APFNet-Funded Project on Rehabilitation and Management of Degraded Forest in Miyun Reservoir Watershed, Beijing [2015P2-BFS]

TERMINAL PROJECT EVALUATION REPORT

November 15, 2018

Miyun Reservoir Watershed Beijing

People's Republic of China

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Project Title: "Rehabilitation and Management of Degraded Forests in Miyun Reservoir Watershed, Beijing [2015P2-MY]"

ACRONYMS

APFNet	Asia Pacific Network for Sustainable Forest Management and Rehabilitation
BFS	BFS Beijing Forestry Society
BMBFP	Beijing Municipal Bureau of Forestry and Parks
BFU	Beijing Forestry University
NTFP	Non-Timber Forest Products
PD	Project Document
CNF	Close-to-Nature Forestry

Acknowledgment

I wish to express my sincere and deepest gratitude to the people below for their warm accommodation and support during the entire duration of my visit to the Project sites. It would not have been possible to undertake this visit successfully without the wonderful facilitation of the team of APFNet and of BFS. I am also grateful for the opportunity given to me to do this evaluation of a very promising project funded by APFNet. Thank you and more power to everyone.

Mr. Lu De – Executive Director, APFNet Secretariat, Beijing
Mr. Huang Kebiao – M&E Manager, APFNet Secretariat, Beijing
Ms. Zhuo Yufang – M&E Officer
Ms. Anne Finke – Project Officer
Dr. Zhi Xin - Project Director and Secretary-General of Beijing Forestry Society Dr. Zhang Bo – Project Manager
Ms. Shen Qianqian – Project Coordinator
Mr. Wang Yongchao – Project Manager
Dr. Zhang Songdan - Evaluator

Executive Summary

The overall objective of the project is to build a pilot and demonstration site of sustainable forest management for China and Asian-Pacific Region with orientation of multi-function forest combining economic, ecological and social benefits together, and make a contribution to the sustainable forest management in Asia Pacific Region.

The specific objectives include:

- To improve the water conservation capacity of the forests in three sites of the project by applying close-to-nature management approach
- To reduce water pollution caused by fertilizer application in the orchard selected;
- To improve the livelihood of the local community selected by promoting the development of forest recreation
- To enhance the capacity of relevant stakeholders in forest management in environment-friendly manner
- To produce best practice models for a better long-term forest management in the watershed

The Evaluation aimed to assess project performance, and determine the outcomes and impacts arising from the project. Specifically the evaluaton sought to:

- Assess whether the goal(s) and objectives of the project are met and whether extension is needed;
- Provide evidence of results to meet accountability requirements;
- Assess the efficiency, effectiveness, sustainability of the project;
- Promote operational improvement, learning and knowledge sharing through results and lessons learned;
- Summarize the achievements of the project and assess how the achievements can be sustained; and
- Identify lessons of operational relevance for future project formulation and implementation.

Evaluation of the Project was based on the performance and outcomes/impacts of the Project implementation. Evaluation of the performance of the Project focused on the accomplishments of the planned activities and targets during the lifetime of the Project. The extent of implementation of the various Project activities and the degree of accomplishment of the corresponding targets were determined. This included the evaluation of the performance of the various players in the Project

implementation, namely: BFS, APFNet, BMBFB, and other implementing agency partners based on how well they carried out their respective roles. The outcomes and impacts of the Project were evaluated based on relevant parameters that were either measured or described during the baseline survey conducted in the early stages of the Project implementation, and based on parameters that were included in the monitoring done by the BFS.

Overall the Project performance is highly satisfactory. It is shown that all the major targets for all the major outputs of the Project were fully accomplished. This could be attributed to the timely implementation of all the required activities and deliverables of the Project that triggered the timely release of the budget from the initial to the third disbursement period as indicated in the Project Completion Report. It is also reflective of the efficient project management and the competence of the project management team. Likewise it is indicative of the empowering approach of APFNet in its oversight function that has a balanced focus on providing technical assistance and enforcing rules and regulations governing all projects of APFNet. In particular the close monitoring of APFNet of its projects is crucial in addressing current and emerging promptly avoiding setbacks in the implementation of various project activities.

According to the Audit report and based on the documents reviewed, the Project appeared to be diligent and efficient in the use of the funds granted by APFNet together with the counterpart funds provided by BFS. Variations were noted in the use of fund allocation per category but in no way did those variations caused delay or shortfall in the implementation of the various activities and accomplishment of targets.

Based on selected indicators, the emerging outcomes and impacts of the Project are found supportive to and consistent with the overall thrusts and priorities of APFNet. It should be noted however that the evaluation of the emerging outcomes and impacts of the Project are based largely on indicators with very limited datasets owing to the short duration on the Project and the inadequate time to monitor and observe the Project sites. Hence the use of the outcomes and impacts of the Project as basis of management and policy decisions should for now be made with caution until further monitoring and observation of the Project sites yield longer time series datasets that will allow the conduct of a more robust evaluation process. Salient observations are listed below.

Emerging positive outcomes and impacts from the establishment of demonstration areas on CNF, improvement of community livelihoods through ecotourism development, capacity building for stakeholders in the management of forests and ecotourism, and dissemination of good practices and lessons learned are briefly described below.

Improvement of habitat quality in the Project sites could be indicated by the increase in the number of tree species that could enhance the attractiveness of the sites to birds, small mammals and insects. Increase in number of the shrubs and herbs could indicate the improvement of the microclimate and soil condition in the Project sites that could lead to greater vegetation cover in the watershed enough to attract more wildlife back into the Project sites.

Improvement in the livelihoods of the local communities in the Project sites could be indicated by the vast improvement of the road network system and the increase in the number of visitors to the Project sites. The vast improvement of the road system makes the transport of farm products easier and faster that could mean greater profitability and viability of the local farming enterprises. Increase in the number of visitors to the Project site likewise could lead to improvement of the livelihoods of the local communities by increasing the opportunities for the local residents to offer home stay facilities to accommodate visitors, and provision of other basic services.

Improvement of the access of the local stakeholders to capture development opportunities in forest management could be indicated by the increase in the number of local farmers involved in the forest management and in the management of ecotourism facilities. Participation in the management of forests could translate to increase in opportunities to influence management decisions that will not jeopardize their share of the benefits generated in the management of forests and ecotourism. Likewise the increase in the number of practitioners visiting the Project sites could also indicate the potential increase in the number of competent personnel who are competent in participatory forest management. This could happen by the exposure of the practitioners to the active engagement of the local residents in the management of forests and ecotourism in the Project sites.

Increase in science-based policies and forest management could be indicated by the conduct of trainings and workshops, and the production of reference materials on forest management. The more people are trained and made aware of and knowledgeable about science-based forest management the more likelihood that its application will be. Likewise the increase in the number of visitors going through experiential learning and direct observation of the actual operation of scientific forest management in the Project sites increases the likelihood of more adopters and advocates of science-based forest management. Lastly, the recognition accorded by the local government to the Project site as venue for extracurricular activities of primary and middle schools in Beijing, and listing of the Project site as learning and demonstration site for forest therapy could be a leverage for recurring funding support from the government and other organizations.

