SOCIO-ECONOMIC IMPACTS OF RURAL ELECTRIFICATION IN WESTERN REGION OF SRI LANKA

Rajapakse Karunasinghege Priyanie Sujai Gunatilake

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Department of Civil Engineering

University of Moratuwa

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DECLARATION

I hereby certify that this dissertation does not incorporate, without acknowledgement, any material previously submitted for a Degree or Diploma in any University and to the best of my knowledge and belief, it does not contain any material previously published or written by another person or myself except where due reference is made in the text. I also hereby give consent for my dissertation, if accepted, to be made available for photocopying and for interlibrary loans, and for the title and summary to be made available to outside organizations

……
R.K.P.S. Gunatilake
December 2011

Approved By …….
Dr.Rangika U. Halwatura
Department of Civil Engineering
University of Moratuwa

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Abstract

Electricity plays a key role in economic and social development of a country. In developing countries, providing all citizens access to modern forms of energy, especially electricity is among the central energy policy objectives. The nexus between modern energy services and human development are widely recognized.

By 2010 only 85% of the population of Sri Lanka had direct access to grid electricity. The intention of development in rural electrification was to provide household benefits, improvement in health services, improvement to education, community benefits, incentive to build houses and improvement to small industries and small commercial activities within the rural community. Further, to achieve the goal of self sufficiency and uplifting the national economy.

However time has come to review the socio-economic impacts on rural communities by having access to standard national energy supply to understand the current issues after electrification. Whether the development intended has been achieved, if not what further actions to be taken to get the maximum benefits over this huge investment.

In this study, some of the rural villages in Kalutara District were focused to identify the impact on access to grid electricity. It was evident that the households were extremely satisfied with grid electricity service that has replaced their kerosene lamps and solar home systems which had been providing their lighting requirements. Longer study hours of children, longer television watching hours for the family and elimination of dirty and hazardous kerosene lamp has improved their quality of life. Migration to urban areas is almost eliminated. But it was revealed that no significant use of electricity for income generating activities such as agriculture, food processing, small industries and small commercial activities are taking place and no authority has touched the valuable source of energy for rural industry and commercial activity development.

It is concluded that the large scale penetration of grid electricity has helped the rural communities in terms of improved socio-economic conditions and bring the modernity to the village. But the country needs to seriously examine its options to motivate, train, and technically assist to rural communities to promote agro-based industries and commercial activities in rural areas. Thereby providing the maximum benefits for the rural communities by electrification and maintaining a healthy and evenly loaded power system throughout the day.

Key words: Electricity, Rural electrification, Socio-economic impact, Income generation

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List of Abbreviations

ADB	Asian Development Bank
CAARP	Conflict Affected Area Rehabilitation Project
CDMA	Code Division Multiple Access
CEB	Ceylon Electricity Board
DCB	Decentralized Budget
DGEU	Department of Government Electrical Undertakings
GDP	Gross Domestic Product
GOSL	Government of Sri Lanka
HDI	Human Development Index
LT120	Less than or equal to 120 kWh
LT180	Less than or equal to 180 kWh
LT30	Less than or equal to 30 kWh
LT60	Less than or equal to 60 kWh
LT90	Less than or equal to 90 kWh
PS	Power Station
PWD	Public Works Department
RE	Rural Electrification
SHS	Solar Home Systems
SIDA	Swedish International Development Agency

Appendix I

Questionnaire Relevant to RE Scheme.

1. Scheme Name:
2. Occupation
3. Number of members in Family
4. Average monthly expenditure

Before Electrification

5. Kind of fuel used **before electrification**

	SHS	Firewood	Kerosene	Other
Lighting				
Cooking				
Other				

6. Amount spent on fuel per month **before electrification** Rs…….

7. What problems you faced without electricity.

Uncomfortable at home ☐ High expenses on Fuel ☐ Shorter study time ☐

Accidents due to unsafe kerosene lamps ☐ Could not work longer hours ☐

could not do business/industry ☐ No self esteem ☐

After Electrification

8. Kind of other fuels **presently** used. (After electrification)

	SHS	Fire wood	Kerosene	Others
Lighting	☐	☐	☐	☐
Cooking	☐	☐	☐	☐
Other	☐	☐	☐	☐

9. **Present expenses** on fuel per month.(After Electrification) Rs……

10. Primary usage electricity supply

Residential purpose
- Comfort at home ☐
- Support education of children ☐
- Entertainment ☐

