Financial Accounting for Forestry Carbon Offsets

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Abstract

Climate change, or as Dr. John Holdren, Co-Chair of the President's Council of Advisors on Science and Technology, prefers "global climate disruption," is occurring today on our Earth – our home. While the exact nature of the causes of these dramatic changes can be discussed, what we have observed over the past 150 year is an increase in our Earth's mean temperature causing global climatic disruption.

To mitigate global climate disruption, the forestry carbon market allows landowners to sequester atmospheric carbon dioxide in return for a payment for ecosystem service. This market has developed in three stages since 1988. In the first stage, which lasted until 2005, the forestry carbon market was an exotic boutique market with few if any regulations. In the second stage, which lasted until 2008, the forestry carbon market was a highly speculative niche market. In the current stage, the regulatory and institutional frameworks of the forestry carbon market are developing. From these frameworks, the forestry carbon market can easily expand into the global compliance market and become an everyday part of the lives of landowners and communities. In the meantime, one of the most important regulatory issues to be addressed for a viable quality market is forestry carbon financial accounting under International Accounting Standards (IAS) and U.S. generally accepted accounting principles (GAAP).

The first section of this paper is an introduction to forestry carbon offsets as an alternative investment asset class with key lessons learned. The second section of this paper explains and analyzes different methods of accounting for forestry carbon offsets under IAS and U.S. GAAP.

Part 1: Forestry Carbon Alternative Investment Asset Class

Across the globe, hundreds of forestry carbon offset projects are under development. These projects primarily focus on our Earth's "emeralds on the equator," our tropical forest legacy that graces the Earth like a necklace. These "emeralds on the equator" are deforested at a rate of 13 million hectares of forests annually. As a result, deforestation accounts for roughly 20% of annual global anthropogenic greenhouse gas emissions originating from these deforestation practices (Gullison et al, 2007). Because trees and plants inhale carbon dioxide, it is possible to mitigate global climate disruption through developing forestry carbon offset projects, where landowners are paid to decrease emissions of carbon dioxide on their property by decreasing land conversion and unsustainable timbering activities. The forestry carbon offset market is a mechanism where stakeholders such as businesses or communities can choose to decrease their carbon emissions. If the decrease occurs through carbon financing and the effort is technically feasible, a forestry carbon offset may be generated. In these situations, businesses are paid to decrease their carbon emissions, providing economic incentives for achieving reductions in the emissions of pollutants. This is called cap and trade. It is where we can develop a "financial asset from an environmental liability" (Thoumi, 2009).

Forestry carbon offset projects may be framed using the following models:

- Development requires effective communication.
- Development needs an appropriate business strategy.
- Generation follows distinct stages.
- Development must focus on intergenerational equity.
- Forestry carbon offsets are an alternative investment asset class.
- Forestry carbon offsets develop from real property rights.
- Finance and sustainability frameworks conflict.

Lesson #1: *Effective Communication*

Successful forestry carbon offset projects have four components. These components form the "Rational Convergence" business strategy model (see: Figure 1).

Scientists will tell us that the "land dictates the rules" of the project. This means that we must understand environmental science qualities of the land that encompasses our project, and its surrounding locale. This implies that forestry carbon offset projects need to be flexible enough to be iterative and adaptively managed for unforeseen events, consequences, and outcomes (Thoumi, 2009).

Local communities and their proxies in civil society such as international non-governmental organizations will tell us "local communities are the gatekeepers of a project." This means we need to work within the local community to gain support for our forestry carbon project because local communities are the catalysts for project success.

Governments "organize rights" and they will tell us that we need to work within their existing legal frameworks to develop a forestry carbon offset project. Yet these frameworks change over time and there may exist different legal criteria at different levels of government, whether local, provincial, national and international. Internationally

accepted "best-practices" may be preferred since this may mitigate project legal risk in the absence of sufficient local, provincial, and national laws.

Businesses such as project developers “structure risks” yet forestry carbon offset projects succeed when they focus on mitigating risks, as opposed to maximizing profits. This is because the forestry carbon offset market is dominated by quality over quantity because higher quality credits receive a price premium.

Finally, it is important to understand the four stakeholders’ situational and psychological profiles and their attitudes and concerns regarding the project’s returns, risks, legal and regulatory framework, tax, time horizons, liquidity concerns, and unique project co-benefits such as biodiversity and community development.

Figure 1: Rational Convergence

Lesson #2: *Forestry Carbon Needs Appropriate Business Strategy*

The successful strategic approach to forestry carbon offset project development includes three stages. These stages are planning, screening, and implementation.

- *Planning*: Each forestry carbon project is managed for aspects related to being real and measurable, permanent, transparent and credible, legal, marketable, and liquid, demonstrating co-benefits, having clear and prior consent of owners, minimizing business risk, minimizing sovereign risk, and providing assurance of completion.
- *Screening*: Each forestry carbon project is screened for aspects related to legitimacy, legality, and forestry carbon offset estimation (see Figure 2: Screening Tool). Various legal interpretations of laws at the four levels of jurisprudence – local, provincial, national, and international – can create confusion for the project owner.

This is why it is important to focus project strategy on the intersection between legality, legitimacy, and forestry carbon offset estimation.

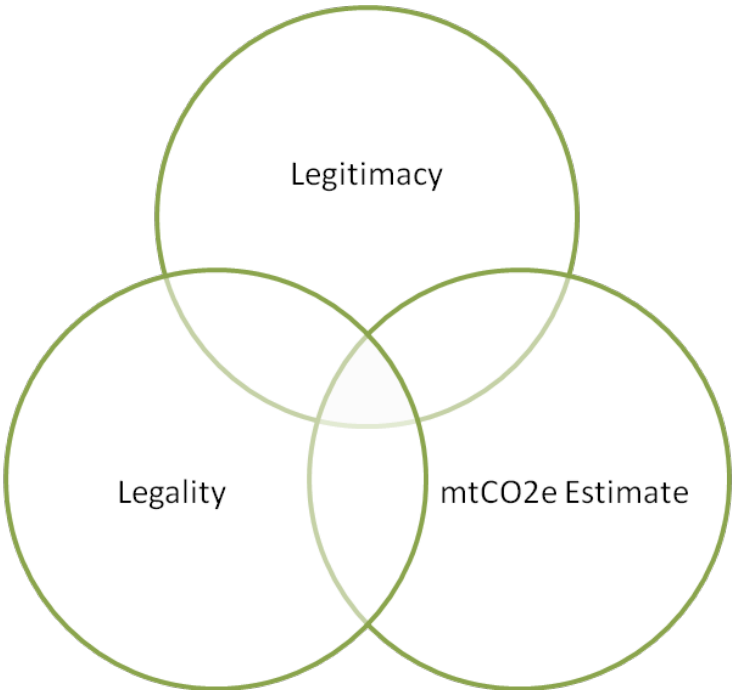


Figure 2: Screening Tool

- *Implementation*: Each forestry carbon project is developed with a complex systems approach to implementation, validation and verification, monitoring, adjustment, and sales. This approach is necessary for projects to realize successful outcomes.