Improvement of the water conservation capacity of the watershed is one of the major outcomes that is expected of the implementation of Project activities. It could be indicated by the increase in the moisture retention ability of litter cover of the soil and increase in soil water storage capacity as a result of the increase in vegetation growth and diversity.

Reduction in water pollution in the watershed could be indicated by the improvement of the vegetation cover of the watershed as result of the CNF. Improved vegetation cover normally means greater protection of the surface soil against erosive forces of rain and surface runoff and hence the reduction of sediment delivery to streams. In addition the reduction in the use of pesticides and herbicides by the local farmers due to improve farming practices such as the use of improved planting materials that reduces the need for pesticides and fertilizers could mean reduction in the amount of pollution loading into the stream.

One of the salient conclusions in this evaluation is the emerging effectiveness of the CNF in improving the habitat quality and water conservation function of the forests in the Project sites as indicated by the increase in vegetation growth and species diversity and the apparent improvement of the condition of the soil. Likewise, ecotourism is showing signs of its potential to improve the livelihoods of the local residents as indicated by the improvement of the road network in the area and the increase in the number of visitors to the ecotourism facilities.

The sustainability of the Project could be indicated by the recognitions it received as learning and demonstration sites for primary and middle schools, and for forest therapy. In addition, the willingness of the BFS to put in big sum of counterpart funding totaling more than USD 230,000 is a likely show of commitment of BFS to the Project not only during the Project life but over the long-term beyond the Project duration.

The initial positive outcomes of the Project could attract increasing attention to what the Project is trying to demonstrate. This could lead to the growth in the interests of more practitioners to learn from the demonstration sites that could spur the replication of CNF in other areas. The early success of the Project in the application of CNF could motivate visitors to consider the practice of CNF in their own sites.

One major recommendation coming out of this evaluation is the need to continue the operation of the Project be it through the support of APFNet or support from other funding agencies. It will be ideal if the government will assume the continuing operation of the Project as a demonstration site for CNF and ecotourism, and as a long-term research and monitoring facility.

Should there be a continuing phase to this Project, there will be a need to improve the system of monitoring and observation of the Project sites in order to establish a robust and long time series datasets that may be used as basis for science-based management and policy decisions. Until then the use of the initial results of this Project as basis for making policies and management decisions should be done with caution.

1 Project Description

1.1 General Information

The general information outlined here is given in the Project Progress Report submitted to APFNet Secretariat for the first half year of the 2nd year of operation (07/2016-12/2016). The Report is also based on Project proposal agreed in the Project Agreement between APFNet and Beijing Forestry Society (BFS). The project will run for two years period. The project design is presented here in summary only and more fully elaborated, as appropriate, in later sections of this report. For the reference document see "Project Progress Report submitted to APFNet Secretariat for the first half year of the 2nd year of operation (07/2016-12/2016)".

1.2 Objectives

The overall objective of the project is to build a pilot and demonstration of sustainable forest management for China and Asian-Pacific Region with orientation of multi-function forest combing economic, ecological and social benefits together, and make a contribution to the sustainable forest management in Asia Pacific Region.

The specific objectives are:

- To improve the water conservation capacity of the forests in three sites of the project by applying close-to-nature management approach
- To reduce water pollution caused by fertilizer application in the orchard selected;
- To improve the livelihood of the local community selected by promoting the development of forest recreation
- To enhance the capacity of relevant stakeholders in forest management in environment-friendly manner
- To produce best practice models for a better long-term forest management in the watershed

1.3 Expected Outputs

Output 1: Construct monoculture plantations of *Pinus tabuliformis* and *Platycladus orientalis* of 280 ha in three project sites (Shitanglu, Schichangyu, and Shidongzi)

Activity 1.1: Development of 5 year forest management plan of project sites

Activity 1.2: Transform monoculture plantation of *Pinus tabuliformis* and *Platycladus orientalis* into mixed forests with broad-leaves species

Output 2: Improve the livelihood of local community by promoting eco-tourism

Activity 2.1: Formulate an eco- tourism plan

Activity 2.2: Development of tourism infrastructure

Output 3: Improve capacity of relevant stakeholders in managing forest and eco-tourism

Activity 3.1: Set up on-site training and guidance of forest management for local forest practitioners for implementation of Long-term Forest Management Plan

Activity 3.2: Organize training program for local farmers involved in eco-tourism

Activity 3.3: Arrange domestic and international study tours

Output 4: Experience and lessons learned summarized and disseminated

Activity 4.1: Establish knowledge hub for supporting forest tourism promotion

Activity 4.2: Organize workshop

Activity 4.3: Prepare and submit of policy recommendations to local and Beijing Municipal government agencies

2 Purpose and Scope of Evaluation

2.1 Purpose of Evaluation

The Evaluation is undertaken to assess project performance, and determine outcomes and impacts arising from the project. Specifically the evaluaton seeks to:

- Assess whether the goal(s) and objectives of the project are met and whether extension is needed;
- Provide evidence of results to meet accountability requirements;
- Assess the efficiency, effectiveness, sustainability of the project;
- Promote operational improvement, learning and knowledge sharing through results and lessons learned;
- Summarize the achievements of the project and assess how the achievements can be sustained; and
- Identify lessons of operational relevance for future project formulation and implementation.

2.2 Scope of the Evaluation

The evaluation is expected to cover the following project components:

a. Establishment of demonstration project sites on close-to-nature forest management;
b. Improvement of local communities livelihood through promoting eco-tourism;
c. Improvement of the capacity building of relevant stakeholders in managing forest and eco-tourism;
d. Dissemination of good practices and lessons learned.

3 Evaluation Framework

3.1 Focus and Priorities

This evaluation process focused on the project implementation performance, impacts of the project, good practices and knowledge generated, and sustainability of the gains and initiatives of the project. Evaluation of the project implementation performance looked into the extent to which the various activities of the project were undertaken and the various targets were achieved. The evaluation of the performance of the Project was based on the evidences indicated by the data that were gathered from progress reports, mid-term evaluation, KIIs and ocular visits.

Qualitative judgment of the efficiency of the project by matching the project outputs and impacts with the amount of budget spent was made. The impacts of the project were evaluated by comparing the baseline values of relevant impact parameters with the values of the same parameters after the implementation of the project activities.

The sustainability of the gains of the Project was evaluated based on selected indicators such as, amount of additional counterpart funding spent by BFU for the Project on top of its contractual commitment. Additional indicators such as the conduct of activities by stakeholders beyond what is required and outside the Project boundaries as well as by the number of stakeholders that adopted and used the various good practices of the Project was also be considered.

Lastly, the good practices and knowledge generated by the project were also assessed in terms of its readiness for dissemination to potential adopters. Recommendations on how the good practices and knowledge could become more accessible to prospective users.

3.2 Evaluation Criteria and Indicators

Evaluation of the Project was based on the performance and outcomes/impacts of the Project implementation. Evaluation of the performance of the Project focused on the accomplishments of the planned activities and targets during the lifetime of the Project. The extent of implementation of the various Project activities and the degree of accomplishment of the corresponding targets were determined. This included the evaluation of the performance of the various players in the Project implementation, namely: BFS, APFNet, BMBFB, and other implementing agency partners based on how well they carried out their respective roles.

