Starbucks Coffee, Conservation and Carbon in Sumatra, Indonesia

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Executive Summary

This report is a review of the performance across Years 1 and 2 of the Indonesian component of the Coffee, Conservation and Carbon Project, a partnership between Starbucks and Conservation International. It presents results achieved to date, explores the experiences and lessons across the various components of the partnership, and includes a set of recommendations that will guide the 'scaling up' of the project in Year 3 and beyond in Northern Sumatra.

The objective of the work in Northern Sumatra is to identify opportunities to link coffee farmers to carbon markets as a means of providing additional income and incentives for forest conservation to producers. The core of this work falls under 2 discrete categories, which have been undertaken in parallel: 1) Physical Assessment of Carbon Stock in Northern Sumatra and 2) Conservation Coffee Pilot in Dairi. The challenge for the future is to integrate these two components so that revenue from Reduced Emissions from Deforestation and Degradation (REDD) can be used as a sustainable source of funding for the delivery of services needed by coffee growers to improve their productivity without resorting to land-clearing for new coffee gardens.

1 – Physical Assessment of Carbon Stock in Northern Sumatra: CI conducted an assessment of the deforestation rates, associated carbon stock and potential REDD revenue for Northern Sumatra. This exercise compared the deforestation rates and carbon potential across Northern Sumatra, but focused on a comparison of three coffee-growing areas: Dairi (North Sumatra), Aceh Tengah (Aceh) and Bener Meriah (Aceh). Together, these districts represent around two thirds of the total land area under arabica production across Indonesia. The following estimates of coffee production, deforestation rates and potential carbon revenue are offered:

Districts/ Kabupaten	Total Area ('000 ha)	Forest Area ('000 ha)	Mean Annual Deforestation Rate 1990-2008 ('000 ha)	Arabica Coffee Production (Kt/year)	Carbon Baseline (MtCO2e)	30y Revenue @ $1- per tCO2e (USDM)
Aceh Tengah (AT)	432	281	1.73	19.5	22.4	179
Bener Meriah (BM)	189	107	0.55	8.5	5.4	43
Dairi (SD)	193	138	N/A	2.6	N/A	N/A

Based on this assessment, Aceh Tengah (or Central Aceh) is the most suitable site for 'scaling up' of the Starbucks work on Reducing Emissions from Deforestation and Forest Degradation (REDD) in Sumatra as it has a) highest rates of historical deforestation, b) highest carbon stock of forested areas, c) a strong relationship between coffee and deforestation and d) high proportion of land with intact forest that is suitable for coffee production.

2 – **Conservation Coffee Pilot in Dairi**: Activities included an assessment of the coffee-related drivers of deforestation in a pilot site (Sumbul Sub-District in Dairi, North Sumatra), formation of community conservation agreements and delivery of technical support through field schools. The key driver for this work was the poor capacity of coffee farmers to maintain and rehabilitate coffee which led to the abandonment of sites when productivity decreased, and land clearing for new coffee gardens.

Additional information on performance against the objectives specified in the 19 March 2008 Agreement between Starbucks and Conservation International is described below:

Objectives from Exhibit A – 19 March 2008	***Performance Notes and Report Page Reference***
A) In Sumatra CI will undertake to examine, understand and explain the relationship between coffee growing and forest conservation (deforestation) and determine an appropriate strategy to promote basic coffee sustainability and forest conservation in Northern Sumatra. In this regard, CI will:	
A1- Complete and refine deforestation maps (Years 1990-2000-2005) for Northern Sumatra and quantify consequences for carbon emissions.	*Deforestation maps and associated analysis were completed in March 2010. This analysis compared the historical deforestation rates, projected future deforestation, estimated carbon stock in the forest 'at risk' and potential carbon revenue for the sites of interest in Northern Sumatra. Aceh Tengah was the district with the highest potential for 'scaling up' of this project. Detailed on pages 31 - 37*
A2 - Provide analysis of deforestation drivers and scenarios for Northern Sumatra.	*Analysis of drivers of deforestation was completed in June 2009. Key results for Dairi was that the primary driver of coffee-related deforestation was that farmers lack the expertise to maintain and rehabilitate their coffee plants. In the absence of such skills it is easier to clear new land when plant productivity falls prematurely. Detailed on pages 13-15*
(B) CI will also develop and define what model site interventions will be most effective in light of learnings gained as a result of activities described in section (a) above. In this regard, CI will:	
B1 - Identify 1-2 sites for the implementation of model site interventions that will engage local coffee-growing communities in sustainable production and forest conservation efforts;	*Based on the drivers of deforestation and discussion of incentives with communities, the model site intervention was the formation of community agreements which obligated the coffee-growers to respect the ad-hoc forest boundary in exchange for delivery of technical services on coffee production.* *Along with the community agreements, key elements of the interventions were as follows:* • *Support in the establishment of a Coffee Forum for Dairi, North Sumatra* • *Support in the establishment of a Coffee Cooperative* • *Field school and demonstration plot established* • *170 famers trained in sustainable coffee production* • *Delineation of ad-hoc forest boundary with concrete markers (in Pagambiran)* *The pilot interventions were delivered in 4 communities, see B2, below. Detailed on pages 23-31*
B2 - Identify communities and begin sensitizing them to forest conservation and coffee sustainability in preparation for possible future carbon project work;	*Community-based Conservation and Conservation Coffee agreements were formed with 4 communities: Perjuangan, Barisan Nauli, Sileu-leu Parsaoran and Pagambiran Villages. Detailed on pages 25-27*
B3 - Initiate participatory management process among local organizations, governments, communities and other stakeholders;	*A number of community consultations were held as a part of the pilot, beginning with a 'how to' multi-stakeholder workshop for regional coffee farmers on successfully developing conservation coffee. Detailed on page 26*
B4- Perform capacity building in connection with carbon project development and complete analysis for technical team; and	*REDD training for 8 staff in the two CI offices in Sumatra was completed in Medan on 21-25 June 2010.Detailed in Annex 9.*
B5 - Set up the framework for future participatory land use planning and zoning activities that will involve local organizations, governments, communities and other stakeholders.	*An application for community forest designation was made through the Dairi Coffee Forum in xx May 2009. This is the legal centerpiece for community-based management in Indonesia, The validation of the designation is still in process by the Provincial and National Authorities is still in process. Detailed on page 27.*

The following lessons have been drawn from the experience over years 1 and 2 in the pilot, and have informed the project plan for year 3 and beyond – most of these issues relate to the implicit 'trade-offs' between on-time delivery, local ownership and project sustainability:

- **Commit to Capacity Building**: While contracting out all elements of the pilot program would have been more likely to ensure timely delivery against the partnership milestones, a key objective of the activities is to build the capacity of CI Indonesia and its partners to undertake deforestation mapping and carbon stock assessments to ensure a more sustainable result that will benefit other project areas.
- **Secure Strong Commitment Early:** Close and equitable partnership arrangements, good coordination and cooperation amongst all stakeholders is necessary to ensure the sustainability of project design and implementation.
- **Plan Sufficient Time for Collaborative Processes**: Participatory, multi-layer policy intervention and collaborative management approaches to conservation-sensitive land use planning, forest conservation and sustainable economic development require more time, energy, resources and efforts compared to conventional 'top down' approaches. The process will be iterative and flexible to address the actual conditions of relevant farming communities.
- **Rely on Existing Cooperatives / Community Organizations:** The Dairi pilot involved an extensive (up to 8 month) negotiation process to establish community agreements with the participating villages. 'Scaling up' will require a more efficient process and will need to rely more heavily on existing networks, such as the coffee cooperatives.
- **Better Capture Conservation Outcomes**: Scaling up project based on 'lessons learned' should better characterize conservation benefits and well as well-human being.
- **Move to Locally-Based Project Management:** Years 1 and 2 involved oversight from CI HQ staff. There is clear advantage in a sustained presence in Indonesia for the project – to take advantage of emerging opportunities and maintain project momentum.

In bringing the two components together in a 'scaling up' exercise, it is clear that a successful project design will:

- Respond to the technical service needs of local growers where such needs are related to the drivers of deforestation – this should target proximate drivers of deforestation but also be sufficiently robust to changes from external drivers (e.g. coffee price)
- Build capacity in the cooperatives that service farmers at the 'forest frontier' both to access carbon revenues and to improve service delivery to members.
- Combine local enforcement capacity of communities with the capacity of cooperatives to manage certification requirements.
- Coordinate partnerships among key stakeholders to maximize and optimize resources and to generate demonstrable livelihood and conservation outcomes.
- Include the establishment of an appropriate mechanism to help resolve forest land use issues. Forest land use is politically sensitive and should be treated with caution.
- Build trust within local communities and local government and other key stakeholders through transparent approaches, and realistically accommodate the time frames that such approaches require.
- Build in the successful elements of the Indonesian government's climate field schools into capacity building to ensure ongoing coffee productivity under climate change.

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1 – Background and Objectives

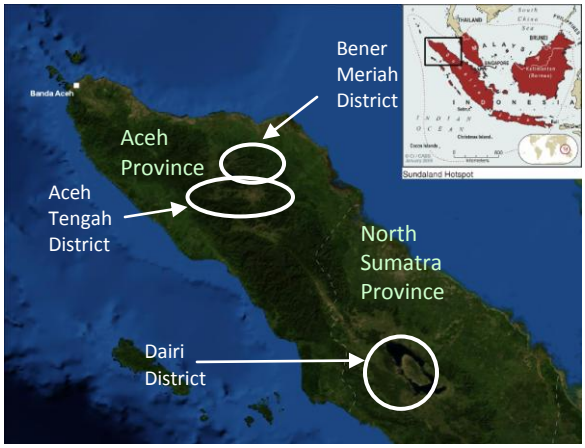
1.1 - Aims of the Report:

1. To describe the results of the range of activities undertaken during year 1 and 2 of the pilot program in Sumatra;
2. To describe lessons that can be drawn from this experience that will guide 'scaling up' of the initiative in year 3 and beyond; and
3. To detail a workplan for year 3 activities that is guided by the lessons learned and the scaling up objective.

1.2 – An Introduction to Northern Sumatra

Northern Sumatra comprises two provinces (or '*Provinsi*') on the island of Sumatra: North Sumatra and Aceh. The highlands of both of these provinces have suitable conditions for coffee production, although Aceh has a stronger tradition of coffee farming. Aceh is one of 5 of the 33 Provinces in Indonesia which has 'special autonomy status'; a legal acknowledgement of diversity and local autonomy.

Map 1 – Northern Sumatra



The next tier of administrative management in the Indonesian Government is the Regency (Districts or *'Kabupaten'*). The efforts in years one and two of the Starbucks Sumatra Partnership have focused on the Dairi District, within North Sumatra, and more specifically, within the Sumbul Sub-district (or *'Kecamatan'*).

The final level of administrative management is the *'Desa'*, or Village. The work during years one and two focused on the formation of agreements and capacity-building in 4 villages: Perjuangan, Barisan Nauli, Sileu-leu Parsaoran and Pagambiran Villages.

1.2 - Definition of the Problem: Linking Coffee and Conservation in Northern Sumatra

One of the major challenges in reducing deforestation in developing countries is that protecting forests can be difficult where people's livelihoods are dependent on access to forest resources. Indonesia is not exception to this, an issue that all tiers of Indonesian Government are acutely aware. This situation introduces the first problem to be explored within this project:

Problem 1 - How can the forests of Indonesia be conserved without worsening poverty?

The next challenge relates to coffee certification programs across the developing world. While consumers are increasingly demanding the assurances associated with such certification programs, the requirements represent an additional cost to production. Once certification is achieved, these costs can be offset by higher coffee prices, but new entrants to the market often struggle to raise the necessary capital and access the technical expertise to meet the requirements of these certification scheme, and hence these growers can remain 'locked' in a poverty trap with limited access to markets. Where there is not

sustained capacity-building support (ie. through government extension programs) coffee growers are less likely to be able to maintain the productivity of their coffee gardens. This introduces the second problem:

> ***Problem 2 - How can farmers be supported when they don't currently have the resources or skills to meet coffee certification standards?***

Finally, there is some evidence suggesting that very little of the benefits of participation in coffee certification schemes flow to individual farm households in Indonesia. The incentive structure that enables the accrual of these benefits and the reduction in certification costs through service-oriented coffee cooperatives in other countries is less effective in Indonesia.

> ***Problem 3 – How can the benefits of participation in certification schemes be passed onto smallholder farming households without implementing an extensive auditing program?***

The Starbucks pilot program in the highlands of the North Sumatra Biodiversity Corridor offers an opportunity to explore these three related problems and to find practical solutions.

1.3 - Background to the CI/Starbucks Partnership

In October of 1998, Starbucks and Conservation International (CI) launched a partnership to promote cultivation of coffee in a manner that protects biodiversity and improves the livelihood of coffee farmers. The focus of the partnership was to support growers of shade coffee in areas of high biodiversity and to promote the use of environmentally sustainable agricultural practices – thereby providing a model of the potential for coffee production to play a positive role in the conservation of the Earth's biodiversity for the coffee industry.

The partnership began with a three-year commitment to support shade coffee cultivation in the multiple-use zone of El Triunfo Biosphere Reserve in Chiapas, Mexico. This collaboration met with early success. In the first year of the partnership, the number of farmers participating in CI's Conservation Coffee program grew by 30 percent, their international coffee sales doubled, and their incomes rose by an average of 40 percent. Starbucks purchased coffee from farmers in El Triunfo and made its first national offering of a shade coffee product. *Shade Grown Mexico* generated impressive sales, positive customer feedback, widespread media coverage, and heavy traffic on the Starbucks and CI websites.

In 2000, Starbucks and CI expanded the partnership to include work with coffee farmers in five regions in Latin America and Asia, development of the Starbucks green coffee purchasing guidelines pilot program (the Preferred Supplier Program), creation of a year-round product line that reflects Starbucks commitment to environmental and social quality, and discussions with other leaders in the coffee business. In a first ever move within the coffee industry, Starbucks launched their green purchasing guidelines in November 2001. Work at Origin continued to progress, and the second product from this partnership, *Conservation Colombia,* appeared in Starbucks stores in March 2003.

In 2003, Starbucks and CI committed to renewing their collaboration for another three years. This expanded collaboration included a common goal – to help small scale coffee farmers improve their livelihood while protecting the important ecosystems that surround their farms. The partnership also committed to ensuring the successful completion and evaluation of the Starbucks Green Coffee Purchasing Guidelines and Pilot Program for Preferred Suppliers, and to demonstrating positive results and raising awareness of the partnership by informing consumers of the program and encouraging them to support these efforts.

Starbucks and CI recognized ten years ago that they share common geographies and stakeholders – the coffee growing regions of the world are also home to a rich array of species and a diversity of cultures. Building on the historical success, shared values and the decade long relationship between the two institutions, in 2008 Starbucks and CI launched a renewed five year partnership to make our shared geographies and stakeholders part of the solution to the most pressing issue facing our planet - global climate change. It has become increasingly clear that these special areas, already under assault from

industrialization, deforestation, and unsustainable ranching and agriculture, now face a new, even more insidious threat in climate change. Climate change is predicted to disrupt agriculture patterns across the world, increasing the severity and frequency of droughts, tropical storms, and wildfires, decreasing soil productivity and crop yields. Combined with expanding ranges for tropical diseases and pests, these impacts will have significant impacts on both the livelihoods of coffee farmers and the broader environment.

Forest conservation projects deliver benefits for community development, climate change mitigation and biodiversity protection. By tying these projects to areas of importance for Starbucks coffee sourcing, linking them to the value-adding activities coffee farmers are already undertaking under C.A.F.E. Practices and offering carbon offset opportunities through Starbucks networks and channels, Starbucks has the opportunity to undertake a holistic and cost-effective strategy that addresses many areas of importance to the company.

Box 1 – What is REDD and how can it benefit coffee smallholders?

There are two types of forest-based activity that can mitigate climate change: Projects that reduce emissions from deforestation and degradation (REDD): forest conservation, and projects that increase uptake of carbon by planting trees: reforestation or restoration of degraded lands. In the case of REDD, projects get credit over time for the 'additional' greenhouse gas emissions that were avoided by conserving the forest. However, to get these credits, projects must apply rigorous methodologies and fulfil specific carbon criteria. For example, a REDD project needs to demonstrate additionality: that in the project site a) the forests are under significant threat from deforestation and b) that the forests are not yet already protected. While the Indonesian government still needs to make some decisions on the 'rules' for community-based REDD, the revenues associated with credits offers a valuable opportunity for coffee smallholders to be rewarded for their efforts in reducing deforestation typically associated with coffee production in Northern Sumatra.

1.4 - Pilot Project Objectives: Starbucks in Sumatra

The following information is drawn from exhibit A from the Agreement established between Conservation International (CI) and Starbucks on 19 March 2008. These objectives have guided the range of activity that has occurred to date, and also serve as a reference point for the performance reporting that is included within this report.

