

Supplementary Information for

Solar energy integration in off-grid communities: Empowering remote areas in Bangladesh for sustainable development

Khusnur Jahan Shapna¹, Jianfeng Li¹, Md Lokman Hossain ^{1,2,*}

¹Department of Geography and Resource Management, The Chinese University of Hong Kong, Hong Kong, China

²Department of Environment Protection, German University Bangladesh, Gazipur, Bangladesh

*Corresponding author: Md Lokman Hossain (lokmanbbd@gmail.com)

SI 1. Household survey questionnaire

Section A: Explanation of study objectives and consent taking

Demographics

Respondent name	Union, sub-district, district
Age	Gender
Education	Primary occupation
Family members	Secondary occupation
Children	Monthly income
School going children	Type of house

Respondent's household information

Gender	Age group (years)				
	Infant (< 1)	Child (1- < 18)	Adult (18- 59)	Elderly (≥ 60)	Person with disabilities
Male					
Female					

Section B: Information of Solar Home Systems (SHS)

1. When did you buy/receive the SHS?
2. If bought, how much was the cost?
3. If you receive the subsidized-SHS from NGOs/government, how much you pay?
4. Why did you buy SHS?

Purpose (multiple answer)	Lighting	Charging	Studying	Entertainment
	Shop-keeping	Tailoring	Poultry farm	irrigation

5. If multiple answers, which one is the primary use of SHS?
6. Is the capacity of your SHS enough for your intended use?
7. If not, do you want to increase the capacity of the existing SHS or buy a new one?

Section C: Impacts of SHS

8. Could you explain some benefits of SHS use?

Open ended with some hints	Night light	Comfort in summer	Prayer comfort	Always in connected with family
	No/less kerosene	Nighttime cooking	Hang around with neighbor	

9. Do you think SHS influences/enhances your family?

10. If yes, which aspects of SHS impacted your family?

Impacts (multiple answer)	Social safety	Education	Disaster response	Living standard
	Communication	Health	Economic benefit	Women empowerment

11. Do you think your children's education is improving?

12. If you are doing any alternative income generating activity, do you use solar energy for this purpose?

13. If respondent is male, whether your wife or any women in your family earn money from the activity associated with solar energy?

14. How many solar powered electric appliances does your family have?

15. What did you use for nightlight before installation of SHS?

16. How do you differentiate the advantages and disadvantages of earlier and current energy sources?

17. Do you need to use other energy sources (kerosene lamp or candle) apart from SHS? If yes, how much is your expenditure for other energy sources?

Section D: Challenges in using SHS

18. What type of problems did you face in using SHS?

Challenges (multiple answer)	Foggy weather	Panel cleanliness	Optimum production	Replacement cost
	Installation cost	Environmental concern	Repair time	Monthly payment (installment)

19. Where do you dispose of your defected appliances of SHS?

20. Do you think inappropriate disposal of this waste can harm your community and environment? If you, could you say some names of it?

21. How do you meet your energy demand because of the mentioned challenges?

22. Do have any suggestions for the government? Do you recommend SHS for others to use?

SI 2. Focus Group Discussion questionnaire

Section A: Explanation of study objectives and consent taking

Respondent name	Union, sub-district, district
Age	Gender
Education	Primary occupation

Section B: Information of Solar Home Systems (SHS)

1. Are you familiar with SHS?
2. How did your community meet the energy demand before the arrival of SHS?
3. Do you think SHS is important for life and livelihood?
4. What kind of benefit does SHS provide to the users?
5. How the society get benefits from SHS users?
6. Do you think students' school attendance and performance has been improving?
7. Is there any alternative income generating activities associated with SHS?
8. How do you see the women empowerment resulted from SHS-driven alternative income generating activities?
9. As your locality is a disaster-prone area, do you think SHS can be used for disaster preparedness, response and recovery?
10. Is there any business established in your union/village market associated with SHS use, repair, retail-shop, etc?
11. Why don't other people in your locality use SHS?
12. Do you think government/NGOs support to SHS can enhance lives and livelihoods of your communities?

SI 3. Key Informant Interview questionnaire

Section A: Explanation of study objectives and consent taking

Respondent name	Union, sub-district, district
Age	Gender
Education	Primary occupation

Section B: Information of Solar Home Systems (SHS)

1. Are you familiar with SHS?
2. How did your community meet the energy demand before the arrival of SHS?
3. Do you think SHS is important for life and livelihood?
4. What kind of benefit does SHS provides to the users?
5. How the society get benefits from the SHS users?
6. Do you think students' school attendance and performance has been improving? (KII with school-teacher).
7. Is there any alternative income generating activities associated with SHS? (KII with union parishad chairman).
8. How do you see the women empowerment resulted from SHS-driven alternative income generating activities? (KII with union parishad chairman).
9. As your locality is a disaster-prone area, do you think SHS can be used for disaster preparedness, response and recovery? (KII with disaster management committee member).
10. Are there any business established in your union/village market associated with SHS use, repair, retail-shop, etc? (KII with business community representative).
11. Why not other people in your locality use SHS? (KII with union parishad chairman, disaster management committee, business community representative, NGO representative).
12. Do you think government/NGOs support to SHS can enhance lives and livelihoods of your communities? (KII with union parishad chairman, disaster management committee, business community representative, NGO representative).