The outcomes and impacts of the Project were evaluated based on relevant parameters that were either measured or described during the baseline survey conducted in the early stages of the Project implementation, and based on parameters that were included in the monitoring done by the BFS.

3.3 Methods & Approaches

3.3.1 Data Collection

Collection of data and information needed for the terminal evaluation were made through ocular visits, review of relevant documents, and interview with key informants.

3.3.2 Ocular Visits

Ocular visits to Schichangyu and Shitanglu sites were done to get first hand impressions on selected areas and facilities related to the project including (Please refer to Annex 1 for the Schedule of Activities):

a. Selected reforestation sites
b. Selected local communities
c. Local government
d. Monitoring sites
e. Ecotourism sites

3.3.3 Review of Related Documents

Related documents were also reviewed to supplement the information gathered during the ocular visits to the Project sites. The documents reviewed include:

a. Forest Management Plans
b. Project Document and Agreement
c. Work Plans of the Project
d. Detailed budget per category and per activity
e. Mid-term Evaluation Report of the Project

f. Annual Progress Reports
g. Project Completion Report
h. Ecotourism Plan

3.3.4 Key Informant Interviews (KIIs)

Key actors and players in the Project were interviewed including:

a. Project management team
b. Representatives of local communities
c. Concerned local government officials
d. Representatives of users of water from the watershed (e.g., farmers, irrigators, industry, residential)

3.3.5 Data Analysis

Simple comparative analysis of the before and after the Project scenario was done to evaluate the positive outcomes and emerging impacts of the Project. The data and information that were gathered using various means described above were compared with the baseline values of selected parameters. Project performance was deemed satisfactory if the planned activities were fully implemented and if the baseline values of key parameters increased or improved the after the Project. Likewise the Project was also rated satisfactory when the anticipated positive impacts of the Project are indicated by the data collected from various sources.

4 Results and Discussions

4.1 Project Implementation

4.1.1 Project Schedule and Implementation Arrangements

As will be further described in details in the succeeding sections, implementation of all the Project activities were done consistent with the specifications on design and timetable as indicated in the Project Documents and Agreement in June 2015 between APFNet and the implementing agency. To provide oversight and guidance in the implementation of the various Project activities, a Project Steering Committee was established consisting of representatives from the Beijing Municipal Bureau of Forestry and Parks, Beijing Forestry University, Miyun County Bureau of Forest and Parks and Beijing Forestry Society.

4.1.1.1 Project Financing

According the audit report covering June 2015-June 2018, as of June 30 of 2018, a total APFNet funding of $487,500 (99.27% of the total APFNet budgeted amount) was used, with an unspent balance of $3,600. The project received a total counterpart contribution of $231,500 from other projects implemented by the executing agency. The funding from APFNet were disbursed to BFS in three installments. $165,000 on November 30 of 2015; USD 174,000 on January 31 of 2017; and USD 102,000 on December 31 of 2017.

Based on the financial report, variances in spending the budget allocation per category were noted. In some cases there were overspending and in some cases underspending. It is appreciated in this evaluation that such variations are within what are normally expected in projects and within the variations allowed by APFNet. The good thing is that no significant variations were noted on per activity allocations and spending. This indicates that sufficient financial resources were made available and spent to properly carry out the various Project activities.

4.1.1.2 Procurement and Consultant Engagement

The total cost spent for consultancy services procured was only 9.2% of the total Project cost of USD 719,163.58 while the total expenditures for project personnel amounted to 2.8% of total Project costs. The total operational expenditure including the monitoring and evaluation and audit amounted to 10.3% of the total Project costs. This translates to about 78% of the total Project cost that was spent for direct implementation activities which is relatively higher than most other projects.

Local and international consultants were engaged in the Project to augment the expertise at BFS for the implementation of various activities. A total of 23 consultants were contracted by the Project in about 18 fields of specialization. The hiring of local and international consultants indicates the recognition of the Project management that successful management of forests in general requires multidisciplinary team considering the spread of concerns from the physical, to biological and socioeconomic dimensions. Multidisciplinary team of experts coming from various organizations and hence orientations likely benefited the Project from the rich diversity of experiences the team of experts brought to the table. A case in point is the infusion of the knowledge and experience of international consultants on ecotourism and forest therapy, a concept that is well practiced in Germany and Japan.

4.1.1.3 Monitoring, Evaluation and Reporting

The quality assurance of the Project implementation and outputs was done through a 3-level monitoring consisting of in-house monitoring by BFS, external monitoring hired by BFS, and independent monitoring engaged by APFNet. This 3-level monitoring ensures that the tracking of the Project was objective, transparent and credible. Such multilevel monitoring allowing the appreciation of the Project from multiple perspectives and using different lenses ensures that the monitoring of the Project was comprehensive and honest. This is seen in the adjustments made by the Project team in the implementation of some of the activities following the recommendations from the independent mid-term evaluation.

4.1.1.4 Information Dissemination and Knowledge Sharing

One of the major objectives of the Project is the sharing of the lessons and experiences that will be gained from the implementation of activities to various audiences and users. Proper documentation of the implementation of various activities was made and packaged for dissemination through diverse means including social media, website, interpersonal means, workshops and conferences, forestry education and trainings. The public in general and other stakeholders were targeted through workshops. Visits and experiential learning were also effective in educating local and international visitors about the Project and its activities.

4.2 Performance of Implementing Agencies and Partners

4.2.1 Performance of the Supervising Agency

The Project sites are within the jurisdiction of the Beijing Municipal Bureau of Forestry and Parks (BMBFB). The BMBFB ensures that the implementation of the Project activities was within the bounds of existing laws and regulations. Compliance with the existing laws and regulations was diligently pursued by BFS such as in securing logging quota. While the BMBFB facilitated the issuance and granting of logging permit and corresponding quota, the implementation of Project activities specifically thinning appeared to have been limited by the quota and timeframe imposed by the government. Nevertheless the overall conduct of thinning was not significantly hindered.

4.2.2 Performance of the Executing Agency

The BFS as the executing agency of the Project is appreciated in this evaluation as compliant with the provisions and stipulations in the Project Document and Agreement. As will be borne out by the succeeding findings of this evaluation, the BFS was sufficiently capable and diligent in implementing the Project activities. The BFS exhibited competence and commitment to the general welfare of the Project sites as indicated by its close relation with the local communities that were observed during the ocular visits.

4.2.3 Performance of the Implementing Agencies and Other Players

The Beijing Forestry University (BFU), Chinese Academy of Forestry (CAF), and Beijing Forestry and Parks Department of International Cooperation along with the consultants appeared to have contributed to the successful implementation of the Project if only based on the accomplishments reported and observed in the field. In particular the design and construction of the ecotourism facilities were observed to have been designed by someone with good knowledge and experience in this area. In other areas like in the identification of trees to be cut during the thinning operations bears the footprints of someone with vast knowledge and experience in thinning procedures.