(a) In Sumatra CI will undertake to examine, understand and explain the relationship between coffee growing and forest conservation (deforestation) and determine an appropriate strategy to promote basic coffee sustainability and forest conservation in Northern Sumatra. In this regard, CI will:

- *Complete and refine deforestation maps (Years 1990-2000-2005) for Northern Sumatra and quantify consequences for carbon emission; and*
- *Provide analysis of deforestation drivers and scenarios for Northern Sumatra.*

(b) CI will also develop and define what model site interventions will be most effective in light of learnings gained as a result of activities described in section (a) above. In this regard, CI will:

- *Identify 1-2 sites for the implementation of model site interventions that will engage local coffee-growing communities in sustainable production and forest conservation efforts;*
- *Identify communities and begin sensitizing them to forest conservation and coffee sustainability in preparation for possible future carbon project work;*
- *Initiate participatory management process among local organizations, governments, communities and other stakeholders;*
- *Perform capacity building in connection with carbon project development and complete analysis for technical team; and*
- *Set up the framework for future participatory land use planning and zoning activities that will involve local organizations, governments, communities and other stakeholders.*

2 – Coffee Livelihoods in Northern Sumatra

2.1 – Indonesian Coffee Production and the Global Coffee Market

Indonesia is a major coffer producer in the global market, with 660 million US dollars in coffee export earnings in 2007(BPS, 2008). Of this total, about 75,000 tons was Arabica and 90% of this coffee is grown by small-holders on farms of one hectare or less. However, comparing the productivity of coffee farms across Indonesia against international productivity benchmarks can illustrate the clear potential for improvement in coffee production. According to a statement by Nyoman Sudarsana, the Director-General of Plantation from the Indonesian Department of Agriculture, the total area under coffee production across Indonesia in 2005 was 1.3 million hectares; comprising 1.19 million hectares of robusta coffee and Arabica coffee area of 0.11 million hectares. Mr Sudarsana also noted that coffee area cultivated by smallholders was 96% of this total, with large country estates and large private plantations shared an equal proportion of the other 4%[1]. Indonesia is second only to Brazil in the total area under production, according to 2005 figures. However, based on the production and export volumes, Indonesia is in fourth place after Brazil, Vietnam, and Colombia. The average productivity level of coffee producers in Vietnam for 1540 kg/ha/year, Columbia 1220 kg/ha/year, and Brazil 1000 kg/ha/year. Productivity coffee in Indonesia is still relatively low with an average of 700 kg/ha/year, or just 60% of potential productivity. Hence, there is a clear need to understand the key challenges to productivity, their relevance to the production areas in North Sumatra and Aceh, and to develop solutions to these problems.

The stability of the world coffee price (see Figure 1) has particular implications for the coffee growing regions of Indonesia, particularly in areas such as Aceh, the major Arabica-producing region in Southeast Asia (Arifin et al, 2008).

Figure 1 – World Coffee Price 1977-2008

2.2 – Challenges to Coffee Production in Northern Sumatra

As part of this study, CI examined three coffee-producing districts Aceh Tengah and Bener Mariah in Aceh, and Dairi in North Sumatra. The overview of their relative production is presented in Table 1, based on 2006 figures:

[1] http://www.kapanlagi.com/newp/h/0000147285.html

Table 1 Approximate Coffee Production in Northern Sumatra (Marsh 2006, NS Province Govt Website[2])

Districts/Kabupaten	Total Area (ha)	Forest Area (ha)	Arabica Coffee Plantation Area (ha)	Robusta Coffee Plantation Area(ha)	Annual Arabica Coffee Production (tonnes)	Annual Robusta Coffee Production (tonnes)
Aceh Tengah	432,000	281,000	44,000	2,300	19,500	200
Bener Meriah	189,000	107,000	33,000	4,700	8,500	800
Dairi	193,000	138,000	5,800	14,000	2,600	6,700

However, it should be noted that the data on production between the three study areas is of variable quality with little internal consistency.

Box 2 – The Conflict in Aceh and Coffee Production in Northern Sumatra

The intense conflict in Aceh from 1998 to 2005 had a serious impact in the Aceh coffee industry. Estimates suggest that between 5000 and 10,000 houses were destroyed during the conflict and a large percentage of the coffee farms abandoned – up to 15% of the estimated 84,000 hectares under production at the time (Dispun 2006).

One of the interesting characteristics of the conflict is the demonstration of the mobility of the coffee sector. Marsh (2006) has estimated that while production in Aceh during the conflict dropped from 25,000 to 15,000 tonnes per year, the production in North Sumatra increased from 7,000 to 15,000 during this period. The challenge in verifying these estimates is that coffee from both North Sumatra and Aceh are exported through Medan.

While the Indian Ocean Tsunami was a disaster for Aceh, the situation it created contributed towards the Aceh Peace Agreement in 2006 and the reconstruction of Aceh created a financial opportunity for the people of Aceh, including the coffee growers through the introduction of the Aceh Coffee Forum. These reconstruction funds are now dwindling as the attention of donors turns to more recent natural disasters.

The investigations that were undertaken as a part of the pilot project included an examination of the challenges to production – focusing predominantly on the areas in Dairi/Sidikalang in North Sumatra, but also looking at the Gayo Highlands in Aceh.

In North Sumatra, we examined the challenges presented by discrete coffee communities in the following villages: Perjoangan, Sileu-Leu Parsaroan, Padumaan and Le Hole Hole. While there are many similarities among the villages (e.g. soil types, all experienced population increases that led to expansion of the village, high mortality - between 50 and 60% - of coffee trees, no shade coffee production) but there are also some significant differences that affect local production:

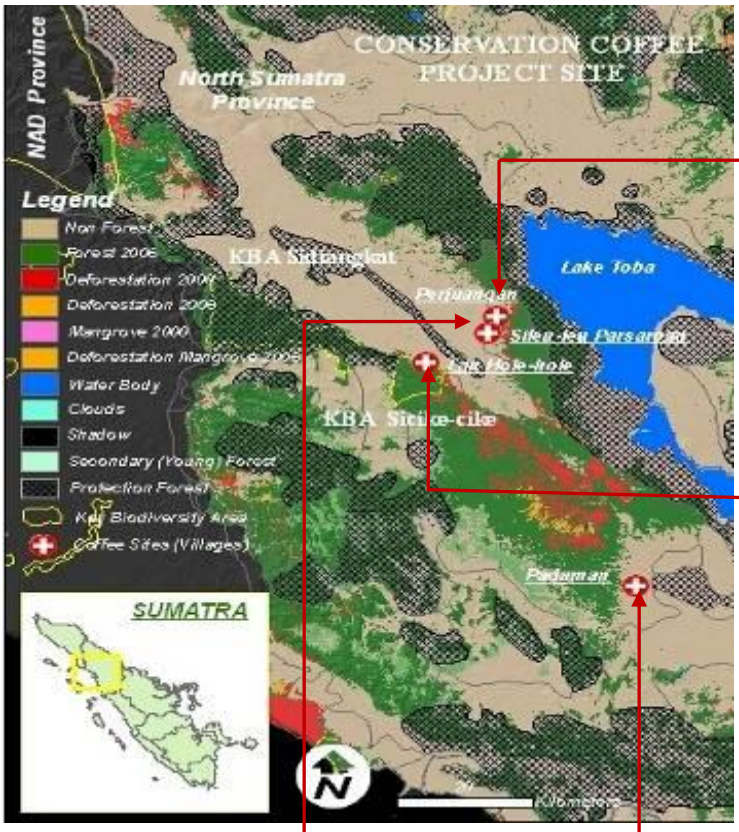
- **Perjuangan:** *Better road access to the city (lower transaction cost); traditional Batak rules of land ownership are not well implemented so the farmers don't feel secure in their tenure; low productivity caused by lack of knowledge of silviculture treatment, fertilizer use and pest and disease; annual attacks by caterpillar worms in December to January.*
- **Sileu-Leu Parsaroan:** *Large land area per farmer but not used efficiently; lack of labor and ability to pay labor is a constraint; farmers plant more vegetables as prices are more stable than for coffee.*

[2] http://www.pempropsu.go.id/ongkam.php?me=potensi_dairi

- **Pandumaan:** *Plant both coffee and Styrax benzoin (called Kemenyan locally) for income; awareness of ecosystem services from styrax forest*; *strong traditional influence on land ownership; constraints in accessing labor for cultural reasons: perceptions of personal prestige.*
- **Le Hole:** *Seasonal insect attack from September to October affects productivity as many farmers get the fl;, vegetable intercropping is common,*

Clearly, there is no 'one-size-fits-all' approach to capacity building can be taken given the diverse range of economic, cultural and biophysical issues that can be applied to address the suite of challenges outlined even across these four villages. However, the common capacity issues in all four communities relate to silviculture treatment, preparation and use of fertilizer, management of pest and disease and application of shade trees.

Figure 2 – Sites of Coffee Surveys



Village Perjuangan

Subdistrict: Sumbul

District: Dairi, North Sumatera

Large area : 915 Ha, consists of settlement area 286 Ha and agriculture area and *kebun* 629 Ha. Soil type: Grey Podsolic

Village: lae Hole-Hole2

Sub District : Parbuluan, Sigalingging

District: Dairi

Large Area: 938 Ha consists of settlement area 50 Ha, Coffee farming 250 Ha, paddy Field is 40 Ha, agriculture land is 10 Ha and the rest is bare area

Village: Sileu Leu Parsaroan

Sub District; Sumbul

District: Dairi, North Sumatera

Large Area: 938 Ha consists of: NFA: 488 Ha; FA: 450 Ha; Coffee Farming: 400 Ha; Settlement: 38 Ha; Bare area: 500 Ha. Geographic position: $02^{0}42'16,9$

Village: Pandumaan;

Sub district: Pollung

District; Humbang Hasundutan, North Sumatera

Large Area: 5,295 Ha consists of Register Forest 41: 1,932 Ha; Non Forest: 558 Ha: Paddy Fields : 500 Ha; Peat land: 200 Ha; Coffee Farming: 400 Ha; *Kemenyan* Forest: 1,700 Ha; Eucalyptus Forest: 150 Ha; Settlement area:

2.3 – Drivers of Deforestation in Northern Sumatra

There are a number of factors which drive deforestation in the coffee-producing areas of North Sumatra and Aceh. To understand the relationship between coffee production and forests, it is firstly necessary to consider the broader drivers that are relevant to deforestation in Northern Sumatra, then test their relevance in the coffee context. Wulandari and Perbatakusuma (2009) describe the main drivers of deforestation in the North Sumatra Corridor as follows:

- **Institutional Policies:**
  - **HPH (Forest Concession**) – HPH has a direct correlation with deforestation. In North Sumatra there are 9 forest companies occupying an area of over 450,000 hectares. In Aceh, there were 11 forest companies active in over 742,000 hectares until the conflict. Following the conflict (in 2006) the Governor of Aceh declared a logging moratorium in Aceh; so for almost 15 years there have not been any logging concessions in Aceh.
  - **Wood Price –** Increasing wood price is also correlated with deforestation, but there is less evidence of this relationship, given the government tendency to raise the domestic price of logs, and the illegal logging operations.
  - **Forest Conversion** – There are two conflicting types of land conversion that have a relationship to deforestation: agricultural and plantation. There are a lot of sub-factors that impact this relationship including availability and quality of fertilizer, prime seeds, good irrigation, agricultural machines and expertise (see Box 3 on the role of agroforestry).
- **Market:**
  - **Demand for commodities** – In relation to demand for wood, this relationship needs to distinguish between raw material needs and export quotas. It has been suggested that a 1% increase in the amount of raw materials of wood industry will reduce forest cover by 2.5%, and a 1% increase in wood export quota will increase forest cover by 3.8%
- **Economic Development:**
  - **Roads** – As roads provide entry to previously inaccessible areas, logging (both legal and illegal) often follows road expansion.
  - **Gross Domestic Product** – The forestry sector has made a significant contribution to the GDP in Indonesia for 30 years. North Sumatra's GDP increased from was Rp 6,7 to Rp 9,7million during 2001-2004 while in the same period Aceh rose from Rp 8,7 to Rp 11,7million.
  - **Monthly Labour Wages** – Rural labor is poorly compensated in North Sumatra relative to Aceh – between 2003 and 2005 the monthly wages in North Sumatra fell from 476 to 430K, while in Aceh they rose from 499k to 752k during the same period.
  - **Poverty Threshold** – BPS data suggests that the poverty threshold in North Sumatra from 2003 to 2004 was around Rp242k and 11.3% of the population are below, while in Aceh it rose from 137 to 141k, where 19.3% of the population is below the poverty line.
- **Social Demographic:**
  - **Local Culture** - Including religious and cultural norms that help to encourage protection of the environment, which are being increasingly challenged by preferences for modern lifestyle choices.
  - **Flux in the population size and distribution**: e.g. related to the transmigration program of the 1980's and the migration associated with signing of the Aceh Peace Agreement in 2006 – see Box 2)
  - **Farmer capacity** – The capacity of farmers to enhance their productivity is a key factor in deforestation; when productivity declines prematurely due to poor maintenance and the knowledge of rehabilitation is limited, a superior alternative is to start new plants, often requiring deforestation.

2.4 – The Role of Coffee Cooperatives in Certification Schemes in Sumatra

The cooperative is a critical element in any agricultural certification scheme that targets smallholders. As suggested by Arifin(2008), the certification of smallholders generally requires the formation of cooperatives to facilitate product traceability; holding a separate certification process for individual growers would be logistically and financially impossible.

As an example in the organic market in North Sumatra, a small scale farmer usually has difficulty in fulfilling quality standards due to lack of capacity. For this purpose, small scale farmers need to form groups to undergo organic certification with other farmers. Through such associations, the farmers can work together to fulfill requirements of organic coffee market. If the group of coffee producers wish to obtain organic coffee certification, they can submit certification to the organic certifying institute. This will require the group to have internal control system (ICS) to ensure quality of coffee and production process in farm until the processing stage, so that the coffee will be ready to be exported to the consumer (Perbatakusuma, et al 2009)

The certification Institute will undertake certification assessment of concordance of produce of organic food with the regulation and particularly investigates implementation ICS. The Institute also undertakes informal evaluations of compliance which includes a check of documentation system ICS, qualification of staff and re-does inspections for some farmers (Perbatakusuma, et al, 2009).

While the institutional support to coffee farmers in Aceh is more sophisticated than it is in North Sumatra, March (2008) notes that there is a lack of farmer representation which is independent of exporting companies, noting that "while these organizations are a useful conduit for farmers to sell coffee, they are not independent advocates for farmer members". Also, while the role of coffee cooperatives is generally to provide a range of services to ensure that their members remain competitive in the global coffee market, a survey of 135 growers in Aceh by the Australia Indonesia Governance Research partnership found that none of the respondents identified services such as credit provision, input supply or technical advice as a benefit of cooperative membership (Arifin, 2008).

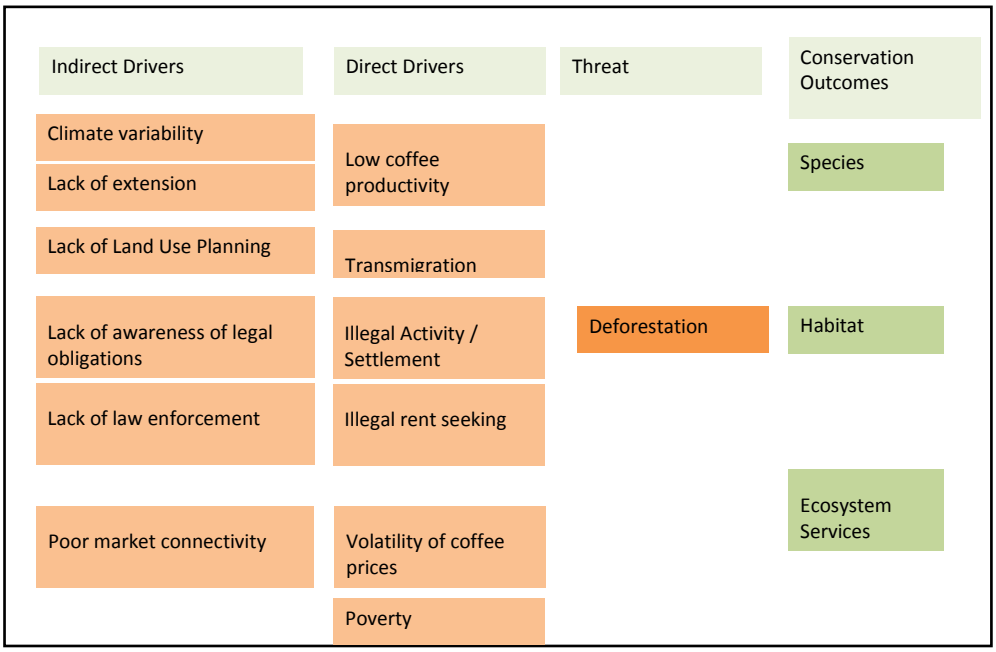
2.5 – The Relationship between Coffee Production and Deforestation in Sumatra

There are many complex synergies between the drivers described in section 2.3 and coffee production, for example low labor costs and high coffee price are related to deforestation. Verbist (2005) notes that coffee prices in 1975 triggered a '*wave of migration to the area, supported by the export-stimulating macro-economic policy of the Indonesian Government*', including devaluations of the Rupiah. He further notes that in addition to the increased export earnings, this stimulation of exports also led to an expansion in the coffee area and thus a greater conversion of forest land. According to Gaveau (2009) the 3-decade deforestation in North Sumatra is caused by poverty, weak enforcement and coffee price.

While coffee production is clearly not the only source of deforestation in North Sumatra and Aceh, it is clearly significant. For example, due to low levels of technical capacity, there is also a tendency to abandon coffee gardens when productivity declines to a certain point. The farmer will normally open up a new forest in such situations so that new gardens can be created.

