Environmental Safeguard Monitoring Report

1st Quarterly Report
December 2015

BHU: Second Green Power Development Project-118 MW Nikacchu Hydropower Project

Prepared by the Tangsibji Hydro Energy Limited for the Asian Development Bank.

Environmental Safeguard Monitoring Report

Reporting Period August, 2015 to November, 2015}
Date December, 2015

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Executive Summary

The Environmental Clearance for 118 MW Nikachhu Hydropower Project was accorded on July 01, 2015. With the receipt of clearance construction of access roads were awarded in November 2015 pre-construction works including access road construction was awarded in November 2014 followed by water supply arrangement, construction power supply arrangement and contractor construction facilities.

The main package works have not yet been awarded and project is still under pre-construction phase due to which the impact experienced is minimum. THyE has been monitoring all aspects of Environment and Social well being in line with the EMP and RP approved by ADB. No major environmental and social issues were experienced except at those areas were inevitable.

The main construction work has not begun, however, implementation of relevant Environment Management Plans and Resettlement Plans have been carried out. Environmental Management Plan (EMP) is based on the analysis of project activity interactions with the baseline features in the project area. The EMP reflects all identified impacts and required mitigation measures, as well as monitoring programs, in conformity with the requirements of the Royal Government of Bhutan, while also being compliant with the Environmental Safeguard Policies of ADB. The Environment Management Plan for following items, during pre-construction phase was proposed:

- Land Acquisition (temporary and permanent);
- Mobilization of equipment;
- Influx of workers;
- Fuel storage;
- Biodiversity and Wildlife management;
- Solid waste management;
- Project water supply system;
- Construction work management;
- Fisheries development plan;
- Catchment Management Plan;
- Transmission line alignment.

Some of the items like mobilization of equipment, influx of workers and fuel storage are not highlighted at this stage since the main contract package has not been awarded. All the management plans that are to be implemented at site were complied and some plans such as Biodiversity Management and Catchment Management involving government counter-parts are at the finalization stage.

1.0. Introduction

1.1. Brief Project Description

Tangsibji Hydro Energy Ltd (THyE) fully owned by Druk Green Power Corporation Limited was incorporated, on April 25, 2014, as a Special Purpose Vehicle to develop 118 MW Nikachhu Hydropower Project. The 118 MW Nikachhu Hydro Power Project was identified in the updated Power System Master Plan (PSMP) of Bhutan (2004). The Pre-Feasibility Study (PFS) that was completed on 31 December, 2011 followed by Feasibility Study in September 2012. The Detailed Project Report was completed in September 2013.

Bhutan Consultants & Research (BHUCORE) carried out Environmental and Social Impact Assessment (ESIA) of the Nikachhu project on June 1, 2012, and revisions to the ESIA report have been made by PWC India consultants under the technical assistance of Asian Development Bank (ADB). The report constitutes three parts comprising ESIA, Environment Management Plan (EMP) and Resettlement Plan (RP)

With an estimated energy generation of 491.52 MU, 85 % shall be exported which will not only enable revenue generation for the nation but reduces Green House Gas emission in the neighbouring country by replacement of fuel by clean and renewable energy, hydropower. Further, the outflow of Nikachhu into Mangechhu reservoir provides additional 323.77 MU to Mangdechhu Hydro Electric Project

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Nikachhu Hydropower Project is located in Trongsa and stretches over 25 km from Dam, at Lorim, to Power House, at Norbuodi with 12.14 km Head race Tunnel (HRT) having five intermediated tunnels, ADITs. With the construction of 38 m high dam, 12.28 acres of land will be impounded by 810 m water back-flow.

1.2. Project Progress Status and Implementation Schedule

During this pre-construction stage, infrastructure facilities such as access road of 17.411 km, about 8 km construction power line, water supply arrangement, residential, labour camps and offices were constructed. The detail is as provided below in the Table 1.1.

Table 1.1 Project Progress Status

Sl. No	Facility	Details	Status
1	Access road to Dam and Bailey bridge	✓ Contractor: Construction Development Corporation Limited, Thimphu ✓ Contract Amount: ○ Construction of 30 m span 24R Bailey Bridge: BTN 14,812,670.43	✓ Road Handed over on 12th November, 2015

		○ Construction of 2.10 km Access Road : BTN 34,791,955.00 ✓ Contract Agreement signed on 15th October, 2014 ✓ Formation cutting started on 28th November, 2014	✓ Camp demobilized on 1st December, 2015
2	Access road to Adit-I	✓ Contractor: M/s Gayjur Construction Private Limited, Mongar ✓ Contract Amount: BTN 18,760,650.00 ✓ Letter of award issued on 19th October, 2014 ✓ Contract Agreement signed on 1st November, 2014 ✓ Formation Cutting started on 23rd November, 2014	Schedule to complete by 15th December, 2015.
3	Access road to Adit-II and Adit-III	✓ Contractor: M/s Lamnekha Construction Private Limited, Thimphu ✓ Contract Amount: BTN 50,626,000.00 ✓ Letter of award issued on 19th October, 2014 ✓ Contract Agreement signed on 3rd November, 2014	Road taken over on 2nd November, 2015
4	Access road to Adit-IV, V, and Surge Shaft	✓ Contractor: M/s Gyalcon Infrastructure Private Limited, Thimphu ✓ Contract Amount: BTN 22,678,100.00 ✓ Contract Agreement signed on 1st November, 2014	Road taken over on 2nd November, 2015
5	Access road to Power House	✓ Contractor: M/s Tshering Construction Private Limited, Bumthang ✓ Contract Amount: BTN 60,158,750.00 ✓ Contract Agreement signed on 1st November, 2014	Schedule to complete by 25th December, 2015
6	Water supply arrangement to Dam and Adit I	✓ Contractor: M/s TGD Construction, Trongsa ✓ BTN 2,838,862.50 ✓ Letter of Award issued on 27th December, 2014. ✓ Contract Signed on 12th January, 2015	Completed
7	Water supply arrangement to Adit II,III &IV	✓ Contractor: M/s L.S. Construction, Trongsa ✓ Contract Amount: BTN 1,820,936.10 ✓ Letter of Award issued on 27th December, 2014. ✓ Contract Signed on 12th January, 2015	Completed
8	Water supply arrangement to Adit V, Surge Shaft & Power House	✓ Contractor: M/s Karma Tshering Construction, Bumthang ✓ Contract Amount: BTN 3,356,028.78 ✓ Letter of Award issued on 27th December, 2014. ✓ Contract Signed on 12th January, 2015	Completed

9	Contractor facility at Dam, Adit-I &Adit-II	✓ Contractor: M/s Gayjur Construction Private Limited, Lingmithang ✓ Contract Amount: BTN 28,477,299.24 ✓ Contract Agreement signed on 5th May, 2015	Schedule to complete by 30th December, 2015
10	Contractor facility at Adit-III, Adit-V, Surge Shaft & Power House	✓ Work Awarded to M/s Z&K Construction Private Limited, Thimphu on 7th April, 2015 ✓ Contract Agreement signed on 22nd April, 2015 ✓ Contract Amount: BTN 31,843,544.50 ✓ Letter of commencement of work issued on 1st July, 2015	Schedule to complete by 30th December, 2015
11	Client facility at Dam	✓ Contractor: M/s Lamnekha Construction Private Limited, Thimphu ✓ Letter of Award: 5th June, 2015 ✓ Contract Agreement signed on 20th June, 2015 ✓ Contract Amount: BTN 18,558,838.10 ✓ Contract Duration: 4.50 months	Schedule to complete by January, 2016
12	Client facility at Power House	✓ Letter of Award: 18th June, 2015 ✓ Contract Agreement signed on 3rd July, 2015 ✓ Awarded to M/s Gyalcon Infrastructure Private Limited, Thimphu ✓ Contract Amount: BTN 18,247,704.75 ✓ Contract Duration: 4.50 months	Schedule to complete by January, 2016

2.0. Compliance to National Regulations

2.1. Terms and Conditions of Environmental Clearance

Table 2.1 compliance with Environment Clearance

Sl.no	Reference to Environmental Clearance	Relevant Condition	Compliance
1	Clause 9	The holder shall ensure that the implementation of the proposed project is strictly confined within the allocated area.	Complied.
2	Clause 15	The holder shall ensure that local residents, households, communities, public, private parties and religious, cultural, historical and ecologically important site are not adversely affected by the construction of proposed project.	Complied, except for the household below the access road of Adit-III, which has been damaged by falling rock. However, a

			new house had been constructed with better facilities and handed over to the owner.
3	Clause 18	The holder shall ensure that the implementation of the proposed project, except the Dam, does not lead to blockage, storage or diversion of river, stream, irrigation channel, waterfall and underground water source.	Complied.
4	Clause 19	The holder shall ensure that a buffer of at-least 100 ft is maintained between the project activities and water streams.	Maintaining buffer from streams were not practical where the road alignment has to cut the water body. However, mitigation measures, for elimination of impact on water, such as causeways, and hume pipes were constructed.
5	Clause 21	The holder shall ensure Biodiversity Management Plan and Compensatory Afforestation Program are implemented in co ordination with the DoFPS to minimize biodiversity impacts.	Complied.
6	Clause 22	The holder shall ensure that the construction works at Adit-II are not carried out from 10 pm to 6 am.	Complied.
7	Clause 24	The holder shall ensure that felling of trees if required are done only upon obtaining approval from DoFPS and as per the conditions of the approval.	Complied.
8	Clause 28	The holder shall ensure that Environment Friendly Road Construction techniques are adopted for construction of access roads.	Complied.
9	Clause 29	The holder shall ensure that the bio engineering practices are adopted on all road side slopes.	Complied.
10	Clause 30	The holder shall ensure construction of side drains, cross drains, causeways, and other supporting structures are required to prevent soil erosion, improve usability and sustainability of road .	Complied.
11	Clause 36	The holder shall ensure that no raw materials of any kind, machineries, plants and equipments and excavated	Not Complied due to space constraint at the access road

		materials are staked along the highway.	side.
12	Clause 37	The holder shall ensure safe and smooth flow of traffic along the highway.	Complied.
13	Clause 40	The holder shall ensure dusts are suppressed.	Complied.
14	Clause 46	The holder shall ensure that dump sites are stabilized with appropriate protection measures	Complied.
15	Clause 52	The holder shall ensure that waste generated from the labour camps and work sites are managed as required under WPMA of Bhutan.	Complied.
16	Clause 59	The holder shall ensure that safety gadgets are provided to all workers and any person entering the worksite.	Complied.
17	Clause 66	Ensure that signboard are erected at the starting point of the project area	Complied

3.0. Compliance to Environmental Covenants from the ADB Loan Agreement

3.1. Schedule 5 Environment (prepare a matrix to show how compliance was achieved)

Table 3.1 Compliance to Environmental Covenants

Sl.No	Relevant Condition	Reference	Compliance status
1	The Beneficiary shall ensure, or cause DGPC and THyE to ensure, that the preparation, design, construction, implementation, operation of the Project and all Project facilities comply with (a) all applicable laws and regulations of the Beneficiary relating to environment, health, and safety; (b) the Environmental Safeguards; (c) the EIAs; and (d) all measures and requirements set forth in each EIA and EMP, and any corrective or preventative actions set forth in a Safeguards Monitoring Report.	Financing Agreement, Schedule 5, Paragraph 3	Complied.
2	The Beneficiary shall ensure, and cause DGPC and THyE to ensure, that(a) there are no measurable adverse impacts on critical habitat that could impair its ability to function; (b) there is no reduction in the population of any recognized endangered or critically endangered species; and (c) any lesser impacts are mitigated. Without limiting the generality of the foregoing, the Beneficiary shall cause DGPC and THyE to establish a biodiversity management committee acceptable to ADB that (a) shall be	Financing Agreement, Schedule 5, Paragraph 4	Complied.

	responsible for implementation monitoring and evaluation of the biodiversity conservation and biodiversity management plan as outlined in the relevant EMP and (b) shall ensure that the Project facilities are constructed and operated in a manner consistent with the JSW National Park Management Plan		
3	The Beneficiary shall cause DGPC and THyE to (a) assess on a continuous basis, in accordance with the relevant EMP, the minimum environmental water flow requirements during the operation of the Project facilities; and (b) ensure a minimum water flow, at a level acceptable to ADB, so as to minimize downstream impacts and make sure there is no net loss of downstream aquatic biodiversity arising from the operation of hydropower facilities in the Mangdechu river basin, including from the Project facilities and the Mangdechu Hydroelectric project. The Beneficiary shall cause DGPC to establish a funding mechanism or internal resources to ensure integrated water resources management for the Mangdechu river basin, including compliance with the minimum environmental water flow requirements as set out in the preceding sentence	Financing Agreement, Schedule 5, Paragraph 5	Not relevant at this stage of project phase.
4	The Beneficiary shall ensure, or cause DGPC and THyE to ensure, that all land and all rights-of-way required for the Project, and all Project facilities are made available to the Works contractor in accordance with the schedule agreed under the related Works contract and all land acquisition and resettlement activities are implemented in compliance with (a) all applicable laws and regulations of the Beneficiary relating to land acquisition and involuntary resettlement; (b) the Involuntary Resettlement Safeguards; and (c) all measures and requirements set forth in the RP, and any corrective or preventative actions set forth in a Safeguards Monitoring Report.	Financing Agreement, Schedule 5, Paragraph 6	Complied.
5	Without limiting the application of the Involuntary Resettlement Safeguards, and the RP, the Beneficiary shall ensure or cause DGPC and THyE to ensure that no physical or economic displacement takes place in connection with the Project until (a) compensation and other entitlements have been provided to affected people in accordance with the RP; and (b) a comprehensive income and livelihood restoration program has been established in accordance with the RP	Financing Agreement, Schedule 5, Paragraph 7	Complied.
6	Submit quarterly Environmental Safeguards Monitoring Reports and semi-annual Involuntary Resettlement Safeguards Monitoring Reports to ADB	Financing Agreement, Schedule 5,	Complied.

	during construction of the Project facilities and annual Environmental Safeguards Monitoring Reports during operation of the Project facilities, and disclose relevant information from such reports to affected persons promptly upon submission;	Paragraph 11, bullet 'a'	
7	If any unanticipated environmental and/or social risks and impacts arise during construction, implementation or operation of the Project that were not considered in the relevant EIA, EMP or the RP, promptly inform ADB of the occurrence of such risks or impacts, with detailed description of the event and proposed corrective action plan;	Financing Agreement, Schedule 5, Paragraph 11, bullet 'b'	Complied.
8	No later than 31 March 2015 engage a panel of experts to monitor and report upon Project implementation, and facilitate the carrying out of any monitoring activities by such panel; and	Financing Agreement, Schedule 5, Paragraph 11, bullet 'c'	Complied.
9	Report any actual or potential breach of compliance with the measures and requirements set forth in the relevant EIA, EMP or the RP promptly after becoming aware of the breach.	Financing Agreement, Schedule 5, Paragraph 11, bullet 'd'	Complied.

4.0. Compliance to Environmental Management Plan

4.1. Biodiversity Management Committee

To constitute Biodiversity Management Committee (BMC) for effective implementation of Biodiversity Conservation Programme enlisted in EMP, besides THyE other members include from National Biodiversity Center (NBC), Royal Society for Protection of Nature (RSPN), Department of Forest and Park Services (DoFPS), Department of Livestock (DoL), and Dzongkhag Administration, Trongsa. The reports received from NBC are attached as **Annexure-I.**

4.2. Biodiversity Conservation Programme

A Memorandum of Understanding (MoU) was signed between NBC and THyE for rescue of rare endangered species, from Nikachhu project site, on December 08, 2014. Till date survey and rescue was carried out thrice as detailed below:

Table 4.1 Details of floral survey and rescue

Survey/Rescue	Date	Remarks
1st survey and rescue	February 26-March 06, 2015	Documentation of existing floral diversity of the Nikachu hydropower project sites.
2nd survey and rescue	April 09- 13, 2015	Rescued 14 species of Orchids.
3rd survey and rescue	August 19-30, 2015	18 plant species were collected and rescued.

The MoU was signed to augment baseline floral data in the project area and to rescue threatened species, if any, to prevent being destroyed during the main project construction.

Figure 1.1 Floral species rescued from project sites

In total 32 plants species were rescued from all the project sites. The rescued floral species are conserved ex-situ as living collection at the Royal Botanical Garden, Serbithang, Thimphu.

Figure 1.2 Orchid species conserved in Orchidarium at Serbithang, Thimphu.

THyE has approved contribution of Nu. 3.6 million to Forest Territorial Division, Zhemgang, for Botanical Garden construction at Tingtibi during the 15th Board Meeting on October 30, 2015

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4.3. Human-Wildlife Conflict Management

Wild bores are the main predator to the crops of farmers. In view of the difficulty faced by the farmer, THyE had discussion with the Geog Administration on electric fencing agriculture lands. During a meeting on October 27, 2015 it was mutually agreed between the Forest Territorial Division, Dzongkhag and Geog Administration that electric fencing system shall be implemented by Department of Forest and Park Services for which Nu.1.5 million was approved.

4.4. Augmentation of Baseline Surveys

To augment baseline data of fish survey carried out in 2012, THyE has approved the proposal for aquatic survey by the College of Natural Resource, Lobesa. The proposal covers fish, butterfly and micro-invertebrate survey during the lean season. The survey shall be conducted from November to December, 2015.

4.5. Compensatory Afforestation

Of the 239. 802 acres of land acquired for project, only about 47 acres by the access road and about 8 acres for contractor construction facility have been cleared. However, Compensatory afforestation was initiated from the project site with plantation of 3,000 seedlings along the slopes of access road side at Surge Shaft and Power House. THyE has also planted 8,000 seedlings in the community forests of Tangsibji and Tshangkha in collaboration with respective community forest group members and Geog forest office.


Figure 1.3 Plantation at Community Forests

THyE has also approved contribution of Nu. 7.5 million to Department of Forest and Park Services for compensatory afforestation.

4.6. Catchment Management

The EMP requires various catchment management program comprising rapid classification of micro-watershed, assessment of critical micro-watershed and implementation of management plans. To implement the plan, THyE had discussion with Watershed Management Division (WMD) under DoFPS and found out that World Wildlife Fund (WWF) has already signed a project with the Department to carry out catchment management along Nikachhu, which also includes the project area of Nikachhu Hydro Power Project. WMD has been carrying out rapid assessment of watershed along Nikachhu from September 2015.

4.7. Panel of Expert

To monitor implementation of EMP an Environmental Expert and Social Development Expert was appointed. They serve as an independent consultant to THyE and back up Environment Unit for any environmental and social issues. The Panel of Experts (PoEs) visited site from February 26-28, 2015 for familiarization of site and from April 19-25, 2015 for consultation and monitoring project sites. The Experts also visited from November 15-22, 2015. The reports have positive feedback about the project.

Figure 1.4 Consultations by PoE

4.8. Aquatic Specialist

National Centre for Riverine and Lake Fisheries (NCRLF), Haa, under the DoL was approved to be appointed as the aquatic specialist to THyE due their expertise and availability of required equipments and man-power. THyE shall be signing MoU with the Centre for duration of six years.

4.9. Air and Water Quality Monitoring

After the award of pre-construction work, air and water quality and noise level were monitored on 15-16 July, 2015. The air quality parameters were all found within the standard while water quality parameters such as PH is 8.68 and 7.50 TU upstream of Dam which may be due to heavy rainfall that the catchment of Nikachhu is experiencing and 8.44 PH and 10.50 TU downstream of dam which may be contribution from road cutting as well. To mitigate any impact from project site the site engineer of contractor was asked to prevent falling of boulders and soil into the river. Monitoring was also done to prevent muck disposal into the river. During the monsoon, run-off from the slope of roads is inevitable. The quality monitoring report is attached as **Annexure-II.** The standard of water quality is attached as **Annexure-II (a)**.

4.10. Bio-Engineering

Although road works have not been completed, few bio-engineering works were done along the slopes of access road to power house and surge shaft to maintain stability. The works included plantation of seedlings and grass seed broadcasting. However, due to slide in many areas the growths of seeds were hampered. Therefore, it is planned to carry out the activities in the next season in collaboration with Department of Forest and Park Services. THyE has already approved Nu. 1.5 million from land management in the project site by DoFPS.

Figure 1.5 Seed broadcasting

4.11. Waste Management

For proper waste management around project area, cleaning campaign and waste seggregation was carried out from View Point till Tsheringma Drupchhu, in collaboration with Tshangkha Central School, on June 05, 2015.

Figure 1.6 Cleaning Campaign

Further, contribution of 25 nos. of garbage bins to Dzongkhag Administration, for waste management, was approved by the management. The Dzongkhag Administration shall be distributing to respective sectors.

For solid waste during the construction phase, THyE have asked Geog Administration to identify suitable area for landfill development in co-ordination with Forest Office. At the initial phase of project, THyE shall be using landfill at Chujapang owned by Dzongkhag Administration. The Procurement of Garbage Compactor Truck was also approved for collection of waste from community as well as from project sites.

