# An Overview: Forest Carbon Accounting

# (Case Study *Ulu Masen* Ecosystem Aceh Province, Indonesia)

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## Abstract

*This thesis is descriptive qualitative research of forest carbon accounting and Ulu Masen Ecosystem of Aceh Province where included in REDD projects for Carbon Trading scenario. The data which is applied in this research are primary data from the field in Ulu Masen Ecosystem Aceh Province and secondary data of International references worldwide related to this issue. The main purpose of this research is to reveal further overview of forest carbon accounting, REDD issues and promote them into publics, accountants, economist as the main role of accountants are not focusing in financial, banking, insurance only but also as social and environment accountants. To probe the Islamic outlook towards these issues and acknowledge local community where REDD projects upcoming to. The research gained information of Aceh Government initiative to have carbon trading of carbon offsets as REDD scheme scenario based on both in Voluntary Carbon Offsets (VCO) and Clean Development Mechanism (CDM) market. Nowadays, both Aceh Government and Merrill Lynch have committed to get carbon trading for 750,000 hectares of Aceh forests in Ulu Masen Ecosystem in total of US $ 9 Million over next 30 years, right after Aceh Government gain verification audit of carbon storage in the ecosystem internationally.*

## 1.Introduction

### 1.1.Research Background

Approximately 20% of carbon emissions worldwide are caused by tropical deforestation and forest degradation. Indonesia is stated in the Guinness Book of Records as the "world"s worst" in deforestation, felling the equivalent of 300 football fields as hour. Indonesia is the third largest emitter of *carbon dioxide* (CO2) behind China and the USA due to the volume of emissions caused by deforestation practices (Gullison *et al*, 2007). The Earth, the place where we live is having a disease called "Global Warming" as the impact of climate change. It can be noticed that the weather anomaly keeps changing from time to time.

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Global Environmental Fund (GEF) which is funded by World Bank has been contributing International fund to Indonesia's forestry projects namely "World Bank Aceh Multi-donor Trust Fund funded FFI"s Aceh Forest and Environment Project".

Cost estimation is one of the key challenges may face in participating in emerging carbon markets. Interest in the role that forests will play in climate change mitigation has prompted research into the potential of forest carbon sequestration for nearly two decades (Richards and Stokes, 2004; Stavins and Richards, 2005). The role that estimation costs play in offset project implementation has been the subject of a number of analyses in recent years (e.g., Antinori and Sathaye, 2007; Bilek *et al*, 2009; Brown *et al*, 2004; Mooney *et al*, 2004).

Islam is the second-largest religion in the world and argued as the fastest growing religion in the world. Muslims are obligated to take Al-Quran and Hadith as the references other besides as a way of life in this life. Islam obligates to conduct any activities based on what Al-Quran and Hadith imply because everything has been discovered before the secular scholars claim the sophisticated invention. Islam manages not only religious services but also including all instruments in this world; it could be economy, society, culture, education or even simpler like the environment.

Hence, this research seeks to identify the overview meanings of Forest Carbon Accounting and local community in REDD projects (Case Study *Ulu Masen* ecosystem in Aceh Province, Indonesia), whether this upcoming REDD projects have affection with local community who live and put their lie on forestry areas, besides the main purpose to promote forest carbon accounting, REDD to publics. In addition, the researcher will reveal the Islamic perspective towards environmental issues as our responsibility to save the earth.

## 2. Literature Review

### 2.1 Theory Rationale

#### 2.1.1 Accounting and the Environment

Accounting has already started to be implicated in the consideration of environmental issues and the probability is that its involvement will develop further over the coming years (Hopwood, 2009). As greater acknowledgment sphere, the need for different approaches to both conceiving and acting upon human and organizational interaction with the environment has started to be recognized, albeit still far too slowly. There are, as a consequence, more signs of an emerging awareness that many aspects of human life are likely to change, even including accounting and other calculative systems (Hopwood, 2009). As changes occur in the concepts and focus of accountability for the environment, the demands for different flows of information, accounting and otherwise, are also likely to grow.

#### 2.1.2 Climate Change, Carbon Trading, and Reducing Emissions from Deforestation and Forest Degradation (REDD)

Climate change is the biggest risk to stable functioning of the Earth system, and ecosystem play critical roles in mitigation of and adaption to climate change. Climate change is a change

of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability over comparable time periods (UNFCCC, 2010). Where these carbon offsets located in carbon pool and being sold among in carbon market as a trading system through which countries may buy or sell units of greenhouse gas emissions (not just carbon dioxide) in an effort to meet their national limits on emissions, either under the Kyoto Protocol or under other agreements, such as that among member states of the European Union. The term comes from the fact that carbon dioxide is the predominant greenhouse gas and other gases are measured in unit called „carbon-dioxide equivalents".

