

**CDM Feasibility Study a(FS) 2012  
Final Report**

**Programme to Reduce Non-Renewable Biomass Consumptions through  
Introduction of High-Efficiency Cook Stoves**

**(Implemented by Tepia Corporation Japan Co., Ltd.)**

<b>FS Partner(s)</b>	<p>&lt;Japan&gt; ALCEDO corporation; Japan Quality Assurance Organization</p> <p>&lt;Nepal&gt; Subhalakshya Developers Pvt. Ltd.; Department of Mechanical Engineering, Kathmandu University</p>
<b>Location of Project Activity</b>	Federal Democratic Republic of Nepal
<b>Category of Project Activity</b>	Energy Efficiency Improvement
<b>Targeted GHG</b>	CO <sub>2</sub>
<b>Description of Project Activity</b>	The PoA aims to reduce the non-renewable biomass (NRB) consumption by introducing the highly efficient cooking appliance named high-efficiency cook stove (HCS) to the households in Nepal. The HCS consumes less quantity of wood fuel than the traditional cook stove (TCS), so that it would result in the reduction of NRB. Thus the PoA achieves the emission reduction of GHG as well as the decrease of smoke and the efficient use of forest resources.
<b>Methodology to be applied</b>	AMS-II.G (ver.05.0): “Energy efficiency measures in thermal applications of non-renewable biomass”
<b>Baseline Scenario</b>	According to AMS-II.G, the baseline scenario is the use of fossil fuel for meeting similar thermal energy needs of the households included in the CPA, PoA. Without the project implementation, a large quantity of NRB would have been continuously consumed. Owing to the high efficiency of HCS, the consumption of wood fuel is reduced and accordingly, the corresponding amount of fossil fuel for generating the same energy contained in NRB.
<b>Monitoring Plan</b>	<p>The following 3 parameters are to be monitored during the crediting period.</p> <ul style="list-style-type: none"> <li>▪ <math>N_y</math> : Number of project devices that are operating in year y</li> <li>▪ <math>\eta_{new}</math> : Efficiency of the device being deployed as part of the project activity in year y</li> <li>▪ <math>f_{NRB,y}</math> : Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass</li> </ul> <p>60 households per each CPA are randomly chosen and done telephone survey as a preliminary survey for cluster sampling survey every year. The result is used for choosing the number of sampling households where the efficiency</p>

	test of HCS (water boiling test; WBT) is carried out. The share of NRB is applied the latest approved value by the Nepalese DNA.
<b>Estimation of GHG Emission Reductions</b>	The estimated emission reduction of CPA-1 is as follows. Annual: 1,887 tCO <sub>2</sub> e Total during the crediting period: 18,868 tCO <sub>2</sub> e
<b>Duration of Project Activity/ Crediting Period</b>	Duration of PoA: 28 years Crediting period of each CPA: 10 years (* The crediting period of CPA-1 is planned to be started from 1/1/2014.)
<b>Environmental Impact Analysis</b>	The environmental impact analysis is carried out at the PoA level. The qualitative analysis against the following 3 fields is conducted in this survey. <ul style="list-style-type: none"> <li>▪ Indoor air quality</li> <li>▪ Forest resource</li> <li>▪ Solid waste (disposal of TCS)</li> </ul>
<b>Demonstration of Additionality</b>	The additionality of CPAs under PoA is demonstrated based on “ <i>Guidelines for demonstrating additionality of microscale project activities</i> ” (ver.04.0). The geographical boundary of the PoA is the whole Nepal, one of the LDCs; the condition (a) of the paragraph 3 is met. In addition, all CPAs also meet another condition (b) since both sub-conditions (i) “each of the independent subsystem (each HCS) in CPA achieves an estimated annual energy savings smaller than 600MWh” and (ii) “end users of the subsystems are households” are met.
<b>Project Feasibility</b>	The HCS production and sales strategy is being set up in the BOP business promotion survey entrusted by JICA as of the end of March, 2013. Thus the implementation of the project is considered very feasible; moreover the Nepalese government also expects the implementation of the project.
<b>Contribution to Sustainable Development in Host Country</b>	The implementation of the CPA under the PoA will contribute to the sustainable development in Nepal on the following field. <ul style="list-style-type: none"> <li>▪ Improvement of people’s health</li> <li>▪ Efficient use of forest resource</li> <li>▪ Decline of dependency on fossil fuels</li> <li>▪ Creation of employment opportunities</li> </ul>

**FS Title: CDM Feasibility Study**

**“Programme to Reduce Non-Renewable Biomass Consumptions through Introduction of High-Efficiency Cook Stoves”**

**FS Entity: Tepia Corporation Japan Co., Ltd.**

**1. FS Implementation Scheme**

Tepia Corporation Japan Co., Ltd. (Tepia) is the main implementer and coordinator of the Feasibility Study. There are four supporting entities: Japan Quality Assurance Organization (JQA), ALCEDO Corporation (ALCEDO), Subhalakshya Developers Pvt. Ltd. (Subhalakshya) and Department of Mechanical Engineering of Katmandu University (KU).