4.12. Private Land

Most of private lands acquired for project construction are under Tsangkha Chiwog. Although only 3.577 acres of private land belonging to 11 households and One Community Primary School were indentified during the project planning stage, five additional households were affected during the actual road construction works as detailed below:

Table 5.1 Additional Affected Persons

Sl.No.	Name	Affected by	Plot No.	Area affected
1	Sumchokmo	Access road to Adit-I	TAN-3253	0.406
2	Kinley Zangmo	Access road to Adit-V	TAN-1906	0.362
3	Tshering Norbu		TAN-2872	0.196
4	Pelden		TAN-1907	0.362
5	Rinzin Wangmo	Access road to Power House	TAN-1876	0.152
TOTAL				**1.596**

Consultations with the additional affected household were carried out and meeting done with them in presence of Geog administration to brief them on the type of compensation they are entitled to. Since the access roads are temporary, it was agreed to provide their land on lease for duration of project completion at the rate prescribed in the Land Lease Rule of Bhutan, 2009. A copy of letter of agreement is attached as **Annexure-III.** However, the PAP at Power House has asked for land compensation. Cadastral surveys are being carried out from October 5, 2015 to verify the actual impact of road construction to private lands that were already compensated. The detail is as shown below:

Table 6.1 Actual Affected Area

Sl. No.	Thram No.	Name	Plot No.	Land Name	Total Affected Area	Compensated area (Ac)
1	255	Sonam Wangchen	TAN-1889	Dorteng	0.699	0.210
2	181	Kunzang Wangmo	TAN-1909	Draktsawa	0.372	0.165

3	258	Dorji Dema	TAN-1863	Dragitsawa	0.460	0.126
4	257	Phub Zangmo	TAN-1855	Ghochemgongwog	0.563	0.241
5	272	Tshewang Lhamo	TAN-1865	Samrang Gongwog	0.336	0.121
6	272	Tshewang Lhamo	TAN-1867	Sakhoglog	0.689	0.348
7	254	Rinzin Wangmo	TAN-1876	Leaychu	0.152	0.000
8	269	Tshang Tshang Dorji	TAN-1878	Tangseydragchun	0.215	0.197
9	269	Tshang Tshang Dorji	TAN-1879	Tangseydragchun	0.203	0.155
10	258	Dorji Dema	TAN-1880	Laychu	0.604	0.267
TOTAL					**4.293**	**1.830**

THyE after receiving survey reports from Dzongkhag Administration shall process for compensation as per the Land Act of Bhutan and ADB Safeguard Policies.

Figure 1.7 Consultation with PAPs

As identified in the Environment Impact Assessment Report, the 132 kV transmission line shall require acquiring 0.6 acres of private land at Drakten and Langthil. Since the work is scheduled to commence in June 2016, THyE has requested Dzongkahg Administration to process for land replacement which will be awarded as deposit work.

4.13. Government Reserve Forest Land

THyE has leased 195.262 acres of GRF land from the National Land Commission (NLC) with lease agreement signed on May 01, 2015. The leased land does not include access

roads which was agreed to be leased only after completion. Till date only about 47 acres for road and 8 acres for contractor construction facilities were used.

4.14. NamgayChholing CPS

Access road to Adit-III takes-off from a point at the farm road to Tangsibji village belonging to Namgay Chholing Community Primary School. 0.44 acres of land was affected by road construction for which land development cost, Nu. 75,000/acre, as provisioned in Resettlement Plan was provided. However, the Geog Administration requested for cash compensation and THyE shall disburse the amount as soon as the office receives letter from Geog.

4.15. Private House

At about 165 meters of access road to Adit-III from the take-off, a house was damaged due to a falling boulder from the access road. However, the mishap occurred only after the completion of all formation cutting of the roads and not during the work. The two storied house belong to Ms. Karma at Tangsibji Chiwog. Several discussions were held with the contractor, Affected Person (AP) and Geog Administration for compensation. It was agreed that the contractor shall re-build a new house for AP and the contractor has replaced all the household items that were damaged.

The new constructed house was handed over to the owner on December 30, 2015 and built in a better condition and improved facilities than earlier, with improved toilet and kitchen provision.

Figure 1.8 Reconstruction of affected house

4.16. Community Development Programme

Community Development Programmes (CDP) were enlisted in the Resettlement Plan (RP) in consultation with PAP and Geog and approved by ADB, DGPC and the Royal Government of Bhutan amounting Nu. 16.40million, excluding 10% contingencies. The programme includes blacktopping of Tangsibji Farm road from national highway till NamgayChholing CPS, which has been completed as part of infrastructure work. The estimated cost for the work is Nu. 10.00 million. Therefore, the balance amount for CDP is Nu. 6.40 million only. However, the Geog Administration has proposed for additional development programme, amounting Nu. 27.00 million which was revised by THyE and was approved in the 15th Board Meeting amounting Nu. 15.15 million. The additional development programmes includes Blacktopping of additional 2.5 km Tangsibji farm road, construction of Temple, study tour for geog officials involved in project service, an ambulance and establishment of Tsogpas' offices.

4.17. Blacktopping of Tangsibji Farm road

Tangsibji Farm road is used by over 77 households. During the mass public consultation meeting on December 27, 2014 for 118 MW Nikachhu Hydropower Project, it was agreed to Blacktop Tangsibji Farm road till Namgay Chholing Community Primary School. The prgramme is therefore listed as one of the Community Development Programmes in the Resettlement Plan (RP). Accordingly, the blacktopping of 2.8 km road was awarded as a package to Adit-III access road construction and has been completed.

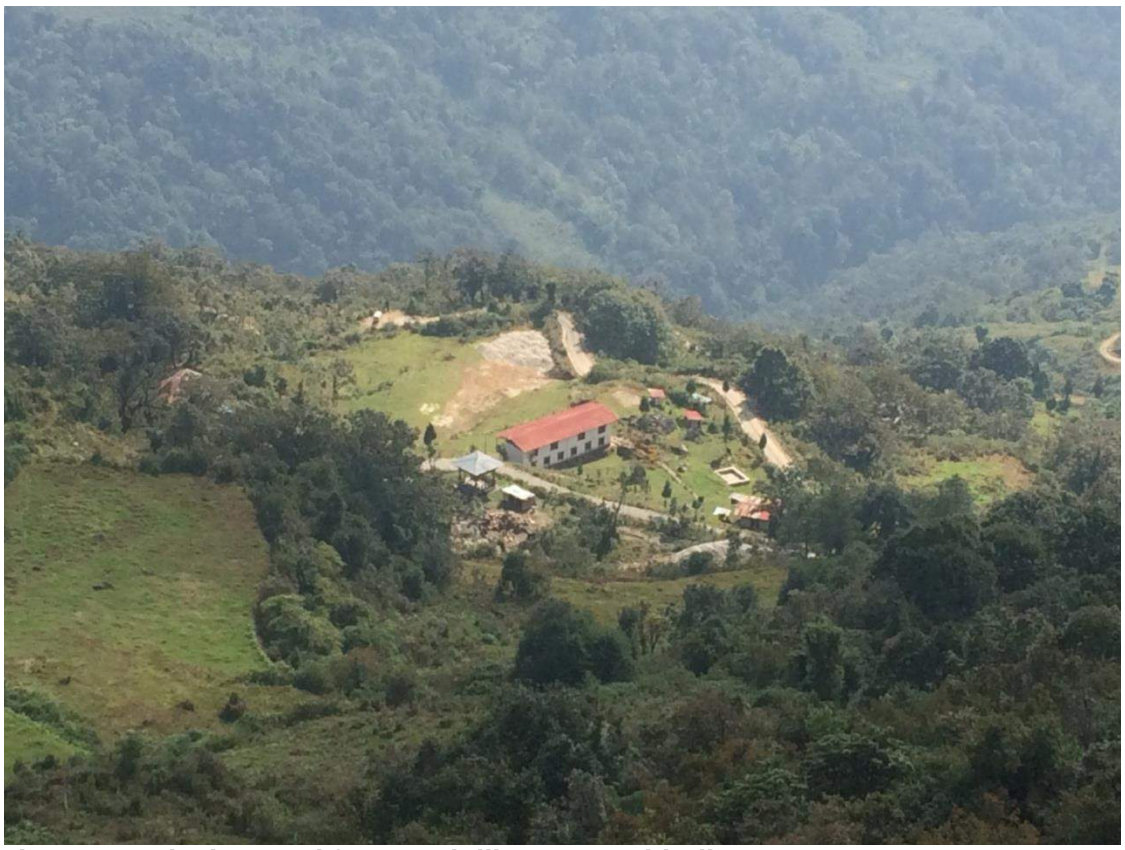

Figure 1.9 Blacktopped farmroad till NamgayChholing

THyE has also approved to continue Blacktopping for additional 2.5 km fully connecting the Highway with Tangsibji Village.

4.18. Income of Affected Persons (APs)

Tshangkha Chiwog has 25 households and almost every household has a nursery each. The main income is from the nursery and also from cash crop, potatoes. To enhance income generation, THyE have purchased over 10,000 seedlings from the APs which were planted in their community forest and also in the project area.

Further, while planting seedlings in the project area and also during the survey works, PAPs were hired to cater labour and earn income, thus, providing employment to them.

4.19. Aesthetics

THyE, with the assistance from contractors, contributed 30 cement bags to Tshangkha Central School to develop Botanical Park in the school campus for aesthetic and educational purpose. The cements shall be used for constructing footpaths and flower pots.

5.0. Safeguards Monitoring Results and Unanticipated Impacts

All the parameters of Environment Management Plan were complied. Besides THyE, the parameters are also monitored by DoFPS and National Environment Commission (NEC).

Unanticipated impacts have not occurred except at Adit-III access road construction. A boulder has damaged a two stored house at Tangsibji However, the house has been rebuilt with better facilities and improved condition. Household items were provided to the house owner. The new house has toilet, kitchen and water supply inside the house and also approached with an access road.

6.0. Implementation of Grievance Redress Mechanism and Complaints Received from Stakeholders

The Grievance Redress Committee with members from Dzongkhag Administration, THyE and Geog Administration was formed to address Grievance Redress Mechanism. Till date the committee did not receive any complaints from the stakeholders.

7.0. Conclusion and Recommendations

The project being in pre-construction phase does not have much environmental impact due to Environment Friendly Road Construction Method followed by THyE. The environment aspects are also strictly monitored by Forest Territorial Division and National Environment Commission.

For all social aspects, people do not have any grievance towards the project and indeed happy for the land development cost freedom to choose substitute land provided to them in addition to land replacement. The project has benefited Tangsibji community in terms of development, income (through rents, nurseries and livestock product) and employment.

Tour Report.

Rescue of plants and rapid assessment of the floral diversity in the Nikachu Hydropower project

Date and duration

- **26th February to 6th March 2015**
- **09th to 13th April 2015.**

Team Members (26th February to 6th March 2015)

1. Nima Gyeltshen, RBGS.
2. Pema yangdon, RBGS.
3. Tshering Wangmo, RBGS.
4. Dupchu Wangdi, RBGS

Team Member (09th April to 12th April 2015)

1. Nima Gyeltshen , RBGS
2. Kezang Tobgay, RBGS
3. Tsheringla, RBGS
4. Alexandra Davey, Royal Botanic Gardens, Kew Wakehurst Place(UK)
5. Kartherian, Royal Botanic Gardens, Kew Wakehurst Place (UK)

Aims and objectives of the tour.

1. Documentation of existing floral diversity of the Nikachu hydropower project sites.
2. To rescue prioritized plant species from the project sites for ex situ conservation at the Royal Botanical garden, Serbithang
3. To explore possibility of seed banking of the floral species of Nikachu hydropower project sites for ex situ conservation.

Introduction.

Rescue, rehabilitation and ex-situ conservation of plant diversity are some of the main objectives of the Royal Botanical Garden, National Biodiversity Centre, Serbithang. Therefore, in line with objectives, National Biodiversity has initiated a joint rescue and restoration collection program for the threatened and rare plant species from the Nikachu hydropower project sites.

During the first trip to Nikachu hydropower project sites, in line with the annual workplan, documentation of floral diversity in different Adits, Surge shaft and Dam sites were carried out. Further, few species which were recue-able were also rescued and conserved ex-situ as living collection at the Royal Botanical Garden, Serbtihang. List of floral diversity documented as well as list of species conserved as living collections are provided as annexes. During 2nd field trip, exploration and documentation of the floral diversity as well as exploration of species for seed banking were continued. Two expertis from the Millennium Seed Bank, Royal Botanical Garden, Kew, UK joined the field work, specifically to explore seed banking opportunities.

Conclusion.

14 live orchid species are collected and rescued from the project sites during the 1st trip to Nikachu hydropower project sites, while a total of 221 species of plants were documented from the Nikachu hydro project sites during first and second trip. However, in order to capture the full diversity, exploration and documentation has to be carried out in different season.

Annex 1: List of species conserved ex-situ as living collection at Royal Botanical garden, Serbithang

SI.No	Scientific name	Family
1	*Bulbophyllum guttulatum*	Orchidaceae
2	*Dendrobium hookerianum*	Orchidaceae
3	*Dendrobium longicornu*	Orchidaceae
4	*Goodyera* sp.	Orchidaceae
5	*Oberonia* sp.	Orchidaceae
6	*Vandopsis undulata*	Orchidaceae
7	*Bulbophyllum reptans*	Orchidaceae
8	*Sunipia* sp.	Orchidaceae

9	*Eria* sp.	Orchidaceae
10	*Phalaenopsis taenialis*	Orchidaceae
11	*Epigenium fuscescens*	Orchidaceae
12	*Otochilus lancilabius*	Orchidaceae
13	*Cymbidium* sp.	Orchidaceae
14	*Eria coronaria*	Orchidaceae

Ione bicolor

Oberonia sp.

Pleione humilis

Bulbophyllum reptans

Annex 2.1: List of species recorded from Dam Site

Sl.No	Species Name	Family	Habitat
1	*Acer campbellii*	Aceraceae	Tree
2	*Aeschynanthus sp*	Gesneriaceae	Epiphytic
3	*Agapetes serpens*	Ericaceae	Epiphytic
4	*Ainsliaea aptera*	Compositae	Herb
5	*Anaphalis sp*	Compositae	Herb
6	*Arisaema sp*	Araceae	Herb
7	*Artemisia vulgaris*	Compositae	Herb/Shrub
8	*Berberis angulosa*	Berberidaceae	Shrub
9	*Berberis sp*	Berberidaceae	Shrub
10	*Betula utilis*	Betulaceae	Tree
11	*Bulbophyllum sp*	Orchidaceae	Epiphytic
12	*Carpinus sp*	Betulaceae	Tree
13	*Castonopsis tribuloides*	Fagaceae	Tree
14	*Clematis sp*	Ranunculaceae	Climber
15	*Daphne bholua*	Thymelaeaceae	Shrub
16	*Daphnephyllum himalense*	Daphnephyllaceae	Tree
17	*Diaplazium esculatum*	Athyriaceae	Annual/Herb
18	*Elaeagnaceae parvifolia*	Elaeagnaceae	Shrub
19	*Epigenium sp*	Orchidaceae	Epiphytic
20	*Eurya acuminata*	Theaceae	Tree
21	*Fagopyrum sp*	Polygonaceae	Herb
22	Fern sp	Pteridophytes	Fern
23	*Ficus sp*	Moraceae	Climber
24	*Fragaria nubicola*	Rosaceae	Herb
25	*Gaultheria semi-infera*	Ericaceae	Shrub
26	*Gentiana capitata*	Gentianaceae	Herb
27	*Gerinium sp*	Geraniceae	Herb
28	*Goodyera sp*	Orchidaceae	Terrestrial
29	*Grass sp*	Poaceae	Grass
30	*Hedera nepalensis*	Araliaceae	Climbing shrub
31	*Hedera sp*	Araliaceae	Climbing shrub
32	*Hemiphragma heterophylla*	Scrophulariaceae	Creeping Herbaceous
33	*Hypercium sp*	Hypericaceae	Shrub
34	*Ilex dipyrena*	Aquifoliaceae	Tree
35	*Ligustrum confortum*	Oleaceae	Shrub
36	*Lindera sp*	Lauraceae	Tree
37	*Lonicera sp*	Oleaceae	Climber
38	*Lycopodium sp*	Lycopodaceae	Fern

39	*Magonila campbellii*	Magnoliaceae	Tree
40	*Mazus sp*	Scrophulariaceae	Annual
41	*Michelia doltsopa*	Magnoliaceae	Tree
42	*Myrsine semiserrata*	Myrsinaceae	Shrub/Tree
43	*Oberonia sp*	Orchidaceae	Epiphytic
44	*Oxalis sp*	Oxalidaceae	Epiphytic
45	*Persea sp*	Lauraceae	Shrub/Tree
46	*Persicaria sp*	Polygonaceae	Herb
47	*Plantogo erosa*	Plantaginaceae	Perennials
48	*Primula sp*	Primulaceae	Herb
49	*Primula denticulata*	Primulaceae	Herb
50	*Qurcus glauca*	Fagaceae	Tree
51	*Qurcus lamelosa*	Fagaceae	Tree
52	*Raphidophora sp*	Araceaa	Climber
53	*Rhodobyrum gigentium*	Bryaceae	Bryophyte
54	*Rhododendron arboreum*	Ericaceae	Tree/shrub
55	*Rhododendron edgeworthia*	Ericaceae	Tree/shrub
56	*Rhododendron falconeri*	Ericaceae	Tree/shrub
57	*Rhododendron grande*	Ericaceae	Tree/shrub
58	*Rhododendron griffithianum*	Ericaceae	Tree/shrub
59	*Rhododendron hodgsonii*	Ericaceae	Tree/shrub
60	*Rhododendron kesangiae*	Ericaceae	Tree/shrub
61	*Rhododendron lindleyi*	Rubiaceae	Tree/shrub
62	*Rubia manjith*	Rubiaceae	Climber
63	*Rubus biflorus*	Rosaceae	Shrub
64	*Rubus sp*	Rosaceae	Shrub
65	*Sarcococca hookeriana*	Buxaceae	Shrub
66	*Smilax sp*	Smilacaceae	Shrub
67	*Sunipia sp*	Orchidaceae	Epiphytic
68	*Symplocos ramosissima*	Symplocaceae	Tree/shrub
69	*Symplocos sp*	Symplocaceae	Tree/shrub
70	*Symplocus glomerata*	Symplocaceae	Tree/shrub
71	*Tsuga domosa*	Pinaceae	Tree
72	*Tupistra sp*	Liliaceaea	Herb
73	*Vaccinium sp*	Ericaceae	Shrub
74	*Vitis sp*	Vitaceae	Climber
75	*Yushinia macophylla*	Bambaceae	Bamboo
76	*Zanthoxylum nepalense*	Rutaceae	Shrub

Annex 2.2: List of species recorded from Adit 1

Sl.No	Scientific name	Family	Habitat
1	*Acer campbellii*	Aceraceae	Tree
2	*Aconogonon molle*	Polgonaceae	Herb
3	*Agapetes serpens*	Ericaceae	Shrub
4	*Ainsliaea aptera*	Compositae	Herb
5	*Alnus nepalensis*	Betulaceae	Tree
6	*Artemisia vulgaris*	Compositae	Shrub
7	Bamboo sp	Bambosae	Shrub
8	*Berberis sp*	Berberidaceae	Shrub
9	*Betula alnoides*	Betulaceae	Tree
10	*Bulbophyllum reptans*	Orchidaceae	Epiphytic
11	*Ceologyne nitida*	Orchidaceae	Epiphytic
12	*Chelianthes sp*	Pteridaceae	Fern
13	*Clematis sp*	Ranunculaceae	Climber
14	*Cymbidium sp*	Orchidaceae	Epiphytic
15	*Daphne bholua*	Thymelaeaceae	Shrub
16	*Dendrobium sp*	Orchidaceae	Epiphytic
17	*Edgeworthia gardeneri*	Thymelaeaceae	Shrub
18	*Elsholtzia strobifera*	Laminacaea	Shrub
19	*Epigenium fusuces*	Orchidaceae	Epiphytic
20	*Eria conorinaria*	Orchidaceae	Epiphytic
21	*Eurya acuminata*	Theaceae	Shrub/Tree
22	Fern sp	Pteridophytes	Fern
23	*Gaultheria fragratissima*	Ericaceae	Shrub
24	*Gaultheria tricophylla*	Ericaceae	Shrub
25	*Gentiana capitata*	Gentianaceae	Herb
26	*Goodyera sp*	Orchidaceae	Terrestrial
27	*Hedera nepalensis*	Araliaceae	Climbing shrub
28	*Hemiphragma heterophylla*	Scrophulariaceae	Creeping Herbaceous
29	*Hypercium sp*	Hypericaceae	Shrub
30	*Ilex dipyrena*	Aquifoliaceae	Tree
31	*Ligustrum confortum*	Oleaceae	Shrub
62	*Lindera sp*	Lauraceae	Shrub/Tree
32	*Lycopodium calvatum*	Lycopodiaceae	Fern
33	*Lyonia ovalifolia*	Ericaceae	Tree
34	*Magonila campbellii*	Magnoliaceae	Tree
35	*Michelia champaca*	Magnoliaceae	Tree
36	*Michelia doltsopa*	Magnoliaceae	Tree

64	*Myrsine semiserrata*	Myrsinaceae	Shrub/Tree
37	*Oberonia sp*	Orchidaceae	Epiphytic
38	*Oleandra pistillaris*	Oleandraceae	Fern
39	*Pholmis sp*	Lamiaceae	Shrub/Herb
40	*Pleione humulis*	Orchidaceae	Epiphytic
41	*Polygomnatum*	Polygonaceae	Herb
42	*Pteridium sp*	Dennstaedtiaceae	Fern
43	*Pteris sp*	Pteridaceae	Fern
44	*Qurcus glauca*	Fagaceae	Tree
45	*Qurcus lamelosa*	Fagaceae	Tree
46	*Rhododendron arboreum*	Ericaceae	Tree
47	*Ribes sp*	Rosaceae	Climber
48	*Rubia manjith*	Rubiaceae	Climber
49	*Rubus biflorus*	Rosaceae	Shrub
50	*Rubus sp*	Rosaceae	Shrub
51	*Scurrula elata*	Lorathaceae	Epiphytic
52	*Smilax sp*	Liliaceaea	Shrub
53	*Sunipia sp*	Orchidaceae	Epiphytic
54	*Symplocus glomerata*	Symplocaceae	Shrub/Tree
63	*Symplocus ramosissima*	Symplocaceae	Shrub/Tree
55	*Tsuga dumosa*	Pinaceae	Tree
56	*Tupistra sp*	Convallariaceae	Herb
57	*Vaccinium nummularia*	Ericaceae	Epiphytic
58	*Viburnum cylindriceum*	Caprifoliaceae	Shrub/Tree
59	*Vites sp*	Rosaceae	Climber
60	*Zanthoxylum nepalense*	Rutaceae	Shrub
61	*Zanthoxylum sp*	Rutaceae	Shrub

