

Environmental Assessment Report

Initial Environmental Examination
Project Number: 42252
August 2010

BHU: Rural Renewable Energy Development Project

Prepared by the Department of Energy, Government of Bhutan for the Asian Development Bank (ADB).

The initial environmental examination is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature.

Royal Government of Bhutan

Asian Development Bank

Technical Assistance

Project Number: 7318-BHU

Preparing the Rural Renewable Energy Development Project

INITIAL ENVIRONMENTAL EXAMINATION (DRAFT)

TRASH YANGTSE ACCELERATED RURAL ELECTRIFICATION SUBPROJECT

MARCH 2010

Contents

I.	EXECUTIVE SUMMARY.....	6
II.	POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK.....	11
A.	Policies relevant to the project	11
B.	RGOB Environmental Clearance Procedures	14
III.	DESCRIPTION OF THE PROJECT	16
A.	Project description.....	16
B.	Project budget and implementation	17
IV.	DESCRIPTION OF THE ENVIRONMENT	23
A.	Physical Resources	23
B.	Ecological Resources.....	26
C.	Economic Development.....	30
D.	Social and Cultural Resources	31
V.	ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES ...	33
VI.	ANALYSIS OF ALTERNATIVES	48
VII.	INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION.....	50
A.	Project stakeholders.....	50
B.	Consultation and disclosure to date	50
C.	Future consultation and disclosure.....	51
VIII.	GRIEVANCE REDRESS MECHANISM	53
IX.	ENVIRONMENTAL MANAGEMENT PLAN	56
A.	Summary of environmental impacts and mitigation measures	56
B.	Environmental Monitoring Plan	56
C.	Institutional Arrangement	64
D.	Environmental management and Monitoring Costs.....	64
X.	CONCLUSION AND RECOMMENDATION.....	66

A. Project Findings	66
B. Recommendations	67
C. Conclusion	67
REFERENCES	68
ANNEXURES	70
Annex 1: List of species found in project area	70
Annex 2: Summary of Public Consultation	73
Annex 3: Photos from project sites	78
Annex 4: Copy of MOU between BPC and Affected Persons	82

TABLES

- Table 1: Summary of distribution lines
- Table 2: Improvements in rural electrification infrastructure proposed in Trashhi Yangtse
- Table 3: Mean maximum temperatures from 2006-2008
- Table 4: Length of MV line through various forest types
- Table 5: Number of trees to be felled along each distribution line
- Table 6: Length of MV line through various types of private land (length in m)
- Table 7: Comparison of alternatives
- Table 8: Details of public consultation conducted in Bumdeling Gewog
- Table 9: Summary of public consultation conducted in Bumdeling Gewog
- Table 10: Length of distribution lines and affected persons/beneficiaries
- Table 11: Total length of feeder through government and private land
- Table 12: Environmental Impacts and Mitigation
- Table 13: Environmental Management Plan
- Table 14: Cost of implementing EMP and monitoring

MAPS

- Map 1: Proposed Distribution lines under this sub-project
- Map 2: Map of Bhutan, Trashhi Yangtse and Bumdeling
- Map 3: Protected Areas in Bhutan
- Map 4: Map showing location of Distribution lines in BWS

FIGURES

- Graph 1: Total Rainfall received each month (2006-2008)

Glossary of Bhutanese Terms

Chathrim:	Act, statute
Chiwog:	A unit under a Gewog
Chuzhing:	Irrigated/Wetland
Dungkhag:	Sub-district
Dungpa:	Sub-district administrator
Dzong:	The administrative center as well as religious centre in the district
Dzongdag:	District administrator
Gewog:	Block/ County
Gup:	Head of a Gewog
Kamzhing:	Dryland
Lhakhang:	Temple
Rabdeys:	Monastic bodies in Dzongs other than Punakha and Thimphu
Sokshing:	Area where dried leaf litter is collected to make manure
Tsamdro:	Pasture land
Tseri:	Shifting cultivation, Slash and burn cultivation
Tshechu:	Religious festival
Tshogpa:	Elected representative of a Chiwog

Abbreviations

ADB:	Asian Development Bank
BAP:	Biodiversity Action Plan
BHU:	Basic Health Unit
BPC:	Bhutan Power Corporation
CS:	Community School
DFO:	Divisional Forest Officer
DoF:	Department of Forest
DoE:	Department of Energy
DYT:	Dzongkhag Yargay Tshogchung
EA:	Environmental Assessment
EA:	Executing agency
EC:	Environmental Clearance
EIA:	Environmental Impact Assessment
FYP:	Five Year Plan
EMP:	Environmental Monitoring Program
FNCA:	Forest and Nature Conservation Act
HH:	Household
HSS:	Higher Secondary School
IA:	Implementing Agency
H&S:	Health and Safety
JSWNP:	Jigme Singye Wangchuck National Park
LSS:	Lower Secondary School
LV:	Low Voltage
MoA:	Ministry of Agriculture
MSS:	Middle Secondary School
MTI:	Ministry of Trade and Industry
MV:	Medium Voltage
NCD:	Nature Conservation Division
NEC:	National Environment Commission
NES:	National Environment Strategy
NGO:	Non-Government Organization
NWFP:	Non-Wood Forest Product
O & M:	Operation and Maintenance
ORC:	Out Reach Clinic
PA:	Protected Area
PM:	Project Manager/Park Manager
PPE:	Personal protective equipment
PPTA:	Project Preparatory Technical Assistance
PS:	Primary School
RE:	Rural Electrification
RGOB:	Royal Government of Bhutan
RMNP:	Royal Manas National Park
RNR:	Renewable Natural Resources
RoW:	Right of Way
RSPN:	Royal Society for the Protection of Nature
TOR:	Terms of Reference
TNP:	Thrumshingla National Park

I. EXECUTIVE SUMMARY

1. Bestowed with abundant water supply from fast flowing rivers over mountainous terrain, Bhutan has long recognized the potential to generate hydropower generation and the possibility of enhancing its GDP from the energy sector. Since 2007, hydropower generation has quadrupled to 1,489 MW and is further expected to increase to 1,602 MW by the end of the Tenth Plan and possibly reach 10,000 MW by 2020 (GNHC, 2009). At the same time, the guiding philosophy of Gross National Happiness dictates that development planning essentially focuses on fulfilling the fundamental objectives of achieving broad based sustainable growth and improving the quality of life while ensuring the conservation of the natural environment.
2. The overall objective of the Energy Sector for the Tenth Plan is the sustainable development and efficient use of energy resources for socio-economic development. While hydro-power development will provide environmentally clean, safe and reliable energy as well as contribute to GDP, providing electricity aims to improve the quality of life and living standard of rural communities, while contributing to self reliance.
3. In its “Vision 2020, Electricity for All” the Royal Government of Bhutan’s (RGOB) pledged to provide 100% electrification by 2020. Accordingly the Rural Electrification Master Plan targeted 85.6% electrification under the 10th Five-Year Plan (FYP: 2008-2013). Since then, the new democratically elected government has placed even higher priority on the goal of achieving its vision of “Electricity for All” and has brought forward the target completion to 2013.
4. To achieve the above target, the Accelerated Rural Electrification Project (ARE) was initiated by the RGOB to ensure that all remaining households are provided with either on-grid or off-grid/solar electrification. When this project is completed, the on-grid electrification is expected to cover 88% of the total number of Households in the country while the remaining 12% will be provided electricity through off grid means.
5. Under the ARE project a total of 8957 households in 478 villages from nineteen Dzongkhags (Thimphu, Paro, Punakha, Wangdue, Ha, Chukka, Samtse, Dagana, Gasa, Trongsa, Zhemgang, Tsirang, Pema Gatshel, Mongar, Lhuentse, Trashy Yangtse, Trashigang, Samdrup Jongkhar and Sarpang) that can be connected through on-grid electrification have been identified. From these the RGOB has requested further ADB assistance in providing power to 5172 rural households in 6 dzongkhags. ADB has helped Bhutan expand rural electrification (RE) via four loans since 1995, covering over 20,000 households (HH).
6. Bhutanese law and ADB policy require that the environmental impacts of all development projects are identified and assessed as part of the planning and design process, and that action is taken to reduce those impacts to acceptable levels. This is done through the environmental assessment process, which has become an integral part of lending operations and project development and implementation worldwide. The Implementing Agency BPC has produced the EIA required by national legislation for the sub-project.

7. IEEs for all each sub-project has been prepared according to ADB Safeguard Policy (2009) and the Environmental Assessment Guidelines (2003) as well as the RGOB Environmental Assessment Act (2000).

8. This document is the IEE for Trashi Yangtse RE subproject. It is one of six IEE documents describing the environmental impacts and mitigation of all subprojects proposed by the Project Preparatory Technical Assistance conducted in 2009-2010. These documents were prepared from January 2010 - April 2010 by one Domestic Environmental Specialist via input of six months. These Environmental Impact applications have been endorsed and approved by the EA.

Sub-Project description.

9. Through the Rural Electrification Project, the BPC aims to electrify 370 rural households and 19 institutions including 2 schools, 1 Basic Health Unit, 4 Rice Mills and 12 religious facilities in Bumdeling gewog. These rural populations presently do not have access to power supply. This will assist the RGOB towards their target of providing electricity to all citizens by 2020; and it should also generate significant improvements in environmental and social conditions in the rural areas.

10. There are three 33kV Medium Voltage distribution lines that will provide electricity to 31 villages, which lie in the buffer areas, as well as inside the multiple use areas of Bumdeling Wildlife Sanctuary, Trashi Yangtse Dzongkhag. 85% of the distribution lines will traverse forested area while the remaining will traverse private land (5.6km). The main type of forest along the transmission line is broadleaf forest and scrub forest from altitudes of 1000-2800m. Most villages are located along the hill slopes and topography along the proposed alignment ranges from gentle to medium. All the distribution lines cross the Kulong Chu and Womina Chu once, to connect villages across the river.

Sub-Project Findings.

11. This is a rural electrification sub-project that is expected to generate significant improvements in environmental and social conditions in the rural areas. These include:

- Improvements in the quality of life from the availability of electricity;
- Reductions in production of greenhouse gases from burning of kerosene and wood;
- Long-term reductions in environmental damage from the logging of trees for fuel;
- Improvements in health from reduced exposure to smoke and other pollutants;
- Reduction in time spent collecting and transporting firewood;
- Opportunities for alternative livelihoods, generating socio-economic benefits;
- Contributing to the long term goals of Conservation of the RGOB.

12. The EIA evaluated the impacts due to the location, design, construction and operation of the project. Minimal negative impacts are expected from the project on Climate, Geology and seismology, Industries and Tourism. This is because the short-term production of dust is the only effect on atmosphere, excavation will not be large

13. The most significant impact of this project is due to project location and design. This is because the target villages are located inside and in the buffer of Bumdeling Wildlife Sanctuary. The protected area system in Bhutan was established to protect important and diverse ecosystems, but local communities were already living in these rural areas long before the PA system was established. As a result all the Protected Areas in the country include settlement areas. A number of parks are in the process of creating various zones with where there are distinct levels of management objectives and different levels of permissible developmental activities. For instance, the primary habitats identified by the park are designated as core areas where no developmental activities are permitted. On the other hand, settlement areas, although interspersed with forest may be designated as multiple use zones, where developmental activities are permitted after review by park management. Due to selection of these villages and beneficiaries, there is no alternative to the impact due to location and design.

14. Impacts from Construction are those expected once the project implementation begins. These impacts have been segregated under Physical, Ecological, Development and Social and Cultural impacts. Impact on forest resources are considered Moderate because a 12m RoW will be cleared in broadleaf forest where approximately 1400 trees will be cut along 32km of forest land. This amounts to approximately 23 trees per km. This negative impact, albeit a permanent one is not expected to be significant because a) all 3 feeders are aligned close to the foot trails which are the main access routes to the villages and used daily by local people; and b) the long term effects of electrification of villages is expected to outweigh the short terms impacts of felling along the right of way of the distribution line.

15. All other physical impacts such as those on air quality, noise, soil stability and erosion, natural drainage and aesthetics are assessed as Not Significant, mainly because these impacts are limited temporarily to the construction period and spatially to the immediate surrounding along the distribution lines and excavation sites at pole locations. Another reason is the remote location of the target villages, surrounded by forest to absorb any dust or noise as well as buffer aesthetic impacts.

16. Bumdeling Wildlife Sanctuary is famous as it has one of the few areas where the endangered species like the Black-necked crane visit each year from Tibet. The environmental impact of the project on the crane is not considered significant because most of the target villages are located far away more than 200m from the roosting and feeding areas of the bird. Also, Sanctuary staff that are responsible for the conservation and management of the cranes are aware of the areas often used by the cranes. During the project location and route selection, they have been actively involved as part of the field survey team with the BPC staff to determine the route alignment, so that sensitive habitats could be avoided. Apart from this species, no endangered wildlife was sighted in close proximity to the route alignment. This is probably because the forest where the MV lines are located is disturbed and degraded to some extent by the local residents.

17. In terms of social impacts, the project will bring about positive socio-economic impacts by providing electricity for lighting, cooking and heating for individual households as well as government and religious institutions. A number of secondary

18. A number of religious sites have been included in the ARE project so that these can derive many positive benefits of electrification. Impact on agriculture and private land, facilities and social and cultural resources are also considered not significant because the quantity of private and agricultural land that will be affected is very small and dispersed and the harvested crop is mostly used for self consumption. Impacts on facilities and social and cultural resources can be mitigated through prior planning, scheduling of work, consultation with local communities and by giving due consideration to local priorities. Visual impacts are generally considered significant where they affect large numbers of people, and that will not be the case here because of the remote nature of these areas.

19. Negative social impacts from the project may result if external workers are brought in from outside the gewog as this can sometimes cause social problems and there is also the risk of diseases like HIV/AIDs, Swine flu from socializing with contract workers as they may not have been properly screened for diseases. This impact is not expected to be significant because in any village work will probably be conducted by one or two small teams of 5-10 workers each, so individual locations will not experience a large influx of foreign workers. This can be mitigated through proper training and precautions, setting of rules and regulations for workers by contractors.

20. The Impacts from Operation and Maintenance are mainly those that occur from keeping the RoW clear of vegetation to reduce the risk of short-circuits and occasional repairs to address power outages and other problems during maintenance. Impacts on physical resources, ecological resources and economic development are not significant because RoW clearance is not as intensive and will not cause as much destruction and disturbance as during the construction Phase. Also, impacts will only occur during maintenance works and will be limited spatially to the same area as the construction Phase. This will not involve any major changes to the newly constructed project.

21. The main hazard to people from the operation and maintenance of the completed RE system is the risk of electrocution. This is a danger to rural consumers unaware of the risks of electrocution and to BPC workers conducting repair and maintenance work. BPC has already gained ample experience in implementing past Rural Electrification projects in all Dzongkhags, and staff are well aware of the risks of such projects. Also, there are established procedures for repair and maintenance of distribution lines which is being practiced very efficiently elsewhere.

22. Mitigation measures during the Construction Phase include those to reduce the impacts of forest cover, endangering vulnerable species, or reducing physical impacts such as air, noise, and drainage and land stability. Reducing ecological impacts requires timing the construction work during periods when the Black-necked cranes are not in Bumdeling valley and following the prescriptions and guidance of PA staff after close consultations with them. The Contractor should be required to provide training to raise the awareness of all site workers and staff, prohibit any hunting, fishing or similar

23. Efforts should still be made to reduce the level of social disruption where possible, and to achieve this, the Implementing Agency should consult all affected communities in advance to inform them of the purpose, nature, duration, extent and timing of all work in and around their village and plan the work to avoid sensitive times.

24. During Operation and Maintenance, mitigation of impacts are easier than those during construction Phase as this involves following the procedures already laid out in the Operation and Maintenance (O&M) manuals and well as the Health and Safety (H&S) Manuals. BPC should also conduct regular training for all BPC staff to improve operation and maintenance works, improve supervision of field workers during all phases as well as conduct community education programs to raise the awareness of all target households before and after they are connected to the grid regarding the dangers of electricity, and the precautionary manner in which house systems should be used.

II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. Policies relevant to the project

25. There are a number of laws and regulations that include elements that may apply to RE subprojects, depending upon their specific nature and location. These include the following:

a. Electrification Act 2001

26. Rural Electrification is strongly promoted in the Electricity Act, 2001. Part 7, Section 61.1 states that “The Minister Shall undertake to promote, support and provide rural electrification programmes through public and private sector participation in order to

1. achieve equitable regional distribution access to electricity;
2. maximize the economic, social and environmental benefits of rural electrification subsidies;
3. promote extension of the grid and development of off-grid electrification;
4. promote renewable energy.”

b. Forest and Nature Conservation Act (FNCA) 1995:

27. The Forest Act (1969) was the first environmental legislation in Bhutan and brought all forest resources under government custody to regulate utilization. This was repealed with the enactment of the FNCA in 1995, which allows community stewardship of forests, and aims to provide protection and sustainable use of forests, wildlife, and related natural resources. Schedule 1 lists those wild animals and plants that are given full protection under the Act and many of these may be found in areas through which rural electrification lines may pass. The FNCA establishes that all forests in Bhutan are Government Reserved Forests (GRF), and prohibits any development activity in these areas except with a permit.

c. Forest and Nature Conservation Rules

28. In Bhutan “Forest” means any land and water body, whether or not under vegetative cover, in which no person has acquired a permanent and transferable right of use and occupancy, whether such land is located inside or outside the forest boundary pillars, and includes land registered in a person’s name as *Tsamdrog* (grazing land) or *Sokshing* (Woodlot for collection of leaf litter)ⁱ. The Country currently has 72.5% forest cover. In 1974, a new Forest policy was promulgated wherein it was declared that at least 60 percent of the country must remain under forest cover for all times. This first declaration was followed in the next few decades by a series of positive initiatives by the RGOB to bring forest areas under protected area status.

29. Under powers established by the FNCA, the Ministry of Agriculture promulgated the FNCR in 2000, which was revised in 2006. Amongst other things the FNCR allows for:

- Allotment of land and land rights in GRF;
- Prohibitions, restrictions and concessions in GRF;
- Transport and trade of forest produce;

- Declaration and administration of protected areas;
- Protection of wildlife and use of certain wild species;
- Prevention of forest fires, land clearance, and activities potentially impacting soil, water and wildlife resources;
- Enforcing penalties for offences related to these and other aspects of the FNCR.

30. As RE subprojects are likely to involve some of these activities, formal “No Objection” from the Department of Forests (DoF) will be required.

31. Since 2008, there are now five National Parks, four Wildlife Sanctuaries and one Strict Nature Reserve in Bhutan. These protected areas have conservation policies that state that all proposed development projects within the boundaries of the protected area will be subject to an EIA under the jurisdiction of the NEC. This initially included buffer zones outside the protected areas, but was extended to include Biological Corridors in 2006 by an addendum to the FNCR.

32. The Forest and Nature Conservation Act of 1995 defines "**Protected Areas**" as any national park, conservation area, wildlife sanctuary, wildlife reserve, nature reserve, strict nature reserve, research forest or critical watershed. The Act gives the Government the power to declare any land in the country to be a protected as defined above for the preservation of areas of natural beauty, protection of biological diversity, management of wildlife, conservation of soil and water and related purposes. If any private registered land is taken under this section, compensation or alternative land rights shall be provided as per the Land Act.

33. Biological Corridors (BC) are defined as “areas set aside to connect one or more protected areas, which shall be conserved and managed for the safe movement of wildlife.” Although BCs do not have the same status as protected areas, activities such as new settlements, quarrying and mining, and leasing of land for grazing are prohibited. All other development activities, including construction of roads, electricity transmission and distribution lines, or any other structures, require a permit from DoF and an EC application to NEC, supported by an EIA.

34. Since more than 79% of the population live in the rural areas and forests cover 72.5% of the land area, it is impossible to separate communities from protected areas. In Bhutan, people were residing inside the PAs before these areas were declared ‘protected’. Although extra effort was made to exclude settlements while rationalizing the location of the national parks, invariably some settlements had to be included in the protected areas, primarily to accommodate the ecosystem representativeness and adjustment of physio-geographical boundaries. Recognizing the fact that it would be a traumatic process to remove the residents out of the national parks by force or legislative means, a more benign policy of working with the local people has been adopted through balancing conservation goals while also providing for the socio-economic development of rural residents.

d. Land Act 1979 (revised 2007)

35. The Land Act 1979 which provides the basis for land tenure in Bhutan was revised in 2007 to streamline many provisions in the Land Act. One major change was

Powers over land management have now been decentralized to local authorities like the gewog Tshogdue, Dzongkhag Tshogdue, and Thromdes. These are empowered to resolve land dispute, endorse land transaction and conversion of land categories more efficiently.

36. Under this Act, there are provisions for requisition of land by the government, if it is required for the benefit of the country. In such cases, the affected person will be compensated with substitute land from the same Dzongkhag or given cash compensation depending on the land classification as per the prevailing land compensation rate determined by the Act. If a house is acquired, compensation is paid on the basis of an evaluation carried out by a qualified engineer appointed by the competent authority.

e. RGOB Decentralization Policy 2002

37. The Dzongkhag and Gewog Yargay Tshogdue Acts were implemented in 2002 to support the Government's decentralization policy and empower locally elected community bodies (DYTs and GYT) with the authority and responsibility to plan and implement development programmes and activities, including those related to environmental management. Through this legislation the DYT is able to:

- Make recommendations on activities with major environmental impacts;
- Designate and protect sites and monuments of cultural or historical interest;
- Designate and protect areas of special scenic beauty or biodiversity, such as Dzongkhag parks and sanctuaries;
- Establish and enforce regulations to control noise pollution;
- Prohibit construction of structures within 50 ft of highways;

The GYT is able to establish and enforce regulations to:

- Control and prevent pollution of air, soil and water;
- Ensure safe disposal of waste and adequate standards of sanitation;
- Conserve and protect water resources, including rivers, streams, springs and lakes; and
- The GYT also has custody of communal lands and community forests and can prevent encroachment onto land and forest.

38. Thus development projects such as Rural electrification can be subject to regulation promulgated by the local authorities, especially during project implementation.