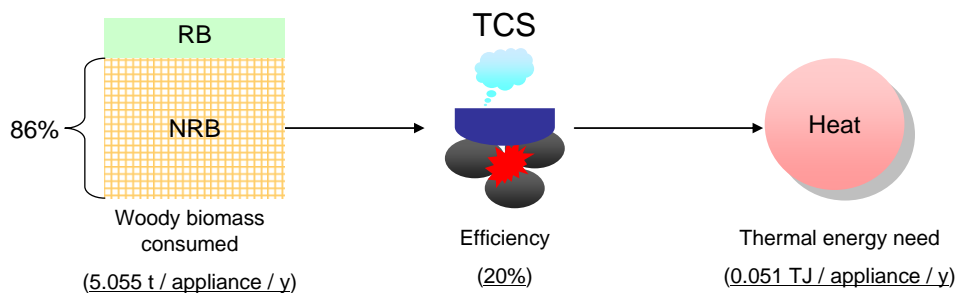
JQA does the validation work as a DOE, Subhalakshya and KU support the local side survey and ALCEDO supports Tepia in whole survey.

**2. Outline of CDM Project**

**(1) Description of Project:**

The PoA aims to reduce the non-renewable biomass (NRB) consumption by introducing the highly efficient cooking appliance named high-efficiency cook stove (HCS) to the households, which currently use the inefficient traditional cooking appliance in Nepal. The HCS consumes less quantity of wood fuel than the traditional cook stove (TCS), so that it would result in the reduction of NRB. According to the methodology AMS-II.G (ver.05.0), there are two default values for TCS: 10% for the most inefficient TCS like 3-stone fire and 20% for other types of TCS like the one with chimney or grate. As to the PoA, the TCS efficiency is applied 20% for the conservative purpose. On the other hands, the HCS to be disseminated under the PoA has about 30% combustion efficiency, thus it would be improved approximately 10 points. As a result, considerable quantity of woody biomass as well as NRB originally consumed within the TCS is reduced.

*Baseline scenario*



↓ Efficiency improvement

*Project scenario*

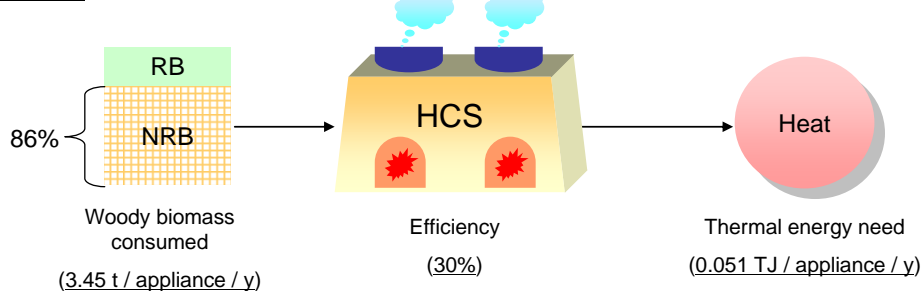


Figure 1. Energy and mass flow under baseline and project scenarios

The PoA boundary includes the whole Nepal. The target area of the first CPA (CPA-1), in other words, the main sales area of HCS in the early stage of PoA is Kavrepalanchouk district, the suburb area of Katmandu. The starting date of PoA duration (28 years) is applied the date of publication of the PoA-DD and CPA-DD for global stakeholder consultation, i.e., February 5, 2013. On the other hands, the crediting period of CPA-1 will be started from January 1, 2014, which is the date when the first HCS is sold and installed. The average annual emission reduction of CPA-1 is estimated as 1,887 tCO<sub>2</sub>e; the total emission reduction during the 10-year crediting period is assumed 18,868 tCO<sub>2</sub>e. Subhalakshya will be in charge of CME as well as the sales and monitoring implementer after the PoA is going into operation.

