	100.00	36,517.76	100.00

The greatest magnitude of land in the land cover is in the case of perennial crops, which has increased in size almost 5 times in just 5 years during the construction phase of the project. This is followed by built-up land, which has increased during the construction phase by around 2.5 times within 5 years. Furthermore, fishponds also have increased by around 74% during the construction stage of the project. The results also imply that road construction is, in fact, a driver of economic development, in this case, in terms of agricultural production, as evidenced by the rapid conversion of lands into agriculture (in this case, perennial crops). New roads have been proven to foster higher agricultural input use, farm productivity, and market participation[37]. Further, roads are also proven to lead to some indirect effects to agricultural communities such as abundance of harvested resource in the community; a potential for technical innovations that can increase production and productivity; available investment to support this increased production; abundant demand for this increased production in the market region [38] (the market widened in spatial terms and prices maintained).

Road construction is also related to the increase of built-up land. Road improvements tend to reduce trade costs as well as migration costs (Morten and Oliveira, 2018), and consequently, this economic trend somehow leads to population growth and urbanization, which is highly correlated to the growth of built-up land[39].

[37] Kiprono, P. and Matsumoto, T. Roads and Farming: The Effect of Infrastructure Improvement on Agricultural Intensification in South-Wester Agrekon, 57, 198-220. 2018.

[38] Olson, J. Improved Road Accessibility and Indirect Development Effects: Evidence from Rural Philippines. Journal of Transport Geography. 2009.

[39] Wu, K.Y. and Zhang, H. Land Use Dynamics, Build-Up Land Expansion Patterns, and Driving Forces Analysis of the Fast-Growing Hanzhou Metropolitan Area (1978-2008), Applied Geography. 2012.

On the other hand, a substantial decrease in land area is greatly observed in the natural ecosystems (forest, mangrove forest, shrubs, and wooded grassland) during the road construction. Natural ecosystems in the adjacent landscape of the road has decreased 4 times within 5 years during the construction stage of the project. This is equivalent to around 7,000 hectares decrease in five (5) years from 2008 to 2013. Roads are seen to be an immediate cause of deforestation[40]. Roads provide accessibility; thus, areas that are previously hard to reach are now easily accessible to loggers and other forest users.

In contrast, during the operational stage of the project (after the construction phase), only minimal changes are observed in the majority of the LU/LC of the area. This implies a positive environmental impact of roads on the environment. In a paper by Laurance and Balmford[41], the authors explained that in agriculturally productive areas and where most forests have already been cleared, improvements such as paving of an existing road can be beneficial. Good roads provide easier movement of crops and easy access to farm inputs thereby increasing yield and profits. Consequentially, migrants are attracted away from vulnerable forests and instead move towards productive agricultural areas. Additionally, road improvement also leads to higher probabilities of forest law enforcement[42], which probably leads to a decrease in activities related to natural resources extraction.

Moreover, an extreme case of an increase in open/barren areas is observed, specifically during the operation phase of the road. In this case, open/barren areas have increased around 30 times the original area in 5 years (although this amounted only to around 400-hectare increase. Usually, open/barren areas are either abandoned croplands, sparsely vegetated areas, and cultivated land in the fallow period. Please refer to the table below.

TABLE 48: LU/LC CHANGE IN THE ADJACENT LANDSCAPE OF THE ROAD PROJECT

LU/LC	Percent Change (%)	
	2008 – 2013	2013 – 2018
Annual Crop	-8.8	-2.5
Built-up	140.7	1.8
Fishpond	74.0	0.0
Forest	-94.6	-0.7
Mangrove Forest	-11.6	-4.5
Perennial Crop	363.7	1.4
Shrubs	-56.0	-0.3
Water	15.0	-0.5
Wooded Grassland	-54.5	-2.0
Open/Barren	10.1	2,835.4
Annual Crop	-8.8	-2.5

[40]Angelsen A. and Kaimowitz, D. Rethinking the Causes of Deforestation: Lessons from Economic Models. The World Bank Research Observer, 14 (1).1999.

[41]Laurance, W.F. and Balmford, A3. A Global Map for Road Building: Roads are Proliferating Across the Planet – Located and Designed Wisely, They can Help Rather than Harm the Environment. Nature, 495 (7441), 308-310. . 201

[42]Borner, J. Wunder, S., Wertz-Kanounnikoff, S., Hyman, G., and Nascimento, N. Forest Law Enforcement in Brazilian Amazon: Costs and Income Effects. Global Environmental Change, 29, 294-305. 2014.

7.5.1 Road Traffic Noise Level

Road traffic has been proven to cause an increase in sound pressure levels in the streets[43]. An increase in motor vehicles due to the improvement of roads leads to an increase in noise levels, which may affect the life and well-being of the residents near the roads. Road traffic noise is also proven to lead to negative effects in physiological systems and behavior of wildlife[44].

Figure 28 shows the correlation between traffic count and noise levels recorded in the study sites. The result shows a high correlation coefficient (r=0.81) based on the Pearson Product Moment Coefficient of Correlation. This means that traffic count significantly has a positive association with the street noise level. Areas with more motor vehicles passing by also have a high noise level and vice versa. Thus, it can be assumed that one of the negative environmental effects of road is traffic noise, which may pose a danger to people living near roads, especially the vulnerable ones (the children and elderly).

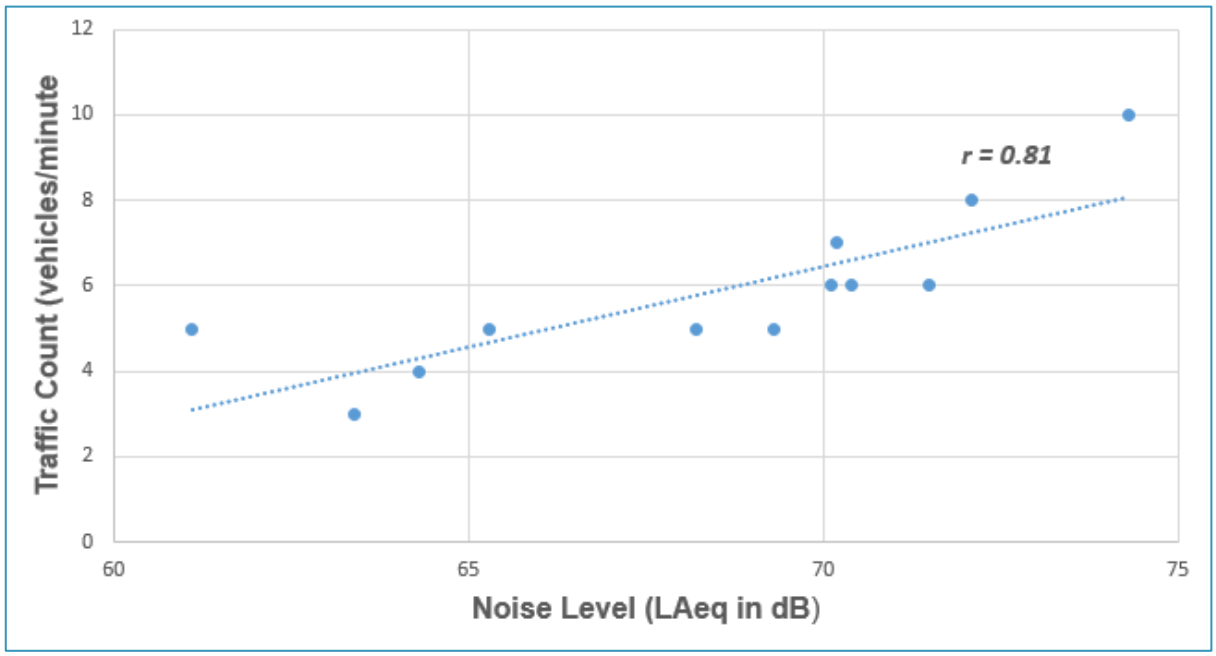


FIGURE 28: SCATTERPLOT OF NOISE LEVEL VERSUS TRAFFIC COUNT

Table 49 shows the variation in the noise level in the different areas of the road project. Based on the standards for noise levels in the area concerned, recorded average noise levels in residential areas (65.07 dBA), as well as commercial areas (71.45 dBA) in the study area, goes beyond the acceptable limits in the Philippines. It is also found to be considered as "normally unacceptable" noise levels based on the standards in the United States. According to the World Health Organization (WHO), the specific health effects of these levels of noise lead to the following: interference with speech perception, sleep disturbance, annoyance, and

[43]Vergel, K.N., Cacho, F.T. & Capiz, C.L.E. A Study on Roadside Noise Generated by Tricycles. Philippine Journal of Engineering, 25 (2), 1-22.2004.

[44] Shannon, G., McKenna, M.F., Angeloni, L. J., Crooks, K. R., Fristrup, Km. M. Brown, E., and McFarland, S. A Synthesis of Two Decades of Research Document the Effects of Noise on Wildlife. Biological Reviews, 91 (4), 982-1005.2016.

reading acquisition in children. These recorded levels, however, are below the threshold for the negative effects on hearing and social behavior[45]. However, these results are limited to the fact that these recorded levels are just 5-minute continuous measurements. It is possible that these values would change over a 24-hour continuous reading, given the variability of the traffic volume in the area. Average daily values may be lower on a 24-hour continuous measurement.