B. RGOB Environmental Clearance Procedures

a. Environmental Classification

39. The environmental classification of projects is decided by NEC on receipt of the Environmental Clearance (EC) application submitted by the proponent. There are three possible outcomes:
- i) NEC may grant Environmental Clearance on the basis of the EC application if the application contains sufficient information and it is clear that the proposed development will not have significant negative environmental impacts;
 - ii) NEC may deny Environmental Clearance on the basis of the EC application if the application contains insufficient information and it is clear that the proposed development will have significant negative environmental impacts that cannot be suitably mitigated; and
 - iii) If the EC application contains insufficient information on the likely nature and extent of the environmental impacts of the project or the manner in which they will be mitigated, NEC will determine that an EIA is required.

b. Preparation of EC Application and Environmental Impact Assessment

40. The requirements of the EC application are set down in sectoral guidelines that were revised with ADB assistance in 2006; and for RE projects the relevant document is entitled "Application for Environmental Clearance: Guidelines for Transmission and Distribution Lines".

41. The information required for environmental clearance is very specific, and in all cases includes information on the applicant, the project, funding agency, the affected environment, potential impacts, mitigation, monitoring and public consultation. In the case of power transmission and distribution lines information on impacts includes details of affected: areas, types, uses and tenure of land; houses/infrastructure; protected areas; wildlife; cultural and heritage sites; etc. BPC surveyors collect most of the data during route surveys when they conduct land use and ownership surveys along proposed transmission/distribution line routes, and by consulting local communities and the Department of Forest.

42. There are three key elements of the EC application. These include the provision of signed 'No Objection Certificates (NOC)' from all affected stakeholders/households, Forestry clearance from the Department of Forest and Dzongkhag Administrative Approval.

43. The Environmental Assessment Act requires the proponent to prepare Terms of Reference (ToR) for the proposed EIA, which is submitted to NEC for their review. NEC will either approve the proposed ToR, or suggest amendments, which the proponent is required to incorporate before the revised scope is approved. The proponent is then required to conduct the EIA and submit the report as described in the ToR.

c. Approval process

44. A key element of the national Environmental Clearance application process is the provision of signed No Objection Certificates (NOC) from stakeholders that are specified in the guidelines, including all affected households, Department of Forest, and other relevant Government Agencies (Dept of Culture, Nature Conservation Division, etc). The National Environment Commission does not consider an EC application that does not contain the necessary NOC and Forestry Clearance. The latter for example is not granted by DoF until a forestry official has surveyed the whole length of any proposed route and has physically marked those trees that may be felled to create the RoW. The NEC in turn requires that all proposed routes are field examinations are conducted by the District Environment Officer and recommended by the District Environmental Committee. This process ensures that the least environmentally disruptive routes have been selected. This elaborate process of revisiting the proposed sites by different agencies ensures that all possible options have been explored, and the most suitable one adopted.

III. DESCRIPTION OF THE PROJECT

A. Project description

45. The sub-project is located in Trashigang Dzongkhag, in eastern Bhutan. Electricity will be provided to 30 villages in Bumdeling gewog/block, The project activities compose of three basic elements:

- (i) Medium Voltage lines to convey electricity from an existing distribution line to individual village,
- (ii) Pole mounted transformers in or near villages to reduce the voltage from 33 KV to the 230 or 415 V required for domestic supply, and
- (iii) Service lines supplying electricity to individual consumers.

46. Under this sub-project, three 33 kV MV lines will run for a total of 37.6km via an estimated 753 poles. These will connect to 30 transformers located in or near villages to be electrified, and from these a 35km LV network of 230 or 415 V will supply electricity to 370 households and 19 facilities in Bumdeling gewog.

Table 1: Summary of distribution lines

No	Gewog	Length of MV Line (km)	Length of LV line (km)	Villages	Beneficiaries
1	ARE3P1	20.6	12.82	17	190
2	ARE3P2	5.18	6.37	5	62
3	ARE3P3	11.83	15.49	8	137
	Total	37.6	34.68	30	389

47. The MV lines will carry 33 kV via three strands of aluminium conductors, mounted on poles located at intervals of around 50-70 m, depending on topography and terrain. Poles are of cast iron, with an iron cross-piece at the top on which insulators are mounted to hold the conductors. Section Poles have two legs and are located every 200-250 m, and between these are located a series of single-strut Interval Poles, to support the conductors and maintain them the requisite 5.8 m above ground level. Poles are 10 m in length and are held in the ground via earth and concrete foundations, 1.6-1.9 m in depth.

48. Conductors are either bare or covered. Bare conductors are of the Aluminium Conductor Steel Reinforced (ACSR) type, which consist of several strands of aluminium wire wound around a central steel core. Covered conductors are of the Aerial Bundle Cable (ABC) type, in which insulated strands of aluminium are wound together and covered with poly-ethylene insulation. Covered conductors are used for LV lines in inhabited areas, but may also be used for MV lines in locations where it is necessary to reduce the width of the Right of Way (RoW) cleared on either side of the line. In forested areas all vegetation is cleared from a specified width around the transmission or distribution line to prevent interruptions in supply from falling trees, or branches touching the line. For bare conductors the RoW is 12 m and for covered conductors it is 4 m (because the insulation reduces the risk of outage).

49. MV lines cross mainly forested areas, but routes have been selected to run along existing farm roads, tracks and pathways where possible, because in these areas there has already been some clearance of trees and other vegetation, so this reduces the amount of new felling required. No clearance is required where routes cross public or agricultural land, and at farm sites, poles will be located on field boundaries where possible, to reduce the loss of productive land.

50. Transformers are ready-made components imported from overseas, which are located with associated components (junction box, fuses, lightning arrestors) on double-strut poles inside or outside the villages to be electrified. Transformers have an outer metal casing and measure around 1 x 1 x 0.25 m for the LV lines, and the junction box is slightly larger.

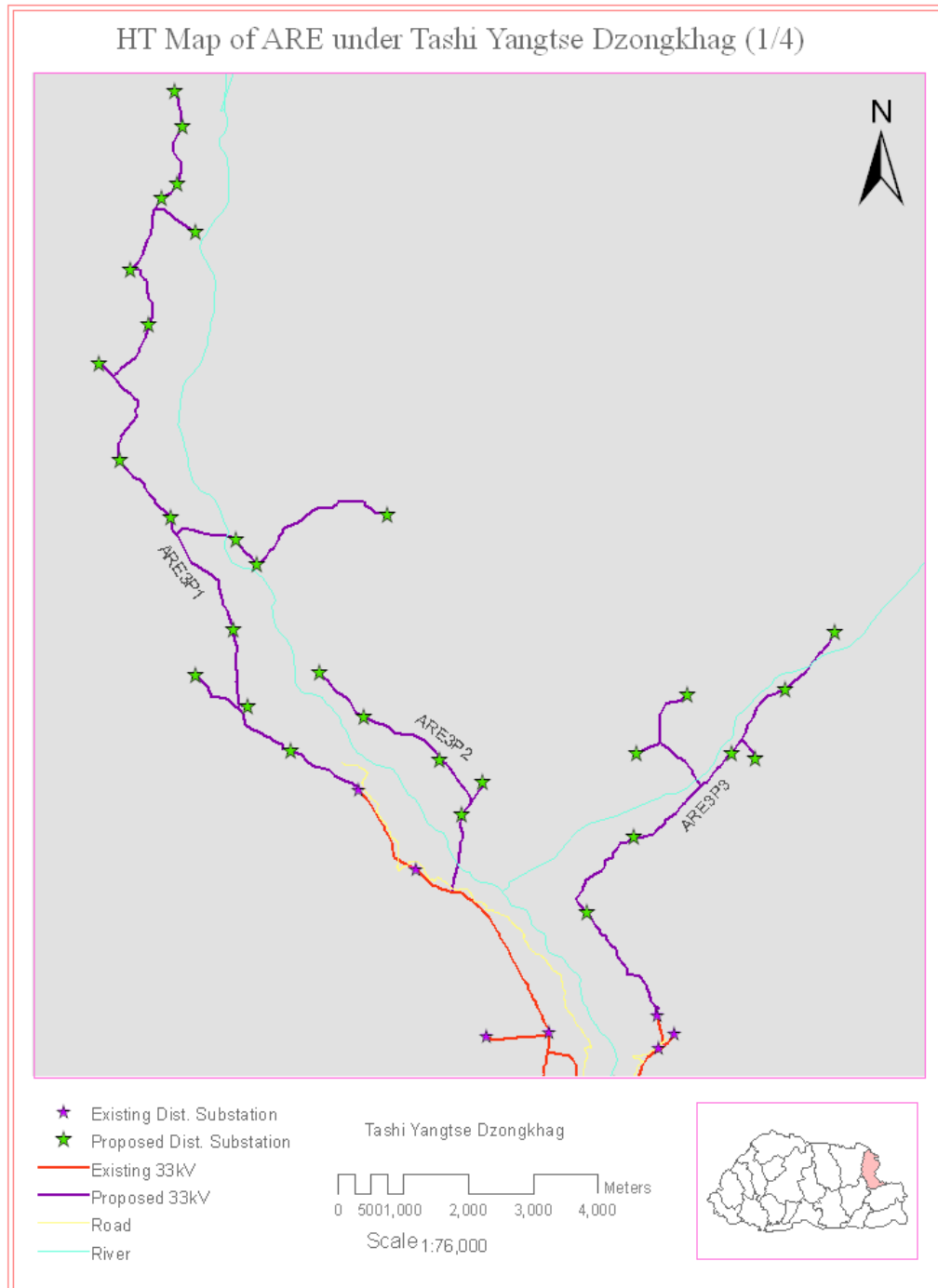
51. A local network of single LV covered conductors (230 or 415 V) will run from each transformer to the supplied village or villages, and branches will run to individual consumers (households, facilities or industries), terminating at a service meter on an outside wall. Conductors will be held on single-strut poles, located alongside the unpaved roadways and at other unobtrusive locations, at intervals of approximately 50 m.

B. Project budget and implementation

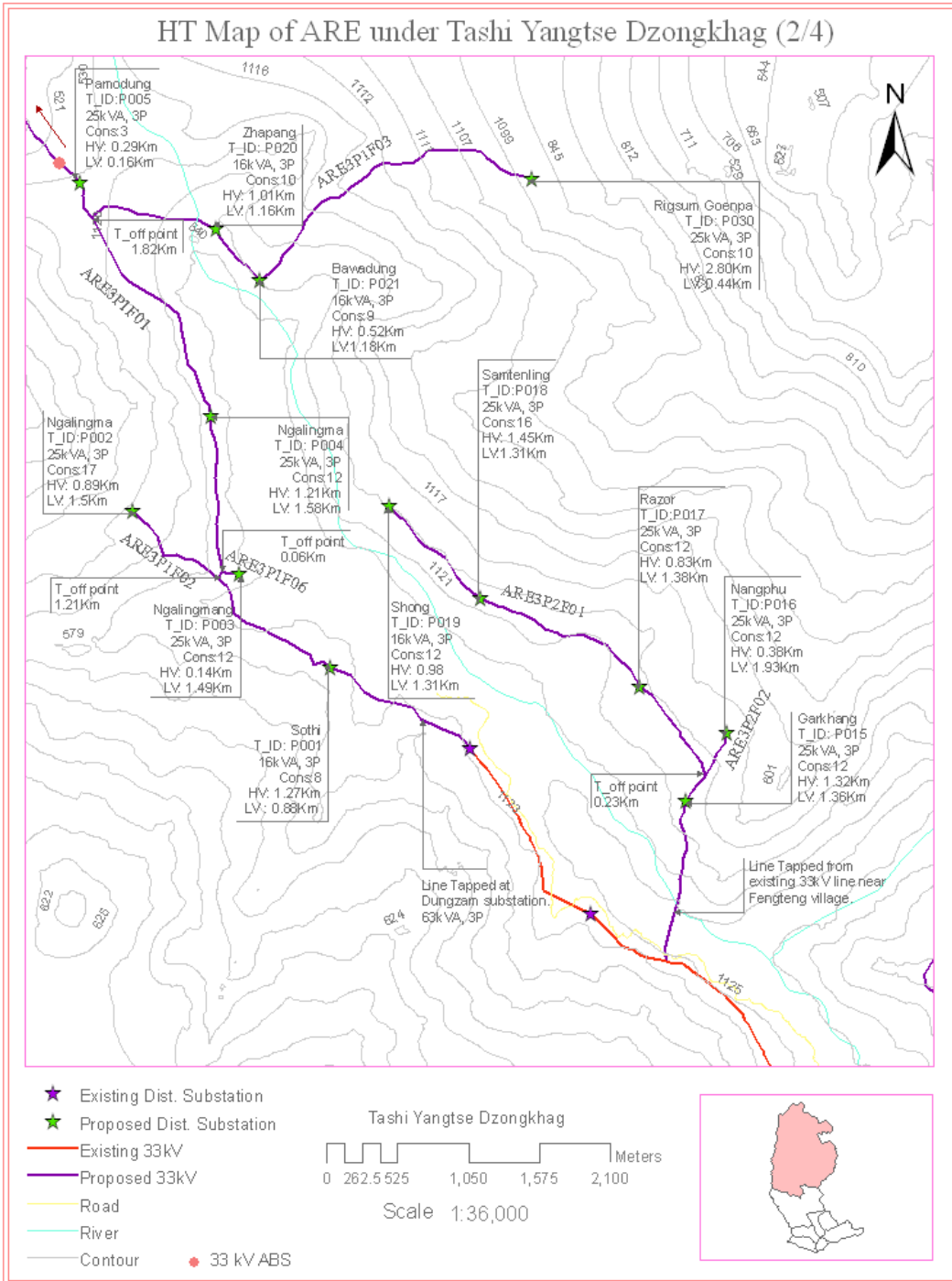
52. Detailed design of the project began in 2009 and should be completed by end of 2010, after which construction will be initiated. All the work should be completed by the end of 2013.

53. The project cost is presently estimated at Nu. 63 million. This is an initial estimate and may change depending on change in prices in material cost as well as changes in regional and local transportation cost. Construction of this subproject should take approximately one year

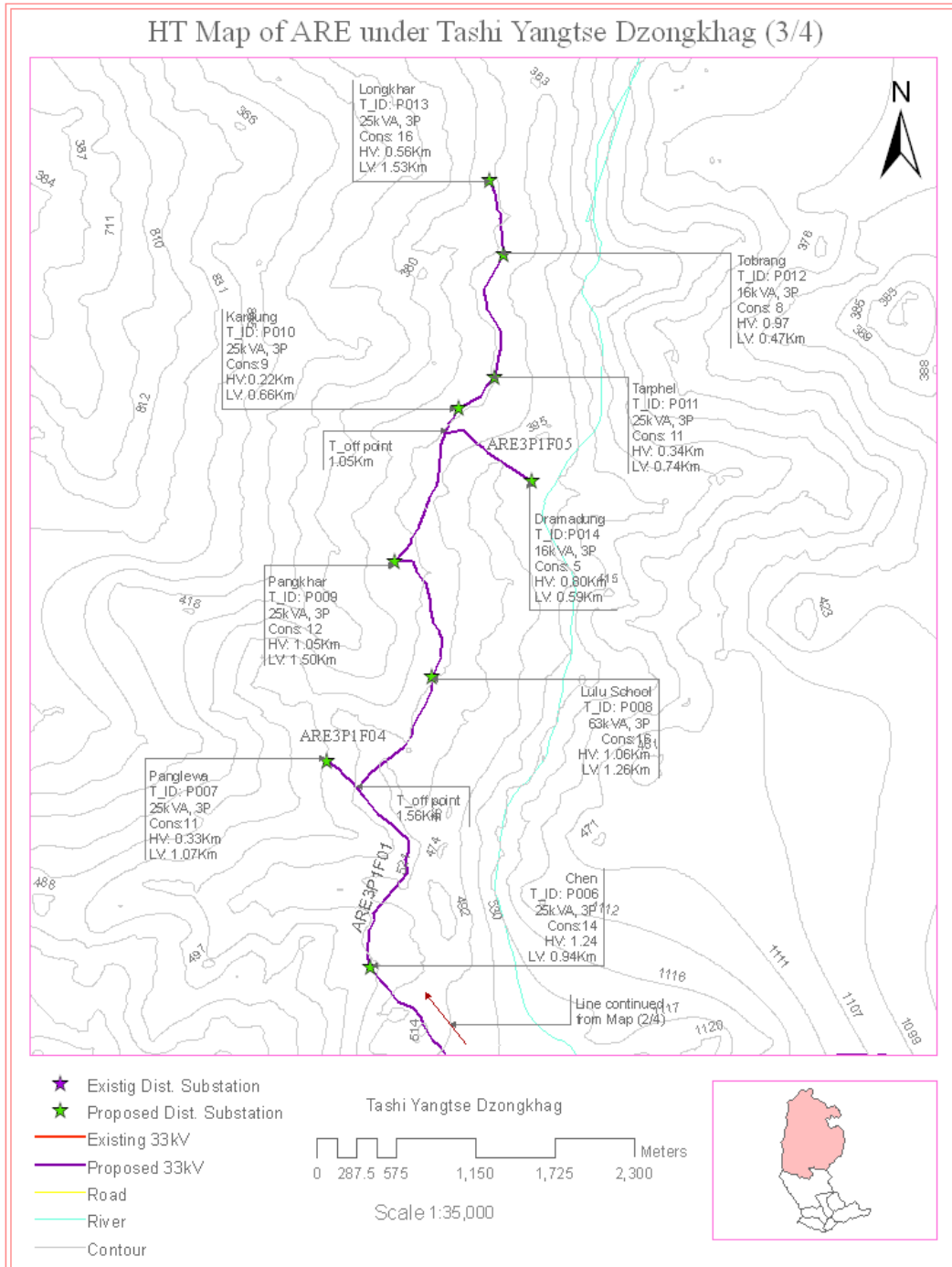
Map 1/4



Map
2/4



Map
3/4



Map 4/4

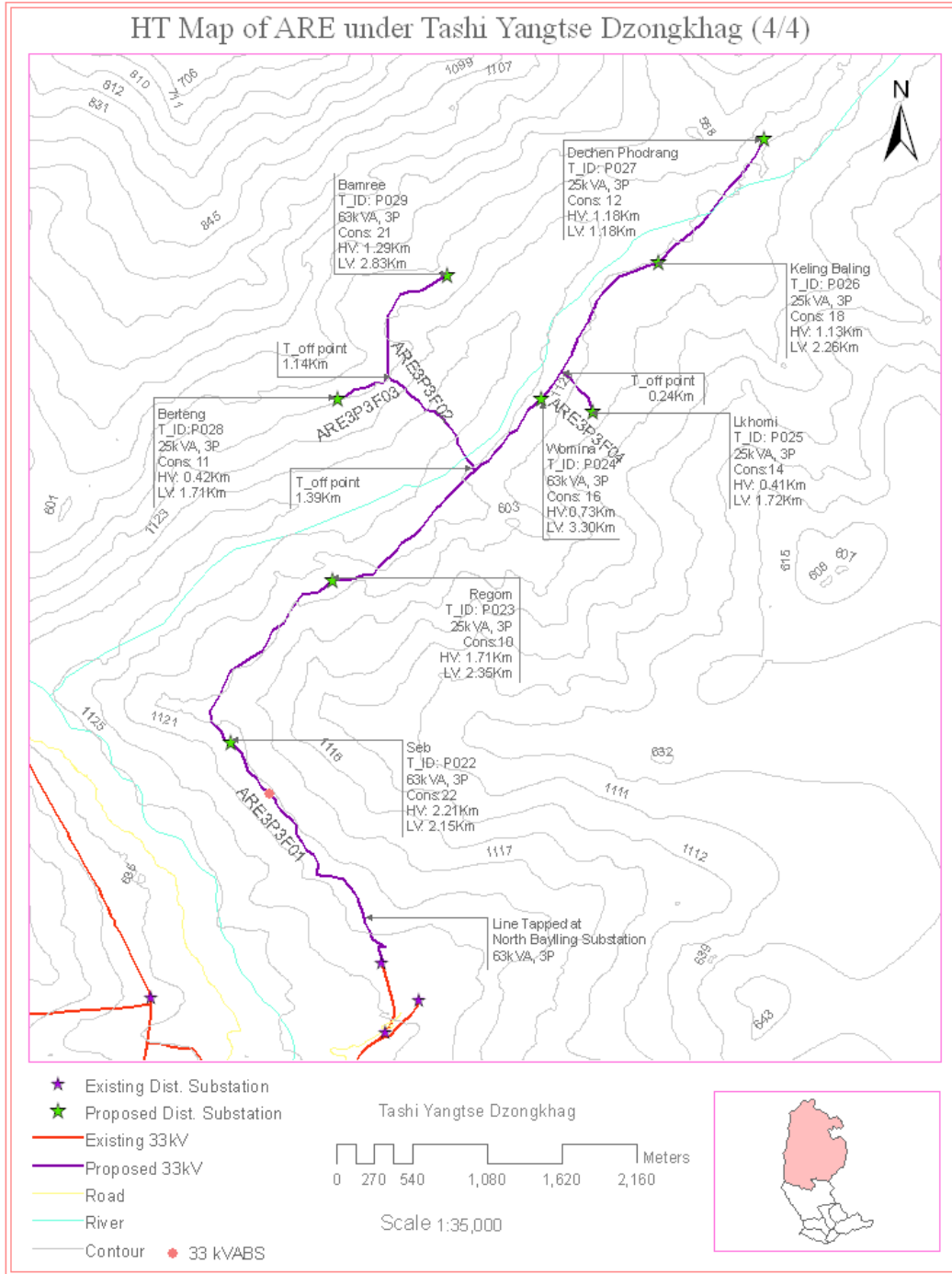


Table 2: Improvements in rural electrification infrastructure proposed in Trashi Yangtse