## **(2) CDM Methodology to be applied to the Project:**

AMS-II.G (ver.05.0): “Energy efficiency measures in thermal applications of non-renewable biomass”

### **3. Study Contents**

#### **(1) Issues to be Addressed in FS:**

- ① Target area for CPA-1  
The target area of CPA-1 has to be chosen.
- ② Marketing plan and dissemination of CPA  
The targeted number of HCS sales, especially of CPA-1 is needed to be considered. At the same time, the sales plan has to be made in consideration of the target area, human resources and so on.
- ③ Sampling for monitoring  
The sampling method has to be chosen from the related UNFCCC regulations. Then the calculation steps and the number of households to be sampled have to be investigated.
- ④ Baseline parameter  
The baseline parameters have to be specified following to AMS-II.G (ver.05.0).
- ⑤ Monitoring parameter, plan and structure  
The monitoring parameters have to be specified following to AMS-II.G (ver.05.0). Accordingly, the monitoring plan and the structure are also needed to be determined.
- ⑥ Local stakeholder consultation  
The local stakeholder consultation must be conducted.
- ⑦ Environmental impact and the sustainable development  
The Nepalese national law or regulation has to be investigated whether there is any related rule which provides that the environmental impact assessment (EIA) has to be implemented either on the CPA or the PoA.
- ⑧ PoA-DD & CPA-DD and validation  
PoA-DD and CPA-DD are made for make them open to the global stakeholders as a part of the validation process. The further validation work will be done after this FS period.
- ⑨ Financial plan and economic analysis  
The financial plan and economic analysis have to be made. The financial plan shall be include the expenses for monitoring devices, sales cost, staff wages and so on.

#### **(2) Process to Solve the Issues in FS:**

- ① Target area for CPA-1  
As to determine the target area of CPA-1, the geographical extent, the potential of HCS

dissemination (the number of households using TCS), the traffic condition and the distance from the CME office (Kathmandu) are taken into consideration.

According to Subhalakshya and Nepal Forester's Association, Kavrepalanchouk district is relatively appropriate to choose as the target area of CPA-1 because of its geographical location, potential of dissemination and the traffic condition.

② Marketing plan and dissemination of CPA

HCS will be sold mainly around a specific target area of each CPA. The HCS will be sold focusing on the target area in consideration of the convenience of monitoring, maintenance and so on. As HCSs are disseminated, another target area will be set one after another.

③ Sampling for monitoring

The number of sampled households is calculated based on the "Cluster Sampling" method of "Standard for sampling and surveys for CDM project activities and programme of activities" (EB69 Anx.4).

④ Baseline parameter

According to AMS-II.G (ver.05.0), two parameters, i.e., the efficiency of the device being replaced ( $\eta_{old}$ ) and the quantity of woody biomass used in the absence of the project activity ( $B_{old}$ ) are determined at the PoA level. The former one is chosen 20% from the default values set in AMS-II.G from a conservative perspective, and the later one is set as 5.055t/household through the investigation of the official report and statistics.

⑤ Monitoring parameter, plan and structure

For implementing the CPA under the PoA, the 3 parameters i.e., the number of project devices of type  $i$  operating in year  $y$  ( $N_y$ ), the efficiency of the device being deployed as part of the project activity ( $\eta_{new,y}$ ) and the fraction of woody biomass saved by the project activity in year  $y$  that can be established as non-renewable biomass ( $f_{NRB}$ ) are monitored during the crediting period. The former two parameters are monitored through the survey methods and the last one is checked the latest data opened on the UNFCCC website. In particular, the Water Boiling Test is conducted for the monitoring of  $\eta_{new,y}$ .

⑥ Local stakeholder consultation

The local stakeholder consultation has been carried out against 400 households in Bagmati zone from August to September in 2012. The households commented that there is no concerns but they expects the installation of HCS.

⑦ Environmental impact and the sustainable development

As to the interview result against Ministry of Environment, Science and Technology in Nepal, it was confirmed that there is no need to implement the environment impact assessment (EIA) to the project at both CPA and PoA level. Thus the qualitative EIA about "indoor air quality", "forest resources", "solid waste" and "trans boundary impacts" induced by the PoA has been done.

⑧ PoA-DD & CPA-DD and validation

The PoA-DD and CPA-DD have been completed in accordance with the initial findings provided from DOE during the FS period. The documents have been opened to public for global stakeholder consultation.