In the forest areas, the recorded levels in the study (68.52 dBA) which can have negative effects on wildlife. Scientific literature on this matter reveals that terrestrial wildlife responses begin at noise levels of approximately 40 dBA. Furthermore, a few literature documented impacts below 50 dBA. Following are the categories of the documented effects of these levels of noise on wildlife based on previous literature: (a) physiology (stress, hearing loss/damage, immune function, gene expression); (b) direct fitness metrics (survival, fecundity, clutch size); (c) mating behavior (attraction, mating success, territorial behavior, pair bonding); (d) foraging behavior (foraging rate, predation rate, hunting/foraging success); (e) movement (spatial distribution, fleeing rate, avoidance, dive pattern); (f) vigilance; (g) vocal behavior (call rate, intensity/amplitude, frequency shift, song length, call type, signal timing); (h) population metrics (abundance, occupancy, settlement, density); and (i) community-level metrics (species composition, predator-prey interactions)[46].

TABLE 49: TRAFFIC NOISE LEVEL AT DIFFERENT AREAS

Category of Area	N	Noise Level (LAeq in dBA)	NPCC Standard	HUD (US) Standard
Residential	4	65.07	Failed	Normally Unacceptable
Commercial	4	71.45	Failed	Normally Unacceptable
Forest	4	68.52	-	Normally Unacceptable
Mean		68.35	-	Normally Unacceptable

7.6 General Perception of the Impact of the Road

POSITIVE IMPACTS OF THE ROAD. From the perspective of the Municipal Mayors, the road has brought benefits to their municipalities. In summary, these benefits include:

- The road has made travel easy/convenient for the people – because it expanded the availability and frequency transport.
- With the paved surface, it has also made the travel safer and faster.
- The length of the road project allows the connectivity between barangays and municipalities. In a sense, it reduces the "distance" from origin to destinations.
- With more transport options, there are now vehicles with high capacity to transport goods, making each trip economical.

[45] World Health Organization. 1999. Guidelines for Community Noise.

[46] Shannon, G., McKenna, M.F., Angeloni, L. J., Crooks, K. R., Fristrup, Km. M. Brown, E., and McFarland, S. 2016. A Synthesis of Two Decades of Research Document the Effects of Noise on Wildlife. Biological Reviews, 91 (4), 982-1005.

- For the government people, the road has made it easy to monitor the activities and municipal projects located in barangays.
- As the road was completed, it has ushered business activities (as more investors have come in to do business in their areas) and opened up opportunities for livelihood or work. People in very remote areas can be reached by the local government delivering basic services. People have options to improve their economic and social conditions.
- The road has persuaded people to buy cars/vehicles for their family use.

The road has benefited all sectors in these municipalities, starting from the farmers, entrepreneurs, women, youth, religious, professions and even the peacekeeping forces. In South Upi though, as the Mayor explains, the single-motor drivers have already complained of lesser income. Before the road project was completed, they had the "monopoly" of passengers. Now, since more modes of transport are available, the passengers have more options which ride to take. Upi FGD participants have taken note of the people migrating into their barangay and buying farm lands.

TABLE 50: POSITIVE CHANGES PERCEIVED BY THE DIFFERENT RESPONDENT GROUPS AFTER THE ROAD CONSTRUCTION, IN PERCENTAGE

	Business Owner Survey	Passenger Survey	Community Level Survey	Household Survey
Shorter travel time	95.3	99.0	68.8	92.2
Safer travel	82.4	96.0	20.8	72.9
Savings on travel cost	38.3	59.4	15.6	29.0
Increase in commercial activities, hence wider choices of goods and services	35.2	33.7	10.4	18.0
Increase in investment	33.2	34.6		25.1
Savings in vehicle repair and maintenance	22.3	20.8		18.4
Higher land value	17.6	64.4		26.3
Increase employment opportunities due to access	16.1	15.8		12.5
Reduction in post-harvest losses	14.5	16.8		6.7
Increase in consumption	10.9	20.8		15.3
Increase in agricultural production	5.2	7.9		5.1
More vehicles plying the route			6.5	
Allows immediate response or services from the government			3.9	
More opportunities to travel			9.1	
No more flood			1.3	
No more ambush			1.3	
Others	3.6			

TABLE 51: NEGATIVE CHANGES PERCEIVED BY THE DIFFERENT RESPONDENT GROUPS AFTER THE ROAD CONSTRUCTION, IN PERCENTAGE

	Business Owner Survey	Passenger Survey
Pollution	25.9	3.9
Chronic noise	21.8	6.9
Erosion	7.8	28.7
Habitat loss/wildlife disturbance	7.8	13.9
Water quality degradation	1.6	
Loss of productive soil	1.6	
Cultural disruption	0.5	
Accidents	18.7	
Displacement	1.6	
Crowded/In-Migration	3.1	

SATISFACTION ON THE ROAD PROJECT. Based on our interviews with the various groups of stakeholders, the general rating on the road is very satisfied. Please refer to the table below.

TABLE 52: SATISFACTION ON THE ROAD PROJECT, VARIOUS RESPONDENT GROUPS

	Very Satisfied	Satisfied	Neutral	Not Satisfied	Very Dissatisfied
Municipal Engineer (N=4)	4				
Municipal Planning and Development Officer(N=4)	4				
FGD participants in DOS (N=2 sessions)	2				
FGD participants in Upi (N=2 sessions)	2				
FGD participants in South Upi (N=2 sessions)	2				
FGD participants in Lebak (N=2 sessions)	2				
FGD participants in Kalamansig (N=2 sessions)	2				
Road-Influence Barangays (N=77)	49	26	2		
Business Owners (N=193)	74	110	8	1	
Vehicle Owners (N=174)	86	82	6		
Passengers (N=101)	16	71	12	2	
Households (N=248)	102	122	23	1	

NEGATIVE IMPACTS OF THE ROAD. The FGD participants in DOS highlighted that because of the good road, drivers of public utility vehicles (van, motorcycles, payong-payong, and multicabs) tend to be very competitive in getting passengers.

PRACTICES TO MAINTAIN THE ROAD. MLGU-DOS says that they conduct monitoring of the road and recommend appropriate action to DPWH. FGD participants say they contribute in the clean-up drive along the roadside like grass cutting and sweeping of waste materials.

MLGU-Upi shares that they participate in road clearing, canal cleaning, and potholes repair of the road. Upi FGD participants confirm their participation in the roadside cleaning (grass cutting and sweeping of trash/waste).

MLGU-South Upi, on the other, discloses that they have crafted a municipal ordinance on prohibiting the grazing/pasturing of draft animals along the stretch of the national road. Further, they have been doing several activities, such as:

- Maintaining the cleanliness and planting trees along the periphery of the road project to prevent soil erosion
- Limiting the payload capacity of the hauler trucks plying the national road
- Promoting the growth of vegetative cover to minimize soil erosion and landslides

RECOMMENDATIONS FROM THE DISTRICT ENGINEERS. Engr. Delfin Viloria of the Construction Section - DPWH Region 12, recommends the following steps for projects of similar nature:

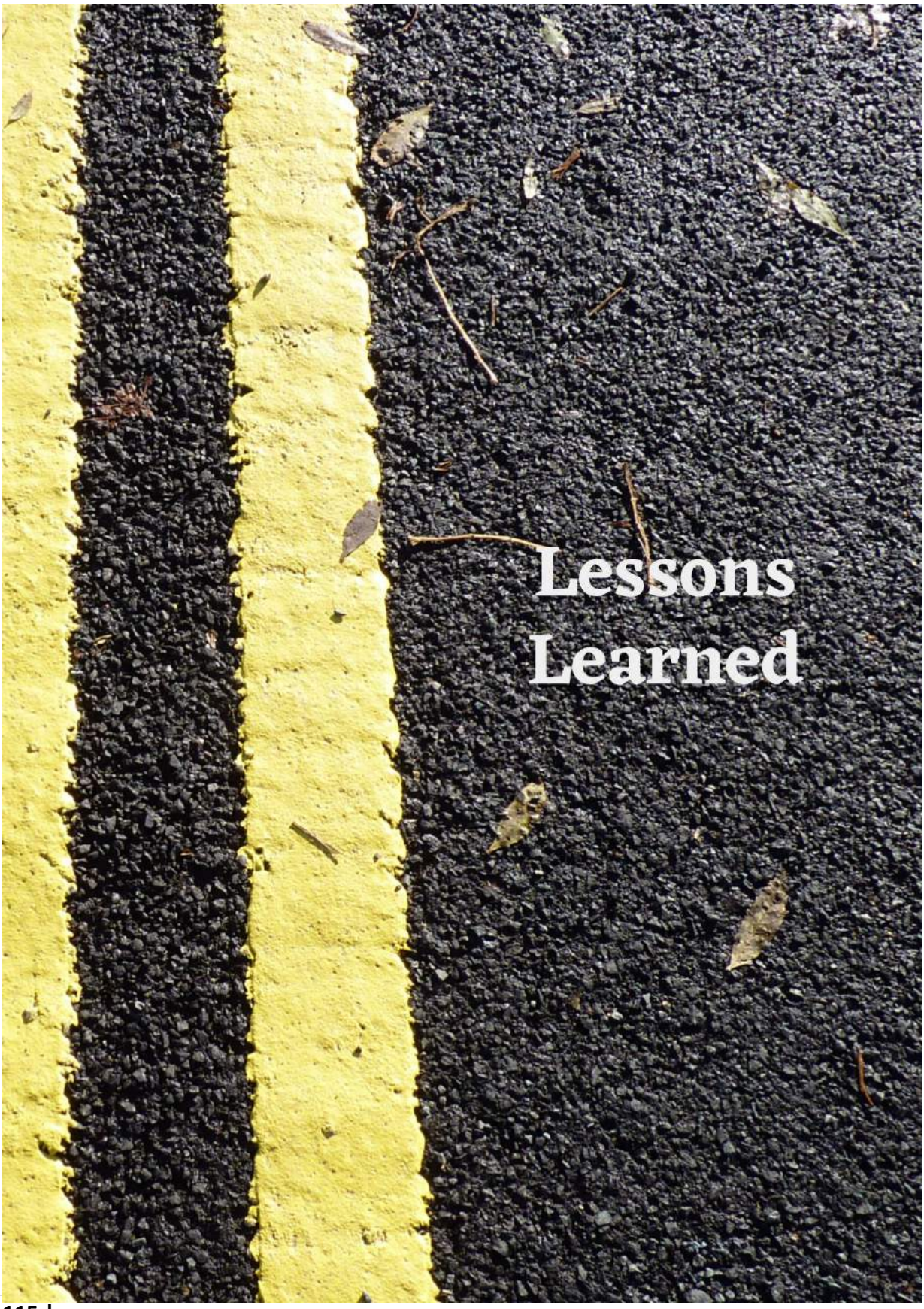
- A thorough and comprehensive conduct of feasibility study
- A thorough conduct of material testing – such as sampling of materials, detailed field density test, and soil composition
- A joint survey together with the expert consultants (though the DPWH has the expertise, they still need reinforcement through hiring of RDI local contractor/consultants from Manila as partner of DPWH in the construction of the road project.
- Proper coordination with the military to participate in the road project in selected conflict-affected area
- Seek the support of the local government to prevent extortion from armed groups such as the MILF or the NPA

