

Project Title: CDM Feasibility Study on *Eucommia ulmoides* Reforestation in Henan Province, People's Republic of China

Project Proponent: Hitachi Zosen Corporation

1 Roles of parties engaged with study

- (1) Henan Lingbao Tiandi Technology Corporation: Host country project participants, major project participants of the CDM project activity.
- (2) Academy of Forest Inventory & Planning, State Forestry Administration: Conduct FS and develop report for CDM activity.
- (3) Henan Province Forestry Department: Permit an approval for FSR<sup>1</sup> and EIA<sup>2</sup>.
- (4) Osaka University, Kyushu University and China Northwest A&F University: Corporate study for *Eucommia ulmoides*.
- (5) Local government officials and community representatives in Lushi County, Lingbao City, Zhuyang Town and Wumu Town: Major stakeholders for CDM project activity.
- (6) Smart Energy Co., Ltd.: Advisory body for PDD drafting.

2 Project outline

(1) Summary

This feasibility study examines the viability of 1,700 hectare of *Eucommica ulmoides* plantation project in Sanmenxia City of Henan Province in People's Republic of China (hereafter "Project"). The Project nominated specie as a major planting species based on economic value of the forest products, suitability for the project site's climatic conditions and expected carbon sequestration amounts.

The project location consists from three locations namely, Zhuyang Town, Lingbao City, Wumu Town, Lingbao City and Duguan Town, Lushi County which are locates in Sanmenxia City.

Henan Lingbao Tiandi Technology Corporation is a Chinese private company and is the project participants of the Project (host country's party). The company's major businesses are responsible for plantation activity, sales of forest products.

Hitachi Zosen Corporation is a Japanese private company and is corporate party for the Project and potential buyer of the CERs from the Project. Hitachi Zosen Corporation has been studied a planting techniques of *Eucommica ulmoides* with Henan Lingbao Tiandi Technology Corporation, China Northwest A&F University,

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<sup>1</sup> FSR : Feasibility Study Report

<sup>2</sup> EIA : Environmental Impact Assessment

Osaka University and Kyushu University to optimize planting yield and to utilize by-products of *Eucommia ulmoides*. An advanced plantation techniques and forest management practices would be applied the Project as a product of the past studies of Hitachi Zosen Corporation.

The Project aimed to plant trees in 1,700 hectares of land over three years between 2012 and 2014. Amount of tCERs, issued as a result of the planting activity, estimated at 270,360 t CO<sub>2</sub>-e with annual average of 13,518 t CO<sub>2</sub>-e/y.

## (2) Applied Methodology

AR-AMS0001 Simplified baseline and monitoring methodologies for small-scale A/R CDM project activities implemented on grasslands or croplands with limited displacement of pre-project activities (Ver.6.0)

## 3 Method of Study

### (1) Outstanding topics to be studies in the program

Prior to conduct this feasibility study program, Hitachi Zosen Corporation conducted a basic study for project background and a prospect of project as a CDM project activity.

- Biomass amount study for existing plant

Project sites have a vegetation of shrubs and a land cover grasses. The prior study measures carbon sequester amount of these vegetations. Above and below ground biomass pools are major sources of carbon pool for this Project activity. For above-ground biomass pool, tree, non-tree vegetations' biomass and for below-ground biomass, roots of tree and non-tree biomass amount are to be estimated. Dead wood, Litter and Soil organic carbon are regarded as a negligible for this Project in accordance with an applied methodology.

- Biomass Sequestered amount research for *Eucommia ulmoides*

A major parameters employed for carbon sequestration including, Root/Shoot Ratio, Basic Wood Density and BEF<sup>3</sup> are encouraged to use regional or nationally accepted values. However, values for intended species are not yet released nor studies in the past. To fulfill an absence of appropriate values, the Project applied values actually measured by Kyushu University for similar study. The Project will compare with IPCC's default value and examine rationality an applications.

- Additionality

The Project will prove its additionality with regard to investment barrier, namely internal rate of return of the Project. The project sites locate in the region based on agriculture where mean annual income of households are relatively low. Financial

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<sup>3</sup> BEF : Biomass Expansion Factor

institutions in the region do not have sufficient financial capabilities to provide loans to long-term investment projects like plantation. The Project intends to prove financial additionality in comparison with the Chinese Forest Industry's investment decision benchmarks which set at 8% in (Economic Evaluation Method and Parameters for Construction Projects (version 03)) through collection of supplemented dataset.

- Contributions for regional community and residents' sustainable development  
Small scale sequestration project are needed to engage with project sites' neighboring low-income community. The study has to examine an engagement of low-income community for the sustainable development practices for the community.

#### 4 Contents of Study

The program consists from basic study, on-site-survey, baseline biomass survey and examining methodology application.

##### (1) Basic Study

Prior to the project study, Hitachi Zosen Corporation consulted with local counter-party and CDM advisory bodies to conduct basic study and to formulate project scheme. Basic study includes understanding project' background, local counter-party's identification and informal consultation with host country's responsible governing bodies.