⑨ Financial plan and economic analysis

As to the preparation of the project implementation, the CME estimated some essential costs, inter alia, the cost for HCS sales, smart phones, network cost and so on.

Without the CER revenue, the CPA operates at a loss because of the lower sales price of HCS than its production cost. On the other hands, the IRR works out to 33.64% with CER revenue. It means the implementation of the project is feasible only after taking the CER revenue into

account.

#### 4. Results of CDM FS

##### (1) Application of CDM Methodology:

AMS-II.G “Energy efficiency measures in thermal applications of non-renewable biomass” (ver.05.0) is applied to the PoA. The scopes and applicability of the methodology are set as follows.

##### <Scope>

Paragraph 2. This category comprises efficiency improvements in thermal applications of NRB.

Paragraph 3. Project participants shall be able to show that NRB has been used in the project region since 31 December 1989, using survey methods or referring to published literature, official reports or statistics.

The combustion efficiency of HCS installed under the CPA is higher than the TCS currently used by the household. The default values 10% and 20% are set in AMS-II.G (ver.05.0) for TCS. As to the project, it is temporarily set 30% as the HCS efficiency disseminated by the CPAs under the PoA, which exceeds 20% default value. Therefore the CPAs meet the condition of Paragraph 2.

For demonstrating that NRB has been used in the project region i.e., Nepal since 31 December 1989, at least 2 out of the 4 supporting indicators have to be shown to exist. As to the project, the indicators (b) *A trend showing an increase in time spent or distance travelled for gathering fuelwood, by users (or fuel-wood suppliers) or alternatively, a trend showing an increase in the distance the fuel-wood is transported to the project area* and (d) *Trends in the types of cooking fuel collected by users that indicate a scarcity of woody biomass* are chosen to demonstrate. According to the forest coverage area change in Nepal, it is confirmed that the area is decreasing from 1978 continuously. Furthermore the wood fuel share in the whole cooking fuel is decreasing at the same time, the fossil fuel share is increasing in these years. Accordingly the both (b) and (d) are shown to exist in Nepal.

##### <Applicability>

Paragraph 4. The aggregate energy savings of a single project activity shall not exceed the equivalent of 60 GWh per year or 180 GWh thermal per year in fuel input.

Each CPA under the PoA is developed to meet the Type II micro scale threshold that the maximum annual energy saving under each CPA does not exceed 20GWh; therefore all CPA meet the applicability. As to the CPA-1, the maximum energy saving is calculated as 37.91 TJ<sup>1</sup>, which equals to 10.53 GWh<sup>2</sup> in a year, thus the applicability is met accordingly.

##### (2) Baseline Scenario and Project Boundary:

The geographical boundary of the PoA includes the whole Nepal; the geographical boundary of each CPA locates in the PoA boundary. However some households in mountain region are depending on TCS for heating purpose; therefore those households are not targeted disseminating HCS under the PoA. The following map shows the PoA boundary (left) and the target area of CPA-1 (right).

<sup>1</sup> Woody biomass saved under CPA-1 \* Total households included in CPA-1 \* Net calorific value of woody biomass  
 = {5.055 t \* (1 - 20 % / 30 %)} \* 1,500 (households) \* 0.015 (TJ/t)  
 = 37.91 (TJ)

<sup>2</sup> The total calories of the woody biomass saved / 3.6 (TJ/GWh)  
 = 37.91 (TJ) / 3.6 (TJ/GWh)  
 = 10.53 (GWh)

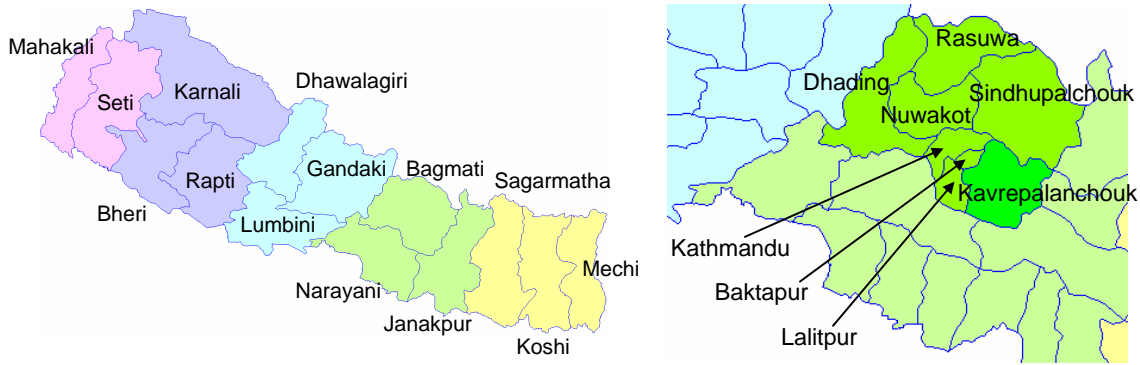


Figure 2 PoA boundary (left) and the main target area of CPA-1 (right)