Engr. Jose Roland Barino, who served as the Project Assistant for Package 3, remembers that during the road construction, the DPWH National team and the JICA Team Leaders discussed the program of work thoroughly.

RECOMMENDATIONS FROM THE OFFICIALS OF THE ROAD-INFLUENCE BARANGAYS. Barangay officials interviewed for the community survey convey their request to continue maintenance works on the road and also to fund the improvement of the road in their barangays. Fifteen (15) barangays have explicitly expressed their appreciation for the road project.

TABLE 53: BARANGAY OFFICIALS' COMMENTS ON THE ROAD

Additional comments	Frequency	%
Maintenance	24	31.2%
Fund barangay road	17	22.1%
Widen road	15	19.5%
Appreciation	10	13.0%
Road signs	13	16.9%
Coordinate with barangay	11	14.3%
EIC on road safety	1	1.3%


Lessons
Learned

8 Lessons Learned

Following our experience in the conduct of this IE study, we realized the following that roads are crucial to the development in the areas they cover. For this Awang-Upi-Lebak-Kalamansig portion of the road, we have generated information on the changes the road helped facilitate:

1. **Transportation Sector**
    a. Shorter travel time by 7.22 minutes per kilometer for the commuters and other users of the road, allowing them to spend the time saved for other productive purposes.
    b. Wider choices for the modes of transport, which have expanded from the typical motorcycles and jeepneys to trucks, vans, and other private vehicles
    c. More vehicles available to the riding public and other users.
    d. Local government units' funding barangay road projects to connect to the main road.

2. **Agriculture, Industries and Other Economic Activities**
    a. Presence of the road is one of the deciding factors for new investments in agriculture (e.g., plantation) or the expansion of existing agricultural activities, which have been observed in eight (8) barangays after the road was completed.
    b. Improved accessibility to the treatment areas (and their proximity to the road) has a positive association with the land prices.

3. **Environment Sector**
    a. The road has increased the agricultural areas as well as the built-up land, converting some portions of the natural ecosystems, which was evident during the construction phase of the project (from 2008 to 2013). Fortunately, this tapered down during the road's operation phase, from 2013 onwards, as no significant change in the land cover and land use was observed.
    b. The increased traffic (number and type of vehicles) passing the road, however, has increased the noise level in areas adjacent to the road.

4. **Social (Activity and Mobilization)**
    a. Easier access to basic services of the government and the private sector.
    b. Better peace and order situation.

Other lessons learned from undertaking this road impact evaluation study are:

1. **Some impacts cannot be quantified.** While the road users acknowledged the road outcomes, the traditional evaluation approach of cost-benefit analysis has yielded findings that the economic impact on households (such as income) is weak. Please note however, the other benefits such as a safer environment, closer relationship with other

communities, and better consumer choices cannot be easily quantified. These later benefits can justify the road investment.

2. **Importance of establishing baseline condition.** Evaluation of development projects is essential as it sheds light on the optimization of limited government resources (more importantly, if the funds used to construct the road was a loan). It is necessary to establish the baseline condition of the road influence areas, preferably with several indicators taken at the household level (income, access to services, health condition, etc.). Comparability of the respondents' transport experience and cost before the road project was mainly based on recall.

3. **Importance of identifying comparison group**. Another worthy lesson is to consider defining/establishing a comparison group to allow a more robust evaluation. However, we also recognize that for impact evaluation on the road – come 10 or 15 years after the road was constructed – there is a high possibility that the comparison community may end up using and benefiting from the road too. However, it is also important to address the ethical considerations of identifying a comparison group – since they will not likely benefit from a development intervention that will be subjected to an evaluation.

4. **Importance of full access to project documents**. To lend efficiency to the study team as they will formulate evaluation approaches, they must have access to the project documents, particularly feasibility study, design, monitoring reports, changes in the cost, maintenance reports.

5. **Importance of including additional days for the PSA approval.** Finally, with the required PSA approval on the methodology and tools to be used, an additional 60 days needs to be included in the impact evaluation timetable.


Conclusions
and
Recommendations

9 Conclusions and Recommendations

9.1 Conclusion

The construction of the Awang-Upi-Lebak-Kalamansig-Palimbang-Sarangani Road has contributed to many changes in the community. It has improved the connectivity between barangays near the road to becoming hubs of services and commercial activities (i.e., Cotabato City and beyond). It has reduced the travel time for the riding public. It has increased the flow of goods and people in and out of the road influence barangays, as evidenced by the number and the type of motorized vehicles plying the road. It has also allowed the people to travel anytime because accessibility is not hampered by weather or lack of daylight. The road has also expanded opportunities in employment, and the services sector may be linked to commuting (finding work outside of the farms) and the presence of new job opportunities. There is also a general observation of improving peace and order situation in the barangays near the road because of the police visibility.

9.2 Innovative and Effective Approaches and Strategies

The construction, operation, and maintenance of this road project rest largely on the Department of Public Works and Highways (DPWH). Some of the approaches and strategies implemented in this road project that should be maintained/considered in future projects are:

- Increasing the involvement of the local government units, particularly the municipalities and the provinces, In the conduct of consultation, implementation, operation, maintenance, and monitoring.
- Tapping the services/support of the other government offices/authorities to ensure the smooth implementation of project activities (i.e., requesting military to secure the safety of the road project consultants and workers).
- Observing the minimum design for vertical and horizontal curves in designing the road projects.
- Building and securing well the standard safety and warning devices to last long and to avoid being stolen.
- Providing crawler lanes, especially on steep slopes for heavy vehicles.
- Providing or regularly updating concerned personnel (e.g., designers) on Detailed Engineering Design Training and utilizing road design software/applications.

9.3 Unplanned and Unintended Outcomes

Below are the unplanned or unintended outcomes:

- Conversion of land use/land cover, where the area for perennial crops has increased by 5 times and area covering natural ecosystems have been converted to other land uses (fortunately, after the road was completed in 2013, there is no significant decrease in the conversion of natural systems).
- Increased level of noise near the residential and commercial areas.
- Road crashes, which many of the respondents and key informants, believed to be primarily attributed to the behavior of the driver (over-speeding, not following the road warning signs, and driving under the influence of alcohol).
- Business owners are claiming to experience extreme competition due to "many" businesses winning over the same market.
- Some business activities affected by new services (i.e., boat service from the Kalamansig to Cotabato stopped their operation, although the risk of boat capsizing while on travel is also reduced).

9.4 Recommendations

9.4.1 Road Sector Policies

- Incorporate results of the land use/land cover trend studies along the road in the formulation of each municipality's Comprehensive Land Use Plans (CLUPs) as well as the Provincial Development and Physical Framework Plan (PDPFP) to avoid or at least minimize future disturbance of the natural ecosystems due to rapid land conversion.
- Local ordinances and policies related to noise mitigations such as regulating the use of horns in busy streets, prohibiting modified exhaust pipes in motorcycles, speed limits, and others should be passed by LGUs to minimize noise along residential/densely populated areas.
- Road construction projects should also be complemented with the construction or improvement of related social services to maximize the road's usefulness.

9.4.2 Related Policies

- Intensify enforcement of forestry laws through enhance monitoring of the naturally vegetated areas along the road. This should also include areas several kilometers from the main road but are accessible through secondary roads connected to the road project.
- Ecological studies such as biodiversity assessments should be undertaken periodically in naturally vegetated areas along the road to monitor its effect on the wildlife in these areas.