- Understand project's background

The Project sites locate three sites neighboring Sanmenxia City of Henan Province with total area of 1,700 hectare. Through on-site survey and hearing to regional government & resident clarified that the project site was not forest land, and that proposed project could be additional and enable to draw baseline scenario accordingly. The group recognized necessity of detailed studies aiming to implement CDM project activity with respect to methodology selection, developing baseline scenario, estimation of project emissions, and project economy.

- Identify local counter-party

Hitachi Zosen Corporation visited the local counter-party several times to exchange information and formulate project scheme with the party. The counter-party, Henan Lingbao Tiandi Technology Corporation, expects the project turned to be CDM and generates CER sales revenue to supplement their plantation program's expenses. On basis of this understanding, the counter-party expresses their interest to cooperate this Project's execution.

- Informal consultation with host government

Hitachi Zosen Corporation had an informal discussion with the host country

government's officer in charge of this CDM project with respect to international context of sink CDM project's trend and outstanding issues and troubles. Hitachi Zosen Corporation also discuss with the process of obtaining the host country's Letter of Acceptance and confirm the documents to be submitted for the Project. Throughout the meetings, the party received some positive feedbacks from the Chinese government and was particularly pointed out that forestry project is highly prioritized project within Chinese policy thus offered any necessary assistance for progresses of the Project.

## (2) On-site Survey

Hitachi Zosen Corporation and Smart Energy Co., Ltd. had conducted an on-site survey from 10 October through 15 October, 2010.

- Visit to site location

To develop Feasibility Study report, the party visited three project location sites with Academy of Forest Inventory & Planning, State Forestry Administration and conduct study of follows;

Study of current vegetation, GPS information collection for plant location, boundary design, eligibility of land and hearing to local residents.

- Baseline biomass research

The group collects current vegetation in the project site and measured biomass stock of above and below ground for the sake of baseline carbon stock data.

- Data collection for planting species

The planned planting species, *Eucommia ulmoides*, is a primordial species and its data shall be furnished by local parties, Chinese academia did not explore carbon sequestration potential of the species thus national default value was not set. Osaka University and Kyushu University conducted carbon sequester amount of *Eucommia ulmoides* tree and obtained dataset. During on-site survey, the team collected a set of samples of above/below biomass of *Eucommia ulmoides* to measure tall medium and low height *Eucommia ulmoides* trees. The results of biomass measurement enables the Project to measure the carbon sequester amount of below-and above ground biomass and usable as a database for the Project. The party has not yet come to the conclusion either applying the data or IPCC's default value to draft PDD, the decision will be made from the principle of conservativeness.

- Stakeholder meeting

The stakeholder meeting was hosted by Hitachi Zosen Corporation during on-site survey. Hitachi Zosen Corporation, Smart Energy CO., Ltd and Henan Lingbao Tiandi Technology Corporation explained project outline and function of CDM project. The

comments collected from local people with regard to the Project.

(3) **Baseline biomass Sequestered amount**

Throughout this study, the party conduct sampling survey with Academy of Forest Inventory & Planning, State Forestry Administration for current vegetation in order to measure above/below ground biomass. The actual measurement shows baseline biomass amount's basic data for the sake of drafting FSR & PDD.

(4) **Methodologies**

Initially, the Project's designed sequestered amount of net anthropogenic GHG removals by sinks reaches 24,000 tCO<sub>2</sub>/year which exceeds 16,000 tCO<sub>2</sub>/year and uses AR-ACM0001: Afforestation and reforestation of degraded land (Version 5.0.0).

Based on the discussion with the local counterpart, Henan Lingbao Tiandi Technology Corporation, and the measurement result of the amount of the baseline biomass, the small-scale methodology AR-AMS0001 (Simplified baseline and monitoring methodologies for small-scale A/R CDM project activities implemented on grasslands or croplands with limited displacement of pre-project activities (Ver.6.0)) was decided to be adopted.

The main reason as follow:

- Reduction of the project scale

Initially, the Project's designed the project scale about 1,960 hectares. Considering the amount of the initial investment cost, forestry management and monitoring cost, the Project scale was changed to 1,700 hectares.

- Decrease of the average amount of net anthropogenic GHG removals by sinks

Smart Energy Co., Ltd. and Academy of Forest Inventory & Planning, State Forestry Administration collected current vegetation in the project site and measured biomass stock of above and below ground for the sake of baseline carbon stock data. As a result, the amount of baseline net GHG removals by sinks was higher than the estimation, and the amount of net anthropogenic GHG removals by sinks falling below 16,000 t CO<sub>2</sub>-e/year.

5 **Results of Study for CDM implementation**

(1) **Baseline Scenario & Project Boundary**

- Project baseline scenario

Baseline scenario for the Project would be drawn based on AR-AMS0001 and applied a description of the methodology which is; "the land-use prior to the implementation of the project activity, either grasslands or croplands."