Lesson #3: *Generation Stages of Forestry Carbon Credits*

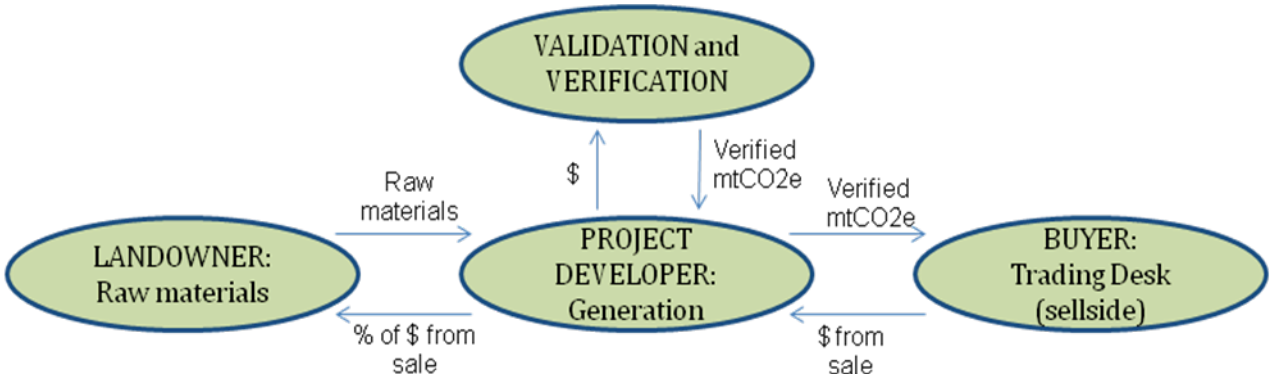


Figure 3: Forestry Carbon Offset Direct Sales Process

Market participants generally use a direct sales model where forestry carbon offsets are sold directly to an emitter (see Figure 3: Forestry Carbon Offset Direct Sales Process). Generation has three stages: raw materials sourcing, validation/verification, and sales.

- *Raw Materials Sourcing*: A project owner needs to have clean and clear title to the land. This title must be registered with the appropriate authorities. The project owner also needs to have clear and prior consent to own and sell forestry carbon offsets generated from trees on their property.
- *Validation and Verification*: Project developers assemble all the parts needed for forestry carbon offsets. The forestry carbon project developer delivers the technical documents to a third-party certification mechanism for third-party independent verification. After successful verification, the new forestry carbon offsets are issued and placed into a third-party independent registry where transactions can occur.
- *Sales*: Buyers have five reasons to purchase credits. They purchase credits for compliance to regulated markets, pre-compliance to regulated markets, investing for a financial return, carbon neutral products' offsetting, and public relations reasons. Recent purchases include:
    A. 600,000 tons purchased by Pacific, Gas and Electric for US$ 9.71 per ton, a sale of $5,826,000. Tons are sold ex-post under the Climate Action Reserve mechanism (Lake County News, 2009).
    B. 500,000 tons purchased by HEAG for US$ 8 per ton; $4,000,000 total sale. Tons are sold ex-post under ISO 14064:2 (ERA Carbon Offsets Ltd., 2009).
    C. 522,000 tons purchased by the Norwegian government for roughly US$ 14.00 per ton and total sale of $7,308,000. Tons are sold ex-post under the New Zealand Permanent Forest Sink Initiative (Carbon Finance, 2009).
    D. 500,000 tons purchased by The World Bank for an unknown price, sold ex-ante from the Ibi Bateke Carbon Sink Plantation Project (World Bank, 2009).

Buyers need transparency to price comparison shop. Sellers need liquidity to sell offsets efficiently and effectively. Regulators need a market providing assurance of completion.

Lesson #4: *Forestry Carbon Must Focus on Intergenerational Equity*

One can split businesses into two groups – those that create value and those that appropriate or take value (Afuah, 2009). Because forestry carbon projects should directly improve carbon sequestration and indirectly improve other ecosystem services, it is possible to discuss forestry carbon assets as value creation projects: the sum of the whole at the end of the process is greater than the sum of the whole at the beginning. Forestry carbon projects usually span 20 to 100 years. Consequently, one can discuss forestry carbon projects in the context of intergenerational equity.

Lesson #5: *Forestry Carbon is an Alternative Investment Asset Class*

With forestry carbon, one can develop a "financial asset from an environmental liability". The source of this financial asset is the natural capital of the land and the activities engaging this natural capital, which make up the geographic and ecological landscape of the properties held by these landowners. This natural capital, or natural hegemony,

develops forestry carbon projects as a new alternative asset class with its specific risk and return profiles depending on the quality of the project.

Lesson #6: *Forestry Carbon Develops from Real Property Rights*

Forestland is real property, and a forestry carbon project needs to be understood within this context. Its legal rights that transfer to the buyer are related to real property ownership, with rights of possession including boundaries establishment, the rights to control how the land is used, the rights to benefits arising from the land, and the rights to give, sell, encumber or bequeath rights or a portion of rights to others (McEvoy, 1998). A forestry carbon project must develop the legal capacity to "give, sell, encumber or bequeath rights or a portion of rights to others" in a commercially viable manner while protecting the public interest of the location where the rights originate.

Lesson #7: *Finance and Sustainability Conflict*

Financial institutions play a key role in sustainable economic development. If we define sustainability as a rational land ethic that incorporates equitable utilization, the no-harm principle, cooperation and sustainability, then forestry carbon projects may yield results that are inherently conditioned to develop intergenerational equity. Equitable utilization is the efficient and fair distribution of natural resources. The no-harm principle means that harm to an ecological system is not done today in an effort to extract economic rent in lieu of consideration for tomorrow. Cooperation means that firms, individuals, nations, and municipalities need to work within an adaptive management framework that is iterative with affirmative prescriptive laws to manage their shared natural resources. Sustainability in this context is not a circular reference, but rather it refers to developing a biophysical systems perspective. The precautionary principle means that actions must demonstrate they will not cause harm today or in the future. The burden of proof lies with the proponents of the action and the action itself.

How finance currently operates in society is not congruent with the principles of this sustainability framework. Current financial analysis has the following three flaws: discounting without a rational time horizon, accounting for natural resources that does not reflect ecological resources, and the separation of growth and development as applied to infinite and finite resources.

- *Discounting*: Discounting finds the present value of cash flows today by using the time value of money equation. The capital asset pricing model (CAPM) can be used to calculate a discount rate. In CAPM, the discount rate is calculated as the sum of the risk-free rate and beta multiplied by the equity risk premium. There are flaws within CAPM. For instance, beta, which can be calculated using various methods, is intrinsically only an educated guess regarding the volatility of a firm or underlying asset versus its appropriate benchmark or index.
- *Accounting*: How we report on natural resources also has discrepancies. For example, methods to account for non-sustainable extractive services, such as for

coal, do not apply a limit to the amount that can be extracted from a mine given the growth rate of the resource. This approach to extractive resources is not sustainable.

- *Growth Potential*: Analysis of growth potential in finance does not make a coherent separation between growth and development and finite and infinite (see Figure 4: Development, Growth, and Natural Capital Accretion). Growth and development are not inherently the same process. One can have development without growth, and one can have growth without development. Development implies overall progress for the community in a sustainable for-profit fashion. Because the Earth has limited resources, our economic systems should use resources more efficiently with the goal of creating intergenerational equity. In summary, any financial analysis could be compared to a baseline where "resources are used sustainably for-profit at a finite or natural rate of natural capital accretion."

	Development	Growth
Finite	**Resources used sustainably for-profit at finite or natural rate of natural capital accretion**	Resources used unsustainably for-profit at a finite or natural rate of natural capital accretion
Infinite	Resources used sustainably for-profit at an infinite rate of natural capital accretion	Resources used unsustainably for-profit at an infinite rate of natural capital accretion

Figure 4: Development, Growth, and Natural Capital Accretion

At present, the International Accounting Standards Board (IASB) and the U.S. Financial Accounting Standards Board (FASB) offer no guidance on how entities should account for voluntary emissions reductions, including forestry carbon offsets. Consequently, there is a lack of consensus as to how emissions reductions should be accounted for on the balance sheet and the income statement.

I. The Value of Accounting

In order for the forestry carbon market to adequately function and further develop, clear accounting standards for these assets must be established. Entities possessing forestry carbon offsets currently have no accounting guidance to follow. As a result, different entities are using different accounting methods, hindering information transparency in the market. Lack of uniform accounting makes it nearly impossible to fairly compare financial statements across entities such as project developers. Entities also struggle with the time and resources required to determine the most appropriate accounting treatment, and this difficulty is exacerbated when an organization follows both a GAAP and IAS. Until accounting guidance is issued, difficulty regarding information transparency and comparability will persist.

