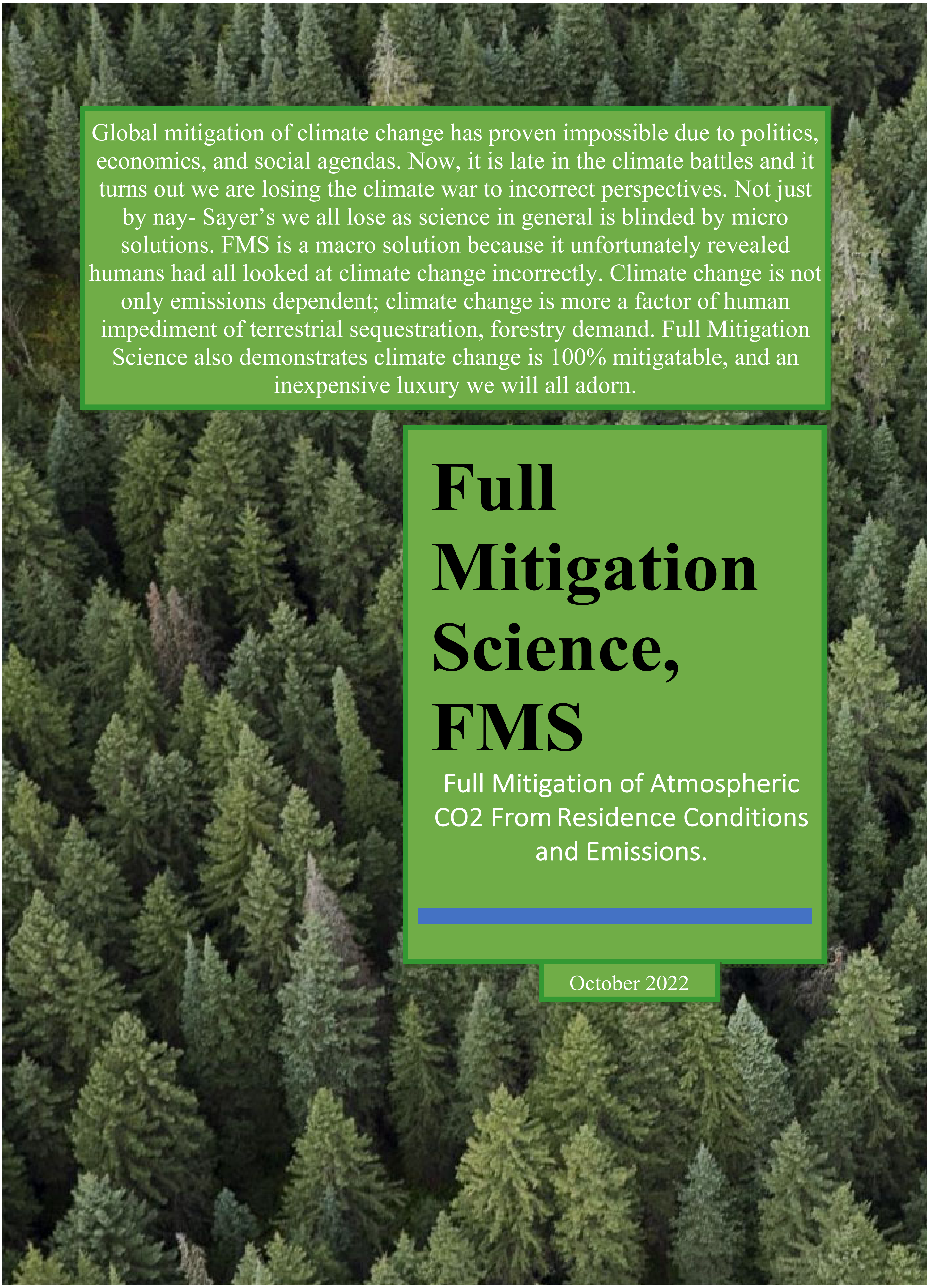

Global mitigation of climate change has proven impossible due to politics, economics, and social agendas. Now, it is late in the climate battles and it turns out we are losing the climate war to incorrect perspectives. Not just by nay- Sayer's we all lose as science in general is blinded by micro solutions. FMS is a macro solution because it unfortunately revealed humans had all looked at climate change incorrectly. Climate change is not only emissions dependent; climate change is more a factor of human impediment of terrestrial sequestration, forestry demand. Full Mitigation Science also demonstrates climate change is 100% mitigatable, and an inexpensive luxury we will all adorn.

Full Mitigation Science, FMS

Full Mitigation of Atmospheric CO_2 From Residence Conditions and Emissions.

October 2022

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This Document uses Microsoft Word enabled hyperlinks.
Links to additional information and definitions are blue underlined. Clicking on the link will change your reading focus to expand the subjects terminology and provide cited material. To return to the links origin use ctrl-Z.

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Abstract II

Lowering human emissions cannot fix climate change. The Earth emits over seven hundred giga tons naturally to humans thirty gigatons annually. Human emissions are a drop in the bucket of the combined emissions and not the climate changing problem they are promoted to be. Emissions are only an input to the actual problem. Post FMS demonstrates that impeded terrestrial sequestration has been and is the entire human influenced climate change cause. All CO_2 emissions have no place to go but into atmospheric residence conditions or into acidic conditions within our oceans.

Contemporary science and most technology result in addressing climate inputs and not full climate mitigation. Because they are incapable or impractical of doing so. In contrast, FMS's new and expanded climate definitions have not only isolated the root cause of climate change FMS's simplified mitigation plans can reverse climate change entirely. And it is the only thing that can reverse climate change, period, end of conversation, drop the mic, this argument is over, and FMS won it. Terrestrial sequestration not emissions inputs.

FMS is not a political miscalculation, economic diversion, or a partial mitigation of climate change conditions with CO_2 leaking technology. FMS is full mitigation science that's historically proven and millions of percentiles more effective. Truly, there is no other viable or practical climate solution that addresses the true source of climate change, impeded fast cycle CO_2 sinks. FMS is actually much more, and it all adds up to one thing and one thing alone. FMS's total solution found the technology, used the science, conducted the research, developed the economics, created the standards, dismissed the politics, wrote the book, and applied real-world practicalities. FMS fixes climate change forever because of its improved definitions of what climate change is and how it all started.

Introduction to Full Mitigation Science, "FMS."

Full Mitigation Science (FMS) describes science based interdisciplinary outcomes from the study of climate changing conditions. FMS bridged those disciplines to study the combined efforts of using advanced woody biomass composites, technological innovations in production efficiency, and economics in order to establish a long-lasting method of environmentally conscious commercialization of net carbon zero and net carbon negative raw materials and products. These renewable and recyclable materials are useful in most industries, not just wood markets. FMS operates within newly discovered and/or affirmed constraints, derivatives, prototypes, and residuals that first produced FMS models and the research that pointed out climate change's actual cause and even went on to define how to actually mitigate it permanently. FMS was developed mostly by very welcome accidents.

FMS came from the positive and significant environmental impacts of advanced woody biomass composite research. Most woody biomass studies looked at woody biomass as fuel for energy production. FMS studies looked the opposite way and discovered much higher efficiencies obtainable that produced very environmentally friendly and world changing ways to better use the renewable resource, trees. In fact, we found ways of barely using trees at all. Woody Biomass Research eventually led to FMS's better description of global warming/climate change as a consequence of human forestry demand and not human emissions.

FMS postulates modern forestry practices are a far more significant contribution to the climate conditions of today then all other forms of CO_2 emissions combined due to the unbalancing of emissions to availability of global terrestrial sequestration cycles that historically were available as unimpeded. To demonstrate, if terrestrial sequestration were only 10% of its level three hundred years ago, we would not be experiencing climate change at all. Today, we only have 3% usable.

FMS models follow the historic atmospheric CO_2 residence conditions increase due to forestry demand and subsequent demand-based forestry management impacts. Unfortunately, demand-based management is an ongoing impediment of global terrestrial carbon sinks which account for today's less than 3% (0.03) available sinks. FMS explains this is quickly approaching an extinction level event because of an established runaway greenhouse gas effect that started around 1950. FMS facts are genuinely concerning because modern science misunderstood what causes climate change and has made predictions on speculation not empirical measurement.

FMS is more a system of understanding and acceptance of human domestication input than contemporary sciences. As such, FMS structured itself around the affirmation of its expanded terminology. It also applied physical terms made relative to climate. This terminology can be quickly defined by following the links provided and are contextually defined throughout this document.