REDD stands for Reducing Emissions from Deforestation and Forest Degradation including carbon stock enhancement from developing countries. In the CIFOR book *Realizing REDD*, REDD is defined as follows: "Uses REDD asan umbrella term for local, national and global actions that reduce emissions from deforestation and forest degradation, and enhance forest carbon stocks in developing countries (REDD). The plus sign indicates enhancement of forest carbon stock, also referred to as forest regeneration and rehabilitation, negative degradation, negative emissions, carbon uptake, carbon removal or just removals. REDD is shorthand for both a set of policies or actions that aim to reduce emissions and increase removals, and for the final outcomes of those policies or actions (i.e., reduced emissions and increased removals)."11 (Angelsen et al. 2009:2).

## 2.1.3 Livelihood and Community

Bebbington and Batterbury (2001) identify livelihood as one of four key components alongside place, scale, and network in understanding development implications in political ecology analysis (Bumpus, 2009). The definition of livelihoods as the term which best expresses the idea of individuals or groups striving to make a living, attempting to meet their various consumption and economic necessities, coping with uncertainties responding to new opportunities and choosing between different value positions (Long, 1997; Bumpus, 2009).

## 2.1.4 Forest Carbon Accounting

Carbon accounting is the practice of making scientifically robust and verifiable measurements of GHG emissions. Although characteristics of forests have been recorded for numerous historical purposes, accounting for carbon is a more recent addition to forest inventories. This follows the growing need to quantify the stocks, sources and sinks of carbon and other GHGs in the context of anthropogenic impacts on the global climate.

Historically, forest inventories recorded stand structure, age, growth rate, biomass accumulation, and the wood densities of tree species. These have served both commercial purposes, such as determining merchantable timber volumes and use in the paper and pulp industry, as well as national or regional planning purposes, such as creating forest and land use inventories for land-use permits, land-use plans and agricultural expansion. As forests raise up the climate change agenda, three types of forest carbon accounting have developed: stock accounting, emissions accounting and project emissions reductions accounting (Watson, 2009).

### a) Stock accounting

Forest carbon stock accounting often forms a starting point for emissions and project-level accounting. Establishing the terrestrial carbon stock of a territory and average carbon stocks for particular land uses, stock accounting allows carbon-dense areas to be prioritized in regional land use planning. An early form of forest carbon accounting, emissions accounting and emission reductions accounting have evolved from the principles established for stock accounting.

### b) Emissions accounting

Emissions accounting is necessary to assess the scale of emissions from the forestry sector relative to other sectors. It also aids realistic goal-setting for GHG emissions targets.

### c) Project emission reductions accounting

Carbon accounting for forestry project emission reductions is required for both projects undertaken under the flexible mechanisms of the Kyoto Protocol and the voluntary carbon markets. Both necessitate good carbon accounting to ensure that emissions reductions are *real, permanent* and *verifiable.* For projects to generate tradable emission reductions, accounting methods between countries, regions and projects must be standardized in both developed and developing countries.

### Table 3.1. Good Practice for Forest Carbon Accounting

| | |
|---|---|
| Accurate and Precis | Two statistical concepts. Accuracy is how close estimates are to the true value; accurate measurements lack bias and systematic error. Precision is the level of agreement between repeated measurements; precise measurements have lower random error. To give confidence in the estimate, both accuracy and precision are desirable and can be increased through removal of bias and reduction in uncertainty as far as possible |
| Comparable | The data, methods and assumptions applied in the accounting process must be those with widespread consensus and which allow meaningful and valid comparisons between areas |
| Complete | Accounting should be inclusive of all relevant categories of sources and sinks and gases, as limited accounting may lead to misleading results. If carbon pools or gases are excluded, documentation and justification for their omission must be presented (for example, for purposes of conservative estimates |
| Conservative | Where accounting relies on assumptions, values and procedures with high uncertainty, the most conservative option in the biological range should be chosen so as not overestimate sinks or underestimate sources of GHGs. Conservative carbon estimates can also be achieved through the omission of carbon pools |
| Consistent | Accounting estimates for different years, gases and categories should reflect real differences in carbon rather than differences in methods |

| Relevance | Recognizing that trade-offs must be made in accounting as a result of time and resource constraints, the data, methods and assumptions must be appropriate to the intended use of the information |
|---|---|
| Transparent | The integrity of the reported results should be able to be confirmed by a third party or external actor. This requires sufficient and clear documentation of the accounting process to be available so that credibility and reliability of estimates can be assessed |

