IMPACT EVALUATION STUDY PROPOSAL FOR SUBPROJECT 2
RDTA 8993 Developing Impact Evaluation Methodologies, Approaches,
and Capacities in Selected DMCs

1.	**Title**: IND-Impact Evaluation – Baseline survey for rural road investment program in the States of Chhattisgarh and Madhya Pradesh	Date submitted: 17 April 2017

2.	**Title of Related Project**: Proposed Multitranche Financing Facility- IND: Second Rural Connectivity Investment Program (New)

3. **Sector**:
- ☐ Agriculture and natural resources
- ☐ Education
- ☐ Energy
- ☐ Finance
- ☐ Health and social protection
- ☐ Industry and trade
- ☐ Public sector management
- X Transport and ICT
- ☐ Water supply and other municipal infrastructure and services
- ☐ Multisector

Subsector(s):

4. Name of Specialist	Number	Department/Division/Organization:
Specialist (IE responsible officer)	Andri Heriawan (6885)	SARD/SATC
Alternate Specialist	Zhigang Li (6467)	ERCD/ERDI
Sector Specialist (if applicable)		
Partner details		
Other		

5. **Overview of the Related Project**:

Context

Rural roads represent about 80% of India's road network, amounting to nearly 3 million km. Many villages still rely on earthen tracks, which are unsuitable for motorized traffic and can easily become impassable during the rainy season. Absence of all-weather road connectivity makes rural communities inaccessible for up to 90 days a year. The Prime Minister's Rural Roads Program (PMGSY) was launched on 25th December 2000 to provide all-weather road connectivity in rural areas of India. It has been continuously confirmed as a priority program by a number of development strategies. As of 31st March 2014, the PMGSY had constructed about 400,000 km of roads, and provided all weather connectivity to 97,838 habitations.

The first stage of PMGSY (or "PMGSY1") focuses on upgrading link roads connecting villages to nearby growth centers (GCs). These link roads are typically less than 5 km. The second stage of PMGSY (or "PMGSY2") emphasizes upgrading Through Routes (TRs) and some Major Rural Links (MRLs) linking GCs and rural hubs (RHs). These roads are typically greater than 10 km.

Proposed Program

The proposed multitranche financing facility (MFF) for Second Rural Connectivity Investment Program (RCIP2) is on the lending pipeline of 2017. RCIP2 will support the government in completing PMGSY1 in three states (Assam, Odisha, and West Bengal), and starting PMGSY2 in two states (Chhattisgarh and Madhya Pradesh). As the first batch of PMGSY2, the RCIP2 will connect around 800 habitations in the states of Chhattisgarh and Madhya Pradesh by constructing to all-weather standard about 7,000 kilometers (km) of rural roads. The immediate outcome of the project will be improved connectivity of rural communities in the participating states to markets, district headquarters, and other centers of economic activity. The performance indicators will be selected from the system indicators with necessary enhancement. Possible indicators include (i) extent of habitation connectivity achieved, (ii) road safety related-targets, and (iii) road maintenance planning and implementation performance.

The project's executing agencies include the Ministry of Rural Development at the central level, and the state governments of Chhattisgarh and Madhya Pradesh through their departments of Panchayat and Rural Development. The implementing agencies will be the rural road development authorities in Chhattisgarh and Madhya Pradesh.

The proposed program is expected to be submitted for the Board of Directors' consideration in the fourth quarter of 2017. The government has requested a loan of $500 million from ADB's ordinary capital resources to help finance the program. The Government counterpart will finance equivalent to $500 million.

6. **Intervention and theory of change**:

The proposed impact evaluation will focus on rural roads covered by RCIP2, which has two key features. First, it does not construct new roads, but upgrade existing roads – through paving road surface-- to "all weather" condition. Second, unlike PMGSY1, which focuses on LRs that connect villages to GCs, PMGSY 2 focuses on TRs that connect GCs with RHs.

In theory, the PMGSY2 intervention is expected to reduce transport costs (both monetary costs and time costs) for both goods and people, and to reduce the uncertainty of delivery. These will likely affect rural society and economy through the following channels:

(i)   Changing the flow of goods (trade). A direct implication is on the increasing participation of agricultural value chains. Cheaper and larger variety of goods may also be "imported".
(ii)   Changing the flow of people by increasing villagers' access to wider labor market, to markets, and to social service providers, such as education and health. These potential impacts may differ by men and women, as theyl use roads differently, especially with respect to agriculture and mobility for employment,
(iii)   Other indirect effects as the results of changing flows of goods or people, including flow of information, agglomeration, risk-buffering behavior and expenditure, especially in areas with larger risks of natural disasters. There may also be gender differentials in these indirect effects.