In May 2007, PricewaterhouseCoopers (PwC) and the International Emissions Trading Association (IETA) released a survey of 26 major European organizations affected by the EU Emissions Trading Scheme (ETS). The survey looked at the accounting approaches for ETS allowances and Certified Emission Reductions (CERs), both acquired and self-generated (IETA and PwC, 2007). Although the study relates to the EU compliance market, its findings may provide insight for the voluntary market. Specifically, findings on self-generated emissions reductions may reflect similar trends and issues as those encountered by entities in the voluntary forestry carbon market.

The survey found that on the balance sheet, 29% of participants accounted for self-generated CERs as inventory upon generation, at an allocated cost of production; 13% recorded the CERs as intangible fixed assets, at fair value; 29% did not recognize the CERs until they were used/sold; and 29% used other treatments. The decision not to recognize CERs until they are used/sold may suggest that the organization anticipates no future economic benefits from the offsets (IETA and PwC, 2007). For the purpose of this paper, however, we assume classification of offsets as assets. This may be consistent with existing guidance.

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). FASB similarly defines an asset as “probable future economic benefits obtained or controlled by a particular entity as a result of past transactions or events” (FASB, 2009). Whether the offset is sold pre-verification or ex-post, money exchanges hands in return for offset ownership rights. A buyer may bank and later sell forestry offsets or use them to settle compliance or pre-compliance emissions obligations. Accordingly, forestry offsets may qualify as assets for financial accounting purposes because they are entity controlled and provide future economic benefits.

Despite the lack of clear rules, various accounting methods applicable to offsets are present in existing standards under IAS and U.S. GAAP. With the assumption that forestry offsets are classified as assets, we focus on the two remaining accounting treatments found in the survey: inventory and intangible assets. In determining the appropriate accounting for forestry carbon offsets, considering their character is imperative. The use of the offsets determines their nature, which in turn dictates how they should be classified in the financial statements (see Figures 7-10).

The following sections explain inventory and intangible assets in financial accounting along with details of cost accounting for self generated offsets. Forestry carbon offsets can be classified in the financial statements as either inventory or intangible assets. The offsets can be held at fair value, net realizable value, or cost. Fair value and net realizable value are based on market prices; however, without an active market for the offsets, it may be prudent to record them at cost. This value is either what an entity purchases its offsets for or the cost the entity incurs to manufacture the offsets. If an entity self generates offsets, it may use cost accounting to arrive at a unit cost regardless of classification as inventory or intangible assets. This unit cost is the amount recorded on the balance sheet and eventually expensed on the income statement when the offsets are sold.

II. Inventory

A project developer may choose to account for forestry carbon offsets as inventory on the balance sheet at cost. International Accounting Standard (IAS) 2, *Inventories,* does not apply to biological assets related to agriculture, and its measurement requirements do not apply to inventories held by producers of agricultural and forest products; however, lack of guidance remains for forestry carbon products (IASC Foundation, 2009). IAS and U.S. GAAP define inventory similarly, as assets:

A. Held for sale in the ordinary course of business;
B. In the process of production for such sale in the ordinary course of business; or
C. In the form of materials or supplies to be consumed in the production process or in the rendering of services (IASC Foundation, 2009).

If an entity sells forestry carbon offsets as part of its normal operations, or uses them to settle emissions liabilities in its ordinary course of business, offsets could classify as inventory under IAS 2. As such, they should be measured at lower of cost and net realizable value. Inventory costs include all costs sustained to bring the inventory to its present state and location, including purchase and conversion costs. Net realizable value equals the estimated, ordinary selling price less estimated costs to complete the sale – in effect, the net amount an entity expects to realize. IAS 2 permits inventory costs to be assigned by first-in first-out (FIFO) or weighted average cost formulas.

U.S. GAAP requires inventory to be measured slightly differently; according to SFAS 151, *Inventory Costs*, inventory is measured at lower of cost or market (FASB, 2008). Unlike under IAS, US GAAP also allows the FIFO method for assigning inventory

costs. To measure cost from a project owner or buy side perspective, the credits would likely be recorded at purchase cost; from a developer perspective, the credits could also be valued at an allocated cost of production (see: Manufactured Product).

Inventory Example

In the following example, a landowner hires a project developer to generate forestry carbon offsets on their property, regardless of the forestry asset class. The project developer sells the credits to a wholesaler. Using our generation analogy, a carbon forestry project has three stages: raw materials sourcing, generation, and sales. The transaction looks like this (see Figure 5: Forestry VER Inventory Sale Diagram):

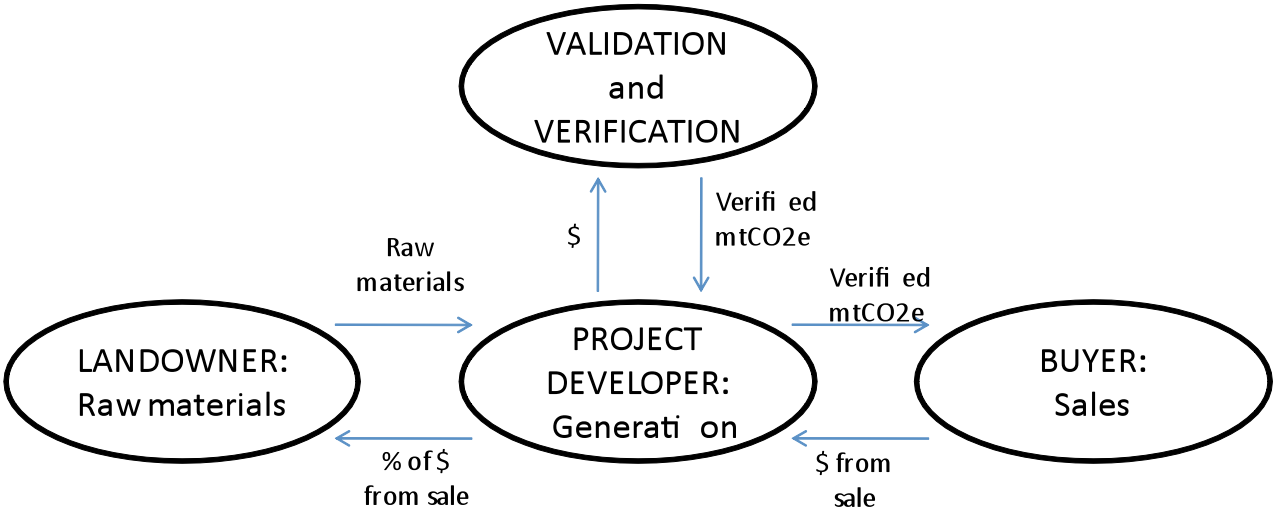


Figure 5: Forestry VER Inventory Sale Diagram

Example
A broker purchases 1,000 credits from a developer whose project is based in the Central American rainforest. Purchase price is $5 per credit; unit cost for the developer is $2.

The total amount the broker pays in the sale is $5,000. The broker records the $5,000 sale on its balance sheet as inventory. The journal entry for the broker's purchase is as follows:

Inventory	**5,000**	
Accounts payable		**5,000**

The gross amount the developer realizes from the sale is also $5000 (less any selling costs, but for this example we will assume the developer incurs no costs to sell the credits). The developer also realizes costs of goods sold related to the credits of $2,000. The developer reduces inventory on its balance sheet and records the following journal entry for the sale:

Accounts receivable	**5,000**	
Sales		**5,000**
Cost of goods sold	**2,000**	
Inventory		**2,000**

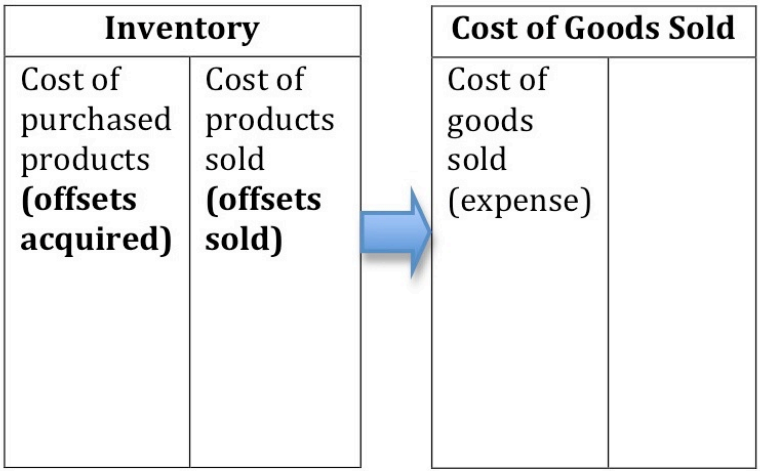
When the broker pays the developer for the credits, it makes the following entry:

Accounts payable	**5,000**	
Cash		**5,000**

The developer makes the following entry when it receives payment from the broker:

Cash	**5,000**	
Accounts receivable		**5,000**

The broker now maintains this inventory on its balance sheet at lower of cost or market under US GAAP or at lower of cost or net realizable value under IAS. If we follow the assumption there are no selling costs associated with the sale of credits, then the value of the inventory is the same regardless of whether US GAAP or IAS is followed. When the broker subsequently sells the credits to a buyer, it removes the cost of inventory sold from the inventory account on its balance sheet and transfers it to cost of goods sold, an expense account on the income statement.