- Appropriate trees species that can act as natural noise barriers should be planted along busy portions, most especially along the residential areas.
- Regular monitoring of noise levels, especially in busy streets, should be undertaken using 24-hour continuous read to characterize noise levels in the area better. This could be a strong basis for noise abatement policies as well as land use planning options related to noise mitigation.

9.4.3 Institutional Mechanism and Arrangements (Road Project Implementation)

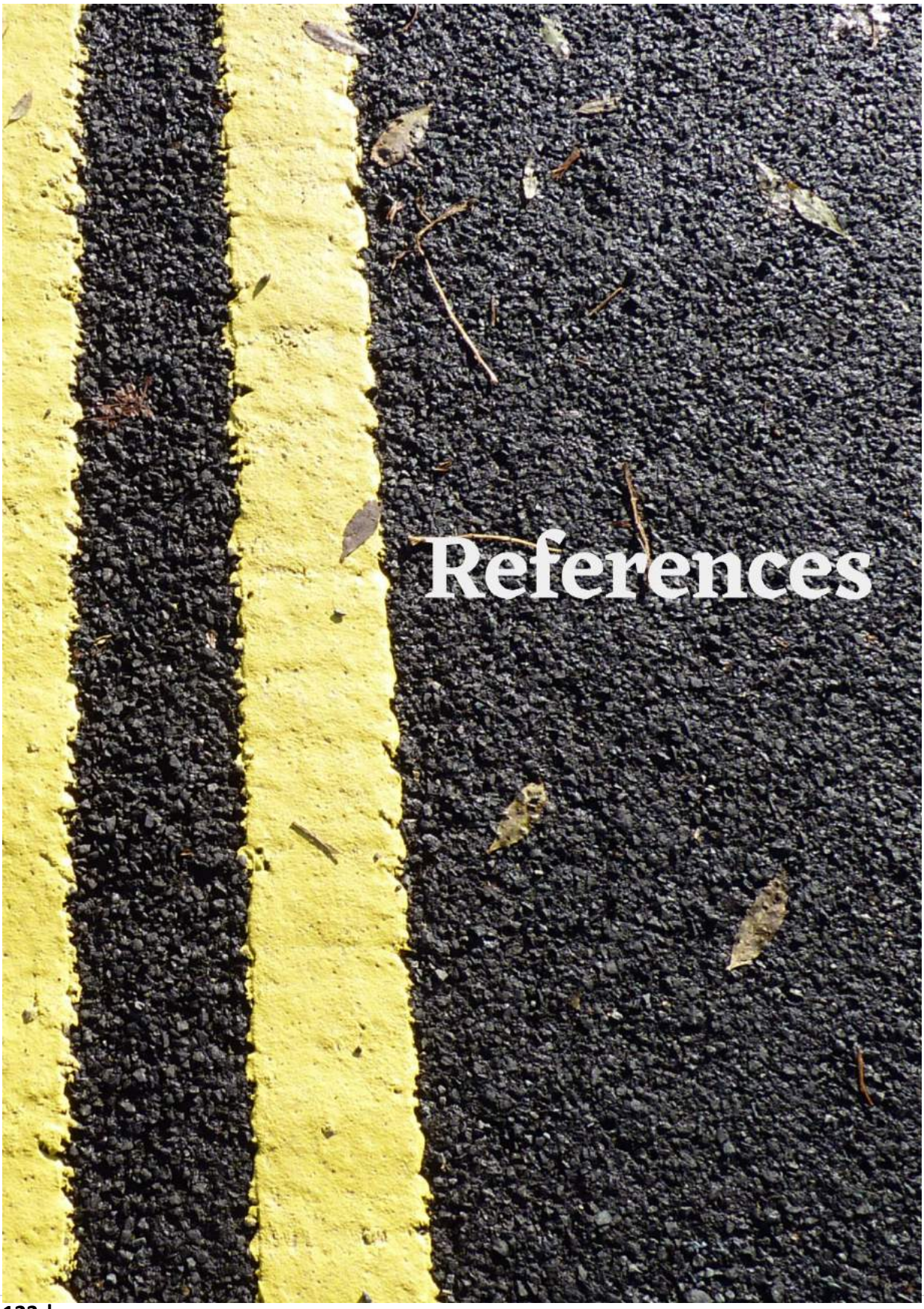
- Routine road condition checks/monitoring should be carried out to assess the current condition of the road.
- The responsibility of undertaking routine and preventive maintenance works should be carried out by DPWH Sultan Kudarat 2nd DEO.
- Road rehabilitation or re-construction is due for the Awang-North Upi and South Upi road sections, putting into consideration the right-of-way acquisition.
- Improve the curved sections through widening to establish proper sight distance and curve radius, as these are elements of road safety.
- Establish road markings and signage in some of the road sections.
- Provide for pedestrians, pedal cyclists, and people with disabilities in appropriate sections.
- Management of traffic conflicts at intersection.

9.4.4 Impact Evaluation Methodology and Related Activities

- Require the conduct of baseline study at the household level to establish pre-intervention situation of the directly impacted households – particularly the sources and level of income, expenditure components, travel behavior, agricultural production, gender dimension, among others – to provide a robust comparison of the "before and after" the road project.
- Include in the baseline study, other related surveys – for business owners, for passengers and vehicle owners – again for comparison for the impact evaluation.
- Build in the evaluation design in the road's project feasibility study.
- Procuring entities of impact evaluation studies must have the necessary project documents, including project feasibility studies, crucial monitoring results, and evaluation reports.
- Follow-up surveys and analyses will still be proposed to capture long-gestation impact of job creation and welfare development appropriately. The IE study findings can be used as "benchmark" conditions of future studies on the said road section. Some of the notable follow-up surveys to capture the impact of the road is assessing the impact if its varies between the poor and the non-poor households; between men, women and youth;

farm-level changes, including adoption of technology, market reach and expanded extension services; more specific health and education indicators; landlessness due to conversion; among others.

Nearly five (5) years after its completion and based on limited information, the road has not yet yielded the economic returns expected from its operation. Yes, roads are an expensive investment; but there are other benefits which cannot be easily quantified but have created positive ripples of change in the daily lives of the people living in the said municipalities and those that do business with them: convenience, comfort, speed, choices, and relative peace.