Infrastructure	Description	Location
<p>Medium Voltage (MV) Line to Convey electricity from an existing distribution line to a transformer.</p> <p>(see map 1 on previous page)</p>	<p>Three strands of 33 kV aluminum conductors (power cables), strung between iron poles located every 50-70 m. Poles are 10 m long and project 8 m above the ground, and are of cast iron with a cross-piece at the top containing insulators to which conductors are attached. Section Poles have two legs and are located every 200-250 m, and between these are single-strut Interval Poles. Bare conductors contain aluminum strands wound around a steel core; and covered conductors consist of insulated strands of aluminum, wound together inside polyethylene insulation.</p> <p>Feeder ARE3P1: MV length = 20.6km, 6 sub-feeders; 412 poles Feeder ARE3P2: MV length =5.18km,2 sub-feeders; 104 poles Feeder ARE3 P3: MV length=11.83k m, 4 sub-feeders; 237 poles</p>	<p>MV lines normally run through forest, farmland and public land, and routes are aligned along existing farm roads and paths where possible. On farm land, poles will be located at field boundaries where possible.</p> <p>All feeders are located in Bumdeling gewog.</p> <p>Feeder ARE3P1: located inside BWS; See maps 1 /4, 2/4 and 3/4 Feeder ARE3P2: located inside BWS; See maps 1 /4, and 2/4 Feeder ARE3 P3: Located inside and buffer of BWS; See maps 1 /4, and 3/4</p>
<p>Transformer to reduce voltage from 33 kV in the MV line to 230 or 415 V in the LV Line.</p>	<p>Pre-manufactured electrical component in metal casing, approximately 1 x 1 x 0.5 m. Numbers per feeder;4</p> <p>Feeder ARE3P1: 17 transformers Feeder ARE3P2: 5 transformers Feeder ARE3 P3: 8 transformers</p>	<p>Generally one transformer per electrified village, on a pole inside or outside the village. Villages as follows:</p> <p>Feeder ARE3P1: Sothi/seb; Naglingmang (phuncheling), Phamodung, Chen, Lulu,Pangkhar, Kardung, Tarphel, Longkhar, Ngalingma,Zhapang,Bawadung, Rigsum Goenpa,Panglewa,Dramadung, Naglingmang, Feeder ARE3P2: Garkhang, Razor, Samtenling, Shong, Nangphu Feeder ARE3 P3: Seb, Regom, Womina, Keling Baling, Dechenphodrang, Bamree, Bertang, Lkhomi</p>
<p>Low Voltage (LV) Line to Convey electricity from a transformer to each individual consumer</p>	<p>Generally single strand of LV covered conductors (230 V for single phase, 415 V for three phase), mounted on single poles at ca 50 m intervals. Each line terminates at a service meter on an external wall of the consumer (household, facility, industry). Length of LV line:</p> <p>Feeder ARE3P1: 12.82km Feeder ARE3P2: 6.37km Feeder ARE3 P3: 15.49km</p>	<p>Total number of connections:</p> <p>Feeder ARE3P1: 182HH, 1 S, 6L, 1R, Feeder ARE3P2: 57HH, 2L,3R Feeder ARE3 P3: 131HH,1S,4L,1B</p>

HH- households, S- school, L-Lhakhang, B-Basic health unit, R-Rice mill, G-Geog office

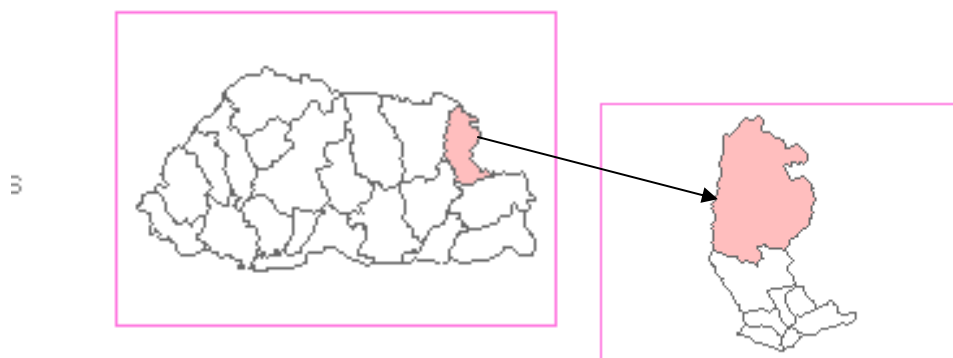
IV. DESCRIPTION OF THE ENVIRONMENT

A. Physical Resources

1. Location

54. Trashy Yangtse Dzongkhag is located in the north-east of Bhutan 550km from Thimphu. It lies between Lhuentse to the west, Mongar at its south west and Trashigang Dzongkhag to the south. In the north it borders with Tibet and towards the east it borders with Arunachal Pradesh, India. In the past it was part of Trashigang Dzongkhag but in 1992 it became a separate Dzongkhag coinciding with the Seventh Five Year Plan. It now covers an area of approximately 1438 sq.km and is subdivided into 8 gewogs namely Bumdeling, Yangtse, Khamdang, Thetsho, Tongzhang, Yalang, Jamkhar and Ramjar. The new Dzong completed in 1997 is unlike other Dzongs where both the monk body and administrative offices are housed together. The new settlement of Trashy Yangtse is near the Chorten Kora, 3km from the old Dzong.

Map 2: Map of Bhutan, Trashy Yangtse and Bumdeling



Source: BPC Limited

55. The project site is in Bumdeling gewog which is under the management of Bumdeling Wildlife Sanctuary. Bumdeling is one of the largest gewog in terms of area in the Dzongkhag. It consists of 18 main villages with 363 households, covering an area of about 850.7 square kilometres. The Gewog shares its boundary with the Tibetan Region of China and Arunachal Pradesh of India. The Gewog has population of around 3219 (registration office), with male 1653 and female 1566. The density of population is 3.8 per sq.km.

2. Topography, geology and soils

56. The elevation of the Dzongkhag ranges from 1200 m to 5400 m above sea level and most of the land (about 23.4%) falls under the altitude of 2400-3000m.

57. Trashy Yangtse Dzongkhag falls under the greater Himalayan sequence and the valleys along the Kulong chhu form a variant of the North-South valleys and ranges. Although the valleys are quite deeply cut, with steep convex side slopes and narrow V shaped valley floors the topography is not as steep as other Dzongkhag like Lhuentse. Bumdeling gewog is an

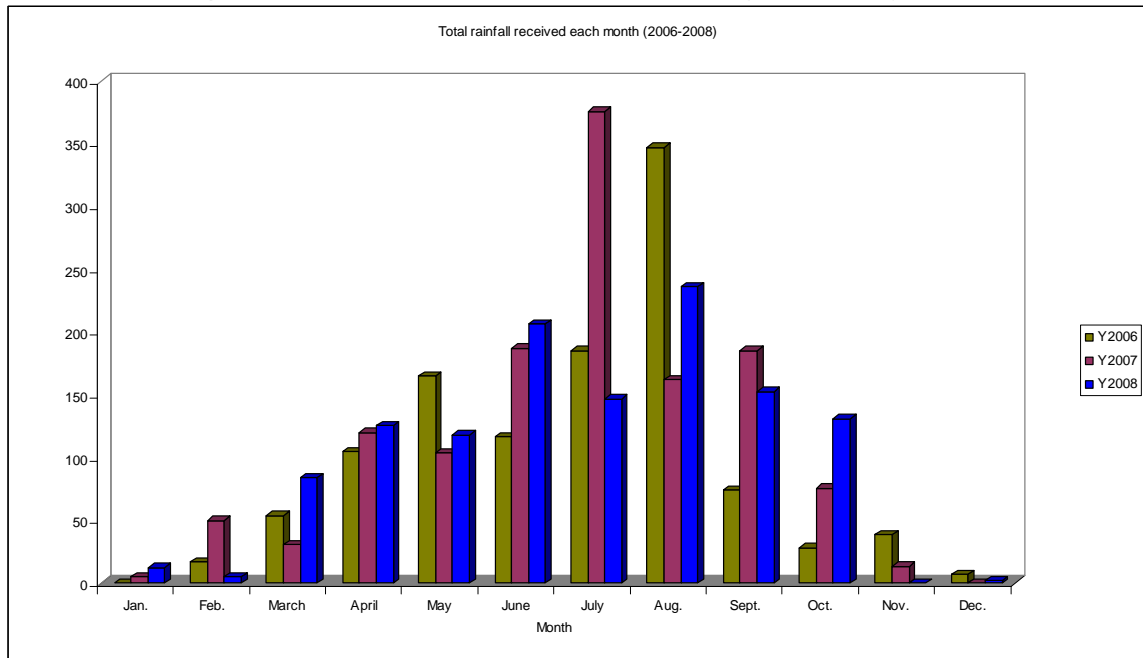
58. The soil types are temperate soils, stagnogleys, podzols, and alpine meadow soils (Norbu et al, 2003).

3. Climate

59. Trashy Yangtse lies in the temperate zone and mostly experiences warm summers and cold winters throughout most of the Dzongkhag. Parts of Bumdeling and Yangtse gewogs at elevations above 2600 m experience much colder winters. Humidity is highest during summer monsoons.

60. The amount of rainfall across each gewog varies with altitude but on an average the annual rainfall for the past three years has been 1222 mm. Rainfall is highest during the monsoon months of June- September during which 65% of the rainfall is received.

Graph 2: Total Rainfall received each month (2006-2008)



61. Temperatures also vary according to the altitudes. The mean maximum temperature ranges from 13.26° C in January to 24° C in August and minimum temperature drop down to 2.96° C during winters. The table below shows the mean maximum and minimum temperatures for the past three years.

Table 3: Mean maximum temperatures from 2006-2008

Year	Jan	Feb	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
2006	14.9	17.5	17.4	20.2	21.9	22.6	24.5	25	22.3	21.3	16.9	14.1
2007	12	14.1	19	19.5	23.4	23.3	22.6	24	-	20.8	17.8	14.6
2008	12.9	14.8	18.4	20	21.9	22.8	24.1	23.1	23	21.3	17.5	15.2
Mean minimum temperature from 2006-2008												
Year	Jan	Feb	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
2006	3.1	9.5	7.1	9.2	12.9	16.5	17.5	16.7	15.9	10.2	7.5	5.1
2007	3.6	4.4	6.7	9.6	13	16.3	17.4	17.3	16.4	13.7	5.8	3.2
2008	2.2	3.1	8.6	10.5	13.2	16.7	17.6	-	16.8	10.2	4.8	6.2

Source: Meteorology Division, DoE

4. Air Quality

62. There are no data available on the air quality of Trashi Yangtse, but as there is such a low population and no heavy industry in the dzongkhag, then it is reasonable to assume that air quality is likely to be generally good. There should thus be low levels of pollutants associated with heavy industry, such as oxides of nitrogen (NO_x) and sulphur (SO_x), and exhaust emissions from vehicles, such as lead. However, as wood and kerosene are the main fuel for cooking and heating in non-electrified rural areas, then there may be localised increases in levels of smoke, soot and carbon dioxide in these areas at times when fuel usage is highest (in the evening and during the winter). Almost certainly within houses people are likely to be exposed to high levels of these pollutants.

63. In addition there are health impacts from the use of fire wood and kerosene lamp that causes eye and respiration problems. Use of electricity will contribute to the reduction of in-house air pollution from Bhukharis and fuel wood use

5. Hydrology

64. The main river is the Kulong chhu flowing through the centre of the BWS that originates from glaciers in the northern part of the Dzongkhag. This is joined by a tributary called the Gongri chhu at Doksum. To the west is the Khoma Chhu and to the south is the Sheri Chhu. Major tributaries of the Kulong Chhu are Singphel Chhu, the Lamzang Chhu, the Langmala Chhu, the Womenang Chhu and the Dongdi Chhu. The Khoma Chhu starts at the confluence of the Singye Dzong Chhu and the Rongmateng Chhu. Because of the distinct dry and monsoon seasons and their greatly differing rainfall characteristics flow in the rivers varies widely throughout the year. Most rivers swell to high levels in the summer when they carry large volumes of water and sediment brought in by the monsoon rains, but flow reduces dramatically during the dry season, when much of the sediment is left on the dry riverbanks. Most of the larger rivers are perennial but also prone to flash floods or debris flows.

65. There are a number of glacial lakes in the north with rock sills rather than moraine walls holding the water.

B. Ecological Resources

1. Protected Areas

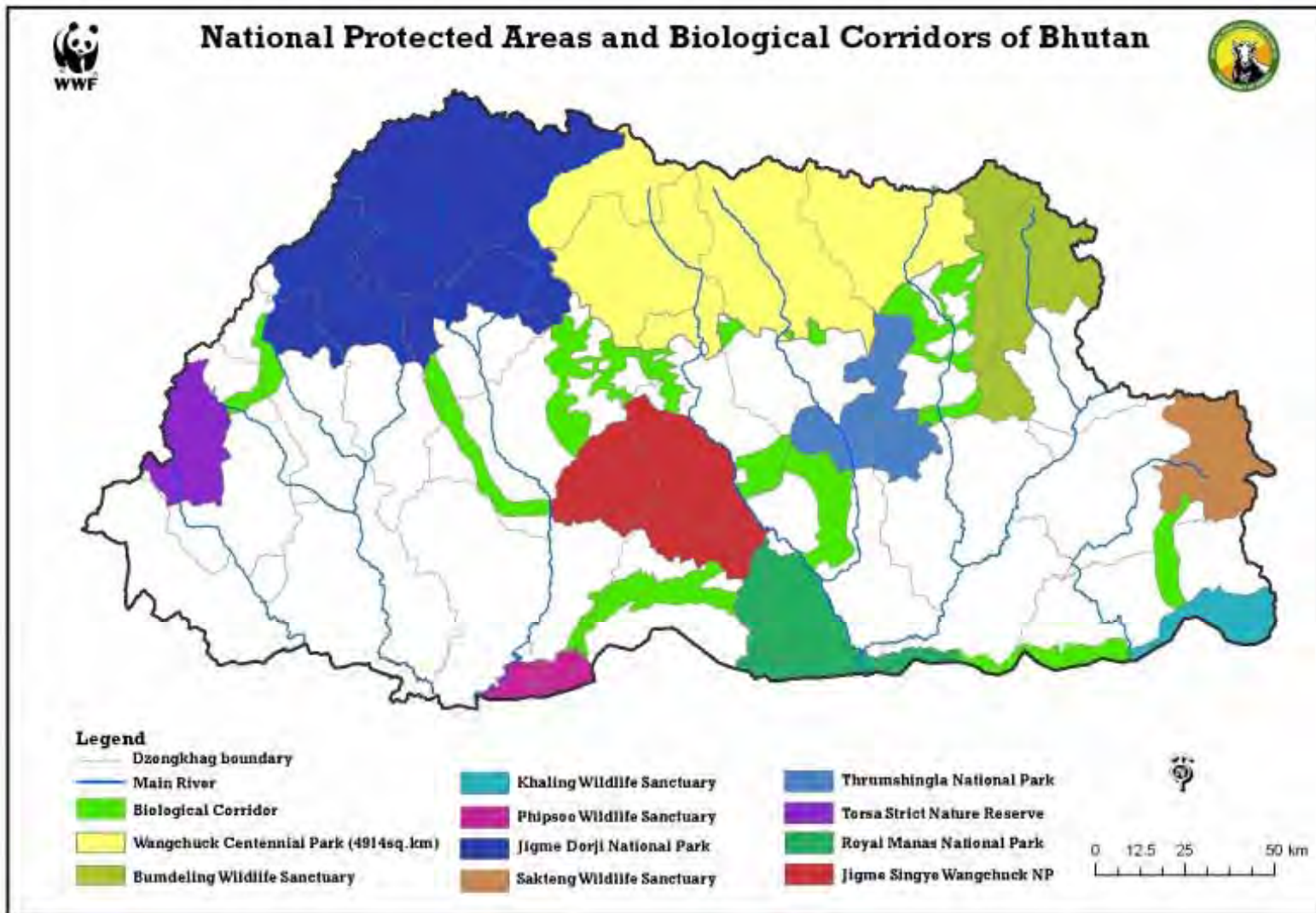
66. Bhutan is one of the top 10% of countries with the highest species density in the world (number of species per unit area), and has the highest proportion of forest cover and protected areas in Asia¹. To date around 5,500 species of vascular plants have been recorded, over 770 species of birds and 165 species of mammal, with many being endemic to Bhutan. This probably represents a fraction of the species that are present, as Bhutan remains one of the least explored countries in the world. The rich biodiversity is due to the remote nature, geographical relief and climatic heterogeneity of the country, and its location between temperate Eurasia in the north and the tropical Indian subcontinent in the south.

67. There are five National Parks in Bhutan, four Wildlife Sanctuaries and one Strict Nature Reserve, shown in Map 3. The protected area system was initially created in the 1960's. However, these were mostly confined to the northern and southern regions of the country, so the PA system was revised to encompass all the different ecosystems and habitats in the country, resulting in 9 protected areas covering 26.5% of the country's land area. In 1999, biological corridors were identified to link the various protected areas adding another 9% to the PA system. In 2008, a new park was created that further increased it to 48%. Now, Bhutan has one of the largest areas under protected area status.

68. The Bumdeling wildlife sanctuary named after Bumdeling gewog includes this entire gewog, as well as parts of Trashi Yangtse, Lhuentse and Mongar Dzongkhags, covering an area of 1545 sq. km and 420 sq.km of buffer area. The project area is located inside and within the buffer (5km) of the Bumdeling Wildlife Sanctuary.

69. The sanctuary was officially gazetted in 1995 and became operational in the year 1998 to protect large areas of the Eastern Himalayan ecosystems, from warm broadleaved forest to Alpine Ecosystems.

¹ MOA (2002): Biodiversity Action Plan for Bhutan. Ministry of Agriculture, RGOB



Map 3: Protected Areas in Bhutan

2. Rare or Endangered Species

70. Bumdeling Wildlife Sanctuary contains a variety of species, several of which are endangered or vulnerable, according to the International Union of Nature Conservation (IUCN), and others that are protected under the RGOB Forest and Nature Conservation Act (1995). At higher altitudes endangered species like Snow leopard (*Uncia uncia*), Red panda (*Ailurus fulgens*), Tibetan blue sheep (*Pseudois nayaur*) and Himalayan musk deer (*Moschus chrysogaster*) have been reported in management plans. Endangered species like Tigers (*Panthera tigris*) have been reported to occur in areas south of the project site. These species however, do not occur at the project sites which are at lower altitudes at the project site. Vulnerable species that have been recorded within the project site include Common Leopard (*Panthera pardus*) and Himalayan Black Bear (*Selanarctos thibetanus*).

3. Forest

71. About 76.6% (110,095 hectares) of the total area of the Dzongkhag is covered by forest. There are three broad forest types, at higher altitudes lie the Fir forest and alpine scrub, scree and meadows. At mid elevations is the Temperate Conifer forest and at lower altitudes is the Broadleaf forest. Out of 76.6% forest cover, 31.4% is coniferous forest while 36% is broadleaf forest, and the remaining is scrub forest.

72. In the areas likely to be affected by the project, the distribution lines will run through mainly warm broadleaf forest at elevations from 1950m to 2900m. Broadleaf is the richer forest habitat in terms of biodiversity with many species of evergreen and deciduous trees, and a rich under-storey of shrubs, herbs and grasses, plus fungi, epiphytes and ferns. Common trees are *Quercus griffithii*, *Quercus lanata*, *Schima wallichii*, *Macaranga denticulata*, *Castanopsis hystrix*, *Castanopsis indica*, *Alnus nepalensis*, *Rhus chinensis*, *Cinnamomum spp*, *Erythrina spp*, *Lyonia ovalifolia*, *Rhododendron arboreum*, *Viburnum cylindricum*, and *Pinus wallichii*. The middle storey comprised mainly of *Michelia spp.*, *Rhododendron spp.*, *Berberis*, *Boehmeria spp*, *Pteridium aquilinum*, *Rubus ellipticus*, *Rubus nepalensis*, *Brassaiopsis mitis*, *Solanum spp*, *Cirsium spp*, *Sambucus adnata*, *Girardiana diversifolia* and many others. Common ground layer species included *Nepeta lemniopsis*, *Remusatia hookerana*, *Galium aparine*, *Cyperus cyperoides*, *Arisaema tortuosum*, *Agrostis conyzoides*, *Cynoglossum furcatum*, *Gnaphalium affine*, *Pteridium* and *Colocasia fallax* among others. A list of species recorded during the field visit is included in the Appendix. Towards Rigsum Goenpa, broadleaf forest is interspersed with pine trees (Coniferous forest) but otherwise until the Goenpa, the vegetation is mostly broadleaf forest.

4. Wildlife

73. Vulnerable species that have been recorded within the project site include Common Leopard (*Panthera pardus*), Himalayan Black Bear (*Selanarctos thibetanus*), while commonly found species include the Capped langur (*Trachypithecus pileatus*), Serow (*Capricornis sumatraensis*), Goral (*Naemorhedus goral*). Others like the wild pig (*Sus scrofa*), Porcupine (*hystrix indica*), Sambar (*Muntiacus muntjak*) and Macaque (*Macaca assamensis*) are considered pests by farmers as they cause much destruction to crops.

74. During the field visit, a Barking deer (*Muntiacus muntjac*) and Capped Langur (*Trachypithecus pileatus*) were sighted but apart from this, there were no evidences of wildlife along the alignment. A list of species known to occur in the project area and/or observed during field surveys for this project is shown in Appendix 2.

75. The most significant species within the project site is the totally protected species, the Black-necked crane. The Bumdeling Wildlife sanctuary was created to protect the winter Habitat of the Black-necked Cranes (*Grus nigricollis*), classified as Vulnerable by IUCN. The cranes are listed under Schedule I and also totally protected under the Forest and Nature Conservation Act of Bhutan, 1995.

76. Each year the cranes visit Bhutan from late October-November until February-March, when they return back to the Tibetan Plateau, where they breed. The cranes forage in wetlands on paddy and other grains and insects in the Khulong chhu valley between Zhapang and Chorten Kora at Beechen, Bayleng, and Wominang and sometimes further South in Gangkhar under Tomzhangtsha gewog or above Yangtse town and Bayling. The main roosting areas however are at Ngalimang and Lamdrawoong in areas where there is minimal human disturbance.

77. Since 1992, Sanctuary staff and Dzongkhag authorities have been monitoring the number of cranes as well as their arrival and departure from Bumdeling valley. The table below shows the number of black-necked cranes in Bumdeling from 1992-2002. At present the population appears fairly stable. Annual fluctuations may be mostly related to conditions in the breeding area in Tibet.

78. The biggest threat to the Black-necked cranes in this area is the reduction of its roosting and feeding sites due to floods in the valley. The roosting area was destroyed 35 years ago when the Kulong Chu over flooded its eastern bank destroying the roosting area north of Dungzam. The newly established roosting area north of the confluence of the Nagpolachu and the Kholongchu was again damaged during the 1994 flood and consequently during the 2003 flood. The high flowing rivers also caused massive damage to many paddy fields, covering these in sand and reducing the feeding area of the cranes.