*Sources: Greenhalgh et al., 2006; Pearson et al., 2005; IPCC, 2000*

## 2.1.5 International Accounting Standard (IAS) 41

The objective of this Standard (*This extract has been prepared by IASC Foundation staff and has not been approved by the IASB. For the requirements reference must be made to International Financial Reporting Standards)* is to prescribe the accounting treatment and disclosures related to agricultural activity.

## 2.1.6 Opportunity Cost Estimation

Opportunity cost is the cost related to the next-best choice available to someone who has picked between several mutually exclusive choices. It is a key concept in economics which has been described as expressing "the basic relationship between scarcity and choice. The notion of opportunity cost plays a crucial part in ensuring that scarce resources are used efficiently (as the concept firstly invented by John Stuart Mill.)[13]

Opportunity cost is an indication of what must be sacrificed to obtain something. In the environmental context, it is a measure of whatever must be sacrificed to prevent or reduce the chances of a negative environmental impact (Pagiola; Bosquet, 2009).

## 2.2 Islamic Point of View towards Environment

There are also practical reasons why the Muslim should master knowledge of the environment. According to Islamic law, it is impossible to implement the *Shari,,ah* without proper knowledge of the environment. In other words, those who do not understand the environment cannot deal properly with the implementation of Islamic laws. For example, according to the *Shari,,ah*, punishment for theft is amputation. However, the decree cannot be implemented on a thief by a judge if there is famine that occurs due to drought.

Allah SWT says in the *Qur"an* in An-Nisaa 126:

"*And whatever is in the heavens and whatever is in the earth is Allah"s; and Allah encompasses (muhit) all things.*"

Thus, the term *Muhit* also means environment. In a deeper sense, it is always true to say that God Himself is the Ultimate Environment which surrounds and encompasses all things. Thus, knowledge about the environment becomes important and obligatory as the knowledge of

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Allah SWT or unity of God. Its understanding is instrumental in bringing us closer to God (Deuraseh, 2009).

## 1.3 Review of Prior Study

Hence, herewith the researcher enclosed some previous study related to this issue whether from International study and National study also. Adam G. Bumpus., "The Geographies of Carbon Offsets: Governance, Materialities and Development" in year 2009. The content: *The dissertation contributes to theoretical debates on environmental governance and the materialities of nature in geography, and the structure-agency interplay between transnational processes and local livelihoods under carbon finance. The outcomes support reform of offsets and the need for better understanding of processes to ensure more equitable carbon development.*

Anthony, G. Hopwood., "Accounting and the Environment" in year 2005. The content: "*The articles give a rich introduction to the issues at stake in the creation of a market in carbon emissions and the roles that accounting and calculative mechanisms can and cannot play in the environmental area*".

Christopher S. Galik., Justin S. Baker., Joseph L. Grinnell., "Transaction Costs and Forest Management Carbon Offset Potential" in year 2009. The content: "*This work paper suggests that transaction costs can be significant for small forest management offset projects. They find that transaction costs likewise vary by protocol and tent to decrease with project size and length of rotation extension. While transaction costs can be an important driver in total project revenue, they appear to be less of a factor than the actual accounting scheme under which the project is being operated*".

The Provincial Government of Aceh, Fauna & Flora International (FFI), and Carbon Conservation Pty. Ltd., "Reducing Carbon Emissions from Deforestation in the *Ulu Masen* Ecosystem, Aceh, Indonesia" in year 2007. The content: "*This project development is designed as the path of carbon finance from sale of Verified Emission Reductions (VERs) to provide immediate and substantial incentive payments to all relevant stakeholders who help the project area arrest deforestation and increase forest protection.*"

Talitha Haller and Gabriel Thoumi., "Financial Accounting for Forestry caron Offsets" in year 2009. The content: "*This paper reveals an introduction to forestry sector offsets as an alternative investment asset class with key lessons learned explains and analyzes different methods of accounting for forestry carbon offsets under IAS and U.S. GAAP.*"

## 3. Research Methodology

### 3.1 Operational Definitions of Variables

In all types of regression analysis, a **Dependent Variable** (it is symbolized by *Y)* is what been measured in the experiment and what is affected during the experiment. In this research, dependent variable is same as the previous research which is used by Galik *et al* (2009) in their working paper to calculate the transaction costs and forest management carbon offset

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potential. Dependent variable here is known as cost estimation in forestry project case study in *Ulu Masen* ecosystem NAD, Indonesia.