4.2.4 Performance of APFNet

The APFNet as the granting institution was evidently diligent in providing not only the financial assistance but also technical and administrative guidance to BFS through out the implementation of the Project. Based on the review of Completion Report, dialogue with APFNet M&E Unit headed by Mr. Huang Kebiao and the interactions with the BFS team led by Dr. Zhi Xin, the APFNet performed its functions well from timely releases of budget, to frequent meetings with BFS project management team, to periodic visits to Project sites to providing opportunities to the BFS to learn from other projects in China and in Canada, and by engaging independent reviewer that provided useful advice for further improvement of the Project.

4.3 General Findings on the Performance of the Project

4.3.1 Overall Project Performance

Table **3** summarizes the overall accomplishments and performance of the Project. It is shown that all the major targets for all the major outputs of the

Project were fully accomplished. This could be attributed to the timely implementation of all the required activities and deliverables of the Project that triggered the timely release of the budget from the initial to the third disbursement period as indicated in the Project Completion Report. It is also reflective of the efficient project management and the competence of the project management team. Likewise it is indicative of the empowering approach of APFNet in its oversight function that has a balanced focus on providing technical assistance and enforcing rules and regulations governing all projects of APFNet. In particular the close monitoring of APFNet of its projects is crucial in addressing current and emerging promptly avoiding setbacks in the implementation of various project activities.

4.3.2 Contribution of the Project to the Goals and Objectives of APFNet

Results of data analysis affirm the claim in the PD that the project is consistent and supportive of the APFNet priorities by improving forest management to reduce forest loss and degradation (i.e. mitigation and adaption to climate change) and promoting forest rehabilitation to meet multi-functional objectives (i.e. water conservation, socio- economic livelihood, ecological processes and services,). During the implementation of the Project, no apparent loss in forests and forest degradation were observed. Instead, the forests in the Project sites improved in biodiversity, soil properties and in its overall function to conserve water that is likely to have positive impacts on the improvement of water yield from Miyun Watershed. This could be attributed to the successful engagement of the local communities in forest management especially in forest protection. Empowerment of the local communities through trainings and provision of incentives helped in making them more active and effective in helping in forest protection in the Project sites. Likewise, the conduct of expert consultations and dissemination of good practices appeared to have helped in improving forest management in the Project sites.

The use of CNF was shown to be effective in transforming the monoculture plantations into diversified forests and eventually in improving the ability of the forests to conserve water. In addition the development of ecotourism facilities in one of the Project sites showed early signs of positive contribution to the enhancement of livelihoods of the local communities.

4.3.3 Safeguarding the Water of Miyun Watershed

The positive influence of the Project on the improvement of water resources in Miyun Watershed was evaluated using qualitative indicators (i.e., water retention capacity of debris and soil water storage capacity) in lieu of quantitative measures that were not part of the Project design. Table **1** shows

that the water retention potential of debris in the managed plots of the Project sites except in Shitanglu were greater than those in the control plots. The suggested improvement in the water retention potential of debris in managed plots could indicate higher volume of organic matter in the plots that is essential in increasing infiltration capacity and water storage capacity of the soil as supported by the results of the assessments done in the Project (Table **2**).

Table 1. Water retention capacity of debris samples in the Project sites.

Project Site/Sampling Plot		**Debris Layer**	**Water Retention Capacity**
Shichangyu	*Pinus tabuliformis* plantation	Undecomposed	1＜2
		Partially decomposed	1＞2
	Shrubland	Undecomposed	1＞2
		Partially decomposed	1＞2
Shitanglu	*Platycladus orientalis* plantation	Undecomposed	1＜2
		Partially decomposed	1＜2
Maoshigou	*Pinus tabuliformis* plantation	Undecomposed	1＞2
		Partially decomposed	1＞2

Table 2. Soil water storage capacity in the Project Sites.

Project Site/Sampling Plot	**Maximum Water Storage**

Shichangyu	*Pinus tabuliformis* plantation	1＜2
	Shrubland	1＜2
Shitanglu	*Platycladus orientalis* plantation	1＞2
Maoshigou	*Pinus tabuliformis* plantation	1＞2

4.4 Specific Findings on the Performance of the Project

4.4.1 Close-to-Nature Forest Management

Transformation of three (3) monoculture plantations of Pinus tabuliformis and Platycladus orientalis in three project sites (Shitanglu, Schichangyu, and Shidongzi) within Miyun Watershed was successfully conducted along with the development of 5-year forest management plans.

The transformation of monoculture plantations in three project sites were meant to test the application of close-to-nature approach of restoring plantation forests back to as close as possible to a natural forests conditions. The aim is to enhance the ecosystem services of the forests in conserving soil and water in watersheds such as the Miyun Watershed that are critical sources of water for rapidly growing urban metropolis. As designed the transformation of the monoculture plantations was accomplished through well planned thinning and enrichment planting operations.

As seen on the field visits to Schichangyu and Shitanglu sites thinning involved the removal of selected trees to reduce the competitors of the more preferred species and accelerate its growth and development. It was administered to create an environment that is more conducive for the growth of the suppressed natural understory vegetation and slowly improve the diversity of the forest stands. In addition particular thinning increased openings in the canopy that allows greater sunlight to penetrate the forest floor and trigger the growth of smaller vegetation and germination of seeds stored in the forest floor. In general the canopy openings created by thinning are limited in diameter due to limited number of tress cut as dictated by the logging quota approved for the Project. It will be interesting to test if greater canopy openings would produce better results in terms of growth rates of suppressed trees and emergence of more shrubs, herbs and other smaller plants. This will require making special arrangement with the BMBFB to

allow the Project to cut more trees beyond limits provided by law so that larger canopy openings could be made and tested.

On the other hand enrichment planting of native species in the monoculture plantations was designed to increase the richness of species by introducing more native species that was expected to facilitate the recruitment of more native species already found in the vicinity of the managed plots.

It was observed in the two Project sites visited that growth of formerly suppressed trees that were liberated from many competing trees are now growing vigorously which in due time will likely create a multistory canopy cover in the Project sites. In addition, shrubs, herbs and other smaller plants were observed to be growing well in Shitanglu that enhances not only biodiversity but also the quality of ground cover in the Project sites. Likewise the trees planted such as the Mongolian Oak planted in Schichangyu as part of the enrichment planting were also observed to be growing well and likely will contribute to the diversification of vegetation in the Project sites. It may be useful to test if increasing the number and diversity of trees planted during the enrichment planting would lead to greater results than what was observed in the Project sites.

Piles of cut pieces of tree trunks and branches most likely during the thinning operations were seen in Shitanglu. While this is a good practice to reduce risks of fire outbreaks, removal of residuals from thinning from the forest floor impedes the natural process of cycling nutrients absorbed by plants. There is a need to strike the proper balance between fire prevention and nutrient recycling from the onsite natural decomposition of thinning residues.

4.4.2 Development of 5-Year Forest Management Plan

Three 5-year forest management plans one each for the 3 Project sites were prepared together with land use plans during the first year of the Project and served as the guiding framework for the implementation of the various activities implemented. The preparation of the management plans adhered to the widely recognized good planning principles, namely: participatory approach through the involvement of local communities, local governments, academe and private sector, horizontal and vertical integration, and science-based. These principles are reflected in the key features of the management plans, namely; people-oriented strategies with the engagement of the local communities in forest management, in harmony with policy and thrusts of the local and national government, engagement of experts from academe, government agencies and international partners, and the conduct of comprehensive baseline situational analysis as foundation of designing strategies and activities of the Project.