1. Constrained and Unconstrained Deforestation Practices
2. FMS Datum additional context
3. Impeded Fast Cycle Sink additional context
4. Laws of Conservation, FMS applied additional context
5. Carbon and/or CO_2 leakage additional context
6. Renewable Resources, FMS expanded additional context
7. Atmospheric Residence Time and Conditions
8. Economic Force Majeure and context
9. Sequestration Dependance additional context
10. Inverse-square law additional context
11. Tree Degradation additional context

Abridged Synopsis

Full Mitigation Science (FMS) is an alternate perspective on the mitigation of greenhouse gas influenced climate change. A continuum of previous human efforts, FMS is engineered to fulfill a sustainable and stable global biome. FMS has a technological panacea with E^3Lumber's advanced woody biomass composites but is not an alternate source of energy that miraculously converts or eliminates CO_2 emissions within its construct or without other consequences, it is not a promise of future results; FMS is a guarantee of a future free of climate change.

FMS takes advantage of using what we have readily to work with. Fortunately, the cure is at hand and has been there naturally from tens of millions of years; FMS offers ways to permanently fix millions of years of balanced sequestration that took humans just over 10,000 years to break. And with FMS we only need a decade or two to fix it. To fix it properly and without much discord, FMS developed methods and woody biomass technology required to do it right and forever. Better stewardship is where it all starts and ends. To achieve this, FMS provides economic incentive by bolstering our next human endeavor of saving us from our worst enemy, ourselves.

Industrial atmospheric CO_2 emissions are being reduced globally with emission reduction efforts. One effort incorporates emission catalysts that convert smokestack emissions into permanent storage for other uses—such as recycled synthetic fossil fuel example below: https://www.cnbc.com › 2019 › 06 › 21 › carbon-engineering-CO_2-capture-backed-by-bill-gates-oil-companies.html .

The conversion from fossil fuel use to atomic energy and alternate forms like solar, wind, fusion, and hydro are on the rise. Most of these projects are government funded and protected by policies like the EU's cap and trade system that incorporate CO_2 offsets, credits along with other monetary and tax structured laws and policy. Individually, reduce, reuse, and recycle efforts are contributing towards reductions of atmospheric CO_2. Electric cars, hydrogen research, graphene battery tech, ecofriendly materials like advanced woody biomass, and other quickly advancing technologies are also contributing efforts in climate mitigation. Regardless of perspective or positive direction, these efforts are post FMS conclusions found to be simply not enough nor practical without FMS involvement. They all leak CO_2 and the leakage is not the direct problem it is an input to impeded sequestration.

According to the most recent science driven data, our efforts as human stewards are neither happening soon enough nor impacting enough to significantly slow the upward trend in global warming. Decades after recognizing our impact and identifying problematic industry practices, our society has adopted no actionable practices towards full mitigation. As ongoing climate mitigation efforts respectively address the complexity of the underlying directions, they all fall short of making significant differences today—or even centuries--from now. Ongoing technological improvements fail to achieve the big picture and full mitigation due to their impracticalities by being focused on eliminating emissions.

Post FMS methodology suggests full mitigation cannot stem from the impractical efforts of today. For example, it is impractical to believe that the removal of fossil fuel, and its associated impacts are at hand today or in the immediate future nor would their removal eliminate CO_2 emissions. Remember mother Earth emits over 700 gigatons of CO2 without humans annually. So, efforts to eliminate fossil fuels are, with very minor exception, impractical to our growing populations food production, transportation, and energy production. Generally speaking, fossil fuels make humanity possible at today's scale and we are eons away from replacing them efficiently.

Immediate elimination of fossil fuels is also made highly impractical because all alternate greenhouse gas mitigation efforts also release CO_2, and they all rely heavily on fossil fuel in their production, deployment, and maintenance. FMS states that reducing fossil fuel is necessary for many environmental reasons, but fossil fuels cannot be eliminated without technological advancements and thus their use requires better human stewardship practices. Which could be centuries away if our current technological path is maintained. Unfortunately, changes are needed now. FMS addresses those changes respectfully, but it does so from the correct sequestration view and not the emissions distraction.

FMS implementation introduces economic innovations, production efficiencies, and some proposed technologies combined. All of which are driven by physical constraints found within pragmatically established sciences, government, and business practices.

FMS recognizes the number one factor contributing to climate change as fast cycle CO_2 sink impedance (forestry fast cycle CO_2 impedance or the elimination and impedance of those sinks). Climate change is a result of what FMS defines under its own modeled knowledge as forestry demand under **constrained and unconstrained deforestation**. Climate change occurs as a result of historical human population levels demand on forestry and to a lesser part other land use.

FMS also models that fossil fuel emissions being eliminated entirely would not stop climate change and human demise. That may only slow contemporary climate change. FMS supports the idea that human population growth and forestry demand will continue the uptick in atmospheric ppm's with or without fossil fuel uses. Earth is currently releasing seven hundred plus gigatons of CO_2 every year as part of its natural cycles, whereas humans release approximately thirty-five gigatons. FMS raises alarm and is unprotracted in modeling combinations of those numbers. FMS states that CO_2 has no place to go but into atmospheric and oceanic residence given the global state of the increasingly impeded fast cycle sinks. As a fact confined physically to laws of conservation FMS demonstrates this point is held in high disregard by low p value sciences currently dominating climate mitigation efforts. Currently, FMS estimates Earth is using less than >3% of the fast cycle sink capacity it could or should have, that is what's causing climate change, not the emissions of human domestication efforts.

FMS describes forestry fast cycle CO_2 impedance within chronological recordings of global temperatures, atmospheric ppm's, human forestry demand, and to a lesser part human emission. FMSs respectively models the contrast derived from the rise of global temperatures correlating more closely with human forestry demand than human emissions alone. FMS also distinguishes a mirrored condition between fast cycle sink impedance increasing over the last few hundred years to the rise of atmospheric CO_2 PPMs within atmospheric residence conditions. The correlation occurred between 1950 to 1990 when an estimated 95% of temperate regions and 90% of tropical region forestry had been fully indoctrinated into FMS's constrained or unconstrained deforestation definition. That relationship with atmospheric CO_2 parts per million becomes further evident with significant annual ppm increases that are not in direct correlation to global fossil fuel emissions or the FMS datum of 1800-1850 conditions as historically unimpeded sinks registry of the seasonal atmospheric residence intervals. These correlations also demonstrate available CO_2 sinks had reached a saturation level (establishing a mostly fixed year over year ability) between 1950-1990. Respectfully, global sinks by 1990 could have been as much or more than 95% impeded leaving less than 5% in annual CO_2 sequestration ability. Today, FMS estimates only 3% is remaining (not including agriculture annual plant sequestration fluctuations, that are problematic to atmospheric residence and not helpful). CO_2 atmospheric residence levels rose exponentially before 1990 and since have indicated other comparisons of data to form FMS's datum hypothesis.

The beginning of climate changing events seems to have occurred as a result of human forest demand and culminated (tipped the climate CO_2 atmospheric residence scale) between 1800-1850. The date range formed FMS's datum within all historical data points as the final industrialized demise of remaining and highly matured biomass was in full swing, as timber or forestry plots were again placed into demand and harvested. FMS registers the beginning of climate change as a datum and as respectfully the year 1850.

FMS also respectively implies that human population levels that increase demand for both fossil fuels and forestry derived products are both expected and welcomed. When compared in climate change relationship are human demand driven efforts that are mitigatable to technology and no technology so long as they are bridged to FMS's suggested stewardship. FMS also clearly indicates the possibility of perpetuity in both forestry uses and human population growth for hundreds of future years. FMS stewardship practices actually propose growth of forestry demand is sustainable under FMS conditions. FMS also proposes a direct relationship with fossil fuels because of stewardships and existing technologies obtaining above average tree growth and water conservation by providing accelerated CO_2 fertilization may be possible.