According to AMS-II.G (ver.05.0), the baseline scenario is the use of fossil fuel for meeting similar thermal energy needs by the households included in the CPA, PoA. Without the project implementation, a large quantity of NRB would have been continuously consumed. Owing to the improvement of combustion efficiency of the cooking appliance, the consumption of wood fuel and NRB is reduced and accordingly, the consumption of the corresponding amount of fossil fuel to NRB is reduced.

The annual emission reduction of CPA-1 is calculated as follows (the number of HCS operating “ $N_{y,i}$ ” is used 1,500, the maximum number of HCS included in CPA-1).

$$\begin{aligned}
 ER_y &= B_{y,savings} * f_{NRB} * NCV_{biomass} * EF_{projected\_fossilfuel} * N_{y,i} \\
 &= \{ B_{old} * (1 - \eta_{old} / \eta_{new,y}) \} * f_{NRB} * NCV_{biomass} * EF_{projected\_fossilfuel} * N_{y,i} \\
 &= \{ 4,803 * (1 - 0.2 / 0.3) \} * 0.86 * 0.015 * 81.6 * 1,500 \\
 &= 2,527 \text{ (tCO}_2\text{e/y)}
 \end{aligned}$$

$ER_y$	Emission reductions during year y in t CO <sub>2</sub> e
$B_{y,savings}$	Quantity of woody biomass that is saved in tonnes per device
$B_{old}$	Quantity of woody biomass used in the absence of the project activity in tonnes per device - Use 4.803t/household*year specified in the of official publications (excluding the 5% as the leakage in accordance with the paragraph 29 of AMS-II.G (ver.05.0))
$\eta_{old}$	Efficiency of the device being replaced (fraction) - Use 20% default value in the conservative purpose
$\eta_{new,y}$	Efficiency of the device being deployed as part of the project activity (fraction) - Use 30% estimated efficiency for the HCS disseminated under the CPA of the PoA
$f_{NRB}$	Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass - Use 86% the value accepted by the Nepalese DNA on June 7 <sup>th</sup> , 2012
$NCV_{biomass}$	Net calorific value of the non-renewable woody biomass that is substituted. - Use 0.015 TJ/tonne IPCC default value for wood fuel on wet basis
$EF_{projected\_fossilfuel}$	Emission factor for the substitution of non-renewable woody biomass by similar consumers - Use a value of 81.6 t CO <sub>2</sub> /TJ
$N_{y,i}$	Number of project devices of type i operating in year y - Use 1,500, the maximum number of HCSs disseminated under CPA-1

**(3) Monitoring Plan:**

According to AMS-II.G (ver.05.0), the three parameters are required to be monitored for the project: Number of project devices of type  $i$  operating in year  $y$  ( $N_{y,i}$ ), Efficiency of the device being deployed as part of the project activity ( $\eta_{new,y}$ ) and Fraction of woody biomass saved by the project activity in year  $y$  that can be established as non-renewable biomass ( $f_{NRB}$ ). The former 2 parameters will be monitored at the sampled households.  $N_{y,i}$  is surveyed by telephone interview to the randomly selected households whether they are still using the HCS. Then the Water Boiling Test (WBT) is done at the households still using the HCS for monitor  $\eta_{new,y}$  at least once every 2 years. As to monitor  $f_{NRB}$ , the CME checks the UNFCCC website to confirm the latest value the Nepalese government accepted. As to implementing the WBT, the CME applies the smart phones for data input and calculation of the test result. The smart phones are installed the specially developed application for the cook stove project called “True Grid”, which is used not only for monitoring but also for the registration of customer information like the picture of the installed HCS and the owner’s family, the owner’s name, phone number, address and the latitude/altitude of the location the household locates (specified on the GPS system).