79. There are several large gravel islands between the present roosting site and Zhapang. The Park and Dzongkhag staff have been rehabilitating the roosting area since 2000, through creation of channels to keep water flowing around the roosting area to provide better roosting conditions and to keep out predators, removal of debris, sand, logs, boulders and gravel deposited by rivers in roosting sites, reclamation of wetlands, river protection works to prevent flooding of paddy fields. Other activities include fencing to minimize disturbance by trespassers traversing through the roosting site, restriction on cultivation of winter crops, discouraging use of barbed wires. To provide incentives for farmers who have to make compromises for the conservation of the cranes, the Park promotes Integrated Conservation and Development Programmes such as trail development, mule track construction, renovation of religious institutions, supply of corrugated galvanised iron sheets for roofing, supply of Jersey bulls, construction of wooden bridges and establishing pilot vegetation gardens. The park is also actively pursuing targeted awareness educational programs aimed at local people and students that provide information pertaining to the conservation of the cranes (BWS management Plan).

80. There are 296 species of birds recorded in the Sanctuary that provides diverse Habitat for globally threatened species or restricted range species such as the Rufous-necked Hornbill *Aceros nipalensis*, Pallas's Fish Eagle *Haliaeetus leucoryphus*, Chestnut-breasted Partridge

C. Economic Development

1. Land use, industry and agriculture

81. 7.8% is under agricultural production of which dry land (Kamzhing) farming is the most prominent followed by wetland and to a minor extent Tseri (shifting cultivation). Paddy, maize, wheat and buckwheat are the most widely grown crops. Other crops cultivated include millet, mustard, potatoes, beans and other vegetables. Horticultural crops include orange, banana, peach, guava, walnut and apples in a few places. The major cash income is from sale of potatoes, chilli, beans and oranges. Trashy Yangtse is famous for its chilli which is in high demand since it ripens earlier and also due to its unique taste. Some families cultivate Oak mushroom (shitake) while others are engaged in harvesting of lemon grass for essential oil. Others supplement their cash income by weaving and working as contract workers along the highway, farm road construction sites or government building construction sites.

82. About 3.3% of the total land area is under Tsamdro (pasture) and almost 91% of the households own livestock. Livestock mainly comprises of Nublang and Mithun cattle, Jersey cattle, and to a lesser extent pigs, poultry, horses/mules and donkeys. Livestock products help in supplementing the household income while cattle are an important source of farmyard manure and draft power.

83. The remaining 12.3% of land falls under settlement which comprises of the main town as well as scattered villages. Less than 1% is covered by highland areas, rocky areas, glacier/snow and water spread.

84. There are no large scale industries in the Dzongkhag. The Zorig Chusum has established a centre at Yangtse where training is provided on traditional arts and crafts. The Dzongkhag has a number of cottage industries and is famous for its exquisite handmade wooden bowls (*Dapas*) and cups which are in high demand by tourists as well as Bhutanese alike. There are also a number of handmade paper units producing deysho, which is also sent to markets in the western part of the country.

2. Infrastructure

85. The Dzongkhag Administration and all other government offices (BWS headquarters, General Hospital, BPC, RNR, Banks etc.) are located at Yangtse town. This town has expanded from a few government buildings to a small town with over 50 shops, restaurants, three guest houses (2 are government owned), housing quarters for government employees and private houses.

86. Individual shops have garbage disposal bins outside and waste collected on a tractor on certain days a week and taken to a waste disposal site. Doksum, a small town serves as a business centre for 6 of the 8 gewogs in Yangtse.

87. 87.1% of the Dzongkhag population has access to safe drinking water supply outside the house. The remaining 12.9% use water from the springs, rivers and ponds. Almost 90% of the population also have toilet facilities, which is an enclosed pit latrine outside the main house. Like most rural Dzongkhags, there is no centralized sewerage system. The housing census study conducted in 2005 indicated that only 29 % of the population used electricity while 76% relied upon firewood as the main source of energy. According to the BPC Master plan (2005), the on-grid electrification percentage in 2007 was expected to cover 59% of the population. With the new project it is expected that by the end of the 10 FYP, only 1 % of the population will be left for off-grid electrification. Gewogs electrified include Yangtse, Khamdang, Toetsho, Yallang and a few households in Bumdeling.

3. Transportation

88. The total road network in the district is 115.3 km and this comprises of 40 km district road, 37 km feeder road, 5.2 km urban road, 22.6 km farm road and forest road. Compared to national figures, this is only 2.54% of the total road network in the country.

89. Access to Trashhi Yangtse Dzongkhag is by the highway that branches north from the main east-west highway that runs to Trashigang in the east. This highway terminates in the town. There is also a blacktopped road connecting the town of Tsenkharla from highway in Zangpозor, which is about 8 kilometres from Doksum. The district highway passes through Jamkhar and Yangtse gewogs, while Tomzhangtshen is connected through a rural access road to Gom Khora. There are farm roads connecting Khamdang, Ramjar, and Bumdeling and only Teotsho and Yallang have no access to Farm roads. Here, the most common mode of transportation in the remote village is still by foot, often walking more than 6 hours to reach their village or on horseback.

90. Private buses and taxis ply frequently between Yangtse and Trashigang, which is 40 km away.

4. The tourist industry

91. Trashhi Yangtse is not a popular tourist destination like other Dzongkhags such as Bumthang or Paro. Still, it draws tourists to because of its two famous religious sites and festivals at the Chorten Kora and Gom Kora. These religious festivals in fact draw thousands of Indian visitors from Tawang to the two Koras to partake in the festivities and religious ceremonies along with the local population.

92. Other visitors are government employees, consultants or expatriates and donors working with the Dzongkhag Administration, agriculture or conservation sector. Tourists that come mainly to see the traditional bowl and paper industry or visit the BWS return to Trashigang on the same day, due to lack of lodging facilities.

D. Social and Cultural Resources

1. Demography

93. The Dzongkhag is comprised of eight Gewogs with a total of 117 villages and 3,294 households. Most of the people of Trashhi Yangtse speak Sharchop, but other dialects commonly used also include Zalakha, Kurtoep and Khengpa. Dzongkha is well understood by the people but not frequently spoken.

2. Health, education and other facilities

94. Trashy Yangtse Dzongkhag has a literacy rate of 54.97% with 21 schools. Currently there are 5029 students enrolled in these schools with 174 teachers with a pupil-teacher ratio of 28.9. In the more remote gewogs, the students have to travel for hours to school and are often provided with food at the school. The Table shows the type and number of schools in the Dzongkhag

95. The Dzongkhag has 1 General hospital, 8 Basic health units (BHU's) and 20 outreach clinics in the district which have successfully achieved more than 90% immunization coverage. Almost 90% of the households have visited health facilities.

96. There are about 15 Renewable Natural Resources (RNR) facilities mainly agriculture extension centres as well as an agricultural farm where seeds are propagated for distribution to the farmers. The Ministry of Agriculture also promotes the construction of irrigation channels to facilitate farming.

3. History and culture

97. Trashy Yangtse has a lot of historical and cultural sites. So far a total of 74 religious structures (Lhakhangs, Goenpas and Chorten) have been listed with the special commission of which 61 Lhakhangs are owned by the public. The Trashy Yangtse Dzong was originally called Dongdi Dzong and was built by Gongkar Gyalpo but during the Tibetan invasion, the people of Donglum fled and the Dzong fell into ruins. Later on, it was renovated by Tertön Pema Lingpa and named Trashy Yangtse.

98. There are two Koras/festivals each year where people circumbulate the chorten to pray for long lives and also to ward off evil; one called the Namgang Kora and the Dhapa Kora. This Koras take place in the first Month of the Bhutanese Lunar Calendar.

99. The Chorten Kora at Yangtse is the replica of the Boudhanath Chorten in Kathmandu, Nepal built by Lam Ngawang Loday of Rigsum Goenpa to subdue the local Demons. The other significant site is the Gomphu Kora Lhakhang that dates back to 850 AD where it is believed that Guru Rinpoche subdued an evil spirit chasing it all the way to Tibet. Guru Rinpoche meditated for three months in the cave after he had suppressed the demon that came out of the cave as a serpent and was subdued again. The imprint of the Guru's hat and body are left on the rock which could be seen today, and also the imprint of snake as well.

100. Other significant sites of Guru Rinpoche that are equally revered are Rigsum Goenpa, Dechenphodrang and Pemaling. Each Lhakhang has a special significance and its own history.

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. Environmental effects due to Project Location and Design

101. Most of the impacts that occur in this project are due to project location and design. This is because these impacts would not occur if an alternative location or design such as off-grid methods of electrification, by the use of solar panels, had been proposed. However this is not a valid comparison because off-grid methods were considered during the planning stages and rejected because they only provide sufficient power for lighting, and have a high maintenance and environmental cost because of the need to replace and dispose of the batteries. The one impact that is clearly a result of both design and location is the ecological impact of clearing the RoW through the Protected Area.

102. The villages to be electrified are located in the buffer and multiple use zone of BWS. Administratively the whole of Bumdeling gewog falls under the management of the park. Almost 68% of the feeders fall inside the Sanctuary while 32 % fall in the buffer zone (see Map 4).

103. All protected areas in Bhutan have settlements located inside the parks, and it is within the Conservation policy to allow these settlements and local communities to remain inside. In Bumdeling Wildlife Sanctuary, the areas with settlements have been designated as multiple use zones. These are areas with settlements/ villages, agricultural land, pastures and forest areas where collection of a non- timber forest products, harvesting of timber, regulated tourism, recreation, grazing, habitat management and reforestation are permissible. Certain developmental activities like rural electrification are allowed as long as the required Environmental Assessment is conducted and the Protected Area Management is convinced that the environmental impacts can be mitigated.

104. The impact on the protected area as stated previously is unavoidable as trees and other vegetation would not need to be removed if the MV lines could have been routed through un-forested areas to these villages (which was not possible), or if the MV lines were run underground (which was not considered because of the excessive cost). Clearance by the BWS management has been granted after conducting field verification of the proposed alignment.

105. The assessment does not consider this impact on the protected area as significant because;

- The proposed distribution lines are all aligned along the access route to the target village where the forest is already degraded to some extent and unlikely to contain endangered species;
- Much of the third feeder ARE3P3 is along the farm road to the villages and at the periphery of the sanctuary;
- The selection of the feeder route has been done in close collaboration with the Department of Forest and Park management whose staff have conducted the field verification and given the Clearance for the proposed alignments;

106. Despite this mitigation measures may be undertaken to ensure that environmental impacts during construction are minimized. These are discussed in the following paragraphs.

Map 4: Map showing location of Distribution lines in BWS



Black lines: Distribution lines from RE 4 project; Red lines: Distribution lines proposed under ARE project
Source: BPC master plan. (Map source: DoE/JICA)

B. Environmental effects due to Construction activity

107. During Construction the project interacts physically with the environment and this is the period during which the environmental impacts occur. As explained above, provision of electricity to 370 households and 19 facilities will involve construction of:

- Three 33 kV MV lines, 37,600 m in total length, of mainly 3-strand bare conductors, located on 753 poles, to convey electricity from existing distribution lines;
- 30 transformers, which depending on the voltage level and the number of phases are either 33/0.240 kV for single phase lines or 33/0.415 kV for three phase lines.
- 35,000 m of LV lines, of mainly single-strand covered conductors located on poles in the villages, to carry electricity to meters outside individual households.

108. The MV lines will carry 33 kV via three strands of Aluminium conductors, mounted on poles located at intervals, depending on topography and terrain. Poles are of steel, with steel cross-rims at the top on which insulators are mounted to hold the conductors. Section Poles have two legs and are located every 200-250 m, and between these are located a series of single-structure Interval Poles, to support the conductors and maintain them at the requisite 5.8 m above ground level. Poles are 10 m in length and are held in the ground via earth and concrete foundations, 1.6-1.9 m in depth.

109. Conductors are either bare or covered. Bare conductors are of the Aluminium Conductor Steel Reinforced (ACSR) type, which consist of several strands of Aluminium wire wound around a central steel core. Covered conductors are of the Aerial Bundle Cable (ABC) type, in which insulated strands of Aluminium are wound together and covered with polyethylene insulation. Covered conductors are used for LV lines in inhabited areas, but may also be used for MV lines in locations where it is necessary to reduce the width of the Right of Way (RoW) cleared on either side of the line. In forested areas, all vegetation is cleared from a specified width around the transmission or distribution line to prevent interruptions in supply from falling trees, or branches touching the line. For bare conductors the RoW is 12 m for 33 kV and for covered conductors it is 4 m (because the insulation reduces the risk of outage).

110. Transformers are ready-made components imported from overseas, which are located with associated components (junction box, fuses, lightning arrestors) on double-structure poles inside or outside the villages to be electrified. Transformers have an outer metal casing and measure around 1 x 1 x 0.25 m for the LV lines, and the junction box is slightly larger.

111. LV covered conductors (415 V or 230V) will run from each transformer to the village, and will also run to individual consumers (households, facilities or industries), terminating at a service meter attached to a wall. Conductors will be held on single-strut poles, located at intervals of approximately 50 m.

112. Construction will start at the tap-off point from the distribution line, and the MV line will be cleared and constructed in sequence, gradually proceeding along the route. Once a length of RoW has been cleared, foundations for poles will be dug by hand, at intervals of approximately 200-250 m for double-structure Section Poles, and 30-70 m for single-structure Interval Poles. Foundations are a standard size of 600 x 700 mm, dug to 1900 mm for 33 kV lines, and after excavation, concrete (mixed on site) is poured into the cavity to create a solid floor, around 250 mm thick. Poles are fitted with a circular metal base plate, which stands on top of the dried concrete, after which the excavated soil and stone is replaced around the pole and compacted tightly by hand. A further layer of concrete is applied 250 mm above and below the ground surface to resist corrosion. The conductors are then attached to insulators at the top of each pole by hand, after which the team moves on to the next location. Where the MV line crosses areas of open ground or agricultural land there is no need to clear the RoW, so the procedure will involve erection of the poles and connection of the conductors only.

113. Transformers are attached to double-structure poles, located inside or outside villages. The poles are erected as described above, and the pre-prepared transformers and other components (junction box, fuses, etc) are attached and joined up by hand. Signs are then attached to the pole warning people of the dangers of electrocution.

114. LV lines in the villages will be constructed in the same way as the MV lines but there will again be no need to clear the RoW as poles will mostly be located as far as possible within the

115. All elements will be completed before commissioning tests are conducted and the final connection to the distribution line will then be opened.

i. Impact on physical resources

1. Forest cover

116. The most significant impact of the Distribution line will be the permanent removal of forest cover from the Sanctuary and the buffer area. 76.6% of the land area in Trashi Yangtse is covered by forest.

Table 4: Length of MV line through various forest types

Feeder	Broadleaf	Conifer	Sokshing	Tseri	Scrub	TL
ARE3P1	7,908	5,560	0	0	4,012	17,480.0
ARE3P2	4,000	0	0	0	400	4,400.0
ARE3P3	1,980	3,130	0	0	2,970	8,080.0

117. The table indicates that along the 37.6km route of the MV line, 8km runs through broadleaf forest of which a total 0.38sq.km of forest will be cleared as the RoW is 12km wide. This is not a major loss in the context of the 1100 sq.km of forest in Trashi Yangtse district, especially as the impact on forest cover will be less than 1% of the total forested area.

Table 5: Number of trees to be felled along each distribution line

No.	Feeder	Total trees to be felled
1	ARE3P1	701
2	ARE3P2	176
3	ARE3P3	292
	Total	1169
	Plus 20%	1402

Source: Rural Electrification Department, BPC

118. Despite the number of trees, the environmental assessment does not consider this a major loss to the environment for two reasons. Firstly, the aim of the project is to provide electricity to rural communities and it is expected that, in the long term, more trees will be conserved, outweighing the loss of trees removed from the RoW. This is more so especially at high altitudes and the extremely cold climate where most residents are forced to use bukharies/stoves during the winter resulting in high demand for firewood. Another reason is that although 0.38 km² of forest will be lost, none of this is located in Core areas of the Wildlife, but mostly in the multiple-use and buffer zones, where activities such as farming and sustainable use of natural resources are permitted by the park. Also, these trees to be cut are along the access routes and not in pristine forest.

119. Still, efforts should still be made to reduce the loss of forest where possible, particularly in densely forested parts where habitats would be more ecologically valuable. One option is to use Covered conductors where feasible, to reduce the width of the RoW. Another suggestion is to collaborate with the Park staff and DoE to see the possibility of planting low growing vegetation so that the RoW is not totally devoid of vegetation.

120. There is a risk that the impacts during construction could be magnified, if workers are allowed to behave irresponsibly on site, causing unnecessary damage to vegetation outside the RoW, hunting forest species, etc. Mitigation measures which the Contractor should be required to undertake on site include;

- In consultation with the PA staff, physically mark the boundary of the RoW before any clearance starts and prohibit workers from trespassing outside this area;
- Ensure that the only trees to be felled are those that have previously been marked by the PA staff;
- Create awareness among all site workers and staff on the value and fragility of wildlife and natural habitats, particularly those found in these locations and to impose strict controls on site for staff violating the rules; and
- All cut trees should be disposed off as required by the Sanctuary management, who will put the timber to beneficial use or allocate them to the public for other purposes, thus reducing need to cut more trees.

2. Air quality.

121. There is no data available on the air quality in Trashy Yangtse but the major contributors to air pollution in Bhutan are industries and vehicular emissions and the former is absent while the latter is minimal in the project site. The main source of pollution in the rural areas is domestic emissions from burning firewood for cooking and heating, use of kerosene for lighting and diesel for mills. These emissions cause localized increases in levels of smoke, soot and carbon dioxide, especially at times when fuel usage is highest. However, once the project is in operation, it is expected that these levels of pollutants will reduce with use of electricity as the amount of fuel wood will reduce and people inside the houses are less exposed to such pollutants.

122. With the initiation of the project, the only impact on air quality is expected from movement of vehicles and from the dust pollution, as dust may blow in from cleared areas at the poles site. Dust pollution caused by pole construction will be localised at pole sites and RoW only and limited to the construction period only. Most of the foundation for poles will be dug by hand and other implements and equipment (including poles and transformers) will be carried to site by porters, from the nearest road. Air emissions from vehicular movement will be minor as this is limited to a few vehicles to selected drop off points, which are at Dungzam and Womina. Thus the impact on air quality will be low with no impact at the regional/Dzongkhag level.

123. Mitigation measures which could be undertaken on site include;

- To reduce the dust from cleared areas along RoW, the lower ground layer of grass and other low vegetation should be retained and cut vegetation apart from logs can be piled at the edge of the RoW and allowed to dry or to rot down *in situ*;
- Avoid using large machinery to minimize dust and do not burn waste vegetation to prevent forest fires.

3. Noise generation.

The main source of noise will be from trucks during material drop off at designated points and to campsites near road access points. These however will be limited to the construction period. All other construction work is small in scale (involving the excavation of small pits for pole foundations and erection of poles and stringing of conductors), and will be conducted by small teams without the use of heavy machinery. Thus noise generation is not expected to be significant as the area is so remote and villages are scattered. Also, with the large forest cover most of the noise created will be buffered by the surrounding forest. There should be no need to mitigate this impact.

4. Natural Drainage.

124. The rivers in Bumdeling gewog are prone to floods and each year the Dzongkhag and BWS management spend time and money on river training works to prevent river overflow. Most of the distribution lines run parallel to the rivers but at certain points each of the three distribution lines will cross the Kulong Chu and the Womina Chu. Here, effects on local drainage and water quality can occur during construction period mainly from loose soils at the excavated site for the pole foundations. This impact is however small in scale, dispersed and will only occur at crossing points.

125. Excavation can also affect aquatic ecology and fisheries if large quantities of silt are washed into the river during rain, or if work is conducted within the river itself. This should not be the case here however, because there is no requirement for any construction in river-beds. Also, excavation for the pole foundations is small in scale and dispersed, and there will be no large stockpiles of soil that could create a major point-source of silt pollution. Almost all of the excavated soil will be replaced into the cavity within a few hours of removal, so any run-off would be short-lived and very small in scale. It should therefore also be unnecessary to mitigate potential impacts on aquatic ecology.

126. To minimize the quantity of soil being washed into the river, it is recommended wherever possible, poles will be located at a minimal distance of 30 m from the river on stable soil. Also, excavation works should be conducted during the dry season (which is expected as it may be impossible to work during the monsoons when the river is too high to be crossed).

5. Land Stability and Soil Erosion.

127. The elevation of the feeders in the project site ranges from 1950m-2300m, and from Zhapang to Bawadung and upwards towards Rigsun Goenpa the elevation ranges from 2095m-2895m. On the whole the majority of the feeders pass through fairly gentle terrain.

128. The removal of vegetative cover and soil excavation work may cause some land instability and soil erosion but this impact is expected to occur only during excavation for poles. Also, the depth of the foundation for the 33kV poles is 1900mm and the area for the foundation is 600mmx700mm (BPC, 2007). There are 752 poles to be constructed. This means that the total volume of soil to be excavated is only 600 m³. Once the poles are ready to be erected, most of the excavated soil will be reused for backfilling and compaction to secure the poles. This impact can be mitigated easily since the size of the excavated area is small. Safety for workers while working on steep slopes should be covered under worker health and safety issues.

ii. Impact on Ecological resources

129. A wide variety of flora and fauna is known to inhabit forested areas in Trashi Yangtse (both inside and outside the BWS). At higher altitudes endangered species like Snow leopard (*Uncia uncia*), Red panda (*Ailurus fulgens*), Tibetan blue sheep (*Pseudois nayaur*) and Himalayan Musk deer (*Moschus chrysogaster*) have been reported in management plans. Endangered species like Tigers (*Panthera tigris*) have been reported to occur in areas south of the project site in less disturbed habitats.