FMS is contrary to the contemporary understanding of human influenced climate change with the following quick overview:

1. FMS observes that atmospheric climate change conditions culminated more in line with forestry demand impeding CO_2 sinks than the industrial revolution or fossil fuel uses alone. Climate change is the result of imperfect forestry stewardship not emissions.
2. FMS demonstrates humans had tipped the scale by establishing a climate change datum with forestry demand around 1850. The FMS datum is entirely human constructed but not with emissions. The FMS datum marks the establishment of the current unbalanced sequestration to emissions biome. Building this biome took thousands of years and was aligned with human domestication efforts that increased population and accordingly forestry demand and impeded global terrestrial sinks.
3. FMS's climate change datum is proposed as the first tipping point for global CO_2 emissions becoming out of balance with global fast cycle CO_2 sink capacities. The result of this out of balance climate changing condition favors CO_2 atmospheric residence conditions and is the cause of human influenced climate change.
4. First, the FMS datum is pronounced by historical forestry demand and land uses that incorporated highly uninformed stewardship practices; second, when emissions began exceeding available biomass fast cycle sink capacities (or when they became highly impeded).
5. FMS understands human derived GHG emissions will increase as human population increases. As such, forestry demand also increases as human population increases. Forestry demand is currently compensated for by humans with both constrained and unconstrained deforestation practices that are applying conditions that eliminate or have significantly impeded terrestrial fast cycle CO_2 sinks. By as much as 97-98%.
6. FMS proposes human influenced climate change as not being the sole result of human emissions or the industrial revolution; although, fossil fuel use and the industrial revolution are significant factors they are considered by FMS as (negative) inputs and not actual causes even when combined. The actual cause grew from the use of convenient forestry and perpetuated itself through time immemorial.
7. Atmospheric climate change conditions became inevitable as human populations increased and spread higher forestry demand across the globe. By unknowingly implementing uninformed stewardship for the economically driven management of forestry and not entertaining an engineered use of forestry's other potentials like carbon sequestration or improving efficiencies, current forestry is now based solely on demand and tree degradation. This created constrained and unconstrained deforestation practices and those actions are linked to today's highly impeded fast cycle CO_2 sinks and ultimately caused today's atmospheric and ocean CO_2 driven climate change.
8. FMS's climate change establishment can be successfully repeated within models because of its contrarian definitions of climate change conditions formed over human historic domestication timelines. Furthermore, FMS's discovery of when and how the climate began changing established the FMS datum that records when global CO_2 emissions

capsized globally available CO_2 sinks and how those impeded sinks impart favoring of today's CO_2 atmospheric residence conditions over sequestration.

9. Human influenced climate change is the direct result of global biome engineering and not in any other particular or single input that cannot also be defined as a datum. As such, restoration, or mitigation of any undesired result (within an engineered biome or closed system) is typically a multifaceted projection from the actual problem's datum. Without a datum, no problem can be defined properly enough to form any tangible solution. Without accounting for a datum in solution any proposed solution can only treat the countless singular inputs as symptoms but not solve the overall problem. FMS fixes the problem by not treating the symptoms as the cause.
10. FMS does not ignore the laws of conservation as non-FMS mitigation efforts do by obtusely ignoring the laws empirical nature or by using diversions to detract from carbon leakages. Without FMS no known climate mitigation effort can fix the actual climate change problem because it is based on emissions not sequestration.
11. The way FMS applies empirical information is contentious to some contemporary sciences, especially those that use renewable resource terminology to describe demand driven forestry practices. Renewable resource (forestry) practices are not sustainable resource practices due to post FMS understandings and its definitions of constrained and unconstrained deforestation. Supplementary, within FMS definitions, sequestration even as sequestration value is not a renewable resource. Although it can be located within a renewable resource it is an entirely separate resource and entirely depleted in human sequestration valuation.
12. FMS demonstrates the negative effect on atmospheric/ocean climate change that previous renewable resource definitions have incurred. These are found to be very alarming to human longevity due to a post FMS 1950 establishment of a runaway greenhouse gas effect. That is also defined by FMS as humans being well-established as sequestration dependent and not emissions dependent. The two must exist in balance.
13. FMS is the only climate mitigation that can use economic force majeure to contend with politics, borders, and entrenched economic environments. The intended results allow Full mitigation Science to globally fix climate change with a like it or not attitude if the incentives are not responded to in kind. It also eliminates many of the free riders in current voluntary and cap and trade markets. All the while FMS can fix non-FMS attempts into better credibility with its exacting standards.

Summary of Abridged

FMS respectfully demonstrates the beginning of climate change, and its predominant cause more conclusively than contemporary sciences explanations of the industrial revolution and emissions as primary causes of human influenced climate change. FMS does recognize the industrial revolution dating from 1713-1913 as a significant climate changing input; as in, the industrialization period created mechanized means to support human population's growth that historically had already aligned itself with forestry management based on demand. As FMS recognizes the post-industrial revolution eras of constrained and unconstrained deforestation procedures that became rooted in human needs and influenced climate change. Eventually, later years of constrained and unconstrained deforestation practices that combined post industrial revolution mechanization that accelerated global fossil fuel uses and further decimated sequestration with increased forestry demand.

Post FMS, it seems evident that the global establishment of (constrained or unconstrained) deforestation is intimately linked to climate changing conditions by elimination or wide scale impeding of global terrestrial fast cycle sinks. Forestry demand caused climate change by eliminating and impeding terrestrial sinks by millions of percentiles.

Closing synopsis

FMS findings can be summarized by our known human existence measured within its historical population expansions as human domestication. Idealistically, humans domesticated themselves with farming and animal husbandry. We have furthered our domestication efforts by experimenting with religion then rule of law, separation of religion and government, economics, health, and longevity, and have been aided with countless technologies and science-based discovery.

Today, FMS provides opportunity to further domesticate with an intentional but second climate manipulating discovery, in order to mitigate our first unintentional climate manipulation. The key to undoing our past is FMS. It is understanding of the predominant cause of climate change as human demand on forestry, FMS has the knowledge that indicates humans can use forestry as a “thermostat” to control global climate. As simple as that sounds, FMS’s use of knowledge makes full mitigation possible and what makes FMS’s datum easily overlooked or even ignored.

Humans have impeded Earth’s 285-million-year-old atmospheric covenant with biomass respiration. We (as two hundred-thousand-year-old humans, Homo Sapiens) must exist within or mitigate our existence to that covenant or become extinct by forces that could be within our own control. FMS is a first step in understanding those forces in that humans lack the ability to force their own will over Earth’s. Try as we have, Earth is undefeated, so we must live within these rules or perish. It really is that simple. You can even call FMS simple, because it is remarkably simple in its truth and does not defy or try to manipulate any known physical properties or economics. Today we have FMS helping to better define that overall climate relationship. Today we as humans can establish FMS’s stewardship foundations in mitigating all our past, current, and future climate sins, not just one or two of them. All it requires from us is the effort.

Author’s Comment

I invented E^3Lumber. E3Lumber is the first group of advanced woody biomass composite products and has many uses, not just as lumber substitutes. I actually regret naming the technology E^3Lumber because later it crossed over to so many other uses it really surprised me. E^3Lumber is important because of what it can do for our climate but gains more importance because it found FMS. I found FMS when I research just how environmentally friendly E^3Lumber really is. Well, it turned out to be friendlier than anything before it. Friendly enough to fix climate change permanently.

That was a surprise I’ll never regret. -Timothy Charles Thompson

I. Part One, Beginning of Human Influenced Climate Change.

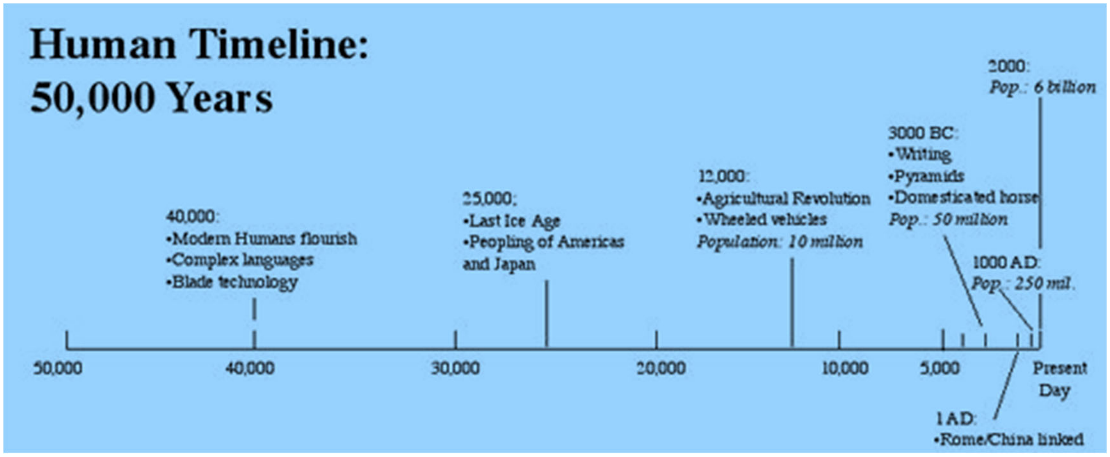


Figure 1 Pintrest.com| Timeline, History Timeline

Historical Human Interface with climate.