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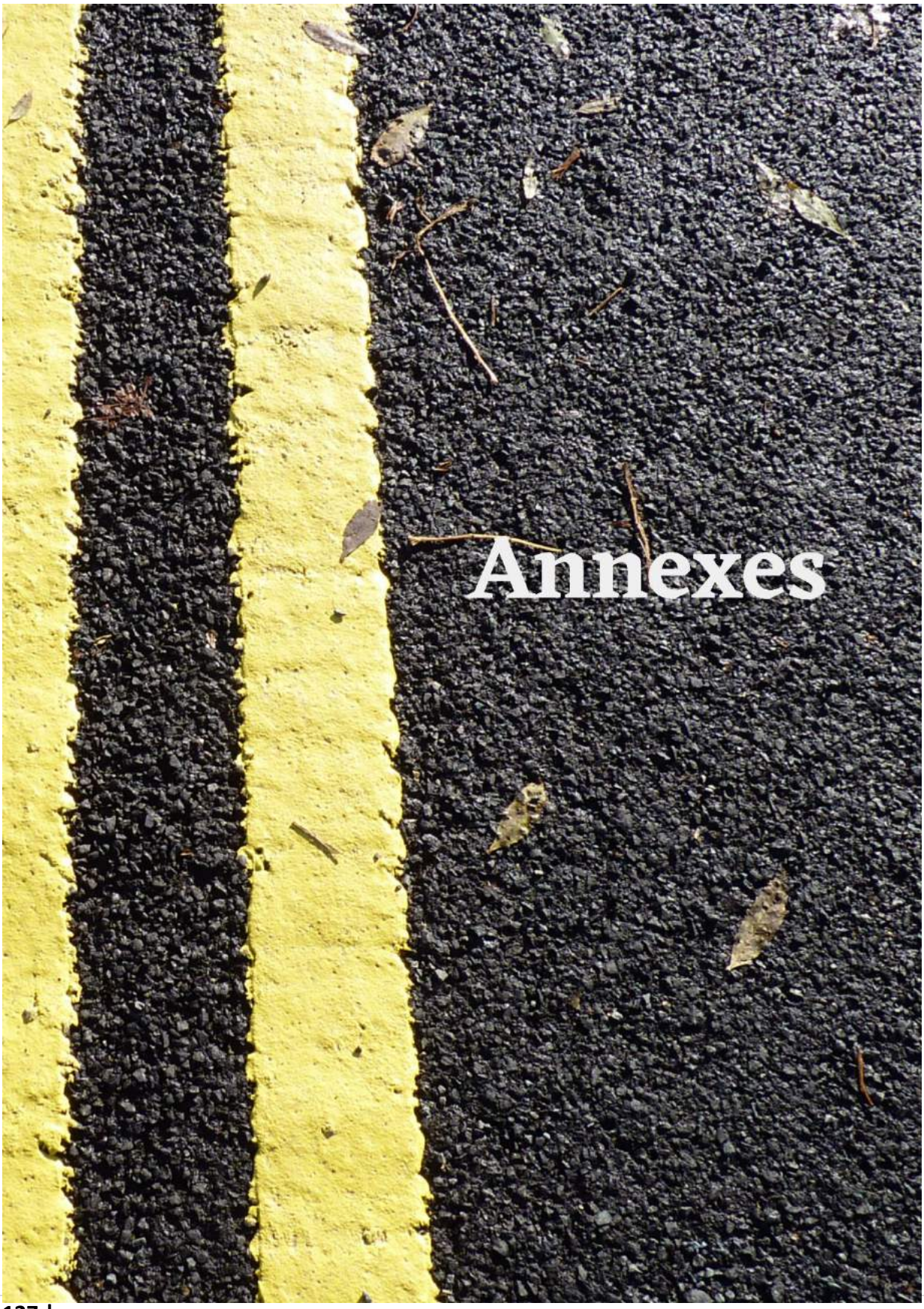
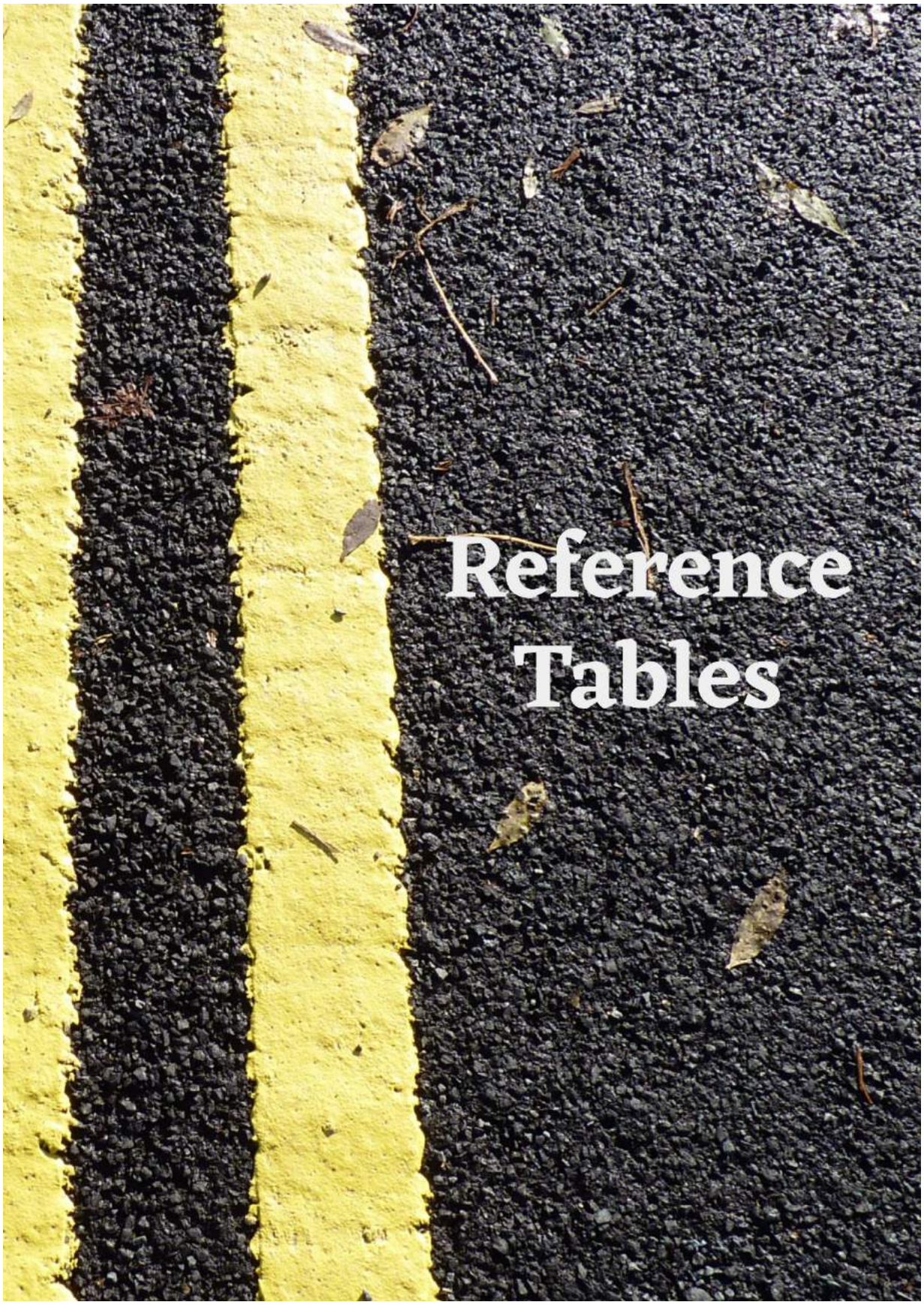

Annexes

ANNEX 1: ROAD CLASSIFICATION SYSTEM, DPWH

Class	Criteria
National – Primary	• Directly connects major cities (at least around 100,000 people) Cities within metropolitan areas are not covered by the criteria
National – Secondary	• Directly connects cities to National Primary Roads, except in metropolitan areas • Directly connects major ports and ferry terminals to National Primary Roads • Directly connects major airports to National Primary Roads • Directly connects tourist service centers to National Primary Roads or • other National Secondary Roads • Directly connects cities (not included in the category of major cities) • Directly connects provincial capitals within the same region • Directly connects major National Government Infrastructure to National • Primary Roads or other National Secondary Roads
National – Tertiary	• Other existing roads under DPWH which perform a local function
Provincial Roads	• Connect cities and municipalities without traversing National Roads • Connect to National Roads to barangays through rural areas • Connect to major provincial government infrastructure
Municipal and City Roads	• Roads within Poblacion • Roads that connect to Provincial and National Roads • Roads that provide inter-barangay connections to major Municipal and City Infrastructure without traversing Provincial Roads
Barangay Roads	• Other Public Roads (officially turned over) within the barangay and not covered in the above definitions
Expressways	• Highways with limited access, normally with interchanges; may include facilities for levying tolls for passage in an open or closed system.

ANNEX 2: COMPARATIVE REGIONAL YEARLY LENGTH, REGION, PAVED, IN KM

YEAR	Functional Classification			Total	Annual Growth Rate
	Primary	Secondary	Tertiary		
Region 12					
2010	672.25	264.87	-	937.12	-
2011	693.86	284.02	-	977.88	4.35%
2012	691.37	305.38	-	996.75	1.93%
2013	728.48	364.69	-	1093.17	9.67%
2014	368.77	584.32	215.05	1168.14	6.86%
2015	368.83	622.47	232.88	1224.18	4.80%
2016	368.33	662.98	284.13	1315.44	7.45%
2017	368.83	696.31	289.32	1354.46	2.97%
2018	368.33	729.07	290.2	1387.6	2.45%


Reference
Tables

REFERENCE TABLE 1: DISTRIBUTION OF RESPONDENTS BY MARITAL STATUS, BY GROUP

Items	Treatment		Control/Comparison	
	f	%	*f*	%
Common law/Live-in	2	0.8	1	0.4
Married	208	81.6	256	93.4
Separated	3	1.2	1	0.4
Single	7	2.7	3	1.1
Widow/Widower	35	13.7	13	4.7

REFERENCE TABLE 2: DISTRIBUTION OF RESPONDENTS BY ETHNICITY, BY GROUP

Items	Control/Comparison		Treatment	
	f	%	*f*	%
Tiduray	128	46.7	22	8.6
Manobo Biit	58	21.2		
Ilonggo	34	12.4	123	48.2
Manobo/Ubo	23	8.4		
Ilocano	11	4.0	4	1.6
Cebuano	9	3.3	16	6.3
Dulanganmanabo	5	1.8		
Tboli	2	0.7		
Bisaya	1	0.4	2	0.8
Igorot	1	0.4		
Leytenio	1	0.4	1	0.4
Waray	1	0.4	3	1.2
Aklanon			6	2.4
Antiqueno			35	13.7
Bagobo			1	0.4
Bicolano			1	0.4
Boholano			1	0.4
Higaonon			2	0.8
Karay-a			1	0.4
Maguindanawon			34	13.3
Moro			1	0.4
Tagalog			2	0.8

REFERENCE TABLE 3: MEMBERSHIP TO ORGANIZATIONS, BY TYPE, BY GROUP

Items	Control/Comparison		Treatment	
	f	%	*f*	%
Cooperative	0	0.0	15	5.9
Farmers' association	24	8.8	29	11.4
Fisherfolks' association	0	0.0	9	3.5
Women's group	4	1.5	70	27.5
Political group (party list organization)	0	0.0	1	0.4
Religious group	5	1.8	9	3.5
Youth group	0	0.0	2	0.8
Cultural association	0	0.0	1	0.4
Indigenous people group (formal)	8	2.9	17	6.7
Others	4	1.5	58	22.7
None	246	89.8	95	37.3

REFERENCE TABLE 4: DISTRIBUTION OF HOUSEHOLDS BY TYPE OF HOUSE, BY GROUP

Items	Control/Comparison		Treatment	
	f	%	*f*	%
Duplex			1	0.4
Single house	274	100	254	99.6

REFERENCE TABLE 5: DISTRIBUTION OF HOUSEHOLD BY MAIN TYPE OF CONSTRUCTION MATERIALS FOR WALLING, BY GROUP

Items	Treatment		Control/Comparison	
	f	%	*f*	%
Light Materials (Thatch roof, sawali, salvaged/makeshift materials)	53	20.8	142	51.8
Mixed But Predominantly Light Materials	64	25.1	56	20.4
Mixed But Predominantly Permanent Materials	55	21.6	66	24.1
Permanent material (tile, concrete, brickstone, asbestos)	83	32.5	10	3.6