130. Vulnerable species that have been recorded within the project site include Common Leopard (*Panthera pardus*) and Himalayan Black Bear (*Selanarctos thibetanus*). However, these are not commonly reported close to the villages. The more common species found in the project area include the Capped langur (*Trachypithecus pileatus*), Serow (*Capricornis sumatraensis*), Goral (*Naemorhedus goral*). Species like the wild pig (*Sus scrofa*); Porcupine (*hysterix indica*), Sambar (*Muntiacus muntjak*) and Macaque (*Macaca assamensis*) are considered pests by farmers as they cause much destruction to the crops. During the field visit, a Barking deer (*Muntiacus muntjac*) and Capped langur (*Trachypithecus pileatus*) were sighted in Trashi Yangtse. Apart from this no other evidences of wildlife was encountered along the alignment, probably because of the high level of disturbance along the access routes to the villages.

131. The removal of trees and other vegetation from along the MV line will have ecological impacts as it will destroy some forest habitat and may displace species that are living in these areas. The impact on rare wildlife however is not expected because the MV routes have been selected close to access routes to the villages, which are used regularly by local inhabitants. Here, the much rarer plant and animal species are less likely to be found. In most cases, the presence of humans disturbing the habitat and the motility of most animals means that they are very likely to move away in response to the disturbance caused by the felling activity, thus avoiding accidental damage or death.

132. The most significant species within the project site is the totally protected species, the Black-necked crane. The Sanctuary has one of the few roosting and feeding sites for this bird but these are mostly located close to the Kulong Chu while the target villages to be electrified are located higher up on the slopes. Also, the birds only visit Bumdeling between November-March each year. During the route survey, Bumdeling staff accompanied the BPC staff to ensure that the proposed alignment along the feeders would not cross or come close to the crane roosting and feeding sites.

133. Apart from this, no rare or important plants were recorded during the survey. This is expected as rare plants are also less likely to be found in these areas, given the fact that the habitats have already been damaged to an extent by farming, constant use as footpaths, grazing and collection of Non-wood forest products.

134. No significant impact on endangered flora or fauna is expected from this project because the alignment of the feeders was selected in close consultation with park staff, who are well aware of the areas that may be sensitive to wildlife and birds and these have been avoided wherever possible.

135. Regardless of these factors, efforts should still be made to reduce the loss of forest where possible, particularly in densely forested parts of the sanctuary and buffer areas where

the habitats would be more ecologically valuable. To ensure that minimum impacts occur, the following mitigation measures are proposed that the BPC and Contractor should be required to undertake ;

- Closely consult PA management and staff prior to commencing construction work, so that the management is aware when the work commences;
- Conduct construction work in villages when the Cranes are away in Tibet, and avoid disturbance of any kind during the winter months (October to March);
- Assess the possibility of using covered conductors to reduce the width of the RoW and at river crossings along the Kulong Chu to reduce the impact of birds flying over the valley and place bright reflectors or balloons along river crossing so that the bird can see this during flight; and
- Assess the technical and economic feasibility of using covered conductors to reduce the width of the RoW
- Provide training to raise the awareness of all site workers and staff on the value and fragility of wildlife and natural habitats, particularly those found in these locations;
- Ensure that labor camps are located in areas where no forest clearance is required, and prohibit any hunting, fishing or logging by camp occupants;
- Ensure that labor camps are provided with adequate heating, lighting and process for permits for firewood from the PA management so that workers do not need to illegally collect firewood.

iii. Impact on Economic development

1. Positive impacts

136. The primary positive impact of the project will be access to electricity for lighting, cooking and heating for individual households as well as governmental and religious institutions. A number of secondary impacts are expected to occur as a result of the project. These include positive impacts on the health and lifestyle of local people through the use of clean technology and reduction of exposure to smoke from use of fuel wood and kerosene, and other health risks. They will also save time processing for fuel wood permits from the PA management. The local people purchase approximately 2 litres of kerosene each week from Yangtse town, which is between 1-4 hours walk for closer villages and one days walk for remote villages. With electrification farmers will no longer have to follow this inflexible procedure and spend time collecting coupons.

137. Although farming and livestock rearing are the main source of livelihood for majority of the population, about a dozen households make a lucrative earning through small cottage industries like making 'Desho' (traditional paper) and 'Dappas' (wooden bowls). These are made for the markets in Thimphu and elsewhere. The Dzongkhag Administration is very active in promoting cottage industries but the current constraints faced in pursuing these activities are lack of electricity and access. Rural households will have the opportunity to explore various means of earning additional incomes such as operating rice mills, weaving or making bamboo mats. Others can benefit from the project if employed during the construction period as porters or for clearing of RoW.

138. Once the telecommunication network is available, farmers can use mobile phones, especially during emergencies. With television and radio farmers can update themselves on current events around the country and the world while saving money spent on purchasing radio batteries. If budget is available, the RNR offices, BHU's, ORC can be equipped with electrical

139. Since the gewog is located on the border with Tibet, there is a military outpost located at Tobrang. Also there is a primary school (till class VI) located at Tarpel which has 115 students and 6 teachers. There is also a Non-formal education program for 25 students (Pangkhar, Tarpel and Longkhar). School students will benefit from the project as electrification will enable them to have computers, internet connections and access to online educational materials. Use of electrical stoves can be promoted in schools to reduce demand for firewood as well as exposure to smoke. Students and monks/nuns/old people residing and meditating in the religious institutions can also live cleaner, healthier lifestyles while devoting more time for study in the early hours of the morning and late evenings.

140. The availability of electricity should bring significant economic benefits to the rural communities, because people will have more time available for work as less time will be spent cutting and carrying firewood, so incomes will increase. People will be able to use electrically powered machinery to process their farm products or to offer services to the community (e.g. rice mills), so again incomes will increase.

2. Impact on private land holdings and agriculture

141. Only 7.8% of the Dzongkhag is under agricultural production. Despite being one of the largest gewogs (area of 850.7 sq. km.), Bumdeling is not inhabited much and the average land holding is about 3.5 acres per household. Most of the settlements are concentrated in the more fertile valleys at lower altitudes and those living at higher altitude are mostly pastoralists rearing yaks.

Table 6.Length of MV line through various types of private land (length in m)

Feeder	wetland	dryland	tseri	tsamdro	sokshing	Total
ARE3P1	90.0	3070.0	0	0	0	3160.0
ARE3P2	0	780.0	0	0	0	780.0
ARE3P3	450.0	1220.0	0	0	53.0	1723.0
TOTAL	540.0	5070.0	0	0	53.0	5663.0

142. In the past, the floods in the Kulong Chu caused a number of farmers to lose valuable wetland and suffer huge losses as their fields were covered with sand and river debris. As identified during the route surveys only 5.6km passes through privately owned agricultural land, mostly dryland. Although poles need to be placed on private land, land acquisition for the alignment and poles should will not be necessary because areas required for pole construction are so small and dispersed (approximately every 50 m) that it is very unlikely that a significant proportion of the land of any one owner will be required.

143. To ensure minimal impact on the individual land owner, the contractor must ensure that where poles are situated on farm land, these are located at field boundaries as far as possible, to reduce the loss of productive land. In order to allow some economic benefits to be directed to those residents who are most affected by the work, contractors should first be required to ensure that they employ as many people as possible from communities in the vicinity of the construction sites.

3. Impact on facilities.

144. Excavation works along the alignments may cause disruption to the target village in terms of disruption/damage to water pipes, impede or block access along routes with construction material, or disturbance during sensitive and religious times. To minimize this, the contractor should consult the Gup/Tsogpa and inform them of the intended project implementation process, so that they are aware when materials are being transported along the narrow routes, and facilities like drinking pipes, drainage, religious sites can be avoided. Also, the contractor should respect local tradition and culture and avoid working during religious festivals/times.

4. Aesthetic impacts.

145. Construction will also affect the landscape, because in some locations the cutting of trees and erection of poles and conductors may be visible from greater distances from across the valley. Visual impacts are generally considered significant where they affect large numbers of people, and that will not be the case here because of the remote nature of these areas.

146. This should also be an impact that does not need to be mitigated, because in many areas the trees outside the RoW will be taller than the electricity poles and because the surrounding forest itself will provide a good natural screen for the electricity poles. To ensure that the MV lines do not visually impair the beauty of the Lhakhangs and their surroundings, these should be aligned as close to the border of the forest and agricultural fields.

iv. Impact on Social and Cultural Resources

1. Impact on Cultural and Religious sites

147. In the project site there are 5 Lhakhangs/goenpas in different villages. The famous ones among them are Rigsum Goenpa and Dechenphodrang Monastery, both famous as sacred places of Guru Rinpoche. The Lhakhangs hold historical and sacred murals and statues as well as various manifestations and body prints of Guru Rinpoche on rocks and cliffs outside the Lhakhangs. Renovation of the two government owned Lhakhangs are undertaken by the Dzongkhag Administration.

148. Electrification of these important Lhakhangs will improve the security of sacred religious and historical texts, statues and valuables from within, as miscreants will be less confident of vandalising religious sites or committing robberies due to the increased risk of being caught. It will also benefit visitors, monks/animas and senior citizens or caretakers residing there in terms of lighting, heating and cooking.

149. Many of the body prints are on rocks in the fields and not easily visible to the untrained eye. Thus it is imperative that the contractor consult closely with the local caretakers prior to the construction so that the distribution lines avoid traversing these sacred sites and 'lus'.

2. Social impacts.

150. The MV lines will be located along access routes to remote villages so it is very unlikely that construction will negatively affect socially important facilities such as schools, clinics, etc. However the transformers and LV lines will be built within and near villages, so there could be impacts on inhabitants, their activities and locally important locations. As the work will involve excavation then the main impacts are likely to arise from construction noise, dust, visual

- Most villages contain only small numbers of households, so the work should be short-in duration, being completed in a few weeks;
- Excavation will be very localized, affecting areas of 1 m² roughly every 30-70 m, so the mounds of soil should not greatly impede access or produce significant dust;
- In any one village, work will probably be conducted by one or two small teams of 5-10 workers each, so individual locations will not experience a large influx of foreign workers; and
- People will tolerate short-term temporary disruption if (as in this case) they are aware that they will gain significant benefits once the work is completed.

151. Efforts should still be made to reduce the level of disruption where possible, and to achieve this, the Implementing agency should

- Consult all affected communities in advance to inform them of the purpose, nature, duration, extent and timing of all work in and around their village; and
- Consult the custodians of all social and cultural facilities that are to be electrified as part of this project (monasteries, schools, health centers) and plan the work to avoid sensitive times (such as key dates in the religious calendar, examination periods, etc).

152. It may be necessary to import workers because the scattered rural population means that not enough people are available, particularly at times of intensive agricultural activity, when rural people prefer to work in their fields or remain with their cattle. Importing workers also deprives local people of the socio-economic benefits of obtaining temporary employment in construction workforce.

153. Negative social impacts from the project may result if external workers are brought in from outside the gewog. Migrant workers are often housed in labour camps, which can create further problems both for workers and host communities if facilities like water, sanitation etc. are inadequate, creating dissatisfaction and unrest. Their presence in communities can be disruptive if the workers do not follow local norms of behaviour, or if they bring other problems such as socially or sexually transmitted diseases like HIV/AIDs or Swine flu from as they may not have been properly screened for diseases.

154. To mitigate these, contractors should first be required to ensure that they employ as many local people so that at least some economic benefits are directed to those residents who are most affected by the work. If it is still necessary to employ foreign workers, then contractors should ensure the following;

- House workers in camps located in areas where no clearance of vegetation is required so that damage to the forest is limited;
- Camps should be provided with safe drinking water and temporary sanitation facilities away from water sources as well as adequate energy source for cooking and heating;
- Provisions must be made to collect solid waste and bury it offsite as well as for discharge of sewage;
- Create awareness among workers on required behavior when interacting with host communities and strictly prohibit them from hunting, fishing or logging;
- Once the construction is over, campsites should also be cleared at the end of their occupation, all sheds should be demolished and all materials removed and disposed of to an approved dumpsite. The campsite must be restored as close to its earlier natural state as possible;

- Screen workers at their point of origin for the more virulent and contagious diseases, including HIV/AIDS, TB, Malaria, Swine flu or any new disease and provide access to medical treatment for workers, both on site and in the nearest hospital if necessary;
- Distribute pamphlets and posters to raise the awareness of workers and host communities of the risks of the various types of socially and sexually transmitted disease, and ways of avoiding infection; and
- Implement practical measures to reduce infection, for example by providing condoms free to workers.

155. Clearance of the RoW is an activity in which there is a significant element of danger, particularly to workers, but also to inhabitants of villages, should they stray into the vicinity. Contractors will be required to prepare and implement a Health and Safety Plan covering all elements of construction. This will include measures that are common to most construction sites, such as:

- Excluding the public from the site;
- Ensuring that workers are provided with and use Personal Protective Equipment;
- Provide Health and Safety Training for all site personnel;
- Ensure that BPC procedures are followed for all site activities; and
- Maintain accident reports and records;

156. In this case the H&S Plan should also include measures to reduce risks specific to tree felling, such as:

- Ensuring that all trees and branches fall into the RoW when cut; and
- Liaison with all local communities to inform them of the nature, extent and timing of all clearance work and to raise awareness of the dangers.

C. Operation and Maintenance work

157. Maintaining RE systems involves keeping the RoW clear of vegetation to reduce the risk of short-circuits, and occasional repairs to address power outages and other problems. These and other issues relating to the operation of the RE system provided by this subproject will be dealt with by the Electricity Services Division in the Dzongkhag.

158. Each ESD has an annual maintenance programme, through which teams of labourers inspect the RoW along each of the distribution lines and remove branches that are overhanging previously-cleared areas, and any re-growing trees or other significant ground vegetation beneath the lines. These operations are conducted by hand using machetes and knives, and cut vegetation is left *in situ*.

159. Power outages are recorded at the nearest sub-station and reported to the ESD, who then despatch repair teams to assess the nature of the problem. The most frequent causes are branches touching a line, trees falling across a line, and landslides causing poles to collapse. In all cases the first action is to isolate the section of line by turning off the isolator switches that are normally located on poles at around 10 km intervals. The fault is then repaired by removing the branch or fallen tree by hand-cutting. If poles need to be repositioned this is done by following the same procedure as occurred when the poles were first erected. Fallen poles and conductors are disconnected and recovered, and may be re-used if they are undamaged. If this is not possible, new equipment is carried to site by hand. New foundations are dug by hand and concrete is poured in to form the solid base, after which the pole is placed into position. Excavated soil and stone is then replaced and compacted; concrete is applied above and below

160. Transformer maintenance is carried out by specialised teams from the Central Maintenance and Training Division of BPC (based in Thimphu), who inspect all electricity generation and distribution facilities twice per year. Checks of transformers include the dielectric strength of transformer oil, which is corrected on site when necessary by draining off the oil and drying to remove moisture. If more extensive maintenance is required (for example replacement of burnt-out transformer windings) the part is removed and transported to Thimphu for repair, and is then brought back to the site and re-fitted.

161. Problems with LV lines are generally caused by overloading, or accidental damage to lines in the villages. These are reported to the ESD by villagers, and ESD then send teams to repair the fault. This normally involves replacement of conductors, or re-location of poles and conductors, repairs which are carried out as described above.

Environmental effects due to Operation and Maintenance work

i. Impact on physical resources

162. Maintaining the RoW by removing overhanging branches and high-growing vegetation from beneath the lines will have very little impact on the physical environment. In fact the general approach of BPC in allowing low-form vegetation to re-grow in the RoW will have benefits in reducing dust and improving soil cohesion and conservation, and helping to prevent landslides that are a risk throughout Bhutan during the monsoon rains.

163. Even though the repair of faults may involve excavation of new foundations and erection of new poles and conductors, this should also have few physical impacts as repairs generally affect short lengths of line, so the work is normally very limited in extent. Even where poles are brought down by landslides it is very rare for these to affect more than two or three poles, which can be repositioned without causing major physical changes. Similarly repairs of the LV lines in villages will be small in scale and thus unlikely to cause physical impacts.

164. Transformer maintenance can contaminate land and water if oil is spilled, so BPC staff should follow their established procedure carefully to prevent this, and should remove and dispose of any contaminated soil in a sealed drum if a spillage occurs.

ii. Impact on ecological resources

165. Maintaining the RoW and repairing faults along the line will have no major ecological impacts as the work is very small in scale and infrequent, and involves few changes to the existing situation. The practice of allowing some re-growth of vegetation along the RoW will also have ecological benefits as it will allow plants and animals to re-colonize the area. Because the forest canopy is now open in these areas the species will be different from those that were originally present, which could be seen as a further gain as this will increase the diversity of Habitats.

166. The major ecological benefit will occur over the longer term, as the availability of electricity in these villages reduces the felling of trees for firewood. Current estimates are that

these ecological gains should become highly significant over time and will greatly exceed the short-term losses from the original clearance of the RoW.

iii. Impact on socio-economic development

167. The routine maintenance of the RoW will not have economic impacts as it will not affect agricultural areas, or farm roads used for transporting produce. If a line failure requires the repositioning of poles, it should not be necessary to purchase land for the new foundations, as owners are very likely to donate the very small amounts of land required (1 m² per pole) in order to restore the electricity supply. New foundations will be dug close to the old ones, so wherever possible land from the same owner should be used, so that the previously used area can be returned.

168. Power outages will have negative economic impacts as people will be unable to use machinery they have installed to diversify their means of livelihood, for the period in which the system is shut down. BPC should therefore keep such periods to a minimum, by responding to line problems rapidly; and repairing faults rapidly and effectively.

169. The Performance-Based Incentive schemes within BPC, whereby annual salary increments and bonus payments are linked to the performance of the electricity supply system, should improve the efficiency of the service.

iv. Impact on social and cultural resources

170. The main hazard to people from the operation and maintenance of the completed RE system is the risk of electrocution. This is a danger to i) Rural consumers who are not highly educated and are generally unaware of the dangers posed by electricity; and ii) BPC workers when repairing lines or components.

171. BPC have procedures set down in Operation and Maintenance (O&M) manuals, which describe how all work on distribution lines is to be conducted. They also have Health and Safety (H&S) Manuals, which describe the personal protective equipment that is to be provided (including safety helmets and belts for climbing poles), plus emergency procedures, etc. However there have been a small number of recent fatalities, which suggest that the systems are not functioning adequately. Some measures for BPC to undertake include:

- Ensure that staff understand and comply with the BPC O&M and H&S manuals and procedures;
- Continue providing regular training for all BPC operatives to raise awareness of the dangers of the work being conducted, the equipment that is to be used, and the procedures that must be followed;
- Conduct regular supervision of field workers during both RoW clearing and repair of faults;
- Conduct regular management reviews of safety records, and follow-up with remedial action where necessary; and
- Continue to conduct community education programmes to raise the awareness of all target households before and after they are connected to the grid regarding the dangers of electricity, and the correct manner in which house systems should be used.

² FAO (2001): National Strategy for Stoves and Other Alternative Energies, Project No BHU/99/005

172. If these actions are implemented thoroughly, then the RE system should function without major accidents or fatalities from misuse or inappropriate operation. There should then be a wide variety of social benefits for the target households and their wider communities from the provision of electricity already discussed previously. Together these should greatly improve the health, wellbeing and quality of life of citizens and the communities, and greatly increase the overall social capital of these rural areas.

173. Once electricity is provided, people rapidly become used to and even become dependent upon the service and the new way of life it supports, and are not greatly tolerant of interruptions in the service. This reinforces the need for BPC to take the actions recommended above in order to minimise power outages by ensuring that the maintenance procedures (RoW clearing, routine checks of lines and transformers) are conducted regularly and diligently; and respond to faults rapidly and ensure that repairs are conducted quickly and effectively.

174. Any disturbance or disruption that residents may experience from the re-erection of poles or replacement of conductors in the villages will be viewed as very minor when compared to the inconvenience of being without electricity, so there should be no need for mitigation.

VI. ANALYSIS OF ALTERNATIVES

175. A number of alternatives were considered for the project. These included a) the no-build alternative, and b) use of solar energy (Photovoltaic panels) and c) on-grid electrification. Each alternative is discussed below.

a. Alternative 1.

176. Maintaining the status quo of not undertaking the project (i.e. the no-build alternative), there will be no ecological impact on the environment or biodiversity from this project. However, the total number of households electrified will remain less than 50%, and the government will fail to achieve its target of electricity for all by 2013.

b. Alternative 2.

177. Using solar energy (photovoltaic panels) is a better alternative than the ‘No project’ one, in terms of development in the rural areas. There are a number of constraints with this alternative; for instance a) it can only be used for lighting purposes, so firewood consumption for heating and cooking will still remain high, b) high maintenance cost for repair of parts and c) need for technical knowledge and low durability.

c. Alternative 3.

178. Provide on-grid electrification. This is the alternative that is proposed by this project. Through this all target villages will be provided with electricity from the existing grid system. The project is expected to significantly reduce demand for firewood, as this is the primary source of heating and lighting in the remote communities. This alternative will contribute positively to improving the lives of the target communities through reduced exposure to smoke, improvement in living conditions, increased communication via use of mobiles and opportunities for seeking alternative livelihood options. Local government institutions like BHU, ORC, Schools, RNR centres and Religious institutions will also benefit through reduced time and money spent on sourcing firewood from local communities, as well as increase in accessibility to information through various media sources, internet and improved communication. Students will have extra time to study during early mornings and evenings.

Table 7: Comparison of alternatives

Parameters	No electricity	Use of solar energy	On grid Rural Electrification
Economic cost	Cost to farmers include cost of kerosene,	- maintenance cost depends on location of households and access to repair facilities -Lack of technology for repair	-High cost to government -Cost of in house electrification
Developmental impacts & people's perception	Village/gewog considered underdeveloped	-Community is still considered 'underdeveloped' -Use limited to lighting purpose alone	-Community is considered 'developed' -Can explore other livelihood alternatives such as rice mills,
Social benefit	Household still exposed to smoke, dirt, and increasing distance/time spent in fuel wood collection	-Clean and renewable energy -Benefit restricted to lighting only	Beneficiaries include -Households -Schools -Government & Religious facilities
Environmental impacts	Yearly increase in fuel wood consumption	-Yearly increase in fuel wood consumption per family -Improper disposal of battery may cause heavy metal pollution	Main impacts are -Impact from Right of Way of Distribution line -Localized impact on endangered

		especially in rural areas -Aesthetic impacts	wildlife -Aesthetic impacts
--	--	---	--------------------------------

179. The third alternative 'providing on-grid electrification for the proposed villages ' is the most feasible in light of the easy availability of hydropower in the country, the positive environmental benefits, and most importantly because this is what the local communities prefer. The first alternative is not feasible because electricity is included as a measure of development in a village and therefore is always given high priority in the list of developmental activities for any gewog plan. It is impossible for the government to overlook this demand especially since the country is a major generator of Hydropower energy. While there will be no environmental cost from this alternative, with increasing population it is expected that the demand for fuel wood will increase each year, putting very heavy pressure on the already dwindling forest resource.