**(4) GHG Emission Reductions:**

Quantity of woody biomass used in the absence of the project activity in tonnes per device ( $B_{old}$ ) is investigated through the official report and statistics at the PoA level, i.e., Nepal. As a result  $B_{old}$  is specified about 5.055t/household·year and then the value 4.802 t/household·year is used for the emission reduction calculation which is deducted 5% as the leakage in accordance with the paragraph 20 of AMS-II.G.

As to the efficiency of the device being replaced ( $\eta_{old}$ ), it is chosen 20% from the default values in the methodology for the conservative purpose. The efficiency of the device being deployed as part of the project activity ( $\eta_{new,y}$ ) is applied for the estimated value 30% since the HCS is still under designing as of the end of March, 2013 (the value will be changed via the efficiency test on the HCS). Accordingly the quantity of woody biomass that is saved in tonnes per device ( $B_{y,savings}$ ) is calculated as 1.601 t/household·year. Other parameters like the fraction of woody biomass saved by the project activity in year  $y$  that can be established as non-renewable biomass ( $f_{NRB}$ ), the net calorific value of the non-renewable woody biomass that is substituted ( $NCV_{biomass}$ ) and the emission factor for the substitution of non-renewable woody biomass by similar consumers ( $EF_{projected\_fossilfuel}$ ) are applied the default values 86%, 0.015TJ/t and 81.6 tCO<sub>2</sub>e/TJ respectively. Then the actual annual emission reduction achieved by CPA-1 is depended on the operation status of HCSs disseminated under CPA-1 and calculated as follows.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
The number of operating HCS *	676	1425	1353	1285	1220	1159	1101	1045	992	942
Emission reduction (tCO <sub>2</sub> e)	1,139	2,401	2,280	2,165	2,056	1,953	1,855	1,761	1,671	1,587

\* Year 1: The No. of operating HCS is counted from the next month of installation (Total number of HCS installed is 1,500)

Year 2: The No. of operating HCS is estimated as 95% of 1,500 HCS installed in Year 1  
 Year 3 – Year 10: The 95% of the No. of operating HCS in the previous year

According to the “Nepal Living Standard Survey 2010/2011” published by the Central Bureau of Statistics of Nepal, almost 73.9% of households are currently using inefficient cook stove like “Open Flare Place” and “Mud Stove”. Then considering that there was 5,659,984 households live in Nepal in 2011, 4,182,728 households are considered to be using some inefficient cook stove. If the HCS is disseminated among those households, there is roughly about 7,049,066tCO<sub>2</sub>e emission reduction potential per year in Nepal.



### **(5) Duration of Project and Crediting Period:**

The PoA duration applies 28 years. The starting date of the PoA duration is 5/2/2013, which is the date of publication of the PoA-DD and CPA-DD for global stakeholder consultation. Furthermore, the crediting period of each CPA applies 10-year fixed period and the project lifetime consists with the lifetime of HCS. The crediting period of CPA-1 is planned to start from 1/1/2014.

### **(6) Environmental Impact Analysis:**

According to the *Nepal Environment Protection Rules, 2054 (1997)*, there is no need to carry out the EIA for CPA or PoA. It was confirmed at the interview against the Ministry of Environment, Science and Technology of Nepal on July 30<sup>th</sup>, 2012.

Therefore the qualitative assessment is implemented at the PoA level as follows.

- Indoor air quality:

A great volume of smoke emitted inside the room from TCS will be dynamically curbed by the use of HCS since it has doors and chimney. Thus the implementation of the PoA would bring about the good influence on the indoor air quality.

- Forest resource:

The installation of the HCS contributes to the reduction of the consumption of woody biomass because of its high combustion efficiency; so that it leads to protect the forest resource in Nepal. Accordingly, the PoA contributes to the improvement of forest environment.

- Solid waste:

The replaced TCSs are disposed appropriately not to give bad influence on the environment. Consequently, there would be little impact on the local environment.

- Transboundary impacts:

The PoA implementation will bring the reduction of fossil fuel consumption indirectly. In Nepal, most of the fossil fuel like coal, LPG and kerosene are imported from India and abroad; the dissemination of the project scheme in Nepal could result in the reduction of pollutions caused by the exploitation of these fuels in other parts of the world. Therefore good impact but no bad impact will exist because of the PoA.