Trading Inventory

Broker inventories of tradable assets such as commodities are exempt from IAS 2 measurement rules, given such inventories are measured following the industry convention at fair value less cost to sell. Periodic changes are thus recognized in profit or loss on the income statement. When tradable inventories are not measured at fair value less costs to sell, they are subject to measurement as per IAS 2, lower of cost and net realizable value. This is relevant in accounting for forestry carbon offsets because at present an active market for them – a transparent market with day-to-day liquidity and transactions that have assurance of completion with standardized contracts – does not yet exist. Without an active market, offsets cannot be held at fair value as trading inventory. Therefore, offsets traded on the voluntary market may be valued on the balance sheet at lower of cost (likely the cost of purchase) and net realizable value. This measurement is also consistent with U.S. generally accepted accounting principles (FASB, 2008), which require measurement at lower of cost or market. Although FASB believes that fair value is the more appropriate measurement for inventories in trading activities (FASB, 2008), it does not require their measurement at fair value.

In the trading inventory scenario, we assume a landowner hires a project developer to generate forestry carbon offsets on their property, regardless of the forestry asset class. The project developer sells the offsets to a wholesaler who then sells the credits to an emitter. Using our generation analogy again, a carbon forestry project has three stages: raw materials sourcing, generation, and sales. The transaction looks like this (see Figure 6: Forestry VER Trading Inventory Diagram).

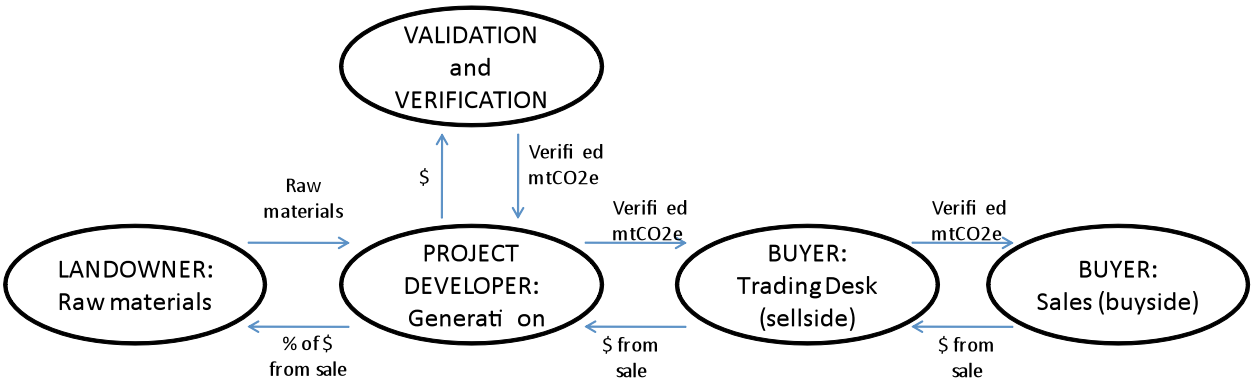


Figure 6: Forestry VER Trading Inventory Diagram

III. Intangible Assets

Entities such as landowners, project developers, and buyers may find it appropriate to account for forestry carbon credits as intangible assets. This section first explains intangible assets under IAS and follows with an intangibles overview under U.S. GAAP.

IAS Requirements

IAS 38, *Intangible Assets* (IASC Foundation, 2009), applies to identifiable, non-monetary assets without physical substance. Outside the scope of this standard are financial assets, recognition and measurement of exploration and evaluation assets, and development and extraction expenditures on minerals, oil, and natural gas. Additionally, IAS 38 does not apply to intangibles covered by another Standard. For example, intangibles sold in the ordinary course of business fall outside the Standard, for they are within the scope of IAS 2, *Inventories*. In addition to meeting the minimum scope requirements, an item must also meet the definition of an intangible asset:

A. The asset is identifiable;
B. The entity has effective control over the asset;
C. There exist future economic benefits

Off-Balance Sheet Intangibles
Currently, the requirements for recognition of intangible assets are quite stringent. If an entity cannot sufficiently meet the definition and requirements (described below) for its intangible assets, including establishing a connection between costs incurred and probable future economic benefits, the assets may not be recognized in the financial statements. This is the likely outcome for voluntary credits because an active market for them does not yet exist. When intangibles cannot be recognized on the financial statements, costs are expensed as incurred rather than capitalized as an asset on the balance sheet. In effect, the project is recognized on the financial statements as a series of expenditures. If the market for voluntary credits becomes active in the future, such assets could possibly qualify for recognition on the balance sheet. Even so, only certain development costs are capitalized. The following sections for internally generated and separately acquired intangibles, along with their subsequent measurement, relate to intangible assets recognized on the balance sheet.

Internally Generated Intangibles
An internally generated intangible asset is commonly generated in two phases, a research phase and a development phase. The research phase includes costs associated with gaining new knowledge, finding materials and designing, among others, and does not result in an intangible asset with the ability to produce future economic benefits. Research costs are expensed as incurred. The development phase, on the other hand, applies findings from the research phase to its plans or designs for the asset. Development may result in recognition of an intangible asset if the project developer can establish the following:

A. The technical feasibility of completing the intangible asset so that it will be available for use or sale;
B. Its intention to complete the intangible asset and use or sell it;
C. Its ability to use or sell the intangible asset;
D. How the intangible asset will generate probable future economic benefits. Among other things, the entity can demonstrate the existence of a market for the output of the intangible asset or the intangible asset itself or, if it is to be used internally, the usefulness of the intangible asset;
E. The availability of adequate technical, financial and other resources to complete the development and to use or sell the intangible asset; and
F. Its ability to measure reliably the expenditure attributable to the intangible asset during its development.

Costs included in the measurement of an internally generated intangible asset are those incurred from the date the intangible meets the recognition criteria above. They include:

A. Costs of materials and services used or consumed in generating the asset;
B. Costs of employee benefits arising from the generation of the asset;
C. Fees to register a legal right; and
D. Amortization of patents and licenses that are used to generate the asset.

Specific costs for a project developer may include:

A. Land title acquisition, lease, and / or title insurance;
B. Technical data;
C. Implementation;
D. Validation, monitoring, and verification;
E. Commercialization costs including registration, carbon insurance, and issuance.

Separately Acquired Intangibles
As with internally generated intangible assets, those acquired separately in a purchase must meet the requirements regarding expected future economic benefits and reliably measurable cost. The cost of the separately acquired intangible asset includes both the purchase price and direct costs necessary to put the asset to its intended use. The intangible is recorded on the balance sheet at this acquisition cost. Once an asset is in its necessary operating condition, subsequent redeployment or operating costs are no longer included in the carrying amount of the asset. Instead, these costs are immediately expensed.