Annex 2.3: List of species recorded form Adit 2

Sl.No	Scientific name	Family	Habitat
1	*Aconogonum molle*	Polyganacaeae	Herb
2	*Agapetes incurvata*	Ericaceae	Epiphytic
3	*Agapetes serpens*	Ericaceae	Epiphytic
4	*Ainsliaea aptera*	Compositae	Herb
5	*Alnus nepalensis*	Betulaceae	Tree
6	*Artemisia vulgaris*	Compositate	Shrub
7	*Bamboo sp*	Bambosae	Shrub
8	*Berberis sp*	Berberidaceae	Shrub
9	*Betula alnoides*	Betulaceae	Tree

10	*Brassaiopsis mitis*	Araliaceae	Tree
11	*Bulbophyllum reptans*	Orchidaceae	Epiphytic
12	*Bulbophyllum sp*	Orchidaceace	Epiphytic
13	*Cautleya gracilis*	Zinginberaceae	Rhizomatous-Herb
14	*Chelianthes sp*	Pteridaceae	Fern
15	*Dendrophthoe falcata*	Lorathaceae	Parasites
16	*Dicynia indica*	Rosaceae	Tree
17	*Edgeworthia gardenia*	Thymelaeceae	Shrub
18	*Elotishizia fruticosa*	Laminacaea	Herb
19	*Epigenium sp*	Orchidaceae	Epiphytic
20	*Eurya acuminata*	Theaceae	Tree
21	*Gaultheran fragratissima*	Ericaceae	Shrub
22	*Hedera nepalensis*	Araliaceae	Climbing shrub
23	*Hedychium sp*	Zinginberaceae	Rhizomatous-Herb
24	*Lingustrum sp*	Oleceae	Tree
25	*Lycopodium calvatum*	Lycopodiaceae	Fern
26	*Lyonia ovalifolia*	Ericaceae	Tree
27	*Magonila campbellii*	Magnoliaceae	Tree
28	*Michelia doltsopa*	Magnoliaceae	Tree
29	*Oberonia sp*	Orchidaceae	Epiphytic
30	*Oleandra pistillaris*	Oleandraceae	Fern
31	*Peperomia tetraphylla*	Piperaceae	Herb
32	*Prunus cerasoides*	Rosaceae	Tree
33	*Pteridium sp*	Dennstaedtiaceae	Fern
34	*Pteris sp*	Pteridaceae	Fern
35	*Qurcus glauca*	Fagaceae	Tree
36	*Qurcus griffithii*	Fagaceae	Tree
37	*Qurcus lamellosa*	Fagaceae	Tree
38	*Rhododendron arboreum*	Ericaceae	Tree/Shrub
39	*Rhododendron dalhousiae*	Ericaceae	Tree/Shrub
40	*Rhodoendron edgeworthii*	Ericaceae	Shrub
41	*Rhus chinensis*	Anacardiaceae	Tree
42	*Ribes sp*	Rosaceae	Climber
43	*Rubus ellepticus*	Rosaceae	Shrub
44	*Rubus sp*	Rosaceae	Shrub
45	*Scurrula elata*	Lorathaceae	Parasites
46	*Smilax myrtillus*	Smilacaceae	Shrub
47	*Smilax sp*	Smilacaceae	Shrub
48	*Strobilanthes sp*	Acanthaceae	Herb
49	*Symplocos glomerata*	Symplocaceae	Shrub/Tree

50	*Tupistra sp*	Convallariaceae	Herb
51	*Vaccinium sp*	Ericaceae	Epiphytic
52	*Vandopsis undulata*	Orchidaceae	Epiphytic
53	*Viburnum cylindriceum*	Caprifoliaceae	Shrub
54	*Viscium sp*	Lorathaceae	Shrub
55	*Vities sp*	Rosaceae	Climber
56	*Symplocos ramosissima*	Symplocaceae	Shrub/Tree
57	*Sorbus griffithii*	Rosaceae	Tree

Annex 2.4: List of species recorded from Adit 3

Sl.No	Species Name	Family	Habitat
1	*Aconogonon molle*	Polygonaceae	Herb
2	*Agapetes incuvata*	Ericaceae	Epiphytic
3	*Agapetes serpens*	Ericaceae	Epiphytic
4	*Ageritinia andophora*	Compositae	Herb
5	*Anaphalis sp*	Compositae	Herb
6	*Anectochilus sp*	Orchidaceae	Terrestrial
7	*Anisleae aptera*	Compositae	Herb
8	*Artemisia vulgaris*	Compositae	Herb
9	Bamboo sp	Bambusae	Shrub
10	*Berberis sp*	Berberidaceae	Shrub
67	*Betula alnoides*	Betulaceae	Tree
11	*Brassaiopsis mitis*	Araliaceae	Tree
68	*Bulbophyllum guttlatum*	Orchidaceae	Epiphytic
12	*Bulbophyllum reptans*	Orchidaceae	Epiphytic
13	*Bulbophyllum sp*	Orchidaceae	Epiphytic
16	*Cautleya gracilis*	Zingiberaceae	Epiphytic
14	*Cinnanamoum sp*	Lauraceae	Tree
15	*Crotoneaster microphyllus*	Rosaceae	Shrub
17	*Cymbidium sp*	Orchidaceae	Epiphytic
18	*Daphne bholua*	Thymelaeaceae	Shrub
19	*Dendrobium falconari*	Orchidaceae	Epiphytic
20	*Dendrobium hookerianum*	Orchidaceae	Epiphytic
21	*Dendrobium longicornu*	Orchidaceae	Epiphytic
22	*Dendrobium sp*	Orchidaceae	Epiphytic
23	*Elaeagnaceae parvifolia*	Elaeagnaceae	Shrub
24	*Epigenium fusuces*	Orchidaceae	Epiphytic
25	*Epigenium sp*	Orchidaceae	Epiphytic
26	*Eria conorinaria*	Orchidaceae	Epiphytic

27	*Eria sp*	Orchidaceae	Epiphytic
28	*Eurya acuminata*	Theaceae	Shrub
29	*Gaultheran fragratissima*	Ericaceae	Shrub
30	*Gesneria sp*	Gesneriaceae	Epiphytic
31	*Goodyera sp*	Orchidaceae	Terrestrial
32	*Gualtheria semi-infra*	Ericaceae	Shrub
33	*Hedera nepalensis*	Araliaceae	Climbing shrub
34	*Hedera sp*	Araliaceae	Climbing shrub
35	*Hedychium sp*	Zingiberaceae	Herb
36	*Hypercium sp*	Hypericaceae	Shrub
37	*Ilex dipyrena*	Aquifoliaceae	Tree
38	*Ione bicolor*	Orchidaceae	Epiphytic
39	*Ione cirrhata*	Orchidaceae	Epiphytic
40	*Ligustrum confortum*	Oleaceae	Shrub
41	*Lithocarpus sp*	Fagaceae	Tree
42	*Lyonia ovalifolia*	Ericaceae	Tree
43	*Michelia doltsopa*	Magnoliaceae	Tree
44	*Oberonia sp*	Orchidaceae	Epiphytic
45	*Peperomia tetraphylla*	Peperominaceae	Epiphytic
46	*Pteris sp*	Pteridaceae	Fern
47	*Qurcus glauca*	Fagaceae	Tree
48	*Qurcus grifithii*	Fagaceae	Tree
49	*Qurcus lamelosa*	Fagaceae	Tree
50	*Qurcus lanata*	Fagaceae	Tree
51	*Rhododendron arboreum*	Ericaceae	Tree/Shrub
52	*Rhododendron edgeworthia*	Ericaceae	Tree/Shrub
53	*Rhododendron falconeri*	Ericaceae	Tree/Shrub
54	*Rubia cordifolia*	Rubiaceae	Climber
55	*Rubus ellepticus*	Rosaceae	Shrub
56	*Rubus sp*	Rosaceae	Shrub
57	*Scurrula elata*	Lorathaceae	Epiphytic
58	*Smilax sp*	Liliaceaea	Climber
59	*Symplocos glomerata*	Symplocaceae	Tree/Shrub
60	*Symplocos ramosissima*	Symplocaceae	Tree/Shrub
61	*Symplocos sumuntia*	Symplocaceae	Tree/Shrub
62	*Vaccinium sp*	Ericaceae	Epiphytic
63	*Vaccnium retusa*	Ericaceae	Epiphytic
64	*Vandopsis undulata*	Orchidaceae	Epiphytic
65	*Viburnum cylindriceum*	Caprifoliaceae	Shrub/Tree
66	*Vites sp*	Rosaceae	Climber

Annex 2.5: List of species recorded from Adit 4

Sl.No	Species Name	Family	Habitat
1	*Aconogonon molle*	Polygonaceae	Herb
2	*Ageritinia andophora*	Compositae	Herb
3	*Alnus nepalensis*	Betulaceae	Tree
4	*Anaphalis sp*	Compositae	Herb
5	*Artemisia vulgaris*	Compositae	Herb
6	*Berberis sp*	Berberidaceae	Shrub
7	*Castonopsis hystrix*	Fagaceae	Tree
8	*Daphne bholua*	Thymelaeaceae	Shrub
9	*Elaeagnaceae sp*	Elaeagnaceae	Shrub
10	*Elotishizia sp*	Laminacaea	Herb
11	*Eurya acuminata*	Thaceae	Tree
12	*Ficus sp*	Moraceae	Climber
13	*Gaultheria fragratissima*	Ericaceae	Shrub
14	*Hedera nepalensis*	Araliaceae	Climbing Shrub
15	*Lyonia ovalifolia*	Ericaceae	Tree
16	*Oleandra pistillaris*	Oleandraceae	Fern
17	*Qurcus grifithii*	Fagaceae	Tree
18	*Qurcus lamelosa*	Fagaceae	Tree
19	*Qurcus lanata*	Fagaceae	Tree
20	*Rhododendron arboreum*	Ericaceae	Tree
21	*Ribes sp*	Rosaceae	Climber
22	*Rubus ellepticus*	Rosaceae	Shrub
23	*Sauaraja naupenensis*	Actinidiaceae	Tree
24	*Securrala elata*	Lorathaceae	Epiphytic
25	*Smilax sp*	Liliaceaea	Climber
26	*Viscum sp*	Lorathaceae	Shrub
27	*Viburnum cylindriceum*	Caprifoliaceae	Shrub
28	*Wendlandia coriaceae*	Rubiaceae	Tree

Annex 2.6: List if species recorded from Adit 5

Sl.No	Species Name	Family	Habitat
1	*Aconogonon sp*	Polyganacaeae	Herb
2	*Agapetes incurvata*	Ericaceae	Epiphytic
3	*Agapetes serpens*	Ericaceae	Epiphytic
4	*Ageritina adenophora*	Compositae	Herb
5	*Alnus napalensis*	Betulaceae	Tree
6	*Anaphilies sp*	Compositae	Herb
7	*Artmesia vulgaris*	Compositate	Herb
8	Bamboo sp	Graminae	Shrub
9	*Berberis asiatica*	Berbediaceae	Shrub
10	*Docynia indica*	Roseaceae	Tree
11	*Elaganeanus sp*	Elaganaecae	Shrub
12	*Erytherina arboresence*	Leguminosae	Tree
13	*Eurya acuminata*	Theaceae	Tree
14	*Eurya sp*	Theaceae	Tree
15	Fern sp	Pteridiphytes	Fern
16	*Indofera dosua*	Leguminosae	Shrub
17	*Juncus sp*	Juncusceae	Herb
18	*Lycesteria formosa*	Caprifoliaceae	Shrub
19	*Lycopodium sp*	Lycopodaceae	Shrub
20	*Pinus bhutanica*	Pinaceae	Tree
21	*Primula denticulata*	Primulaceae	Herb
22	*Pteridium sp*	Dennstaedtiaceae	Fern
23	*Qurcus griffithii*	Fagaceae	Tree
24	*Qurcus lanata*	Fagaceae	Tree
25	*Rhododendron arboreaum*	Ericaceae	Tree
26	*Rhus Chinensis*	Anacardiaceae	Tree
27	*Rosa bruononii*	Roseaceae	Climber
28	*Salix sp*	Salicaceae	Tree
29	*Securrla elata*	Lorathaceae	Epiphytic
30	*Viburnum cylindracieum*	Capriofoliaceae	Tree
31	*Viscium album*	Lorathaceae	Epiphytic

Annex 2.7: List of species recorded from Surge Shaft

Sl.No	Species Name	Family	Habitat
1	*Acer campbelli*	Aceraceae	Tree
2	*Aconogonon molle*	Polygonaceae	Shrub
3	*Agapetes incurvata*	Ericaceae	Shrub
4	*Agapetes serpens*	Ericaceae	Epiphytic
5	*Ageratina adenophora*	Compositae	Herb
6	*Agrostophyllum callusom*	Orchidaceae	Epiphytic
7	*Ainsliaea aptera*	Compositae	Herb
8	*Alnus nepalensis*	Betulaceae	Tree
9	*Anthogonium gracile*	Orchidaceae	Epiphytic
10	*Ardisia macrophylla*	Myrsinaceae	Shrub
11	*Aristolochia griffithii*	Aristolochiaceae	Climber
12	*Artemisia vulgaris*	Compositae	Herb
13	*Berberis asiatica*	Berberidaceae	Shrub
14	*Betula utilis*	Betulaceae	Tree
15	*Brassaiopsis mitis*	Araliaceae	Tree
16	*Bulbophyllum reptans*	Orchidaceae	Epiphytic
17	*Bulbophyllum sp*	Orchidaceae	Epiphytic
18	*Castonopsis hystrix*	Fagaceae	Tree
19	*Chelianthes sp*	Pteridaceae	Fern
20	*Clematis sp*	Ranunculaceae	Climber
21	*Cupressus corneyana*	Cupressaceae	Tree (Plantation)
22	*Cautleya gracilis*	Zingiberaceae	Herb
23	*Dendrobium hookerianum*	Orchidaceae	Epiphytic
24	*Dendrobium longicornu*	Orchidaceae	Epiphytic
25	*Desmodium elagans*	Leguminosae	Shrub
26	*Dicynia indica*	Rosaceae	Tree
27	*Drynaria propinqua*	Polypodiaceae	Fern
28	*Dryopteris sp*	Dryopteridaceae	Fern
29	*Elsholtzia fruticosa*	Labiatae	Shrub
30	*Eria coronaria*	Orchidaceae	Epiphytic
31	*Eria sp*	Orchidaceae	Epiphytic
32	*Eria spicata*	Orchidaceae	Epiphytic
33	*Erytherina stricta*	Leguminosae	Tree
34	*Eurya acuminata*	Thaceae	Tree
35	*Eurya serreta*	Thaceae	Tree
36	*Exbucklandia populnea*	Hamamelidaceae	Tree
37	*Fagopyrum sp*	Polygonaceae	Herb

38	*Gaultheria fragrantissima*	Ericaceae	Shrub
39	*Gentiana sp*	Gentianceae	Herb
40	*Geranium sp*	Geraniaceae	Herb
41	*Hedera nepalensis*	Araliaceae	Climbing Shrub
42	*Hedychium sp*	Zingiberaceae	Herb
43	*Hedychium spicatum*	Zingiberaceae	Herb
44	*Holboellia latifolia*	Lardizabalaceae	Shrub
45	*Hypericum sp*	Hypericaceae	Shrub
46	*Ilex dipyrena*	Aquifoliaceae	Tree
47	*Indofera dosubia*	Leguminosae	Shrub
48	*Juglans regia*	Julandaceae	Tree
49	*Lycopodium calvatum*	Lycopodiaceae	Fern
50	*Lyonia ovalifolia*	Ericaceae	Tree
51	*Macarange sp*	Euphorbiaceae	Tree
52	*Michelia doltsopa*	Magnoliaceae	Tree
53	*Nephrolepis cordifolia*	Olendraceae	Fern
54	*Oberonia falcata*	Orchidaceae	Epiphytic
55	*Oberonia sp*	Orchidaceae	Epiphytic
56	*Oleandra pistillaris*	Orchidaceae	Epiphytic
57	*Peperomia tetraphylla*	Piperaceae	Herb
58	*Persicaria sp*	Polygonaceae	Herb
59	*Plagiogyria sp*	Plagiogyraceae	Fern
60	*Polystichum nepalense*	Dryopteridaceae	Fern
61	*Prinsepia utilis*	Rosaceae	Shrub
62	*Prunus cerasoides*	Rosaceae	Tree
63	*Pteridium sp*	Dennstaedtiaceae	Fern
64	*Pteris sp*	Pteridaceae	Fern
65	*Pyrrosia boothii*	Polypodiaceae	Fern
66	*Pyrrosia sp*	Polypodiaceae	Fern
67	*Quercus griffithii*	Fagaceae	Tree
68	*Quercus lamellosa*	Fagaceae	Tree
69	*Quercus lanata*	Fagaceae	Tree
70	*Rhododendron arboreum*	Ericaceae	Tree/Shrub
71	*Rhus chinensis*	Anacardiaceae	Tree
72	*Rosa macrophylla*	Rosaceae	Shrub
73	*Rubia cordifolia*	Rubiaceae	Climber
74	*Rubus ellipticus*	Rosaceae	Shrub
75	*Rubus sp*	Rosaceae	Shrub
76	*Saurauja nepaulensis*	Actinidiaceae	Tree
77	*Schima wallichii*	Theaceae	Tree

78	*Securrla elata*	Lorathaceae	Epiphytic
79	*Sedum sp*	Crassulaceae	Herb
80	*Senecio sp*	Compositae	Herb
81	*Smilax myrtillus*	Smilacaceae	Shrub
82	*Solanum viarum*	Solanaceae	Herb
83	*Symplocos ramosissima*	Symplocaceae	Shrub/Tree
84	*Thalictrum sp*	Ranunculaceae	Herb
85	*Toddalia asiatica*	Rutaceae	Shrub
86	*Toricellia tillifolia*	Cornaceae	Tree
87	*Urtica sp*	Urticaceae	Herb
88	*Vandopsis undulata*	Orchidaceae	Epiphytic
89	*Viburnum cylindricum*	Caprifoliaceae	Shrub
90	*Vitis sp*	Vitaceae	Climber
91	*Yushinia sp*	Graminae	Bamboo
92	*Zanthoxylem sp*	Rutaceae	Tree

Annex 2.8: List of species recorded from Power House

Sl.No	Species Name	Family	Habitat
1	*Acer campbelli*	Aceraceae	Tree
2	*Acer oblongum*	Aceraceae	Tree
3	*Aconogonon molle*	Polygonaceae	Herb
4	*Aconogonon sp*	Polygonaceae	Herb
5	*Aeschynanthus sikkimensis*	Gesneriaceae	Epiphytic
6	*Agapetes serpens*	Ericaceae	Epiphytic
7	*Ageratina adenophora*	Compositae	Herb
8	*Agrostophyllum callusom*	Orchidaceae	Epiphytic
9	*Ainsliaea aptera*	Compositae	Herb
10	*Albizia sp*	Leguminosae	Tree
11	*Anaphalis sp*	Compositae	Herb
12	*Ardisia macrophylla*	Myrsinaceae	Shrub
13	*Artemesia vulgaris*	Compositae	Herb
14	*Berberis asiatica*	Berberidaceae	Shrub
15	*Berberis sp*	Berberidaceae	Shrub
16	*Betula alnoides*	Betulaceae	Tree
17	*Boehmeria sp*	Urticaceae	Shrub
18	*Brassaiopsis mitis*	Araliaceae	Tree
19	*Bulbophyllum reptans*	Orchidaceae	Epiphytic
20	*Bulbophyllum sp*	Orchidaceae	Epiphytic
21	*Calanthe sp*	Orchidaceae	Epiphytic

22	*Cannabis sativa*	Cannaabaceae	Herb
23	*Carex sp*	Cyperaceae	Herb
24	*Castonopsis hystrix*	Fagaceae	Tree
25	*Celtis sp*	Ulmaceae	Tree
26	*Chelianthes sp*	Pteridaceae	Fern
27	*Clematis sp*	Ranunculaceae	Climber
28	*Cymbidium sp*	Orchidaceae	Epiphytic
29	*Debregeasia longifolia*	Urticaceae	Shrub/Tree
30	*Dendrobium fimbriatum*	Orchidaceae	Epiphytic
31	*Dendrobium hookerianum*	Orchidaceae	Epiphytic
32	*Dendrobium longicornu*	Orchidaceae	Epiphytic
33	*Desmodium sp*	Leguminosae	Shrub
34	*Diaplazium esculatum*	Athyriaceae	Herb
35	*Dicynia indica*	Rosaceae	Tree
36	*Diplazium sp*	Athyriaceae	Fern
37	*Docynia indica*	Rosaceae	Tree
38	*Dryopteris sp*	Dryopteridaceae	Fern
39	*Elsholtzia fruticosa*	Labiatae	Herb
40	*Engelherdia spicata*	Juglandaceae	Tree
41	*Eria sp*	Orchidaceae	Epiphytic
42	*Erytherina stricta*	Leguminosae	Tree
43	*Eurya acuminata*	Theaceae	Tree
44	*Eurya sp*	Theaceae	Tree
45	*Fagopyrum sp*	Polygonaceae	Herb
46	*Hedera nepalensis*	Ariliaceae	Climbing Shrub
47	*Hoya sp*	Gesneriaceae	Epiphytic
48	*Jasminium grandiflorum*	Oleaceae	Shrub
49	*Juglans regia*	Juglandaceae	Tree
50	*Kydia sp*	Malvaceae	Tree
51	*Lycopodium calvatum*	Lycopodiaceae	Fern
52	*Lyonia ovalifolia*	Ericaceae	Tree
53	*Macarange sp*	Euphorbiaceae	Tree
54	*Maesa chisia*	Myrsinaceae	Shrub
55	*Michelia doltsopa*	Magnoliaceae	Tree
56	*Morus sp*	Moraceae	Shrub
57	*Murraya sp*	Rutaceae	Shrub
58	*Nephrolepis cordifolia*	Olendraceae	Fern
59	*Oberonia sp*	Orchidaceae	Epiphytic
60	*Oleandra pistillaris*	Oleandraceae	Fern
61	*Otochilus lancilabius*	Orchidaceae	Epiphytic

62	*Peperomia tetraphylla*	Piperaceae	Herb
63	*Phalaenopsis taenialis*	Orchidaceae	Epiphytic
64	*Piper sp*	Piperaceae	Shrub
65	*Plagiogyria sp*	Plagiogyraceae	Fern
66	*Polystichum nepalense*	Dryopteridaceae	Fern
67	*Prunus cerasoides*	Rosaceae	Tree
68	*Pteridium sp*	Dennstaedtiaceae	Fern
69	*Pteris sp*	Pteridaceae	Fern
70	*Quercus griffithii*	Fagaceae	Tree
71	*Rhododendron arboreum*	Ericaceae	Tree
72	*Rhus chinensis*	Anacardiaceae	Tree
73	*Rhus succedanea*	Anacardiaceae	Tree
74	*Ribes sp*	Grossulariaceae	Shrub
75	*Rosa macrophylla*	Rosaceae	Shrub
76	*Rubia cordifolia*	Rubiaceae	Climber
77	*Rubus ellepticus*	Rosaceae	Shrub
78	*Saurauja nepaulensis*	Actinidiaceae	Tree
79	*Schelfflera sp*	Araliaceae	Shrub
80	*Securrla elata*	Lorathaceae	Epiphytic
81	*Sedum sp*	Crassulaceae	Herb
82	*Smilax myrtillus*	Smilacaceae	shrub
83	*Stephania sp*	Menispermaceae	Twiner
84	*Sunipia sp*	Orchidaceae	Epiphytic
85	*Tetrastigma sp*	Vitaceae	Shrub
86	*Toddalia asiatica*	Rutaceae	Shrub
87	*Toricellia tillifolia*	Cornaceae	Tree
88	*Urtica sp*	Urticaceae	Herb
89	*Vaccinium sp*	Ericaceae	Shrub
90	*Viburnum cylindricum*	Caprifoliaceae	Tree
91	*Viola sp*	Violaceae	Herb
92	*Viscium album*	Lorathaceae	Epiphytic
93	*Wedlandia sp*	Rubiaceae	Shrub
94	*Wendlandia coriaceae*	Rubiaceae	Shrub
95	*Yushinia sp*	Graminea	Bamboo

Annexure III.