The following conceptual model describes the relationship between coffee growing communities in Northern Sumatra and serves as the basis for the selection of interventions.

Figure 3 – A Conceptual Model for Coffee Production and Deforestation in Northern Sumatra



This figure illustrates a range of direct and indirect drivers and is a critical tool in identification of 'leverage points' – i.e. points within the system which can be most influenced through the comparative advantage of CI/Starbucks. This figure will be revisited in section 4.

From early investigation (i.e. survey work conducted under 2.2), it is clear that there are two capacity needs are likely to reduce pressure on the forest boundary:

- improved maintenance of coffee plant and
- techniques for rehabilitation

Improvements to productivity may directly reduce these pressures – but there is increasing body of evidence that such measures need to be complemented with other policy mechanisms to be effective. For example, one of the key productivity-increasing measures that is relevant to smallholder coffee production that has been discussed for over a hundred years is the role of agro-forestry – see Box 3.

Box 3 – The Role of Agro-forestry in Reducing Deforestation

Agro-forestry is a summary term for practices that involve the integration of trees and other large woody perennials into farming systems through the conservation of existing trees, their active planting and tending, or the tolerance of spontaneous tree regrowth (Schroth et al). Historically, there has been a 'rule of thumb' suggestion within the scientific community that 1 hectare of agroforestry saves 5 to 10 hectares of forest. However, based on their findings in Sumatra, ASB suggested that "*it is naïve to expect that productivity increases necessarily slow forest conversion or improve the environment. Indeed, quite the opposite is possible*". Clearly, agroforestry alone is not the solution to deforestation in Sumatra, with Angelson and Kaimowitz (2004) suggesting that "*the impact of introducing agroforestry practices is conditioned by the type of practice, farmer characteristics, and market and tenure conditions*."

The legal status of the land will increasingly become an important consideration, but uncertainly of tenure and delineation of boundaries has led to a culture of forest intrusion in the past. There are anecdotal examples where farmers have invested many (10+) years of production without being aware that they are illegally located – primarily due to lack of access to the appropriate information and lack of enforcement.

There is already significant evidence of forest intrusion from the smallholder coffee farmers in Northern Sumatra (see Plate 1 in Annex 6). In addition, CI conducted surveys in late 2009 across the forest frontier in Aceh Tengah to identify suitable sites for 'scaling up' the coffee and carbon activities. The survey results confirm that such intrusion is commonplace. The first phase of the survey was completed in 8 areas considered to be of 'high risk' for intrusion and involved 213 respondents across 20 villages; 95 % of the coffee operations were located in the forest (whether in protection forest, production forest and/or hunting forest). The second phase was done in 11 subdistricts which were considered of lower risk of intrusion across 57 villages and 537 respondents. The survey was conduct in the forest boundary. Most of the area was village development (e.g. houses), and 65 % the coffee area was located in the forest or near the forest (within the boundary).

In North Sumatra Province, the relationship is particulay prevalent in state-owned forests within Dairi and South Simbuatan in Western Lake Toba, which have been converted to multipurpose areas across 15,000 hectares, for resettlement, agriculture, infrastructure development and an estimated 9,000 hectares for Arabica coffee production. This case is aggravated by the lack of income alternatives and a general lack of law enforcement and land use planning. This ad-hoc conversion to agricultural land is accompanied by enterprise uncertainty for coffee farmers in the long term as they are unsure of their tenure, which in turn reduces their willingness to invest in coffee maintenance (Pratama and Perbatakusuma, 2008)

Looking specifically at the Lake Toba basin, there have been reports on deforestation in the surrounding forests and parts of the deforested area also serve as the Renun River Basin. The Dairi District administration stated that it has lost 60% of its water catchment forests due to logging, both legal and illegal. Although it may seem that this deforestation has direct impacts on water supply of the Lake Toba and the Renun River(ie reductions in water quality), further studies are needed to confirm this.

The Lake Toba watershed has vegetation cover which protects it from erosion, but the more forest there is, the more water is 'lost' to the lake through evaporative transpiration. The question is whether this moisture will ever return as rain to the Lake Toba area. If the Renun River catchments area were effectively reforested, it would probably deliver less water to the river and to Lake Toba – although such water would likely have a higher quality. Reforestation may not be the solution, but it helps to maintain the forest-based natural services and livelihoods in the area. There are other water-related problems that must be considered within an integrated strategy for catchment management. The most significant is the decreasing flow of water on the Renun River alongside the decreasing water surface of the Lake Toba. There have been concerns that if these trends continue, there won't be enough water to spin the turbine of the 82 Mega Watt Hydro Power Plant of Lae Renun (Pratama and Perbatakusuma, 2008; Perbatakusuma, et al, 2009)

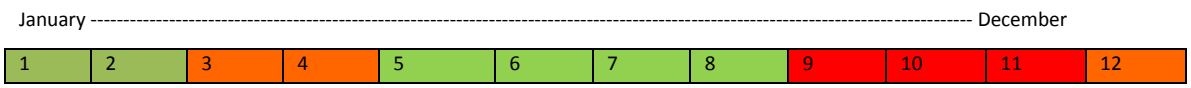
2.6 – Ecosystem Services and Coffee Production

As with all agricultural production environmental conditions are the foundation for sustaining coffee productivity, and production levels depending on the provision of key ecosystem services. Coffee production also has the ability to impact the continued provision of these services. Consistency of these conditions is particularly important for Arabica production in Northern Sumatra, which has a high price (a premium of 30% over coffees grown in similar environments across the world) but, as observed by Marsh (2006), this region does not yet have a reputation as a producer of consistently high quality coffee. Trends in the delivery of these ecosystem services are therefore a critical element in the risk management of the coffee industry in Northern Sumatra.

As noted by Clifford (1985,) coffee is a tropical plant that requires very specific environmental conditions for commercial cultivation. Temperature, rainfall, sunlight, wind and soils are all important, but

requirements vary according to the varieties grown. Ideal average temperatures range between 15 to 24°C for Arabica coffee. All coffee is easily damaged by frost, but this is a greater danger at altitudes around 2000 metres, and the majority of Arabica production in Northern Sumatra occurs at between 1000 and 1800 metres. In general, coffee needs an annual rainfall of 1500 to 3000 mm, with Arabica needing less than other species. The pattern of rainy and dry periods is important for growth, budding and flowering. Rainfall requirements depend on the retention properties of the soil, atmospheric humidity and cloud cover, as well as cultivation practices. All coffee needs good drainage, but it can grow on soils of different depths, pH and mineral content, given suitable applications of fertilizer.

Figure 4: Harvesting Time of Coffee in Dairi District (Ernawati, 2009)



	Green color indicates no harvests. If there is a harvesting activity done by the farmers during these months, the coffee yield is very low, just for home consumption.
	This color indicates that this village has harvesting activities but the yields is not so high; the average of coffee bean yields is 3 kg/tree.
	These months are peak harvesting time comparing with other months. Each tree will produce green coffee average 8-14 kg and will reduce to be 4.6 Kg (coffee bean) in dry condition, so the total yields will be approximately 7,6 ton/Ha. In this time, mainly the quality of coffee is better than other months and already ripe, and the colors of fruits are red.

Formation and retention of soil is an ecosystem function that is particularly relevant for coffee production. The central plateau of Bener Meriah has ideal conditions for coffee expansion, but as noted by Arifin et al(2009), as production reaches the perimeter of these soils, productivity falls and less intensive production systems begin to dominate – but deforestation continues.

Rising temperatures and changing patterns of precipitation will have a devastating impact for many countries that depend on coffee as an vitally important export, including Indonesia. It is estimated that a change of only 1^0C would cost the world's biggest coffee grower, Brazil, more than $113m per year. Since coffee has an upper temperature limit, after which yields dramatically decline, growers are being forced to ever-higher altitudes, rising on average by 3-4 meters per year. AdapCC research conducted on the pilot areas in Peru, Nicaragua and Mexico predicted a rise of up to 2.5 degrees Celsius with mean annual rainfall rising in Peru, but falling by up to 150 mm in Nicaragua and Mexico (Coffee Direct, 2009)

Table 2 – Environmental Parameters, Climate Change and Coffee Production

Environmental Parameter	Requirement - Arabica	Current Condition/Trend in Northern Sumatra Highlands	Climate Change Projection in Indonesia
Temperature (min)	15°C[3]	16.5 °C	0.2 to 0.3°C increase/decade
Temperature(max)	30°C	29 °C	
Precipitation (seasonality)	Distinct wet and dry seasons	Less predictable[4]	Less distinct seasonality
Precipitation (min)	1,500mm/year	929mm	-10 to +5% by 2020
Precipitation (max)	3,000mm/year	3,200mm	-10 to +5% by 2020
Extreme Events	N/A	Increase	Increase in frequency and intensity

Table 2 describes the key ecosystem services that are relevant to coffee production, their current condition and expectations under climate change.

[3] Temperatures greater than 30°C cause plant stress leading to a cessation of photosynthesis. Mean temperatures of less than 15°C limit plant growth and are considered sub-optimal. Arabica coffee is frost susceptible. Use of shade trees will reduce the incidence of frost.

[4] In most of Sumatra, the onset of the wet season is now 10 to 20 days later and the onset of the dry season is now 10-60 days earlier (UNDP Indonesia - 2007) – The Other Half of Climate Change)

Box 3 – Shade Coffee and Ecosystem Services

In 1901 the US Department of Agriculture published 'Shade in Coffee Culture' which pointed out the multiple benefits of nitrogen-fixing leguminous shade trees, noting that such trees: "hold the soil in place, seldom require replanting or other case; their shade discourages the growth of weeds, diminishes the cost of cultivation, and lessens the bad effects of drought". While mechanized plantations produce more beans, they must also support an acceleration of photosynthesis through heavy application of oil-based fertilizers. In relation to pest vulnerability, the coffee has thrived on 'sun coffee' monocultures. While shade coffee is not part of coffee growing tradition in North Sumatra, it has been part of the Gayo production methods for many generations. When new land is available, Gayo coffee farmers will typically plant shade trees (such as Dadap [*Erythrina sp*], Lamtoro [*Leucaena sp*], Gamal [*Glinicedea sp*] at around 300-500 trees/hectare. The Gayo highlanders also plant vegetables (cabbage, chili, potatoes) at the same time as their coffee plants as they provide food and a source of livelihood while the coffee plants reach maturity. The Gayo highlanders also plant Kayu Manis (*Cassievera sp*) and Minyak Kayu Putih (*Eucalyptus sp*) as a wind-break, at a distance of 1-2m.

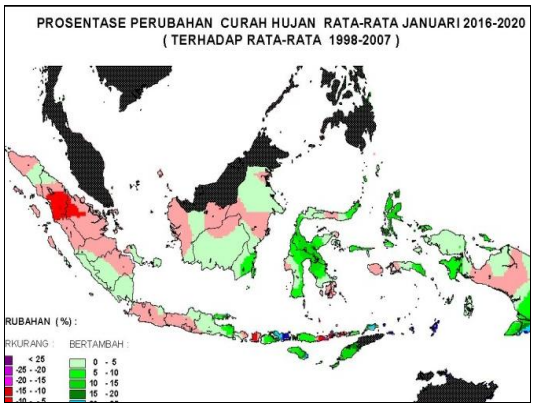


Figure 5 – Projected % of Rainfall Change in January 2016–20 compared to 1998-07 (BMKG, 2010)

These projections have particular significance for coffee production in Northern Sumatra. As Wulandari and Perbatakusuma note (2009), while coffee plants can produce fruit for decades, drought or heat in summer can diminish production and quality. Wulundari also notes that while coffee requires a dry period in the spring, heavy rains in this season can disrupt flowering.

The centerpiece of the Indonesian government's approach in supporting the agricultural sectors resilience to the impacts of climate change is through their climate field schools – currently focused on rice production. There are many lessons within the field schools approach that can be both transferred to the coffee sector generally, and built into the capacity building approach undertaken through the pilot.

Another key supporting ecosystem service for coffee is pollination. Rickets et al(2004) found that forest-based pollinators increased coffee yields by 20% within 1 km of forest and that pollination also improved coffee quality near forest by reducing the frequency of 'peaberries' (i.e., small misshapen seeds) by 27%.

2.7 – Coffee Production and Biodiversity

While it is not always easy to identify a strong relationship between agricultural production, ecosystem services and biodiversity, the intrinsic value of biodiversity should also be considered within planning decisions.

The results of an avifauna survey in coffee garden areas from the CI's survey in Dairi – South Simbuatan Forest Block in 2006 indicated similar results from various studies of other places, but no species richness similarity was revealed from the present survey. Several comparative studies to assess the coffee plantation as refugee and or buffer zone for birds revealed that the coffee garden had similar species richness to the natural forest (Coffee gardens created a new avifaunal pool, new species composition and sometimes even higher species richness). However, the similarity indices across different habitat types (from forest to agroforestry system, e.g. coffee) were very low which indicated different species

composition between these habitat types). In other words, coffee gardens could not accommodate forest specialist birds (Marty and Perbatakusuma, 2006)

In total 82 bird species were recorded during the survey in coffee farm of Sileu –leu Parsaoran and Barisan Nauli Villages, including two Sumatran endemic birds; Blue-masked Leaf bird *Chloropsis venusta* and Sumatran Treepie *Dendrocitta occipitalis*. Beside that we also recorded 17 species of Sundaic lowland biome and 9 species of Sundaic montane biome. By habitat, forest had the most number of species followed by shrub and coffee (*see* Table 3).

Table 3. Species Richness per Habitat Type in Sample Coffee Farms in North Sumatra

Habitat Type	# of Species
Shrub	39
Forest	52
Coffee farm	30

The highest similarity index was between coffee and scrub habitat, and with the lowest between secondary forest and coffee. In general, the similarity indices were low for each possible combination.

Vertical and horizontal vegetation diversity played important part in increasing species richness and composition. Vertical vegetation diversity simply means the variety of shade trees used in coffee gardens, where using fruiting plant species could make coffee gardens suitable for birds). In terms of horizontal vegetation diversity, liana, epiphytes or hanging dead leaves also contribute to high bird species richness. In short, diversity in floristic structure and composition is an important factor in improving the species richness in the shade coffee gardens. Besides that, as the coffee trees grow older, they will accommodate more species due to the increase in vertical and horizontal habitat diversity. These apply not only for birds but also for other taxa such as ants .Despite that the shade coffee could not fully facilitate forest specialist species, it still provides much better habitat for birds than sun-grown coffee. The value of shade coffee for bird conservation still needs further investigation in particular in areas like Sumatra where natural forest area continues to decline (Marty and Perbatakusuma, 2006).

The coffee growing region in Western Toba Watershed also overlaps with the distribution and population of the Thomas Leaf Monkey -- ***Presbytis thomasi margae*** **(** local name 'KIAH-KIAH'). Almost no publications or scientific reports exist for this subspecies, as it has been relatively untouched by scientific research until recently. The species of *Presbytis thomasi* or Thomas'leaf monkey or Thomas langur is a legally protected species under the Government regulation number 7 / 1999 This endemic species is categorized as a near threatened (LR/nt) in the IUCN Redlist. The existence of the 'Kiah-kiah' in the Key Biodiversity Area (KBA) of Dairi areas strengthens the KBA's status. Geographical distribution is only in North Sumatra from Wampu river to the south possibly up to about Riau Province. The *P.t.thomasi* distribution is from Wampu River to Aceh in the northern most of Sumatra island, while the *P.t.margae* from Wampu river to the south although no information of the southern most limit. The Kiah-kiah were detected in various habitat types in the study areas such as primary forest, secondary forest and shrubs, around the coffee farmlands, the riparian areas, the natural habitat near settlements. It seemed that Kiah-kiah preferred the riparian forest and surrounding areas or the habitat those not far from the river (Gumarya and Perbatakusuma, 2009).

The interaction among coffee farm, forest, biodiversity and coffee price is clearly powerfully demonstrated by civet species. There are civet species founded in Dairi and South Simbuatan Forest Blocks namely *Arctictis binturong (binturong)*, *Paguna larvata* (masket palm civet) and *Viverra tangalunga (Malayan civet)*. These species are classified as globally threatened according to the IUCN Red List (IUCN Red List 2010). Civets are carnivorous and most consistently frugivorous and nocturnal arboreal animals, living in trees and found in a variety of forests from primary to secondary forest This might indicate that they would require forested areas near the coffee farms where they forage. Ecologically, civets are considered as a form of predator control because they occasionally eat rodents They also assist in maintaining the natural forest communities, based on their role as an important seed disperser -- they travel long distances due to their frugivorous diet and defecate intact seeds of the parent trees on which they feed. (Corlett, 1998; Lundrigan, and Baker, 2003) Zhou (2010) noted *C*ivets took many fruits and

acted across heterogeneous forest habitat, thus they had the significant accelerating role in forest recruitment and regeneration of fragmented natural landscapes.

Another key role of civets is as a natural biofermenter of coffee beans. They eat the riped coffee beans and excrete them undigested. This speciality coffee known as a palm civet coffee or "Kopi Luwak" is the most expensive coffee in the world according Forbes Magazine and one of world's rarest coffees. Prices for this delicacy in 2009 ranged from USD$300 at Luwak Coffee sourcing region, to USD$ 1,400 in the USA, per pound weight clean or 15 up to 30 USD per-cup.