Subsequent Measurement
After the initial recognition of an intangible asset, whether self-generated or acquired, the entity may choose to account for the intangible using the cost model or the revaluation model. In the cost model, an entity carries its intangibles at cost less amortization (if the asset has a finite useful life) and any impairment. Because voluntary

offsets have an indefinite useful life, they likely should not be amortized. In the revaluation model, an entity carries its intangibles at fair value less any accumulated amortization or impairment loss. For an entity to use the revaluation model, however, an active market for the intangible must exist. Because there is not an active market for voluntary emissions reductions, intangibles would most appropriately be measured at cost less accumulated impairment.

US GAAP Requirements

Accounting rules for intangibles under U.S. GAAP are more stringent than those under IAS and are thus less complicated. Unlike the IAS measurement criteria, US GAAP requires both research and development costs to be expensed as incurred under SFAS 142 (FASB, 2001). As a result, internally developed intangibles are not recognized as assets. For certain internally developed intangibles, however, a few development costs are capitalized, including legal fees, filing and other costs related to establishing the intangible. The intangible qualifies for such treatment if it meets one of the following:

A. Provides distinct future cash flows;
B. Provides contractual, legal rights to the owner; or is
C. Exchangeable

Other costs, both direct and indirect, related to the actual development of the product are expensed. Furthermore, according to APB Opinion 17 relating to SFAS 142, development, maintenance, and restoration costs for intangible assets with "indeterminate lives" are expensed as incurred. Because there is no guidance on how to account for voluntary offsets, judgment should be exercised on whether to capitalize certain legal costs. It may be simplest for a developer to expense all costs as incurred and disclose the intangible off-balance sheet in the footnotes of its financial statements.

The accounting for separately acquired intangible assets is more straightforward. When acquired either individually or in a group, the intangible asset is recognized and subsequently measured at fair value.

Example
A broker purchases 1,000 credits from a developer whose project is based in the Central American rainforest. Purchase price is $5 per credit; unit cost for the developer is $2.

The total amount the broker pays in the sale is $5,000. Because the offsets are separately acquired, the broker may record the $5,000 sale at cost on its balance sheet as intangible assets. The journal entry for the broker's purchase is as follows:

Intangibles	**5,000**	
Accounts payable		**5,000**

The gross amount the developer realizes from the sale is also $5000 (less any selling costs, but for this example we will assume the developer incurs no costs to sell the credits). The developer does not realize any costs of goods sold related to the credits because the developer chooses to account for credits as intangible assets. Under U.S. GAAP, all costs are expensed as incurred. Therefore, the cost of the credits has already been expensed through the income statement, and the developer does not have any relevant balance sheet accounts to reduce. It records the following journal entry for the sale:

Accounts receivable	**5,000**	
Sales		**5,000**

When the broker pays the developer for the credits, it makes the following entry:

Accounts payable	**5,000**	
Cash		**5,000**

The developer makes the following entry when it receives payment from the broker:

Cash	**5,000**	
Accounts receivable		**5,000**

Under U.S. GAAP, the broker maintains these intangibles on its balance sheet at fair value with Level 2 or 3 inputs and may not revalue them. Under IAS, the broker maintains the intangibles at cost less any accumulated impairment. The value of the intangibles will vary depending on whether US GAAP or IAS is followed.

IV. Cost Accounting for Manufactured Products

Cost accounting encompasses various product-costing methods that may be used to calculate the unit cost for internally manufactured offsets. This unit cost is the basis for the monetary amount used in financial statements, regardless of the offsets' classification as inventory or intangible assets. According to both IAS and US GAAP, assets in the process of production constitute three types of inventory: raw materials, work in process, and finished goods. Production costs flow through the raw materials and work in process accounts before entering the finished goods account, where the aggregate cost of completed products lies on the balance sheet. As goods are sold, their costs are removed from the finished goods account on the balance sheet and become an expense, cost of goods sold, on the income statement. Relevant production costs in forestry carbon projects include:

A. Land title acquisition, lease, and / or title insurance;
B. Technical data;
C. Implementation;
D. Validation, monitoring, and verification;
E. Commercialization costs including registration, carbon insurance, and issuance.

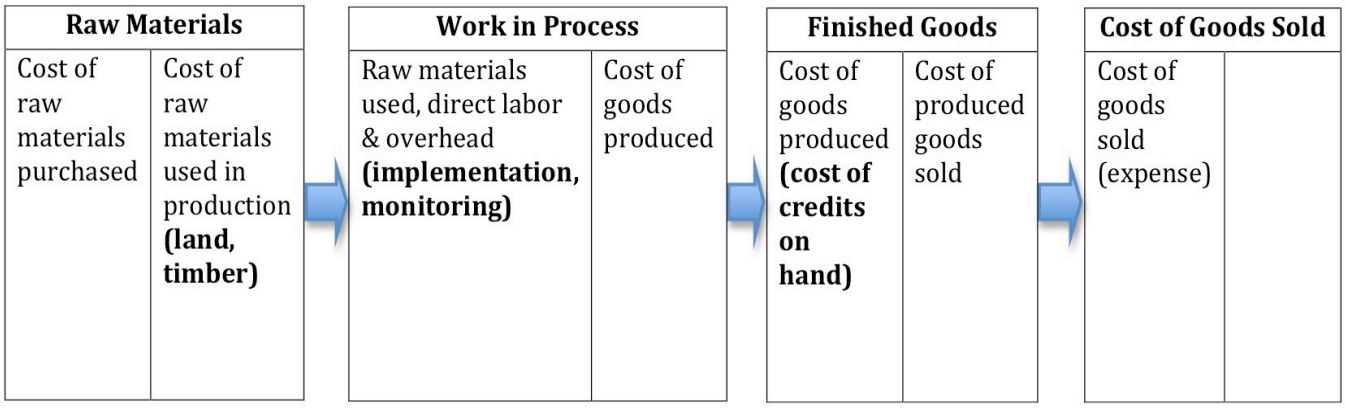
Raw materials inventory includes the costs of materials, such as parts and equipment, from which a good is eventually manufactured. For a project developer, these costs would relate to inputs such as land (owning and leasing) and timber from which the final outcome, a reduction in emissions, is produced. As raw materials are used in production, their costs transfer to the work in process account. All costs involved in the manufacturing process accumulate in this account. In addition to raw materials costs, the account also includes direct labor and overhead. Costs are transferred from work in process to the finished goods account as the manufacturing process concludes. For project developers, a finished product is realized after validation and verification.

There may be a balance in all three accounts at the close of each accounting period. For raw materials and finished goods, this number represents the cost of items remaining at the periods' close. For the work in process account, this number represents the accumulated costs incurred for goods still in the production process. The relative balances of these accounts depend on the nature of the manufacturer. For example, a manufacturer of products with lengthy, complex production processes (i.e. technological or electronic goods) may have a large balance in the work in process account relative to raw materials or finished goods. Conversely, a manufacturer of goods with short run production processes may have a relatively smaller work in process balance. For all three manufacturing accounts, inventory is held at lower of cost or net realizable value under IAS and at lower of cost or market under US GAAP. In the context of forestry carbon projects, the project developer is likely the only entity to use this method because it is the only one engaged in a production process.

Example

We focus again on a project based in the Central American rainforest. The project baseline is 10,000 hectares, and it spans 20 years. Using the Gibbs Brown average-biome approach, there exist 197 tons carbon stock per hectare climax forest. The developer estimates 97 tons carbon per hectare will be removed from the atmosphere each year, resulting in CO2 reductions of approximately 249 tons per hectare after a 30% buffer**.** We estimate amount of CO2 removed from the atmosphere and available for sale in the first year of the 20-year project at 12.45 tons per hectare. The project covers 10,000 hectares, so in total 124,597 tons CO2 per year are available for sale. The cost of raw materials is zero; we assume the landowner already holds inputs such as land. The Work in Process account therefore only includes costs related to monitoring and overhead. Most overhead costs are fixed at the project level.

There are many different cost accounting methods and within them multiple assumptions which one can use to arrive at a unit cost. For simplicity, we assume pure historical measurement basis, the full absorption method for valuing inventory, job order costing for cost accumulation method, and specific identification (by job) for our cost flow assumption. One unit equates to one-ton of CO2 removed from the atmosphere.