4.4.3 Improvement of Community Livelihood through Ecotourism Development

4.4.3.1 Ecotourism Plan Development

An ecotourism plan was developed in one of the 3 Projects sites, at Long Mountain Valley in Schichangyu. The plan was developed with the involvement of the local government of Beijing, local communities and team of local and international consultants. This is in line with the fundamental concept that ecotourism is intended to conserve natural environment and improve the quality of life of the local communities. The plan also laid down the design of the ecotourism facilities in harmony with the natural attributes of the area to ensure that influx of tourists will in no way compromise the sustainability of the landscape and the culture of the local community. In addition plan also ensured that it will cater to the basic needs of potential visitors by including facilities for forest therapy, forest education and experiential learning, farming practice, and research and demonstration. This could likely attract more visitors to the ecotourism facility that provides several activities that they can engage in the facility.

It was noted that the planned facilities were built as designed with inputs from local and international experts hired by the Project. While yet in its infancy period, there are additional measures that may need to be implemented to enhance the attractiveness and ability of the ecotourism site to lure more visitors to the area. In this regard I will re-echo the recommendations proposed in the Mid-Term Evaluation Report listed below.

2. Increase signages that are informative, graphic, and easy to read and understand by both local and international tourists.
3. Local residents especially the youths in the area and in the adjoining communities could be trained as park guides.
4. Fees collection from visitors could be considered to help generate funds for the upkeep of the ecotourism facilities and avoid heavy reliance on government funding. Collected fees may also be used to provide incentives to local communities that are involved in forest management and protection. Part of the collection may also be used to provide assistance to local community development projects.
5. Provision of accommodation facilities for multiple day-visitors needs to be prioritized as part of the attractions of the ecotourism project. Homestay guided by strict standards could be a viable option and may be further enhanced by indoor activities like traditional singing and dancing, and hands-on experience in some local cottage industry.

Additional attractions that may be considered are flea markets where fruits, medicinal herbs and wellness products and other local products can be displayed for sale to visitors. Further festivals such as walnut or Hawthorne harvesting day or week may also be considered.

6. Some outdoor activities such as mountain biking, bird watching, and trekking may be considered.
6. Local schools could be engaged more actively in the ecotourism project by serving as agents in raising the awareness and interests on ecotourism among students as potential visitors or managers of ecotourism project.

4.4.3.2 Development of Ecotourism Infrastructure

Several infrastructures that offer variety of activities that visitors can do were observed in the Schichangyu Project site. Infrastructures that were fully built include forest therapy facility, network of foot trails, yoga and tai chi platforms, Hawthorn Platform, Persimmon Garden, forest classroom, rest and recreation area, and educational signages. Culture Exhibition Center is yet to be completed but the Project Team assured that funding is available and construction will move forward once all regulatory impediments are cleared. As planned these infrastructures were observed to be mostly built of local materials, in harmony with the natural architecture, minimally disruptive of the natural landscape, and designed so that visitors will have maximum opportunities to commune with nature, to appreciate the natural beauty of the area, to learn of local culture, and to be inspired to participate in the protection of the forests and the natural environment, and the preservation of the local culture.

4.4.3.3 Marketing of Ecotourism in Beijing

The marketing plan to attract visitors to the ecotourism site uses different methods to reach out to various potential clients. Booklets and brochures were printed, and social media platforms were developed to inform prospective clients from Beijing and surrounding areas. It is expected that the area will be able to attract enough visitors to become self sustaining considering that it is highly accessible from the main highway and relatively close to Metro Beijing, and it boasts of top class facilities.

4.4.4 Capacity Development for Stakeholders in Management of Forests and Ecotourism

4.4.4.1 Training Manuals Development

Training manuals on forest management, forest community development and ecotourism were developed as specified in the Project Document and Agreement. These manuals were intended to enhance the residents' awareness on environmental protection, forest management, and enhancement of the ecological, economic and social benefits from the forests. The manual on ecotourism was intended to develop the skills of the local communities on ecotourism in order to create opportunities for them to earn from ecotourism as source of livelihood. Based on the observations in the Project sites, the contents of the forest management manual including sustainable timber collections, energy efficient brick-beds, management of *Juglans regia* and *Castanea mollissima,* treatment of wastewater and garbage segregation are consistent with the local needs and activities of the local residents. Likewise the contents of the ecotourism manual including tourism service etiquette, dining service, accommodation, sanitation, souvenirs & special products and transportation, requirements for employees and three international and domestic case studies, were likewise relevant to the local residents' needs based on highly limited field observations.

4.4.4.2 Training of Local Practitioners in the Implementation of Long-Term Forest Management Plan

More than 10 indoor and onsite training sessions were conducted for forestry practitioners and local residents who were involved in forest management activities in order to enhance their knowledge on CNF and associated practices including pruning, ground preparation, seeding, and planting among others. The CNF being a new approach being tested in the Project sites, the training sessions on CNF were necessary to complement the traditional skills of the local residents and forestry practitioners in the proper implementation of CNF.

4.4.4.3 Training of the Local Farmers Involved in Ecotourism

Trainings for community residents who are employed to manage the forests and the infrastructure facilities were trained conducted to enhance their skills and competence. Training sessions for local residents were also done to raise their awareness on ecotourism planning. It is not clear from available data how the skills of the local residents were enhanced as a result of training. However engagement of local residents in forest management and ecotourism

development normally requires capacity building to reconcile their largely traditional skill sets with the innovative management skill sets required.

4.4.4.4 Organization of Domestic and International Study Tours

A number of study tours to domestic water source areas, such as Chengdu, Changsha, Xiamen, Danjiangkou, Wuhan were conducted for project staff and concerned consultants, to learn best management practices and gain experience in forest management and watershed conservation. The Project Coordinator, Ms. Shen Qianqian, was sent to Canada's eastern province of New Brunswick to learn about forest management, watershed management, public involvement and payments for ecosystem services, forest recreation, etc.

4.4.5 Documentation and Dissemination of Experiences and Lessons Gained from the Project

4.4.5.1 Establishment of a Knowledge Hub

A knowledge hub about the Project was established in the website of the BFS. As can be seen in the website, valuable information are available in the site that includes information about the Project its goals, activities and accomplishments, some reading materials on PES, public involvement in watershed management and others. The knowledge hub will not only render information about the Project accessible to prospective users but will also elevate the level of awareness about the Project that may prove useful in gaining interests and support from various individuals and organizations that have interests on the activities of the Project. It is therefore essential that the current knowledge hub be further enhanced such as by putting in more pictures and maps that could be presented as directory of available information about the various areas in the Project sites by simply clicking on specific areas in the map. Games or tools may also be added such as those that will allow users to estimate the potential increase in water yield as a result of thinning.