Operating machinery ☐

Agricultural purpose ☐

Other industrial purpose ☐

Farming ☐

Trading ☐

Work long hours ☐

11. Average monthly expenditure for electricity

Rs 100-200 ☐ Rs 200-300 ☐ Rs 300-400 ☐ Rs 400-500 ☐

Rs. More than 500 ☐

12. Kind of electrical appliances used

Electric bulbs ☐

Electric hot plates ☐

Electric heaters ☐

Electric iron ☐

Television/Radio ☐

Electric Fan ☐

Water pump ☐

Refrigerator ☐

Blender ☐

Rice Cooker ☐

Any other (Please Specify) ☐

……

13. Self employment project or any other Income generating activity that started using electricity:

Yes ☐ No ☐ In future ☐ No Idea ☐

14. If yes, what is it?.....

15. If you have started an income generating activity using electricity did you

Obtained any financial assistance from banks: Yes ☐ No ☐

Obtained any training: Yes ☐ No ☐

Obtained any technical assistance. Yes ☐ No ☐

16. Any other infrastructure development after electrification

Roads ☐ Telecommunication ☐ Health Clinic/Dispensary ☐ School ☐

17. Do you think that electricity has enlighten your life Yes ☐ No ☐

18. In what means would you like to improve your standard of living

RURAL ELECTRIFICATION PROJECT RE (8)- IRAN

SRI LANKA

INVESTIGATION REPORT

AND

FEASIBILITY STUDY OF

PROPOSED SCHEMES

NAME OF THE SCHEME : IHALA HEWESSA MANANHENA

PROVINCE : Western
DISTRICT : Kalutara
ELECTORATE : Agalawatta
AGA DIVISION : Walallawita
VILLAGE : Mananhena

SER. NO. : IRAN/AG/WL/010
C.E.B. AREA : Kalutara
CSC : Matugama
EIRR : 5.82%

RURAL ELECTRIFICATION UNIT
DISTRIBUTION PLANNING BRANCH
CEYLON ELECTRICITY BOARD
COLOMBO.

Appendix II

GENERAL DATA

Section I

1.	CEB Area	Kalutara
2.	CEB Area Code No.	11
3.	District	Kalutara
4.	Electorate	Agalawatta
5.	Name of Scheme	Ihala Hewessa Mananhena
6.	Scheme Ref. No.	IRAN/AG/WL/010

Section II

1.	CEB Province	WPS 1
2.	(Administrative) Province	Western Province
3.	Consumer Service Centre	Matugama
4.	Divisional Secretariat	Walallawita
5.	GN Division	Ihala Hewessa
6.	Village/s	Mananhena
7.	Initiated by	
8.1 8.2 8.3 8.4	Population of the Village Total No. of Houses No. of Households of Village(s) covered by the RE Scheme No. of houses beyond 100m from the feeder.	431 120 86 14
9.	No. of persons directly benefited by RE Scheme	
10.	Village economic activity : Mainly : Others : 1 2	Agriculture
11.	No. of persons receiving food stamps	42
12.	No. of employees in Schemes : 1. Public Sector 2. Private Sector 3. Self Employment	3 14 38
13.	Approximate land values in scheme area ; 1. Within developed area 2. Outside developed area	

Notes for :

8.1 & 8.2 *Population & No. of Households as at date of investigation. Population be checked with 2001 census available with GN*

8.3 *Count number of houses within 100 Meters from the proposed LV Lines of the scheme.*

9 *The persons benefited are 1. Members of the house.*
2. Number of employees in prospective Industries & Commercial establishment.

10 *Village economic activities to be classified under coconut growing, rubber growing, tea growing, paddy*

cultivation general agriculture, bricks & tiles manufacturing, gemming, timber craft external employment, tourism, fishing, food processing and others.