A SUMMARY OF FLORAL DIVERSITY OF NIKACHU HYDROPOWER PROJECT

SL.No	Species Name	Family	Habitat
1	*Acer campbellii*	Aceraceae	Tree
2	*Acer oblongum*	Aceraceae	Tree
3	*Albizia* sp.	Leguminosae	Tree
4	*Alnus nepalensis*	Betulaceae	Tree
5	*Betula alnoides*	Betulaceae	Tree
6	*Betula utilis*	Betulaceae	Tree
7	*Brassaiopsis mitis*	Araliaceae	Tree
8	*Carpinus* sp.	Betulaceae	Tree
9	*Castanopsis hystrix*	Fagaceae	Tree
10	*Castonopsis tribuloides*	Fagaceae	Tree
11	*Celtis* sp.	Ulmaceae	Tree
12	*Cinnanamoum* sp.	Lauraceae	Tree
13	*Cupressus corneyana*	Cupressaceae	Tree
14	*Daphnephyllum himalense*	Daphnephyllaceae	Tree
15	*Docynia indica*	Rosaceae	Tree
16	*Engelherdia spicata*	Juglandaceae	Tree
17	*Erytherina arboresence*	Leguminoseae	Tree
18	*Erytherina stricta*	Leguminoseae	Tree
19	*Eurya acuminata*	Theaceae	Tree
20	*Eurya serreta*	Theaceae	Tree
21	*Eurya* sp.	Theaceae	Tree
22	*Exbucklandia populnea*	Hamamelidaceae	Tree
23	*Ilex dipyrena*	Aquifoliaceae	Tree
24	*Juglans regia*	Juglandaceae	Tree
25	*Kydia* sp.	Malvaceae	Tree
26	*Lindera* sp.	Lauraceae	Tree
27	*Lithocarpus* sp.	Fagaceae	Tree
28	*Lyonia ovalifolia*	Ericaceae	Tree
29	*Macarange* sp.	Euphorbiaceae	Tree
30	*Magonila campbellii*	Magnoliaceae	Tree
31	*Michelia champaca*	Magnoliaceae	Tree
32	*Michelia doltsopa*	Magnoliaceae	Tree
33	*Persea* sp.	Lauraceae	Tree
34	*Pinus bhutanica*	Pinaceae	Tree
35	*Prunus cerasoides*	Rosaceae	Tree
36	*Quercus griffithii*	Fagaceae	Tree
37	*Quercus lamellosa*	Fagaceae	Tree
38	*Quercus lanata*	Fagaceae	Tree

39	*Qurcus glauca*	Fagaceae	Tree
40	*Rhododendron grande*	Ericaceae	Tree
41	*Rhus chinensis*	Anacardiaceae	Tree
42	*Rhus succedanea*	Anacardiaceae	Tree
43	*Salix* sp.	Salicaceae	Tree
44	*Sauaraja naupenensis*	Actinidiaceae	Tree
45	*Schima wallichii*	Theaceae	Tree
46	*Sorbus griffithii*	Rosaceae	Tree
47	*Toricellia tillifolia*	Cornaceae	Tree
48	*Tsuga domosa*	Pinaceae	Tree
49	*Rhododendron arboreum*	Ericaceae	Tree/shrub
50	*Rhododendron falconeri*	Ericaceae	Tree/shrub
51	*Rhododendron griffithianum*	Ericaceae	Tree/shrub
52	*Rhododendron hodgsonii*	Ericaceae	Tree/shrub
53	*Rhododendron kesangiae*	Ericaceae	Tree/shrub
54	*Rhodoendron edgeworthii*	Ericaceae	Tree/shrub
55	*Myrsine semiserrata*	Myrsinaceae	Tree/shrub
56	*Aeschynanthus sikkimensis*	Gesneriaceae	Epiphytic
57	*Aeschynanthus* sp.	Gesneriaceae	Epiphytic
58	*Bulbophyllum guttlatum*	Orchidaceae	Epiphytic
59	*Bulbophyllum reptans*	Orchidaceae	Epiphytic
60	*Bulbophyllum* sp.	Orchidaceae	Epiphytic
61	*Anthogonium gracile*	Orchidaceae	Epiphytic
62	*Agrostophyllum callusom*	Orchidaceae	Epiphytic
63	*Agapetes incurvata*	Ericaceae	Epiphytic
64	*Agapetes serpens*	Ericaceae	Epiphytic
65	*Calanthe* sp.	Orchidaceae	Epiphytic
66	*Dendrobium falconari*	Orchidaceae	Epiphytic
67	*Cymbidium* sp.	Orchidaceae	Epiphytic
68	*Dendrobium fimbriatum*	Orchidaceae	Epiphytic
69	*Dendrobium hookerianum*	Orchidaceae	Epiphytic
70	*Ceologyne nitida*	Orchidaceae	Epiphytic
71	*Dendrobium longicornu*	Orchidaceae	Epiphytic
72	*Dendrobium* sp.	Orchidaceae	Epiphytic
73	*Epigenium fusuces*	Orchidaceae	Epiphytic
74	*Epigenium* sp.	Orchidaceae	Epiphytic
75	*Eria conorinaria*	Orchidaceae	Epiphytic
76	*Oberonia falcata*	Orchidaceae	Epiphytic
77	*Phalaenopsis taenialis*	Orchidaceae	Epiphytic
78	*Otochilus lancilabius*	Orchidaceae	Epiphytic
79	*Hoya* sp.	Gesneriaceae	Epiphytic
80	*Scurrula elata*	Lorathaceae	Epiphytic

81	*Sunipia* sp.	Orchidaceae	Epiphytic
82	*Ione bicolor*	Orchidaceae	Epiphytic
83	*Pleione humulis*	Orchidaceae	Epiphytic
84	*Vandopsis undulata*	Orchidaceae	Epiphytic
85	*Ione cirrhata*	Orchidaceae	Epiphytic
86	*Oberonia* sp.	Orchidaceae	Epiphytic
87	*Eria* sp.	Orchidaceae	Epiphytic
88	*Eria spicata*	Orchidaceae	Epiphytic
89	*Gesneria* sp.	Gesneriaceae	Epiphytic
90	*Goodyera* sp.	Orchidaceae	Terestrial
91	*Anectochilus* sp.	Orchidaceae	Terestrial
92	*Ageratina adenophora*	Compositae	Herb
93	*Ainsliaea aptera*	Compositae	Herb
94	*Aconogonon molle*	Polgonaceae	Herb
95	*Anisleae aptera*	Compositae	Herb
96	*Arisaema* sp.	Araceae	Herb
97	*Aconogonon* sp.	Polyganacaeae	Herb
98	*Cannabis sativa*	Cannaabaceae	Herb
99	*Carex* sp.	Cyperaceae	Herb
100	*Cautleya gracilis*	Zinginberaceae	Rhizomatous-Herb
101	*Cautleya* sp.	Zinginberaceae	Herb
102	*Elotishizia* sp.	Labiatae	Herb
103	*Elsholtzia fruticosa*	Labiatae	Herb
104	*Elsholtzia strobifera*	Labiatae	Herb
105	*Anaphalis* sp.	Compositae	Herb
106	*Thalictrum* sp.	Ranunculaceae	Herb
107	*Fragaria nubicola*	Rosaceae	Herb
108	*Gaultheria fragrantissima*	Ericaceae	Herb
109	*Gaultheria semi-infera*	Ericaceae	Herb
110	*Gaultheria tricophylla*	Ericaceae	Herb
111	*Tupistra* sp.	Convallariaceae	Herb
112	*Urtica* sp.	Urticaceae	Herb
113	*Viola* sp.	Violaceae	Herb
114	*Gentiana capitata*	Gentianaceae	Herb
115	*Gentiana* sp.	Gentianaceae	Herb
116	*Juncus* sp.	Juncusceae	Herb
117	*Mazus* sp.	Scrophulariaceae	Herb
118	*Primula* sp.	Primulaceae	Herb
119	*Primula denticulata*	Primulaceae	Herb
120	*Solanum viarum*	Solanaceae	Herb
121	*Sedum* sp.	Crassulaceae	Herb
122	*Senecio* sp.	Compositae	Herb

123	*Strobilanthes* sp.	Acanthaceae	Herb
124	*Peperomia tetraphylla*	Piperaceae	Herb
125	*Polygomnatum*	Polygonaceae	Herb
126	*Persicaria* sp.	Polygonaceae	Herb
127	*Geranium* sp.	Geraniceae	Herb
128	*Pholmis* sp.	Lamiaceae	Shrub/Herb
129	*Hedera nepalensis*	Ariliaceae	Climbing Shrub
130	*Hedera* sp.	Ariliaceae	Climbing Shrub
131	*Hedychium* sp.	Zinginberaceae	Perennials Herb
132	*Hedychium spicatum*	Zinginberaceae	Perennials Herb
133	*Hemiphragma heterophylla*	Scrophulariaceae	Creepering Herbaceous
134	*Holboellia latifolia*	Lardizabalaceae	Shrub
135	*Hypericum* sp.	Hypericaceae	Shrub
136	*Indofera dosubia*	Leguminosa	Shrub
137	*Maesa chisia*	Myrsinaceae	Shrub
138	*Jasminium grandiflorum*	Oleaceae	Shrub
139	*Rubus biflorus*	Rosaceae	Shrub
140	*Wedlandia* sp.	Rubiaceae	Shrub
141	*Wendlandia coriaceae*	Rubiaceae	Shrub
142	*Yushinia macophylla*	Bambaceae	Shrub
143	*Yushinia* sp.	Bambaceae	Shrub
144	*Zanthoxylum nepalense*	Rutaceae	Shrub
145	*Zanthoxylum* sp.	Rutaceae	Shrub
146	*Rubus ellepticus*	Rosaceae	Shrub
147	*Rubus* sp.	Rosaceae	Shrub
148	*Sarcococca hookeriana*	Buxaceae	Shrub
149	*Schelfflera* sp.	Araliaceae	Shrub
150	*Smilax myrtillus*	Smilacaceae	Shrub
151	*Prinsepia utilis*	Rosaceae	Shrub
152	*Ribes* sp.	Grossulariaceae	Shrub
153	*Ardisia macrophylla*	Myrsinaceae	Shrub
154	*Artemisia vulgaris*	Compositae	Shrub
155	Bamboo sp	Graminae	Shrub
156	*Berberis angulosa*	Berberidaceae	Shrub
157	*Berberis* asiatica.	Berberidaceae	Shrub
158	*Berberis* sp.	Berberidaceae	Shrub
159	*Boehmeria* sp.	Urticaceae	Shrub
160	*Crotoneaster microphyllus*	Rosaceae	Shrub
161	*Daphne bholua*	Thymelaeaceae	Shrub
162	*Debregeasia longifolia*	Urticaceae	Shrub
163	*Desmodium elagans*	Leguminosae	Shrub
164	*Edgeworthia gardeneri*	Thymelaeaceae	Shrub

165	*Elaeagnaceae parvifolia*	Elaeagnaceae	Shrub
166	*Elaganeanus* sp.	Elaeagnaceae	Shrub
167	Piper sp,	Piperaceae	Shrub
168	*Desmodium* sp.	Leguminosae	Shrub
169	*Rosa bruononii*	Rosaceae	Shrub
170	*Rosa macrophylla*	Rosaceae	Shrub
171	*Symplocos glomerata*	Symplocaceae	Shrub
172	*Symplocos ramosissima*	Symplocaceae	Shrub
173	*Symplocos* sp.	Symplocaceae	Shrub
174	*Symplocos sumuntia*	Symplocaceae	Shrub
175	*Tetrastigma* sp.	Vitaceae	Shrub
176	*Toddalia asiatica*	Rutaceae	Shrub
177	*Morus sp.*	Moraceae	Shrub
178	*Viscium album*	Lorathaceae	Shrub
179	*Viscium* sp.	Lorathaceae	Shrub
180	*Murraya* sp.	Rutaceae	Shrub
181	*Vaccinium nummularia*	Ericaceae	Shrub
182	*Vaccinium* sp.	Ericaceae	Shrub
183	*Vaccinium retusa*	Ericaceae	Shrub
184	*Viburnum cylindricum*	Caprifoliaceae	Shrub
185	*Lycesteria formosa*	Caprifoliaceae	Shrub
186	*Ligustrum confortum*	Oleaceae	Shrub
187	*Lingustrum* sp.	Oleaceae	Shrub
188	*Rhododendron dalhousiae*	Ericaceae	Shrub/Ephytic
189	*Rhododendron lindleyi*	Ericaceae	Shrub/ Ephytic
190	*Lycopodium calvatum*	Lycopodiaceae	Fern
191	*Lycopodium* sp.	Lycopodiaceae	Fern
192	*Chelianthes* sp.	Pteridaceae	Fern
193	*Diaplazium esculatum*	Athyriaceae	Fern
194	*Diplazium* sp.	Athyriaceae	Fern
195	*Drynaria propinqua*	Polypodiaceae	Fern
196	*Dryopteris* sp.	Dryopteridaceae	Fern
197	*Nephrolepis cordifolia*	Olendraceae	Fern
198	*Oleandra pistillaris*	Olendraceae	Fern
199	*Plagiogyria* sp.	Plagiogyraceae	Fern
200	*Polystichum nepalense*	Dryopteridaceae	Fern
201	*Pteridium* sp.	Dennstaedtiaceae	Fern
202	*Pteris* sp.	Pteridaceae	Fern
203	*Pyrrosia boothii*	Polypodiaceae	Fern
204	*Pyrrosia* sp.	Polypodiaceae	Fern
205	*Lonicera* sp.	Oleaceae	Climber
206	*Smilax* sp.	Smilacaceae	Climber

207	*Rubia cordifolia*	Rubiaceae	Climber
208	*Aristolochia griffithii*	Aristolochiaceae	Climber
209	*Rubia manjith*	Rubiaceae	Climber
210	*Ficus* sp.	Moraceae	Climber
211	*Stephania* sp.	Menispermaceae	Twiner
212	*Vites* sp.	Vitaceae	Climber
213	*Clematis* sp.	Ranunculaceae	Climber
214	*Raphidophora sp*	Araceaa	Climber
215	*Rhodobyrum giganteum*	Bryaceae	Bryophite
216	*Dendrophthoe falcata*	Lorathaceae	Parasites
217	*Fagopyrum* sp.	Polygonaceae	Perennials
218	*Oxalis* sp.	Oxalidaceae	Perennials
219	*Plantogo erosa*	Plantaginaceae	Perennials
220	Grass sp.	Graminae	Grass
221	Fern sp.	Pteridophytes	Fern

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2nd Tour Report

Rescue of plants and rapid assessment of the floral diversity in the Tangsibji Hydropower Project

Date and duration

- **19th August to 30th August 2015**

Team Members

1. Sangay Dema
2. Nima Gyeltshen
3. Wangmo
4. Kezang Tobgay
5. Tsheringla
6. Kezang Gyelpo

Aims and objectives of the tour.

1. Documentation of existing floral diversity of the Tangsibji hydropower project sites.
2. To rescue prioritized plant species from the project sites for ex situ conservation at the Royal Botanical garden, Serbithang

Introduction

Rescue, rehabilitation and ex-situ conservation of plant diversity are some of the main objectives of the Royal Botanical Garden, National Biodiversity Centre, Serbithang.

Therefore, in line with objectives, National Biodiversity has initiated a joint rescue and collection program for the threatened and rare plant species from the Nikachu hydropower project sites.

During the second diversity assessment trip to Tangsibji hydropower project sites, resurvey and documentation was carried out in different parts of Adits, Surge shaft and Dam sites, which were missised during the first survey. Further, additional species which were recueable were also collected for ex-situ conservation as living collection at the Royal Botanical Garden, Serbtihang.

Results and observations

18 plant species were collected and rescued from Tangsibji hydropower project sites as living collection, based on the quantitative vegetation data from eight sites (5 Adits, Dame Site, Surge-Shaft and Power house). A total of 402 species belonging to 106 families were recorded. The tree vegetation belonged to 106 families (95 Angiospermous and 4 of Gymnospermous) and the rest comprised 37 orchid species, 6 bamboo species and 264 other herbaceous and shrubs species. During this second floral diversity assessment, additional 201 plant species was recorded form the project sites.

List of floral diversity documented form each sites along with result of the rapid assessment of the percent cover of each species, list of additional plant species documented from project site and the list of species conserved as living collections are provided as annexes.

Observation: The team observed that the revegetation on the sides of road towards Power house was done using conifer species (*Cupressus* species). As the sites fall in warm broad leaved forest zone, it is recommended that revegetation be done using the natives species of the locality such as *Erythrina* species, *Rhus* sp, *Alnus* etc

Annex 1: List of plant species conserved ex-situ as living collection at Royal Botanical garden, Serbithang

SI.No	Scientific name	Family
1	*Bulbophyllum guttulatum*	Orchidaceae
2	*Dendrobium hookerianum*	Orchidaceae
3	*Dendrobium longicornu*	Orchidaceae
4	*Goodyera* sp.	Orchidaceae
5	*Oberonia* sp.	Orchidaceae
6	*Vandopsis undulata*	Orchidaceae
7	*Bulbophyllum reptans*	Orchidaceae
8	*Platanthera* sp	Orchidaceae
9	*Goodyera schlechtendaliana*	Orchidaceae
10	*Phalaenopsis taenialis*	Orchidaceae
11	*Satyrium nepalense*	Orchidaceae
12	*Bulbophyllum cylindraceum*	Orchidaceae
13	*Acer campbellii*	Aceraceae
14	*Symplocos ramosissima*	Symplocaceae
15	*Begonia* sp	Begoniaceae
16	*Fern* sp	Pteridophytes
17	*Aristolochia griffithii*	Aristochiaceae
18	*Oberonia* sp	Orchidaceae

The plants found in Nikachu hydropower project sites.

Impatients sp.

Begonia sp.

Platanthera sp.