The on-site survey identified the local vegetation of the project site is barren grassland

and mostly covered by shrubs and grasses. Partially identify trees, however, the percentage of crown cover is less than 20% and tree height is less than 2m which does not satisfy Chinese government's forest description. The survey also clarified the site was not forest at the time of 1989. Regional authority tried to plant trees to recover forestation at the Project site to prohibit illegal grazing and illegal fire-wood collection activity. The measure was ineffective due to financial shortage and results in barren land.

On-site survey identify that the project site is barren land covered with grass and shrubs which is similar to vicinity.

- Project Boundary

The project sites locates in Sanmenxia City, Henan Province with three individual project sites which are; #1 Zhuyang Town, Lingbao City, #2 Wumu Town, Lingbao City and #3 Duguan Town, Lushi County. Geographical data of the project boundary describes in following table.

**Table 1: District involved and location of the Project**

District Number	County/City	Country/Town	Land Evaluation	Geography Coordinate	Area (ha)
1	Lingbao City	Zhuyang Town	Degraded grassland	34°23'21"~ 34°23'21"N 110°43'20"~ 110°45'E	240
2	Lingbao City	Wumu Town	Degraded grassland	34°24'49"~ 34°26'24"N 110°43'59"~ 110°46'18"E	493.3
3	Lushi County	Duguan Town	Degraded grassland	34°16'11"~ 34°19'54"N 110°51'3"~ 110°52'47"E	966.7

- Application of methodology

The Project satisfies applicability condition of envisaged methodology as follows;

**Table 2: Meth applicability conditions**

Applicability	AR-AMS0001 (Version 5)	Project Activity
1	Project activities are implemented on grasslands or croplands;	All of the three project sites are grasslands.
2	Project activities are implemented on lands where the area of the cropland within the project boundary displaced due to the project activity is less than 50 per cent of the total project area;	All of the three project sites are grasslands, and not the cropland.

Applicability	AR-AMS0001 (Version 5)	Project Activity
3	Project activities are implemented on lands where the number of displaced grazing animals is less than 50 per cent of the average grazing capacity of the project area;	Pasturing is prohibited, due to the project area have been closed for environment conservation by local government. There are few local residents who pasture it in the project area now.
4	Project activities are implemented on lands where $\leq 10\%$ of the total surface project area is disturbed as result of soil preparation for planting.	There will be no disturbance activity in the project activity.

- Baseline Emissions

The amount of ex ante baseline net GHG removals by sinks is calculated as a sum of carbon pool within project boundary.

Baseline GHG removal are calculated as below:

$$B_{(t)} = (B_{A(t)} + B_{B(t)}) * A \quad (1)$$

Where:

$B_{(t)}$  = carbon stocks in the living biomass pools within the project boundary in absence of the project activity (t C);

$B_{A(t)}$  = carbon stocks in above-ground biomass at time t in the absence of the project activity (t C/ha)

$B_{B(t)}$  = carbon stocks in below-ground biomass at time t in the absence of the project activity (t C/ha)

$A$  = project activity area that is additional (ha)

For above-ground biomass:

$$B_{A(t)} = M_{(t)} * 0.5 \quad (2)$$

$$M_{(t)} = M_{woody(t=0)} \quad (3)$$

Where:

$M_{(t)}$  = above-ground biomass at time t that would have occurred in the absence of the project activity (t d.m./ha).

$M_{woody(t)}$  = above-ground biomass of woody perennials at time t that would have occurred in the absence of the project activity (t d.m./ha).

As the result of preliminary samples study by experts from State Forestry Administration, the above ground biomass stocks for woody perennials (absolute dried

weight) within 15 samples were 1551.75g, which means  $(1551.75/15/2)= 51.7\text{g d.m./m}^2$ , and  $M_{woody(t=0)}= 0.52 \text{ t d.m./ha}$   
 Therefore,  $B_{A(t=0)} = 0.52*0.5= 0.26 \text{ t C/ha}$

For belowground biomass:

$$B_{B(t=0)} = B_{B(t)} = 0.5*(M_{grass} + M_{woody}) \quad (4)$$

Where:

$M_{grass}$  = belowground biomass in grass on grassland at time t that would have occurred in absence of the project activity (t C/ha)

$M_{woody}$  = belowground biomass of woody perennials at time t that would have occurred in absence of the project activity (t C/ha)