180. The Solar PV system involves the utilization of renewable and clean energy, but it is considered a temporary measure for those villages where the cost of providing electricity is too high for the moment. The utility of the solar system depends on the location of the target villages. For instance, if villages are located close to access roads, then repair and maintenance is easy compared to remotely located villages where there are no such facilities available.

181. Based on the above comparisons the first two alternatives are no longer under consideration. However, there are still some villages that are too remote and it is too expensive or technically very difficult to provide on-grid electrification. In such cases, these villages will be provided off-grid electrification.

VII. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

A. Project stakeholders

182. Most of the main stakeholders have already been identified and consulted during preparatory phase of this project. Primary stakeholders are

- Residents of 370 households that will be electrified by this subproject;
- Residents and users of 19 facilities that will be electrified by this subproject;
- People who work on agricultural land that will be crossed by the MV lines;
- Owners or users of land that is acquired for the erection of poles for MV or LV lines; and

183. Secondary stakeholders are:

- DoE as the Executing Agency;
- BPC as the Implementing Agency.
- BWS management as the custodian of the sanctuary and its adjoining areas
- NEC as the agency granting Environmental Clearance; and
- Dzongkhag Administration under whose jurisdiction the sub-project is being implemented; and
- ADB

B. Consultation and disclosure to date

184. In order to involve various stakeholders during the preparation of the EIA, consultations were held with the Project Management Office at Thimphu and the Rural Electrification Staff at Trashigang and Monggar, Park Officials at Bumdeling Wildlife Sanctuary and Dzongkhag Officials at Trashigang.

185. Two public consultations were held in June 2009 inside the Sanctuary with the affected community. In total 52 participants including local teachers, government staff, army officers and farmers attended the meeting. During the public consultation, a presentation was given on the aim of the subproject and the benefits it will bring, together with the likely impacts and the ways in which they will be mitigated. Participants were invited to discuss their views and concerns, which were then incorporated into the EIA. Appendix 2 contains a summary of the meeting.

Table 8: Details of public consultation conducted in Bumdeling Gewog

No.	Date	Location	Total participants
1	7 th June, 2009	School area	11 from Panglo, Chen villages
2	8 th June 2009	Tarphel	41 from Longkhar, Tarphel, and Pangkhar villages

Table 9: Summary of public consultation conducted in Bumdeling Gewog

Issue	Participant's opinion, comments and suggestions
Turn out at the village meeting	Many participants had wanted to attend the meeting but were called away on emergency to clear the landslide that had blocked the access route the previous night.
General perception about the project and support for the project	The participants were very excited about the project and said that they really want it to be implemented as soon as possible
Alignment of the distribution line and Impact on Private land	There were no issues regarding the proposed alignment, participants said they were aware of the alignment and were happy with it. One participants said that at the moment the exact location of the poles were not finalized, so they are not clear whether they will be affected but despite this they are willing to sacrifice whatever is needed as the project is for their own benefit
Religious sites	There were no religious sites to be concerned about in their village
Environmental impacts	Participants felt that electricity will benefit in conserving the forest as well. Many positive impacts were discussed. No endangered species are usually found near their settlements so there should be no concern about impacts on wildlife.
Other negative impacts	The participants did not see many negative impacts but also stated that since it is the first time for the village, maybe they were unaware of future impacts. Others said that they have heard that there is a risk of electrocution due to short circuit. It was clarified that awareness programs will be conducted prior to project operation period.
Public consensus	The participants were also aware of the public consensus forms. There was some discussion on whether or not all the households and villages had completed signing the forms. Since some households were not sure, the Dzongkhag clerk who participated in the meeting was asked to verify this. A participant from Longkhar, the last village along the alignment requested other participants all participants from villages before them to allow the distribution line to pass through their village before it reaches Longkhar, by signing the Public consensus forms.
Absentee owners	Participants said that there is only 1 absentee owner who is living in Dungzam, so no problems are expected with absentee owners.
Project implementation	- Participants wanted to know when the project will start. - A participant from Derma Drung wanted to know if his village was included and this was affirmed.
Queries regarding project	Participants wanted to how soon the project would begin and requested that priority be given to their dzongkhag

186. This IEE will be disclosed to the public by making it available at RED offices in Trashi Yangtse and the project as a whole will be disclosed to a wider audience via the ADB website.

C. Future consultation and disclosure

187. DoE/BPC will extend and expand the consultation and disclosure process significantly during implementation of the project. They will conduct a wide range of activities in relation to all subprojects in each dzongkhag, to ensure that the needs and concerns of stakeholders are registered, and are addressed in project design, construction or operation where appropriate. The program of activities will be developed during the detailed design stage, and is likely to include the following:

188. Consultation during pre-construction stage:
- Focus-group discussions with affected persons and other stakeholders (including women's groups and NGOs) to hear their views and concerns, so that these can be addressed in subproject design where necessary;
 - Structured consultation meetings with the institutional stakeholders (government bodies such as Department of Roads, NEC, Department of Forest) to discuss and approve key aspects of the project;
189. Consultation during construction:
- Public meetings with affected communities to discuss and plan work programmes and allow issues to be raised and addressed once construction has started;
 - Smaller-scale meetings to discuss and plan construction work in individual villages to reduce disturbance and other impacts, and provide a mechanism through which stakeholders can participate in subproject monitoring and evaluation;
190. Project disclosure:
- Public disclosure meetings at key project stages to inform the public of progress and future plans.
 - Formal disclosure of completed project reports by making copies available at the RED field office and the BPC head office.

VIII.GRIEVANCE REDRESS MECHANISM

191. The target gewog that will be affected by the project has a total of 370 households with a population of almost 4000 persons. Within the project site there are also 2 schools, 12 religious sites, 1 Basic Health Unit and 4 privately owned Rice mills.

192. The process of including these villages in the Project is pretty straightforward. Keeping Rural Electrification Masterplan 2005 as the reference, the un-electrified villages were included in the project scope based on the Dzongkhag's priorities. The list of the targeted households was then provided to BPC for implementation. This preliminary list of non-electrified villages was further segregated into two, those that could easily be connected to the grid and those that were too far in terms of distance, or due to technical and economic reasons.

193. Using the list of villages selected on grid electrification, BPC fielded surveyors to conduct field studies to finalize which distribution lines could actually be included in the target areas. Criteria used for this include a) distance of the village to the nearest feeder, b) number of houses to be electrified, c) accessibility and means of transportation d) location of the villages (environmental sensitivity), e) topography, and f) material cost, transportation and head loading costs. Based on the field data, the list of distribution lines, number of beneficiaries, along with the technical route survey to ascertain length of MV and LV lines, number of substations, transformers etc. was finalized.

194. MV lines cross mainly forested areas but these routes have been selected to run along existing access routes, tracks and pathways where possible, because in these areas there has already been some clearance of trees and other vegetation, so this reduces the amount of new felling required. The Table shows the amounts along each distribution line, as identified during the route surveys.

Table 10: Length of distribution lines and affected persons/beneficiaries

No	Gewog	Length of MV Line (km)	Length of LV line (km)	Villages	Beneficiaries
1	ARE3P1	20.6	12.82	17	190
2	ARE3P2	5.18	6.37	5	62
3	ARE3P3	11.83	15.49	8	137
	Total	37.6	34.68	30	389

Table 11: Total length of feeder through government and private land

Feeder	Forest	Private	Total length
ARE3P1	17,480.0	3,160.0	20,640.0
ARE3P2	4,400.0	780.0	5,180.0
ARE3P3	8,080.0	1,723.0	11,903.0
TOTAL	29,960.0	5,663.00	37,723.0

Note: Slight differences in length (≈-1km) may occur between field data and GIS data

195. The total length of the three distribution lines is 37.6km of which only 5.6km passes through privately-owned (mainly fields and other agricultural land) land in 30 villages, which amounts to 14.8% of the total line length. These areas that are traversed are so small and

land of any one owner or tenant would be acquired;

196. Along the distribution line it is estimated that 752 poles will be constructed, 640 poles on government land and 112 poles on private land. Where the lines cut across private land, poles will be located on field boundaries where possible, to reduce the loss of productive land. The areas required for pole foundations are so small (around 0.5 m² each) and residents are so eager to have electricity supplied to their homes, that landowners normally allow BPC to locate poles on their land, without the need for purchase or acquisition.

197. A key element of the national Environmental Clearance application process is the provision of signed No Objection Certificates (NOC) from stakeholders that are specified in the guidelines, including all affected households. Public consultation and participation was sought beginning from project planning and route identification phase wherein the local village representatives were called upon by the District authorities to conduct awareness on the prospective project and to seek the consensus from potential affected persons.

198. In the past, any grievance against RE projects have been approached personally to BPC office or forwarded through the Gup to the Dzongkhag and BPC office and resolved informally through mutual agreement wherever possible. In other cases, where the APs are not satisfied the case has been forwarded to the court for a resolution. There have been instances in the past when the APs put their grievances after the lines are constructed and commissioned. In such cases, it was very difficult for BPC to realign the distribution lines because shifting a pole required realigning 4 to 5 poles both up-stream and down-stream. Due to the high cost of the adhoc and unbudgeted realignment, the BPC has asked APS to do it at their own cost. To avoid such complications in the future, BPC now conducts awareness program during the preconstruction period.

199. ADB safeguards policy (2009) requires that no-one should be worse-off as a result of an ADB-funded project, and if this is the case, the Executing Agency provides additional compensation (for loss of crops, structures and other assets) through the mechanism of a Resettlement Plan. This should however not be necessary in this case, because privately-owned areas are normally not forested so there is no need to acquire and clear a RoW, so the only land to be obtained is small parcels at each pole location. BPC field staff has been clearly instructed to ensure that where poles are situated on farm land, these are located as field boundaries as far as possible, to reduce the loss of productive land. Besides, the distribution substations are pole-mounted for all RE works minimizing private land usage.

200. A memorandum of Agreement cum Application for Rural Electrification was prepared between the BPC and the beneficiaries through the local government (village headman/Gup) and forwarded to the BPC after being endorsed by the Dzongkhag administration. This agreement states that the applicants are aware of the ARE project and would like to be included for the electricity service connection as potential consumers. The applicants agree to provide the Right of Way for the construction, operation and maintenance of electricity lines passing through their private land, free of cost to the BPC as they are the primary beneficiaries. The BPC should avoid traversing existing khimsa (where the house exists) at all costs and try to avoid the use of cultivated land as much as possible.

³ ADB policy on Involuntary Resettlement considers loss of land to be significant if it amounts to 10% or more of the total land holding of any one owner.

201. Because the impact on the private land of any individual household is so small with no impact on infrastructure, RE schemes are not expected to have major negative socio-economic impacts as there will be no need for land acquisition or resettlement. Wherever possible, the project will avoid or minimize traversing private land by identifying possible alternative routes. For the loss of Crops and Fruit trees if any, the BPC will compensate the APs at the prevailing government approved rate, which shall be built into the project cost. A copy of the Memorandum of Agreement is in the Annex.

Complaints and Grievance Redress mechanism

202. During the process of project implementation, stakeholders may file complaints if they are not happy with the alignment of the distribution line, pole, substation or service centre locations. Any person who believes that his/her land or structure has been expropriated or altered and believes that their private land, house, or agricultural crops are being unfairly affected by the project will be able to express their grievances through a grievance redressal mechanism that will be instituted under this project. Through this mechanism the Affected Person may submit their grievance to the Dzongkhag office, which will record the grievance and ensure that all complaints and resolutions are properly documented and also available for review for monitoring purposes. The Dzongkhag office will conduct the necessary field visit to verify and assess the grievance/complaint, determine the validity of the grievance, and resolve the grievance within 1 month of receipt of the complaint.

Grievance Redress Procedure

203. The grievance redress procedure will be as follows;

1. Each grievance must be dealt with within a two weeks of receipt of complaint from the AP.
2. The necessary field verification/assessment will be conducted and the AP informed of a decision in writing within 4 weeks/28 days
3. Issues may be resolved amicably through third party arbitration and negotiation but If APs are not satisfied they can take recourse to the civil court if he/she so desires, or resolve the issue by taking it to next level of Grievance Redress, which is the National Land Commission (NLC), the highest body to approve land replacement and compensation allotments in the country.

204. During Project implementation, the BPC will ensure that APs are briefed on the grievance redress mechanism and procedures.

205. In the unlikely case of unforeseen environmental impacts, any grievances regarding environmental impacts will be submitted to the Dzongkhag Environmental Officer and BPC, who will conduct a field assessment of the situation and recommend appropriate mitigation measures to be implemented by the BPC. Where the Environmental Officer unable to take a decision, the case will be referred to the National Environment Commission for advice on necessary corrective measures. Such grievances will also be documented for monitoring purposes. All environmental issues must be resolved within 21 days of receiving the complaint.

IX. ENVIRONMENTAL MANAGEMENT PLAN

A. Summary of environmental impacts and mitigation measures

206. All the potential adverse impacts of the project have been identified and discussed in the previous chapters. All the potential adverse impacts of the project have been identified and discussed in the previous chapters. The EMP table outlines potential environmental impacts and mitigation measures proposed to reduce these impacts to acceptable levels. It also identifies the agency responsible for a) planning and implementation as well as b) supervision and monitoring, for each phase of the project.

207. Taking off from the first table, the second table then describes: (i) mitigation measures, (ii) parameters to be monitored, (iii) location, (iv) measurement method, (v) frequency of monitoring, (vi) responsibility (for both mitigation and monitoring), and (vii) cost of monitoring. Most of the mitigation measures are fairly standard methods of reducing the impacts of RE schemes (preventing damage outside the RoW, providing suitable living conditions for imported workers, etc), and experienced domestic contractors should be familiar with most of the requirements.

B. Environmental Monitoring Plan

208. During the construction stage all mitigation activities are the responsibility of the Construction Contractors employed to build the infrastructure. Responsibility will be assigned via the contracts through which they are appointed (prepared by RED during the detailed design stage), so they will be legally required to undertake the necessary actions. Mitigation when the system is operating is the responsibility of the Electricity Services Divisions (ESD) as the agency responsible for maintaining the system in working order.

209. A senior Environmental Officer (EO) will be responsible for implementing the Environmental Monitoring Plan in the construction stage, and reporting the results to RED, with recommendations for remedial action if measures are not being provided or are not protecting the environment effectively. The senior EO will be assisted by more junior EOs who can make many of the routine observations on site. Post-construction/Operation monitoring will be conducted by BPC.

210. Monitoring of such measures normally involves making observations in the course of site visits, although some require more formal checking of records and other aspects. There will also be some surveys of residents and workers, to review those measures that are aimed at ensuring their safety and wellbeing. Based on the EMP, the environmental officer, BPC will prepare the necessary monitoring checklist and surveys for themselves and ESD staff to follow during their site visits during the construction and operation and maintenance phase. Monitoring may be conducted every two weeks during the construction phase and if field inspections and monitoring reveal good environmental performance, the frequency may be reduced. Conversely, if the opposite occurs, then the matter will be reported to the Environmental Officer who will in turn direct the Contractor to take necessary mitigative measures, and monitoring frequency will be stepped up.

Table 12: Environmental Impacts and Mitigation

Project Activity	Potential Environmental issues	Management/Mitigation Measures	Responsibility	
			Planning and Implementation	Supervision and Monitoring
Pre-construction stage				
Design and location of three 33kV Distribution lines	Impact due to location of target villages in the buffer and multiple use areas of Bumdeling wildlife Sanctuary.	<ol style="list-style-type: none"> 1.Route selection in close consultation with Park management, Department of Forest, BPC field staff to avoid sensitive areas; 2. Route selection approved by National Environment Commission and District Authorities 3. Route should be selected so that clearance along forested areas are avoided wherever possible; Where there is no alternative to routing lines through forest, align routes alongside farm roads and footpaths where possible, alongside forest edges where habitats are already degraded to an extent, and will involve minimum tree felling. 4.Explore possibility of using ABC conductors to Reduce RoW 	RED, BPC DoE	Requires 'No Objection' Clearance from <ol style="list-style-type: none"> i.Park Management/Department of Forest ii.District Environmental Officer iii.National Environment Commission iv.District Administrative Approval v.Public Consensus from local residents
Construction				
Clearing of RoW along Distribution line	Removal of forest cover in protected area	<ol style="list-style-type: none"> 1.Ensure that only those trees marked by the forestry staff are felled 2.Follow standard BPC procedures and practices in clearing ROW 3. Explore possibility of planting low growing vegetation in RoW 4. Reforestation or afforestation to make up for forest cover loss 	Contractor, BWS, BPC	Environmental Officer, BPC District Env. Officer NEC
	Workers could damage species & Habitats outside RoW	<ol style="list-style-type: none"> 1.Mark RoW boundary & prohibit cutting outside; 2.Only fell trees that have been marked by Forestry staff; 3.Prohibit hunting or fishing by workers and enforce strictly; 4.Train workers in importance of wildlife and habitats; 5.Locate labor camps where no forest clearance is needed; 	Contractor	Environmental Officer, BPC
	Disturbance to Black-necked crane Habitat	<ol style="list-style-type: none"> 1. Closely consult BWS management prior to commencing construction work, which should be only conducted during periods when the cranes are not at Bumdeling. 2.Use ABC conductors if possible along river crossings and reflectors for birds to avoid hitting distribution lines 	Contractor	Environmental Officer, BPC
	Impact on private land holdings	<ol style="list-style-type: none"> 1.Route the distribution lines along edge of villages 2.Where routes cross private land, avoid alignments too close to houses or cutting through the centre of fields 	Contractor	Environmental Officer, BPC
	Risk of forest fires if cut vegetation is burnt	<ol style="list-style-type: none"> 1.Leave cut material to rot down <i>in situ</i> and do not burn; 2.Leave a covering of grass & other low vegetation in RoW; 3.Dispose of trees as required by NRDCL or BWS management; 	Contractor	Environmental Officer, BPC

Delivery of RE materials to drop off points	Air pollution from vehicular movement	Minimize number of deliveries through timely scheduling	Contractor	Environmental Officer, BPC
	Carriage of materials to site could block access	Consult Gup and farmers when transporting material	Contractor	Environmental Officer
Excavation at pole sites	Dust may blow from cleared areas	Avoid using large machinery, Manual excavation at pole sites and minimize disturbance at excavated sites,		
	Effect on local drainage and soil erosion	Locate poles at a minimum distance of 30 m from rivers, and construct these on stable ground	Contractor	Environmental Officer
	Excavation for poles could damage water pipes in villages	Consult community to identify and avoid infrastructure	Contractor	Environmental Officer
	Work in villages may create noise, dust & impede access	1. Inform communities of work in advance; 2. Identify sites of local significance; locate no poles nearby; 3. Consult custodians of facilities (monasteries, nunneries, schools, clinics, etc) and avoid working at sensitive and religious times;	Contractor	Environmental Officer, BPC
Social and cultural impacts	Economic benefits if local people are employed	Employ as many local residents as possible in workforce	Contractor	Environmental Officer, BPC
	Importing foreign workers can cause environmental and social problems at labour camps and in host community	1. Ensure imported workers are provided with housing that has ample toilets, proper drainage and treatment for sewage. 2. Collect solid waste weekly and bury offsite. 3. Instruct workers on required behaviour in host community and prohibit them from hunting and fishing. 4. Camps must be cleaned up and restored after project is completed.	Contractor	Environmental Officer
	Diseases can be introduced into host communities from social and sexual contact with imported workers	1. Initial screening of workers for HIV/AIDS, TB, malaria, swine flu, etc.; 2. Facilitate access to the nearest Health facility for check up; 3. Raise worker/community awareness of risks of socially & sexually transmitted disease; 4. Practical measures, e.g. free condoms for workers;	Contractor	Environmental Officer
	Workers and villagers are at risk from accidents on site	Prepare and implement a site Health and Safety Plan that includes measures to: - Exclude the public from all construction sites; - Ensure that workers use Personal Protective Equipment; - Provide Health & Safety Training for all personnel; - Follow documented procedures for all site activities; - Keep accident reports and records; - Inform local communities about the work and dangers	Contractor	Environmental Officer
	Impact on private land and infrastructure	Conduct awareness programs/meetings Grievance Redress mechanism in place	BPC	Environmental Officer

Project Activity	Potential Environmental issues	Management/Mitigation Measures	Responsibility	
Operation and Maintenance				
Provision, Operation and maintenance of new RE system	People cannot use new electrical machines during power cuts so income may suffer	Field personnel should report power outages to the ESD and repair faults quickly and effectively	ESD	BPC
	Consumers are at risk of electrocution if they do not understand the dangers of electricity	1. Train and supervise BPC field operatives to ensure that they check house wiring carefully and reject if deficient; 2. Public education to raise villagers' awareness of dangers of electricity and how to utilize the system safely.	RED, BPC	BPC
	BPC workers are at risk if they do not follow BPC procedures when clearing RoW or repairing faults	1. Follow BPC O&M and H&S manuals and revise these manuals if necessary to increase safety of workers; 2. Regular training of BPC workers to raise awareness of dangers and working procedures to be followed; 3. Improve supervision of field workers; 4. Regular management reviews of safety record, with remedial action where necessary.	RED and ESD, BPC	BPC
	People will not be very tolerant of power cuts once they become used to the benefits of electricity	1. As above: repair faults quickly and effectively; 2. Conduct system maintenance regularly and diligently	RED and ESD, BPC	BPC