TECHNICAL DATA

1.	Capacity of the Transformer (kVA)	100
2.	Medium Voltage of the System	33kV
3.	Length of MV Line (km)	1.35
4.	Length of 3 phase line only (km)	6.12
5.	Length of 3 phase line on Existing MV Poles (km)	
6.	Length of 3 phase line on Proposed MV Poles (km)	0.85
7.	Closest Grid Substation	Matugama
8.	Installed Capacity of Grid Sub. (MVA)	94.5
9.	Peak Load of Grid Sub (MVA)	55
10.	MV Feeder closest to Scheme	Kithulgoda
11.	MV feeder distance to the scheme	
12.	Present load on feeder (peak) Amperes : Day : Night	70 120
13.	Additional load due to scheme (peak) Amperes : Day : Night	

Appendix II

DESIGN DATA

Number Feeders	2
Number of spurs in Feeder 1	3
Number of spur in Feeders 2	3
Number of spur in Feeders 3	

	F1	S1	S2	S3	F2	S1	S2	S3	F3	S1	S2	S3
Identification	ABDEF	BB′C	HH′	EC′	AKLN	AA′	II′J′	KK′L′				
Distance from transformer		300	1350	1150		0	300	600				
Length of 3 phase lines Length of 2 phase lines Length of 1 phase lines	1800	370	125	100	1800	375	1100	1300				
Number of large houses	10	2	2		5	3	2	5				
Number of medium houses • Tiled/Asbestos • G.S. Sheet • Thatch	3	1		3	3	2	6	5				
Number of small houses • Tiled/Asbestos • G.S. Sheet • Thatch	10	**5**	1		4	2	3	7				
No. of medium commercial No. of small commercial	1											
No. of medium industries No. of small industries												
No. of religious premises												
Prospective Iron Work Shops												

Small House - below 750 sq.ft.
Medium House - below 750 & 1500 sq.ft.
Large House - over 1500 sq.ft.

Small Industries - below 10 kVA
Medium Industries - above 10 kVA below 42 kVA

Commercial

Small - Small shops. Boutiques, farms etc. Adjoining the house and area below 500 sq.ft.

Medium - Individual Shop and adjoining shops above 500 sq.ft.

SOCIO ECONOMIC DATA

Road Distance of Scheme from Colombo 145 Km

	Grade	a	b	c
Distance to A or B category Road	b	<5 Km	5 to 10	>15
Distance to Tarred Road	b	Thro. Sh.	< 3 Km	>3
Distance to Railway Station	c	< 10 Km	10 to 25	>25
Distance to Bus Service	b	Thro.Sh.	< 3 Km	>3
Distance to Post Office	b	Thro.Sh.	< 3 Km	>3
Distance to Telephone Service	a	< 3 Km	3 to 6	>6
Distance to Base Hospital	b	< 10 Km	10 to 25	>25
Distance to Rural Hospital	b	< 5 Km	5 to 15	>15
Distance to Dispensary	b	Within	< 3 Km	>3
Distance to Maha Vidyalaya	b	< 3 Km	3 to 6	>6
Distance to Primary School	b	Within	< 3 Km	>3
Distance to AGA Office	b	< 5 Km	5 to 15	>15
Distance to Fair	b	< 3 Km	3 to 6	>6
Distance to Government Bank	b	< 5 Km	5 to 15	>15
Distance to Private Hotel	b	< 10 Km	10 to 25	>25
Distance to Tourist Hotel	b	< 10 Km	10 to 25	>25
Distance to Large Industries	b	< 5 Km	5 to 15	>15
Distance to Irrigation Scheme	b	Within	< 3 Km	>3
How many have a vehicle	b	>5	2 to 5	<2
How many have a Motor Cycle	a	>10	5 to 10	<5
How many have a Generator	b	>5	2 to 5	<2
How many have a Water Pump	b	>5	2 to 5	<2

Percentage having well	a	>50%	25% - 50%	<25%
Percentage having toilet	a	>75%	50% - 75%	<50%
Percentage having food stamps	a	>50%	50% - 75%	>75%

DIRECT ENVIRONMENTAL IMPACT ASSESSMENT

	HT	LT
1. Approximate No. of trees required to be felled for HT Line/LT Lines * Rubber		
* Coconut		
* High value trees		
* Others		
2. Does the proposed HT Line/LT Lines run through a. Forest reservations (y/n)	N	N
b. Archaeological reserves (y/n)	N	N
c. Estate lands (y/n)	N	N
d. Paddy fields (y/n)	N	N
3. Will the proposed LT Lines require Widening of rural roads or pathways Yes/No No If yes approximate length (Km)		
4. Will the proposed substation require Clearing of existing Yes/No No If yea give nature of cleaning and extend :		