Without raw materials, capitalization of costs begins in Work in Process. Costs relating to activities such as monitoring, verification, and registration accumulate in the Work in Process account as incurred. After credits are validated and verified, their associated cost moves to Finished Goods. When credits are sold to buyers, the cost of goods sold transfers from the Finished Goods account on the balance sheet to the Cost of Goods Sold account on the income statement. To compute Cost of Goods Sold, it is necessary to compute the per-unit manufacturing cost of the finished goods (see below). Once the unit cost is determined, this cost transfers with the units sold from Finished Goods to Cost of Goods Sold.

Cost	Amount	Units	Per Unit
Startup Costs	$280,000	2,796,675	$0.10
Legal	$25,000	699,169	$0.03
Verification	$20,000	699,169	$0.02
Issuance	$8,390	139,834	$0.06
Registration	$8,390	139,834	$0.06
Monitoring	$22,000	139,834	$0.15
Total Unit Cost			$0.42

In the example, we assume job order costing as our cost accumulation method; others, such as process or hybrid methods, may not be appropriate due to the nature of forestry carbon projects. Job order costing itself, however, may not provide the best information for decision-making. Forestry carbon projects have relatively high development and maintenance costs with minimal physical production and few raw materials; job order costing focuses more on products than activities. Additionally, costs may vary over the years of a project, even though the product, essentially abated carbon, remains largely homogenous. Because we assume full absorption costing, which U.S. GAAP requires for inventory valuation, the unit cost of offsets may also vary considerably between years. For example, assume verification, issuance, and registration occur every five years. If we allocate overhead based on annually determined rates, this would result in both over and under allocation of overhead costs throughout the lifetime of a project.

Life cycle costing, a method that has gained momentum in recent years, may offer management the most comprehensive picture for planning purposes. Although life cycle costing is not allowed for financial reporting purposes, it is a tool that could greatly benefit decision-making in a forestry carbon scenario. What distinguishes this costing method from those traditionally used is its focus on the value chain. Life cycle costing looks at costs incurred prior to production, such as research and development, as well as costs incurred post-sale, such as warranties and marketing costs. For a forestry carbon project, the unit cost would therefore include startup costs, commercialization fees, and administrative costs along with production costs. All costs incurred throughout the value chain are added together and then divided by the number of units the entity expects to sell. This yields the total cost per unit.

Viewing cost from a value chain perspective may help managers make better-informed decisions before starting the production process. First, including the lifetime costs of a product in its unit cost may help managers make the most effective pricing decisions. Even if the market essentially sets the price, however, there may still be benefits. Forestry carbon projects can span decades, placing a great deal of importance on a project's design phase. Life cycle costing may enhance project design through value engineering. With such processes, management has the opportunity to analyze the value chain, eliminating wasteful activities while boosting efficiency. The following chart shows the unit cost calculation using life cycle costing, with amount of cost shown on a per annum basis, spread over the number of units each affects:

Cost	Amount	Units	Per Unit
Startup Costs	$280,000	2,796,675	$0.10
Legal	$25,000	699,169	$0.03
Verification	$20,000	699,169	$0.02
Issuance	$8,390	139,834	$0.06
Registration	$8,390	139,834	$0.06
Monitoring	$22,000	139,834	$0.15
Management	$50,000	139,834	$0.35
Commercialization	$149,515	699,169	$0.21
Total Unit Cost			$1.01

V. Comparison

Classification as Inventory or Intangible Assets

If offsets are recorded on-balance sheet as inventory, initial measurement is at cost to manufacture the offsets. Variations in unit cost result from differences in cost accounting assumptions. Discrepancies in amounts recorded on-balance sheet for intangibles, however, may be more substantial. This holds for both IAS and US GAAP because not all related costs are eligible for capitalization, and eligible costs vary between the two sets of standards. Under IAS, eligible costs are only capitalized after the intangible meets all recognition criteria. Under US GAAP, only direct costs to obtain the intangible, such a legal costs, are capitalized. Regardless of what group of standards is followed, forestry offsets recorded as intangibles will most likely result in off-balance sheet classification. This is the logical result of the lack of an active market. Consequently, the major accounting implications from choosing one method over the other lie less in measurement and more in where the assets are recognized in the financial statements.

Most simply put, accounting for voluntary offsets as inventory results in balance sheet recognition, whereas accounting for them as intangibles results in a series of expenditures on the income statement with no balance sheet recognition. When voluntary credits are recorded on an entity's balance sheet as inventory, they increase total assets, in turn diluting the entity's return on assets. While this may appear to be the less preferable treatment, favoring classification as off-balance sheet intangibles, academic research may prove otherwise, especially for entities whose assets are predominantly intangible. This mix of assets could be the case for landowners, project owners, and project developers in the forestry carbon scenario. Findings indicate that when intangible assets are capitalized, an entity receives both superior analyst following and lower forecasting errors (Matolcsy, 2006). If intangibles are not capitalized, an entity shows few assets on the balance sheet along with negative operating cash flows. Although intangibles likely won't be recognized on the balance sheet without an active market under IAS (and, if internally generated, likely wouldn't be recognized either way under U.S. GAAP), voluntary offsets could be capitalized as inventory if they are sold in the ordinary course of business. If an entity is concerned with analyst following and attractiveness to investors, it may consider accounting for credits as inventory.

Accounting for credits as inventory or intangibles also has implications for the income statement. The inventory option will result in smoother earnings patterns than will classification as intangibles. This is because of the matching principle.[1] Inventory costs (the cost of goods sold) are 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. Alternatively, when offsets are recorded as off-balance sheet intangibles, costs are expensed as incurred; these expenses are not matched with relevant sales proceeds. As a result, accounting for forestry offsets as intangibles will lead to greater earnings volatility. If an entity does not operate to a large extent with

[1] According to Investopedia.com, "economic events are recognized by matching revenues to expenses at the time in which the transaction occurs rather than when payment is made (or received)."

intangibles, the resulting earnings volatility may not have much of an effect on overall earnings. However, for an entity that operates mainly with intangibles, earnings volatility can have serious repercussions, such as the perception the entity is a risky investment.

Cost Accounting Assumptions

How developers calculate their unit cost, which depends on the cost accounting assumptions chosen, affects internal decision-making. For example, if full absorption costing[2] is not applied, the full cost of the resources used to produce the offsets, including fixed costs, is not measured. Fixed costs, of course, must be paid regardless of whether they are included in unit cost calculations. Therefore, if only variable costs are included in pricing decisions, sales proceeds may be insufficient to cover all the associated costs. Even if the market sets the price for offsets, only including variable costs in unit cost calculations could still result in lower than expected profits. Furthermore, forecasts based on prices that do not include fixed costs may render future projects unprofitable. This may cause developers to avoid taking on certain projects that may be profitable but appear unattractive due to poorly informed decisions. The use of life cycle costing for internal decision-making may remedy these problems.

Conclusion

The world's ecosystems are experiencing rapid degradation, placing great urgency on ecosystem protection and ensuring access to their goods and services. At the same time, deforestation of our forestlands accounts for approximately 20% of annual global greenhouse gas emissions. The forestry carbon market addresses these crises by both mitigating global climate disruption through carbon sequestration and preserving other ecosystem services such as biodiversity and watershed protection. Forestry carbon projects develop from real property rights and require effective communication, appropriate business strategies, and a focus on intergenerational equity. The resulting offsets have become an alternative investment asset class.

The focus of this paper – financial accounting for forestry carbon offsets – is important for both internal and external decision-making. Appropriate cost accounting is significant for landowners and project developers, who make crucial decisions based on cost calculations. Appropriate and uniform classification of forestry carbon offsets in the financial statements is imperative both for internal decision-making and for external stakeholders such as investors. Without clear accounting guidance for forestry carbon or voluntary offsets, comparability across projects will remain vague. The global forestry carbon market is gaining momentum; however, it must still develop the regulatory and institutional frameworks necessary to become a viable and active market.