3 – Indonesia and the Carbon Market

3.1 – Overview of Relevant Forest Law and REDD Law in Indonesia (From Wulundari and Perbatakusuma – 2009)

Indonesia's Constitution establishes the basis of state authority over land and natural resources in Article 33, which states "Land and water and the natural riches therein shall be controlled by the State and made use of for the greatest welfare of the people." Based on that article, meaning of "land, water and natural riches" are including forest resources." Particularly in Indonesia, government has divided the forest management onto 2 major classifications i.e. (1.) conservation areas, and (2.) protection and production forest areas.

Management of protection and production forest areas is further articulated in the Forestry Law number 5 in 1967 and revised in 1999 as Forestry laws number 41, which establishes types of forest lands and the management objectives assigned to each. And, management of conservation areas (*Kawasan Pelestarian Alam* or Nature Conservation Forest Area *and Kawasan Suaka Alam* or Nature Reserve Forest Area) will be articulated in the Conservation of Natural Resources and its Ecosystem Laws number 5 year 1990. Both laws are critical considerations/constraints in delivering carbon revenues to coffee communities in Sumatra.

Law Number 41 Year 1999 on Forestry shows clearly that Indonesia's legal framework for forest management is based on three broad goals of promoting economic growth, providing widespread and equitable benefits to society (livelihoods and poverty reduction), and sustaining environmental services and benefits.

Article 18 of Law 41 requires that the Government maintain "adequate forest area and forest cover … *to optimize the environmental, social and economic benefits of local communities"* (emphasis added). Article 23 states that forest utilization "*shall be aimed at obtaining optimal and fair benefits for people's welfare while maintaining its sustainability*." The next article reiterates the multiple use concept, allowing that all types of forest areas can be used, "except nature reserves and core zones of national parks." Article 19 allows changes in allocation of forest area with the approval of the House of Representatives.

Article 4 assigns forest control to the government, which can "regulate and organize all aspects related to forest, forest area and forest products; assign the status of certain area as forest or non-forest area; and regulate and determine legal relations between man and forest, and regulate legal actions concerning forestry. Forest control by the state shall respect customary law, as long as it exists and its existence is recognized and not contradicting national interests." Article 70 obliges the Government to encourage people's participation through various effective and efficient forestry activities and to effect this participation through assistance from a stakeholder forum.

Chapter IX regulates rights and access of "customary law communities," which (as long as they exist and are recognized) have the rights to: collect forest products for daily needs, undertake forest management under customary laws (that do not contradict national laws), and be empowered for improving their welfare. Chapter X on community participation states that communities can utilize forest and forest products and be informed about plans of forest allocation, forest product utilization and forestry

information. Communities also have the right to compensation for losing access to their forests due to its designation as forest area, in accordance with prevailing laws and regulations. Communities are obliged to participate in maintaining and preventing forest areas from disturbance and damage and can seek assistance and guidance in this task, even from third parties.

In Government Regulation No. 3/2008 a detailed account of PES is restricted to protected and production forests, together with some viable schemes. It also mentions that, considering conservation areas, it should refer to a relevant law, i.e. in this case, Law N0.5/1990 which has been in national legislation since three years ago and, again, postponed to the next year's national legislation.

This government regulation, a sequent to Law No. 41/1999 also PP No. 3/2008 states that PES can be implemented through Community-based Forestry, Community Plantation Forest and Village Forest schemes. The availability of these 3 schemes gives local communities freedom to choose a suitable forest management in their respective areas. As yet no region in Indonesia has implemented Community-based Forestry, Community Plantation Forest or Village Forest and at the same time PES, of water, biodiversity, landscape beauty or carbon. The community-based forestry management in Indonesia has so far been much connected with the land tenure security issue so community-based forest management certificates given to relevant communities will ensure them the rights to manage the forests.

Similarly, CDM and REDD should also be socialized in compliance with Minister of Forestry Decree No. 68/2008 concerning Reducing Carbon Emission from Deforestation and Forest Degradation Demonstration Activitiy Implementation and Minister of Forestry Decree No. 30/2009 concerning Mechanism of Decreasing Carbon Emission from Degradation and Deforestation Forest as there is still much misunderstanding of these programs. This will hold back the implementation, besides risking their continuity after 2012. On one hand, there have been many middlemen of service to local governments in organizing carbon trade, but on the other local governments have not fully understood of REDD's definition, mechanisms, benefits and punishment.

The community-based forestry scheme has been started in several provinces, including North Sumatera and Aceh. However, the implementation has been slowed down by the indefinite status and authority of its management in some locations. In view of this, initially, it is necessary to propose a community-based forestry management to Forestry Ministry. In support of Community-based Forest as well as CDM and REDD, the Revision of Minister of Forestry Decree No. P.18/2009 concerning Community-based Forest, article 23 mentions that communities participating in or candidates for community-based forestry management are entitled to facilitation.

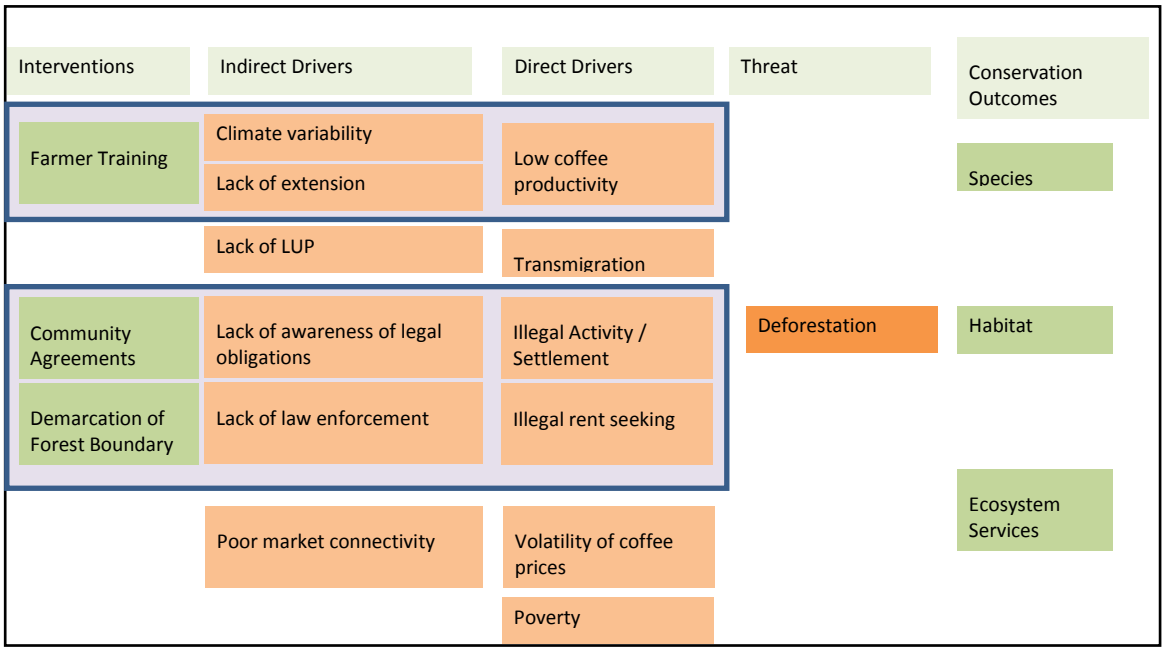
Similarly, Minister of Forestry Decree No. 68/2008, in Minister of Forestry Decree No. 36/2009 regarding Permit Procedure for Carbon Sequestration and /or Carbon Storage Work states that owner of community-based forestry utilization work permit can obtain *Carbon Sequestration and /or Carbon Storage Work Permit*. In relation with benefit sharing mechanism, this regulation stated that community, developer and government will get 50%, 30% and 20% respectively. These arrangements require a community-managed Trust Fund with good governance principles.

4 – Project Design – Pilot (Years 1 and 2)

4.1 – Identification of Leverage Points within Conceptual Model

There are particular elements of the coffee and deforestation 'system' within Northern Sumatra that are within the capacity of CI and Starbucks to sustainably and directly influence. These are as follows:

Figure 6 – Leverage Points for the Stage 1 Pilot



This gives us three key elements that link this pilot together: 1) provision of technical and legal support services to coffee communities and institutions; 2) formation of community conservation agreements, and; 3) the demarcation of the forest boundary.

4.2 – Provision of Technical Services to Coffee Communities

Based on the potential for improvements in coffee productivity and their relationship to forest intrusion in Sidikalang, there is clear value in establishing a capacity building program for the coffee farmers. To efficiently improve the capacity of coffee farmers requires the design of a program that:

- incentivizes broad participation and uptake;
- uses existing service provider networks that are familiar and trusted by the growers;
- delivers services that are relevant to the needs of the coffee farmers;
- includes a strong 'hands on' component; and
- is culturally relevant and links to local concepts of status.

4.3 – The Role of Community Agreements

As described above, in cases where there is a relationship between agricultural productivity and deforestation, capacity-building needs to be complemented with formal agreements to avoid the risk of 'opening' new forests to increase production even further with the new-found skills.

One of the key issues associated with the formation of these agreements is the logistics associated with ensuring long term compliance. Verification (and the option for associated measures in cases of non-

compliance) either need to come from strong, local community-wide ownership or from an external source (such as through regular verification audits).

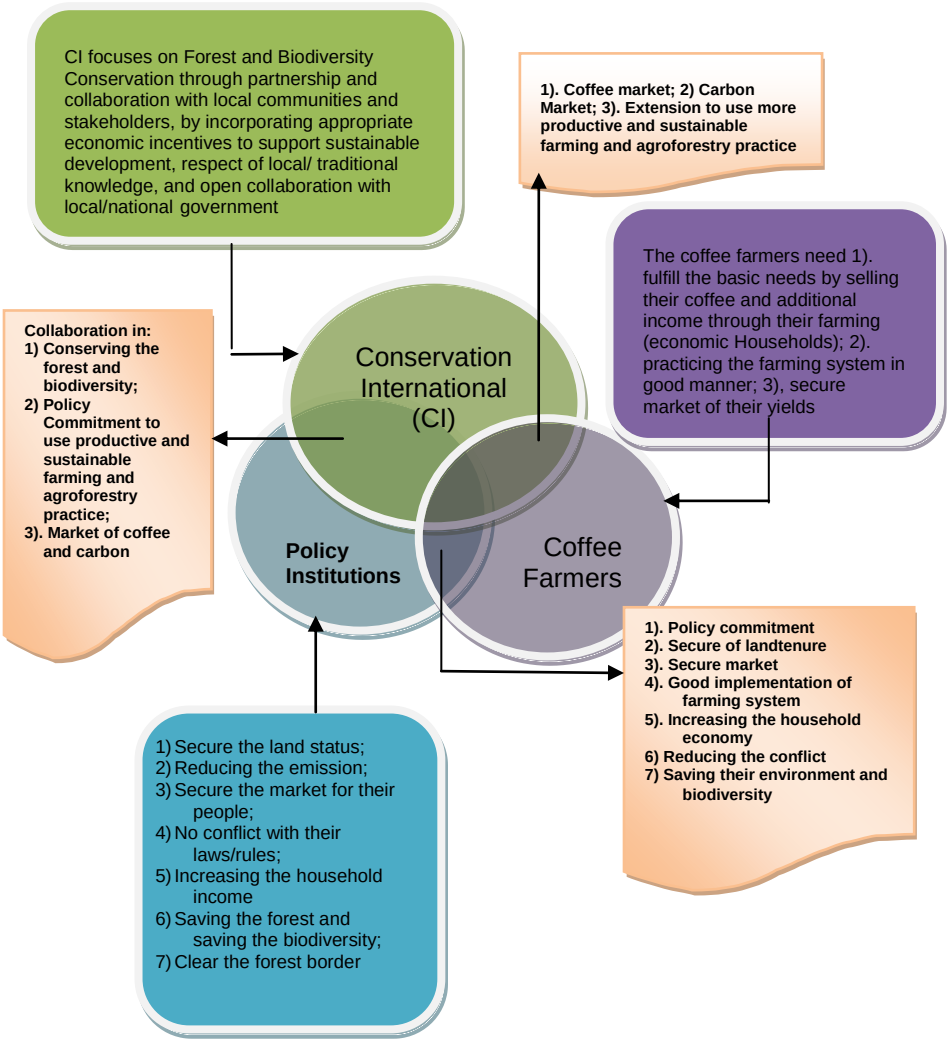
4.4 – Use of the Carbon Market as Sustainable Revenue Source for Service Delivery

While mechanisms for the services described above can be designed and delivered within the budget and time-frames of the Starbucks partnership, both long term sustainability and 'scaling up' of such approaches requires a long-term revenue stream.

Payment for Ecosystem Services(PES) offers the possibility of a sustainable revenue stream to maintain the delivery of technical support – the most promising of which is carbon via the mechanisms for Reduced Emissions from Deforestation and Degradation(REDD), given the relationship between coffee and deforestation. While such revenue streams will not be huge in the case of coffee production-related deforestation in Northern Sumatra, they may be sufficient to support the continued delivery of technical services. This project therefore needs to identify the sites where the relationship between coffee production and deforestation is strongest, and where the carbon emission reductions associated with a scheme would be greatest. This investigation is detailed in section 6 of this report.

The pilot project in Dairi required a partnership between three diverse groups of stakeholders. The following figure describes the specific role that each partner group would have in the pilot program – Figure 7.

Figure 7. Partner Roles in North Sumatra Pilot Project (adapted from Ernawati, 2009)



5 – Pilot Results: Sidikalang, North Sumatra

5.1 – Site Description

The Dairi –Simbuatan Forest Block was the location of the pilot activities. More specifically we worked in the villages of Barisan Nauli, Sileu-leu Parsaoran, Pagambiran and Perjuangan Villages located in Dairi Regency Districts which cover a total of around 43,000 hectares.

The forest bock is a part of the Western Toba Watershed Ecosystem and situated in adjacent area of Lake Toba. Lake Toba is the world's second largest lake and important for the protection of two hydro power plants (Asahan and Lae Renum). Lake Toba is as a freshwater Key Biodiversity Area (KBA) and Sicikeh-cikeh and Puncak Sidiangkat as a terrestrial KBA. The significance of conserving the remaining areas of

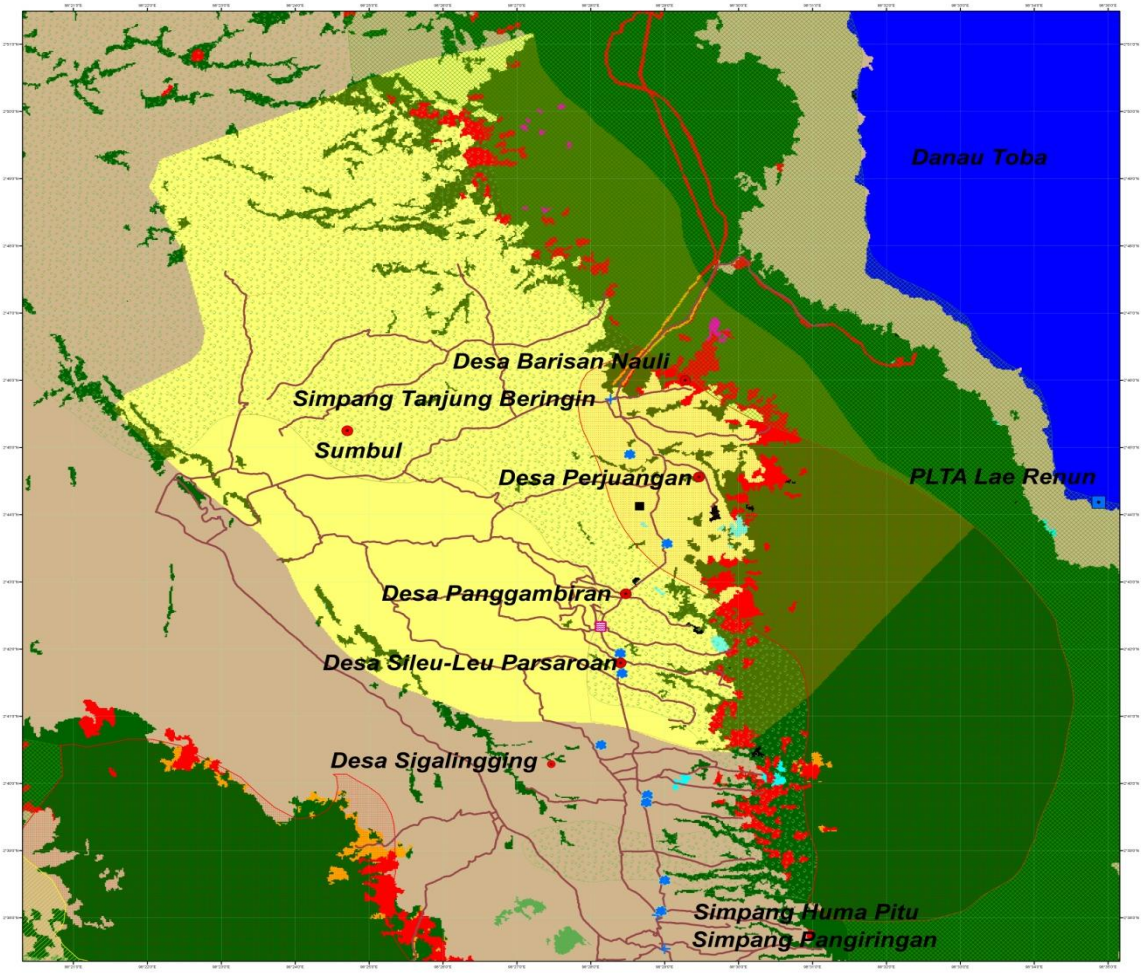
protection forest, production forest, nature reserve and its watershed from coffee-based agricultural expansion has also increased.