**Independent Variable** (it is symbolized by *X*) is a hypothesized cause or influence on a dependent variable. One way to distinguish these variables is to ask ourselves what are needed to learn from the research. The dependent variable is variable which is going to be predicted. In this research the independent variable are forest regions, forest types, forest tracts and rotation of the forest type"s default.

The following multivariate linear regression is applied, where the natural log of cost estimation is the dependent variable:

$$\log (CE) = \alpha + \sum_{i=1}^{I} \hat{a}\iota \; REGION_i + \sum_{j=1}^{J} \lambda j \; TYPE_j + \sum_{k=1}^{K} \mu k \; TRACT_k + \gamma \; ROTATION + \varepsilon$$

log (CE)   = The natural log of cost estimation is the dependent variable

REGION = The forest area of the case study *Ulu Masen* ecosystem

TYPE      = The forest type of the case study *Ulu Masen* ecosystem

TRACT    = The size of area where the study is conducted

ROTATION = The length of rotation extension from each forest type"s default rotation is  represented by a continuous variable ranging from 1 to 25

$\alpha$ = Constant, $\Sigma$ $\beta$i-k = Coefficients, $\varepsilon$ = Residual / Error

## 3.2 Research Indicators

Aceh Province is divided into 21 districts, five of which (Aceh Besar, Aceh Jaya, Aceh Barat, Pidie and Pidie Jaya) encompass the research field. Approximately 130,000 people live in communities adjacent to forest areas of the *Ulu Masen* ecosystem. 61 Mukims surround the *Ulu Masen* ecosystem within these communities there are an estimated 2,000 to 3,000 villagers participating in illegal logging, although tthere is a hugh level of uncertainty about this estimate.

### 3.2.2 Forest Types and Tracts

Forest type classifications carried out in the past recorded lowland broadleaf forest, pine forest, submontane broadleaf forest, montane broadleaf forest, and other forest.

**Table 3.1. Area and Carbon in *Ulu Masen* Forest Classes**

| Forest Type | | Hectares | Total Carbon | Average tC/ha |
|---|---|---|---|---|
| Elevation (m) | Condition | | | |
| 0-500 | Intact | 132,547 | 27,834,870 | 210 |
| | Disturbed | 162,759 | 26,041,440 | 160 |
| 500-1000 | Intact | 220,814 | 44,162,800 | 200 |
| | Disturbed | 28,078 | 4,211,700 | 150 |
| 1000-1500 | Intact | 143,732 | 27,309,080 | 190 |
| | Disturbed | 1,309 | 183,260 | 140 |
| >1500 | Intact | 61,289 | 11,028,520 | 180 |
| | Disturbed | 0 | 0 | n/a |
| TOTAL | | 750,528 | 140,771,670 | 188 |

Source: An assessment which was conducted by FFI Aceh with collaboration from local NGOs and Local Government of Aceh *Reducing Carbon Emissions from Deforestation in the Ulu Masen Ecosystem, Aceh, Indonesia* 2007

**3.2.3 Livelihood**

In this indicator showed that majority of local community in *Ulu Masen* ecosystem work in farming and agriculture, meanwhile few work in other private sectors, official government institution or work as daily labor

**3.3 Research Methods**

The researcher uses field research and descriptive qualitative as methodology of this research by assistance from Center for International Forestry Research (CIFOR) as vehicle to gain all essentials data, information, field research assistances.

**3.4.1 Source of Data**

The researcher uses International Journals which are related to forest carbon accounting, REDD projects and International protocols issues and the environment besides Islamic The researcher will use primary data collection using case study in *Ulu Masen* ecosystem case study base in Aceh Province, Indonesia and secondary data collection using literature review.