Further research and debate should be pursued in other relevant areas of forestry carbon and ecosystem services. Pertinent issues include legal aspects of projects as well as forestry insurance. Forestry carbon projects also present an opportunity to explore overlaying offsets in areas such as biodiversity and nitrogen.

[2] This is the traditional valuation method: all manufacturing costs are capitalized as inventory. U.S. GAAP requires full absorption costing for external financial reporting but other methods may be used internally.

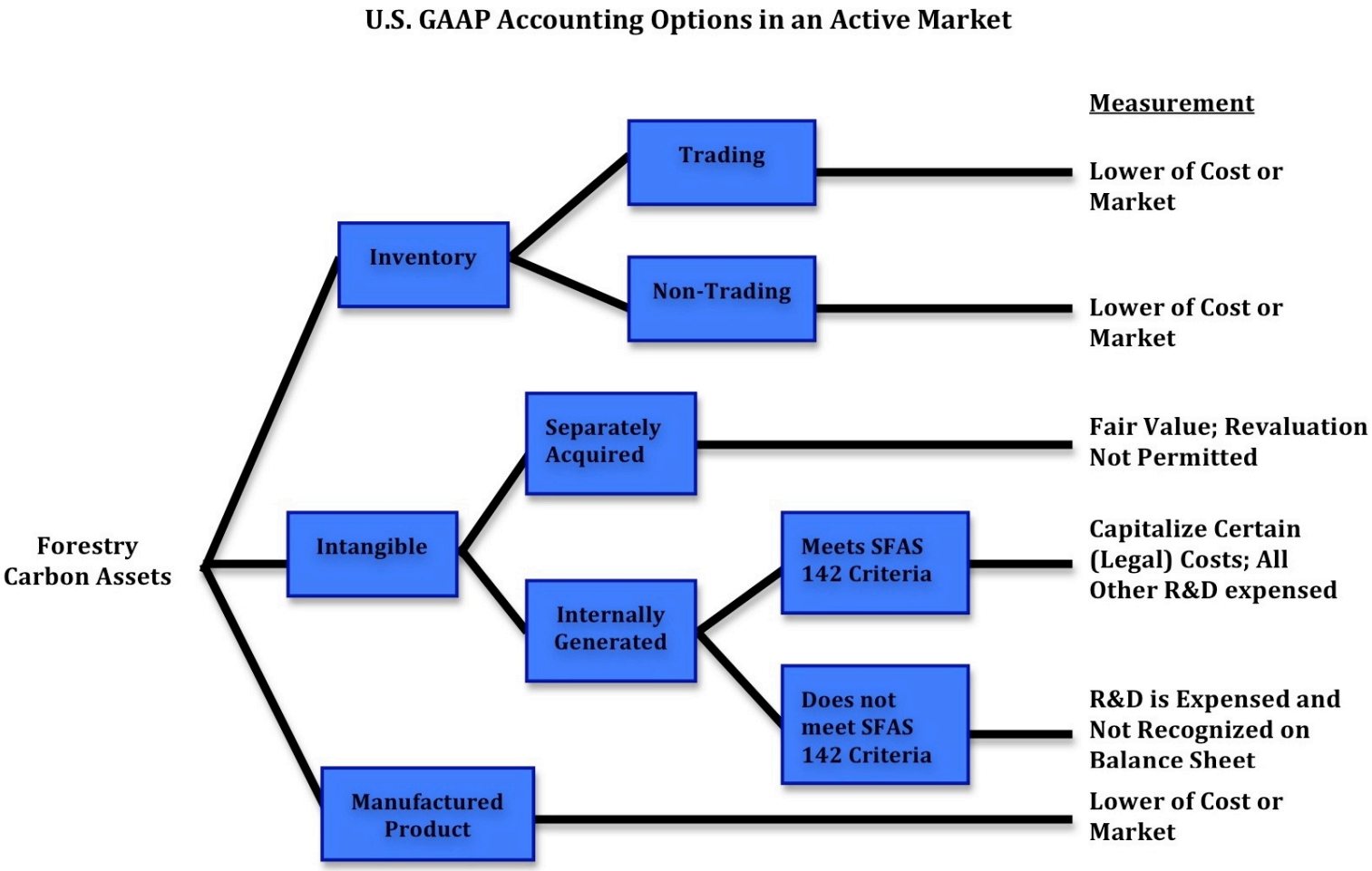


Figure 7: U.S. GAAP Accounting Options in an Active Market

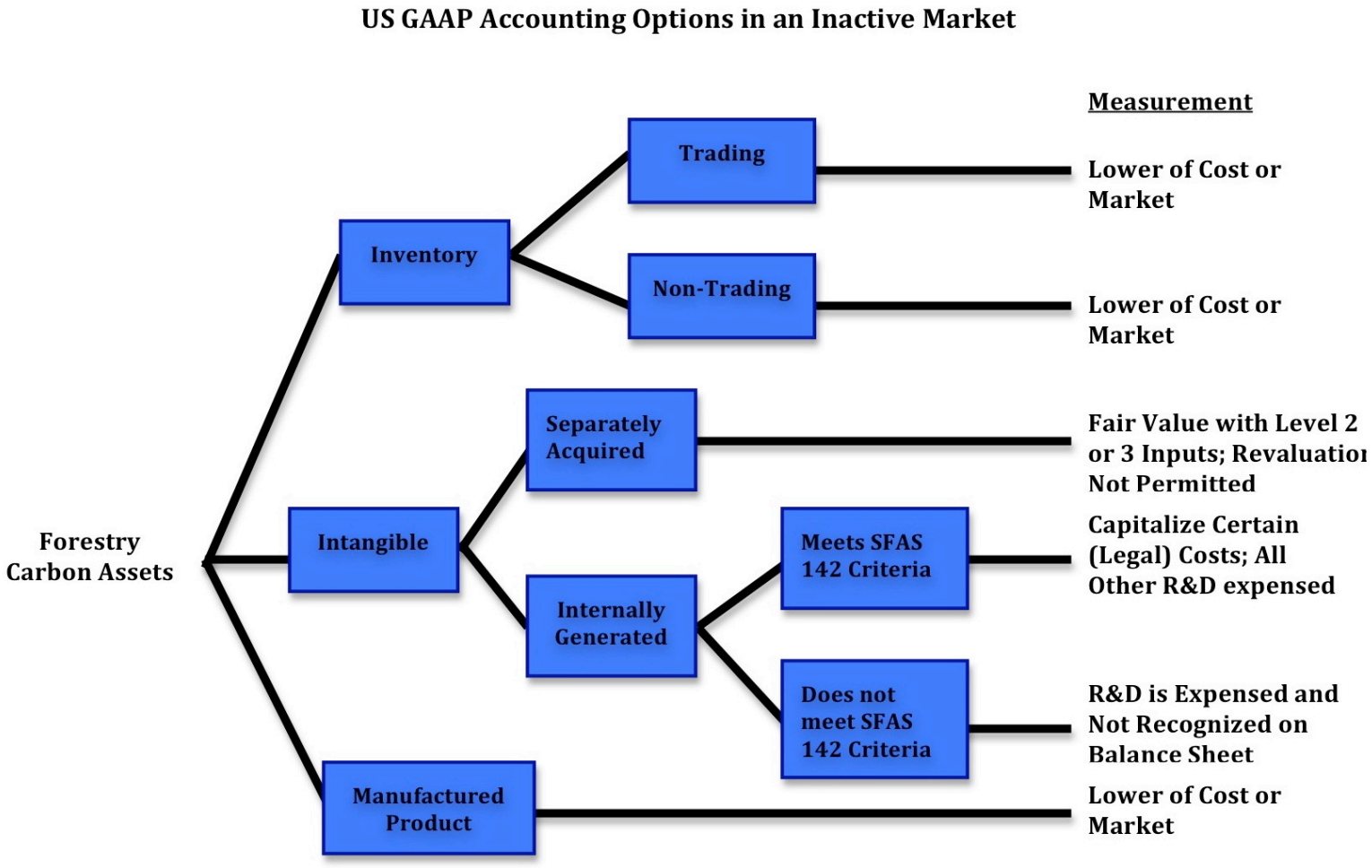


Figure 8: U.S. GAAP Accounting Options in an Inactive Market

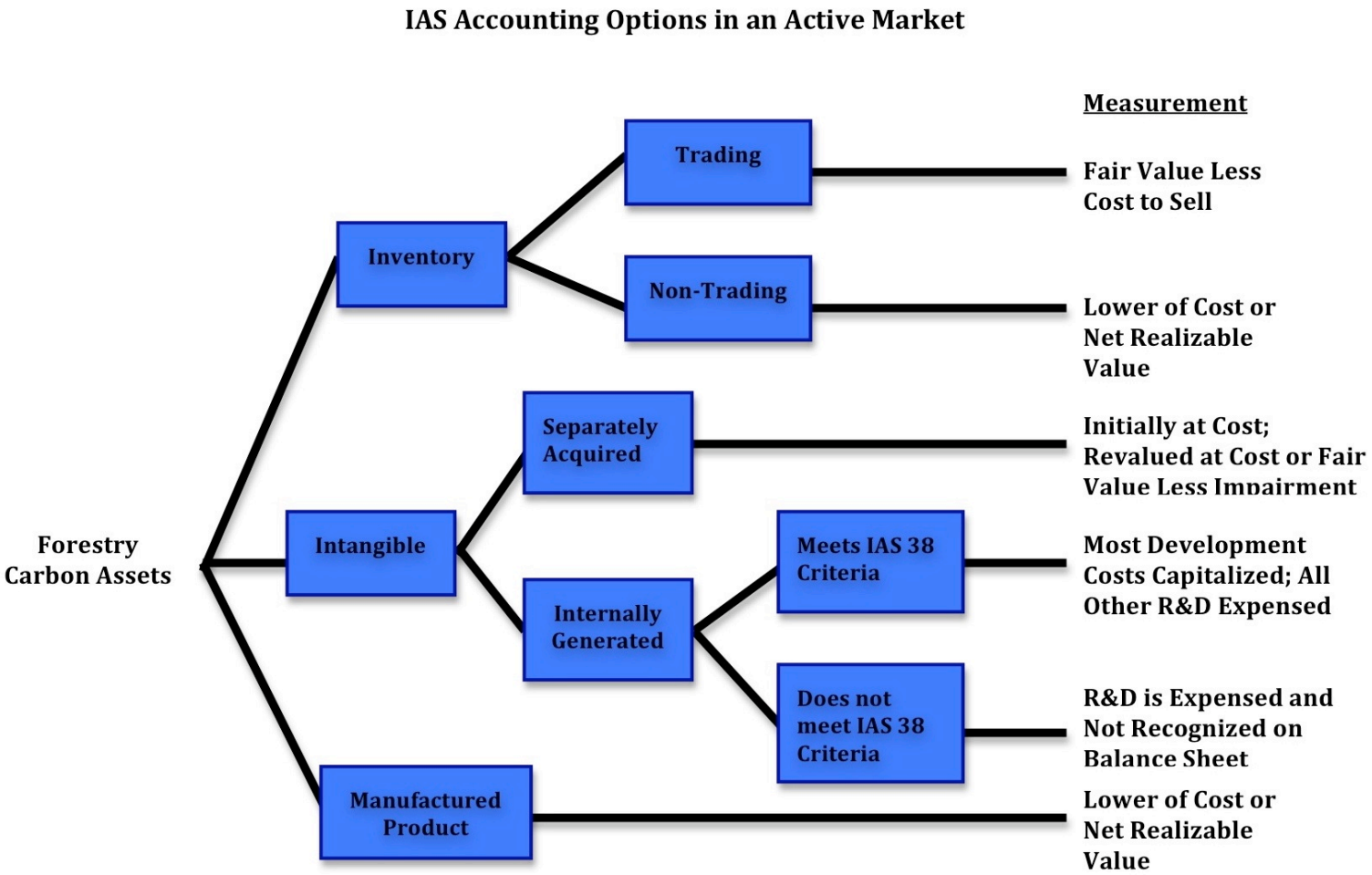


Figure 9: IAS Accounting Options in an Active Market

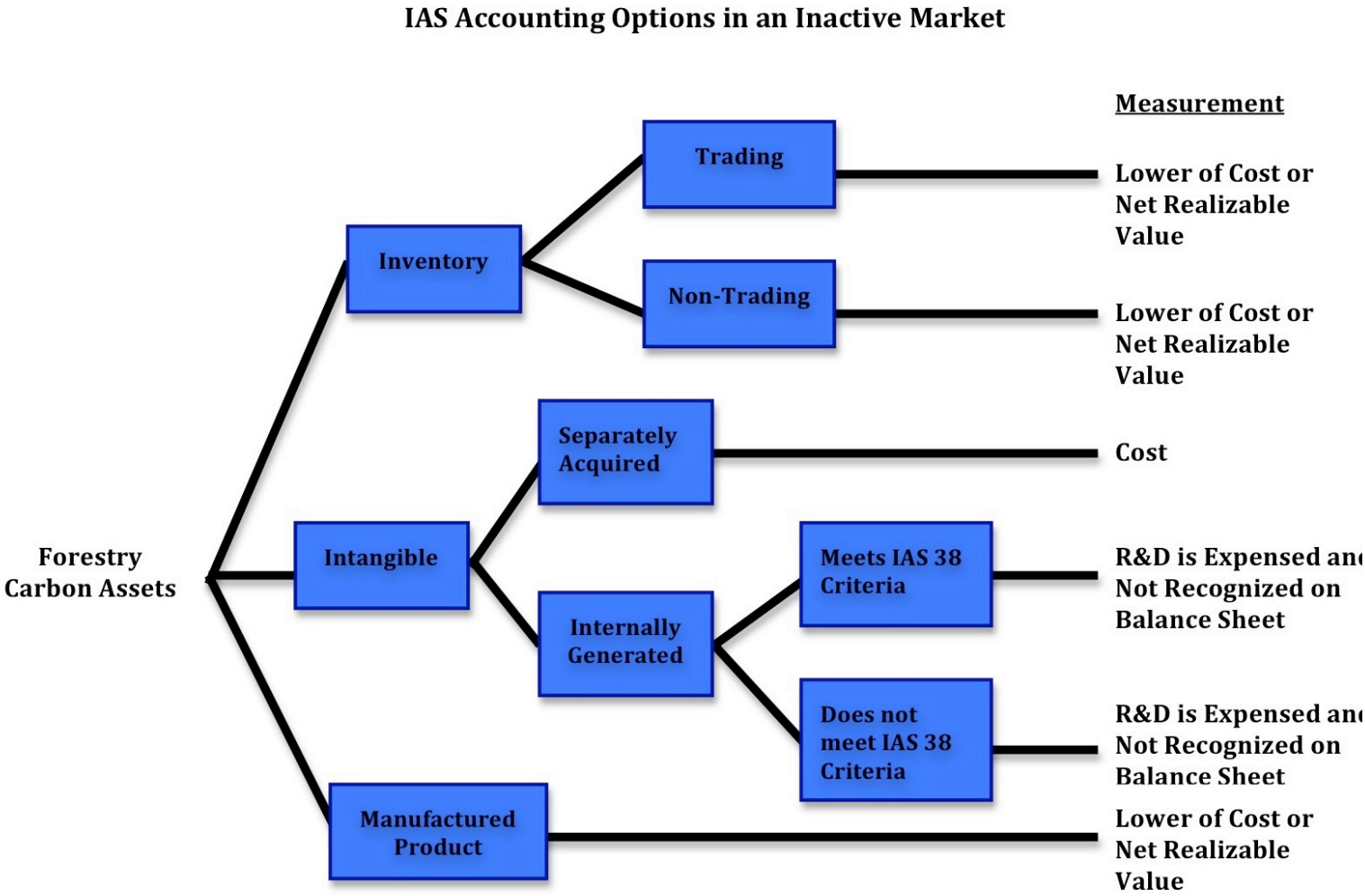


Figure 10: IAS Accounting Options in an Inactive Market

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