Prehistoric humans would move into a geographic area and deplete that area of resources. That was the best practice for survival under nomadic dogmas. Resources for heat, cooking, and to the lesser extent shelter building could always be obtained nomadically. FMS states nomadic actions created the first demand for forestry and engrained them into all of us.

Nomadic actions provided time for resources like animals and forests time to recover. As human domestication gained traction (Human Domestication Theory-Roger Silverstone) nomadic humans began to settle into fixed communities. Townships, roads, and trade routes expanded and lessened recovery durations.

Resources from agriculture and animal husbandry became steady-state and readily available. As a result, township communities matured and formed into cities; some of which we inhabit today. More populated areas formed entanglements of rural areas and trade routes to support the resources needed for the blooming cities that became economic centers and eventually matured into city states. Within the FMS relationship to global human domestication, it can be argued that atmospheric climate changing conditions were established by those cities turned into states and then countries. Domestication demanded an increase in resources and forestry was that resource.

FMS refers to early humans developing a practice to use forestry under convenient forestry. Just as today, forestry resources came to the cities from near first and much farther later. Now, forestry resources are entirely extracted in economically influenced globally traded markets because convenient forestry is all but gone.

To pursue more climate-aware options, FMS explores expanded definition by saying constrained and unconstrained deforestation practices (commonly termed as forest degradation but as a lesser to FMS terms). Incidentally, all convenient forestry had been harvested multiple times by early humans and now. Eons ago, regrowth or forestry recovery periods may have been 100's of years between the non-convenient forests harvests because it took millenniums for human populations to prehistorically develop into the population quantities that could influence a deforestation affect. Some communities even disappeared entirely from areas and then redeveloped the area into countable populations centuries later. It is thought, but not yet FMS documented, that around 12,000 BC humans really began to start to master their lands. If so, the effort was helped by increasing their forestry demand. Ever since, humans have been decimating their convenient forestry first and then using all other forestry sources available.

FMS respectfully points out that during human domestication, from timelines starting around 12,000 years ago, humans also started releasing quantities of CO_2 beyond human physiology releases. Humans were first very balanced (to their environment). The biomass (forestry) for all their primary demands such as heating and cooking and had even began making charcoal for metallurgy were much less than sequestration available.

By 1000 BC coal was being mined and used in Fushun China and by 100-200 AD the Romans in England had highly expanded metallurgy practices using coal's high BTUs (British Thermal Units as Heat). By the year 1600, coal was being mined in high volumes in Asia and Europe but it had yet to reach its first pinnacle that was achieved in the Victorian age for heating.

FMS educationally speculates that coal slowly became economically advantaged because it produced many more BTU's than wood and it could be transported cheaply. It was however expensive to mine. It's Victorian status came as more of a necessity. By the Victorian age (1837-1901) in Europe, humans had used up their geographically convenient forest and most forestry was not being regulated for maturity. There was regulation, usually by royal decree, as strategic reserves (mostly for ship building). So exceptions did exist, but generically speaking Europe and Asia had both used up much of what was readily available and suitable for instant gratification. What this boils down to is mature trees in Europe and Asia no longer existed and had not for an exceedingly long time prior.

To FMS's point, according to ice core samples, in Victorian times and before climate conditions as measured in CO_2 atmospheric ppm's remained within a CO_2 sequestration balance with emissions. That balance produced climate stability regardless of human actions. FMS states that is due to the available and ample overseas CO_2 sinks that were still mature and untouched and not because Europe and Asia had immature trees everywhere.

To further establish the relation; around 1 AD and with Rome's linking to China, humans had already well established the path to modern atmospheric climate change conditions. Fortunately, even for man's greatest efforts of that time, fast cycle CO_2 sinks still worked regionally and more importantly globally. Not near enough human influence on forestry demand was due to the times low populations levels. In addition, prior to 1500, few tropical areas, huge portions of Africa or the Americas had not been influenced by human population increases. Many of the areas within them were still nomadic or very low impact. But Europe and Asia could not say the same. However, and less than a century later, the Americas were no longer in isolation from historical European and Asian forestry demand. The great human expansion also meant increased use of forestry resources; and that was the goal of many early expeditions, find ship building resources.

As historically documented, demand for ships, fuel, railroads, and general wood products increased demand on global forestry and is closely tied to population increases. In example, In 15 BC Roman General Germanicus had cut huge swaths of German forests to build ships, bridges, and roads to continue the previous decades of war with Germanic tribes. Germanicus was not the first or the last to do this in Germany. The fact is that unconstrained deforestation was a widespread practice on both sides of all wars and led to constrained deforestation practices later.

The most really notable offense was the King of Spain, Ferdinand. He literally destroyed Spain's entire ecosystem for a religious war. His tool of demise was building the Spanish Armada around 1588 (1). To build his armada he wiped out the entirety of Spain's and even some of his neighboring countries forests. But you can believe all of those forests had been repeatedly harvested since time immemorial, so Ferdinand was not the first, he was just the most destructive in the shortest duration. Many of those forests turned stump farms have yet to fully recover and are certainly impeded sinks today. Modern and historical forestry demand driven practices will not allow for them to recover, now or ever without FMS.

By FMS definition those ill-advised demand actions created constrained deforestation. To summarize the FMS noted result, Spain's population and their forestry demand did not stop with the loss of its forests to build the Spanish Armada. Over the next few centuries, Spain's forestry demand actually increased. Spain's population grew faster than their forests could or would be allowed. The result of which had the Spanish people prematurely harvesting forests again and again. Even to this day, younger and younger trees are harvested not just in Spain, it is a customary practice most everywhere forests grow. FMS defines this as a part of constrained deforestation from tree degradation.

In (global) regions trees had all but disappeared due to over harvesting or other irreversible (at that time) damage like soil degradation. Worse yet, their removal of forests created microclimate changes and eventually climate change. By FMS's constrained deforestation definition, keeping any forest from recovery eventually succumbs to unconstrained deforestation and that ultimately leads to undesired terraforming. Something that today's global populations demonstrate with actions and inaction of FMS stewardship.

The world exhibits a firm subscription to what FMS calls out as constrained deforestation just like Spain's example. Sorry Spain, we don't intend to pick on you but Ferdinand provided an example that is too true. Remember this is a global example, not just Spain.

Spain's internal forestry demand from 1588 on has resulted in parts of Spain that were already in constrained deforestation prior to 1588 going into unconstrained deforestation. Those parts are now the savannah or even desert like ecosystems seen there today. Spain's shipbuilding and even previous wars were not the first human widespread act of undesired terraforming. Spain provides FMS well documented examples of the globe's current practices, which are also documented. Spain's deforestation is currently replicated on all continents, by and with the authority of all governments, and made even more so within all the tropics and Americas. It is thought only 3% of forestry on Earth is untouched, old growth; although it is ignored only due to the inability to access it, not the desire to cash in.

Human demand on forestry started long before antiquity began recording it. For the most part, prior to 1400-1500 forestry demand had been safely isolated by the oceans, lack of technology, and of course nomadic lifestyles. The date associated with finding the Americas by Europeans is 1492. FMS speculated that date is touted because Europe did not have the timber until then to build ocean voyage capacity ships. Point in fact, Columbus' fleet of ships were tiny in comparison to the time frames ships of the line. Even if FMS is wrong about that, it is not wrong to say the America's were known, if not considered discovered long before 1492. Really, they had been populated 15 to 20,000 years earlier. Columbus gets the credit, regardless of how incorrect his theories were, because Europeans and Asians both knew the lands existed, but they were not mapped so nobody really knew how far or how much land there was. They thought the world was smaller and each believed it was quicker to sail the ocean blue to reach the other. The discovery of the Americas opened a flood gate of opportunity to the overcrowded and repressed Europeans. And they came for the resources.

At that time in history, European and Asian influences were the most detrimental to establishing climate change conditions of today. They also established todays FMS's observations with their documentation and accordingly, FMS's possibility to provide a future for our children's children to be without climate change.

Modern humans' forestry demand is by far greater now than during any part of the antiquities or human history in general. Humans have offset insatiable forestry demand with the use of materials like steel, plastics, and cement. Unfortunately, all of them are enormous greenhouse gas producing and all of which can only be made commercially possible with significant fossil fuel use.

It is at this point FMS defines the split with contemporary and historical practices by further defining previous human nomadic lifestyles as more relevant to mitigating climate change conditions than contemporary practices serving forestry demand only. FMS observations now make apparent that our nomadic ancestors were unconsciously smarter regarding climate change. The required emission to sequestration balance is now a modern human's climate decision that is sequestration dependent. Not ironically, our nomadic ancestor's survival depended on that balance, and now so does ours. It's our responsibility to restore it, or else.