Table 13: Environmental Management Plan

Potential impacts	Mitigation measure	Parameters to be monitored	Location	Method	Monitoring Frequency	Responsibility	Cost
Pre-construction							
Impact due to location of target villages in the buffer and multiple use areas of the Sanctuary	1.Route selection in close consultation with Park management, Department of Forest, BPC field staff to avoid sensitive areas;	EC clearance process	MV lines	Route selection and	n/a	RED, BPC	n/a
	2. Route selection approved by National Environment Commission and District Authorities	EC Clearance process	MV lines	Field investigation by Environmental officer	n/a	NEC	n/a
	3. Route should be selected so that clearance along forested areas are avoided wherever possible; Where there is no alternative to routing lines through forest, align routes alongside farm roads and footpaths where possible, alongside forest edges where habitats are already degraded to an extent, and will involve minimum tree felling.	EC clearance process	MV lines	Mapping of field information	n/a	RED, BPC	n/a
	4.Explore possibility of using ABC conductors to Reduce RoW		MV lines	Field assessment	n/a	RED, BPC	To be ascertained
Construction							
Removal of forest cover in protected area	1.Ensure that only those trees marked by the forestry staff are felled 2.Follow standard BPC procedures and practices in clearing ROW	No.of violations	MV lines	Site Observations	Two weeks	EO, BPC	Included in CB
	Explore possibility of planting low growing vegetation in RoW	Revegetation of RoW	MV lines	Site Observations	Two weeks	EO, BPC	n/a
Workers could damage species & Habitats outside RoW	1.Mark RoW boundary & prohibit cutting outside; 2.Only fell trees that have been marked by Forestry staff;	No. of violations	MV lines	Site Observations	Two weeks	EO, BPC	n/a
	3.Prohibit hunting or fishing by workers and enforce strictly	Number of illegal reports	Camp sites	Site Observation Surveys	Monthly	EO, BPC	n/a
	4.Train workers in importance of wildlife and habitats;	Number of illegal reports	Labour camps	Contractor records	Monthly	EO, BPC	Included in CB
	5.Locate labour camps where no forest clearance is needed;	Location of camps	Labour camps	Site observations	Monthly	EO, BPC	Included in CB

	6. Provide adequate food supply so workers do not need to hunt or fish	Illegal activities	Labour camps	Site observations	Monthly	EO, BPC	Included in CB
Disturbance to Black-necked crane Habitat	1. Closely consult BWS management prior to commencing construction work, which should be only conducted during periods when the cranes are not at Bumdeling.	No. Consultations	MV lines	Survey	Monthly	EO, BPC	n/a
	2. Use ABC conductors if possible along river crossings and reflectors for birds to avoid hitting distribution lines	Use of ABC	MV lines	Site observations	As needed	EO, BPC	Included in CB
Impact on private land holdings	Route feeders along edge of villages, avoid locating poles in the centres of fields	Feeder alignment	MV lines	Site observations	Monthly	EO, BPC	n/a
Risk of forest fires if cut vegetation is burnt	Leave cut material to rot down <i>in situ</i> and do not burn; Leave a covering of grass & other low vegetation in RoW;	No. Of fires	MV lines	Site observations	Two weeks	EO, BPC	n/a
	Dispose of trees as required by NRDC or BWS management;	Disposal of trees	MV lines	Site observations	Two weeks	EO, BPC	Included in CB
Delivery of RE materials to drop off points- Air pollution from vehicular movement	Minimize number of deliveries through timely scheduling	No. Of deliveries	Drop off points	Site observations	Monthly	EO, BPC	n/a
Carriage of materials to site could block access	Consult Gup and farmers when transporting material	No. Of consultations	MV and LV lines	Site observations; Village survey	Monthly	EO, BPC	n/a
Excavation at pole sites- Dust may blow from cleared areas	Avoid using large machinery, Manual excavation at pole sites and minimize disturbance at excavated sites,	Site observations	MV lines	Site observations	Monthly	EO, BPC	n/a
Effect on local drainage and soil erosion	Locate poles at a minimum distance of 30 m from rivers, and construct these on stable ground		MV lines	Site observations	Monthly	EO, BPC	n/a
Excavation for poles could damage water pipes in villages	Consult community to identify and avoid infrastructure	No. Of consultations	MV and LV lines	Site observations; Village survey	Monthly	EO, BPC	n/a
Work in villages may create noise, dust & impede access	1. Inform communities of work in advance;		MV and LV lines	Site observations; Village survey	Monthly	EO, BPC	n/a
	2. Identify sites of local significance; locate no poles nearby;		MV and LV lines	Site observations; Village survey	Monthly	EO, BPC	n/a
	3. Consult custodians of facilities (monasteries, nunneries, schools, clinics, etc) and avoid working at sensitive and religious times;		MV and LV	Site	Monthly	EO, BPC	n/a

			lines	observations; village survey			
Economic benefits if local people are employed in Contractor's workforce	Employ as many local residents as possible in workforce	No. of locals employed	All sites	Site observations; worker survey	Monthly	EO, BPC	n/a
Importing foreign workers can cause environmental and social problems at labor camps and in host community	1. Ensure imported workers are provided with housing that has ample toilets, proper drainage and treatment for sewage.	No. of Observations from camp site	All sites	Site observations; worker survey	Monthly	EO, BPC	Include d in CB
	2. Collect solid waste weekly and bury offsite.		All sites	Site observations	Monthly	EO, BPC	
	3. Instruct workers on required behaviour in host community and prohibit them from hunting and fishing.		All sites	Site observations; worker survey	Monthly	EO, BPC	
	4. Camps must be cleaned up and restored after project is completed.		Labour camps	Site observations; worker survey	Monthly	EO, BPC	
Diseases can be introduced into host communities from social and sexual contact with imported workers	1.Initial screening of workers for HIV/AIDS, TB, malaria, swine flu, etc.;	Contractors record on Health issues	Labour camps	Site observations; worker survey	Monthly	EO, BPC	Include d in CB
	2.Facilitate access to the nearest Health facility for check up;		Labour camps	Site observations; worker survey	Monthly	EO, BPC	
	3.Raise worker/community awareness of risks of socially & sexually transmitted disease;		Labour camps	Site observations; worker survey	Monthly	EO, BPC	
	4.Practical measures, e.g. free condoms for workers;		Labour camps	Site observations; worker survey	Monthly	EO, BPC	
Workers and villagers are at risk from accidents on site	Implement Health and Safety Plan that includes measures to: -Exclude the public from all construction sites; -Ensure that workers use Personal Protective Equipment; - Provide Health & Safety Training for all personnel; - Follow documented procedures for all site activities; - Keep accident reports and records; - Inform local communities about the work and dangers	Health and safety mgt.plan	Labour camps	Site observations	Monthly	EO, BPC	
Operation and Maintenance							

Provision, Operation and maintenance of new RE system	Field personnel should report power outages to the ESD and repair faults quickly and effectively	# reports and repairs	MV and LV lines	Reports observations	Monthly	EO, BPC	n/a
	1. Train and supervise BPC field operatives to ensure that they check house wiring carefully and reject if deficient; 2. Public education to raise villagers' awareness of dangers of electricity and how to utilize the system safely.	Training and awareness Reports	All sites	Reports Observations	Monthly	EO, BPC	n/a
	1. Follow BPC O&M and H&S manuals and revise these manuals if necessary to increase safety of workers; 2. Regular training of BPC workers to raise awareness of dangers and working procedures to be followed; 3. Improve supervision of field workers; 4. Regular management reviews of safety record, with remedial action where necessary.	# trainings and supervision reports	All sites	Reports Observations	Monthly	EO, BPC	n/a
	1. As above: repair faults quickly and effectively; 2. Conduct system maintenance regularly and diligently	# Repair and maintenance reports	All sites	Reports Observations	Monthly	EO, BPC	n/a

ESD: Electricity Supply Division, Trashi Yangtse, RED: Rural Electrification Division, BPC, EO- Environmental officer

C. Institutional Arrangement

211. The subproject will be managed and implemented within the institutional framework that already exists in Bhutan for the provision of rural electrification services. The main agencies and their roles will be as follows:

- DoE is the Executing Agency (EA) responsible for management, coordination and execution of all activities funded under the loan.
- BPC is the Implementing Agency (IA), responsible for the successful construction and subsequent operation of all the RE subprojects. BPC is the Implementing Agency (IA), responsible for the successful construction and subsequent operation of all the RE subprojects. Implementation will be managed by the Rural Electrification Department (RED), headed by a General Manager in the Head Office and other Senior Managers in the Divisions.
- RED will coordinate construction of subprojects across all Dzongkhags, and ensure consistency of approach and performance. They will appoint Construction Contractors (CC) to build elements of the infrastructure in a particular Dzongkhag.
- Local implementation will be managed by the field offices of the RED in each of the target Dzongkhags, who will supervise the Construction Contractors, and will be responsible for quality control, contract supervision, monitoring and reporting, etc.
- Environmental issues will be coordinated by the BPC Environmental Unit, who will ensure that all subprojects comply with national environmental safeguards. The Environmental Monitoring Plan (EMP) involves observations and surveys to be conducted during construction and operation to ensure that mitigation measures are provided and that they protect the environment as intended. Construction monitoring will be conducted by RED field offices, and monitoring during operation will be co-ordinated by Distribution and Customer Services Department (DCSD), BPC.

D. Environmental management and Monitoring Costs

212. Most of the mitigation measures require the contractors to adopt good site practice, which should be part of their normal procedures already, so there are unlikely to be major costs associated with compliance. Costs of mitigation by the contractors are included in the budgets for the civil works and do not need to be estimated separately here.

213. Mitigation that is the responsibility of BPC should be included as part of their management of the project. Environmental monitoring during construction must be conducted by BPC Environmental Officers, and budget is required for their travel. Customer satisfaction must be gauged and for this survey expenses may be incurred. There may also be unforeseen mitigation measures that may arise. The costs of these are shown in the following Table. The figures show that the total cost of environmental management and monitoring for the subproject as a whole (covering design, construction and operation) is Nu. 229,800.00

Table 14: Cost of implementing EMP and monitoring

	Activity	Quantity	Unit Cost	Total Cost (Nu.)	Source of Fund
A	Design phase				
	Use of Covered conductors and reflectors	To be ascertained	To be ascertained	To be ascertained	Project
B	Construction phase				
1	Monitoring by Environmental Officer from BPC once every quarter	1person x 2 weeks * 4 times	14000	56000	Project
2	Monitoring by project field staff every month	1personx1week * 12 times	4900	58,800	Project
3	Conducting awareness among public in each gewog	1 gewog	15,000	15,000	Project
4	Capacity building and training for stakeholders & staff		1,00,000	1,00,000	Project
5	Compensation costs (social)		0	0	Project
6	Afforestation/Reforestation by E & GIS Div.		1,00,000	1,00,000	
C	Operation phase				
	Unforeseen environmental impacts	will be covered from project contingency cost			
	Total			229,800.00	

Assumptions:

- Construction works will be completed within one year of commencement
- DSA rates for government officers/staff is as per prevailing rate
- Environmental Division has adequate staff to cover all project sites

X.CONCLUSION AND RECOMMENDATION

A. Project Findings

214. The process described in this document has assessed the environmental impacts of all elements of the infrastructure proposed under the Rural Electrification Subproject. The findings of the assessment are as follows;

- The most significant impact of the project is due to its location and design as all the target villages are either located inside or in the buffer of Bumdeling Wildlife Sanctuary. Keeping in mind the government's policy of equity among all, these communities cannot be ignored or deprived of developmental opportunities simply because they reside in protected areas. Doing so will in fact cause resentment and a negative attitude towards conservation.
- Bumdeling Wildlife Sanctuary was specifically designated to conserve the Black-necked crane that winters in its valley and surrounding areas from October-March. Therefore, any development activity must not by any means interfere/disrupt/destroy the habitat of this endangered bird. In order to ensure that these habitats are protected, the BWS management was involved in the ARE project from the initial planning and design Phase. For instance, BWS staff and BPC staff together conducted the field survey to select the appropriate alignment keeping in mind the sensitive habitats. The final alignment therefore, does not cross Black-necked crane habitat.
- Most of the target villages are actually far away from the Crane habitat which is closer to the river.
- The MV lines are routed along existing footpaths where the forest has already been partially cleared as well as disturbed due to heavy use by locals.
- The three feeders will require a RoW of 12 m each and a total of 1400 trees will be felled along the RoW. This negative impact is expected to be offset by the positive reduction of firewood as local communities are all directly dependent on the forest and use firewood for cooking, lighting and heating. The demand for such resources puts huge pressure on the surrounding forest.
- Potential negative impacts identified were mostly during construction period but these are not considered significant because of the short duration and localised nature of impacts.
- As many of the ARE villages are remote, isolated and not easily accessible; most of the environmental impacts are common across RE projects elsewhere in the country. Thus, BPC already has developed much experience in executing similar projects like these.

215. If the mitigation measures proposed are implemented thoroughly then the new infrastructure should provide major benefits for the recipient households and communities including greatly improved living conditions, improved health, increased incomes from new alternative livelihood opportunities, improved communication and access to information from the use of television, radio, mobile telephones and the Internet and improved education and health facilities.

216. This should greatly improve the health, wellbeing and quality of life of citizens and communities. There will also be ecological benefits as the increased usage of electricity for lighting, heating and cooking will reduce the felling of trees by the rural communities.

B. Recommendations

217. Some recommendations to improve the project and reduce potential environmental impacts are;

- The BPC should also explore the technical and economic feasibility of using ABC conductors to reduce the width of the RoW or across the river crossing to reduce the risk of birds getting hit when flying towards their feeding area.
- All work near the valley areas should be conducted during the months when the birds are not in Bhutan, to minimize disturbance to the birds. In other villages far away, work may be conducted as per the contractors convenience;
- All mitigation, compensation and enhancement measures as well as the Environmental Monitoring Plan proposed in this report should be implemented in full; and
- The BWS management must be involved during the construction Phase just to ensure that critical Habitats are not disturbed or damaged.

C. Conclusion

218. A key element of the national Environmental Clearance application process is the provision of signed No Objection Certificates (NOC) from stakeholders that are specified in the guidelines, including all affected households, Department of Forest, and other relevant Government Agencies (Dept of Culture, Nature Conservation Division, etc). NEC will not consider an EC application that does not contain the necessary NOC, and Forestry Clearance for example is not granted by DoF until a forestry official has surveyed the whole length of any proposed route and has physically marked those trees that may be felled to create the RoW.

219. Once the Environmental assessment has been conducted and the application submitted to the NEC, the District Environmental Officer in collaboration with BPC and Park again revisit the proposed sites to confirm the proposed alignment and ensure that the least environmentally disruptive routes have been selected. This elaborate process of revisiting the proposed sites by different agencies ensures that all possible options have been explored, the environmental impacts of the proposed improvements in rural electrification infrastructure have been assessed and the and the most suitable one adopted.

220. Thus the overall conclusion of this process is that provided the mitigation measures are implemented in full, there should be no significant negative environmental impacts as a result of location, design, construction or operation of the subproject. There should in fact be some small benefits from recommended mitigation and enhancement measures, and major improvements in quality of life once the scheme is in operation.

REFERENCES

- Bhargava, O.N (ed.). (1995). *The Bhutan Himalaya: A geological account*. Special publication 39. Geological Survey of India.
- BPC. (2007). BPC monthly System Performance Reports of ESD
- DGM (2002). *Geology of Bhutan*, Department of Geology and Mines, Ministry of Trade and Industry
- DoE. (2007). Climatic data (Meteorology Division)
- DoF. (1974). *National Forest Policy 1974*, Royal Government of Bhutan
- DoF. (2002). *Forestry in Bhutan, Facts and Figures 2002*. Department of Forestry Services, MoA
- DoF. (2007). "Rules on Biological Corridors" as an addendum to the Forest and Nature Conservation Rules 2006. MoA. RGOB
- Geological Survey of India (1995). *The Bhutan Himalaya: A Geological Account*. Bhargava. O.N. (ed). Special publication 39. Geological Survey of India.
- GNHC (2009): Tenth Five Year Plan 2008-2013. Gross National Happiness Commission. Royal Government of Bhutan
- MoA. (1997). *Atlas of Bhutan, Land cover & Area Statistics of 20 Dzongkhags*, Land Use Planning Project. 1994. Ministry of Agriculture, Thimphu, Bhutan, RGOB.
- MoA. (1997). *Biodiversity Action Plan for Bhutan*, Ministry of Agriculture, RGOB
- MoA. (2002). *Biodiversity Action Plan for Bhutan. 2002*. Ministry of Agriculture, Royal Government of Bhutan
- MoE. (2007). *General Statistics*, Policy and Planning Division, Ministry of Education, Royal Government of Bhutan
- MoHCA .(2006). *National Disaster Risk Management Framework. Reducing Disaster Risks for a Safe and Happy Bhutan*. Disaster Management Division. Department of Local Governance. Ministry of Home and Cultural Affairs. Royal Government of Bhutan.
- MoP. (1997). *9th FYP document, (2002-2007)*, Ministry of Planning, RGOB
- MoWHS. (2006). *Annual Information Bulletin*, PPD, Ministry of Works and Human Settlement, RGOB
- MPFD. (1991). *Master Plan for Forestry Development*, Main Report. 1991. Ministry of Agriculture, Department of Forestry, Royal Government of Bhutan.
- Namgay, K. (2005). Biodiversity Conservation and Protected Area system in Bhutan, pp 129-133, in *People and Protected Areas in South Asia*. Uday.R.Sharma and Pralad. B.

Yonzon. IUCN World Commission on Protected Areas

National Statistical Bureau. (2004). *Statistical yearbook of Bhutan, 2004*. National Statistical Bureau, RGOB

National Statistical Bureau. (2007). *Statistical yearbook of Bhutan, 2007*. National Statistical Bureau, RGOB

NCD. (2001). *Bumdeling Wildlife Sanctuary: Conservation Management Plan July 2001-June 2007*. Nature Conservation Division. Department of Forestry Services. MoA, RGOB

NCD. (2004). *Bhutan Biological Conservation Complex (Living in Harmony with the Nature). A Landscape Conservation Plan: a way forward*. Nature Conservation Division, DoFS, MoA

NEC (2000). *Environmental Assessment Act, 2000*. National Environment Commission. Royal Government of Bhutan

NEC. (2002). *Regulation on Strategic Environmental Assessment, 2002*, NEC, Royal Government of Bhutan

Norbu, C; Baillie, I; Dorji, T; Tamang, H.B; Tshering, K and Hutcheon, A. (2003). *A provisional physiographic zonation of Bhutan*. Journal of Bhutan Studies. 54.

REMP. (2004). *Rural Electrification Master Plan*, Japan International Corporation Agency (JICA)

RGOB. (1995). *Forest and Nature Conservation Act of Bhutan*. Royal Government of Bhutan

RGOB. (2001). *Electricity Act of Bhutan*, Royal Government of Bhutan

RGOB. (2002). *GYT (Gewog Yargay Tshogdue) Act*. Royal Government of Bhutan

RGOB. (2005). *Population and Housing Census of Bhutan, 2005*. Office of the Census Commissioner, Royal Government of Bhutan

RGOB. (2006). *Forest and Nature Conservation Rules 2006* DoF. Royal Government of Bhutan

Special Commission (2007). *List of Monasteries in Bhutan*, Special Commission

ANNEXURES

Annex 1: List of species found in project area

Table 1.1: Flora recorded from project sites during field surveys for this project

<i>Abies densa</i>	<i>Agapetes spp.</i>	<i>Acorus calamus</i>
<i>Aconogum mollee</i>	<i>Berberis insignis</i>	<i>Agertum conyzoides</i>
<i>Alnus nepalensis</i>	<i>Berberis spp.</i>	<i>Altilbe spp.</i>
<i>Betula utilis</i>	<i>Boehmeria spp.</i>	<i>Amaranthus hybridus</i>
<i>Castanopsis spp.</i>	<i>Boehmeria platyphylla</i>	<i>AnapHalis busua</i>
<i>Cinnamom spp.</i>	<i>Brassaiopsis nitis</i>	<i>AnapHalis triplinervis</i>
<i>Cupressus corneyana</i>	<i>Caeslpinia coriaria</i>	<i>Anemone biflora</i>
<i>Daphniphyllum spp.</i>	<i>Cirsium verutum</i>	<i>Anemone rivularis</i>
<i>Docynia indica</i>	<i>Gaultheria fragrantissima</i>	<i>Anemone vitifolia</i>
<i>Elaeagnus parvifolia</i>	<i>Gaultheria spp.</i>	<i>Aquarus calamus</i>
<i>Erythrina arborescens</i>	<i>Girardinia diversifolia</i>	<i>Arisaema</i>
<i>Eurya acuminata</i>	<i>Girardinia heterophylla</i>	<i>Arisaema tortusum</i>
<i>Ilex spp.</i>	<i>Hedychium densiflorum</i>	<i>Artemesia myriantHa</i>
<i>Juglans regia</i>	<i>Hydrangea stylosa</i>	<i>Artemesia vulgaris</i>
<i>Lyonia ovalifolia</i>	<i>Hypericum ludlowii</i>	<i>Astragalus dominus</i>
<i>Michelia cHampaca</i>	<i>Morina polyphylla</i>	<i>Astragalus spp.</i>
<i>Michelia dolstopa</i>	<i>Rhododendron anthopogon</i>	<i>Circium spp.</i>
<i>Persea spp.</i>	<i>Rhododendron arboreum</i>	<i>Cissampelos pareira</i>
<i>Picea spinolosa</i>	<i>Rhododendron barbetum</i>	<i>Clinopodium umbrosum</i>
<i>Pinus bhutanica</i>	<i>Rhododendron hookeri</i>	<i>Colocasia fallax</i>
<i>Pinus wallichiana</i>	<i>Rhododendron kesangii</i>	<i>Conyza canedensis</i>
<i>Prunus prostata</i>	<i>Rhododendron scutti</i>	<i>coriaria nepalensis</i>
<i>Quercus glauca</i>	<i>Rosa bruninii</i>	<i>Corolopsis</i>
<i>Quercus griffithii</i>	<i>Rubus ellipticus</i>	<i>Cotoneaster frigidus</i>
<i>Quercus hystrix</i>	<i>Rubus foliosus</i>	<i>Crassocephaleum crepidiodes</i>
<i>Quercus semecarpifolia</i>	<i>Rubus hoffmeisterianus</i>	<i>Cynoglossum furcatum</i>
<i>Querus lanata</i>	<i>Rubus paniculata</i>	<i>Cyperus cyperoides</i>
<i>Rhus chinensis</i>	<i>Rubus wardi</i>	<i>Dioscorea bulbifera</i>
<i>Rhus hookeria</i>	<i>Sambucus adnata</i>	<i>Fragaria nubicola</i>
<i>Rhus wallichii</i>	<i>Sambucus adnata</i>	<i>Galium aparine</i>
<i>Salix wallichiana</i>	<i>Smilax spp.</i>	<i>Geranium spp.</i>
<i>Schima wallichii</i>	<i>Viburnum erubescens</i>	<i>GnapHalium affine</i>
<i>Sorbus spp.</i>	<i>Ranunculus diffisus</i>	<i>Gonathanthus pumilus</i>
<i>Symplocus glomerata</i>	<i>Remisatia hookerana</i>	<i>Houttuynia cordata</i>
<i>Symplocus paniculata</i>	<i>Roscoea auriculata</i>	<i>Impatiens spp</i>
<i>Taxus baccata</i>	<i>Rotala roundifolia</i>	<i>Indigofera dosua</i>
<i>Tsuga dumosa</i>	<i>Solanum</i>	<i>Nepeta lemiopsis</i>
<i>Viburnum cylindricum</i>	<i>Tanaceteum gracile</i>	<i>Nycea japonica</i>
<i>Oxytropis spp.</i>	<i>Pteridium aquilithum</i>	
<i>Pilea umbrosa</i>	<i>Potentilla atosanguinea</i>	