A part of West Toba that is adjacent to Lake Toba is a part of a larger ecosystem which is known as the Lake Toba Ecosystem. The Lake Toba Ecosystem refers to a 369,854 hectare water catchments area surrounding the lake. It covers the lake itself, the Samosir Island, and a 190,312 ha land area around the lake. The main function of this particular zone is to provide water supply for the lake and rivers that have the lake as their source (Pratama and Perbatakusuma, 2008).

The Renun is one of the large rivers that flow through the West Toba area. The water sources of Renun River come from many small rivers in Dairi – South Simbuatan Forest Block. 293,239 ha of land area forms the Renun Drainage Basin. The drainage basin comprises of forests (36%), scrubs (15%), critical land (30%), and the rest are agricultural and population area. The land area surrounding Lake Toba has diverse degrees of steepness. Around 29% of the land is flat, more than 49% has 0-15% of steepness, almost 13% has 15-40% of steepness, and the rest has more than 40% of steepness. Degree of steepness of a land area, along with the type of soil and the vegetations that grow on it, will have impact on how it can hold sediment and water runoff. The steeper the land is the less capability it has to hold water and sediments. It also faces a larger threat of erosion compared to less steep land. Looking at only the degree of steepness of the Lake Toba water catchments area, we can say that for most of the land area, it will have little to medium threat of erosion, while a small part will have a high threat of erosion. (Pratama and Perbatakusuma, 2008).

The state-owned Dairi Forest block covers a total area of 22,000 hectares. It is estimated that 15,000 hectares of this forest has been converted to multipurpose areas , such as resettlement, agriculture, infrastructure development, including 8,800 hectares converted for Arabica coffee gardens. Conversion to coffee is caused by coffee farmers needing fertile land for agricultural purposes and the lack alternatives to increase the income of local people. In addition, lack of law enforcement and lack of land use planning from government side. Forest function change to agricultural land causes acute, serious and endless land use problems and increasing enterprise uncertainty for coffee farmer on a long term. Conversion also causes decreases in environmental service quality, such as water supply, micro climate and biodiversity.

The conservation coffee project sites are located predominantly within forest areas. Tanjung Beringin, Perjuangan, Barisan Nauli, Pagambiran and Parsaroan villages lie within a production forest. This would mean that there has to be a change in land use designation from protection forest to legally permit coffee plantation. It is generally believed that this kind of conversion will have negative impacts, especially on watershed function. On one hand, it is true that forest conversion will reduce the lands ability to hold water, but on the other hand, a coffee plantation will have more capacity to ensure continued flow of water to rivers and streams. Considering the high rainfall in this area, a coffee plantation might be positive in providing more water flow, in this case, to the Renun River and the Lake Toba – but could be negative if fertilizer use leads to high local pollutant loads. According to a study in Sumberjaya District, Lampung province, after 10 to 15 years, the coffee plantation managed to increase its water holding capability while maintaining a steady water flow to the adjacent river through the introduction of a shade grown agro-forestry coffee plantation.



MAP 2. Map showed community-based conservation agreement sites i.e Perjuangan, Barisan Nauli, Sileu-leu Parsaoran and Pagambiran Villages

Legend : Forest Deforestation 1990 – 2000 Deforestation 2000 – 2008 Non Forest

5.2 – Establishment of Community Agreements

Protecting biodiversity and key ecosystem services in Dairi- South Simbuatan Forest Block in an area of high poverty underlines the need for designing conservation mechanisms that provide development opportunities to local populations. Coffee farmers will choose to protect key biodiversity areas and ecosystem service, if conservation benefits them in concrete ways that help them meet their livelihood objectives.

In relation to bridging conservation and economic development in micro level, this pilot project used a conservation agreement approach. Resource users, (particularly coffee farmers) choose to commit to conservation in exchange for benefits that compensate for foregone income from this choice. These benefits are provided conditional on meeting conservation goals, all of coffee farmer jointly defined

through a participative process. Conservation agreements are applied to build stewardship, fair and transparent, adaptable, positive human impact, concrete conservation results, equitable and flexibility allows for replication (Perbatakusuma, et al 2009).

Discussion of community agreements was initiated with three villages (Sileuleu Parsaoran, Pergambiran, Barisan Nauli) in July 2009 during the initial meeting for the establishment of the demonstration plots, and intensive discussions continued until the community agreements (Village Conservation Natural Resources Agreement) were finally signed on the 19th of October 2009 at GPMI Church, Perjuangan village. An additional agreement was established with Perjuangan village in 2008.

The four identical agreements were established between Conservation International and communities in the Sumbul Sub-District of Sidikalang (see plate 2 in Annex 6). In return for respecting the forest boundary (which, in the case of Pergambirian, was defined though the installation of concrete markers).

More specifically, under the agreement the farmers will:

- stop encroachment and opening forest area for plantation
- conduct coffee conservation (organic and agro-forestry system)
- participate in forest protection and rehabilitation programs
- engage in sustainable and fair coffee trading.
- participate in forest land use and land tenure conflict resolution and sensitive conservation local spatial planning, i.e community-based forestry, village-based forestry
- increase their knowledge and skills and to organize their aspirations for their local institutions

CI's obligations are as follows:

- facilitated farmers for marketing coffee (it is CI facilitated trough Coffee Cooperation and C.A.F.E. Practices)
- assist farmers through training and other conservation program (CI will collaborate with the Coffee Conservation Forum in the future)
- assist participatory demarcation of natural forest boundary – coffee farm border with involvement of local government and adjacent communities through establishing "No Forest Encroachment" cement markers
- Continue support to adjacent coffee farmer communities in exchange for respecting forest boundaries in production forest and facilitate a process to provide forest permit rights to get legal and secure forest land access for farmers adopting coffee agro-forestry systems
- Support efforts by the cooperative to complete verification under the Starbucks C.A.F.E. Practices program and export coffee to Starbucks and/or other specialty company

The agreement system builds self-enforcement using traditional village-level processes rather than relying on external mechanisms and is therefore more sustainable. Monitoring and enforcement will be based on obligations of signatories against the agreement requirements but also will also reflect national law.

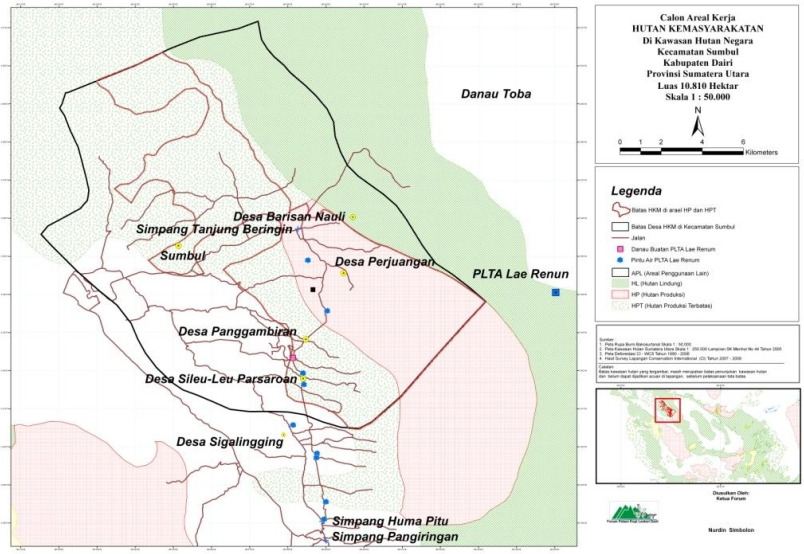
To scope the work in accordance with the local perceptions and needs, Conservation International conducted a 'how to' multi-stakeholder workshop for regional coffee farmers on successfully developing conservation coffee by combining agro-forestry approaches, growing organic coffee, responsible and fair trade approaches, and sustainable use of the remaining forest. This workshop was held in Sidikalang, with around 200 participants from 21 villages. As a result, the first conservation agreement launched. **Conservation Coffee Farmer Declaration** was signed and both the Dairi Conservation Coffee Farmer Forum Association and the "Baperda Organik" Farmer Cooperative Institution were established and the future strategy for conservation coffee and saving the remaining natural forest in Dairi – South Simbuatan Forest Block was developed.

The coffee farmers of Perjuangan Village, Barisan Nauli, Pagambiran Sileu-leu Parsaoran announced and signed a second conservation agreement. This agreement was signed by the head of the village, chairman

of the village, people representatives, and the chairman of farmer group and was supported by approximately 475 households (1600 people) in Pagambiran Village, 340 households (1900 people) in Sileu-leu Parsaoran Village, and 24 members of the farmer group in in Barisan Nauli Village. This agreement is called a community-based conservation and conservation coffee agreement.

These agreements also help to resolve an acute conflict over forest land use in the Dairi District. The Dairi Conservation Coffee Farmer Forum Association has been progressing the designation of the forest as a *community forest* from the Ministry of Forestry and the Head of the District, and this agreement currently appears likely. In mid October 2009, a community forestry coordinating planning workshop was executed in Sidikalang. This workshop was attended by 53 participants, including representatives from Dairi Regency Forestry Office and Wampu – Sei Ular River Management Agency – Department of Forestry. The workshop resolved that there is a need to enforce establishing a verification team from local government to verify community forest permit use rights proposal as submitted by Dairi Conservation Coffee Farmer Forum Association. The association will re-submit the proposal for a second time with more support from association members from coffee farmers in seven villages. An official *community forestry scheme* with a total area of 10,000 hectares was submitted by Dairi Conservation Coffee Forum Association to the Minister of Forestry and the Head of Dairi District.

Map 3 – Delineation of Community Forest Boundary



5.3 – Delivery of Technical, Legal and Institutional Support Services for Coffee Farmers

After conservation agreements were agreed by coffee farmers, trainings through Farmer Field School and conservation coffee demonstration plots methods were conducted. Training emphasized planting and growing organic coffee in the shaded areas of multipurpose trees, pruning, and improving coffee post harvest (see plate 3 and 4 in Annex 6).

The first task in the development of the technical services was the site-identification and establishment of a 'best practice' Arabica coffee demonstration plot in each of the four villages within the Sumbul sub-district area: Pagambiran, Perjuangan, Sileu-leu Parsaoran and Barisan Nauli.

Following this, a farmer group was established, along with a schedule to conduct training sessions in groups of 25 farmers every two weeks. The field school activity started in August 2009 and included:

- Training in organic compost making (August)
- Coffee plant pruning (September)

- Making biostarter (September)
- Management of coffee seedlings (October)
- Agroforestry: using avocado, sugar palm, suren. (October)
- Post harvest management (November)
- Marketing (November)
- Provision of tree seedlings for Agroforestry (November)
- Closing ceremony: evaluation, certification and guide (December)

Additionally, the training included an ecological awareness module that engaged in discussions on the services provided by the local ecosystems, and the importance of conserving these ecosystem functions for coffee health. One of the recurring issues from these training sessions was the availability of practical options for managing the impacts of 'climate change' on coffee production.

In addition, a tree nursery was built by the community and multipurpose trees produced by the nursery will be planted to create a live forest boundary along remaining natural forest – coffee farm border and coffee gardens under shade trees. Coffee gardens in four villages enriched and rehabilitated their coffee production areas by planting more than 10,000 seedlings of various multi-purpose tree species.

Participatory forest border marking and planting of a live forest boundary marker was carried out along the border of the remaining natural forest and coffee garden across a total of 10 km (see plate 6 in Annex 6).

There was evidence of uptake of practices during the course of the 3 month program, with participants reporting compost production and use in the September sessions. Additionally, there was significant interest from non-participants in receiving field training in Perjuangan village, so an additional session was held at no cost.

As a part of the training, each farmer received 250 coffee seedlings, 20 avocados, 20 sugar palm and 10 Toona sureni (suren) seedlings (see plate 7 in Annex 6).

In addition to practicing skills at the demonstration site, the October sessions also involved a site visit to a C.A.F.E. Practices-verified site – recently verified by Control Union. This was used to illustrate the quality of production that farmers would aspire to as a result of their efforts (see plate 9 in Annex 6).

An evaluation session was held in December to explore the impacts of the training. This covered three main areas: quantity of compost produced, shade trees planted for agroforestry and incidence of sharing information with non-participant farmers. Results showed:

- 7,800 trees planted across the 5 training groups
- 108,700 kilograms of organic compost produced across the 5 training groups
- Information shared between 170 participants and over 500 non-participants

5.4 – Cooperation with Local Institutions

The identification and formation of partnerships has been critical to the success of the pilot project. The role of both the coffee cooperative (KSU-Baperda Organik) and the farmer conservation coffee forum (Frontkopi Lestari) was critical to the success of the pilot.

Baperda Organic was established in Sidikalang and legalized based on Binahar Hutapea Notary Act No.58]2008. The main aim of establishing the cooperative is to increase human welfare and economic income particularly for coffee farmers who are member of cooperative. Internal regulation of KSU Baperda Organik (No. 001/KSU-BO/Kpts/XII/2009 in Article 2) describes the cooperative aims are to "*improve the sustainability of natural resources and sustainable use of ecosystems and the efforts of natural resources and ecosystems for the needs of different generations in the present and future needs*".

Baperda Organik is carrying out its activities according to a set of principles, namely:

a. Struggle for survival and protection of natural ecosystem health and environmental services to provide benefit to the improvement of community welfare
b. Build strategic partnerships with stakeholders in achieving its vision and its mission.
c. Struggle for more environmentally sound and social justice agricultural systems
d. Position ourselves to empower disadvantaged and neglected farmers.

In connection with providing the focus of the implementation of business activities, Baperda Organik in its internal regulation stated that it will undertake the following activities:

a. Conducting the business of production, processing, buying and selling environmentally friendly coffee, such as certified organic coffee, certified C.A.F.E. Practices coffee and fair trade certified coffee
b. Organizing efforts to carry out supporting activities such as developing, establishing and implementing the Internal Control System for improving coffee quality following implementation of procurement guidelines in the special regulation of cooperatives, to improve management capacity and increase forest conservation efforts to obtain certified status.

The Dairi Conservation Coffee Farmer Forum or called Front Kopilestari was declared by 128 representatives of coffee farmers covering 12 villages in Dairi District in Conservation Coffee Multi-stakeholder Workshop dated on December 12, 2008. This institution was established and legalized based on Binahar Hutapea Notary Act No.26/2009.

In the statute of Front Kopilestari, this institution has the goal to "*realize the achievement of better coffee farmer livelihoods sustained between generations that is based on best practices, produce coffee that is sensitive to the environment, preserve environmental benefits of natural forests and biodiversity and fair trade coffee, through local community organizations that are based on principles of justice, accountability and sustainability aspects of environmental, economic and social culture*".

To achieve its vision Front Kopilestari has set as a mission and or strategic role, to act as driver (motivators) and process facilitator (facilitator) of coffee farmers in the acceleration of movement toward the implementation of the coffee production practices that are sustainable and equitable in Dairi district through a series of efforts:

a. Restrict, reduce and stop activities leading to natural forest cover change and loss of function of natural forest preservation area that reduces the benefits of environmental services and biodiversity to support sustainable coffee farming
b. Restrict, reduce and stop the use of fertilizers, pesticides, herbicides and synthetic fungicides in coffee production
c. Strive to improve the quality of coffee production by practicing various types of tree planting coffee protective benefit, the use of organic fertilizers and pesticides, proper use of coffee seeds with the local environment and the selection of an appropriate land use for gardening coffee.
d. Encourage rehabilitation efforts in abandoned lands, critical lands and / or degraded forest areas by introducing coffee agroforestry practices or crop mix.
e. Arranging the institutional strengthening of sustainable coffee economy and increasing economic income of coffee farmers through improved coffee marketing by developing environmental friendly and fair trade products.
f. Developing partnerships with stakeholders, including governments, private sector and other nonprofit organizations.

g. Encourage and pursue development of concepts, formulation of local policies and legal products as well as conflict mediation processes to support the utilization of forest-based natural resource management, local communities, the development of agroforestry coffee and certainty to long-term coffee farmers through Community Forest schemes and / or Village Forest.
h. Develop awareness, outreach and disseminate information about sustainable coffee farming and forest conservation and the environment.
i. Develop and improve organizational capacity, including members of the Front Kopilestari which includes insights, knowledge and skills.

Facilitating conservation coffee development in the Pilot also also included the development of organically certified coffee market. Assessors from Control Union Certification (CU) have conducted C.A.F.E (Coffee and Farmer Equity) Practices field evaluation. Coffee production chain, including 315 coffee garden areas in Sumbul Sub-district and Olivia Christy - owned coffee warehouse will be inspected by CU in early November. The result of evaluation in February 2010 is that coffee quality fulfills C.A.F.E. Practices standards and received "verified" score(See Annex A8). This will translate to generation of additional income for 315 coffee farmers who will get premium from conservation coffee trading benefits.