As the results of samples study by experts from State Forestry Administration, the below ground biomass stocks for woody perennials and grass (absolute dried weight) were:

$$M_{woody} = 1768.9/15/2= 59.0\text{g d.m./m}^2 = 0.59 \text{ t d.m./ha};$$

$$M_{grass} = 1914.5/15/2= 63.8\text{g d.m./m}^2 = 0.64 \text{ t d.m./ha};$$

Therefore,  $B_{B(t=0)} = 0.5*(0.59+0.64) = 0.62 \text{ tC/ha}$ , and

$$B_{B(t=0)} = B_{A(t=0)} + B_{B(t=0)} = 0.26+0.62= 0.88\text{tC/ha}.$$

The baseline net GHG removals by sinks are calculated using:

$$\Delta C_{BSL,t} = (B_{(t)} - B_{(t-1)})*(44/12) \quad (5)$$

Where:

$\Delta C_{BSL,t}$  = baseline net GHG removals by sinks (t CO<sub>2</sub>-e)

$B_{(t)}$  = carbon stocks in the living biomass pools within the project boundary at time t in the absence of the project activity (t C)

Since the changes in biomass stock of natural vegetation are except to be zero in the absence of the project activity,  $B_{(t)}$  is constant.

Therefore:

$$\Delta C_{BSL,t} = 0$$



**Table 3: Estimation of the ex ante baseline net GHG removals by sinks**

<i>Year</i>	$C_{BSL,t=0}$ [t-CO <sub>2</sub> -e]	$\Delta C_{BSL,t}$ [t-CO <sub>2</sub> -e/y]
2012	5,485	5,485
2013	5,485	0
2014	5,485	0
2015	5,485	0
2016	5,485	0
2017	5,485	0
2018	5,485	0
2019	5,485	0
2020	5,485	0
2021	5,485	0
2022	5,485	0
2023	5,485	0
2024	5,485	0
2025	5,485	0
2026	5,485	0
2027	5,485	0
2028	5,485	0
2029	5,485	0
2030	5,485	0
2031	5,485	0

**(2) Project Emission**

As described in AMS001, for the ex ante calculation of the project biomass, the project should be stratified according to the project planting plan that is, at least by tree species (or groups of them if several tree species have similar habits), and age classes. The planting plan on different site types of the project activity is listed as below:

**Table 4: The planting plan on different site types of the project activity**

<b>Tree specie</b>	<b>Land Type</b>	<b>Land Preparation</b>	<b>Planting Density</b>	<b>Fertilize</b>	<b>Seedling Age</b>
<i>Eucommia ulmoides</i> <i>Oliver</i>	top of sun slope	1*1*0.8m	4*4.5m	5-6kg fertilizer per tree	2 years' first-class seedling
	top of shade slope				
	underneath of sun slope	1*1*1m	4*4m	4-5kg fertilizer per tree	
underneath of shade slope					
	table land		4*5m		
<i>Pinus tabuliformis</i>	any	1*1*0.8m	2*3m	0.5kg fertilizer per tree	

And the project area should be stratified for calculating ex-ante actual net GHG removal by tree species and their age class.

**Table 5: The project area for each stratum area**

Ex-ante stratified				
Stratum Number	Tree Species	Age Class	Hectare	Area %
1	<i>Eucommia ulmoides</i> Oliver	2012	510	30%
2	<i>Eucommia ulmoides</i> Oliver	2013	510	30%
3	<i>Eucommia ulmoides</i> Oliver	2014	510	30%
4	<i>Pinus tabuliformis</i>	2012	56.7	3.3%
5	<i>Pinus tabuliformis</i>	2013	56.7	3.3%
6	<i>Pinus tabuliformis</i>	2014	56.7	3.3%
<b>Total</b>			1,700	100%

The Ex-ante GHG removal are calculated as below:

$$N_{(t)} = (N_{A(t)i} + N_{B(t)i}) * A_i \quad (6)$$

Where:

$N_{(t)}$  = total carbon stocks in biomass at time t under the project scenario (t C)

$N_{A(t)i}$  = carbon stocks in above-ground biomass at time t of stratum i under the project scenario (t C/ha)

$N_{B(t)i}$  = carbon stocks in below-ground biomass at time t of stratum i under the project scenario (t C/ha)

$A_i$  = project activity area of stratum i (ha)

$i$  = stratum i (i = total number of strata)

For above-ground biomass,  $NA(t)i$  is calculated per stratum i as follows:

$$N_{A(t)i} = T_{(t)i} * 0.5 \quad (7)$$

Where:

$T_{(t)i}$  = above-ground biomass at time t under the project scenario (t d.m./ha)

0.5 = carbon fraction of dry matter (t C/t d.m.)

For below-ground biomass,  $N_{B(t)i}$  is calculated per stratum i as follows:

$$N_{B(t)i} = \exp(-1.085 + 0.9256 * \ln T_{(t)i}) * 0.5 \quad (8)$$

Where:

$N_{B(t)i}$  = Carbon stocks in below-ground biomass at time t achieved by the project activity during the monitoring interval (t C/ha)

$T_{(t)i}$  = Estimate of above-ground biomass at time t achieved by the project activity (t d.m./ha)

0.5 = Carbon fraction of dry matter (t C/t d.m.)