### **(7) Stakeholder Consultation:**

The stakeholder consultation has been done at CPA level. The reason why the stakeholder consultation has been done at CPA level is that the result can reflect more localized situations around each CPA targeted area. The area of this time stakeholder consultation covers Bagmati zone, which includes whole boundary of CPA-1. The stakeholder consultation, the door-to-door interview survey at Bagmati zone was conducted in August to September in 2012. As to the survey, the overview of the CPA and the PoA is introduced at the same time, the people's current TCS-related concerns, situations and the health status and the expectations to the project were heard face to face. As to the interview survey result, it was turned out that many of the TCS users have some complaints like its longer cooking time, concerns of fire, smoke and so on. At the same time, they expressed that their expectation against the installation of HCS for solving those problems.

### **(8) CDM Project Implementation Scheme:**

As to implementing the PoA, Subhalakshya (CME of the PoA), Tepia and ALCEDO take in charge of "Joint Focal Point" which is responsible for communications with the CDM Executive Board.

Subhalakshya will be responsible for selling HCS, maintenance and monitoring. Then Tepia and ALCEDO do the consultation to Subhalakshya about the CDM related matters.

The right of the CER will belongs to the Joint Focal Point so that the CME can sell the HCS at low price.

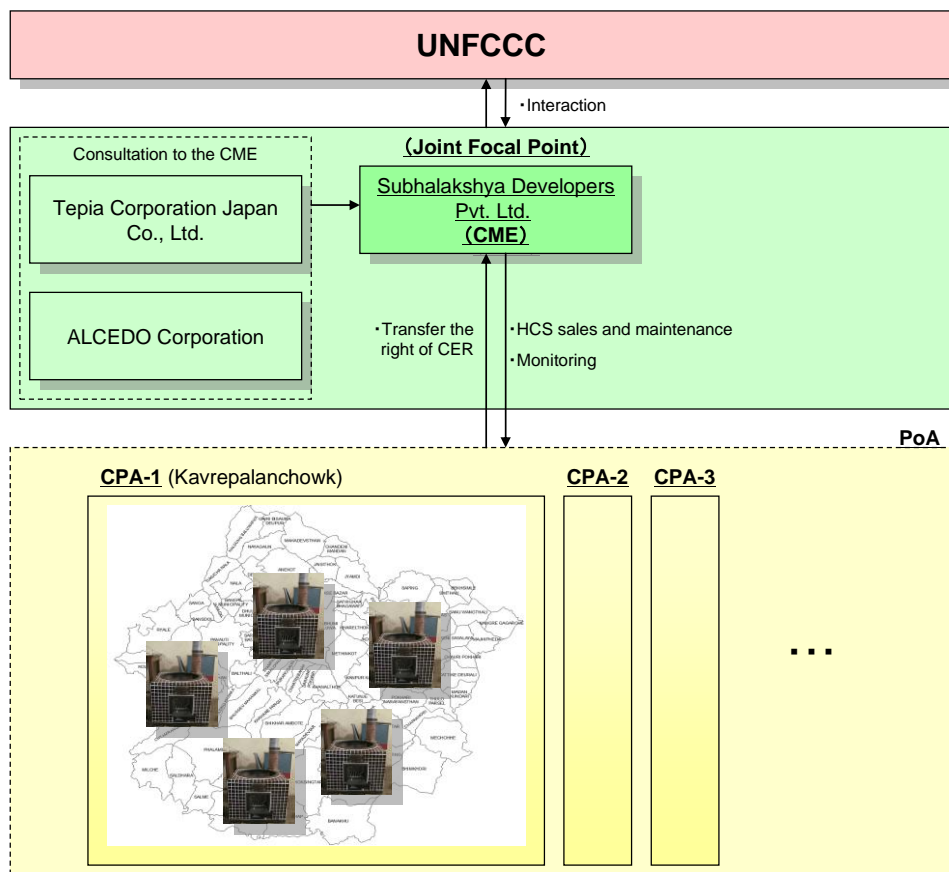


Figure 3 PoA implementation structure

**(9) Financial Plan:**

The following expense and revenue are to be considered for CPA-1.

- Expense: HCS production, rental fee for the factory(/CPA), staff wage, transportation etc.
- Revenue: HCS and CER sales

According to the financial estimation made by the CME, the total production cost for one HCS is about 6,079NPR ~ 6,601NPR including the materials, rental fee of property, staff wages and transportation cost. Adding to that, there is the O&M cost about 113,000NPR ~ 133,000NPR per month for the CPA-1. In implementing the project, the CME will fund the CPA-1 via self-financing.