5.5 – Delivering Carbon Revenue to Communities in the Pilot Sites

Based on the information provided in Section 3 (Indonesia and the Carbon Market), there are two main legal challenges to the delivery of carbon revenue to the project sites:

A – Areas of coffee production need to be designated as community forest so that the communities are legally able to 1) produce coffee and 2) benefit directly from carbon revenues

B – Willingness of the Indonesian National Government to allow participation in the global voluntary market for carbon.

In relation to the first challenge (A), significant progress has already been made in the case of Dairi in North Sumatra on the community designation – as described in section 5.2 above.

The second challenge is more complex. The Indonesian government has not yet articulated a specific position on participation within voluntary carbon markets. CI will continue to actively pursue this result through both international fora (i.e. the UNFCCC) and through CI's strong relationship with the Indonesian Government, particularly the Ministry of Forestry.

5.6 – Key Lessons from the Phase 1 Pilot

The following lessons have been drawn from the experience over years 1 and 2 in the pilot, and have informed the project plan for year 3 and beyond – most of which relate to the implicit 'trade-offs' that underpin on-time delivery and project sustainability:

- **Commit to Capacity Building**: While contracting out all elements of the pilot program would have been more likely to ensure timely delivery against the partnership milestones, a key objective of the activities is to build the capacity of CI Indonesia and its partners to undertake deforestation mapping and carbon stock assessments to ensure a more sustainable result that will benefit other project areas.

- **Secure Strong Commitment Early:** Close and equitable partnership arrangements, good coordination and cooperation amongst all stakeholders is necessary to ensure the sustainability of project design and implementation.

- **Plan Sufficient Time for Collaborative Processes**: Participatory, multi-layer policy intervention and collaborative management approaches to conservation-sensitive land use planning, forest conservation and sustainable economic development require more time, energy, resources and efforts compared to conventional 'top down' approaches. The process will be iterative and flexible to address the actual conditions of relevant farming communities.

- **Rely on Existing Cooperatives / Community Organizations::** The Dairi pilot involved an extensive (up to 8 month) negotiation process to establish community agreements with the participating villages. 'Scaling up' will require a more efficient process and will need to rely more heavily on the cooperatives.
- **Better Capture Conservation Outcomes**: Scaling up project based on 'lessons learned' should better characterize conservation benefits and well as well-human being.
- **Move to Locally-Based Project Management:** Years 1 and 2 involved oversight from CI HQ staff. There is clear advantage in a sustained presence in Indonesia for the project – to take advantage of emerging opportunities and maintain project momentum.

6 – Site Selection for Large Scale Carbon Coffee Project in NSC:

On a physical basis, the most favorable location for a conservation coffee project that uses REDD as a suitable source of funding will meet 4 criteria:

A – High rates of historical deforestation
B – High carbon stock forested areas
C – A strong relationship between coffee and deforestation
D – High suitability of forested land for coffee production

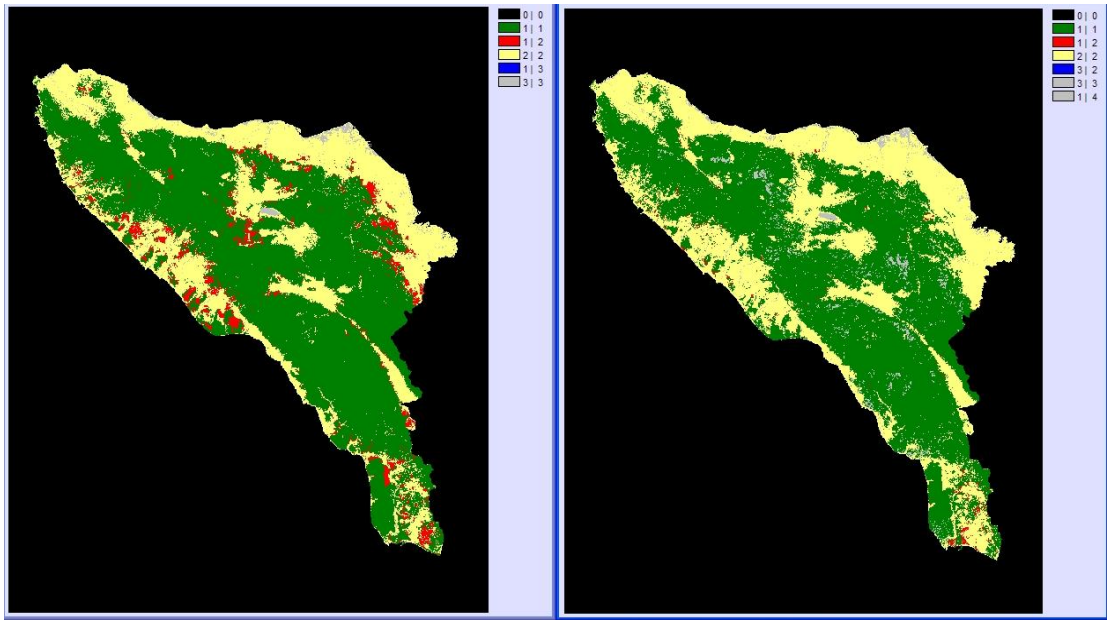
This section describes the spatial analysis that was conducted under Year 1 and 2 of the Starbucks Sumatra project. This work includes the obligations established under the agreement with Starbucks but also includes some valuable no-cost additions that will greatly strengthen decision-making on REDD within and outside the direct stakeholders of this project. Additional information is available as Annex A3.

6.1 – Observed Forest Cover Change in Northern Sumatra (2000-2006)

Figure 8 illustrates the observed changes to forest cover in Aceh across the periods of 1990-2000 and 2000-2006. While observed changes for North Sumatra have been prepared, they are not presented as at these resolutions, the deforested areas (shaded in red) are undistinguishable. These observations help to establish the existing rates of deforestation and hence are a vital component of the REDD baseline scenario development. The red shading illustrates areas of loss of forest cover for that time period. From the figures it is clear that deforestation rates decline during the period of 2000-2006. There are a number of plausible explanations for this decline, the most plausible of which is Aceh conflict that ran from 1998-2005 (see Box 1).

Figure 8 – Observed Forest Cover Change in Aceh (1990-2006)

Actual Change 1990-2000 **Actual Change 2000-2006**

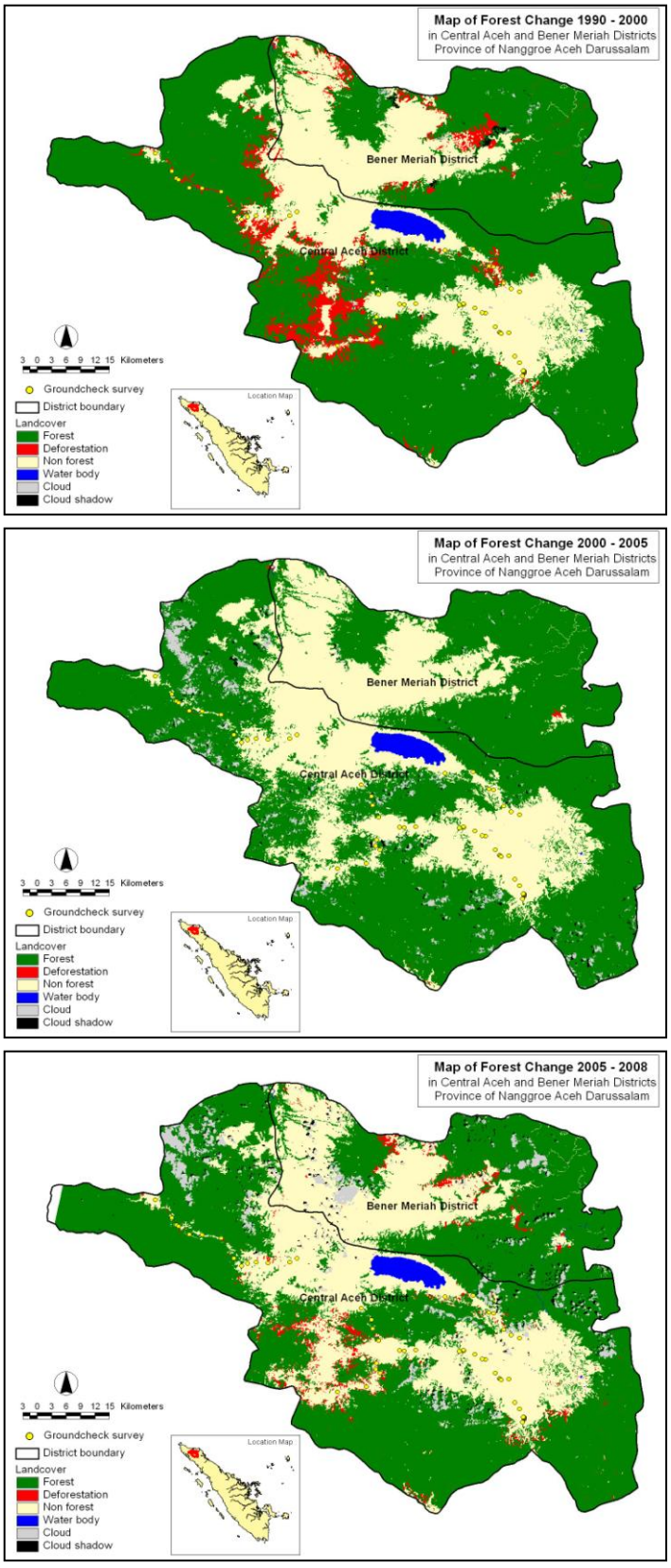


In order to test this theory it is necessary to examine the deforestation rates after the peace agreement that ended the conflict was initiated; reflecting a return of the combatants to their livelihoods. Figure 9 and 9a breaks the time series into three segments: before (1990-2000), during (2000-2005) and after (2005-2008) the conflict. This analysis focuses on the key coffee growing disticts: Central Aceh and Bener Meriah and confirms that deforestation continues after the signing of the peace agreement.

Figure 9 - Observed Forest Cover Change in Central Aceh and Bener Mariah (1990-2008)

No.	District	Forest Loss (ha)		
		1990-2000	2000-2005	2005-2008
1	Central Aceh	24287,66	134,51	8385,26
2	Bener Meriah	6913,47	228,57	3376,85

Figure 9a - Deforestation in Central Aceh and Bener Meriah Districts from 1990-2008



6.2 – Modeled Forest Cover Change in Northern Sumatra

In order to understand the potential revenues associated with a REDD activity, the future deforestation in the target area must be estimated. Figure 10 illustrates the deforestation 'hotspots' by looking at the areas most likely to change. Note that this is a 'soft' classification that shows probability of change based on the change maps, and the drivers of deforestation, including existence of local roads, XXX etc..

Figure 10 Northern Sumatra: Probability of Change

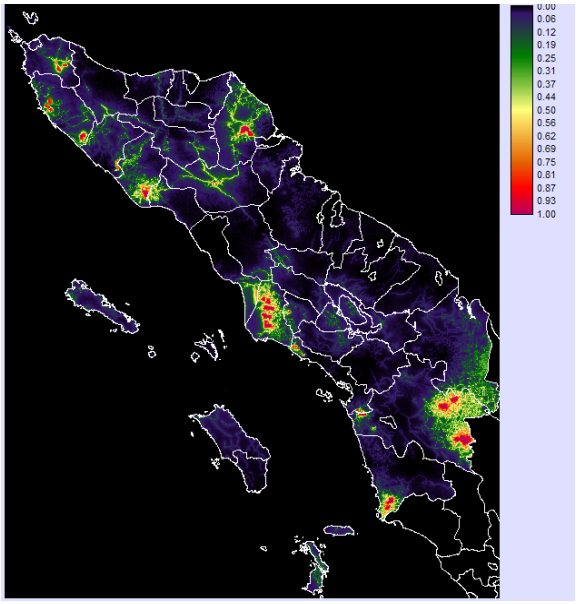
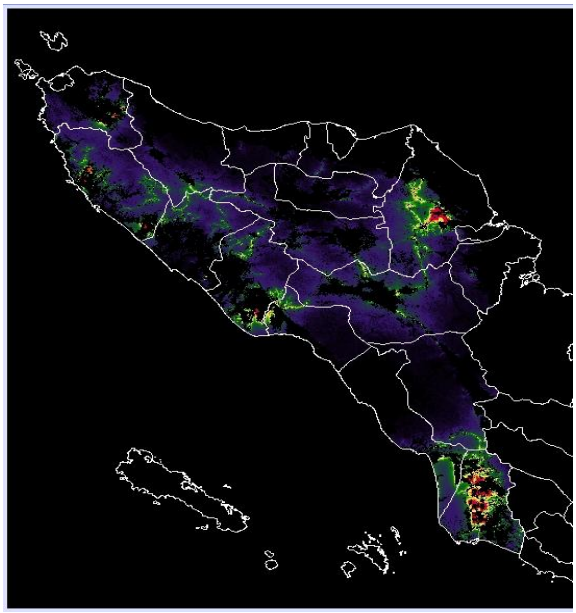


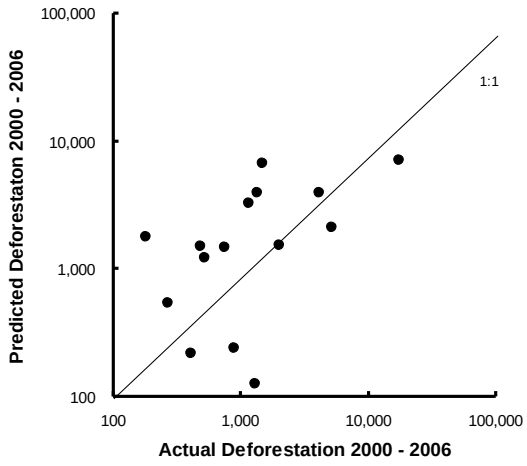
Figure 11 then illustrates the conversion of probability data to deforestation rates.

Figure 11 - Modelled Hectares of Change - Aceh



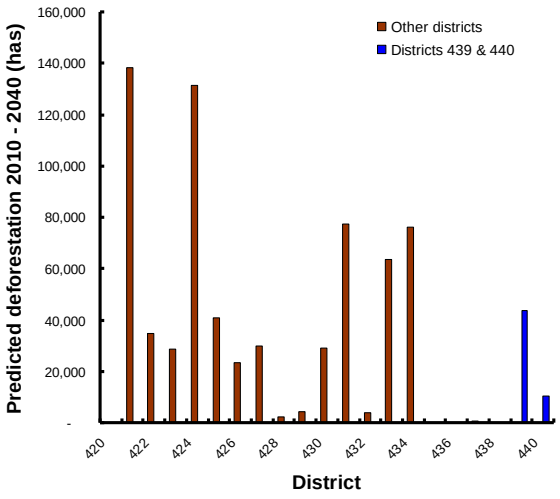
Part of the validation process for the modeling exercise is to confirm that the model is able to predict historical deforestation rates. Figure 12 illustrates the strength of this relationship. This gives sufficient confidence in the model to quantify the deforestation rates (Figure 13) and progress to the carbon stock assessments.

Figure 12 - Modeled vs actual change 2000 – 2006: Aceh districts



Note that the two districts of interest are presented in blue: 439 is Central Aceh and 440 is Bener Mariah. There are certainly higher deforestation rates in other districts, but these are lowland areas with high historical rates of deforestation and not related to coffee production. The highlands of these coffee-producing districts are of particular interest as they are contiguous blocks of rich forest.

Figure 13 - 30y deforestation Prediction: Aceh districts



6.3 – Forest Carbon Stock Assessment in Northern Sumatra

Table 4 outlines the preliminary estimate for the potential 30-year REDD revenue associated with reduced deforestation in the two districts. This table also includes information on the key assumptions that underpin this estimate, including failure rates, leakage rates and the market price of carbon.

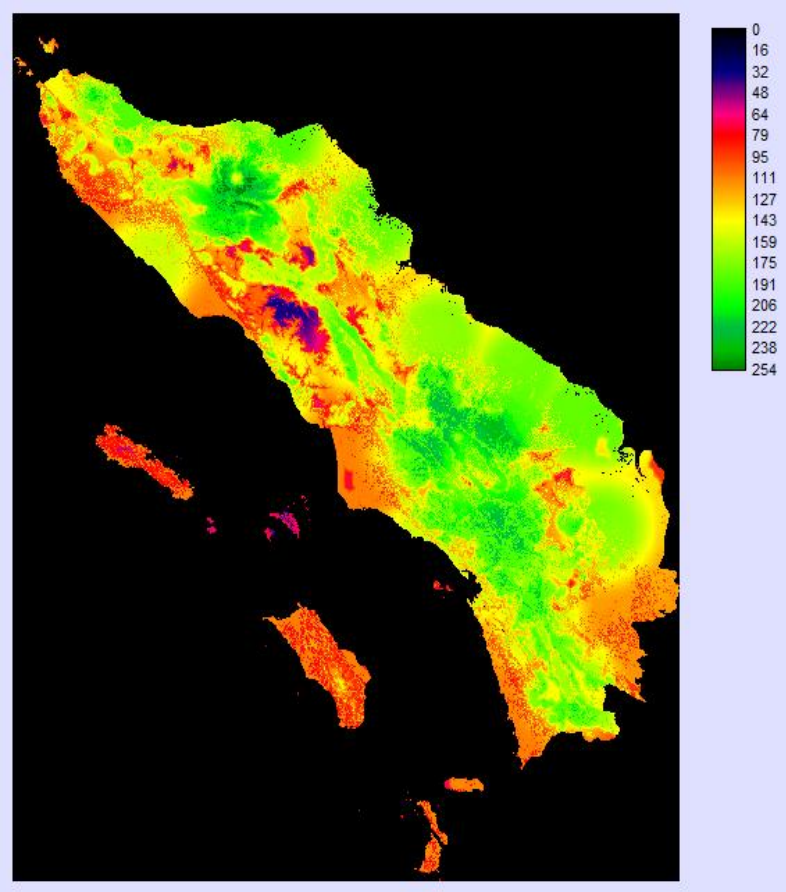
Parameter	Aceh Tengah	Bener Meriah
Average biomass (t dry wt per ha)	280	280
Baseline (tCO2e)	22,399,249	5,356,772
Failure rate inside	0.1	0.1
Leakage rate	0.1	0.1
Ex ante REDD benefit (tCO2e)	17,919,400	4,285,418
30y Revenue @ $10- per tCO2e	179,193,995	42,854,179

Based on these estimates, Aceh Tengah appears to have a higher potential to generate forest carbon revenues through a REDD project with coffee producers.