The removal component of actual net GHG removals by sinks can be calculated by:

$$\Delta C_{PROJ,t} = (N_{(t)} - N_{(t-1)}) * (44/12) / \Delta t \quad (9)$$

Where:

$\Delta C_{PROJ,t}$  = Removal component of actual net GHG removals by sinks per annum (t CO<sub>2</sub>-e/year)

$N_{(t)}$  = Total carbon stocks in biomass at time t under the project scenario (t C)

$\Delta t$  = Time increment = 1 (year)

Project emissions are considered insignificant and therefore:

$$GHG_{PROJ,t} = 0$$

The ex ante actual net green gas removals by sinks in year t are equal to:

$$\Delta C_{ACTUAL,t} = \Delta C_{PROJ,t} - GHG_{PROJ,t} \quad (10)$$

Where:

$\Delta C_{ACTUAL,t}$  = Ex ante actual net greenhouse gas removals by sinks in year t (t CO<sub>2</sub>-e/year)

$GHG_{PROJ,t}$  = Project emissions (t CO<sub>2</sub>-e/year)

Since project emissions are considered insignificant, therefore,

$$\Delta C_{ACTUAL,t} = \Delta C_{PROJ,t}$$

### (3) Monitoring Plan

The project owner will establish a vocation department to supervise and monitor the project activity. The project owner will monitor the verifiable changes in carbon stock in the carbon pools as table 5.

To ensure data integrity and correctness, following QA/QC procedures are implemented.

- Data and information collection
  - ✓ Before monitoring starts, the Project nominates responsible person and person in charge for each procedure with furnishing an appropriate training for each task. The training includes data collection procedures and data analysis procedures. The training aimed to promote staff's understandings on each procedure.

**Table 6: Data to be collected or used in order to monitor the verifiable changes in carbon stock in the carbon pools**

Data variable	Source of data	Data unit	Measured calculated or estimated	Recording frequency (years)	Proportion of data to be monitored	Archiving	Comment
Location of the areas where the project activity has been implemented	Field survey or cadastral information or aerial photographs or satellite imagery	latitude and longitude	Measured	5	100 percent	Electronic, paper, photos	GPS can be used for field survey
Size of the areas where the project activity has been implemented for each type of strata	Field survey or cadastral information or aerial Photographs or satellite imagery or GPS	ha	Measured	5	100 percent	Electronic, paper, photos	GPS can be used for field survey
Location of the permanent sample plots	Project maps and project design	Latitude and longitude	Defined	5	100 percent	Electronic, paper	Plot location is registered with a GPS and marked on the map
Diameter of tree at breast height	Permanent plot	cm	Measured	5	Each tree in the sample plot	Electronic, paper	Measure diameter at breast height ( <i>DBH</i> ) for each tree that falls within the sample plot and applies to size limits
Height of tree	Permanent plot	m	Measured	5	Each tree in the sample plot	Electronic, paper	Measure height ( <i>H</i> ) for each tree that falls within the sample plot and applies to size limits
Basic wood density	Literature	tonnes of dry matter per m <sup>3</sup> fresh volume	Estimated	Once		Electronic paper	
Total CO <sub>2</sub>	Project activity	Mg	Calculated	5	All project data	Electronic	Based on data collected from all plots and carbon pools
Ownership of land	Legal agreements supplied by landowners	Land tenure and carbon rights	Calculated	Each monitoring period	100 percent	Electronic and paper	

- ✓ Staffs in charge of monitoring activity shall have through understanding over the monitoring procedures including, duration, timing, and items to be recorded to furnish monitoring report for the review of technical department of the Project. Technical department shall review the monitoring report accordingly.
- Data monitoring
  - ✓ For the sake of data re-collection, 15% of all sample plots are extracted as a sample.
  - ✓ Monitoring data includes a location data of sample plot, DBH and tree height.
  - ✓ Initial measurement data and re-measured data are compared and record deviations. If the deviation exceeds 5% thresholds, data collection and reporting of deviation analysis are to be presented.
  - ✓ To avoid human error, collected data are monitored and checked by technical person who has a capability to make technical judgment.
  - ✓ Data are archived with electronic and paper record, for documented data; initial monitored data and its report, calculation format, monitoring report and backup file.

Henan Lingbao Tiandi Technology Corporation, local counter-party of the Project, has been planting *Eucommia ulmoides* since 1994 and plantation techniques are confirmed. The company developed forest management technology and exchange information, propagate its skills through inter-net. To implement the Project, the company established a special purpose company aimed to operate project and hire a staff focused on forest management with training furnished.

To monitor net anthropogenic sequestered amount, the Project intended to establish training department to provide appropriate training for project monitoring, operation of GPS, and other tools for operations. To maintain data integrity, technical department will responsible for local staff training.