Historical Impedance of Fast Cycle CO_2 Sinks.

Defining the historical human influence on forestry, FMS can postulate that early populations demand on forestry was not yet global enough to create the lasting climate change measurements of today. Prior to 1700, ample CO_2 sinks were still viable in the Americas, but they were falling into constrained and unconstrained deforestation. Also prior to the 1700, historical populations within the Americas were still nomadically motivated, had spread out geographically, or had an extremely low or no impact on forestry, with some cultural exceptions of course. Climate change ignorance allowed Europe and Asian populations to unknowingly invoke carte blanche to expand their demand driven forestry practices globally. FMS understands that nobody back then recognized the environmental or climate changing impact being created or even understood biomes. Really, impeding or eliminating a fast cycle CO_2 sink in history was as common as the animals used or consumed as the well-established norm. Today, it is still as common as the automobile and encoded into industry.

I would propose nobody, back then and/or today, considered the impact of removing or impeding a forest when gain in coin was available from its resources. I am convinced that before FMS and when the ax fell, they, like us, only considered the work required to earn those coins.

During prehistory timelines (BC) clearing forestry for crops and for animal husbandry took priority over forest health. Then, Europe, the Americas, and Asia, etc. were as densely wooded as todays untouched portions of Amazonian forests (as differing arid or tropical species and forestry densities). Trees took hundreds of millions of years to do it but then, as now, trees are one of the more predominant lives on Earth. Today's inherited result is that American, European, and Asian landscapes are not the historical old growth deciduous, evergreen, or jungle landscapes.

In the millenniums of domestication, humans traded the horse for the train and later the train for the automobile but kept the deforested landscape for food production until around 1940's. Since then, contemporary efforts in food production have created a global "mini" reversal of unconstrained deforestation mostly as a global disbanding of small farms for larger, more productive, GMO corporate type producers. Naturally, those abandoned small farms began some natural afforestation while other human driven afforestation efforts also began in the 1980's (see Figure 2 below). Unfortunately, most of modern (1980-current) afforestation efforts are entirely offset by the unconstrained and constrained deforestation still present in tropic regions (see Figure 2 below). Those natural afforested places in the America's are also forests under logging contracts and so they are still entirely grasped by constrained deforestation. Most are still too young to harvest but they will be.

As human population increased and spread globally, so did a relentless forestry demand within the Americas. The result is the time between forest harvests recovery decreased just as it had overseas. That beginning in the Americas was the first stage of failure of the global balance with atmospheric CO2 residence conditions. Newly established (1700 forward) geographic population regions across the globe had begun applying constrained and unconstrained deforestation practices. By 1850, FMS's datum point, European and Asian global expansion had firmly established their presence within the Americas and by 1990 we had spread unconstrained and constrained deforestation practices to all points of the globe, with extraordinarily little exception due to accessibility.

From the 1990's to current, many global afforestation efforts have today aged 20-25 years. These efforts are highly likely within constrained deforestation conditions as they approach marketable status within a recently renewed and even higher demand for forestry in 2021-2022. Historically again and post FMS, replanting has never been the answer since it is not guarded by any incentive to not harvest later. Replanting to FMS is an input because the replants impact on fast cycle sinks is both admirable, needed and within FMS's marketable ways to help establish new sinks. But it is not as optimal as targeting 20–40-year-old commercial tree plots to remove them from clear cutting rotation.

Replants or regenerated growth take years to mature into what FMS defines as marketable sequestration simply because a replanted tree that matures three years can only remove 10-15 lbs. CO_2 annually from atmospheric residence. The clearcut or fire damaged land those trees sit in release more carbon than the replants can absorb. That makes replants or regeneration growth *CO_2* emitters. Whereas, a typical thirty-year-old tree of the same species can annually remove 150-180 lbs. CO_2 more than the land it is in (estimated for this example, species as typical southern loblolly's pine tree). The pounds in difference is one factor that FMS uses to describe the sink as impeded or as an impeded fast cycle CO_2 sink.

The sink is impeded because it was replanted under constrained deforestation conditions, not to restore the sink's potential but to supply a replacement for a previous tree that will be harvested again (supplying demand again). Had the original tree been left to mature it could have had 100's of times the CO_2 sequestering ability and 1000's of times the biomass. Ironically, those two numbers can be inverted to 1000's of times more sequestration and 100's of times of biomass. That in all practicality could modernly be 1300-1400 lbs. in annual CO_2 sequestration ability that is modernly impeded to just 10-150 lbs. annually (and growing yearly at about 3-8%).

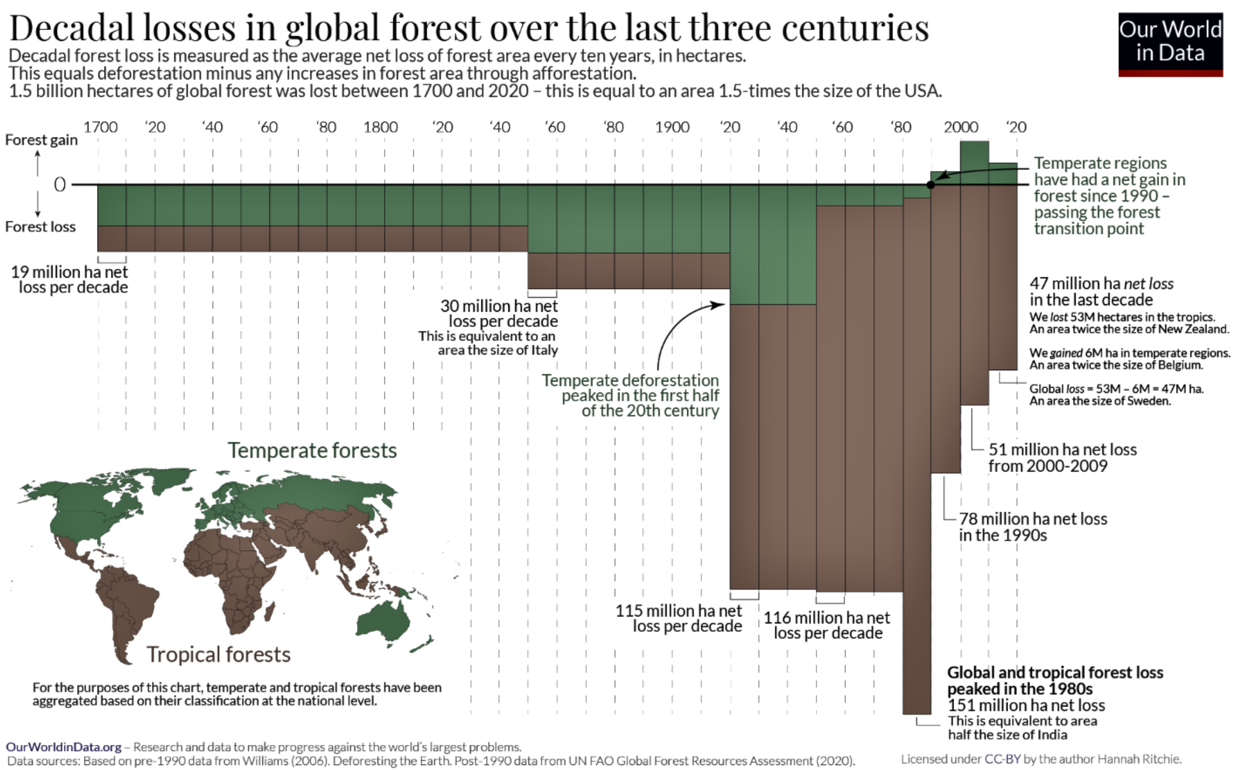


Figure 2 Decadal Losses in Forest

FMS respectfully offers the following Contextual Summaries to climate change beginnings:

1. Human demand for forestry has been detrimental to forestry health and longevity. FMS understands state-of-the-art stewardship, or lack thereof, affects human health and welfare, biodiversity, and the human species longevity negatively. FMS further defines forestry health and human health are interrelated in both the duration of effort and (climate effecting) vectors. Climate change is a direct result of overlooking that relationship and CO_2 respiration's 285-million-year-old covenant with Earth to sequester it.
2. Excess CO_2 atmospheric residence conditions create a global warming effect. FMS understands this effect can slow with reduction of fossil fuel uses but global temperatures will continue to rise, and oceans will continue their acidic alteration as a focused result of current stewardship impeding fast cycle CO2 sinks. FMS defines this as constrained deforestation's effect by not allowing forestry recovery durations between harvests due to demand. Constrained deforestation impedes fast cycle sinks by not allowing mature growth before harvest and accounts for global sinks being impeded at the least 90-97% from their potential capacities.
3. Generations of high forestry demand within arid and tropical geographic areas have created global practices that residually constructed the climate changing atmospheric residence conditions of today. FMS defines this outcome as a climate changing datum or the point that human forestry influence began effectively modifying atmospheric residence conditions, negatively. FMS establishes the datum around 1850 or reasonability between 1800-1850. FMS's datum explanation is further defined as the beginning of human

influenced atmospheric climate change or otherwise as when human ability to influence global climate conditions culminated and produced the datum.