6.4 – Coffee Suitability Assessment for Northern Sumatra

Figure 14 presents the 'first cut' assessment of suitability of coffee production in Northern Sumatra to ensure that there is consistency between the areas of predicted deforestation and coffee production areas: if the areas projected to be deforested are unsuitable for coffee production, then it follows that coffee production is not likely to be a key driver of deforestation. The parameters used for this modeling included elevation, rainfall, temperature, road, proximity to roads and proximity to cities – note that this did not include soil characteristics, or consider climate change projections. These preliminary results suggest that coffee suitability overlaps with existing forest areas in the three districts of interest in North Sumatra and Aceh, so this finding supports the argument that these forest areas are at risk of deforestation because of future expansion of coffee gardens.

Figure 14 – Assessment of Coffee Suitability in Northern Sumatra



6.5 – Findings and Recommendations Based on Carbon Stock and Coffee Suitability

- Based on this assessment, Central Aceh is the most suitable site for 'scaling up' of the Starbucks work in Sumatra as it has a) highest rates of historical deforestation, b) highest carbon stock forested areas, c) a strong relationship between coffee and deforestation and d) high proportion of land with intact forest that is suitable for coffee production.
- Subdistricts with more limited forest resources appear to have higher coffee productivity. This reinforces the argument that it is currently easier to clear more land rather than maintain and rehabilitate existing coffee gardens – this maintenance (and higher associated productivity) appears to occur where there are more limited forest resources.
- Accuracy of deforestation and carbon stock assessment could be improved through the inclusion of better infrastructure information into the model.
- Accuracy of coffee suitability assessment could be improved through the inclusion of social information (poverty rates, income) and soil information.
- Climate Change impacts should be considered within coffee suitability assessments.

7 - Conclusions and Recommendations

Based on the lessons above, there are a number of characteristics that this project modality will need to be successful. These characteristics are described below

7.1 – General Management

This section described the characteristics that should be considered in the design and implementation plan when these approaches are 'scaled up' in new geographies. It is clear from the pilot that a successful design will:

- Respond to the technical service needs of local growers where such needs are related to the drivers of deforestation – this should target proximate drivers of deforestation but also be sufficiently robust to changes from external drivers (e.g. coffee price)
- Build capacity in the cooperatives that service farmers at the 'forest frontier' both to access carbon revenues and to improve service delivery to members.
- Combine local enforcement capacity of communities with the capacity of cooperatives to manage certification requirements.
- Coordinate partnership among key stakeholder to maximize and optimize resources and to generate demonstrable livelihood and conservation outcomes.
- Include the establishment of an appropriate mechanism to help resolve forest land use issues. Forest land use is politically sensitive and should be treated with caution.
- Build trust within local communities and local government and other key stakeholders through transparent approaches, and realistically accommodate the time frames that such approaches require.
- Build in the successful elements of the Indonesian government's climate field schools to ensure ongoing coffee productivity under climate change.

The information gathered in Years 1 and 2 is a significant portion of the information required for the establishment of the first community-based coffee and carbon project in Indonesia.

Annex A5 describes the requirements of a detailed feasibility analysis which will be undertaken on the sites selected for year 3 'scaling up' of the project in Northern Sumatra.

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** Indicates studies produced specifically for the Starbucks Partnership*

Annex 1 – Additional Material

A1 - DRIVERS OF DEFORESTATION IN DAIRI AND CENTRAL ACEH DISTRICTS – Christine Wulandari and Erwin A Perbatakusuma (2009)

According to World Bank and WRI (2000), the leading cause of deforestation in Indonesia is large-scale commercial logging and follows by agricultural conversion and shifting cultivation. Such activities illegal logging can have adverse effects on forest communities and also almost certainly undermine attempts to sustainably manage forests it could be due to the current government lacks the legitimacy, capacity or political will to secure Indonesia's remaining forests. Its condition also proven in the field, government officer who have responsibility to manage the forest and natural resources do not know or aware and understand of updating relevant regulations and policies, for examples the revision of PP 6/ 2007 to PP 3/2008, and some schemes of community base forest management which could implemented in their authority forest areas such as *Hutan Desa* or Village Forest, HKm in production and protected forest, *Kemitraan* or Partnership in Conservation Forest and HTR or Community Plantation Forest. It could be happened due to the weakness of policy dissemination system at all level (national, province, district and village) or due to lack of capacity or political will of local government toward to sustainability of forest resources.

Different opinions of experts and practitioners in general confirmed the deforestation driven factors in Indonesia, which include Nanggroe Aceh Darussalam (NAD) and North Sumatera namely: Institutional Policy, Market, Economic Development as well as Social and Demographic Trends.

I.Institutional Policy

Factors of the institutional policy in Indonesia will greatly affect the rate of deforestation, one of which is the number and area of HPH (a forest concession).

I.a. HPH (Forest Concession)

Candrakirana (2005) stated that HPH had a direct correlation with deforestation, an increasing of HPH area and number of HPH will reduce forest cover. According to Maryudi (2001), in the mid 1990s, a large area of forests was occupied by a few entrepreneurs. Data from APHI recorded 25 major HPHs and 2 private companies operated in an area of 27.5 million ha. This is considerably large, compared to the area of production forests both permanent and limited production forests, covering an area of 64 million ha. Thus, almost a half of production forests in Indonesia are managed by 27 HPHs.

In North Sumatera Province alone, there are 9 forest companies occupying an area of 450.095 hectares (*Statistik Kehutanan Sumatera Utara*,2008). One of them, PT Toba Pulp Lestari Tbk, covers an area of 269,060 ha and part of it is located in Dairi District. In Nanggroe Aceh Darussalam Province year 2001-2006 there are 11 forest companies and total areas amounted 742,915 ha but only one company has operated i.e. Kopontren Najmussalam (30,846 ha). And, based on data of *Aceh Tengah dalam Angka* year 2007 and 2008, there is only one company that operated i.e. PT Alas Helau (67,878 ha).

As mentioned by Candrakirana, the number and area of HPH have a clear correlation with deforestation. Based on BPS data 2007, in North Sumatera HPHs cover an area of 943,999 ha, and HPHTIs (HPH for industrial timber plantation) 247,265 ha - only 40.251 ha of which is properly managed, besides 14 IPHHKs, only 3 of them operating, 37 ha each. The statements of World Bank and WRI are proven in this district since PT Toba Lestari Tbk's commercial logging area has been converted to agricultural and shifting-cultivation fields. Deforestation in this region, therefore, is also caused by land clearance for HPHs. Right now along the border there are coffee plantations (part of them are HTIs) established and managed by local communities around the forests.

At CI working area in Central Aceh stretches in 280,647 ha of forest areas, or 64.9% of the district's territory (431,839 ha). Here, the production forests, both permanent and limited, amount to 18.8% of the existing

forests. Based on the available data of 2008 and 2009, the size of critical lands has slighty shrunk from 39,863 ha to 39,541 ha. This is barely significant compared to the unproductive area since there is only one HPH operating in Aceh Tengah District, namely PT Overseas Lumber Indonesia (Olindo). While 3 others, PT Alas Helau, PT Aceh Prima Plywood Industri (APPI) and PT Hugurya, are inactive. Under the circumstances, it is likely that one of the main causes of deforestation in Central Aceh is the HPHs not operated through best practices way.

I.b. Wood Price

Wood price is the second parameter of the institutional policy, an increasing wood price will reduce forest cover (Candrakirana, 2005). Meanwhile, the price of logs has varied with qualities and buyers. According to Manurung and Buongiorno (1997), the Indonesian government should already be in the position of raising the domestic price of logs, which is always lower than the international price. The increase of domestic price will be incentive for the wood industry to use logs more efficiently in order to reduce the waste product. In other words, the higher price of logs may diminish demands for logs and eventually reduce the rate of deforestation. This assumption is applicable on condition that a HPH holder is also a wood processing plant's owner.

Other research has also suggested the opposite, however. The rising wood price has triggered off forest cover loss. This takes place when a wood processing plant's owner does not hold a HPH. Thus, with the higher price of logs, company cannot afford legally-cut timber. To meet the need for raw materials, its owner will buy illegally-cut timber which is naturally cheaper. In this case, the increase of wood price has encouraged illegal logging. Fuad (2001) mentioned that illegal logging was led by many interests, for example for personal use and for sale either on collectors' orders or bought by other people. Moreover, GBETNKOM (Kamerun, 2001), Katila (1995), Panayatou and Sussengkarn (Thailand, 1992) also concluded that the increasing wood price closely correlates with deforestation.

In general, the Government (Ministry of Forestry, Ministry of Trade) has a regulation on timber tax. Every local government will also regulate its own timber tax through a *Perda* (Local Regulation). In fact, several regions have already had their respective local regulations concerning wood forest product taxes and, in several regions, regulating non-wood forest products. For example, Central Aceh District has issued a local regulation concerning wood forest product management, which only regulates owned-land non wood forest product use retribution. This regulation, on page 1, states that its issue is an effort to increase the regional income (Qanun Kabupaten Aceh Tengah No. 4/2008, the revision of Qanun No. 14/2004). In addition to the inavailability of guidelines on SFM, the Provincial Forestry Office 2007 -2011 Strategic Plan has been based on Qanun No. 8/2006 concerning the 2006's Regional Budget.

I.c. Forest Conversion

Another deforestation driving factor embedded in the institutional policy is forest conversion regulation. There are 2 conflicting types of land conversion, i.e. conversion to agricultural area and conversion to plantation. In general, studies have suggested that there is a negative correlation between agricultural productivity and deforestation. According to Candrakirana (2005) increase in food stock will increase forest cover. Gbetnkom (2001) also found that variables in the annual yield were quite influential in Kamerun. Some of the deciding factors are fertilizer, prime seeds, good irrigation, agricultural machines and experts, which help farmers improve the yield without extending their lands.

Land conversion that accelerates deforestation is the conversion of forest areas to oil palm/rubber plantations. According to FAO (1998) and Nasendi (1997), deforestation in Indonesia was driven by high demands for timber, palm oil and rubber as between the1980s and the 1990s the forestry sector was also a great pillar of the national economic development.

Data on forest conversion to plantations for 1987 – 2001 indicated that 520 plantations covering 4,672 million ha, or 4,45% of the forest areas in Indonesia[5] were already designated in 20 provinces outside the Island of Java. The rising prices of those three commodities will motivate companies to apply for the conversion of forest areas to plantations as well as encourage farmers around forests to encroach and develop plantations of those commodities there. Data from Forestry Ministry also showed that until 2001 there were 1896 applications for the conversion of forest areas, with the total area of 30,168 million ha.

Forestry Ministry recorded that 66%[6] of the designated plantation areas remain idle. According to Manurung (2001), investors request for plantation permits on conversion forests under the guise of oil palm development to access IPK (*Ijin Pemanfaatan Kayu*/timber use permit) wood. IPK wood is highly needed by the wood industry, especially pulp and paper plants, since the production of HPH wood has continuously decreased. Motivated by gaining profits in thick and fast through IPK, natural forest conversion to oil palm plantations has created millions of hectares of derelict lands. Meanwhile, the oil palm plantation development does not go according to plan.

Based on the above-mentioned facts and a study by Manurung (2001), plantations are best developed on unproductive lands instead of conversion forests and will benefit to environment sustainability. Besides, the environmental costs are considerably lower. Controlling the requisitions for forest conversion to plantations, the government in 2000 issued a moratorium on the conversion of forest areas. This aimed at not only slowing down the deforestation rate but also encouraging plantations' owners to best manage their lands according to their designated use since forest conversion has been one of the culprits of forest destruction in Indonesia.

Illegal conversion such as encroachment by local people including shifting cultivation and other actors for commercial purposes was recorded as one of the drivers of deforestation. Shifting cultivation especially which applied slash and burn techniques was not a serious problem with small population, however, along with the increase of people practicing shifting cultivation, the problem is then recognizable and will be a main cause of deforestation without appropriate positive incentives to tackle its root cause. Inadequate burn techniques will lead to forest fire which both because of natural phenomenon and human induced fires has also been a predominant cause of deforestation in Indonesia. The forest fire season occurred in 1997/1998 was a combined El-Nino effect and human induced fire, caused forest loss of about 10 million ha and released 1 Gt C, equivalent to 2 ppm CO_2.

The conversion rate in both provinces is considerably high, but there have not been official statements about the annual rates of forest conversion and deforestation. In 2008 data from the Central Aceh local government showed that 100,205 ha of the existing forest areas (431,839 ha) have got APL (*Area Peruntukan Lain* or area for other purposes) , but there was no information on the area of forests to be converted. While the area of community oil palm plantations increased from 77,108 ha in 2003 to 92,297 ha in 2007. This also applies to large-scale oil palm plantations, i.e. from 161,580 ha in 2003 to 173,370 ha in 2007. The following year's data recorded that the APL increased to 100,593 ha, while the size of protected forests significantly decreased from 180,850 ha in 2008 to 120,432 ha in 2009. There is also the mentioning of the classification of conversion production forest at 60,418 ha. All the above-mentioned information point out that forest conversion is also a main cause of deforestation in Central Aceh. Further mentioned by Aceh in Numbers

[5] Forest and waters areas based on the Decree of Forestry Ministry on Forest Area and Waters Designation (eclusive of North Sumatra, Riau and Central Kalimantan provinces), Indonesian Forestry Statistics 2000, Forestry Ministry.
[6] Citing the Letter of Menhutbun No.603/Menhutbun-VIII/2000 on 22 May 2000 concerning the moratorium on forest conversion to Governors and Heads of District in Indonesia.

year 2008, oilpalm area that belong to community was increasing from 77,108 Ha in year 2003 become 92,297 Ha in 2007. Either else big oil palm companies also increasing by 161,580 Ha in 2003 and 173,370 Ha in 2007.

II. Market

II.a.Demand for other crops

Based on the studies by Osei and Obeng (2000) in Ghana, Angelsen *et al* (1998) in Tanzania, and Barbier and Burgess (1996) in Mexico, increase in crop price has been a major factor of forest conversion that leads to the increasing deforestation rate. Similarly, studies by Skole et al (1994), Pagiola (2001), Candrakirana (2005) and Boer et al. (2007) indicated that one of the main causes of deforestation in Indonesia was some change in price and increase in yields of premium commodities such as coffee, oil palm and rubber.

In Dairi District, as recorded in 2005 by the Provincial Forestry Office, there are 1,907 households (of 16,587 households around the forests in North Sumatra Province) encroaching forests, 99.86% (57,591 households) of which are farmers. BPS Data 2007 showed that the annual yield in North Sumatra Province continuously increased since 1976. Between 2002 and 2005 the annual yields were 3,006.65; 3,024.88; 3,341.93; and 4,077.71, respectively. Meanwhile, in NAD (Nanggroe Aceh Darussalam) Province the annual yields during 2002-2005 were 2,557.76; 2,392.71; 2,982.48; and 3,463.38, respectively. Thus, it can be said that the deforestation in both provinces is also led by the rising demands for crop commodities.

II.b. Demand for timber

Here, raw material needs and export quotas should be distinguished. Although the least significant among the other independent variables, the need for raw materials due to a gap between supply and demand in the wood industry is influential. A 1% increase in amount of raw materials of wood industry will reduce forest cover by 2.46%. Owing to a gradual ban on the export of logs since 1980, the fixed capacity of timber and plywood industries soared up during 1980 – 1989. The fixed capacity of plywood industry peaked at 98% in 1997 at a production level of 11.6 million m^3 because of the high timber export tax effective from November 1989. While, the fixed capacity of timber industry reached its highest production level of 10.1 million m^3 at 97% of fixed capacity in 1989 (Simangunsong, 2004). Since 1998, the fixed capacity of timber and plywood industries has remained constant, but the realization of the application has decresed, which indicates the scarcity of raw materials. The need for raw materials is far beyond what forest resources can provide for the wood industry. A gap of 20– 30 million m^3 per year between supply and demand has promoted forest resource extraction through illegal logging.