The initial economic and natural conditions of different households and habitations before the improvement of the roads are different. For example, road surface conditions and major sources of income can vary widely by villages. Hence, the impact of intervention would differ by different areas because of the heterogeneous nature before the road project is completed.

The key research questions to be examined include:

a)   How does road condition affect the development of agricultural value chains?
b)   How much do improved road conditions affect people's working in non-local areas, and the change of occupation?
c)   What pre-cautious behaviors are changed due to the reduced impact of disasters, and what are the implied benefits?
d)   How much are the welfare improvement due to better quality of consumption?

7. **Rationale for the Proposed Impact Evaluation Study:**

The key hypothesis to be tested include (1) improved rural roads increase farmers' participation in agricultural value chains and raises their income conditional on the crop types, crop patterns and land holding status, etc., (2) rural road upgrading improves female labor participation and non-agricultural income, and (3) improved rural roads reduce uncertainty of transport service and weaken the need for precautious behaviors of village households, such as excess storage of production inputs to address natural hazards. Farmers' participation in agricultural value chain may reflect on the fraction of output sold to market, contractual agreement with major wholesalers for selling agricultural products, and output of perishable agricultural products that are supplied to organized value chains.

Although existing studies have provided much evidence on the effect of rural roads on rural community,[1] the impact of improved rural roads on agricultural value chain and farmers' precautious behavior are not well understood. Moreover, the majority of existing studies estimate the "average" effects across villages, while the impact of rural roads can vary widely by village of different initial conditions. This heterogeneity has important implications for assessing the return of road investment and tailoring policy for rural development.

---

[1] Existing studies have provided evidence in various aspects, including income growth, rising land values, agricultural productivity gains, intensified search and competition among agricultural traders, human capital formation, agricultural technology adoption, reduced price dispersion, consumption diversity, poverty reduction, and structural transformation from agricultural to wage jobs. Binswanger et al., 1993; Fan and Hazell, 2001; Zhang and Fan, 2004; Jacoby, 2000; Shrestha, 2015; Gollin and Rogerson, 2014; Casaburi et al., 2013; Khandker et al., 2009; Khandker and Koolwal, 2011; Ali, 2011; Dercon et al., 2009); (Gibson and Olivia, 2010); (Gibson and Rozelle, 2003); (Mu and van de Walle, 2011; Aggarwal, 2015; Wantchekon and Stanig (2015); Fafchamps andShilpi (2005); Asher and Novosad, 2016.

Better understanding of the hypothesis proposed is related to the bigger question of optimal transport infrastructure investment to achieve country strategic development goals, including reducing poverty (faster and more inclusive growth), accelerating agricultural growth and the rural economy, creating jobs, and social development. Also, whenever possible, we will investigate how women are impacted differently by rural roads than women because they use roads in different ways.

The proposed IE is closely aligned with ADB's country partnership strategy (CPS) for India, which is to continue ADB assistance for development of rural roads, which are critical for rural development as they provide access to markets, health, education, and administrative services. Moreover, it also has implications for disaster buffering activities, such as disaster relief support and households pre-cautious saving.

i)   Proposed Methodology:

The proposed evaluation design is quasi-experimental, utilizing regression-discontinuity (RD) feature of the Program. Aiming to conduct rigorous big-data analysis, the present IE project focuses on the baseline survey. The end-line survey is expected to be conducted within one year of the completion of the road project. Once the two rounds of data are available, the RD methodology is proposed to assess the impact of the projects. Alternatively, matching technique is also used as an alternative approach to construct control groups.

Sample

The study sample will target:

A. Treatment group: We propose to randomly sample 400 growth centers (GCs). The units of treatment include households and traders in these GCs. In addition, for each GC we propose to randomly sample one PMGSY1 village and one non-PMGSY1 village among villages that produce the major agricultural products of the region.

B. Control group: For each TR covered in the treatment group, a "control" TR is selected that satisfies the following criteria: a) the control TR is not included in PMGSY2 and b) the control TR connects to the same rural hub connected by the treatment TR. For each TR, one GC is randomly sampled for among those that meet the above criteria. For each GC, we sample villages following the same approach as that for constructing the treatment group. As spillovers from treatment group to control group is possible, information will be collected on this potential spillover and utilized in data analysis.

In total, we expect to collect information on around 800 GCs and 1200 villages connected to these GCs. The survey will be at village level or household level. Households are randomly sampled. Within households, information on all women and men will be collected as much as possible. In addition, we also survey major shops in markets for market information.

Baseline Data Gathering

Before the rural road upgrading is made, baseline data will be collected through two main sources. One is to compile existing administrative data sources, including master plans of roads, Pavement Condition Index, and administrative information on growth centers and villages.