4.4.5.2 Development of a Book on Integrated Forest Management in Miyun Reservoir Watershed

A book on Integrated Forest Management in Miyun Reservoir Watershed book was written in Chines and translated into English as stipulated in the Project Document and Agreement. The book contains details on close-to-nature forest management of different types in the Miyun Reservoir

Watershed and introduces experiences in forest management and eco-tourism development and lessons-learned. It is intended to be used as a reference for local policy makers and forest practitioners. The Chinese version was distributed to participants of the project workshop.

4.4.5.3 Organization of Workshops

Two workshops one in October 2016 and another in June 2018 were conducted in Beijing on ecotourism particularly on forest therapy. Local policy makers, experts and other technical personnel along with invited international participants and resource persons from Japan, South Korea, Canada, Greece and the Netherlands participated in the workshops.

4.4.5.4 Preparation and Submission to Policy Recommendations to Local and Beijing Municipal Government Agencies

The key policy recommendations on forest management distilled from the activities implemented in the Project sites include the procedures in applying for logging quota, the importance of forest management planning and the need to subsidize forest management. On ecotourism the key policy recommendations are focused on cross-sectorial cooperation, regional ecotourism planning, demonstration, capacity building and publicity. The policy recommendations have been submitted to the Beijing Municipal Bureau of Science & Technology that will then submit it to the Municipal Government.

4.5 Outcomes and Impacts of the Project

The full value of the gains of the Project could be estimated by assessing its short to long-term outcomes and impacts in various fronts. Table **4** shows a list of the indicators that were used to measure the emerging outcomes and impacts of the Project.

4.5.1 Improved habitat quality of the monoculture plantations of Pinus tabuliformis and Platycladus orientalis in three project sites (Shitanglu, Schichangyu, and Shidongzi)

Increase in the number of tree species along with shrubs and herbs could indicate that the quality of the monoculture plantations in the Project sites has improved. Increase in the number of trees could enhance the attractiveness of the monoculture plantations to birds, small mammals and insects. Increase in number of the shrubs and herbs could indicate the improvement of the

microclimate and soil condition in the Project sites that could lead to greater vegetation cover in the watershed enough to attract more wildlife back into the Project sites.

4.5.2 Improved livelihoods of local community by promoting ecotourism

Improvement in the livelihoods of the local communities in the Project sites could be indicated by the vast improvement of the road network system and the increase in the number of visitors to the Project sites. The vast improvement of the road system makes the transport of farm products easier and faster that could mean greater profitability and viability of the local farming enterprises. Increase in the number of visitors to the Project site likewise could lead to improvement of the livelihoods of the local communities by increasing the opportunities for the local residents to offer home stay facilities to accommodate visitors, and provision of other basic services.

4.5.3 Improved access of local stakeholders in capturing opportunities for development

Improvement of the access of the local stakeholders to capture development opportunities in forest management could be indicated by the increase in the number of local farmers involved in the forest management and in the management of ecotourism facilities. Participation in the management of forests could translate to increase in opportunities to influence management decisions that will not jeopardize their share of the benefits generated in the management of forests and ecotourism. Likewise the increase in the number of practitioners visiting the Project sites could also indicate the potential increase in the number of competent personnel who are competent in participatory forest management. This could happen by the exposure of the practitioners to the active engagement of the local residents in the management of forests and ecotourism in the Project sites.

4.5.4 Increase in science-based policies and management of forests

Increase in science-based policies and forest management could be indicated by the conduct of trainings and workshops, and the production of reference materials on forest management. The more people are trained and made aware of and knowledgeable about science-based forest management the more likelihood that its application will be. Likewise the increase in the number of visitors going through experiential learning and direct observation

of the actual operation of scientific forest management in the Project sites increases the likelihood of more adopters and advocates of science-based forest management. Lastly, the recognition accorded by the local government to the Project site as venue for extracurricular activities of primary and middle schools in Beijing, and listing of the Project site as learning and demonstration site for forest therapy could be a leverage for recurring funding support from the government and other organizations.

4.5.5 Improvement of water conservation capacity of the watershed

Improvement of the water conservation capacity of the watershed is one of the major outcomes that is expected of the implementation of Project activities. One indicator of this could be the increase in the moisture retention ability of the litter cover in the Project sites. This is a likely result of the increase in vegetation growth after thinning the monoculture plantations and conducting enrichment planting. Increase in moisture retention by litter cover could indicate increase in litter volume that eventually could enrich the organic matter content of the soil, improve soil structure and porosity, and consequently enhance the infiltration capacity of the soil. Relatedly, the increase in the soil water storage capacity could indicate improving soil condition in the Project site due to increase in vegetation growth and production of more organic matter. Both indicators point to the potential increase in the capacity of the Project site to capture and store water from the litter cover down to the deeper portion of the soil layer.

4.5.6 Reduced water pollution

Reduced pollution of water is another major outcomes expected from the various activities implemented in the Project sites. In the absence of data on pollution loads in the streams within the various Project sites, the increase and improvement in vegetation cover is a good indicator of the potential positive impact of the Project on the reduction of sediment load of streams. Improvement in the vegetation particularly as a result of making the Project sites more conducive for accelerated growth of preferred tree species and creating more open space for the growth of more shrubs and herbs could indicate the reduction in surface soil erosion and sediment loading into the streams. Improved vegetation growth in the watershed is normally associated with increase in the protection of the surface soil from the erosive force of surface runoff during rainfall events. Good vegetation cover could also filter out eroded soil materials carried by surface runoff before entering into the streams.

The reduction in the application of pesticides and herbicides by local farmers due to improve farming practices such as the use of improved planting materials that reduces the need for pesticides and fertilizers is also an indicator of the potential beneficial impacts of the Project on water quality improvement in Miyun Watershed. Before the Project water from Miyun Watershed are polluted with pesticide and herbicide residues coming from tree orchards where large amounts of these chemicals are applied to boost harvest.

5 Conclusions and Recommendations

5.1 Conclusions

1. Overall the performance of the Project is very satisfactory on account of the full implementation of the planned activities and accomplishment of the corresponding targets of each activity listed in the Project Document. This could be largely attributed to the efficiency and effectiveness of the APFNet, supervising agency (BMBFB), and implementing/cooperating agencies in performing its roles as facilitators, technical and financial assistance providers, and auditors that empowered the BFS in the timely and diligent implementation of the Project activities.
2. Proper and efficient use of the funds granted by the APFNet to the BFS was evident from the satisfactory completion of all planned activities and the accomplishment of targets that are likely to produce positive outcomes and impacts in the long term.
3. Based on the activities implemented, the targets accomplished and the projected outcomes and impacts, the Project is consistent with and supportive of the priority thrusts and overarching goals of the APFNet.
4. Early signs of the effectiveness of the CNF approach in transforming the monoculture plantations in the Project sites into natural forests conditions in terms of forest architecture, biodiversity and habitat quality, soil condition, productivity, and capacity to improve conservation of water were observed.
5. There are also early indications that ecotourism development could be a viable enterprise in the Project site for generating income to support forest management, local community development, and improving the livelihoods of local farmers, for education and training of youths, practitioners, researchers and policy makers, and for the promotion of human wellness.