#### (4) GHG Sequestered Amount

Net anthropogenic GHG removals by sinks is given by

$$ER_{AR CDM, t} = \Delta C_{PROJ, t} - \Delta C_{BSL, t} - GHG_{PROJ, t} - L_t \quad (11)$$

Where:

$ER_{AR CDM, t}$  = net anthropogenic GHG removals by sinks (t CO<sub>2</sub>-e / y)

$\Delta C_{PROJ, t}$  = project GHG removals by sinks at time t (t CO<sub>2</sub>-e / y)

$\Delta C_{BSL,t}$  = baseline net GHG removals by sinks (t CO<sub>2</sub>-e / y)

$GHG_{PROJ,t}$  (=0)= project emissions (t CO<sub>2</sub>-e / y)

$L_t$ (= 0)=leakage from project (t CO<sub>2</sub>e/y)

Therefore;

Net anthropogenic GHG removals by sinks of GHG is as follows

**Table 7: Estimation of net anthropogenic GHG removals by sinks**

<i>Year</i>	$\Delta C_{PROJ,t}$ [t CO <sub>2</sub> -e/year]	$\Delta C_{BSL,t}$ [t CO <sub>2</sub> -e/year]	$GHG_{PROJ,t}$ [t CO <sub>2</sub> -e/year]	$L_t$ [t CO <sub>2</sub> -e/year]	$ER_{AR CDM,t}$ [t CO <sub>2</sub> -e/year]
2012	4,882	5,485	0	0	-604
2013	9,657	0	0	0	9,657
2014	14,405	0	0	0	14,405
2015	14,262	0	0	0	14,262
2016	14,230	0	0	0	14,230
2017	14,235	0	0	0	14,235
2018	14,264	0	0	0	14,264
2019	14,310	0	0	0	14,310
2020	14,367	0	0	0	14,367
2021	14,430	0	0	0	14,430
2022	14,494	0	0	0	14,494
2023	14,556	0	0	0	14,556
2024	14,611	0	0	0	14,611
2025	14,659	0	0	0	14,659
2026	14,698	0	0	0	14,698
2027	14,728	0	0	0	14,728
2028	14,749	0	0	0	14,749
2029	14,764	0	0	0	14,764
2030	14,771	0	0	0	14,771
2031	14,774	0	0	0	14,774
<i>total</i>	275,846	5,485	0	0	270,360

(5) Project Duration

The Project is still at the planning stage and has not yet been implemented. Project starting date shall be defined as the date to start project investment. Therefore, either one of the earliest date will be chosen to determine project starting date, date of order of major equipment, date of order an civil works, date of agreement for bank loan and date of agreement for land lease.

Project duration can be chosen from following with project participants' preference.

- tCER: 20 years with 2 renewals (maximum 60 years)
- ICER: 30 years without renewal

This Project chooses tCER of 20 years and chooses 60 years with twice renewal fro crediting period. The first crediting period will set 20 years between 2012 and 2031.

## (6) Environment Impact and other indirect impact

The Project proposed at the site where serious soil erosions are observed. The Project is expected to increase forest density to decelerate erosion and other positive effects as follows;

- Cultivation of biodiversity

The Project increases the tree density and coverage of forest in the area. The project sites are mostly barren land, however, increase forest density further encourages the wild animals' habitation whereby exists. Implementation of the project generates job opportunities of local people and improves income level of the community. These households' economy improvement reduces the chances of illegal firewood collections or logging activity which endanger overall biodiversity of the project area.

- Reduce soil erosion

Decelerate soil erosion improve the watershed character of the area. The area designated as the watershed protection area of western Henan province. The steep and characteristic requires full awareness on appropriate forest planning and forest management plan. Proposed planting species, *Eucommia ulmoides* has a character to extend its roots at shallow but wider area compare to other native species. The Project enables to monitor planting activities' effect to avoid soil erosion applying Universal Soil Loss Equation: USLE, developed by U.S. Dept of Agriculture.

For the social aspects, the *Eucommia ulmoides* plantation enables the community to expand the production of *Eucommia ulmoides* by-products including leaves, tea and other commercial value products. *Eucommia ulmoides* made into pharmaceutical products and related industry could be flourished in the region. Plantation management and forest management requires intensive labor forces from local community which could generates job opportunities to the society and further stabilize the regional economy. Henan Lingbao Tiandi Technology Corporation will invest in improvement of planting technologies to attain superior product quality and growth rate of the trees. The Project is expected to be a model case of plantation activities in the region. A successful implementation of the Project could propagate forest management skills and utilization of bi-products in the region through planned training provided by project proponents.

## (7) Stakeholders' Comments

The Project conducts a physical interview and collection of comments from identified stakeholders for the proposed plantation project. Procedures and received comments

are summarized as follows;

- Establishment of working group

To conduct field survey for collecting comments from local stakeholders, the Project establish a working group consists from regional government authorities, forest managers, representative of resident and engineering parsons for bi-product usage.

- Announcement of public hearing

Working group made a leaflet and poster to notify project outline and overall function of the Project. Leaflet also explain how proposed project trigger social and environmental consequences to the local society.