Hedychium spicatium

Hedychium gardnerianum

Satyrium nepalense

Annex 2.1: List of plant species recorded from Dam Site

Sl.No.	Scientific name	Cover (%)
1	*Acer campbellii*	40
2	*Acer sterculiaceum*	20
3	*Aconogonon molle*	50
4	Arisaema consanguineum	20
5	*Agapetes serpens*	15
6	*Ainsliaea aptera*	4
7	*Alnus nepalensis*	50
8	*Anaphalis margaritaceae*	5
9	*Anoectochilus* sp.	1
10	*Artemisia vulgaris*	5
11	*Begonia* sp.	10
12	*Berberis* sp.	10
13	*Betula alnoides*	15
14	*Bulbophylum reptans*	5
15	*Carex* sp.	5
16	*Castanopsis hystrix*	30
17	*Castanopsis triboloides*	20
18	*Cautleya spicata*	15
19	*Coelogyne* sp.	10
20	*Colocasi* sp.	20
21	*Commelina benghalensis*	5
22	*Corylopsis himalayana*	20
23	*Cremanthodium sp.*	3
24	*Cyanotis vaga*	10
25	*Daphne bholua*	20
26	*Dendrobium porphyrochilum*	5
27	*Dipliazium esculentum*	10
28	*Dodecadenia grandiflora*	20
29	*Drynaria propinqua*	5
30	*Dryopteris* sp.	5
31	*Elaeagnus parviflora*	20
32	*Elaeagnus* sp.	10
33	*Elatostema lineolatum*	5
34	*Elatostema* sp. 1	15
35	*Elatostema* sp. 2	10
36	*Equisetum* sp.	5
37	*Euonymus* sp.	20
38	*Eurya acuminata*	40
39	*Eurya cerasifolia*	20
40	*Fragaria nubicola*	50

41	*Fraxinus* sp.	30
42	*Galinsoga* sp.	15
43	*Gentiana capitata*	10
44	*Geranium* sp.	5
45	*Gesneria* sp.	10
46	*Girardinia diversifolia*	10
47	*Gnaphalium* sp.	5
48	*Goodyera* sp.	2
49	*Halenia elliptica*	10
50	*Hemiphragma heterophyllum*	20
51	*Herdera nepalensis*	20
52	*Hypericum choisianum*	15
53	*Ilex depreyana*	20
54	*Impatiens* sp. 2	20
55	*Impatiens urticifolia*	10
56	*Juncus* sp.	15
57	*Leucas ciliata*	10
58	*Ligularia* sp.	2
59	*Ligustrum compactum*	3
60	*Ligustrum confusum*	5
61	*Lindera* sp.	5
62	*Lycopodium culvatum*	5
63	*Michelia champaca*	20
64	*Michelia doltsopa*	30
65	*Myrsine semiserrata*	40
66	*Nepata* sp.	20
67	*Oberonia* sp.	2
68	*Oleandra pistillaris*	3
69	*Oplismenus* sp.	10
70	*Osmanthus suavis*	10
71	*Oxalis* sp.	30
72	*Panax pseudoginseng*	10
73	*Peperomia tetraphylla*	25
74	*Persicaria chinensis*	5
75	*Persicaria runcinata*	20
76	*Plagiogyria* sp.	10
77	*Plantago eriosa*	5
78	*Polystichum nepalense*	5
79	*Potentilla* sp.	20
80	*Primula* sp.	5
81	*Prunus* sp.	20

82	*Pteridium aquilinium*	5
83	*Pteris* sp.	5
84	*Quercus glauca*	30
85	*Quercus lamellosa*	70
86	*Quercus oxyodon*	50
87	*Rhododendron edgeworthii*	50
88	*Rhododendron falconeri*	10
89	*Rhododendron grande*	10
90	*Rhododendron kesangiae*	10
91	*Rhododendron lindleyi*	10
92	*Ribes glaciale*	5
93	*Rubia cordifolia*	10
94	*Rubus biflora*	10
95	*Rubus* sp.	50
96	*Rumax nepalensis*	10
97	*Sambucus adnata*	10
98	*Sanicula elata*	5
99	*Sarcococca hookeriana*	10
100	*Senecio* sp.	10
101	*Skimmia laureola*	5
102	*Smilax ferox*	5
103	*Smilax myrtillus*	50
104	*Smilax* sp.	5
105	*Sorbus thomsonii*	5
106	*Spiranthes sinensis*	2
107	*Swertia* sp.	20
108	*Symplocos glomerata*	30
109	*Symplocos lucida*	20
110	*Symplocos ramosissima*	50
111	*Symplocos sumuntia*	40
112	*Tetrastigma* sp.	10
113	*Thalicturm* sp.	5
114	*Tipularia josephi*	2
115	*Triflolium* sp.	10
116	*Tsuga dumosa*	60
117	*Vaccinum nummularia*	5
118	*Yushinia macophylla*	25
119	*Zanthoxylum nepalensis*	10
120	*Zanthoxylum* sp.	5

Annex 2.2: List of plant species recorded from Adit-1

Sl.No.	Scientific name	Cover (%)
1	*Acer campbellii*	70
2	*Aconogonon molle*	20
3	*Agapetes serpens*	20
4	*Ainslaea aptera*	50
5	*Alnus nepalensis*	70
6	*Anaphalis* sp. 2	5
7	*Anaphalis* sp.1	5
8	*Arisaema consanguineum*	10
9	*Artimisia* sp.	15
10	*Berberis cristata*	20
11	*Berberis* sp.	30
12	*Betula alnoides*	50
13	*Borinda grossa*	15
14	*Bulbophyllum* sp.	20
15	*Carex* sp.	20
16	*Castanopsis triboloides*	50
17	*Centella asiatica*	10
18	*Cirsium falconeri*	5
19	*Cyperus* sp.	10
20	*Dendrobium longicornu*	10
21	*Dendrobium* sp.	20
22	*Drymaria* sp.	5
23	*Equisetum* sp.	30
24	*Eria* sp.	5
25	*Eurya acuminata*	4
26	*Eurya serrata*	5
27	*Fraxinus* sp.	20
28	*Gentiana* sp.	5
29	*Gnaphalium* sp.	3
30	*Halenia* sp.	5
31	*Hedera nepalensis*	20
32	*Hemiphragma* sp.	20
33	*Hypericum* sp.	15
34	*Ilex dipyrena*	20
35	*Impatiens* sp. (white)	5
36	*Impatiens* sp.(Yellow)	5
37	*Leucas ciliata*	5
38	*Lycopodium calvatum*	5
39	*Magnolia campbellii*	40

40	*Myrsine semiserrata*	20
41	*Nepeta* sp.	5
42	*Oberonia* sp.	5
43	*Ophiopogon* sp.	5
44	*Peperioma tetraphylla*	20
45	*Persea bootanica*	5
46	*Persea clarkeana*	50
47	*Persea duthiei*	40
48	*Persicaria* sp.	30
49	*Persicaria* sp. 2	25
50	*Plantago eriosa*	5
51	*Polygonatum* sp.	10
52	*Quercus glauca*	20
53	*Quercus lamellosa*	50
54	*Quercus oxyodon*	50
55	*Rhododendron arboreum*	40
57	*Rhododendron griffithianum*	20
56	*Rhododendron lindleyi*	30
58	*Rhodoendron edgeworthii*	30
59	*Rubus biflora*	10
60	*Schelfflera* sp.	5
61	*Senecio* sp.	10
62	*Smilax myrtillus*	10
63	*Swertia* sp.	10
64	*Symplocos glomerata*	20
65	*Symplocos lucida*	20
66	*Symplocos ramossima*	50
67	*Tetrastigma* sp.	40
68	*Thalictrum* sp.	5
69	*Tsuga dumosa*	30
70	*Tupistra* sp.	5
71	*Viburnum cylindricum*	50
72	*Viburnum erubescens*	5
73	*Yushania microphylla*	5
74	*Zanthoxylum* sp.	3

Annex 2.3: List of floral species recorded form Adit-2

Sl.No	Species Name	Cover (%)
1	*Acer pectinatum*	15
2	*Aconogonon molle*	20

3	*Aconogonum* sp.	20
4	*Agapetes incurvata*	10
5	*Ainsliaea aptera*	20
6	*Alnus nepalensis*	50
7	*Anaphalis* sp.	10
8	*Anthogonium gracile*	20
9	*Artemisia* sp.	10
10	*Bulbophylum reptans*	15
11	*Kyllinga* sp.	5
12	*Carex* sp.	10
13	*Carpinus viminea*	15
14	*Cautleya* sp.	10
15	*Centella asiatica*	15
16	*Corylopsis himalayana*	5
17	*Cotoneaster* sp.	10
18	*Crassocephalum crepidioides*	5
19	*Cyanotis vaga*	10
20	*Daphne bohloua*	15
21	*Delphinium cooperi*	5
22	*Dendrobium longicornu*	20
23	*Desmodium* sp.	40
24	*Diaplazium esculentum*	30
25	*Diplodenum* sp.	5
26	*Dynaria* sp.	10
27	*Elaeagnusm* sp.	5
28	*Elsholtzia* sp.	5
29	*Epigeanum* sp.	10
30	*Equisetum* sp.	10
31	*Eurya acuminata*	30
32	*Eurya serreta*	20
33	*Dicranopteris linearis*	30
34	*Fragaria* sp.	40
35	*Fraxinus* sp.	30
36	*Galinsoga parviflora*	20
37	*Galium elegans*	10
38	*Gaultheria semi-infera*	20
39	*Gaultheris fragantessima*	30
40	*Geranium* sp.	10
41	*Gamblea ciliata*	2
42	*Gnaphallium* sp.	4

43	*Goodyera schlechtendaliana*	3
44	*Hedera nepalensis*	5
45	*Hedychium* sp.	10
46	*Hedychium spicatum*	20
47	*Holsokadia sanguine*	3
48	*Hydichium gardeneri*	5
49	*Hydichium specatum*	10
50	*Hypericum* sp.	3
51	*Impatiens* sp. (white)	3
52	*Indigofera* sp.	10
53	*Leucas ciliata*	10
54	*Ligustrum confusum*	5
55	*Lindera* sp.	5
56	*Lithocarpus elegans*	2
57	*Lyonia ovalifolia*	40
58	*Melatostema* sp.	40
59	*Morus* sp.	5
60	*Myrsine semiserrata*	15
61	*Neillia rubiflora*	30
62	*Oberonia* sp.	5
63	*Ophiopogon clarkei*	5
64	*Otochilus lancilabius*	2
65	*Persicaria* sp.	10
66	*Pholidota* sp.	2
67	*Polystichum nepalense*	5
68	*Potentilla* sp.	5
69	*Prunus* sp.	10
70	*Pteridium aquilinium*	40
71	*Quercus griffithii*	50
72	*Quercus lamelosa*	30
73	*Rhododendron arboreum*	40
74	*Rhus* sp.	20
75	*Rosa sericea*	10
76	*Rubus biflora*	10
77	*Rubus paniculata*	20
78	*Sauaraja naupenensis*	30
79	*Schima wallichi*	5
80	*Smilax myrtillus*	30
81	*Sorbus* sp.	10
82	*Strobilanthes* sp.	15
83	*Sunipia* sp.	5

84	*Swertia* sp.	10
85	*Symplocos ramossima*	15
86	*Symplocos glomerita*	5
87	*Tetrastigma* sp.	20
88	*Thalictrum virgatum*	5
89	*Trifolium* sp.	20
90	*Vaccinium* sp.	20
91	*Viburnum cylindricum*	50
92	*Viola* sp.	5
93	*Viscium album*	2
94	*vitis* sp.	5
95	*Wendlandia* sp.	10
96	*Wenlandia* sp. 1	5
97	*Yushinia macophylla*	30
98	*Zanthoxylum* sp.	5

Annex 2.4: List of plant species recorded from Adit-3

Sl.No	Scientific name	Cover (%)
1	*Acer campbellii*	55
2	*Aconogonon* sp.	20
3	*Arisaema consanguineum*	20
4	*Agapetes serpens*	5
5	*Ageratina adenophora*	30
6	*Agrotophylum*	5
7	*Ainslaea* sp.	40
8	*Anaphalis* sp.	20
9	*Ardisia macrophylla*	15
10	*Arisaema consanguinium*	25
11	*Artimesia* sp.	30
12	*Berberis asiatica*	15
13	*Carpinus viminea*	10
14	*Castanopsis hystrix*	15
15	*Centella asiatica*	5
16	*Combretum* sp.	10
17	*Cotoneaster microphyllum*	5
18	*Crassocephalum crepidioides*	10
19	*Cuppresus corneyana(plantation)*	15
20	*Cuscuta* sp.	5
21	*Cyanotis vaga*	20

22	*Daphne bholua*	40
23	*Dendrobium falconeri*	30
24	*Dendrobium longicornu*	5
25	*Dendrobium longicornu*	10
26	*Dendrophthoe falcata*	5
27	*Diaplazium* sp.	5
28	*Dyneria* sp.	10
29	*Edgeworthia gardneri*	10
30	*Engelhardia cordifolia*	30
31	*Epigenium* sp.	20
32	*Eria fructicosa*	30
33	*Eria fruscence*	40
34	*Eurya acuminata*	30
35	*Exbucklandia* sp.	20
36	*Galingsoga* sp.	10
37	*Gaultheria fragrantessima*	20
38	*Gnaphylum* sp.	30
39	*Habenaria* sp.	10
40	*Hedychium densiflorum*	2
41	*Impatiens* sp.	4
42	*Indigofera dosua*	3
43	*Indigofera* sp.	5
44	*Inula* sp.	10
45	*Jasminium* sp.	20
46	*Kydia calycina*	3
47	*Leucas ciliata*	5
48	*Lycopodium calvatum*	10
49	*Lyonia ovalifolia*	3
50	*Oberonia* sp.	3
51	*Oleandra pistillaris*	10
52	*Osbeckia* sp.	5
53	*Otochilus* sp.	5
54	*Parochetes communis*	2
55	*Peperomia tetraphylla*	40
56	*Persicaria* sp.	40
57	*Pholidota* sp.	5
58	*Pleione praecox*	15
59	*Prunus* sp.	30
60	*Pteridium aquilinium*	5
61	*Quercus grifithii*	5
62	*Quercus lanata*	2

63	*Rhododendron arboreum*	10
64	*Rhus chinensis*	2
65	*Rhus* sp.	5
66	*Ribes* sp.	5
67	*Rubia cordifolia*	10
68	*Rubus paniculata*	40
69	*Rubus* sp.	5
70	*Saurauja griffithii*	40
71	*Thladiantha cordifolia*	50
72	*Smilax* sp.	20
73	*Solanum nigrum*	5
74	*Spiranthes sinensi*	3
75	*Sigesbeckia orientalis*	5
76	*Strobilanthes* sp.	10
77	*Tetrastigma* sp.	5
78	*Thylacturm* sp.	15
79	*Vaccinium* sp.	5
80	*Vandanopsis* sp.	20
81	*Viburnum cylindricum*	40
82	*Viscum* sp.	5
83	*Vitis* sp.	15
84	*Wendlandia* sp.	5
85	*Zanthoxylum* sp.	10

Annex 2.5: List of species recorded from Adit-4

Sl.No.	Species Name	Cover (%)
1	*Aconogonon molle*	50
2	*Agapetes serpens*	10
3	*Ageratina adenophora*	20
4	*Alnus nepalensis*	40
5	*Boehmeria macrophylla*	50
6	*Castonopsis tribuloides*	5
7	*Cautliya* sp.	7
8	*Celtis tetrandra*	5
9	*Cirsium* sp.	3
10	*Cryptomeria japonica*	**P**
11	*Diaplazium esculantum*	10
12	*Ficus* sp.	2
13	*Galingsoga* sp.	5
14	*Galium* sp.	10

15	*Houttuynia cordata*	20
16	*Hedera nepalensis*	5
17	*Hedychium* sp.	15
18	*Impatiens* sp.	2
19	*Inula hookeri*	3
20	*Jasminium* sp.	5
21	*Leucas ciliata*	25
22	*Lyonia ovalifolia*	10
23	*Myrsine semiserrata*	20
24	*Neillia rubiflora*	5
25	*Oplismenus* sp.	10
26	*Persea clarkeana*	4
27	*Persea duthiei*	10
28	*Persicaria* sp.	3
29	*Phalaenopsis taenialis*	10
30	*Plantago depressa*	5
31	*Polystchyachium* sp.	1
32	*Pteridium aquilinium*	5
33	*Quercus griffithii*	50
34	*Quercus lanata*	50
35	*Rhododendron arboreum*	40
36	*Rhus hookeri*	2
37	*Ribes* sp.	1
38	*Rubia cordifolia*	5
39	*Rubus ellepticus*	15
40	*Smilax* sp.	10
41	*Solanium khasianum*	5
42	*Strobilanthus* sp.	55
43	*Tetrastigma* sp.	20
44	*Thladiantha cordifolia*	15
45	*Trifolium* sp.	5
46	*Vaccinium* sp.	3
47	*Viburnum cylindricum*	45
48	*Viburnum erubescens*	5
49	*Vitis* sp.	15
50	*Xanthium indicam*	5
51	*Yushania macrophylla*	20
	P= Plantation	

Annex 2.6: List of floral species recorded from Adit-5

Sl.No.	Scientific Name	Cover (%)
1	*Aconogonon* sp.	20
2	*Agapetes serpens*	5
3	*Ageratina adenophora*	50
4	*Ainsliaea latifolia*	30
5	*Alnus nepalensis*	40
6	*Anaphalis* sp.	10
7	*Anthogonium garcile*	25
8	*Arisaema consanguineum*	5
9	*Artimesia* sp.	5
10	*Benthamidia capitata*	3
11	*Berberis angelosum*	5
12	*Berberis asiatica*	10
13	*Bidens sp.*	5
14	*Bohemeria* sp.	15
15	*Brassaiopsis hispida*	20
16	*Buddleja davidii*	2
17	*Buddleja* sp.	5
18	*Cannabis sativus*	15
19	*Carex* sp.	20
20	*Cautleya* sp.	5
21	*Centella asiatica*	25
22	*Crassocephalum crepidioides*	10
23	*Commelina* sp.	5
24	*Cuppresus corneyaya*	25
25	*Cuscuta campestris*	10
26	*Cyanotis vaga*	4
27	*Cyperus* sp.	10
28	*Docynia indica*	5
29	*Drynaria* sp.	1
30	*Drynaria propinqua*	5
31	*Elaganeanus* sp.	4
32	*Eurya acuminata*	10
33	*Fagopyrum dibotrys*	25
34	*Fragaria nubicola*	50
35	*Galingsoga* sp.	30
36	*Galium aparine*	10
37	*Galium elegans var. punduanum*	5
38	*Gaultheria fragrantissima*	5
39	*Geranium nepalensis*	2
40	*Geranium polyanthus*	3

41	*Gnaphylum* sp.	5
42	*Hedera nepalensis*	15
43	*Hemiphragma* sp.	10
44	*Houttuynia cordata*	15
45	*Hydichium* sp.	5
46	*Hypericum* sp.	3
47	*Indigofera* sp.	55
48	*Juglans regia*	5
49	*Juncas* sp.	15
50	*Leucas ciliata*	25
51	*Leycesteria formosa*	20
52	*Lycopodium calvatum*	5
53	*Lyonia ovalifolia*	25
54	*Morina longifolia*	3
55	*Neillia rubiflora*	5
56	*Oleandra pistillaris*	1
57	*Oxalis* sp.	5
58	*Persicaria* sp.	10
59	*Plantago* sp.	5
60	*Pteridium aquilinium*	45
61	*Quercus lanata*	50
62	*Rhododendron arboreum*	35
63	*Rhus sinensis*	25
64	*Rosa sericea*	2
65	*Rubia cordifolia*	5
66	*Rubus biflora*	10
67	*Rubus ellipticus*	15
68	*Rubus* sp.	15
69	*Rumax nepalensis*	25
70	*Solanum nigrum*	5
71	*Strobilanthes* sp.	5
72	*Swertia* sp.	2
73	*Cynoglossum furcatum*	5
74	*Thalictrum virgatum*	5
75	*Thladiantha cordifolia*	10
76	*Trifolium* sp.	5
77	*Urtica* sp.	5
78	*Vaccinium* sp.	5
79	*Viscum album*	1
80	*Xanthium indicum*	5
81	*Yushania macrophylla*	25

Annex 2.7: List of plant species recorded from Surge Shaft

Sl.No.	Scientific Name	Cover (%)
1	*Achyranthes bidentata*	5
2	*Acer campbellii*	50
3	*Acer palmatum*	5
4	*Ageratina adenophora*	25
5	*Acer strachophylum*	15
6	*Aeschynanthus* sp.	5
7	*Aerisima* sp.	5
8	*Agapetes serpens*	15
9	*Agapetes incurvata*	5
10	*Albizia* sp.	10
11	*Alnus nepalensis*	50
12	*Ardisia macrophylla*	5
13	*Aristlochia griffithii*	3
14	*Artemisia* sp.	5
15	*Athogonium gracilles*	10
16	*Axonopus affinis*	5
17	*Begonia* sp.	5
18	*Boehmeria macrophylla*	10
19	*Brassaiopsis mitis*	5
20	*Bulbophylum reptans*	25
21	*Bulbophylum* sp.	10
22	*Cannabis sativa*	20
23	*Kyllinga* sp.	5
24	*Carex* sp.	15
25	*Cassia occidentalis*	5
26	*Cautleya* sp.	5
27	*Cersium* sp.	3
28	*Chrysosplenium* sp.	2
29	*Clematis* sp.	5
30	*Climatis* sp. 2	2
31	*Clinopodium umbrosum*	5
32	*Combrectum* sp.	1
33	*Commelina* sp.	2
34	*Crassiocephalum crepidoides*	5
35	*Cuppresus corneyana*	P
36	*Cyanotis vaga*	5
37	*Daphne bholua*	25

38	*Dendrobium longicornu*	5
39	*Desmodium* sp.	15
40	*Diaplazium esculatum*	30
41	*Docynia indica*	5
42	*Elaeocarpus lanceifolius*	2
43	*Eleocharis* sp.	1
44	*Elsholtzia* sp.	3
45	*Equisetum* sp.	5
46	*Eria* sp.	5
47	*Erytherina* sp.	4
48	*Eurya acuminata*	30
49	*Fagopyrum dibotrys*	25
50	*Ficus* sp.	5
51	*Gaultheria fragrantissima*	25
52	*Geranium nepalensis*	5
53	*Hedera nepalensis*	20
54	*Hedychium spicata*	15
55	*Hydichium gardenia*	5
56	*Ilex depreyana*	25
57	*Impatiens* sp.	5
58	*Inula* sp.	5
59	*Jasminium* sp.	10
60	*Juglans regia*	15
61	*Kydia calycina*	5
62	*Leucas ciliata*	20
63	*Leucosceptrum canum*	5
64	*Scurrula elata*	15
65	*Lyonia ovalifolia*	50
66	*Macaranga* sp.	30
67	*Monotropastrum humile*	5
68	*Morina polyphylla*	3
69	*Oleandra pistillaris*	5
70	*Otochilus lancilibus*	3
71	*Oxalis* sp.	5
72	*Parasassafras confertiflora*	10
73	*Peporoma tetraphylla*	25
74	*Persicaria* sp.	5
75	*Leguminosae* sp.	2
76	*Polygonatum* sp.	5
77	*Prinsepia utilis*	5
78	*Prunus* sp.	5