6. Engagement of properly trained and adequately motivated local residents in forest management potentially have positive impacts on forest protection and in the improvement of livelihoods and quality of life of the local communities.
7. Mixed forests as is typical of natural forests appear to have better capacity to conserve water than monoculture forest tree plantations.
8. Proper packaging and communication of the knowledge and experiences gained from the Project could potentially influence the formulation of science-based policies and the application of scientific strategies to forest management.
9. The Project is more likely than not going to be sustainable as indicated by the recognitions granted to the Project site as learning and demonstration sites for primary and middle schools, and for forest therapy. In addition, the willingness of the BFS to put in big sum of counterpart funding totaling more than USD 230,000 is a likely show of commitment of BFS to the Project not only during the Project life but over the long-term beyond the Project duration.
10. Replication of the Project in other sites with similar physical and social circumstances could be possible as indicated by the positive outcomes from CNF applied in two Project sites. The early positive outcomes of the CNF approach to forest restoration and conversion of monoculture plantations into mixed forests could be motivating to visitors in the sites. Increasing influx of visiting forestry practitioners to observe and learn how the CNF approach to forest management is operationalized could indicate the potential replication of such as an approach in other areas where the visitors are based.
11. The initial outputs, outcomes and potential beneficial impacts of the Project could indicate the worthiness of the Project for fresh grants to continue the upscaling and monitoring of the implemented activities.
12. The duration of the Project implementation is too short to realize the desired outcomes and impacts of the various activities implemented. The impacts on the hydrology of a watershed of most of the activities implemented including thinning and enrichment planting normally takes many years before they can be detected and measured.
13. The current system for Project monitoring is not sufficient enough to generate datasets and information that are needed for a robust detection, measurement and evaluation of the outcomes and impacts of the Project. Further, system for tracking the improvement of the capability of the local residents, forestry practitioners and other subject of training programs conducted by the Project is not in place.

14. The evaluation of the outcomes and impacts of the Project are based largely on indicators with very limited datasets owing to the short duration on the Project and the inadequate time to monitor and observe the Project sites. Hence the use of the outcomes and impacts of the Project as basis of management and policy decisions should for now be made with caution until further monitoring and observation of the Project sites yield longer time series datasets that will allow the conduct of a more robust evaluation process.
15. The very satisfactory overall rating of the Project notwithstanding, there remains plenty of rooms for improvements of the various activities implemented. These are formulated as recommendations listed below along with the salient outcomes of the Project that may be focal areas of follow up and spinoff projects.

5.2 Recommendations

a. Special arrangements with government agencies such as the BMBFB can be made to allow more flexibility in testing certain technology such as thinning beyond what is allowed by existing laws on the grounds that the results of the studies will be valuable in improving current policies and programs. Specifically, special permit to log beyond the allowable quota could be requested from the government so as to be able to test thinning intensities exceeding beyond logging quota.
b. To complement the top class ecotourism facilities established in Long Mountain Valley, it is recommended that basic services facilities such as adequate and accessible comfort room facilities be built. In addition, more signages will increase the experiential learning opportunities for the visitors. Lastly, there is a need to increase precautionary information to visitors to reduce accidents and enhance the security and safety of visitors especially elementary students.
c. Feedback mechanisms to allow visitors to communicate their satisfaction rating on their experience in the ecotourism facility should be set in place. This could be done onsite by the visitors or online if they so choose. Feedback information gathered from the visitors will be valuable in the improvement of the facilities.
d. For better tracking and evaluation of the effectiveness of capacity building activities, it is recommended that mandatory diagnostic tests prior to the conduct of training be administered to the trainees, and post training assessment be done as a good practice.
e. It is essential that the current knowledge hub be further enhanced such as

by putting in more pictures and maps that could be presented as directory of information available in various parts of the Project sites by simply clicking on that site in the map. Games or tools may also be added such as those that will allow users to estimate the potential increase in water yield as a result of various intensities of thinning.

f. The current monitoring system of the Project need to be redesigned to improve comprehensiveness and generation of robust datasets on:
   i. Climate and microclimate in the Project sites
   ii. Streamflow volume and quality (i.e., sediment yield, temperature, pH, conductivity, total dissolved solids, nitrates, phosphates, pesticide and herbicide residues among others)
   iii. Biodiversity (i.e., flora and fauna)
   iv. Land cover (i.e., ground cover and canopy cover)
   v. Height and diameter of trees
   vi. Date and extent of thinning including species and biometrics of trees cut
   vii. Date and extent of enrichment planting including species and number of trees planted
   viii. Soil properties (i.e., organic matter content, pH, bulk density, nitrogen, phosphorus and potassium among others)
   ix. Non-timber products derived from the Project sites
   x. Number of visitors per Project site

g. To complement the comprehensive monitoring system, a Database and Information Management System should be set in place as repository of all data and information generated from the Project. This system should be designed to ensure security, and to allow quick and easy access of prospective users.

h. In addition to the compilation of policy recommendations at the end of the Project, production of Policy Briefs as new data and information are generated may be prepared and disseminated to policy makers, local governments, academe and other stakeholders.

i. The success in enhancing the participation of the local communities in forest management and ecotourism project should be documented and packaged as a model for applying the engagement and incentive mechanisms that were used in the Project in other areas with similar circumstances as Miyun Watershed.

j. This Project is another proof that grant from APFNet is properly spent

when combined with counterpart funding from implementing agency. It could be a modality that APFNet may implement as the rule rather than an exception.

k. The Project sites have been transformed as a learning and research facilities for forest management and ecotourism development. A network of this kind of learning and research facilities may be considered as a long-term project worthy of financial support from not only the APFNet but also from the government.

l. Another key lesson from this Project is the value of enhancing the capability of local government in playing greater role in forest management by importing expertise and by building the in-house expertise. It is shown in this Project that precise assessment of the gaps in the local expertise is critical to the enlistment of appropriate outside expertise and packaging of responsive trainings and other capacity building programs.

Table 3. Accomplishments of the Project.

Output/Activity	**Target**	**Accomplishment**	**Remark/Problems**
Output 1: Transform 280 ha of monoculture plantations of Pinus tabuliformis and Platycladus orientalis in three project sites (Shitanglu, Schichangyu, and Shidongzi) within Miyun Watershed		101%	283 ha of monoculture plantations were transformed into close-to-nature condition through thinning and enrichment planting
Activity 1.1: Development of 5 year forest management plan of project sites	3 forest management plans (1 per site)	100%	Three 5-year forest management plans were prepared together with land use plans through participatory approach involving the local communities
Activity 1.2: Transform monoculture plantation of Pinus tabuliformis and Platycladus orientalis into mixed forests with broad-leaves species	3 monoculture plantations transformed	100%	Thinning and enrichment planting were done in 3 monoculture plantations of *Pinus tabuliformis* and *Platycladus orientalis* with a total area of 280 ha
Output 2: Improve the livelihood of local community by promoting ecotourism			
Activity 2.1: Formulate an ecotourism plan	1 ecotourism plan	100%	The ecotourism plan was developed for Long Mountain Valley (a small natural village) located within the Shichangyu

			project site in Miyun District
Activity 2.2: Development of tourism infrastructure	Basic ecotourism facilities for	100%	Four main infrastructure facilities for each of the 4 major ecotourism functions, Namely: forest therapy, forest education and experience, agricultural farming practice, and forest research and demonstration were built in Long Mountain Valley
Output 3: Improve capacity of relevant stakeholders in managing forest and ecotourism	Training sessions conducted for 400 participants/session	100%	
Activity 3.1: Training manuals development	3 training manuals (one each for forest management, forest community development, and ecotourism	100%	Training manuals on forest management, forestry community development and ecotourism were developed to improve residents' livelihood in the Miyun Reservoir Watershed, to enhance residents' awareness to protect the environment and to better manage local forests as well as to enhance forests' ecological, economic and social benefits.