4. FMS's datum point is located at the time human CO_2 emissions had begun saturating available but impeded global fast cycle CO_2 sinks and began limiting (by actual quantity sequestered measurement) year over year the global sinks capacity to sequester CO_2. The datum formed in direct relation to constrained and unconstrained deforestation practices driven by human forestry demand. Figure 2 illustrates unconstrained deforestation offset by extremely limited afforestation with a timeline of 1700-2020.

5. The capacity of terrestrial sinks and how much they sequestered year over year (as delta in year end to year begin ppm reduction, see Figure 4 below) is equivalent, even though atmospheric CO_2 PPMs in residence conditions continue to rise, see Figure 3 below. This correlation does seem to further indicate FMS's prediction within Figure 3 that demonstrates the available CO_2 sink capacity abilities. FMS outcomes demonstrate CO_2 has nowhere to go but into atmospheric residence or oceanic sinks, and further defines that the Figure 3 graph's slopes (dashed red) require much higher magnitudes with steeper downward trends during the seasonal fast cycle terrestrial sink duration to prove otherwise. If the CO_2 sinks were unimpeded, Figure 3's hills and valleys during plant growth periods would and should be significantly more dramatically downwards. Furthermore, PPM's would not be increasing the year over year trend. In summary, what else but impeded sequestration could manipulate PPMs so minuscule during planet plant growth cycles. There just isn't enough terrestrial sequestration capacity.

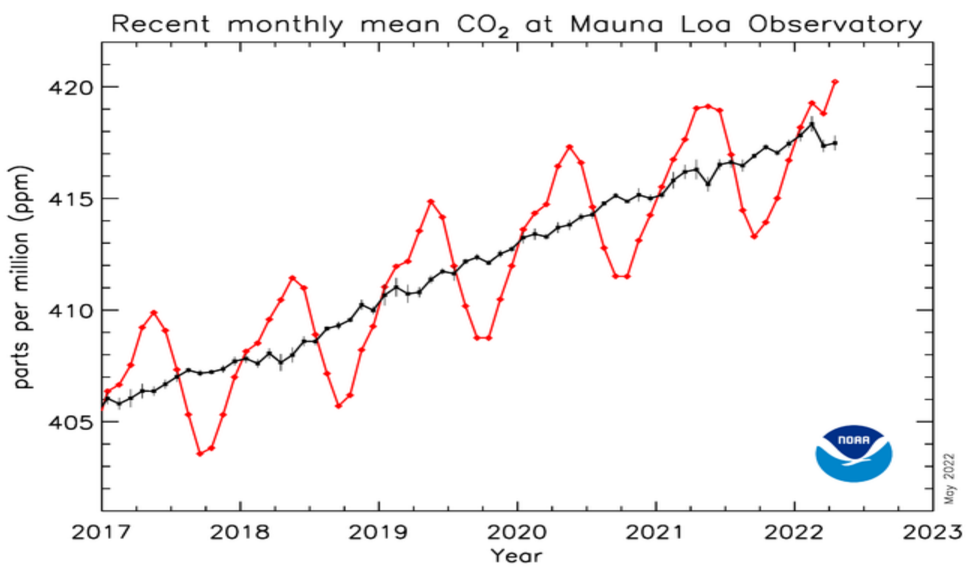


Figure 3 Mauna Loa Observatory CO2

The dashed red line with diamond symbols represents the monthly mean values, centered on the middle of each month. The black line with the square symbols represents the same, after correction for the average seasonal cycle.

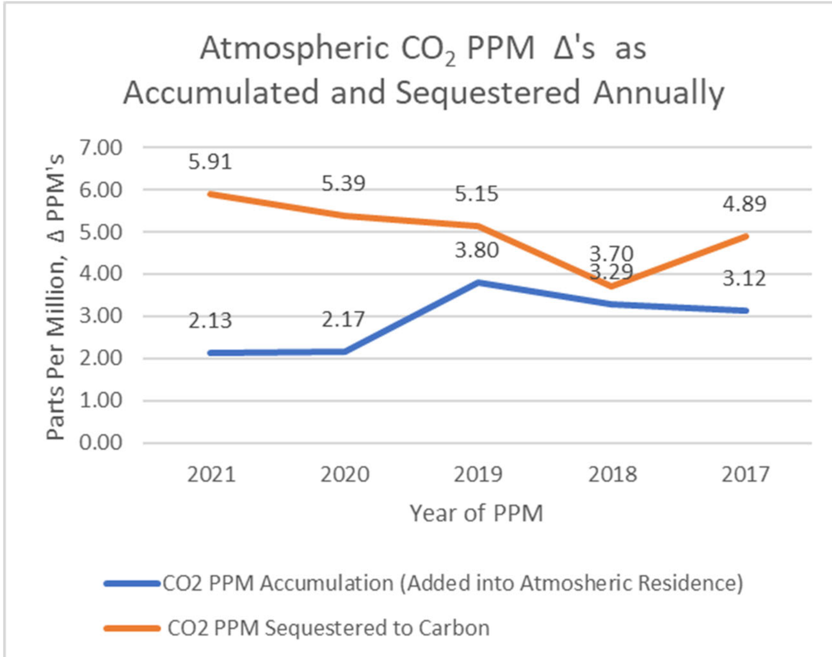


Figure 4 Global PPMs as Deltas.

Data extracted from www.esrl.noaa.gov/gmd/ccgg/trends/ compiled by FMS, Thompson 2022

See Figure 4 notes in metrics section.

Figure 4's deltas are used to estimate annual global atmospheric CO_2 accumulation and fast cycle sink sequestration abilities. Note: The sample size is five years and presented in descending order of years. Therefore, the sequestration trend, orange line, is decreasing left to right but is a year over year increase. FMS believes that positive was 30 years in the making as being aligned with global afforestation efforts from 1990 to present. In more recent years, 2021 seems impacted by COVID-19 shutdowns reducing emissions. However, an increase in **atmospheric accumulation is known in Figure 3.** Which should be related to the sequestration trend, which is fairly stable but showing some increase (but not fast enough). Unfortunately, the atmosphere level of CO_2 today exceeds 420 PPMs and has a still increasing trend when using the larger PPM data in Figure 3. Which, in contrast to this smaller sample, again demonstrates the importance of increasing CO_2 sequestration rates.

Figure 4 demonstrates a 5.91 CO_2 PPM delta in 2021. That is the best sequestered PPMs within this sample's timeline. Under today's impeded sinks, Figure 4 also demonstrates the need for improvement in fast cycle sinks if lower atmospheric PPMs are desired. In summary of the observations of Figure's 3 and 4, FMS simply states sequestration of CO_2 PPMs is really flat and has been for too long due to impeded sinks.

Lowering emissions cannot fix climate change but that action can help FMS fix climate change economically. The true identity of the problem is the Earth emits over seven hundred gigatons naturally to humans thirty gigatons annually. Human emissions are an input but not the overall climate change problem. That responsibility falls entirely onto impeded carbon dioxide sinks, or lack thereof. As a point of FMS fact, if global terrestrial sinks were unimpeded, they would have millions of times more ability than todays.

In addition, unimpeded sinks are naturally regulated under CO_2 fertilization limitations. This means the world can never have too much capacity of unimpeded sinks (water vapor has more climate impact in producing higher temperatures than atmospheric CO_2 but elevated levels of CO_2 create more water vapor, this is why CO_2 emission are also important to regulate due to there more instant atmospheric reaction). Sinks can safely exceed atmospheric CO_2 input and prior to 1850, they did and had for millions of years prior.

Note that with only ten times the FMS sink improvements (not the millions), the 2021 PPM delta becomes 59.1 atmospheric CO_2 PPMs sequestered annually. As demonstrated in the FMS Calculated Section of this document, a goal of ten times and more in improvement is scalable by FMS mitigation. See Figure 4 notes in metrics section.

Fast Cycle CO_2 Sinks and Forestry a Unity to Climate Changing Conditions

Post FMS respectfully points out that decisions affecting fast cycle CO_2 sinks have had negative impact (primarily as tree harvest and replant cycles continue to shorten in duration). Those decisions define modern forestry practices (under capture, miscalculation, or lack of FMS knowledge). Nor do they address the cause - what FMS defines as CO_2 sink impedance.