- Interview and information gathering

Research person from the working group conduct an interview to all towns and villages locates in the proposed project sites. During the interview, he interviewee optionally chooses outstanding stakeholders' in the site and brief about the Project. The session was interactive and interviewee received a comments, suggestions and opinions and kept in record. To supplement optional nomination of the interview, comments are received through post set up in villages in the project site. Further stakeholder meeting held on October 15<sup>th</sup>.

- Stakeholder meeting

One month prior to the stakeholder meeting, Henan Lingbao Tiandi Technology Corporation placed an announcement to held stakeholder meeting. Working group members are encouraged town/village representatives and forest industry people to engage with the meeting. During the session, the project outlines was briefed and further explain environmental and social impacts envisaged from project implementation. The meeting was recorded as a minutes of the stakeholder meeting and shared among attendees.

Major comments and opinions received during the meeting are as follows;

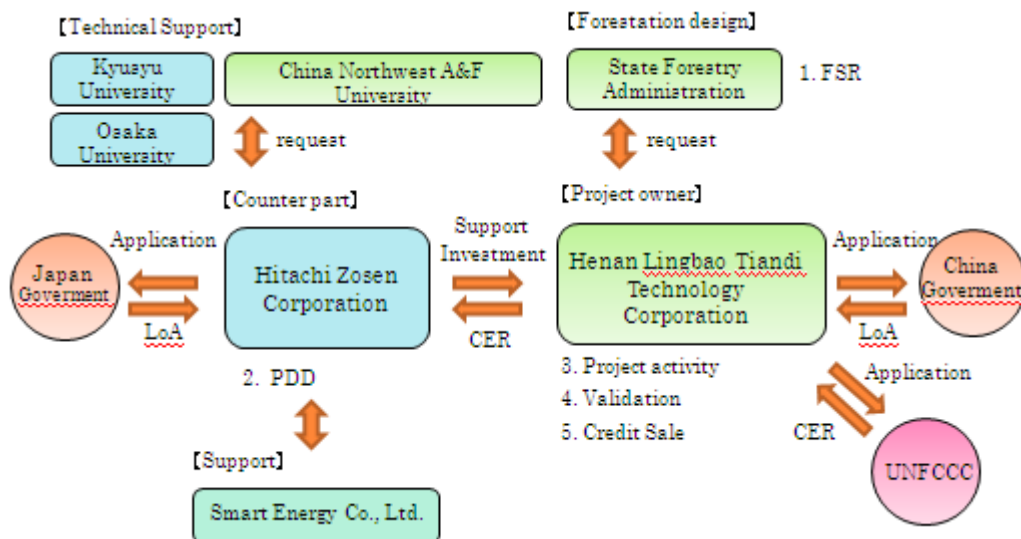
- ✓ The village hopes the Project brings job opportunities. (Representative of local residents)
- ✓ Local residents are willing to participating project to learn advanced forest management practices to propagate small scale forest management in neighboring area. (Representative of local residents)
- ✓ Local government hopes the Project improves local economy with an income generation and recovers regional government's balance of payment. (Local government's representative)
- ✓ The plantation project increases the forest coverage of the area and prevents natural disaster caused by soil erosion and degradation of the mountainous region.



(Representative of regional government)

(8) Project Formation

Project participants of the Project are Henan Lingbao Tiandi Technology Corporation and Hitachi Zosen Corporation. Hitachi Zosen Corporation is an expected buyer of the credit and also is responsible for coordination between local counterpart, planning, data provision for PDD drafting. Henan Lingbao Tiandi Technology Corporation is a participant of project host country and is responsible for local administration of investment, forest management and engage with provincial and local government's representatives. Smart Energy Co., Ltd. provides advises to the parties whereby needed and assist PDD development, obtaining approval letters from both governments. Upon project starting CDM processes, it assists due processes for CDM, i.e. validation, and registration processes etc.



**Figure 1: Project scheme**

Academic organizations, including Kyushu University, Osaka University and China Northwestern Agricultural University provides botanical data required for project design. The project scheme was showed on the following figure.

(9) Financial Plan

Total investment costs reaches RMB<sup>4</sup> 37.65 million, among which includes RMB 34.96 million of construction costs. The Project planned to loan 50% of project costs from local banks with interest costs RMB 1.64 million and cash capital of RMB 1.05 million. Henan Lingbao Tiandi Technology Corporation will acquire RMB 20.17

<sup>4</sup> RMB: Rénmínbì, CNY

million (53.6% of total project costs) and lend from local banks with RMB 17.48 million (46.4% ditto). In case these projections are not accepted by local banks, the party may consider either subsidies program by the international financial institutions, government's subsidies programs and/or a loan arrangement under the name of Hitachi Zosen Corporation.