REFERENCE TABLE 6: DISTRIBUTION OF HOUSEHOLDS BY MAIN TYPE OF CONSTRUCTION MATERIALS FOR ROOFING, BY GROUP

Items	Treatment		Control/Comparison	
	f	%	*f*	%
Light Materials (Thach roof, sawali, salvaged/makeshift materials)	32	12.5	85	31.0
Mixed But Predominantly Light Materials	27	10.6	14	5.1
Mixed But Predominantly Permanent Materials	38	14.9	41	15.0
Permanent material (e.g. galvanized iron)	158	62.0	134	48.9

REFERENCE TABLE 7: DISTRIBUTION OF HOUSEHOLDS BY TENURIAL STATUS OF HOUSING UNIT AND LOT, BY GROUP

Items	Treatment		Control/Comparison	
	f	%	*f*	%
Own house and lot, or owner-like possession of house and lot	195	76.5	254	92.7
Own house but rented lot	7	2.7	1	0.4
Own house, rent-free lot with consent of owner	28	11.0	14	5.1
Own house, rent-free lot without consent of owner	3	1.2	1	0.4
Rented house/room, including lot	4	1.6		
Rent-free house and lot with consent of owner	17	6.7	4	1.5
Rent-free house and lot without consent of owner	1	0.4		0.0

REFERENCE TABLE 8: DISTRIBUTION OF HOUSEHOLDS BY TYPE OF ASSETS, BY GROUP

Items/ No. of Units	Treatment		Control/Comparison	
	f	*%*	*f*	*%*
Television				
0	45	17.6	136	49.6
1	208	81.6	138	50.4
2	2	0.8		0.0
Radio/cassette				
0	202	79.2	147	53.6
1	53	20.8	126	46.0
2		0.0	1	0.4
Mobile Phone/ telephone				
0	38	14.9	85	31.0
1	98	38.4	165	60.2
2	72	28.2	17	6.2
3	34	13.3	4	1.5
4	8	3.1	2	0.7
5	2	0.8	1	0.4
6	2	0.8		0.0
7	1	0.4		0.0
Computer/Laptop				
0	235	92.2	268	97.8
1	19	7.5	6	2.2
8	1	0.4		0.0
Refrigerator				
0	189	74.1	244	89.1
1	61	23.9	30	10.9
2	4	1.6		
5	1	0.4		
Washing machine				
0	207	81.2	264	96.4
1	48	18.8	10	3.6
Stove/cooking range				
0	223	87.5	261	95.3
1	32	12.5	12	4.4
3			1	0.4
Electric fan or air-conditioner				
0	128	50.2	262	95.6
1	96	37.6	12	4.4
2	26	10.2		
3	2	0.8		
4	3	1.2		

REFERENCE TABLE 9: DISTRIBUTION OF HOUSEHOLDS BY TRANSPORTATION ASSETS, BY GROUP

Item/No. of Units	Treatment		Control/Comparison	
	f	*%*	*f*	*%*
Bicycle or trisikad				
0	203	79.6	270	98.5
1	48	18.8	4	1.5
2	3	1.2		
4	1	0.4		
motorcyle or tricycle				
0	129	50.6	162	59.1
1	111	43.5	108	39.4
2	11	4.3	4	1.5
3	3	1.2		
8	1	0.4		
Car, jeep or van				
0	246	96.5	268	97.8
1	9	3.5	5	1.8
3		0.0	1	0.4

REFERENCE TABLE 10: PERCENTAGE OF HOUSEHOLDS WITH ACCESS/CONNECTION TO ELECTRICITY, BY GROUP

Item	No	Yes	% Yes
Control/Comparison	81	193	70.4
Treatment	7	248	97.3

REFERENCE TABLE 11: DISTRIBUTION OF HOUSEHOLDS BY MAIN WATER SOURCE FOR DOMESTIC USE AND DRINKING

Items	Treatment		Control/Comparison	
	f	%	*f*	%
Dug Well	54	21.2	17	6.2
Own Use, faucet, community water system	87	34.1	2	0.7
Own Use, Tubed/Piped Well	21	8.2	1	0.4
Shared, faucet, community water system	58	22.7	63	23.0
Shared, Tubed/Piped Well	27	10.6	30	
Spring, river, stream, etc.	8	3.1	161	58.8

REFERENCE TABLE 12: DISTRIBUTION OF HOUSEHOLDS BY THEIR ACCESS TO DOMESTIC USE AND DRINKING

Items	Treatment		Control/Comparison	
	f	%	*f*	%
Within the House	102	40.0	7	2.6
Outside the House	153	60.0	267	97.4
Minutes of walking if outside the house				
1	64	25.1	21	7.7
2	36	14.1	35	12.8
3	8	3.1	11	4.0
4	2	0.8		0.0
5	10	3.9	50	18.2
6		0.0	1	0.4
10	7	2.7	44	16.1
15	2	0.8	20	7.3
20	6	2.4	11	4.0
25	1	0.4	3	1.1
30	16	6.3	59	21.5
45		0.0	4	1.5
50		0.0	1	0.4
60	1	0.4	7	2.6

REFERENCE TABLE 13: INFORMATION ON AND OBSERVATION OF BUSINESS OWNERS (N=193)

	f	*%*
A. Location		
Lebak	75	38.9
Kalamansig	49	25.4
South Upi	42	21.8
Upi/North Upi	17	8.8
Datu Odin Sinsuat	10	5.2
B. Sex		
Female	154	79.8
Male	39	20.2
C. Civil Status		
Married	156	80.8
Single	17	8.8
Widow/Widower	13	6.7
Separated	6	3.1
Common-law/live-in	1	0.5
D. Year Established		
Between 1962 – 1980	9	4.7
Between 1981 – 1990	11	5.7
Between 1991 – 2000	35	18.1
Between 2001 – 2010	76	39.4
Between 2011 - 2018	62	32.1
E. Classification of Enterprise		
Single proprietorship	190	98.5
Partnership	2	1.0
Corporation	1	0.5
F. Type of Business Activities (multiple responses)		
Retail store	151	66.2
Restaurants, carenderia, bakery and similar establishments	26	11.4
Buy-and-sell of agri products	21	9.2
Services	16	7.0
Hardware and construction supplies	7	3.1
Clothes and other dry goods	7	3.1
G. Initial Capitalization		
Below Php 20,000	145	75.1
Between Php 20,001 to 50,000	23	13.5
Between Php 50,001 to 100,000	10	5.2
Between Php 100,001 to 500,000	9	4.7
Between Php 500,001 to Php 1,000,000	2	1

	f	*%*
Between Php 1,000,001 to 5,000,000	1	0.5
H. Latest Capitalization (2018)		
Below Php 20,000	72	37.3
Between Php 20,001 to 50,000	56	29.0
Between Php 50,001 to 100,000	28	14.5
Between Php 100,001 to 500,000	24	12.4
Between Php 500,001 to Php 1,000,000	6	3.1
Between Php 1,000,001 to 5,000,000	5	2.6
Between Php 5,000,001 to 10 million	1	0.5
More than Php 10,000,000	1	0.5
I. Estimated Monthly Sales		
Before the project	Php 23,568	
Now	Php 53,416	
J. Effect of the road project on the business		
Increase in sales	142	73.6
Increase in number of customers	94	48.7
Decrease in sales	32	16.6
Decrease in number of customers	23	11.9
No changes on the number of customers	22	11.4
No changes in sales	21	10.9
K. Observation on any change (increase or decrease) of business establishments/ activities in the area		
Yes	190	98.5
No	3	1.5
L. With Plan to Expand		
Yes	101	52.3
None	92	47.7
M. More Travels Outside of the Municipality or Province		
Yes	165	85.5
No	28	14.5
N. Observation on Improvement of the Peace and Order		
Yes	175	93.7
None	18	9.3

REFERENCE TABLE 14: INFORMATION ON AND OBSERVATION OF VEHICLE OWNERS (N=174)

	f	%
A. Distribution by Municipality		
Lebak	77	44.3
Kalamansig	47	27.0
South Upi	28	16.7
Upi/North Upi	11	6.3
Datu Odin Sinsuat	10	5.7
B. Sex		
Male	155	89.1
Females	19	10.9
C. Civil Status		
Married	159	91.4
Single	8	4.6
Separated	6	3.4
Widow/Widower	1	0.6
D. Respondent is Vehicle Owner		
Yes	166	95.4
No	8	4.6
E. Vehicle is Used for Livelihood		
Yes	115	66.1
No	59	33.9
F. Year of Establishment		
Between 1962 – 1980	0	
Between 1981 – 1990	6	5.2%
Between 1991 – 2000	17	14.8%
Between 2001 – 2010	56	48.7%
Between 2011 - 2018	36	31.3%
G. Nature of business		
Transport of people	93	81.7
Transport of goods	36	39.3
H. Initial Capitalization		
Below Php 20,000	53	46.1
Between Php 20,001 to 50,000	26	22.6
Between Php 50,001 to 100,000	25	21.7
Between Php 100,001 to 500,000	6	5.2
Between Php 500,001 to Php 1,000,000	3	2.6
Between Php 1,000,001 to 5,000,000	2	1.7
I. Latest Capitalization (December 2018)		
Below Php 20,000	47	40.9
Between Php 20,001 to 50,000	26	22.6