Furthermore, post FMS, contemporary forest conservation efforts touting impact on climate change are not practical, not economically viable, and often ineffective or just fraudulent. They are mostly unsustainable and are not scalable. And all create CO_2 with emissions in implementation. Many of these attempted “fixes” have been handed down over generations of foresters. All forestry experts are also under pressure from increasing demand and being instructed to sell publicly these practices as environmentally friendly and for what post FMS perceives as a good reason, economics.

FMS points out that the effect of perpetually impeding forestry CO_2 sinks is what is creating “the” most significant climate changing condition known, impeded fast cycle sinks, see FMS Calculation for more details. FMS also points out that this global oversight can be addressed successfully with an economically scalable process and no malice towards forestry.

FMS argues that human absence from forestry resources is not required. FMS states forestry use can be made more productive, practical, economically sound, and useful with better technology like E^3Lumber’s net negatives and economic incentives found within FMS commercialization. Technology that applies FMS’s new understanding of forestry’s relation to climate change is the only known option that is practical to climate mitigation. Exceptions may exist, but as of this writing there are none that can be described as empirically measured, economically viable, or that are not inherently misleading or deceptive in their nature.

Essentially, contemporary forestry practices are not post FMS’s nor are they unable or unwilling to increase the duration time between harvests. But they must have reason and survive the cure. As with everything in the modern world, forestry is profit driven first and environmentally concerned second. All contemporary practices studied seem in construct to be purely for profit and increasing demand. Which is not problematic with woody biomass substitutions.

FMS is for increasing profit for forestry-based business. FMS uses economic incentive to coerce responsible stewardship to restore sinks, while making net zero products from the products of that stewardship. See FMS economics for further definition.

FMS respectfully offers the following estimated graph:

Respectfully, GLOBAL OVERLAY of Our World in Data: Global CO_2 Atmospheric Concentration and Annual CO2 Emissions From Fossil Fuels, by World Region.

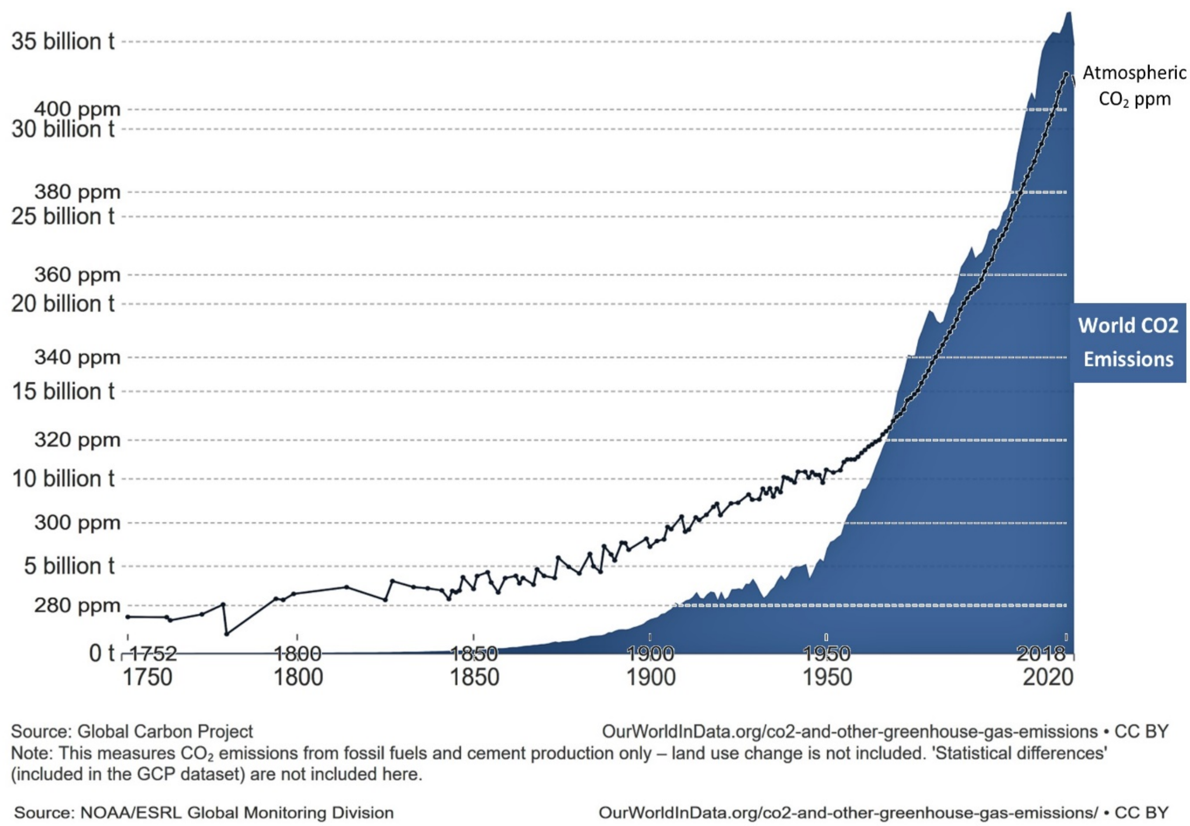


Figure 5 Global Overlay CO2 PPMs, CO2 Emissions

As an additional conclusion to this FMS section and as Figure 5's graphicly demonstrates fossil fuel use is fairly limited during the beginnings of human influenced climate change as charted by atmospheric CO_2 PPMs in comparison to emissions. Yet Figure 9's graph of temperatures, seems a relative as an instant measurement, not estimate, which shows increases with constrained deforestation implementation in the Americas and not due to fossil fuel use (as measured in atmospheric ppm's).

FMS uses both Figure 5 and 9 for correlation as a climate or 'biome' indicator to establish its 1850 datum and 1950 runaway point. Over time, these indicators show the depletion and the impeding of fast cycle sinks by forestry correlation in the other figures and timelines.

Again, by 1990 the graphs and timelines help FMS demonstrate the use of fossil fuel emissions as not being solely responsible for climate change, in fact, just the opposite. To add, Figure 6a shows from 1940 to 1990 unconstrained deforestation was peaking within tropical regions. In logical conclusion, global temperature increase is due to CO_2 emissions within atmospheric residence time. That is only possible by emissions exceeding the fast cycle sink abilities (of global forests or global biomasses). Figure 6a graphs the unconstrained deforestation which is a well-documented subject more commonly known as deforestation. What Figure 6a doesn't graph is constrained deforestation's effect on the remaining global forests sequestration capacity. FMS states that constrained deforestation has been and is more damaging to our current climate conditions.

The depletion and ongoing impedance of forestry CO_2 sinks is due to state-of-the-art wood industries waste and inefficiencies (see Nominal Measurement for example) which are the direct cause of excess atmospheric CO_2 in residence. It's not due to their direct CO_2 releases which also contribute to emissions as CO_2 leakage. Inefficiencies like artificial demand create inadequate forestry stewardship attune to suppling demand, not sequestration.

Much higher efficiencies found in woody biomass composite products can mitigate that effect. Point in fact, if the world's CO_2 sinks were maintained to FMS's proposed woody biomass status quo (not to mention FMS offsets), their abundance alone could mitigate all of today's CO_2 emissions by restoring balance. Today's excess atmospheric CO_2 could not exist in FMS's balanced stewardship model.

FMS suggests a balanced CO_2 sequestration to CO_2 emissions and therefore wholly subscribes to fossil fuel emission reductions to avoid further aggravation of the FMS proposed 1950 CO_2 runaway greenhouse tipping point; Doing less could result in additional temperature and weather extremes that further modify biome from effective FMS implementation of forestry-based or future FMS agriculture mitigation.

If fast cycle CO_2 sequestration were not the major contributor to global warming, Figure 9's two temperature demonstrations from 1880 to 1990 would not indicate erratic linear behavior as hills and valleys, whereas 1990 begins a more logarithmic or smooth increase that is correlated to tropic forests constrained and unconstrained deforestation. Little to no average temperature differences occur earlier than 1900 and are highly erratic due to residence time variations. However, the more steeply inclined upward trend beginnings in the 1990's are timed with fast cycle CO_2 impedance and a saturation effect of those impeded sinks. See Figure 6B for later correlation that reflects previous periods, historically. These dates coincide far better with known *CO_2* sequestration depletion and impedance than emissions s before, during, and after the industrial revolution 1713-1913. [1] , this cannot be coincidental.