Activity 3.2: Training local forest practitioners in the implementation of a long-term forest management plan	10 training programs	100%	More than 10 indoor and outdoor onsite training sessions helped forestry practitioners and local residents who were involved in forest management activities of this project to gain a better understanding of community forest management, pruning, ground preparation, seeding and planting
Activity 3.3: Training of local farmers involved in ecotourism	Several training sessions for local farmers	100%	Training sessions were made for local residents to enhance their awareness forest therapy, forest education and experience, and ecotourism planning in Long Mountain Valley and improve their knowledge and capacity of eco-tourism
Activity 3.4: Arrange domestic and international study tours	___ domestic study tours ___ international study tours		A number of study tours for project staff and relevant consultants were conducted to domestic water source areas, such as Chengdu, Changsha, Xiamen, Danjiangkou, Wuhan, to learn best management practices and gain experience in

			forest management and watershed conservation. Ms. Shen Qianqian was also sent on a study tour to New Brunswick, Canada to learn about forest management, watershed management, public involvement and payments for ecosystem services, forest recreation, etc.
Output 4: Experience and lessons learned summarized and disseminated			
Activity 4.1: Establishment of a knowledge hub for forest management, watershed management, and ecotourism	Web-based Knowledge Hub established	100%	Web-based knowledge hub was developed where the best management practices, experiences gathered from previous BFS projects on forestry and watershed management, and related topics such as establishment of a water fund, eco-tourism etc.
Activity 4.2: Development of Integrated Forest Management Book in Miyun Reservoir Watershed	1 Forest Management Book developed	100%	Experiences from the implementation of the Integrated Forest Management in Miyun Reservoir Watershed were encapsulated in a book

			written and translated into English.
Activity 4.3: Organize workshop	At least 2 workshops	100%	The project organized two workshops in 2016 and 2018. The first workshop was held during the 6th Beijing Forest Forum in October 2016, with a theme of "Forest Therapy and Healthy China." The second workshop was held in June 2018 at Beijing with theme focused on Ecotourism
Activity 4.4: Preparation and submission of policy recommendations to local and Beijing Municipal government agencies	A compilation of policy recommendations submitted to local and Beijing Municipal government	100%	Policy recommendations on forest management focused on the procedures on applying for the logging quota, the importance of forest management planning and the need to subsidize forest management. For ecotourism, the policy recommendations focused on cross-sector cooperation, regional eco-tourism planning, demonstration, capacity building and publicity.

Table 4. Outcomes and impacts of the Project.

Outcome/Impact and Indicator	Before Project	After Project	Remark/Problems
Impact 1: Improved habitat quality of the monoculture plantations of Pinus tabuliformis and Platycladus orientalis in three project sites (Shitanglu, Schichangyu, and Shidongzi)			
Indicator 1.1: Number of tree species in the project sites	Exotic tree species greater in number than native species	Native tree species greater in number than exotic species	Increase in number of native species indicates that the habitat quality of the monoculture plantations are improving through CNF
Indicator 1.2: Number of plant species in the project sites	Shrubs and herbs less before the Project	Shrubs and herbs increased in number after the Project	Increase in shrubs and herbs are indicative of improvement of microclimate in the Project sites as a likely result of the increase in vegetation growth
Impact 2: Improved livelihoods of local community by promoting ecotourism			
Indicator 2.1: Road system	Poor roads and impassable to	Much improved road network	Better roads in the Project sites allow faster transportation of farm products

	transport		
Indicator 2.2: Number of tourists arrival in the project sites	None	More students including local and international visitors are coming	More visitors means increase in opportunities to earn income such as through home stay of visitors for a fee and provision of other basic services to visitors
Impact 3: Improved participation of concerned stakeholders in managing forest and ecotourism			
Indicator 3.1: Number of local farmers involved in forest management and ecotourism	None	13 local residents	Active participation of the local residents could be a result of increased understanding of the importance of forests to their livelihoods and well-being
Indicator 3.2: Number of practitioners visiting the Project sites	None	Many practitioners visited the Project sites during the implementation	It is likely that practitioners who visited the Project sites gained new knowledge and skills on participatory forest management that they may apply in forest management elsewhere
Impact 4: Increase in science-based policies and management of forests			
Indicator 4.1: Number of forums and trainings, and reference materials on science-based forest management	Likely to be minimal	At least 220 received a copy each of the book on Integrated Forest Management; policy recommendations submitted to	This could result to ground swell of advocates for science-based policies and forest management. However changes in policy and management of forests

		local government	normally takes time in response to policy advocacy arising from research results
Indicator 4.2: Number of visitors to the sites for training	Likely few to none	Increase in visitorship to the Project site particularly in Shichangyu for recreation and experiential learning	Experiencing and witnessing first hand the positive results of scientific management of the forests in the Project sites could slowly increase the appreciation of the visiting practitioners of the positive outcomes of the application of science in forest management
Indicator 4.3: Recognition of the Project sites as learning and demonstration areas	None	**Long Mountain Valley** has been recognized by governments as a site for **extra-curriculum programs** for primary and middle school students in Beijing. It has also been listed as a demonstration site for forest therapy in Beijing.	Such recognitions by the government indicates recognition of the Project sites as veritable sources of knowledge and information on good forest management and ecotourism development
Impact 5: Improvement of water conservation capacity of the watershed			
Indicator 5.1: Moisture retention ability of litter cover	Lower moisture retention ability of litter	Increased moisture retention ability of litter	Improved growth of vegetation produces more litter that means more organic matter in the soil that could

			improve the permeability and infiltration capacity in the watershed
Indicator 5.2: Soil water storage capacity	Lower storage capacity	Increased storage capacity	Increased storage capacity of soil could indicate improved soil quality that is conducive for increased vegetation growth that could translate to greater organic matter and improvement of soil and infiltration capacity of the watershed
Impact 6: Reduced water pollution			
Indicator 1: Vegetation cover	Ground cover was sparse	Ground cover vegetation increased	Thinning triggered the growth of suppressed and new plants that could increase the ground cover, enhance the protection of the soil against erosion, and reduce sediment load in the streams
Indicator 2: Herbicides and pesticides use	Local farmers used to apply excessive pesticides and herbicides	Almost stopped using herbicides and pesticides	Enhanced productivity of *Juglans regia* and *Castanea mollissima* without the application of excessive pesticides and herbicides through the use of improved quality of planting materials