	f	%
Between Php 50,001 to 100,000	24	20.9
Between Php 100,001 to 500,000	12	10.4
Between Php 500,001 to Php 1,000,000	0	0
Between Php 1,000,001 to 5,000,000	4	3.5
Between Php 5,000,001 to 10 million	1	0.9
More than Php 10,000	1	0.9
J. Types of Vehicle Before the Road Project		
Motorcycle	59	51.3
Modified motorcycle	27	23.5
10-wheeler truck	4	3.5
Elf truck	3	2.6
Jeep (lawin and other passenger type)	7	6.1
Others	15	13.0
K. Types of Vehicles Now		
Motorcycle	50	43.5
Modified motorcycle	40	34.8
10-wheeler truck	5	4.3
Elf truck	4	3.5
Jeep (lawin and other passenger type)	7	6.1
Others	15	13
L. Transport of Goods Before the Road Project		
No	70	40.2
Yes	45	25.8
M. Type of Goods Transported Before the Road project		
Agricultural raw products (crops)	32	71.1
Dry goods	10	22.2
Construction materials	4	8.9
Fish, meat and poultry	3	6.7
Fuel, oil and lubricants	2	4.4
Processed food	2	4.4
Water and other liquid products	2	4.4
N. Goods Transported After the Road Project		
Agricultural raw products (crops)	38	84.4
Dry goods	16	35.6
Construction materials	6	13.3
Fish, meat and poultry		
Fuel, oil and lubricants	3	6.7
Processed food	3	6.7
Water and other liquid products	2	4.4
Construction materials	2	4.4
Transport of Goods in Weight, average per trip		

	f	%
Before the project -food, in kl	250	
Now – food, in kl	761	
Before the project – non-food, in kl	921.8	
Now – non-food, in kl	1571.7	
O. Transport of People Before the Road Project		
Yes	91	
No	24	
P. Average of Passengers Transport Daily		
Before the Road	8	
Now	14	

REFERENCE TABLE 15: INFORMATION ON AND OBSERVATION OF PASSENGER RESPONDENTS (N=101)

	f	*%*
A. Distribution by Province		
Sultan Kudarat	57	56.4
Maguindanao	28	27.7
Other Provinces	11	10.9
North Cotabato	5	5.0
B. Sex		
Female	59	48.4
Male	42	41.6
C. Modes of Transport Before the Road Project		
Jeepneys, multi-cabs and similar transport	34	33.7
Motorcycles	29	28.7
Horse or animal-drawn carts	3	3.0
Tricycles or pedicabs	1	1.0
Double tires	20	19.8
Pump boat (sea)	27	26.7
Trucks	9	8.9
D. Modes of Transport Now		
Van	77	76.2
Motorcycles	48	47.5
Jeepneys, multicabs and similar transport	38	37.6
Tricycles or pedicabs	26	25.7
Bus or minibus	13	12.9
Private cars	8	7.9
E. Purpose of the Trip (during day of interview)		
Leisure/visiting friends/relatives, tourism	62	61.4

	f	%
Business	14	13.9
Regular work	13	12.9
Purchase items	6	5.9
Others	6	5.9
F. Travel Frequency in a Month (during the day of interview)	5 times	
G. Distance travel (during the day of interview)	81 km	
H. Availability of motorized transport from origin to destination (during the day of interview)		
Several times a day	71	70.3
Once a day	30	29.7
I. Type of Transport before Origin to Destination (route during day of interview)		
Jeepney, multicab or similar transport vehicle	40	39.6
Motorcycle	12	11.9
Truck	4	4.0
Bus or minibus	1	1.0
Pump boat	26	25.7
Trucks	27	26.7
J. Types of Transport Now (route during day of interview)		
Van	53	52.5
Jeepney. Multicab or similar public transport vehicles	27	26.7
Motorcycles	19	18.8
Others	2	2.0
K. Other Alternative road Apart from the Road Project		
Yes	67	66.3
No	34	33.7
L. Save Time Using the Road compared to the Alternative (n=67)		
Yes	61	91
No	6	9

REFERENCE TABLE 16: NUMBER OF BARANGAYS COVERED IN THE COMMUNITY SURVEY AND AVERAGE YEARS OF RESIDENCY OF THE OFFICIAL-RESPONDENTS

Municipalities	No. of Barangay	Average years of residency of the respondent
Datu Odin Sinsuat	2	36
Kalamansig	15	48
Lebak	27	47
South Upi	10	41
Upi	23	43
Total/Average	77	45

REFERENCE TABLE 17: PERCENTAGE OF BARANGAYS CONNECTED TO THE ROAD, BEFORE AND AFTER (TREATMENT BARANGAY OFFICIALS' PERCEPTION)

Municipalities	2008	2018	diff
Datu Odin Sinsuat	100.0	100	0.0
Kalamansig	86.7	87	0.0
Lebak	59.3	74	14.8
South Upi	60.0	60	0.0
Upi	47.8	57	8.7
Average	62.3	70	7.8

REFERENCE TABLE 18: AVERAGE DIFFERENCE IN TRAVEL TIME (IN MINUTES), FROM BARANGAY HALL GOING TO MUNICIPAL HALL USING 2-WHEEL MOTORIZED VEHICLES, BY MUNICIPALITY

Municipalities	2008	2018	diff
Datu Odin Sinsuat	105.00	31.50	-73.5
Kalamansig	46.67	27.00	-19.7
Lebak	73.85	34.44	-39.4
South Upi	97.70	56.70	-41.0
Upi	93.26	36.91	-56.3
Average	78.26	36.55	-41.7

REFERENCE TABLE 19: AVERAGE COST (IN PHP) OF TRANSPORTING A 50-KG SACK OF PRODUCE TO THE MUNICIPAL MARKET, BY MUNICIPALITY

Municipalities	2008	2018	diff
Datu Odin Sinsuat	85.00	37.50	-47.50
Kalamansig	9.00	6.00	-3.00
Lebak	10.78	12.19	1.41
South Upi	134.50	112.00	-22.50
Upi	105.43	70.39	-35.04
Average	56.70	41.99	-14.71

REFERENCE TABLE 20: NUMBER OF DAYS A FARMER CAN TRANSPORT PRODUCTS TO MARKET (TREATMENT BARANGAY OFFICIALS' PERCEPTION)

	Before Road		After Road Project	
	f	%	*f*	%
1x a week	15	19.5%	30	39.0%
2x a week	43	55.8%	31	40.3%
3x a week	6	7.8%	3	3.9%
4x a week	1	1.3%	1	1.3%
5x a week	5	6.5%		0.0%
6x a week	0	0.0%		0.0%
7 x a week	7	9.1%	12	15.6%

REFERENCE TABLE 21: COMMUNITY-LEVEL SURVEY ON ACCESS TO BASIC SERVICES/FACILITIES

	Before Road		After Road Project	
	f	%	*f*	%
Rural health unit	40	51.9%	76	98.7%
Hospital	39	50.6%	76	98.7%
Secondary schools	49	63.6%	74	96.1%
colleges and universities	36	46.8%	70	90.9%
Groceries/consumer stores	65	84.4%	76	98.7%
Banks	7	9.1%	64	83.1%
Eateries/restaurants	47	61.0%	77	100.0%
Churches, mosques	46	59.7%	64	83.1%

REFERENCE TABLE 22: DESCRIPTION OF THE BARANGAYS' MAIN ROAD, THEN AND NOW, MULTIPLE RESPONSE (TREATMENT BARANGAY OFFICIALS' PERCEPTION)

Respondents	***f***	***%***
Before the project:		
• Unpaved/uneven road	60	77.9%
• Unlighted during night time	45	58.4%
• Obstructed view (trees, houses, etc.)	36	46.8%
• With roadside activities (houses, stores, etc.)	27	35.1%
• Road accidents/crashes more than once a month	24	31.2%
After the project:		
• Even, well-drained and good texture road	43	55.8%
• With functional light posts at regular interval	8	10.4%
• Unobstructed view	32	41.6%
• With traffic control devices	3	3.9%
• With appropriate road and warning signs/markers	28	36.4%
• Reduced roadside activities (houses, stores, etc.)	32	41.6%
• Reduced road accidents/crashes (one or none at all a month)	32	41.6%

REFERENCE TABLE 23: CHANGES IN INVESTMENT LEVEL IN OWN FARMING ACTIVITIES

Items	**Treatment**		**Comparison**	
	f	*%*	*f*	*%*
I have decreased my investment in agriculture.	18	7.1	17	6.2
I have increased my investment in agriculture	44	17.3	222	81.0
No change.	41	16.1	13	4.7
No Crop Production	*152*	*59.6*	*22*	*8.0*

REFERENCE TABLE 24: AVERAGE NUMBER OF FARM WORKERS AND BUYERS (SUKI), BY GROUP

Type	**Number of farm workers**			**Number of Suki**
	Before	After	*diff*	Before
Treatment	2	2	*0*	1
Comparison	3	6	*3*	1

REFERENCE TABLE 25: NUMBER OF BARANGAYS WITH LARGE AGRICULTURAL PLANTATIONS OR AGRI-BASED PROCESSING ACTIVITIES, BY MUNICIPALITY