In addition, a baseline survey is conducted to collect information on sampled habitations and randomly sampled households in them. The survey will be conducted in two major forms:

A. For village-level information, focus group discussions and key informant and expert interviews with beneficiaries and stakeholders on the structure of agricultural value chains for different agricultural products, local logistics industry, local policy environment and other social or economic programs that may affect the value chain activities, frequency and severity of natural hazards and policies to mitigate them.

B. Interviewing households in sampled habitations in both treatment and control group. The survey questionnaire with cover basic background, the participation of value chains, pre-cautious behavior (e.g. saving), uses of roads, job choices and decision, market and job related information exposures, uses of ICT products. The use of ICT-assisted survey method, e.g. via an app installed in handheld devices, will be explored as much as possible and experimented in selected sub-samples.

In both types of surveys, gender-specific information will be obtained as much as possible to study the differential impact of roads on women and men.

We propose to conduct this survey using local consultants because their familiarity with local environment and logistics.

Empirical strategy

Estimating the impacts of roads is challenging because of potential endogeneity problem: economic potential and pro-poor targeting could lead road projects to be correlated with other government programs and economic growth. An example of the pro-poor program is 'Aajeevika' launched during the 12th Five-year Plan period. If these simultaneous policy changes are not fully controlled for, they would bias the estimates of roads' impact.

To address the endogeneity issue, our empirical strategy utilizes the guideline for PMGSY2 road choices. The selection of candidate roads is objectively based on road score, which is the sum total of the marks of GCs directly connected by the candidate road leading to higher order growth centers or higher order roads. The calculation of GC marks would be based upon socio-economic/ infrastructure variables. With the road score, factoring in the road condition (in terms of Pavement Condition Index) and maintenance, a Comprehensive Upgradation cum Consolidation Priority Lists (CUCPL) is decided for choosing roads.

Only roads with score above a certain threshold will be selected for PMGSY2 treatment. Hence, the likelihood of PMGSY treatment will discontinuously increase at these population thresholds, making it possible to estimate the effect of the program using a fuzzy regression discontinuity design. Even if selection into PMGSY2 treatment is partly determined by confounding economic factors, these factors are not likely to change discontinuously at these population thresholds. Under the assumption of continuity at the treatment threshold, the fuzzy RD estimator is implemented (Imbens and Lemieux, 2008). With this estimator, we provide estimates to answer the following key questions.

    i.   What is the condition of selected project roads, what is the anticipated level of maintenance funding, and execution of maintenance works on these roads?
    ii.   What kind of agricultural value chains are more sensitive to rural road quality? How much do improved rural roads affect agricultural value chains? What kinds of policies are needed to turn improved rural roads into the development of agricultural value chains?
    iii.   How much do improved road conditions affect villagers' taking up non-farm jobs? How are female villagers affected differently in labor participation activities?
    iv.   How is the storage of production inputs of villagers affected by the improved rural roads? Is this reaction more significant in villages more prone for natural hazards?
    v.   Do village shops sell larger variety of goods with improved rural roads? Is the change of variety more significant in goods used by female?

8. **Risks and Ethical issues**

We expect low risk for executing the baseline survey, although there could be some uncertainty in collecting administration data as they may not be fully disclosed. We will try to communicate with local officials and consultants to minimize this uncertainty. We foresee no ethical issues.

9. **Dissemination Plan**

- Methodology notes on survey design.
- A report summarizing comprehensive findings from the baseline survey will be produced. The report will be made available to the general public on www.adb.org.
- A dissemination workshop will be organized to present the outcome of the baseline survey and discuss the findings.
- Findings of the evaluation will be published as ADB working paper, and may also be published in a reputable academic journal.
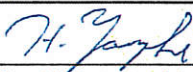
10. **Proposed Implementation Period**:
    a. Approval of Project: 30 Nov 2017
    b. Start of Project implementation: Jan 2018
    c. IE inception report from scoping mission: Aug 2017
    d. Start of the IE activities: Jul 2017
    e. Hiring of consultant: May 2017
    f. Proposed timing of the baseline survey: Jul-Sep 2017
    g. Proposed timing of subsequent surveys: n.a.
    h. Presentation of the initial IE results: Dec 2017
    i. Submission and dissemination of IE report (findings from baseline survey): Mar 2018

11. **Cost Estimate**:
    The total cost of the subproject is estimated at $200,000, including contingencies.

Cost Item	Proposed TA Financed ($)	Other Sources ($)	Total ($)
Survey expenses	160,000	n.a.	160,000
International consultants (design and analysis)	12,000	n.a.	12,000
Local consultants (data cleaning and analysis)	8,000	n.a.	8,000
Dissemination	10,000	n.a.	10,000
Contingencies	10,000	n.a.	10,000
Total	**200,000**	**n.a.**	**200,000**

Endorsed by:

Hiroaki Yamaguchi
Director, SATC
Date: 10 May 2017

Approved by:

YI JIANG
Co Chair, IE Committee
Date: 11 May 2017