79	*Pteridium aquilinium*	10
80	*Quercus griffithii*	55
81	*Quercus lanata*	70
82	*Qurcus oxyodron*	50
83	*Rhododendron arboreum*	25
84	*Rhus hookeriana*	15
85	*Rosa brunnonii*	5
86	*Rubus ellipticus*	15
87	*Rubus* sp.	5
88	*Sambacas* sp.	10
89	*Sigesbeckia orientalis*	5
90	*Smilax* sp.	10
91	*Smilax* sp. 3	5
92	*Solanum viarum*	5
93	*Strobilanthus* sp.	25
94	*Swertia* sp.1	3
95	*Swertia* sp. 2	5
96	*Symplocos ramossima*	30
97	*Symplocos sumentha*	25
98	*Cynoglossum furcatum*	5
99	*Tetrastigma objectum*	10
100	*Thladiontha cordifolia*	5
101	*Thalictrum virgatum*	10
102	*Toona sureni*	5
103	*Toricilia ciliata*	15
104	*Tricholepis falcata*	5
105	*Urtica parviflora*	25
106	*Girardinia diversifolia*	15
107	*Viburnum cylindricum*	25
108	*Viscum* sp.	3
109	*Unknown* sp.	2
110	*Xanthium indicum*	5
111	*Youngia* sp.	2
112	*Zanthoxylum* sp.	10
	'P= Plantation	

Annex 2.8: List of plant species recorded from Power House

Sl.No.	Scientific Name	Cover (%)
1	*Abelmoschus crinitus*	1
2	*Achyranthes bidentata*	5
3	*Acer oblongum*	15

4	*Aconogonon molle*	25
5	*Aconogonon* sp.	15
6	*Arisaema* sp.	5
7	*Agapetes serpens*	10
8	*Ageratina adenophora*	15
9	*Albizia* sp.	20
10	*Alnus nepalensis*	60
11	*Anaphalis* sp. 2	2
12	*Ardisia macrophylla*	10
13	*Artimesia* sp.	3
14	*Benthamedia capitata*	5
15	*Berberis asiatica*	10
16	*Berberis cristata*	5
17	*Bidens* sp.	5
18	*Bidens pilosa*	10
19	*Bohmeria* sp.	45
20	*Borinda grossa*	25
21	*Brassaiopsis hispida*	10
22	*Brassaiopsis mitis*	20
23	*Bulbophylum cylindriasum*	15
24	*Bulbophylum guttilatum*	15
25	*Bulbophylum reptans*	5
26	*Bulbophylum* sp.	5
27	*Cassia occidentalis*	3
28	*Castanopsis hystrix*	25
29	*Cautleya gracilis*	5
30	*Celtis tetrandra*	55
31	*Centella asiatica*	25
32	*Cerotium glomeratum*	1
33	*Clematis* sp.	2
34	*Clintonia udensis*	1
35	*Commelina* sp.	5
36	*Combrectum* sp.	5
37	*Crassocephalum crepidioides*	15
38	*Cucurbita moschata*	1
39	*Cuppressus corneyana*	50
40	*Cuscuta campestris*	10
41	*Cyanotis vaga*	5
42	*Cyprus* sp.	2
43	*Debregeasia longifolia*	25
44	*Debregeasia wallichiana*	15

45	*Dendrobium longicornu*	5
46	*Dendrocalamus* sp.	1
47	*Desmodium* sp.	4
48	*Diaplazium esculatum*	70
49	*Dioscorea hispida*	5
50	*Dioscoria floribunda*	5
51	*Dioscria* sp.	2
52	*Diplocyclos uspalmat*	5
53	*Docynia indica*	20
54	*Dodecadenia grandiflora*	15
55	*Drynaria propinqua*	5
56	*Elaeagnus parviflora*	10
57	*Elsholtzia fruticosa*	5
58	*Engelhardia spicata*	5
59	*Equis ciliata*	5
60	*Equisetum* sp.	15
61	*Eria* sp.	5
62	*Erytherina arboresence*	50
63	*Eurya acuminata*	15
64	*Fagopyrum dibotrys*	25
65	*Ficus narvosa*	5
66	*Galinsoga* sp.	10
67	*Galium aparine*	5
68	*Gerardania grandifloia*	30
69	*Hedera nepalensis*	15
70	*Hedychium* sp.	3
71	*Hydichium gardneri*	5
72	*Hydichium spicatum*	10
73	*Impatiens* sp.(yellow)	2
74	*Indigofera* sp.	5
75	*Inula* sp.	2
76	*Ipomea* sp.	5
77	*Juglans regia*	15
78	*Schoenoplectus juncoides*	3
79	*Leucas ciliata*	10
80	*Leucoseptum oblongum*	10
81	*Scurrula elata*	5
82	*Lyonia ovalifolia*	25
83	*Macaranga* sp.	15
84	*Malva verticiliata*	5
85	*Mohonia nepalensis*	5

86	*Morina longifolia*	5
87	*Morus* sp.	10
88	*Musa chisa*	25
89	*Neillia rubiflora*	15
90	*Nephrolepsis cordifolia*	10
91	*Nepita* sp.	5
92	*Nicandra phassiloiides*	25
93	*Oberonia* sp.	3
94	*Oplismenus* sp.	5
95	*Oleandra pistillaris*	1
96	*Otochilus lancilabus*	5
97	*Oxalis* sp.	5
98	*Panisea* sp.	5
99	*Peporoma tetraphyla*	15
100	*Persicaria* sp.	10
101	*Phaelonopsis tenialis*	15
102	*Bamboo* sp.	15
103	*Phylanthus* sp.	5
104	*Phyllanthus parvifolius*	5
105	*Phytolacca acinosa*	10
106	*Piper suipigua*	5
107	*Piper* sp.	15
108	*Piptanthus nepalensis*	3
109	*Potamogeton* sp.	2
110	*Pouzolzia hirta*	5
111	*Prinsepia utilis*	2
112	*Prunus ceersoiedes*	40
113	*Pteridium aquilinium*	25
114	*Quercus griffithii*	50
115	*Quercus lanata*	55
116	*Randia* sp.	2
117	*Rhus chinensis*	25
118	*Rhus succedina*	1
119	*Rosa brunonnii*	5
120	*Rubia cordifolia*	10
121	*Rubus ellipticus*	5
122	*Senecio* sp.	15
123	*Schelfflera* sp.	3
124	*Sigesbeckia orientalis*	5
125	*Cynoglossum furcatum*	5
126	*Solanum nigrum*	5

127	*Soleanum viarum*	5
128	*Stephania elegans*	10
129	*Strobilanthes* sp.	50
130	*Tetrastigma objectum*	10
131	*Thladiantha cordifolia*	5
132	*Thysanolaena* sp.	5
133	*Toona sureni*	15
134	*Toricellia tillifolia*	40
135	*Trichosanthes lepiniana*	5
136	*Trifolium pratense*	2
137	*Urtica* sp.	5
138	*Verbascum thapsus*	10
139	*Viburnum cylindriasum*	25
140	*Viburnum erubescens*	10
141	*Viola* sp.	5
142	*Viscium* sp.	1
143	*Vitis heyneana*	5
144	*Vitex quinata*	25
145	*Wendlandia coriaceae*	15
146	*Zanthoxylum* sp.	20

Annexure III.

THE LIST OF ADDATION NEW PLANT SPECIES RECORDED FROM TANHSEBJI HYDRO PROJECT

SL.No	Species Name	Family	Habitat
1	*Bidens pilosa*	Compositae	Annual herb
2	*Bidens* sp.	Compositae	Annual herb
3	*Crassocephalum crepidioides*	Compositae	Annual herb
4	*Galinsoga parviflora*	Compositae	Annual herb
5	*Galinsoga* sp.	Compositae	Annual herb
6	*Sigesbeckia orientalis*	Compositae	Annual herb
7	*Tricholepis furcata*	Compositae	Annual herb
8	*Dicranopteris linearis*	Acanthaceae	Herb
9	*Bamboo* sp.	Gramineae	Bamboo
10	*Borinda grossa*	Gramineae	Bamboo
11	*Dendrocalamus* sp.	Gramineae	Bamboo
12	*Cirsium falconeri*	Compositae	Biennial herb
13	*Cirsium* sp.	Compositae	Biennial herb

14	*Cucurbita moschata*	Cucurbitaceae	Climber
15	*Dioscorea floribunda*	Dioscoreaceae	Climber
16	*Dioscorea hispida*	Dioscoreaceae	Climber
17	*Dioscorea* sp.	Dioscoreaceae	Climber
18	*Diplocyclos uspalmat*	Cucurbitaceae	Climber
19	*Ipomoea* sp.	Convolvulaceae	Climber
20	*Smilax ferox*	Smilacaceae	Climber
21	*Smilax* sp. 1	Smilacaceae	Climber
22	*Smilax* sp. 2	Smilacaceae	Climber
23	*Smilax* sp. 3	Smilacaceae	Climber
24	*Thladiantha cordifolia*	Cucurbitaceae	Climber
25	*Trichosanthes lepiniana*	Cucurbitaceae	Climber
26	*Unknown* sp.	Leguminosae	Climber
27	*Vitis heyneana*	Vitaceae	Climber
28	*Combretum* sp.	Combretaceae	Climbing shrub
29	*Piper suipigua*	Piperaceae	Climbing shrub
30	*Qurcus oxyodron*	Combretaceae	Climbing shrub
31	*Cryptomeria japonica*	Taxodiaceae	Conifer Tree
32	*Trifolium pratense*	Leguminosae	Creeping Herb
33	*Tetrastigma objectum*	Vitaceae	Creeping Shrub
34	*Equisetum* sp.	Equisetaceae	Fern
35	*Axonopus affinis*	Gramineae	Grass
36	*Bromus racemosus*	Gramineae	Grass
37	*Eulalia mollis*	Gramineae	Grass
38	*Leguminosae* sp.	Gramineae	Grass
39	*Oplismenus* sp.	Gramineae	Grass
40	*Thysanolaena* sp.	Gramineae	Grass
41	*Abelmoschus crinitus*	Malvaceae	Herb
42	*Achyranthes bidentata*	Amaranthaceae	Herb
43	*Anaphalis margaritaceae*	Compositae	Herb
44	*Arisaema consanguineum*	Araceae	Herb
45	*Begonia* sp.	Begoniaceae	Herb
46	*Cautleya* sp.	Zingiberaceae	Herb
47	*Cautleya spicata*	Zingiberaceae	Herb
48	*Centella asiatica*	Umbelliferae	Herb
49	*Cerastium glomeratum*	Caryophyllaceae	Herb
50	*Chrysosplenium sp.*	Saxifragaceae	Herb
51	*Clinopodium umbrosum*	Labiatae	Herb
52	*Clintonia udensis*	Uvulariaceae	Herb
53	*Colocasia* sp.	Araceae	Herb
54	*Commelina benghalensis*	Commelinaceae	Herb

55	*Commelina* sp.	Commelinaceae	Herb
56	*Cuscuta campestris*	Cuscutaceae	Herb
57	*Cuscuta* sp.	Cuscutaceae	Herb
58	*Cyanotis vaga*	Commelinaceae	Herb
59	*Cynoglossum furcatum*	Boraginaceae	Herb
60	*Cyperus* sp.	Cyperaceae	Herb
61	*Delphinium cooperi*	Ranunculaceae	Herb
62	*Drosera* sp.	Droseraceae	Herb
63	*Elatostema* sp. 1	Urticaceae	Herb
64	*Elatostema* sp. 2	Urticaceae	Herb
65	*Eleocharis* sp.	Cyperaceae	Herb
66	*Erytherina* sp.	Cruciferae	Herb
67	*Fagopyrum dibotrys*	Polygonaceae	Herb
68	*Galium aparine*	Rubiaceae	Herb
69	*Galium elegans var. punduanum*	Rubiaceae	Herb
70	*Geranium nepalensis*	Geraniaceae	Herb
71	*Geranium polyanthus*	Geraniaceae	Herb
72	*Girardinia diversifolia*	Urticaceae	Herb
73	*Halenia elliptica*	Gentianaceae	Herb
74	*Halenia* sp.	Gentianaceae	Herb
75	*Hedychium densiflorum*	Zingiberaceae	Herb
76	*Hedychium gardnerianum*	Zingiberaceae	Herb
77	*Houttuynia cordata*	Saururaceae	Herb
78	*Impatiens* sp.	Balsaminaceae	Herb
79	*Impatiens* sp. (pink)	Balsaminaceae	Herb
80	*Impatiens* sp. (white)	Balsaminaceae	Herb
81	*Impatiens* sp.(Yellow)	Balsaminaceae	Herb
82	*Impatiens urticifolia*	Balsaminaceae	Herb
83	*Kyllinga* sp.	Cyperaceae	Herb
84	*Lepidium* sp.	Cruciferae	Herb
85	*Leucas ciliata*	Labiatae	Herb
86	*Malva verticillata*	Malvaceae	Herb
87	*Monotropastrum humile*	Monotropaceae	Herb
88	*Nepeta lamiopsis*	Labiatae	Herb
89	*Nepeta* sp.	Labiatae	Herb
90	*Ophiopogon clarkei*	Convallariaceae	Herb
91	*Ophiopogon* sp.	Convallariaceae	Herb
92	*Parochetus communis*	Leguminosae	Herb
93	*Persicaria runcinata*	Polygonaceae	Herb
94	*Persicaria* sp. 1	Polygonaceae	Herb
95	*Persicaria* sp. 2	Polygonaceae	Herb

96	*Phytolacca acinosa*	Phytolaccaceae	Herb
97	*Potamogeton* sp.	Potamogetonaceae	Herb
98	*Potentilla* sp.	Rosaceae	Herb
99	*Pouzolzia hirta*	Urticaceae	Herb
100	*Sanicula elata*	Umbelliferae	Herb
101	*Schoenoplectus juncoides*	Cyperaceae	Herb
102	*Solanum nigrum*	Solanaceae	Herb
103	*Swertia* sp.	Gentianaceae	Herb
104	*Swertia* sp.1	Gentianaceae	Herb
105	*Thalictrum virgatum*	Ranunculaceae	Herb
106	*Morina longifolia*	Morinaceae	Herb with rhizome
107	*Morina polyphylla*	Morinaceae	Herb with rhizome
108	*Xanthium indicum*	Compositae	Monoecious annuals
109	*Agrotophylum* sp.	Orchidaceae	Orchid
110	*Anoectochilus* sp.	Orchidaceae	Orchid
111	*Bulbophylum cylindriasum*	Orchidaceae	Orchid
112	*Coelogyne* sp.	Orchidaceae	Orchid
113	*Dendrobium porphyrochilum*	Orchidaceae	Orchid
114	*Eria fructicosa*	Orchidaceae	Orchid
115	*Eria fruscence*	Orchidaceae	Orchid
116	*Goodyera schlechtendaliana*	Orchidaceae	Orchid
117	*Habenaria* sp.	Orchidaceae	Orchid
118	*Ione bicolor*	Orchidaceae	Orchid
119	*Ione cirrhata*	Orchidaceae	Orchid
120	*Oberonia falcata*	Orchidaceae	Orchid
121	*Otochilus* sp.	Orchidaceae	Orchid
122	*Pholidota* sp.	Orchidaceae	Orchid
123	*Pleione praecox*	Orchidaceae	Orchid
124	*Spiranthes sinensis*	Orchidaceae	Orchid
125	*Tipularia josephi*	Orchidaceae	Orchid
126	*Artemisia* sp.	Compositae	Perennial herb
127	*Cremanthodium* sp.	Compositae	Perennial herb
128	*Hemiphragma* sp.	Scrophulariaceae	Perennial herb
129	*Inula hookeri*	Compositae	Perennial herb
130	*Inula* sp.	Compositae	Perennial herb
131	*Ligularia* sp.	Compositae	Perennial herb
132	*Nicandra physalodes*	Solanaceae	Perennial herb
133	*Plantago depressa*	Plantaginaceae	Perennial herb
134	*Youngia* sp.	Compositae	Perennial herb
135	*Anaphalis* sp. 2	Compositae	Shrub
136	*Anaphalis* sp.1	Compositae	Shrub

137	*Berberis cristata*	Berberidaceae	shrub
138	*Cassia occidentalis*	Leguminosae	Shrub
139	*Cotoneaster* sp.	Rosaceae	Shrub
140	*Holmskioldia sanguinea*	Verbenaceae	Shrub
141	*Hypericum choisianum*	Hypericaceae	Shrub
142	*Indigofera dosua*	Leguminosae	Shrub
143	*Indigofera* sp.	Leguminosae	Shrub
144	*Mahonia nepaulensis*	Berberidaceae	Shrub
145	*Melastoma normale*	Melastomataceae	Shrub
146	*Neillia rubiflora*	Rosaceae	Shrub
147	*Osbeckia* sp.	Melastomataceae	Shrub
148	*Panax pseudoginseng*	Ranunculaceae	Shrub
149	*Phyllanthus parvifolius*	Euphorbiaceae	Shrub
150	*Piptanthus nepalensis*	Leguminosae	Shrub
151	*Ribes glaciale*	Grossulariaceae	Shrub
152	*Rubus paniculata*	Rosaceae	Shrub
153	*Rubus* sp. 1	Rosaceae	Shrub
154	*Rubus* sp. 2	Rosaceae	Shrub
155	*Skimmia laureola*	Rutaceae	Shrub
156	*Zanthoxylum* sp.	Rutaceae	Shrub
157	*Sambucus* sp.	Caprifoliaceae	Shrub or small tree
158	*Benthamidia capitata*	Cornaceae	Shrub/Tree
159	*Climatis* sp. 2	Clethraceae	Shrub/Tree
160	*Corylopsis himalayana*	Hamamelidaceae	Shrub/Tree
161	*Euonymus* sp.	Celastraceae	Shrub/Tree
162	*Leucosceptrum canum*	Labiatae	Shrub/Tree
163	*Ligustrum compactum*	Oleaceae	Shrub/Tree
164	*Osmanthus suavis*	Oleaceae	Shrub/Tree
165	*Saurauja* sp.	Actinidiaceae	Shrub/Tree
166	*Sorbus* sp.	Rosaceae	Shrub/Tree
167	*Buddleja davidii*	Buddlejaceae	Shurb
168	*Buddleja* sp.	Buddlejaceae	Small tree/shurb
169	*Sambucus adnata*	Caprifoliaceae	Srubby herb
170	*Boehmeria macrophylla*	Urticaceae	Subshrub
171	*Elatostema lineolatum*	Urticaceae	Subshrub
172	*Persicaria chinensis*	Polygonaceae	Subshrub
173	*Acer pectinatum*	Aceraceae	Tree
174	*Acer sterculiaceum*	Aceraceae	Tree
175	*Acer strachophylum*	Aceraceae	Tree
176	*Brassaiopsis hispida*	Araliaceae	Tree
177	*Celtis tetrandra*	Ulmaceae	Tree

178	*Debregeasia wallichiana*	Urticaceae	Tree
179	*Dodecadenia grandiflora*	Lauraceae	Tree
180	*Elaeocarpus lanceifolius*	Elaeocarpaceae	Tree
181	*Ficus narvosa*	Moraceae	Tree
182	*Ficus* sp.	Moraceae	Tree
183	*Fraxinus* sp.	Oleaceae	Tree
184	*Gamblea ciliata*	Araliaceae	Tree
185	*Gnaphalium* sp.	Verbenaceae	Tree
186	*Kydia glabrescens*	Malvaceae	Tree
187	*Lithocarpus elegans*	Fagaceae	Tree
188	*Parasassafras confertiflora*	Lauraceae	Tree
189	*Persea bootanica*	Lauraceae	Tree
190	*Persea clarkeana*	Lauraceae	Tree
191	*Randia* sp.	Bignoniaceae	Tree
192	*Rhus hookeri*	Anacardiaceae	Tree
193	*Schima wallichii*	Theaceae	Tree
194	*Sorbus thomsonii*	Rosaceae	Tree
195	*Symplocos dryophila*	Symplocaceae	Tree
196	*Symplocos lucida*	Symplocaceae	Tree
197	*Toona sureni*	Meliaceae	Tree
198	*Vitex quinata*	Verbenaceae	Tree
199	*Codonopsis purpurea*	Campanulaceae	Tuberous herb
200	*Clematis* sp. 1	Ranunculaceae	Woody climber
201	*Urtica parviflora*	Urticaceae	Woody Herb

Annexure IV.