Export quota has a considerable influence on forest cover at 10%, accountability. However, based on some researches, a 1% increase in wood export quota will increase forest cover by 3,8%. Since the issue of *SKB Tiga Menteri* (Three-Minister Decree) concerning the gradual ban on the export of logs as of 8 May 1980 and then the permanent ban as of 1985, the production of logs has dropped. While, the production of timber and plywood has soared up, and so have the export quotas on timber and plywood, where the export quota on plywood has far exceeded that on timber (Simangunsong, 2004). The ban on the export on logs has promoted timber and plywood industries in Indonesia, besides turning Indonesia from the world's biggest exporter of logs to the worls's biggest exporter of timber. The increase in timber export has encouraged afforestation through industrial timber plantation forests to meet the increasing need for raw materials of wood industry, which, in turn, will reduce the deforestation rate.

Based on data of forestry office of NAD Province, distribution of logs during 2001 – 2006 are 92,245.011 m^3, 163,233.274 m^3, 64,323.930 m^3, 44,298.167m^3 and 37,490.211 m^3 respectively.

III. Economic Development

The monetary crisis leading to a multi-dimentional crisis in Indonesia has also accelerated deforestation. A devaluation of 1% will reduce forest cover by 33.49% (Candrakirana, 2005). Due to the economic crisis, prices rose, and so did exports of non- agricultural products, while imports fell. Studies by World Bank (1994) in Ghana and Cattaneo (2002) in Brazil indicated that devaluation has intensified logging activities and, therefore, accelerated the deforestation rate.

III.a. Roads

The single biggest direct cause of tropical deforestation is conversion to cropland and pasture, mostly for subsistence, which is growing crops to meet daily needs. The conversion to agricultural land and or coffee plantation usually results from multiple direct factors. The road development itself causes a limited amount of deforestation. But roads also provide entry to previously inaccessible areas. Logging, both legal and illegal, often follows road expansion (and in some cases is the reason for the road expansion). When loggers have harvested an area's valuable timber, or encroacher harvested coffee or others Non Timber Forest Products (NTFP) they move on. The roads and the logged areas become a magnet for settlers—farmers and ranchers who slash and burn the remaining forest for cropland, completing the deforestation chain that began with road building. All impacts of roads as transportation from and to all sub districts in Dairi could be seen as threat for sustainability of forests. According to Boer (2007), roads density as well as others agents such as commodities price, population density etc. will be involved in baseline activities of deforestation throughout the project timeframe and the activities they engage in. Its statement could be happened in Dairi due to protection forests areas located at all sub district (except Sitinjo and Silahisabungan) and increasing long road follows by total forest area that encroached (year 2006 total area encroachment is 13,480 ha and 13,595 ha in year 2007). Year 2007, Dairi District have 59.50 km state road, 59.50 km provincial road, 1.333,08 km district road in various conditions (good, fair, bad) and also in various forms (asphalts, cement, land) so in total its district has 1.452,08 km roads. In fields, those road is connect to all or 15 sub districts in Dairi, therefore its road have strategic functions for transportation among sub districts, to others district, to North Sumatera and to other province such as NAD (Nanggroe Aceh Darussalam).

Based on that factual greater access to forests generally leads to more deforestation. This is valid with regard to roads, forest fragments, and islands. The simple correlation between roads and deforestation, however, overstates the real causal relation because roads are partly endogenous. Nevertheless, no policy designed to reduce inappropriate deforestation can be considered comprehensive unless it includes clear guidelines regarding this issue.

In her speech on The Bill on The State Budget For the 2005 Fiscal and its Financial Note the former President Megawati Soekarnoputri stated …" Road construction had been carried out to support regional development……Included in the development of Trans-West Sumatra is the construction of Ladia Galaska road in Nangroe Aceh Darussalam, which in fact is requested by people living in the southern part of that province, in order to open up the isolation of the area. It is for this reason that the road crossing the island from the eastern to the western coast is being built." (Embassy of Indonesia, Ottawa, Canada, 2004 in Haryadi, 2006).

The road is named Ladia Galaska because it lead from the coast of the Indian Ocean (Lautan Hindia=Ladia) through the main centers of two indigenous peoples' groups, the Gayo and Alas (=Galas), to the east coast by the Malacca Straits (Selat Malaka=ka). The Ladia Galaska road network was proposed to cut through the Leuser Ecosystem in at least nine places. It ignores all legal environmental impact assessments (EIA's), and cuts through `protection forests', non-conservation forests that have an average slope of 40% or more), as well as conservation forests (including the designated Mount Leuser National Park).

Deforestation may be considered an easy way to generate fast cash. In the long term, however, the negative consequences will dominate. According to van Beukering (2003) in Haryadi (2006), in the deforestation scenario, ample revenues are generated in the first seven years. After that revenues decline. The conservation scenario shows a steady increase in annual benefits throughout the 30-year period.

Contrary to popular belief, the local community (the main beneficiary of the Leuser ecosystem) receive approximately 60 percent of the benefits. These benefits mainly result from the support of agriculture and the prevention of floods. Therefore, conservation will further benefit all categories of stakeholders in society, except for the elite (logging and plantation) industry.

The road network cutting through forest areas will lead to a massive wave of illegal logging, encroachment and settlements inside the Leuser Ecosystem. Once the first waves of local people move in along the main roads, this will then lead to dozens of finger roads off each main road, each with the same effect of eventual forest conversion for the `benefit and development of the people.

This will lead to the destruction of all the areas of highest biodiversity in the lowland and hill forests, leading to the local extinction of all the endangered large mammals, followed eventually by hundreds of other species, including species of lowland plants of unknown benefit for human welfare. Because all categories of stakeholder benefit significantly from conservation of the Leuser Ecosystem, Government of Indonesia should promote a strong incentive for all to stakeholders develop and enforce a common plan on conservation.

Actually it is not recommending the construction of Ladia Galaska go ahead by crossing Leuser Ecosystem. Those are suggestions to the Local Government, Provincial Government and Federal Government to take other alternatives of route where settlement/residential are concentrated:

Alternative 1 is through north-westward along Hindia Ocean and Sabang Port and continues to Malaka strait.

Alternative 2 is through Kabanjahe (North Sumatra)- and to Malaka Strait. Because people are concentrated in this route the road construction is potentially to have highest economic impact and good ecological impact.

III.b. GDP

The forestry sector for three decades has been one of the main sectors greatly contributing to the Gross Domestic Product (GDP), for example by providing job opportunities and national income as well as encouraging regional development and economic growth. The non oil and gas export policy has promoted a large-scale wood processing industry. This policy, however, has created a huge gap between the need for raw materials of wood processing industry and the wood supply (Simangunsong, 2004). Based on BPS data, the forestry sector contribution to GDP decreased from 1.8% in 1994 to 1.56% in 1997 and due to the economic crisis in 1997 fell at 1.05% in 2002.

The economic crisis variable has had a negative impact, but insignificant. Although the economic crisis will make a negative impact on the country's economy, it is not a key factor that promotes forest cover reduction by means of forest conversion. According to San *et al* (2000), devaluation will raise prices of export-products. Regional Export will increase particularly on non agricultural products, considering the

agricultural sector gives a small contribution to both national and regional exports. Food prices except for sugar and rice will decrease, while wood price will increase.

BPS Data (2007) mentioned that in 2001 the North Sumatra's GDP was Rp 6,727,711, and between 2002 and 2004: Rp 7,508,867; Rp 8,672,097; Rp 9,741,566, respectively. While GDP in NAD province during 2001-2004 amounted to Rp 8,716,399; Rp 10,432,760; Rp 11,003,930; and Rp 11,719,844, respectively.

III.c. Monthly Labour Wages

In Southern Sumatra particularly and Sumatra island in general, farmers grow coffee instead of working elsewhere (e.g. in the off-farm sector) because rural labour is poorly compensated (Rp 20,000 – 30,000 per day or equal to US$ 1.8 – 2.8). Therefore, higher local process for coffee combined with low labour costs, rather than coffee price per se, may be the synergistic underlying cause of deforestation in Indonesia's main coffee producing region, including in Dairi and Aceh Tengah Districts (Soeseno in Gaveau *et al*., 2009).

In North Sumatra Province, monthly labour wages between 2003 and 2005 amounted to Rp 476,800; Rp 431,410; and Rp 430,530, respectively. While, during the same period the wages in Nanggroe Aceh Darussalam (NAD) province amounted Rp 499,840; Rp 616,840 , and Rp 752,680, respectively.

III.d. Poverty threshold (per month)

The BPS Data 2007 showed that the poverty threshold in North Sumatra was at Rp 141,771 in 2003 and Rp 142,966 in 2004. While in NAD during the same periode it amounted to Rp 137,440 and Rp 141,926, respectively.

According to a study Gaveau *et al.* (2009), the 3-decade deforestation in Southwest Sumatera is caused by poverty besides the weak law enforcement and coffee price. The research team recommend that should be put some conservation'efforts for decreasing the deforestation rate in Southwest Sumatra i.e. agricultural intensifiaion, coffee certification, off-farm employment, and highly education to reverse deforestation trends in near future. Sources of field survey and relevant references indicated that a similar phenomenon also takes place in forest areas of the Northern Sumatra include Aceh.

IV. Social Demographic

Other cause of deforestation was forest conversion for settlements to support transmigration programme during 1980s. Transmigration was one of national priority programmes intended to balance population and development between Java and outer islands as well as to improve well being of the migrated people. For these purposes and to anticipate the needs for land in the future, by law it was allocated 26.6 million ha of forest land which could be converted to other land uses.

Certainly, population has a significant influence on deforestation. The estimation will be more accurate if it uses the population living around forests and highly depending on the existence of the forests as a representative sample. Owing to the inavailability of relevant data, it is made through a total population approach. According to Candrakirana (2005), increasing of population growth will reduce forest cover. Bigger population will increase the need for agricultural lands as well as settlements. Besides, the population growth will affect farmers' land ownerships, which will continuously reduce and this will encourage the extension of settlements into forest areas. Thus, the encroachment of forests is inevitable, which will certainly reduce forest cover. Population growth also limits job opportunities and food stocks, and will indirectly influence forest cover. Based on researches by Ndiyo (2000) in Nigeria and Scrieciu (2000) in 50 countries with tropical forests, population growth is one of the main causes of forest ecosystem destruction.

Based on Forestry Laws Number 41 year 1999, protection forest (Hutan Lindung) which functions as water catchment area is declared as prohibited area. In Kehutanan dalam Angka of North Sumatra 5,720 hectares of 145,537.28 Hectares

of Dairi forests is located surround DTA (*Daerah Tangkapan Air* or Water Catchment Area) *Danau Toba*. It will need law or regulations enforced to manage that areas as protection area and restricted for any human use and occupancy particularly in "buffer zone" of *Danau Toba* (Toba Lake).

In Dairi District, recorded by Forestry Provincial Office in 2005 majority of community or villagers are farmers (99.86% or 57,591 households out of 16,587 households) and there are 1,907 households encroached the forest. In Central Aceh District there are 164,402 households and based on Strategic Planning of Forestry Office of Central Aceh year 2007-2011, majority of them are farmers and living surround forest.

Dairi and Aceh Tengah Districts are also the designated transmigration areas, including the spontaneous transmigration program. Data on the number of transmigrants is not available and, therefore, the estimation has used the population density approach. BPS Data (2007) indicated that the population density in Dairi District in 2000 was 158 and between 2004 and 2005 it became 167 and169, respectively. In addition, the population growth for 1990-2000 was 1.32 and became 1.35 during 2000-2005. In the circumstances, Dairi and Aceh Tengah should immediately develop a sustainable forest development strategy according to local conditions and potential due to increasing of population will affect to forest sustainability. In general the forest management at both sites must be based on Forestry laws number 41 year 1999. In Dairi, forest management also must be based on local regulation that developed based on their culture such as based on their Batak ethnic and particularly for Central Aceh also must be based on Qanun on Forestry and Natural Resources Management.

The population density in Aceh Tengah in 2000 was 76 and became 77 and 78, respectively between 2004 and 2005. During 1990-2000 the population growth in Aceh tengah was 1.46 and decreased to 0.55 during 2000-2005. However, Central Aceh should also set an SFM strategy according to post-Tsunami local conditions and its regional authonomy. The decreasing rate of the population growth is possibly affected by the Tsunami and this may be temporary.

In the absence of tangible incentives to conserve tropical forests, farmers seek to maximize individual profits by clearing protected forests for cash crops (Angelsen, 1999). In Southern Sumatra particularly and Sumatra island in general, farmers grow coffee instead of working elsewhere (e.g. in the off-farm sector) because rural labour is poorly compensated (Rp 20,000 – 30,000 per day or equal to US$ 1.8 – 2.8). Therefore, higher local price for coffee combined with low labour costs, rather than coffee price per se, may be the synergistic underlying cause of deforestation in Indonesia's main coffee producing region including in Dairi and Central Aceh Districts. Those condition has already predicted by Pagiola (2001) that related to East Asia crisis and affected land use and deforestation i.e. changes in relative prices particularly for premium commodities on such areas e.g. coffee, palm oil or rubber. Therefore agricultural intensification should been proposed as one appropriate way to simultaneously boost farmer income and reduce deforestation (Angelsen, 1999; Raynolds et al., 2007 in Gaveau, 2009).

Annex 2 - Proposed structure of a feasibility analysis For REDD Initiative in Northern Sumatra Biodiversity Corridor

I. INTRODUCTION
- a. Background
- b. Conservation International – Starbucks Climate Change Partnership
- c. Objectives

II. METHODS AND PROCESS

- a. Selection of Potential REDD Project Types
- b. Field Assessment
- c. Stakeholder Consultations and Revision of Documents

III. THE PROJECT LOCAL, REGION AND NATIONAL CONTEXT
- a. Description of project site, current status of forest cover and threats
- b. Description of conservation value and socio-economic context
- c. National REDD+ context (REDD+ Readiness activities, previous REDD or AR project precedents)
- d. Current Legal and Institutional Framework for REDD
  1. Land and Tree Tenure
  2. Tenure/Institutional Systems
  3. Legislative Basis for Payment Environmental Services and REDD
  4. National, District and Local Institutional Framework

IV. CLASSIFICATION AND RANKING REED PROJECT TYPES
- a. Establishment of project type scoring criteria
- b. Identification and characterization of forest ecosystems
- c. Identification and classification of project types
- d. Scoring of project types
- e. Selection of higher potential REDD project types

V. PROJECT DESCRIPTION
- a. Clear project boundaries, including land tenure, legal status, and carbon rights within proposed project area
- b. Project partners (current and proposed)
- c. Description of carbon generation activities (e.g. REDD, ARR, etc)
- d. Preliminary timeline of project design and/or start-up if funding were to be secured
- e. Current level of project stakeholder buy-in (government or landowner agreements signed, MOUs developed, communities sensitized, etc)
- f. Proposed benefits sharing structure (can be a loose proposal of how carbon and other project revenues will be distributed among various stakeholders, including government and local communities). A description of in-country precedents is useful to include.
- *g. (Optional) History of CI (or partner leading project) activities in the region*
- *h. (Optional) Description of complementary community support and non-carbon generating activities (e.g., agroforestry, fuel wood plantations, etc) (if known)*

VI. CARBON METHODOLOGY APPLICATION TO THE PROJECT
- a. Description of possible carbon methodologies to be applied and associated requirements
- b. Proposed project's ability to address general carbon project requirements
- c. Leakage, Additionality, and Permanence
- d. Proposed project's ability to address methodology-specific factors
- e. Land eligibility
- f. Methodology applicability
- g. Project start date
- h. Forest definitions
- i. Legal requirements

VII. CARBON OFFSET ANALYSIS
- a. Delineation of proposed project area (*optional analysis of project-eligibility according to criteria in III.c above*)
- b. Historical land use and deforestation analysis (2- or 3-date change map, historical change rate and discussion of principle drivers)
- c. Forest carbon stock information (based on current available information)
- d. Preliminary analysis – reference scenario (future deforestation model and without-project emissions)

e. Preliminary analysis – range of potential success rates and with-project emissions reductions
f. Near-term offset vintages (up to 2017?)

VIII. MULTIPLE CO- BENEFIT ANALYSIS
a. Sustainable livelihood and social co-benefits of project
b. Biodiversity benefits of project co-benefits
c. Sustainable development co-benefits

IX. PRELIMINARY RISK ASSESSMENT
a. Political and social risk (potential national or local government support or lack thereof, support or opposition by IP or forest communities involved)
b. Legal risk (potential problems with land tenure and carbon rights)
c. Methodological risk (non-approval of proposed methodology, or potential problems with leakage rules such as due to migration, etc)
d. Project risk (potential for the project to not realize or reverse carbon benefit)

X. LEGAL AND INSTITUTIONAL GAPS AND OPPORTUNITIES ANALYSIS

a. Protection Forest in Montane Cachment Forest in Aceh and North Sumatra Province
b. Production Forest in Aceh and North Sumatra Province
c. Forest Conservation Area in Aceh and North Sumatra Province
d. Community Forest, Village Forest and People Plantation Forest
e. Cross-cutting legal and institutional issues

XI. FINANCIALS
a. Estimate of project costs (project design costs + LT project management costs)
b. Estimate of project revenue
c. Estimate of opportunity costs
d. Feasible and economically viable to implement a REDD project

XII. CONCLUSION AND RECOMMENDATIONS
a. Analysis of REDD project types
b. Critical information gaps
c. Recommended legal, policy and institutional measures
d. Options for taking project forward and overall recommendation, including overview of preliminary project financial viability (cost vs revenue)
e. Next steps required if project is to go forward