Municipality	2008			2018			diff (% Yes)
	No	Yes	% Yes	No	Yes	% Yes	
Datu Odin Sinsuat	2		0.0	2		0.0	0.0
Kalamansig	13	2	13.3	13	2	13.3	0.0
Lebak	25	2	7.4	21	6	22.2	14.8
South Upi	10		0.0	6	4	40.0	40.0
Upi	21	2	8.7	21	2	8.7	0.0
Grand Total	71	6	7.8	63	14	18.2	10.4

REFERENCE TABLE 26: CHANGES IN THE NUMBER OF BUYER, COMPARING THEN TO NOW, BY GROUP

Items	Comparison		Treatment	
	f	%	f	%
The number of regular buyers (suki) has increased.	38	14.9	21	7.7
No change in the number of regular buyers (suki).	62	24.3	230	83.9
The number of regular buyers (suki) has decreased.	3	1.2	1	0.4
No Crop Production	152	59.6	22	8.0

REFERENCE TABLE 27: MANNER OF TRANSPORTING/DISPOSAL OF AGRICULTURAL PRODUCTS, THEN AND NOW, BY GROUP

Items	Treatment				Comparison			
	Before		After		Before		After	
	f	%	f	%	f	%	f	%
Farmer transports the products on his/her own to the market/s.	54	47.0	43	36.1	232	77.6	227	57.6
A trader picks the products at the farm.	51	44.3	64	53.8	23	7.7	132	33.5
A consolidator comes to gather products from the different farms.	10	8.7	12	10.1	44	14.7	35	8.9

REFERENCE TABLE 28: NUMBER OF BARANGAYS WITH FARMERS WHO EXPERIENCE PRODUCTION WITH MARKETABLE SURPLUS, BY MUNICIPALITY

Municipality	2008			2018			diff (% Yes)
	No	Yes	% Yes	No	Yes	% Yes	
Datu Odin Sinsuat	2		0.0	2		0.0	0.0
Kalamansig	11	4	26.7	1	14	93.3	66.7
Lebak	16	11	40.7	6	21	77.8	37.0
South Upi	5	5	50.0	1	9	90.0	40.0
Upi	15	8	34.8	9	14	60.9	26.1
Grand Total	49	28	36.4	19	58	75.3	39.0

REFERENCE TABLE 29: PERCENTAGE OF RESPONDENTS WHO EXPERIENCED POST-HARVEST LOSSES AND PERCENTAGE OF LOSS, THEN AND NOW, BY GROUP

Items	Before				After			
	No	Yes	%Yes	Average Loss (%)	No	Yes	%Yes	Average Loss (%)
Treatment	43	50	53.8	45.3	48	45	48.4	16.2
Comparison	158	94	37.3	32.0	72	180	71.4	56.3
Diff (T-C)			16.5	13.3			-23.0	-40.1

REFERENCE TABLE 30: PERCEIVED CHANGES IN AGRICULTURAL LOSSES, THEN AND NOW, BY GROUP

Items	Treatment				Comparison			
	Before		After		Before		After	
	f	%	f	%	f	%	f	%
Losses due to absences/lack of storage/warehousing in the area	32	12.5	19	7.5	94	34.3	90	32.8
Losses due to absences/lack of solar dryer/other post-harvest facilities	22	8.6	15	5.9	148	54.0	45	16.4
Losses of quantity enroute to market/ during transport	28	11.0	18	7.1	145	52.9	56	20.4
Spoilage of products enroute to market/ during transport	23	9.0	4	1.6	126	46.0	73	26.6
Spoilage of products due to lack of transportation option	26	10.2	3	1.2	107	39.1	81	29.6
None of the above	23	9.0	43	16.9	15	5.5	75	27.4

REFERENCE TABLE 31: NUMBEROF BARANGAYS WHERE MICRO, SMALL AND MEDIUM ENTERPRENEURS ARE MAKING REASONABLE PROFIT, BY MUNICIPALITY

Municipality	2008			2018			diff (% Yes)
	No	Yes	% Yes	No	Yes	% Yes	
Datu Odin Sinsuat		2	100.0		2	100.0	0.0
Kalamansig	13	2	13.3	1	14	93.3	80.0
Lebak	20	7	25.9	4	23	85.2	59.3
South Upi	2	8	80.0		10	100.0	20.0
Upi	1	22	95.7		23	100.0	4.3
Grand Total	36	41	53.2	5	72	93.5	40.3

REFERENCE TABLE 32: DESCRIPTION OF BARANGAYS' ECONOMIC ACTIVITIES, THEN AND NOW (TREATMENT BARANGAY OFFICIALS' PERCEPTION)

	Before Road		After Road Project	
	f	*%*	*f*	*%*
Presence of agricultural plantations	5	6.5%	11	14.3%
Farmers and fishermen able to produce marketable surplus	24	31.2%	47	61.0%
Micro and small businessmen able to make reasonable profit	35	45.5%	60	77.9%
15 years and older able to find work easily/regularly	29	37.7%	31	40.3%

REFERENCE TABLE 33: NUMBER OF BARANGAYS WHERE 15 YEARS OLD AND ABOVE CAN FIND WORK EASILY/REGULARLY, BY MUNICIPALITY

Municipality	2008			2018			diff (% Yes)
	No	*Yes*	*% Yes*	*No*	*Yes*	*% Yes*	
Datu Odin Sinsuat		2	100.0		2	100.0	0.0
Kalamansig	15		0.0	15		0.0	0.0
Lebak	26	1	3.7	26	1	3.7	0.0
South Upi	1	9	90.0		10	100.0	10.0
Upi	2	21	91.3		23	100.0	8.7
Grand Total	44	33	42.9	41	36	46.8	3.9

REFERENCE TABLE 34: AVERAGE INCOME OF HOUSEHOLDS (TREATMENT BARANGAY OFFICIALS PERCEPTION)

	Before Road		After Road Project	
	f	%	*f*	%
Php 3000 and below	40	51.9%	10	13.0%
Between 3000 to 6000	34	44.2%	44	57.1%
Between 6001 to 10,000	2	2.6%	18	23.4%
Above 10,000	1	1.3%	5	6.5%

REFERENCE TABLE 35: PEACE AND ORDER SITUATION IN BARANGAY (TREATMENT BARANGAY OFFICIALS' PERCEPTION)

	Before Road		After Road Project	
	f	%	*f*	%
Strongly agree	18	23.4%	46	59.7%
Agree	38	49.4%	28	36.4%
Neither agree or disagree	10	13.0%	1	1.3%
Disagree	10	13.0%		0.0%
Strongly disagree	1	1.3%	2	2.6%

REFERENCE TABLE 36: SUMMARY OF THE ROAD SURVEY (PHYSICAL CONDITION)

Station		Length (m)	Observable Distress
From	To		
AWANG-NORTH UPI ROAD SECTION (27 km) From Sta. 0+000 to Sta. 27+000			
0+600	0+660	60	Corner Break, Longitudinal & Transverse Cracks
2+600	2+640	40	Corner Break, Longitudinal & Transverse Cracks
5+100	5+130	30	Scaling with minor longitudinal & transverse cracks
6+800	6+900	100	Block Cracking, Corner Break, Longitudinal& Transverse Cracks
7+000	7+700	700	Block Cracking, Corner Break, Longitudinal& Transverse Cracks

Station		Length (m)	Observable Distress
From	To		
8+400	8+700	300	Block Cracking, Corner Break, Longitudinal& Transverse Cracks
12+200	12+500	300	Corner Break, Longitudinal & Transverse Cracks
14+000	14+100	100	Scaling with minor longitudinal & transverse cracks
14+400	14+800	400	Scaling with minor longitudinal & transverse cracks
20+000	20+800	800	Block Cracking, Corner Break, Longitudinal& Transverse Cracks
21+000	21+500	500	Potholes, Block Cracking, Corner Break, Longitudinal& Transverse Cracks
23+000	24+000	1000	Potholes, Block Cracking, Corner Break, Longitudinal& Transverse Cracks
24+200	24+300	100	Potholes, Block Cracking, Corner Break, Longitudinal& Transverse Cracks
25+100	25+400	300	Potholes, Block Cracking, Corner Break, Longitudinal& Transverse Cracks
NORTH UPI-SOUTH UPI ROAD SECTION (39.30 km) From Sta. 27+000 to Sta. 66+300			
27+400	29+000	1600	Potholes, Block Cracking, Corner Break, Longitudinal& Transverse Cracks
36+400	38+500	2100	Potholes, Block Cracking, Corner Break, Longitudinal& Transverse Cracks
39+300	39+600	300	Block Cracking, Corner Break, Longitudinal& Transverse Cracks
42+400	42+440	40	Block Cracking, Corner Break, Longitudinal& Transverse Cracks
47+900	48+000	100	Scaling with minor longitudinal & transverse cracks
48+300	50+600	2300	Potholes, Block Cracking, Corner Break, Longitudinal& Transverse Cracks
58+500	58+515	15	Road Slip
SOUTH UPI-LEBAK ROAD SECTION (28.70 km) From Sta. 66+300 to Station 92+500			
72+800	72+900	100	Block Cracking, Corner Break, Longitudinal& Transverse Cracks
LEBAK-KALAMANSIG ROAD (10.50kms) From Sta. 92+500 to Sta. 103+000			
95+000	97+000	2000	Sectional Scaling with minor patching

Station		Length (m)	Observable Distress
From	To		
97+000	98+000	1000	Sectional Re-blocking
99+400	99+600	200	On-going concreting works
102+000	103+000	1000	Sectional Scaling and re-blocking

REFERENCE TABLE 37:XXX