A SUMMARY OF FLORAL DIVERSITY OF TANGSIBJI HYDROPOWER PROJECT

SL.No	Species Name	Family	Habitat
1	*Cynoglossum furcatum*	Boraginaceae	Annual herb
2	*Bidens pilosa*	Compositae	Annual herb
3	*Bidens* sp.	Compositae	Annual herb
4	*Crassocephalum crepidioides*	Compositae	Annual herb
5	*Galinsoga parviflora*	Compositae	Annual herb
6	*Galinsoga* sp.	Compositae	Annual herb
7	*Sigesbeckia orientalis*	Compositae	Annual herb
8	*Tricholepis furcata*	Compositae	Annual herb
9	*Mazus* sp.	Scrophulariaceae	Annual herb
10	*Bamboo* sp.	Graminae	Bamboo

11	*Borinda grossa*	Gramineae	Bamboo
12	*Dendrocalamus* sp.	Gramineae	Bamboo
13	*Bamboo* sp.	Gramineae	Bamboo
14	*Yushinia macophylla*	Gramineae	Bamboo
15	*Yushinia* sp.	Gramineae	Bamboo
16	*Cirsium falconeri*	Compositae	Biennial herb
17	*Cirsium sp.*	Compositae	Biennial herb
18	*Rhodobyrum giganteum*	Bryaceae	Bryophite
19	*Raphidophora* sp.	Araceaa	Climber
20	*Cucurbita moschata*	Cucurbitaceae	Climber
21	*Diplocyclos uspalmat*	Cucurbitaceae	Climber
22	*Thladiantha cordifolia*	Cucurbitaceae	Climber
23	*Trichosanthes lepiniana*	Cucurbitaceae	Climber
24	*Dioscorea floribunda*	Dioscoreaceae	Climber
25	*Dioscorea hispida*	Dioscoreaceae	Climber
26	*Dioscorea* sp.	Dioscoreaceae	Climber
27	*Unknown* sp.	Fabaceae	Climber
28	*Leguminosae* sp.	Leguminosae	Climber
29	*Ficus* sp.	Moraceae	Climber
30	*Jasminum* sp.	Oleaceae	Climber
31	*Clematis* sp.	Ranunculaceae	Climber
32	*Rubia cordifolia*	Rubiaceae	Climber
33	*Smilax ferox*	Smilacaceae	Climber
34	*Smilax* sp.	Smilacaceae	Climber
35	*Smilax* sp. 1	Smilacaceae	Climber
36	*Smilax* sp. 2	Smilacaceae	Climber
37	*Smilax* sp. 3	Smilacaceae	Climber
38	*Tetrastigma objectum*	Vitaceae	Climber
39	*Tetrastigma* sp.	Vitaceae	Climber
40	*Vitis heyneana*	Vitaceae	Climber
41	*Vites* sp.	Vitaceae	Climber
42	*Lonicera* sp.	Oleaceae	Climber
43	*Ipomoea* sp.	Convolvulaceae	Climbing Herb
44	*Hedera nepalensis*	Ariliaceae	Climbing Shrub
45	*Hedera* sp.	Ariliaceae	Climbing Shrub
46	*Combretum* sp.	Combretaceae	Climbing shrub
47	*Piper suipigua*	Piperaceae	Climbing shrub
48	*Cupressus corneyana*	Cupressaceae	Conifer Tree
49	*Pinus wallichiana*	Pinaceae	Conifer Tree
50	*Cryptomeria japonica*	Taxodiaceae	Conifer Tree
51	*Tsuga domosa*	Pinaceae	Conifer Tree

52	*Jasminium* sp.	Oleaceae	Creepering Herbaceous
53	*Hemiphragma heterophylla*	Scrophulariaceae	Creepering Herbaceous
54	*Trifolium pratense*	Leguminosae	Creeping Herb
55	*Diaplazium* sp.	Athyriaceae	Fern
56	*Diaplazium esculatum*	Athyriaceae	Fern
57	*Pteridium aquilinium*	Dennstaedtiaceae	Fern
58	*Dryopteris* sp.	Dryopteridaceae	Fern
59	*Polystichum nepalense*	Dryopteridaceae	Fern
60	*Equisetum* sp.	Equisetaceae	Fern
61	*Dicranopteris linearis*	Gleicheniaceae	Fern
62	*Lycopodium calvatum*	Lycopodiaceae	Fern
63	*Lycopodium* sp.	Lycopodiaceae	Fern
64	*Oleandra pistillaris*	Oleandraceae	Fern
65	*Nephrolepis cordifolia*	Olendraceae	Fern
66	*Plagiogyria* sp.	Plagiogyraceae	Fern
67	*Drynaria propinqua*	Polypodiaceae	Fern
68	*Pteris* sp.	Polypodiaceae	Fern
69	*Pyrrosia boothii*	Polypodiaceae	Fern
70	*Pyrrosia* sp.	Polypodiaceae	Fern
71	*Chelianthes* sp.	Pteridaceae	Fern
72	*Axonopus affinis*	Gramineae	Grass
73	*Bromus racemosus*	Gramineae	Grass
74	*Eulalia mollis*	Gramineae	Grass
75	*Oplismenus* sp.	Gramineae	Grass
76	*Thysanolaena* sp.	Gramineae	Grass
77	*Achyranthes bidentata*	Amaranthaceae	Herb
78	*Arisaema consanguineum*	Araceae	Herb
79	*Arisaema* sp.	Araceae	Herb
80	*Colocasia* sp.	Araceae	Herb
81	*Gnaphalium* sp.	Asteraceae	Herb
82	*Impatiens* sp.	Balsaminaceae	Herb
83	*Impatiens* sp. (pink)	Balsaminaceae	Herb
84	*Impatiens s*p. (white)	Balsaminaceae	Herb
85	*Impatiens* sp.(Yellow)	Balsaminaceae	Herb
86	*Impatiens urticifolia*	Balsaminaceae	Herb
87	*Begonia* sp.	Begoniaceae	Herb
88	*Cannabis sativa*	Cannabceae	Herb
89	*Sambucus* sp.	Caprifoliaceae	Herb
90	*Cerastium glomeratum*	Caryophyllaceae	Herb
91	*Commelina benghalensis*	Commelinaceae	Herb
92	*Commelina* sp.	Commelinaceae	Herb

93	*Cyanotis vaga*	Commelinaceae	Herb
94	*Ophiopogon clarkei*	Convallariaceae	Herb
95	*Ophiopogon* sp.	Convallariaceae	Herb
96	*Polygonatum* sp.	Convallariaceae	Herb
97	*Tupistra* sp.	Convallariaceae	Herb
98	*Sedum* sp.	Crassulaceae	Herb
99	*Lepidium* sp.	Cruciferae	Herb
100	*Cuscuta campestris*	Cuscutaceae	Herb
101	*Cuscuta* sp.	Cuscutaceae	Herb
102	*Cyperus* sp.	Cyperaceae	Herb
103	*Eleocharis* sp.	Cyperaceae	Herb
104	*Kyllinga* sp.	Cyperaceae	Herb
105	*Schoenoplectus juncoides*	Cyperaceae	Herb
106	*Drosera* sp.	Droseraceae	Herb
107	*Gentiana capitata*	Gentianaceae	Herb
108	*Gentiana* sp.	Gentianaceae	Herb
109	*Halenia elliptica*	Gentianaceae	Herb
110	*Halenia* sp.	Gentianaceae	Herb
111	*Swertia* sp.	Gentianaceae	Herb
112	*Swertia* sp.1	Gentianaceae	Herb
113	*Geranium nepalensis*	Geraniaceae	Herb
114	*Geranium polyanthus*	Geraniaceae	Herb
115	*Geranium* sp.	Geraniaceae	Herb
116	*Juncus* sp.	Juncaceae	Herb
117	*Clinopodium umbrosum*	Labiatae	Herb
118	*Leucas ciliata*	Labiatae	Herb
119	*Nepeta lamiopsis*	Labiatae	Herb
120	*Nepeta* sp.	Labiatae	Herb
121	*Phlomis* sp.	Labiatae	Herb
122	*Parochetus communis*	Leguminosae	Herb
123	*Abelmoschus crinitus*	Malvaceae	Herb
124	*Malva verticillata*	Malvaceae	Herb
125	*Monotropastrum humile*	Monotropaceae	Herb
126	*Oxalis* sp.	Oxalidaceae	Herb
127	*Phytolacca acinosa*	Phytolaccaceae	Herb
128	*Peperomia tetraphylla*	Piperaceae	Herb
129	*Fagopyrum dibotrys*	Polygonaceae	Herb
130	*Persicaria chinensis*	Polygonaceae	Herb
131	*Persicaria runcinata*	Polygonaceae	Herb
132	*Persicaria* sp. 1	Polygonaceae	Herb
133	*Persicaria* sp. 2	Polygonaceae	Herb

134	*Fagopyrum* sp.	Polygonaceae	Herb
135	*Persicaria* sp.	Polygonaceae	Herb
136	*Potamogeton* sp.	Potamogetonaceae	Herb
137	*Primula denticulata*	Primulaceae	Herb
138	*Primula* sp.	Primulaceae	Herb
139	*Delphinium cooperi*	Ranunculaceae	Herb
140	*Thalictrum* sp.	Ranunculaceae	Herb
141	*Thalictrum virgatum*	Ranunculaceae	Herb
142	*Fragaria nubicola*	Rosaceae	Herb
143	*Potentilla* sp.	Rosaceae	Herb
144	*Galium aparine*	Rubiaceae	Herb
145	*Galium elegans var. punduanum*	Rubiaceae	Herb
146	*Houttuynia cordata*	Saururaceae	Herb
147	*Chrysosplenium* sp.	Saxifragaceae	Herb
148	*Verbascum thapsus*	Scrophulariaceae	Herb
149	*Solanum nigrum*	Solanaceae	Herb
150	*Solanum viarum*	Solanaceae	Herb
151	*Centella asiatica*	Umbelliferae	Herb
152	*Sanicula elata*	Umbelliferae	Herb
153	*Elatostema lineolatum*	Urticaceae	Herb
154	*Elatostema* sp. 1	Urticaceae	Herb
155	*Elatostema* sp. 2	Urticaceae	Herb
156	*Girardinia diversifolia*	Urticaceae	Herb
157	*Pouzolzia hirta*	Urticaceae	Herb
158	*Urtica* sp.	Urticaceae	Herb
159	*Clintonia udensis*	Uvulariaceae	Herb
160	*Coelogyne* sp.	Uvulariaceae	Herb
161	*Viola* sp.	Violaceae	Herb
162	*Cautleya spicata*	Zinginberaceae	Herb
163	*Hedychium gardnerianum*	Zinginberaceae	Herb
164	*Carex sp.*	Zinginberaceae	Herb
165	*Cautleya gracilis*	Zinginberaceae	Herb
166	*Hedychium densiflorum*	Zinginberaceae	Herb
167	*Hedychium* sp.	Zinginberaceae	Herb
168	*Hedychium spicatum*	Zinginberaceae	Herb
169	*Agrotophylum* sp.	Compositae	Herb or subshrub
170	*Panax pseudoginseng*	Araliaceae	Herb with rhizome
171	*Morina longifolia*	Morinaceae	Herb with rhizome
172	*Morina polyphylla*	Morinaceae	Herb with rhizome
173	*Xanthium indicum*	Compositae	Monoecious annuals
174	*Gesneria* sp.	Gesneriaceae	Orchid

175	*Agrostophyllum callusom*	Orchidaceae	Orchid
176	*Anoectochilus* sp.	Orchidaceae	Orchid
177	*Anthogonium gracile*	Orchidaceae	Orchid
178	*Bulbophyllum guttlatum*	Orchidaceae	Orchid
179	*Bulbophyllum reptans*	Orchidaceae	Orchid
180	*Bulbophyllum* sp.	Orchidaceae	Orchid
181	*Bulbophylum cylindriasum*	Orchidaceae	Orchid
182	*Ceologyne nitida*	Orchidaceae	Orchid
183	*Cymbidium* sp.	Orchidaceae	Orchid
184	*Dendrobium falconari*	Orchidaceae	Orchid
185	*Dendrobium fimbriatum*	Orchidaceae	Orchid
186	*Dendrobium hookerianum*	Orchidaceae	Orchid
187	*Dendrobium longicornu*	Orchidaceae	Orchid
188	*Dendrobium porphyrochilum*	Orchidaceae	Orchid
189	*Dendrobium* sp.	Orchidaceae	Orchid
190	*Epigenium fusuces*	Orchidaceae	Orchid
191	*Epigenium* sp.	Orchidaceae	Orchid
192	*Eria conorinaria*	Orchidaceae	Orchid
193	*Eria fructicosa*	Orchidaceae	Orchid
194	*Eria fruscence*	Orchidaceae	Orchid
195	*Eria* sp.	Orchidaceae	Orchid
196	*Eria spicata*	Orchidaceae	Orchid
197	*Goodyera* sp.	Orchidaceae	Orchid
198	*Goodyra eschathia*	Orchidaceae	Orchid
199	*Habenaria* sp.	Orchidaceae	Orchid
200	*Oberonia* sp.	Orchidaceae	Orchid
201	*Otochilus lancilabius*	Orchidaceae	Orchid
202	*Otochilus* sp.	Orchidaceae	Orchid
203	*Phalaenopsis taenialis*	Orchidaceae	Orchid
204	*Pholidota* sp.	Orchidaceae	Orchid
205	*Pleione humulis*	Orchidaceae	Orchid
206	*Pleione praecox*	Orchidaceae	Orchid
207	*Spiranthes sinensis*	Orchidaceae	Orchid
208	*Sunipia* sp.	Orchidaceae	Orchid
209	*Tipularia josephi*	Orchidaceae	Orchid
210	*Vandopsis undulata*	Orchidaceae	Orchid
211	*Dendrophthoe falcata*	Lorathaceae	Parasites
212	*Scurrula elata*	Lorathaceae	Parasites
213	*Ainsliaea aptera*	Compositae	Perennial herb
214	*Anaphalis margaritaceae*	Compositae	Perennial herb
215	*Anaphalis* sp.	Compositae	Perennial herb

216	*Anaphalis* sp. 2	Compositae	Perennial herb
217	*Anaphalis* sp.1	Compositae	Perennial herb
218	*Cremanthodium* sp.	Compositae	Perennial herb
219	*Inula hookeri*	Compositae	Perennial herb
220	*Inula* sp.	Compositae	Perennial herb
221	*Ligularia* sp.	Compositae	Perennial herb
222	*Senecio* sp.	Compositae	Perennial herb
223	*Youngia* sp.	Compositae	Perennial herb
224	*Plantago depressa*	Plantaginaceae	Perennial herb
225	*Plantago erosa*	Plantaginaceae	Perennial herb
226	*Hemiphragma* sp.	Scrophulariaceae	Perennial herb
227	*Nicandra physalodes*	Solanaceae	Perennial herb
228	*Schelfflera* sp.	Araliaceae	Shrub
229	*Mahonia nepaulensis*	Berberidaceae	Shrub
230	*Berberis angulosa*	Berberidaceae	Shrub
231	*Berberis asiatica*	Berberidaceae	Shrub
232	*Berberis cristata*	Berberidaceae	Shrub
233	*Berberis* sp.	Berberidaceae	Shrub
234	*Sarcococca hookeriana*	Buxaceae	Shrub
235	*Leycesteria formosa*	Caprifoliaceae	Shrub
236	*Viburnum erubescens*	Caprifoliaceae	Shrub
237	*Viburnum cylindricum*	Caprifoliaceae	Shrub
238	*Elaeagnaceae parvifolia*	Elaeagnaceae	Shrub
239	*Elaganeanus* sp.	Elaeagnaceae	Shrub
240	*Agapetes incurvata*	Ericaceae	Shrub
241	*Agapetes serpens*	Ericaceae	Shrub
242	*Vaccinium nummularia*	Ericaceae	Shrub
243	*Vaccinium retusa*	Ericaceae	Shrub
244	*Vaccinium* sp.	Ericaceae	Shrub
245	*Phyllanthus parvifolius*	Euphorbiaceae	Shrub
246	*Aeschynanthus sikkimensis*	Gesneriaceae	Shrub
247	*Aeschynanthus* sp.	Gesneriaceae	Shrub
248	*Ribes glaciale*	Grossulariaceae	Shrub
249	*Ribes* sp.	Grossulariaceae	Shrub
250	*Hypericum choisianum*	Hypericaceae	Shrub
251	*Hypericum* sp.	Hypericaceae	Shrub
252	*Elsholtzia* sp.	Labiatae	Shrub
253	*Holboellia latifolia*	Lardizabalaceae	Shrub
254	*Indofera dosubia*	Leguminosae	Shrub
255	*Cassia occidentalis*	Leguminosae	Shrub
256	*Indigofera dosua*	Leguminosae	Shrub

257	*Indigofera* sp.	Leguminosae	Shrub
258	*Piptanthus nepalensis*	Leguminosae	Shrub
259	*Viscium album*	Lorathaceae	Shrub
260	*Viscium* sp.	Lorathaceae	Shrub
261	*Desmodium elagans*	Leguminosae	Shrub
262	*Desmodium* sp.	Leguminosae	Shrub
263	*Melastoma normale*	Melastomataceae	Shrub
264	*Osbeckia* sp.	Melastomataceae	Shrub
265	*Ardisia macrophylla*	Myrsinaceae	Shrub
266	*Maesa chisia*	Myrsinaceae	Shrub
267	*Lingustrum* sp.	Oleaceae	Shrub
268	*Piper* sp .	Piperaceae	Shrub
269	*Cotoneaster* sp.	Rosaceae	Shrub
270	*Crotoneaster microphyllus*	Rosaceae	Shrub
271	*Neillia rubiflora*	Rosaceae	Shrub
272	*Rubus biflorus*	Rosaceae	Shrub
273	*Rubus ellepticus*	Rosaceae	Shrub
274	*Rubus* sp.	Rosaceae	Shrub
275	*Rubus* sp. 1	Rosaceae	Shrub
276	*Rubus* sp. 2	Rosaceae	Shrub
277	*Prinsepia utilis*	Rosaceae	Shrub
278	*Rosa bruononii*	Rosaceae	Shrub
279	*Rosa macrophylla*	Rosaceae	Shrub
280	*Wedlandia* sp.	Rubiaceae	Shrub
281	*Wendlandia coriaceae*	Rubiaceae	Shrub
282	*Toddalia asiatica*	Rutaceae	Shrub
283	*Smilax myrtillus*	Smilacaceae	Shrub
284	*Daphne bholua*	Thymelaeaceae	Shrub
285	*Edgeworthia gardeneri*	Thymelaeaceae	Shrub
286	*Debregeasia longifolia*	Urticaceae	Shrub
287	*Holmskioldia sanguinea*	Verbenaceae	Shrub
288	*Rhododendron dalhousiae*	Ericaceae	Shrub/Ephytic
289	*Rhododendron lindleyi*	Ericaceae	Shrub/Ephytic
290	*Buddleja davidii*	Buddlejaceae	Shurb
291	*Sambucus adnata*	Caprifoliaceae	Srubby herb
292	*Strobilanthes* sp.	Acanthaceae	Subshrub
293	*Artemisia* sp.	Commelinaceae	Subshrub
294	*Artemisia vulgaris*	Commelinaceae	Subshrub
295	*Ageratina adenophora*	Compositae	Subshrub
296	*Gaultheria fragrantissima*	Ericaceae	Subshrub
297	*Gaultheria semi-infera*	Ericaceae	Subshrub

298	*Gaultheria tricophylla*	Ericaceae	Subshrub
299	*Elsholtzia fruticosa*	Labiatae	Subshrub
300	*Elsholtzia strobifera*	Labiatae	Subshrub
301	*Aconogonon molle*	Polygonaceae	Subshrub
302	*Aconogonon* sp.	Polygonaceae	Subshrub
303	*Boehmeria macrophylla*	Urticaceae	Subshrub
304	*Bohemeria* sp.	Urticaceae	Subshrub
305	*Acer campbellii*	Aceraceae	Tree
306	*Acer oblongum*	Aceraceae	Tree
307	*Acer pectinatum*	Aceraceae	Tree
308	*Acer sterculiaceum*	Aceraceae	Tree
309	*Acer strachophylum*	Aceraceae	Tree
310	*Saurauja nepaulensis*	Actinidiaceae	Tree
311	*Saurauja* sp.	Actinidiaceae	Tree
312	*Rhus hookeri*	Anacardiaceae	Tree
313	*Rhus succedanea*	Anacardiaceae	Tree
314	*Ilex dipyrena*	Aquifoliaceae	Tree
315	*Brassaiopsis hispida*	Araliaceae	Tree
316	*Brassaiopsis mitis*	Araliaceae	Tree
317	*Gamblea ciliata*	Araliaceae	Tree
318	*Alnus nepalensis*	Betulaceae	Tree
319	*Carpinus viminea*	Betulaceae	Tree
320	*Betula alnoides*	Betulaceae	Tree
321	*Elaeocarpus lanceifolius*	Elaeocarpaceae	Tree
322	*Lyonia ovalifolia*	Ericaceae	Tree
323	*Rhododendron grande*	Ericaceae	Tree
324	*Macarange* sp.	Euphorbiaceae	Tree
325	*Lithocarpus elegans*	Fagaceae	Tree
326	*Lithocarpus* sp.	Fagaceae	Tree
327	*Quercus griffithii*	Fagaceae	Tree
328	*Quercus lamellosa*	Fagaceae	Tree
329	*Quercus lanata*	Fagaceae	Tree
330	*Qurcus glauca*	Fagaceae	Tree
331	*Qurcus oxyodron*	Fagaceae	Tree
332	*Castanopsis hystrix*	Fagaceae	Tree
333	*Castonopsis tribuloides*	Fagaceae	Tree
334	*Exbucklandia populnea*	Hamamelidaceae	Tree
335	*Engelherdia spicata*	Julandaceae	Tree
336	*Juglans regia*	Julandaceae	Tree
337	*Dodecadenia grandiflora*	Lauraceae	Tree
338	*Lindera* sp.	Lauraceae	Tree

339	*Parasassafras confertiflora*	Lauraceae	Tree
340	*Persea bootanica*	Lauraceae	Tree
341	*Persea clarkeana*	Lauraceae	Tree
342	*Persea duthiei*	Lauraceae	Tree
343	*Erytherina arboresence*	Leguminosae	Tree
344	*Erytherina* sp.	Leguminosae	Tree
345	*Albizia* sp.	Leguminosae	Tree
346	*Magonila campbellii*	Magnoliaceae	Tree
347	*Michelia champaca*	Magnoliaceae	Tree
348	*Michelia doltsopa*	Magnoliaceae	Tree
349	*Kydia glabrescens*	Malvaceae	Tree
350	*Toona sureni*	Meliaceae	Tree
351	*Ficus narvosa*	Moraceae	Tree
352	*Fraxinus* sp.	Oleaceae	Tree
353	*Sorbus griffithii*	Rosaceae	Tree
354	*Sorbus* sp.	Rosaceae	Tree
355	*Sorbus thomsonii*	Rosaceae	Tree
356	*Docynia indica*	Rosaceae	Tree
357	*Prunus cerasoides*	Rosaceae	Tree
358	*Skimmia laureola*	Rutaceae	Tree
359	*Zanthoxylum* sp.	Rutaceae	Tree
360	*Salix* sp.	Salicaceae	Tree
361	*Eurya acuminata*	Theaceae	Tree
362	*Eurya serreta*	Theaceae	Tree
363	*Schima wallichii*	Theaceae	Tree
364	*Celtis* sp.	Ulmaceae	Tree
365	*Celtis tetrandra*	Ulmaceae	Tree
366	*Debregeasia wallichiana*	Urticaceae	Tree
367	*Vitex quinata*	Verbenaceae	Tree
368	*Rhus chinensis*	Anacardiaceae	Tree/shrub
369	*Euonymus* sp.	Celastraceae	Tree/shrub
370	*Corylopsis himalayana*	Hamamelidaceae	Tree/shrub
371	*Leucosceptrum canum*	Labiatae	Tree/shrub
372	*Ficus* sp.	Moraceae	Tree/shrub
373	*Morus* sp.	Moraceae	Tree/shrub
374	*Ligustrum compactum*	Oleaceae	Tree/shrub
375	*Ligustrum confusum*	Oleaceae	Tree/shrub
376	*Osmanthus suavis*	Oleaceae	Tree/shrub
377	*Zanthoxylum nepalensis*	Rutaceae	Tree/shrub
378	*Zanthoxylum* sp.	Rutaceae	Tree/shrub
379	*Buddleja* sp.	Araliaceae	Tree/shrub