**4.Result Of The Research**

**4.1 Accounting Treatment on REDD projects Implementation**

The result, only few consensuses as to how emissions reductions should be accounted for on the balance sheet and the income statement. Due to this situation different entities are using different accounting methods, hindering information transparency in the market. According to IASB, an asset "is a resource controlled by the entity as a result of past events and from which future economic benefits are expected to flow to the entity" (IASC Foundation, 2009). With this assumption that forestry offsets are classified as assets, the researcher can take two

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examples on how accounting treatments for inventory and assets during carbon trading financing process (after the REDD projects implementation)

### 4.1.1. Inventory

If entity (or in this case the Aceh Governance) sells forestry carbon offsets as part of its normal operations, offsets could be classify as inventory under IAS 2.(Haller & Thoumi, 2009). It should be measured at net realizable value and lower of cost. This inventory will include all costs included in it, and IAS 2 permits inventory costs to be assigned by first-in-first-out (FIFO). To measure cost from a project owner or buy side perspective, the credits would likely be recorded at purchase cost; form a developer perspective, the credits could also be valued at an allocated cost of production (Haller & Thoumi, 2009).

### 4.1.2. Intangible Assets

Landowners, project developers, and buyers may find it appropriate to account for forestry carbon credits as intangible assets. Carbon offsets in not kind of tangible assets but it refers to intangible assets. Clarified by IAS 38, Intangible Assets (IASC Foundation, 2009), applies to identifiable, non-monetary assets without physical substance. Additionally, IAS 38 does not apply to intangibles covered by another Standard (Haller & Thoumi 2009).

### 4.1.3 Comparison Offsets (Carbon Credits) as Inventory or Intangible Assets

If offsets are recorded on balance sheet as inventory, accounting for credits as inventory or intangibles also has implication for income statement. The inventory option will result in smoother earnings patterns that will classification as intangibles (Haller and Thoumi, 2009). This is because of the matching principle.30 The cost of goods sold is expensed through the income statement when inventory is sold, and so both the revenue and expense from the sale of inventory are recorded in the same period.

Cost accounting assumptions for developer"s policy within calculation in unit costs in carbon accounting market both in active and inactive market. Basically, forest carbon accounting for carbon offsets is important for both internal and external decision making. Aceh Government as landowner will need hands from developers to interact with buyers (investor) in this REDD projects.

### 4.1.4 Community Livelihood (Case Study of Two Intervention Villages in REDD projects)

It has to be several villages included in this case study, unfortunately due to several obstacles and limitations; there are two villages only revealed. Whereas, both of these villages are within intervention REDD projects foregoing. These two villages are placed in Aceh Besar region, where most of the population do not have proper education (approximately >80% graduated from elementary school only), the primary occupation is farming both in their own land or as daily farming labor. As the researcher could see the condition of houses, general information gained; the roof is from zinc, the wall comes from woods and so does the floor. Below are the figures and tables of two intervention villages REDD projects (Awek and

Jantho Lama). As additional information, these data are coming from interview with 33 head households in each village (data per households not personals).
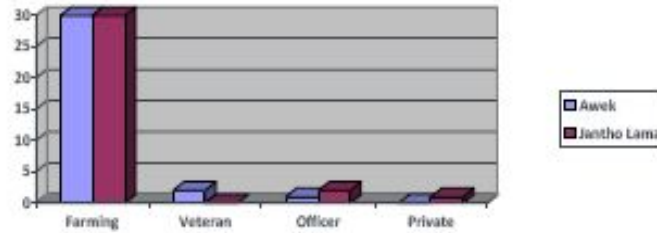


**Figure 4.4 Occupations in 33 Households Interviewing**

Source: Households Interview in Awek and Jantho Lama

From the figure above we could see that in Awek village; 91% of population works in farming sector, 6% are veterans, and only 4% work as official governments. Meanwhile, in Jantho Lama; 91% are working in farming/ agriculture sector, 6% as officers in government, and 4% work in private sector for instance carpenter.

**Table 4.5 Condition of Households (33 Households as Respondents)**

| Village | Floor | | | Wall | | Roof | Electricity | | Toilet | |
|---|---|---|---|---|---|---|---|---|---|---|
| | F1 | F2 | F3 | W1 | W2 | zinc | Yes | No | Yes | No |
| Awek | 5 hh | 28 hh | 0 hh | 33 hh | 0 hh | 33 hh | 30 hh | 3 hh | 32 hh | 1 hh |
| | 15% | 85% | 0% | 100% | 0 % | 100% | 90% | 10% | 96% | 4% |
| Jantho Lama | 20 hh | 12 hh | 1 hh | 14 hh | 19 hh | 33 hh | 33 hh | 0 hh | 5 hh | 28hh |
| | 60% | 36% | 4% | 42% | 58% | 100% | 100% | 0% | 15% | 85% |