#### (10) Project Economy Assessment

Project's initial investment reaches RMB 34.69 million which includes forestation, civil works for roads and other costs. Forestry consists from leveling, drilling for plantation, watering, fertilizer application and seedling, thus the costs reaches 68.34% of total investment value RMB 23.89 million. The Project proposed to plant two species which are *Eucommia ulmoides* and *Pinus tabuliformis*, although *Eucommia ulmoides* requires sophisticated planting technology and seedlings are expensive compared to pine trees.

While revenue-side, the Project relies on sales of by-products of *Eucommia ulmoides*. By-products can be harvested from age 5 and its yield projected at 150kg/ha. The yield improves every year and full harvest is expected on age 15 with 1,500kg/ha. At the time of this research, 2010, the seed worth RMB 10.8 per kg, and annual revenue from seed sales are expected at RMB 24.79 million per year.

Chinese forest industry's IRR benchmark is set at 8.00%. For the Project, with an absence of credit sales, the IRR is calculated at 5.94% (EAT) and lower than national benchmark. If the project counts credit sales, IRR improves to 6.91% and 7.88%, for the unit price of US\$ 5.00 and US\$ 10.00 per ton of CER respectively.

It is, therefore, fair to assume that the turning project into CDM will improve project economy and realize loan arrangement from local financial institutions. The credit revenues are utilized for forest maintenance and project's continuousness.

#### (11) Additionality Analysis

Project's additionality will be proven with an application of "Tool for the demonstration and assessment of additionality".

- Investment barrier

As per explained previous sections, unit area cost of investment for *Eucommia ulmoides* is far more expensive than common planting species. The logic is also applicable for forest management costs. *Eucommia ulmoides* planted widely from 1980s to 1990s and result in over-supply in pharmaceutical market. Demand for *Eucommia ulmoides* tree as pharmaceutical products are limited to the band of age 20 to 25, thus newly planted *Eucommia ulmoides* will hardly be productive instantly. The

proposed project's sites are located where agriculture are the major industry and household income levels are relatively low. Overall, the business climate of the region is not suitable for newly startup plantation activity or acquiring financial institutions to consider loan arrangements.

- Technology barrier

The Project proposed in steep mountainous area and local forest management practices could not overcome this topographical condition. There are little successful planting project in the region until today.

- Common practice barrier

Historically, the area relied on mining industry and not many companies are engaged with forestry or timber industry. The skilled person for plantation and/or forest management is short and hard to hire skilled people with stable manner.

#### (12) Implementation Plan

The immediate hurdle for the Project is fund-raising. As described previously, the project participants are exploring local bank's loan arrangement, however, where the negotiations unable to find solutions, other external funding sources are explored. Upon clarifying funding issues the Project could easily take off.

#### 5 Validation

The Project has not received validation. The nomination of DOE is, however, underway. Considering experiences and registration record, the Party prioritize JACO CDM as the first candidate DOE.

#### 6 Co-benefit Impact

The Project performed research over numerical measurement of soil erosion and quantitative measurement of improvement of biodiversity through project implementation. Since the Project, itself has a multiple positive impacts regardless directly or indirectly to the society, the co-benefit measurement as outline in the "Co-benefit Quantitative Measurement" Manual.

#### 7 Contribution for sustainable development

China has been experiencing serious inhibition over agriculture and other human activities of its major river system of Yellow River and Yantze River. In light of these situations, Japanese government provided a fund like Obuchi Foundation to prevent expansion of desertification of inland China. To back off these phenomenons, voluntary participation of

local residents with evident incentives to tackle with disastrous situation is important. There are so many failures in the field where failed to achieve local people's continuous support to the program and failed to manage sustainable forest. Based on these experiences the Project is willing to share the forest products with the local communities and create incentive for local people to actively engage with protection of the forest. The Project is unique in that the value added process is integrated and further encouraged the community development through skill development.

Even through the Project is "sink" CDM and not presumed technology transfer, plantation techniques and high-value products production processes are integral. Technology owner, Hitachi Zosen Corporation involves in the Project so deeply that Project can go beyond conventional "sink" project. The Project will dedicate to the Chinese sustainable development through following functions. First, the native species *Eucommia ulmoides* could easily adopt local climate and reduce disaster risks by improving water-shed and stabilize agricultural activities. Second, Hitachi Zosen Corporation's technology is an established technology and improves rural Chinese economy by transferring technology. Lastly, the Project involves Chinese local communities to be eligible for small scale sink CDM project.

- The Project will invite project sites' responsible person for key role of the project vehicle and seek advice based on operation of the organization and local practices.
- Periodical training session would be held and conduct training session with regard to forest management and epidemics. The improved forest management skills could be applicable for other small scale commercial plantations operated by farmers and further improve the local economy.
- The Project will engage with local schools to seek corporation for field survey and enlighten for global warming issues for locals. While the Project open for regional corporate entities to join for philanthropic activities in systematic way.

These activities will not only giving economical improvement but regional sustainable development and awareness improvement for future.