380	*Benthamidia capitata*	Cornaceae	Tree/shrub
381	*Toricellia tillifolia*	Cornaceae	Tree/shrub
382	*Daphnephyllum himalense*	Daphnephyllaceae	Tree/shrub
383	*Rhododendron arboreum*	Ericaceae	Tree/shrub
384	*Rhododendron falconeri*	Ericaceae	Tree/shrub
385	*Rhododendron griffithianum*	Ericaceae	Tree/shrub
386	*Rhododendron hodgsonii*	Ericaceae	Tree/shrub
387	*Rhododendron kesangiae*	Ericaceae	Tree/shrub
388	*Rhodoendron edgeworthii*	Ericaceae	Tree/Shrub
389	*Myrsine semiserrata*	Myrsinaceae	Tree/shrub
390	*Randia* sp.	Rubiaceae	Tree/shrub
391	*Symplocos dryophila*	Symplocaceae	Tree/Shrub
392	*Symplocos glomerata*	Symplocaceae	Tree/Shrub
393	*Symplocos lucida*	Symplocaceae	Tree/Shrub
394	*Symplocos ramosissima*	Symplocaceae	Tree/Shrub
395	*Symplocos sumuntia*	Symplocaceae	Tree/Shrub
396	*Codonopsis purpurea*	Campanulaceae	Tuberous herb
397	*Aristolochia griffithii*	Aristolochiaceae	Woody climber
398	*Stephania elegans*	Menispermaceae	Woody climber
399	*Clematis* sp. 1	Ranunculaceae	Woody climber
400	*Climatis* sp. 2	Ranunculaceae	Woody climber
401	*Rubus paniculata*	Rosaceae	Woody climber
402	*Urtica parviflora*	Urticaceae	Woody Herb

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Monitoring Data for Summer Season

Physical Environment Sampling Baseline Data

Nikachhu		
Location	**Up Stream of Dam**	**Down Stream of Dam**
Date	**15/07/2015**	**15/07/2015**
Longitude		
Latitude		
pH	8.68	8.44
TDS mg/L	9.80	11.82
Conductivity µs/cm	86.60	88.90
Chlorine	BDL	BDL
Turbidity TU	7.50	10.50
Arsenic	BDL	BDL
Water Temp (°C)	14.70	
Noise Day dB	57.85	65.73
Noise Night dB	30.96	34.76

Air Sampling Baseline Data

Nikachhu		
Location		**Tashiling**
Date		**15-16/07/2015**
Weather		Partially Sunny
Air Temp (°C)		21.00
RSPM (µgm/m³)	24 HRs Average	37.83
SPM (µgm/m³)		32.43
TSPM (µgm/m³)		70.13
Longitude		
Latitude		

Note*

1. RSPM: Respirable Suspended Particulate Matter (> PM 10);
2. SPM: Suspended Particulate Matter (< PM 10);
3. TSPM: Total Suspended Particulate Matter (TSPM=RSPM+SPM)

ENVIRONMENTAL STANDARDS

National Environment Commission
Royal Government of Bhutan
November 2010

Environmental Standards

National Environment Commission
Royal Government of Bhutan
November 2010

Table of Contents

1) Ambient Water Quality Criteria for various uses (September 2010)

Sl#	Parameters	A	B	C
1	PH	6.5 – 8.5	6 – 9	6 – 9
2	Colour, Hz units	5	50	-
3	TSS mg/l	25	100	-
4	Conductivity, µS/cm	800	1000	2000
5	Odour	Unobjectionable	Unobjectionable	-
6	Mineral oil	No film	No film	-
7	Nitrate, mg/l	10	50	
8	Fluoride, mg/l	1.0	2.0	-
9	Sulphates, mg/l	25	100	-
10	Chloride, mg/l	50	200	-
11	Surfactants, mg/l	0.1	0.2	-
12	Phosphates, mg/l	0.5	<1.0	-
13	DO, mg/l	6	4	-
14	BOD, mg/l	2	5	50
15	TKN, mg/l	0.5	2	
16	Ammonia, mg/l	0.05	0.5	
17	T.coliform, MPN/100 ml*	50	5000	10000
18	F. coliform, MPN/100 ml*	20	2000	5000
19	F.streptococci,MPN/100 ml*	20	1000	1000
20	Dissolved iron, mg/l	0.2	0.5	-
21	Copper, mg/l	0.05	0.1	-

22	Zinc, mg/l	0.2	0.5	
23	Arsenic, mg/l	0.01	0.05	-
24	Cadmium, mg/l	0 .003	0.003	-
25	Total-Chromium , mg/l	0.05	0.05	-
26	Lead, mg/l	0.02	0.02	-
27	Selenium, mg/l	0.01	0.01	-
28	Mercury, mg/l	0.0005	0.0005	-
29	Phenols, mg/l	0.001	0.002	-
30	Cyanides	0.05	0.05	-
31	PAH, mg/l	0.0002	0.0002	0.001
32	Total Pesticides, mg/l	0.0005	0.0005	0.001
33	PCB mg/L	0.0002	0.0002	-
34	SAR	-	-	26
35	Boron	-	-	1
36	Floating Materials such as wood, plastic, rubber, excreta, garbage etc	Absent	Absent	-

NOTE:

A: (Very good)
Drinking water source without conventional treatment, but after disinfection whenever necessary.

B: (Good)
Drinking water source with conventional treatment.

C: (Moderate)
Uses for irrigation, industrial cooling etc.
**To achieve the drinking quality standard, disinfection/ boiling of the water is recommended. The total coliform may be high due to their*

contribution from natural sources like soil, litter etc. which does not relate to pathogen. If MPN of total coliform is noticed to be more than the limit suggested, then regular tests should be carried out. The criteria would be satisfied if during a period not more than 5% samples show greater than prescribed limit.

Aronyms:

SAR:	Sodium Absorbtion Ratio;
PAH:	Poly Aromatic Hydrocarbon;
MPN:	Most Probable Number;
PCB:	Poly Chlorinated Biphenyle;
BOD:	Biochemical Oxygen Demand;
DO:	Dissolved Oxygen

2) Industrial Effluent Discharge Standards (September 2010)

Sl #	Parameters (maximum permissible)/unit	GENERIC	Specific Standards (Industries)				
			Food	Mini-ng	Metals Ind. (Electric Arc Furnane)	Chemicals (Textile and Carpet)	Wo-od
1	Ammoniacal nitrogen (NH_3-N)	**10**	10			8	8
2	Arsenic (As)	**0.1**		0.1	0.1		
3	Biochemical Oxygen Demand (BOD_5)	**30.0**	30	30	30	30	100
4	Boron (B)	**1.0**					
5	Cadmium total (Cd)	**0.05**					
6	Chemical Oxygen Demand	**150**	150				200
7	Chloride (Cl)	**500**					
8	Chromium total (Cr)	**0.5**					
9	Chromium Hexavalent(Cr^{+6})	**0.1**					
10	Colour and Odour	*					
11	Copper total (Cu)	**0.1**		0.5	0.5		
12	Cyanide (CN)	**0.1**					
13	Fluoride (F)	**2.0**					
14	Phosphate(PO4)	**3.0**					
15	Nitrate(NO3)	**10.0**					
16	Iron total	**2.0**					
17	Lead total (Pb)	**0.1**		0.1	0.1		

18	Manganese (Mn)	**0.5**					
19	Mercury (Hg)	**0.001**		0.001	0.001		
20	Nickel (Ni)	**0.1**		0.5	0.5		
21	Oil and grease	**5.0**					
22	pH	**6.5 - 8.5**					
23	Phenolic compounds (as C6H5OH)	**0.5**				0.5	0.5
24	Selenium (Se)	**0.05**					
25	Sulphate (SO_4)	**500**					
26	Sulphide (S)	**1.0**				0.2	
27	Total Dissolved Solids (TDS)	**1500**					
28	Total Suspended Solids (TSS)	**80**	80	50.0	50.0		
29	Temperature, degree C	**<3** **					
30	Total Kjeldahl Nitrogen (N)	**20**					
31	Total residual chlorine	**0.5**					
32	Zinc total (Zn)	**3.0**		2.0	2.0		

NOTE:

The generic standard will apply unless otherwise stated.
All units in mg/L unless otherwise stated

* For color and odor, it is recommended that, as far as practicable, color and unpleasant odor should be absent in the samples.
** Temperature of the receiving water bodies shall not exceed 3 degree Celsius from the ambient in any section of the streams within 15 m downstream from the point of effluent discharge.

3) Standard for final effluent from Sewerage Treatment Plant (STP)

Sl #	Parameters (Max Permissible Limit)	Concentration not to exceed
1	BOD(mg/L)	30
2	TSS(mg/L)	100
3	Fecal Coliform(MPN/100 ML)	1000

4) Ambient Air Quality Standards (Maximum Permissible Limits in $\mu g/m^3$

Parameter	Industrial Area	Mixed Area*	Sensitive Area**
Total Supended Particulate matter			
24 Hour Average	500	200	100
Yearly Average	360	140	70
Respirable Particulate Matter (PM 10)			
24 Hour Average	200	100	75
Yearly Average	120	60	50
Sulfur Dioxide			
24 hour Average	120	80	30
Yearly Average	80	60	15
Nitrogen Oxides			
24 hour Average	120	80	30
Yearly Average	80	60	15
Carbon Monoxide			
8 Hour Average	5,000	2,000	1,000
1 Hour Average	10,000	4,000	2,000

***Mixed Area** means area where residential, commercial or both activities take place

****Sensitive Area** means area where sensitive targets are in place like hospitals, Schools, sensitive ecosystems.

5) Industrial Emissions: Maximum limits for Pollutants (mg/Nm3)

	Maximum Limits for Pollutants (mg/Nm^3)			
Industrial Type by Technology	**SPM**	**SO2**	**NOx**	**CO**
Lime Kilns	150	100	100	50
Arc furnace, Induction Furnace	150	100	100	50
Tapping Fune Stack	150	-	-	-
Coal fired, Oil fired and Wood fired Boiler	150	100	100	50
Horizontal/Rotary Kiln, Vertical Shaft Kiln and other Kiln	150	100	100	50
Other Technologies: for sectors that are not covered in the above sections	150	100	100	50

6) Workplace Emissions for 8 hour average

Parameter	Standard
Total Suspended particulate	10mg/m3
Respirable Particulate Matter	5mg/m3
Sulfur Dioxides	1mg/m3
Nitrogen Oxides	1mg/m3
Carbon Monoxide	5mg/m3

7) Vehicle Emission Standards

Fuel Type	Vehicles registered prior to 1 Jan 2005	Vehicles registered after 1 Jan 2005	Type Approval
Petrol (%CO)	4.5	4	Euro II
Diesel (% HSU)	75	70	

Note: Two strokes Engine banned from Import

8) Noise Level Limits

Industrial Area		Mixed Area		Sensitive Area	
Day*	Night*	Day	Night	Day	Night
75dB(A)	65dB(A)	65dB(A)	55dB(A)	55dB(A)	45dB(A)

Note: All the values are maximum values

* *Day time is from 0600 hours to 2200 hours (human activities)*

** *Night time is from 2200 hours to 0600 hours (no human activities)*

Maximum value allowed in workplace in any point of time is 75dB(A)

Save water, it does not grow on trees!

Keep Bhutan beautiful
Reduce waste

Protect air quality
Reduce air pollution

Protect our natural resouces

Say 'NO' to ozone depleting substances

There is no planet 'B'

For further information please contact

National Environment Commission
P.O. Box : 466
Thimphu : Bhutan
Tel: 323384/326386/324323/326993,
Fax No. 323385
Website: www.nec.gov.bt

དཔལ་ལྡན་འབྲུག་གཞུང་།
རྒེད་འོག་བདག་སྐྱོང་ཡོག་ཚང་ སྐང་མི་སྦྱིས་རྒེད་འོག
ཚོས་རྩེས་ གློང་གསར།
Gewog Administration Office
Tangsibji Gewog, Trongsa.

ཨི་ཙེ་ཀྱི/བཤ་གསྒོང་(ཏྲ་ཁུ་ཁུ)/2024-2026/1ཀ2ཁ4 ཟླ་ཚེས་07/10/2024

ཟ ཁཨིའི་སྒོང་ཁ་གི་དཔོན་མཆོག་ལུ།

ནྲི་ག་ཚུ་ཐྲོག་མེ་ལས་འགྲུལ་ ཟུང་ས་སྦྱི།

ཀཤད་དོན: **ལ་ཆའི་ཇོ་ལེ་ཡིག་ཁུ།**

ཁྱེས་པས་ཀྱོལ་ལ་འདེབ་ཞྱོལ་ དེ་ནི་ དཔེས་བང་ཁ་ཀོག་བཤད་གསྒོང་ཡིག་ཚང་དུ་ ཚང་ཁ་ལྷི་ཀོག་ནང་ལས་ ཁོང་ཟུར་སྦྲག་པ་ཀོད་ པའི་མི་ངོ་མ་ཚུ་ཀྱིས་ ལ་ཆ་ནྲི་ག་ཚུ་ཐྲོག་མེ་ལས་འགྲུལ་ནང་ལུ་ཚུད་འདི་ཡོད་མི་ཚུ་ཀྱིས་ ལ་ཆ་ཚུ་གཅར་ལྷོ་ཡིག་ཁའི་ངོ་མ་ཚུ་ལས་ ཡིག་ཆ་ཁྱེད་ནང་ལུ་ལྷོད་ནི་ལུ་ཞུ་ཡི་ཨིན་པའི་ངོ་ཁྱེད་ཀྱི་ཡིག་ཁའི་ལེ་ཡིག་ཀུ་ཟུལ་ བ་འདི་ཟུར་སྦྲག་ལུ་སྤྲོད་གཐུག་ཞུ་ཏེ་མཐུན་མེ་འགལ་ཞུ། ཞེས་ཟུང་ས་སྦྱི་ཆ་པོ་ནས་ཕྱལ།

ཁཏ;

1. རྩེ་གལ་ཅོ་ཏང་མཆོག་ལུ་སྤྲུན་སྦྲེག་འབུལ་བ།
2. ཅོ་ཏང་ཁ་ལ་ཁྲམ་ཁ་གི་དཔོན་མཆོག་ལུ།
3. ཚང་ཁ་ལྷི་ཀོག་ཚོགས་པ་ལུ།
4. ལ་ཆའི་ཇོ་བཤད་ཁུ།
5. ཡིག་ཚང་ཁཏ།

Telephone#03-527002/03-527029. Fax# 03-527003

ཚེས་ 07-10-2024

ཞི་ ཆེད་ལེགས་ཆོལ་མཛོད་ལུ།

ཕྱང་ལི་སྒྲིལ་ཆེད་ལེགས་བཤད་གསྒོང་ཡིག་ཚང་།

ཕྱང་ལི་སྒྲིལ་ ཀྲོང་གསལ།

གཞན་དོན: **ཨ་ཀྱི་བླ་ངུལ་ལྷོད་ནང་ལྷོད་རྒྱུའི་ཞིག་སྐོར།**

གྲས་ ཕྱང་ལི་སྒྲིལ་ཆེད་ལེགས་ ཚང་ཁ་གཡུས་ཚན་ལང་ཏོ་ཝང་ཀུན་ལེགས་བཅང་མོ་ དོ་ལྷོད་ཤས་ཆེའོ་ཝང་ 11705040032101 གྲངས་ ཐ-9 ཡ་ཐུམ་ཝང་ 2024 ཟླ་མ་ཚེས་ 07 ཉིན་ཏེ་ཀྱི་ ད་རེས་ཆོལ་མཛོད་ལུ་སྒྲུབས་མ་དཀྲོལ་བཅས་མེད་ཤེ། དེ་ཝང་ ལས་ཀི་ཝང་སྐེབ་སྒྲིལ་ ཡངཏྲི་ 0.36 བཅད་མི་ཀའི་ ད་རེས་ཀྱི་ཁ་ཆུ་བྲོག་མེ་ཁམས་ཀུན་ལང་ཚུ་ ལ་ལྷོད་ 4 པའི་ ཏེཀ་ཚུ་ཁམ་ཁབས་ཁའི་སྐྱང་ལ་ཆ་དྲིལ་ 0.36 ཆུད་ཚོད་མི་ཀའི་ ལ་ཆ་བླ་ངུལ་ལྷོད་ནང་ཚུ་བཏང་ནི་ཀཅད་ཡིན་པའི་དོན་ཆུལ་ བདེན་ཀཆོར་གཙང་ཡིག་ཀཆུལ་ཁ་ཤས་ཀྱང་ཡོད་ཚར་ལས་ཤི།

ཁེལ་གཏམ་ཡོད་ཤིང་མོལ་ཞུག་ལུ་ ཟླ་ 2 པའི་ ཚེས་ 19 ལུ་ཕྱག་བཏང་མོ།

ཕྱག

(ཀུན་ཚགས་བཅང་མོ།)

Ugyen
Ishangkha Chewog
Tangsibi Geog

ཚེས་07-10-2024

ཇོ་རྡོ་ཀོག་ཆུ་པོ་མཆོག་ལྟུ།

ལྗང་ལི་སྒྲི་རྡེ་ཀོག་བདག་སྒྲོང་ཡིག་ཚང་།

ལྗང་ལི་སྒྲི། ཁྱོང་གསར།

གཏན་དོན: **ལས་གྲུབ་བྱེད་གནང་གྲོས་སྐྱོར།**

གྲལ་ ལྗང་ལི་སྒྲི་རྡེ་ཀོག་ ཚང་ཁ་གཡུས་ཚན་ལས་ངོ་མིང་དཔལ་སྒྲོན་ དང་གྲོང་གསལ་ཁྲེར་ཨང་ ११७०५००२७९२ གིར་ཨང་ ९-५-१९९ ལ་བཟུམ་ཨང་ ২৩৬ ཞེན་མ་ཤེས་ ཁྲོལ་རེ་ཤི་ དཔེས་རྡོ་པོ་མཆོག་ལྟུ་ཐུགས་མ་དཀྱོགས་ཐབས་མེད་ཀྱི། དེ་ཨང་ ལས་མིང་སྒེའ་སྒྲི་ ཡིདྲེས་ ०.৩৫ ཁབད་མི་ཁའི་ དཔེས་ཀྱི་ཀ་ཆུ་བྱོག་མ་ལས་ཁ་ཤུལ་ནང་ལྟུ་ ལ་དྲེད་པ་ཡི་ ཇོ་ཤེ་ལྟུ་ཁམ་ཐབས་ཁ་ཁྱི་སྒང་ས་ཆ་དྲིས་ ०.৩৫ ཚུད་ཨོད་མི་ཁའི་ ལ་ཆ་བྱས་སྒྲོར་ནང་ལྟུ་ཐ་ཁད་ཡིན་ཁ་ཤེ་ཁ་ཆྱོར་ལ་ ཐད་ཤེ་ཁ་ཆྱོར་ཁ་ནང་ཡིག་ཚང་ཁ་མཆུན་ཤེ་ཁ་ཁག། ཁེས་ཁ་ནས་མ་ཁྱོ་ཀྱིད་མོ་ལྟུ་ཁ་ལྟུ་ ཟླ་ བཡི ཚོས་ ཀྱེལྟུ་ཚུ་ཁ་ཐཅས་

Tshangkha Chewog
Tangsibi Geog

སྐུལ།

(དཔལ་སྒྲོན)

སྤྱི་ཚེས་༠༡-༡༠-༢༠༡༥

ཨུ་ རྒེད་འོག་རྒཔོ་མཆོག་ལུ།

ཏང་སི་སྦྱི་རྒེད་འོག་བདག་སྐྱོང་ཡིག་ཚང་།

ཏང་སི་སྦྱི། ཀྲོང་གསར།

གནད་དོན: **ས་གཞི་གླར་སྤྱོད་ནང་སྤྱོད་གནའི་སྐོར།**

གུས་ ཏང་སི་སྦྱི་རྒེད་འོག་ ཚང་ཁ་གཡུས་ཚན་ལས་ངོ་མིང་ཚེ་རིང་ནོར་བུ་ ངོ་སྤྲོད་ལག་ཁྱེར་ཨང་༡༡༤༡༠༠༠༧༨༩༡ གུང་ཨང་ ཚ-༡༡-༨༩༢ ས་ཁྲམ་ཨང་༢༢༧༥ ཅན་མ་ནས་ ཞིང་ལ་དེ་ནི་ ད་རེས་རྒཔོ་མཆོག་ལུ་ཞུགས་མ་དགོས་ཐབས་མེད་ལུ་ དེ་ཡང་ སའི་མིང་སྐལ་གྱི་ཨེཀྲས་༠.༡༩ འབད་མི་འདི་ ད་རེས་ཉི་ཀ་ཆུ་གློག་མེ་ལས་འགུལ་ནང་ལུ་ ས་སྒོང་༥པའི་ དོན་ལུ་ལམ་བསལ་བའི་སྒང་ས་ཆ་ཨེཀྲས་༠.༡༩ ཚུད་ཡོད་མི་འདི་ ས་ཆ་གླར་སྤྱོད་ནང་ལུ་བཏང་ནི་འབད་ཨིན་པའི་ངོ་འཛིན་ལུ་ བདེན་འཛིན་གནང་ཡིག་འབུལ་བ་མཁྱེན་ལགས་ཞུ། ཞེས་གནམ་ལོ་ཤིང་མོ་ལུག་ལོ་ ཟླ་༨ པའི་ ཚེས་༡༩ལུ་ཕུལ་བཅས

[illegible]

ཕྱག།

(ཚེ་རིང་ནོར་བུ།)

Tshogpa
Tshangkha Chewog
Tangsibi Ge