Source: Households Interview in Awek and Jantho Lama

*Codes:*

F1  = Cement

W1 = Cement

F2  = Wood

W2  = Wood

F3  = Ceramic

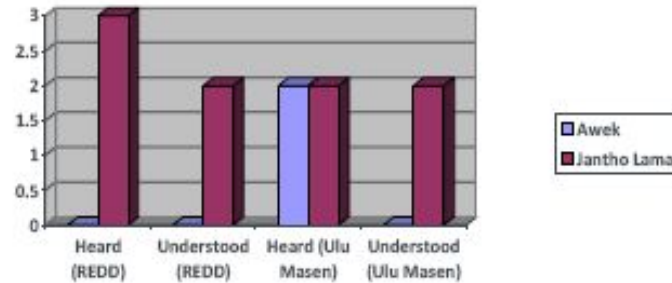In the interview, the researcher asked their knowledge of REDD projects and herewith the result is.



**Figure 4.5 Local Communities Understanding of REDD and *Ulu Masen***

Source: Households Interview in Awek and Jantho Lama

From 33 households interviewing in Awek only two households gave answer that they heard about *Ulu Masen* but they do not understand what REDD, the purpose of REDD projects and *Ulu Masen* ecosystem are. In the other hand, there was a little progressive among the community, because from 33 households the researcher interviewed, there were 3 households who ever heard about REDD, and also two households who have heard *Ulu Masen* ecosystem and understood what REDD and *Ulu Masen*'s benefits. The researcher realizes that this research only conducted in two intervention REDD villages only, but if this research keeps going as the result there will be a significant differences appeared.

As the conclusion from the field research in five major regions of *Ulu Masen* ecosystem in Aceh Province, Indonesia, where is one of REDD projects are going to be implemented. The researcher could reveal that in these two interventions REDD villages; most of the local community depends on their livelihood from forest. Their habit using shifting cultivation has been changed into permanent one, which means that the land cover is decreasing time by time.

Since, the local community has to decrease their forestry activities, it will affect to revenues and cost because they will lose their main livelihood in forestry sector and have to change with other alternative. Once the REDD projects are implemented, as the compensation of these project the local community will take the opportunity costs. In this term, the accountants will take their actions to account the transaction between the land owner (Aceh Governance), the brokers, investors and local community.

## 5. Conclusion And Recommendation

## 5.1. Conclusion

There are four key challenges have been identified for REDD schemes:

**1. Measuring carbon** To place a value on the carbon-bearing potential of any forested area, we must accurately estimate how much carbon is being stored there. New technologies such as satellite imaging and computer modeling are making the measurement of carbon stocks both swift and accurate. A transparent system to measure and verify emission reductions now looks feasible.

**2. Making payments** It concerns to how will countries be rewarded and what form will that reward take? Who should be paid for protecting a specific forested area: national governments, local forest communities or logging companies? Donor countries are asking that payments should benefit poor people. National governments in countries likely to benefit from REDD, however may wish to retain control over how payments are distributed.

**3. Accountability** We have to consider the aspect of "accountability" if a REDD payment is made, but a forest still gets destroyed, we must find a best solution to face this situation.

**4. Funding** Something have to be considered for developed countries that create a fund to reward countries that reduce emissions from deforestation. These emissions reductions should be linked to a market-based carbon trading system, also to make a market system work in practice.

## 5.2. Recommendation

The writer realize that further researches are still needed to obtain more qualified and reliable information towards this forest carbon accounting and local community in REDD projects issue. A research agenda to better understand the links between materials carbon reductions and development needs to take this task to hand in order to, as Liverman and Boyd (2008) note, open up hopeful possibilities for a better and more ethical development component within future carbon offsets, and contribute meaningfully to the twin goals of climate change mitigation and sustainable poverty alleviation.

Herewith few recommendations address to Aceh‟s Governance as the path for compensation distributions within local community in *Ulu Masen* ecosystem as REDD projects‟ upcoming. Some of respondents stated what they needed to achieve as their action for not having deforestation, forest degradation and forest protection from illegal loggers, if governance distribute money compensation then it will not address their livelihood and economic development higher than present, what people need are good infrastructures, health access, free education for children and build more education buildings, more teachers in rural areas, seeds, fertilizers, and other agriculture stuffs because this way can stop their depending on land lord, besides the important one irrigations.

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