5. Proposed remedial measures (briefly) :

CHECK LIST FOR DISTRIBUTION SUB PROJECTS WITH CAPITAL INVESTMENT LESS THAN $ 100,000

1. Distribution Substations (Including Approach Roads) :

    1. Are any homes for more than 5 percent in all to be demolished/R\relocated? N
    2. Are more than 2 hectares of farmland or 1 hectare of forest/wetland to be converted to other use? Y/N N
    3. Are more than 5 high-value trees and/or 10 trees in all to be cut down? N
    4. Are PCBs and/or asbestos from old transformers to be disposed off? N
    5. Are prescribed safety measures not provided? N
    6. Is a freshwater source located at the site of the substation? N

2. Power Lines (Including Maintenance Roads) :

    1. Are any homes for more than persons in all to be demolished/relocated? N
    2. Are more than 2 hectares of farmland or 1 hectare of forest/wetland to be converted to other use? N

3. Are more than 15 high-value trees and/or 50 trees in all per kolometer of distribution line to be cut down? N

4. Are the power lines located on irrigation/perambulation paths of wildlife? N

5. Are the proposed power lines visible from generally recognized scenic sites/views? N

6. Are the proposed power lines within 50 meters of historical/heritage sites? N

    1. Do the proposed power lines pass through a protected area, old growth forest, or wildlife/bird reserve? N

    2. Do the proposed power lines require widening of more than 2 kilometers (km) of rural roads/pathways? N

7. Do the proposed power lines traverse irrigation tanks and/or canals? N

Note : A single "Y" in answer to the above questions will mean that an IEE should be prepared

CERTIFICATION

Name of the Scheme	IHALA HEWESSA MANANHENA
Scheme Ref. No.	IRAN/AG/WL/010

Investigated by :

Name	S.U. HEWAGAMA
Designation	ES
Signature	
Date of Investigation	

Recommendation of Planning Engineer

Signature

Appendix II

Authorization of Commercial Engineer

Signature

26 July 2000 ver 3.16

SUMMARY OF THE EVALUATION REPORT

SCHEME NAME : AGAPPOLA

SCHEME REF. NUMBER : CEP/RE5?HK/07

DISTRICT : N'ELIYA ELECTORATE : HANGURANKETHA

POTENTIAL CONSUMERS IN THE SCHEME

Large houses	15	Small commercial	5
Medium houses	31	Medium Industry	0
Small houses	64	Small Industry	0
Medium Commercial	0	Religious centres	0

NUMBER OF CONSUMERS IN THE INITIAL YEAR : 65

MV LINES	33KV	LV LINES 3 PHASE	5.05 km
	11KV	2 PHASE	0 km
		1 PHASE	0 km

MINIMUM VOLTAGES

Feeder 1	226	Branch 1	230	Branch 2	230	Branch 3	230
Feeder 2	226	Branch 1	226	Branch 2	230	Branch 3	230
Feeder 3	226	Branch 1	229	Branch 2	230	Branch 3	230

MAXIMUM DEMAND AT FIRST YEAR : 17.85 kVA

MAXIMUM DEMAND AT TENTH YEAR : 34.61 kVA

Appendix II

ECONOMIC INTERNAL RATE OF RETURN : 11.11%

INITIAL INVESTMENT : 4772.35 (000 Rs.)

COST OF LOSSES @ 10% DISCOUNT RATE : 88.54 (000 RS.)

PRESENT VALUE OF NET ECONOMIC BENEFITS : 393.13 (000 RS.)

AVG. LOSSES (kWh) YEAR 5 : 1.93% YEAR 10 : 3.32%

AVG. DOM. CONSUMP. (kWh) YEAR 5 : 40.4 YEAR 10 : 49.5
(per month per household)

AVG. ECNO.VALUE OF ELEC. CONSUMPTION : (Rs./kWh) 18.51

LOSS EVALUATION : DESIGN SATISFACTORY