**(10) Analysis of Project Profitability:**

Regarding the financial plan, the project IRR of CPA-1 works out to 33.64% with the CER revenue. On the other hands, without the CER revenue, the CPA-1 would not have been carried out because of the low profitability throughout the crediting period.

**(11) Demonstration of Additionality:**

The maximum annual energy saving achieved by each CPA under the PoA is developed in accordance with the paragraph 3 of “Guidelines for demonstrating additionality of microscale project activities” (ver.04.0). According to the guideline, a project which falls into Type II, energy efficiency improvement project is considered to be a micro scale project in case where the annual energy saving is less than 20GWh. As to the CPA-1, the energy saving is calculated about 10.53GWh, which is less than 20GWh.

$$\begin{aligned}
 & \text{Woody biomass saved under CPA-1} * \text{Total households included in CPA-1} * \text{Net calorific value of woody biomass} \\
 & = \{5.055 \text{ t} * (1 - 20 \% / 30 \%)\} * 1,500 \text{ (households)} * 0.015 \text{ (TJ/t)} \\
 & = 37.91 \text{ (TJ)}
 \end{aligned}$$

The total calories of the woody biomass saved / 3.6 (TJ/GWh)  
 = 37.91 (TJ) / 3.6 (TJ/GWh)  
 = 10.53 (GWh)

### (12) Project Feasibility:

As to implementing the PoA, the HCS production factory and marketing system will be established in 2013 and then it will be started to sell the HCS from January, 2014. The HCS distributed under the PoA is specially designed in consideration of the features of the Nepalese households. The design is based on the Japanese cooking stove of Isolite Insulating Products Co., Ltd. and Isolite Juki Co., Ltd. under the BOP business promotion survey entrusted by JICA as of March, 2013. Thus the implementation of the CPA under the PoA is very feasible.

The starting date of the CPA is correspond to the date the first HCS is sold under each CPA. The first CPA (CPA-1) will be started on 1/1/2014, the date the first HCS will be sold.

The “prior consideration” will be submitted to the Nepalese DNA and the UNFCCC after the HCS production factory and marketing system have been established and prepared.

### (13) CPA Promotion under PoA:

In Nepal, about 73.9% of total households are currently using some traditional cooking stove. In other words, about 4,182,728 out of total households (5,659,984 households) are depending on TCS as their main cooking appliance. Then supposing that the all of the TCS user households replace their cook stove by the HCS, the PoA would have 7,049,066 tCO<sub>2</sub>e potential to reduce GHG emission annually.

Table 1 Emission reduction potential in whole Nepal

HCS penetration (%)	The number of households (households)	Emission reduction (tCO <sub>2</sub> e)
100%	4,182,728	7,049,066
90%	3,764,455	6,344,160
80%	3,346,182	5,639,253
70%	2,927,910	4,934,346
60%	2,509,637	4,229,440
50%	2,091,364	3,524,533
40%	1,673,091	2,819,626
30%	1,254,818	2,114,720
20%	836,546	1,409,813
10%	418,273	704,907
5%	209,136	352,453

In developing a CPA under the PoA, the number of each CPA will be determined so that the aggregated scale of energy saved under the CPA does not exceed the Type II micro scale limitation, i.e., each CPA achieves energy savings at a scale of no more than 20GWh per year. This clarification is included as one of the Eligibility Criteria (“*The aggregated scale of the annual energy saving per each CPA does not exceed 20GWh during the crediting period.*”)

## 5. Contribution to Sustainable Development in Host Country

Many households use a simple open fire type or other type of TCS in Nepal. Due to inefficient fuel combustion, and absence of chimney, residents are exposed to smoke and discharged substances such as carbon monoxide (CO), total suspended particulates (TSP), polycyclic aromatic hydrocarbons (PAH). The implementation of this CPA under the PoA will help to reduce indoor air pollution and can mitigate health issues especially for women and children who stay indoor for long time.

As to the forest area change, it has decreased at an annual rate of 59,050ha/y (1.23%) in Nepal. Main causes of deforestation are need of energy source such as firewood, forage for livestock and others. TCS used in Nepal consumes huge amount of firewood due to its low efficiency. Firewood consumption can be reduced by the distribution of high efficiency HCS through this CPA under the

PoA and hence prevent deforestation. The efficiency of HCS leads to reduce time to collect firewood. This enables people to use surplus time in work, study and social activities and also to improve income. In city area where people often buy firewood can reduce cost of firewood purchase so that they can have extra money to buy other stuff to enhance the quality of their lives.