Table 1.2: Fauna known to occur in Project sites

Common Name	Scientific Name
Leopard	<i>Panthera pardus</i>
Tiger	<i>Panthera tigris</i>
Leopard cat	<i>Prionailurus bengalensis</i>
Wild dog	<i>Cuon alpinus</i>
Barking deer	<i>Muntiacus muntjak</i>
Indian porcupine	<i>Hystrix indica</i>
Sambar	<i>Cervus unicolor</i>
Wild pig	<i>Sus scrofa</i>
Goral	<i>Naemorhedus goral</i>
Serow	<i>Capricornis sumatraensis</i>
Sloth Bear	<i>Melursus ursinus</i>
Himalayan Black Bear	<i>Selenarctos thibetanus</i>
Clouded Leopard	<i>Neofelis nebulosa</i>
Capped Langur	<i>Trachypithecus pileatus</i>
Marbled Cat	<i>Felis marmorata</i>

Table 1.3: Avifauna recorded in Project sites

	Common name	Scientific name
1	Ashy Drongo	<i>Dicrurus leucophaeus</i>
2	Asian House Martin	<i>Delichon dasypus</i>
3	Aberrant Bush Warbler	<i>Cettia flavolivacea</i>
4	Ashy-throated Warbler	<i>Phylloscopus maculipennis</i>
5	Asian Barred Owlet	<i>Glaucidium cuculoides</i>
6	Barred Cuckoo Dove	<i>Macropygia unchall</i>
7	Bay Woodpecker	<i>Blythipicus pyrrhotis</i>
8	Black Bulbul	<i>Hypsipetes leucocephalus</i>
9	Black Eagle	<i>Ichthyophaga malayensis</i>
10	Black-necked Crane	<i>Grus nigricollis</i>
11	Blue Rock Thrush	<i>Monticola solitarius</i>
12	Blue Whistling Thrush	<i>Myophonus caeruleus</i>
13	Blue-fronted Redstart	<i>Phoenicurus frontalis</i>
14	Brown Dipper	<i>Cinclus pallasii</i>
15	Common Hill Partridge	<i>Arborophila torqueola</i>
16	Common Hoopoe	<i>Upupa epops</i>
17	Common Kestrel	<i>Falco tinnunculus</i>
18	Darjeeling woodpecker	<i>Dendrocopos darjellensis</i>
19	Eurasian Cuckoo	<i>Cuculus canorus</i>
20	Eurasian Jay	<i>Garrulus glandarius</i>
21	Eurasian Tree Sparrow	<i>Passer montanus</i>
22	Fork-tailed swift	<i>Apus pacificus</i>
23	Great Barbet	<i>Megalaima virens</i>
24	Green-backed Tit	<i>Parus monticolus</i>
25	Grey Treepie	<i>Dendrocitta formosae</i>
26	Grey Wagtail	<i>Motacilla cinerea</i>
27	Grey-backed Shrike	<i>Lanius tephronotus</i>
28	Indian Cuckoo	<i>Cuculus micropterus</i>
29	Kalij Pheasant	<i>Lophura leucomelanos</i>
30	Large-billed Crow	<i>Corvus macrorhynchos</i>
31	Little Forktail	<i>Enicurus scouleri</i>
32	Long-tailed Minivet	<i>Pericrocotus ethologus</i>
33	Long-tailed Shrike	<i>Lanius schach</i>
34	Mountain Bulbul	<i>Hypsipetes mcclllandii</i>
35	Mrs Gould's Sunbird	<i>Aethopyga gouldiae</i>
36	Nepal House Martin	<i>Delichon nipalensis</i>
37	Oriental turtle dove	<i>Streptopelia orientalis</i>
38	Plumbeous Water Redstart	<i>Rhyacornis fuliginosus</i>
39	Small Niltava	<i>Niltava macgregoriae</i>
40	Spotted Dove	<i>Streptopelia chinensis</i>
41	Streaked Laughingthrush	<i>Garrulax lineatus</i>
42	Verditer Flycatcher	<i>Eumyias thalassina</i>
43	Ward's Trogon	<i>Harpactes wardi</i>
44	White-throated Laughingthrush	<i>Garrulax albogularis</i>

Annex 2: Summary of Public Consultation

Two meetings were held at Bumdeling Wildlife Sanctuary, in June, 2009. At the first meeting there were 11 participants from Panglo and Chen villages while at the second meeting there were 41 participants from Longkhar, Tarphe and Pangkhar. Fortunately, the meeting was timed just prior to the Cordeyceps collection period, when all senior members of the households leave the village to collect this medicinal plant. The 2 meetings were conducted as per the following agenda.

Introduction. The consultant gave a brief introduction to the project, its objectives and the inclusion of the target villages in the project. It was made clear that the new government had given extra priority to commencing the rural electrification works by 2010-11 and wanted to complete the project by 2013.

EIA and Public consultation. The consultant gave an explanation about the National requirement for initiating any development project, especially focussing on the Protected Area Conservation Policy, and the requirement for an Environmental Impact Assessment to be conducted for projects inside protected areas. It was explained that the objectives of the Environmental Assessment was to assess both the positive and negative impacts in terms of social, cultural/religious, environmental and economic considerations. As part of the EA process, public consultation was required to seek the views of all stakeholders involved. As such, all participants were urged to take this opportunity to seek any clarification on any aspect of the project.

Social considerations. The importance of the field survey to determine the exact alignment of the distribution line was emphasized. During such surveys, the route surveyors were able to determine the exact location of the distribution lines, and placements of transformers and poles. At this time, a representative from the village was required to accompany the route surveyor to provide accurate information on land tenure and use, especially as there were different types of land use. With the help of the village representative the surveyors can estimate how much private land will be impacted.

Cultural and Religious consideration. The government has given equal importance to the conservation of religious and cultural sites. Since there are a number of religious Lhakhangs, monasteries, Neys and Lu's, which the surveyors were not aware of, the Tshogpa or community representative should ensure that such information is given to him so that the line can be rerouted to avoid such sensitive areas.

Aesthetics. The importance of aesthetics was also explained to the participants, especially in view of Lhakhangs, neys etc.

Environmental consideration. It was explained that Bhutan is renowned for environmental conservation and therefore when donors are willing to pay for development projects, they are equally concerned that the environmental concerns are given due consideration. At the same time Environmental Conservation is one of the four pillars of Gross National Happiness and it is within the Forest Policy to maintain at least 60% forest cover at all times. It was explained that in terms of forest cover, the RoW depended on the voltage of the distribution line. For 33kV, the RoW is 12m while for 11kV the RoW is 10m.

Economic consideration. The process and the criteria used for selecting villages for inclusion in the 10th FYP was explained in detail. Those villages that were too far and extremely

isolated were not included for on-grid electrification but will be included under Solar Energy Program. The very remote location of such individual houses require very lengthy distribution lines which were not techno-economically feasible and also very expensive.

Public consensus. In order to seek the consensus of all affected households, the BPC was seeking public consensus from all households in the target villages. Through the Dzongkhag and Gup, individual households are asked to sign a public consensus form, basically a “No Objection” statement allowing the BPC to construct poles on their land and align the distribution line through their private land. In many areas, the Gups convened meetings to inform all households and the Tsogpa’s had already collected the signatures.

BPC Policy. Since the BPC has already undertaken the route surveys in consultation with the local representative, and residents have given their approval to allow the distribution line to traverse their land, no problems are expected during project implementation. According to the BPC policy, once the construction is complete, if there are residents that may want to reroute the distribution line, the individual household is fully responsible for incurring the financial cost of removal or shifting of distribution line and poles. Therefore, to avoid such problems or disputes in the future, participants were urged to make themselves aware of the project and the route so that any changes to be made to the alignment should be incorporated during the planning stage, without loss to any party.

Environmental impacts. The positive impacts as well as the negative impacts of rural electrification was highlighted and discussed. The village representatives were asked to be actively involved during campsite selection for workers and to raise awareness with contractors and workers on sanitation, waste generation, illegal activities such as poaching and timber felling.

Participant views. The participants were asked for their views on the project and their comments were solicited.

Summary of Discussions

Turn out at the meeting. The meeting was attended mostly by village representatives who were instructed to inform other members of the community about the discussions during the meeting. This was because a number of farmers were preoccupied in clearing the huge landslide had blocked the access route to the northern remote villages .

Impact on private land. Some participants said that they had seen the surveyors during the route survey, when they visited the village so they were aware of the project. There were no issues regarding the proposed alignment and a number of participants said that there were no religious sites to be concerned about in their village. One participant said that since the exact location of the poles were not finalised, they are not clear whether their household will be affected. Despite this they are willing to sacrifice whatever is needed as the project is for their own benefit.

The participants were also aware of the public consensus forms. There was some discussion on whether or not all the households and villages had completed signing the forms. Since some households were not sure, the Dzongkhag clerk who participated in the meeting was asked to verify this.

A participant from Longkhar, the last village along the alignment requested other participants from other villages to allow the distribution line to pass through their village before it reached Longkhar, by signing the Public consensus forms. Participants said that there is only 1 absentee owner who is living in Dungzam, so no problem is expected with absentee owners.

Positive interest in the project. The participants were very excited and said that they really want the project to be implemented as soon as possible. One participant even said that they will feel like they have reached heaven once they get electricity. Participants felt that electricity will be cheaper for them compared to kerosene and will benefit in conserving the forest as well.

Impact of the project. Many participants felt that the project will help in conservation as each Household currently uses 8-9 small trees or 3-4 big trees per year, which could be reduced with Electricity. Electrification will also help them to live in a clean environment and improve the living standard of the people and increase their life expectancy through reduced exposure to smoke. Currently they are using about 2 liters of kerosene a week which they buy with coupons from Yangtse about 4 hours- 2 days walk. With electricity, they will not need to spend time following lengthy procedures. Students will have better opportunities for studies as they can study in the evenings.

Farmers have to be vigilant over their crops to prevent them from being destroyed by wildlife such as Sambar, Wild pigs, Barking Deer and Monkeys. It is difficult in the dark at the moment, but with electricity they can light their fields and chase them away. The women said that they can weave more and the men can carve or involved themselves in carpentry works in the evenings. Participants from Longkhar said that with electricity they can use rice cookers, boilers and even mobiles, through which they can communicate with their relatives elsewhere.

Current constraints in the villages. In the past, the Dzongkhag provided training for cottage industries but due to lack of electricity and the remote location of their villages, many locals were unable to take up such opportunities. Some participants said that they wanted to make potato chips to sell, while others said that the rice mill owners can replace diesel with electricity and still others want to start small cottage industries to make bamboo products, dapas or traditional paper. No households use solar electricity because they cannot afford to buy it.

The villagers face a number of constraints such as difficulties in obtaining fuelwood because some households walk between 1-2 km and a lot of time and energy is spent in cutting and bringing back the cut wood due to lack of power chains. Other problems are lack of access roads. Participants said they are proud to live in BWS but the rules are quite strict, so they dare not cut trees illegally.

Negative impacts from the project. The participants did not see many negative impacts but also stated that since it is the first time for them, maybe they were unaware of future impacts. Others said that they have heard that there is a risk of electrocution due to short circuit. It was clarified that awareness programs will be conducted prior to project operation period.

No endangered species are usually found near their settlements so there should be no concern about impacts on wildlife.

There were few questions regarding the project. Participants wanted to know when the project will start. A participant from Derma Drung wanted to know if his village was included and this was affirmed. Some participants wanted to know what a transformer was, which was clarified by the Dzongkhag clerk.

Once the discussions on the ARE project was over, other topics were discussed such as house construction forms, Farmers said that they earn between Nu 20,000 to 50,000 during the Cordeyceps auction which is arranged by the Sanctuary management.

List of Participants at the Public consultation

No.	Cheng village		Dramadung village
1	Phurpa Tshering	1	Tshering Yangchen
2	Pema Wangyel	2	Kelzang Wangdi
3	Choki Lhamo	3	Tashi Tenzin
4	Chhimi Dorji	4	Tenpa Gyeltshen
	Panglewoong village		Pangkhar village
1	Tashi Wangdi	1	Sonamla
2	Nima Norbu	2	Thagoen
3	Leki Dorji	3	Sacha Zangmo
4	Karma Leytho	4	Gempo Dorji
5	Kunzang Dorji	5	Tashi
6	Karma Wangchuk	6	Kunzang Namgyal
7	Dorji Tshering	7	Kuenley Wangchuk
			Shachala
	Nangphu village		Longkhar village
1	Dechen Zangmo	1	Tenzinla
2	Tshering Yuden	2	Kunzang Namgyal
3	Tshewang Tashi	3	Karma Wangdi
4	Thugten Tashi	4	Dema
5	Yonten	5	Ugen Yangchen
6	Choeden Zangmo	6	Wangmo
7	Dechen	7	Ugen
8	Sangay Wangmo	8	Tshumpa
9	Jubdula	9	Shacha Dorlma
10	Deki Dolma	10	Sangay Lhamo
11	Thinley Pemo	11	Sonam Choden
12	Dorji	12	Chorten Wangmo
13	Karma Dorji	13	Dolma
14	Kelzang		
15	Kukumo		
16	Chhimi Peldon		
TOTAL		52	

Annex 3: Photos from project sites



Photo 1: Trashi Yangtse town



Photo 2: Trashi Yangtse town



Photo 3: The main valley in Bumdeling



Photo 4: Broadleaf forest along route



Photo 5: Tarpheh village
Both are target villages with few scattered households



Photo 6: Bamree village



Photo 7: Kardung village
Both target villages too



Photo 8: Chen village



Photo 9: Park office in Yangtse town



Photo 10: Zhapang village



Photo 11: Religious rocks known only to locals



Photo 12: Famous religious site in Yangtse



Photo 13: Women carrying drinking pipes



Photo 14: Paddy transplantation



Photo 15: Public consultation, Longkhar



Photo 16: Public consultation, Tarpel



Photo 17: Womina Primary school



Photo 18: Tarpel Primary School



Photo 19: Common Tap outside the house



Photo 20: Horses are one means of carrying materials to the village



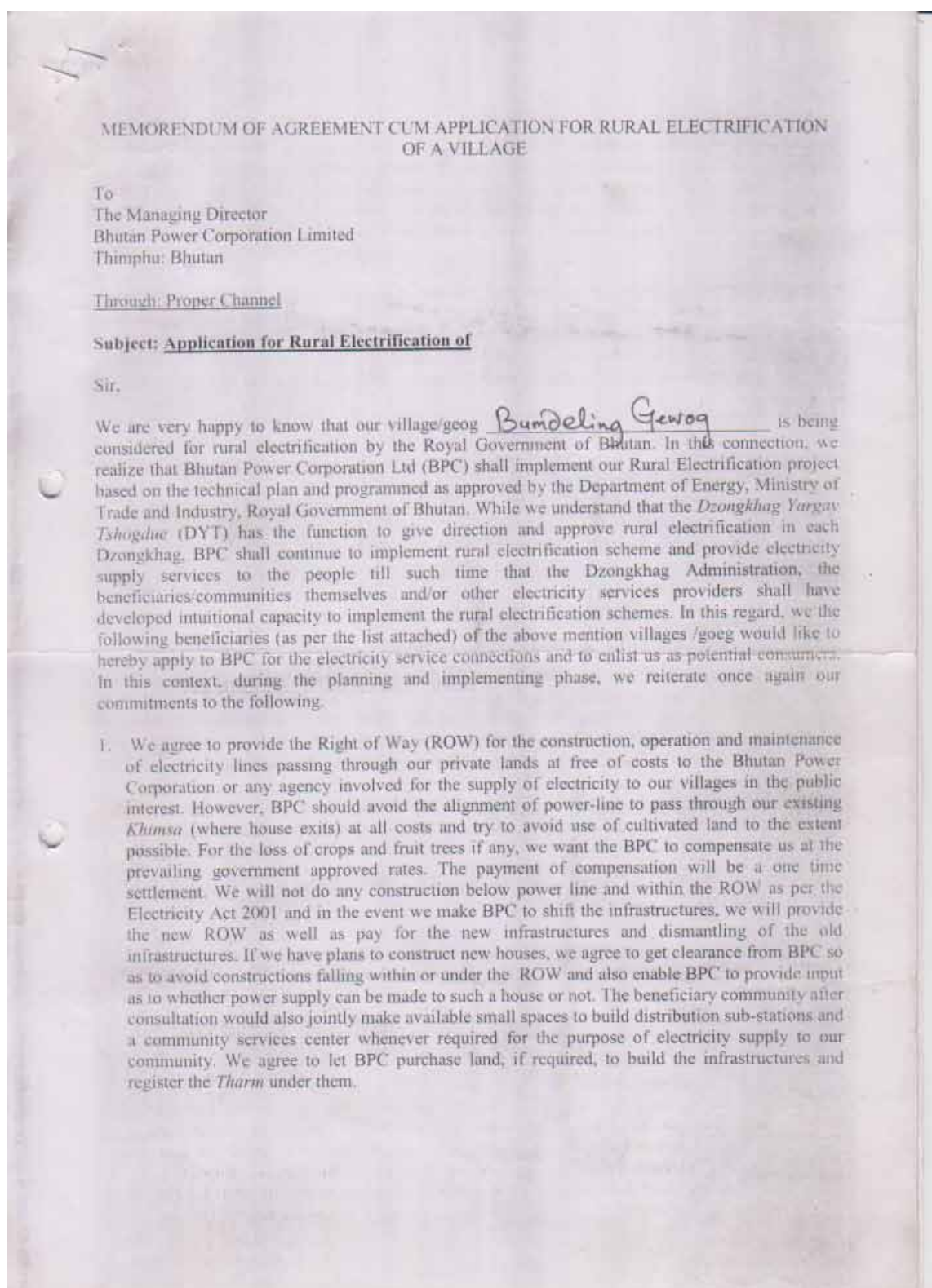
Photo 21: Pole mounted transformer



Photo 22: Dechenphodrang Monastery

Annex 4: Sample copy of MOU between BPC and individual households

Page 1/3



2. We also agree to do our own internal wiring of houses and to be ready at the time of completion of electric lines and substations to receive the electricity supply as soon as power supply system is charged and we shall refrain ourselves from being near to the electric lines for safety reasons. We agree to not hold BPC responsible for any accidents that happen within the premises of consumers since their responsibility ends at the nearest LT pole from where the services wire is connected to the consumers' premises.
3. We agree to abide by all the terms and conditions of Electricity Supply Rules and Regulations of the Kingdom in force as per the Electricity Act 2001 and we shall pay the monthly electricity bill regularly. We also agree to safe guard and protect the electricity supply infrastructures and the assets such as power lines, sub-stations and energy meters provided by BPC in the public interest and installed in our households/villages/geog for the benefit of all the electricity consumers in the vicinity.

Thanking you in anticipation,


Yours faithfully,
**BUMELING
TRASHI YANGDES**

(Name, signature & seal of Gup)

On behalf of the consumers as listed in the following pages

Recommendation & Approval of Dzongkhag Yargay Tshogdue (DYT)

The *Dzongkhag Yargay Tshogdue* hereby approves and recommends for rural electrification for the above mention village/geog as per terms and conditions agreed upon by the.....Households/Consumers of.....village/geog and the application is forwarded herewith to Bhutan Power Corporation for kind consideration and further necessary action. We have noted that this proposal is generally in line with the Rural Electrification Master Plan program, which has been adopted by the DYT for implementation guidance in future.

DYT fully endorses the rural electrification of the village..... as per the decision of the DYT held ondated.....


CHAMPDEEN
(Signature, Name, Seal of the
Dzongkhag Yargay Tshogdue
DYT, Trashi Yangdes)

The Dzongkhag Administration will provide all necessary assistance and support to the BPC, and its staff for the successful implementation of the rural electrification scheme in this village/geog of the Dzongkhag.


འབྲུག་རྒྱལ་ཁབ་གཞི་རྒྱུ་རྒྱུ་
(Signature, Name and Seal of Dzongda)
Dzongkhag Administration
འབྲུག་རྒྱལ་ཁབ་གཞི་རྒྱུ་རྒྱུ་

ARE Public Clearance.

4

APPLICATION FORM FOR ELECTRIFICATION OF A VILLAGE/GEWOG

List of households /Electricity consumer applying for rural electrification

Name of Village...*Tsingling*.....Geog...*Khondoling*..Dzongkhag...*Tokhonyang*...

Sl.#	Name of the head of family	Gung No.	Thram No.	Identity card No.	Signature
1.	Ugyen Chada	242	339	11601002232	old
2.	Chonimo	243	340	0122138	
3.	Ngaymo	244	341	11601002242	
4.	Karma Dacci	245	342	0216119	
5.	Tharpagaymo	246	344	11601002269	
6.	Dema	247	132	11601002270	
7.	Tsolori Uden	248	131	11601002279	
8.	Ugyen Tengzi	249	346	11601002279	
9.	Khenzangmo	250	347	0122187	
10.	Tadi Gaymo	251	248	11601002309	
11.	phurpa Tsolori	252	349	11601002326	
12.	Ugyenla	253	350	11601002334	
13.	Sambu Dema	254	345	11601002343	

ⁱ Forest and Nature Conservation Act, 1995, RGOB