As graphed in Figure 5, fossil fuel use is already well established by 1750 Europeans and later by 1830's Americans. By the 1840s, the world used fossil fuels consistently but fairly limited by low populations. Somewhere around 1850 global CO_2 emissions begin rapidly rising. Post WWII (1945) emissions globally accelerated with to today's levels of an estimated forty billion metric tonnes annually (40 giga tonnes). However, atmospheric CO_2 concentration levels, measured in atmospheric parts per million (PPM), do not necessarily correlate to fossil fuel uses anywhere in the timeline. As example: CO_2 atmospheric ppm has increased drastically since the 1990's but not directly in response to fossil fuel use that increased drastically beginning in the 1940's. Even with atmospheric residence factors applied in 1–5-year durations the effect is the same but in later years. Residence factors are also demonstrated by the graph prior to 1950 with the peaks and valleys formed by annual CO_2 PPM measurements (as historic ice) that indicate remaining fast cycle CO_2 sinks were

[1] Britannica, The Editors of Encyclopedia. "Industrial Revolution Timeline". *Encyclopedia Britannica*, Invalid Date, https://www.britannica.com/summary/Industrial-Revolution-Timeline. Accessed 22 December 2021.

becoming overwhelmed. FMS describes that attribute could not be due to CO_2 emission's volume then it must be because of sink impedance as measured by available capacity.

In furthering the understanding, by 1950, the last remaining and highly matured CO_2 sinks were in the final stages of entering constrained and unconstrained deforestation, see figure 2 for deforestation. By the year 2000, or even before, global constrained deforestation had been globally implemented. As figure 5 and figure 2 graph, by the 1940's terrestrial forestry sinks were or had lost the sequestration battle as global unconstrained and constrained deforestation practices took over. By 1990, there was nowhere near enough sinks or sink capacity in comparison to emissions volume, both natural or manmade, for what remained of sink capacity to prevent atmospheric CO_2 accumulation into residence conditions. In fact PPMs in residence started running rampant in the upward trend.

The upward CO_2 PPM trend seems to have begun around 1800 with 1850 the year remaining sink capacity fell into deficit to CO_2 emissions. As in our CO_2 breathing biome shifted into an atmospheric CO_2 accumulation biome.

FMS recognizes 1850 as its climate changed datum, or when humans succeeded in influencing atmospheric climate change conditions. Our unintended success had taken over 40,000 years to obtain from a globally applied coalition of labor. No doubt the longest duration construction project (undesired terraforming) of all time. It has only been in the last 40 years that humans discovered the negative impact and the last 5 years for FMS to define it clearly (2022).

In conclusion to this section

To further correlate the two data sets of tonnes CO_2 emissions and atmospheric CO_2 ppm's, one must apply FMS's new knowledge of human invoked constrained and unconstrained deforestation as human expansion (forestry demand). The industrialized or modern world developed forestry processes continent by continent starting in the 1500's and ending around 1913 or WWI. All that remained afterwards was continuing to implement unconstrained and constrained deforestation to enact with population increases (1850 to current) that created more forestry demand.

1750 to 1950 offers respectable proof when graphed where global 1800-1950's forestry use in shipbuilding, railroad development, population expansion, and the lumber industry's nominal measurements increased demand for mature forestry and further impeded sequestration. As such, the relationship clearly demonstrates the duration that concluded expansion of European and Asian misguided stewardship into the Americas and elsewhere. The addition of the Americas to constrained deforestation practices provided the global warming tipping points of 1850 and the 1950 runaway greenhouse gas effect we are experiencing.

Businesses using mature forests in the Americas had, by 1990, entirely adopted the European and Asian derived constrained deforestation. The exception is the Amazonian areas and other tropical forests where unconstrained deforestation has been implemented (but slowed, not stopped) by the difficulty for humans to access the areas.

FMS points out respectfully (Figure 2) that around 1920 much of the globe's mature and efficient fast cycle CO_2 ability was Amazonian and to a lesser extent other tropical forests. Temperate forests were in conversion to nominal measurements from the 1920's on. Although temperate forest loss slowed in 1950 and has even gained hectares in 1990 to now, the majority (exceeding 88%) of global temperate forests are under stewardship practices

FMS recognizes as constrained deforestation and tree degradation that perpetuates impedance of fast cycle CO_2 potentials by 90-98%.

In agreement with FMS's fundamental science, Amazonian forest results demonstrate 'in-time' increase in global atmospheric CO_2 ppm's as a direct correlation to ongoing Amazonian unconstrained deforestation periods. Furthermore, that correlation testifies to FMS's previous assessment of fast cycle CO_2 impedance and its timing as the cause or tipping point of global warming as an occurrence. FMS demonstrated in linear analysis of atmospheric ppm increasing from 1920 to 1980' peak deforestation graphicly while more recently 2000-2020 afforestation efforts have helped to increased CO_2 sequestration. Also used, 2022 NOAA atmospheric CO_2 ppm measurements in correlation to atmospheric CO_2 residence conditions.

In conclusion, the more tropical constrained deforestation practices being implemented or the more unconstrained forestry destruction of fast cycle CO_2 sinks, the more CO_2 is accumulated into atmospheric or oceanic residence. Furthermore, FMS resolves an understanding that most temperate regions are in 100% constrained deforestation practices and are respectfully the cause of climate change. Furthermore, they formed a tipping point in human influenced climate change conditions as a runaway effect.

As further conclusion

The Amazonian and other tropical deforestation and biome terra forming are residually applied pinch points from previous misguided European and Asian continental forestry stewardship practices of constrained and unconstrained deforestation and not as contemporary science indicates as highly problematic or unmitigable.

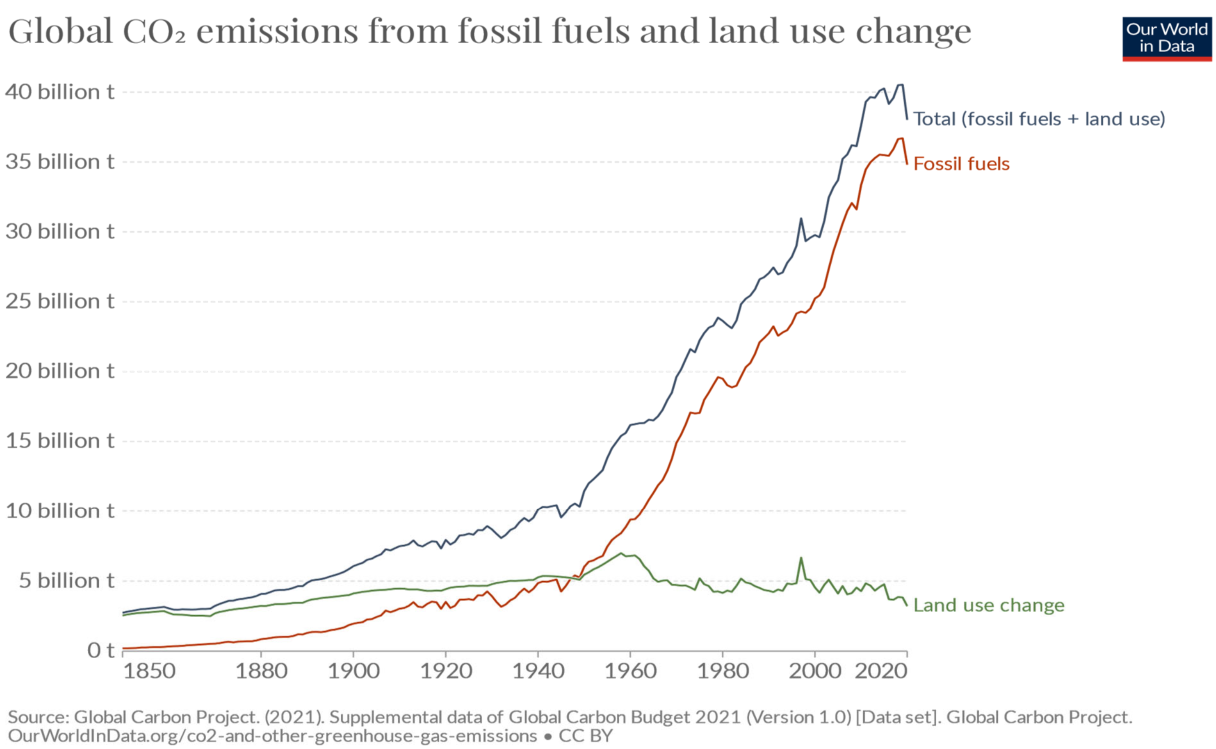


Figure 6A, Emissions and Land Uses

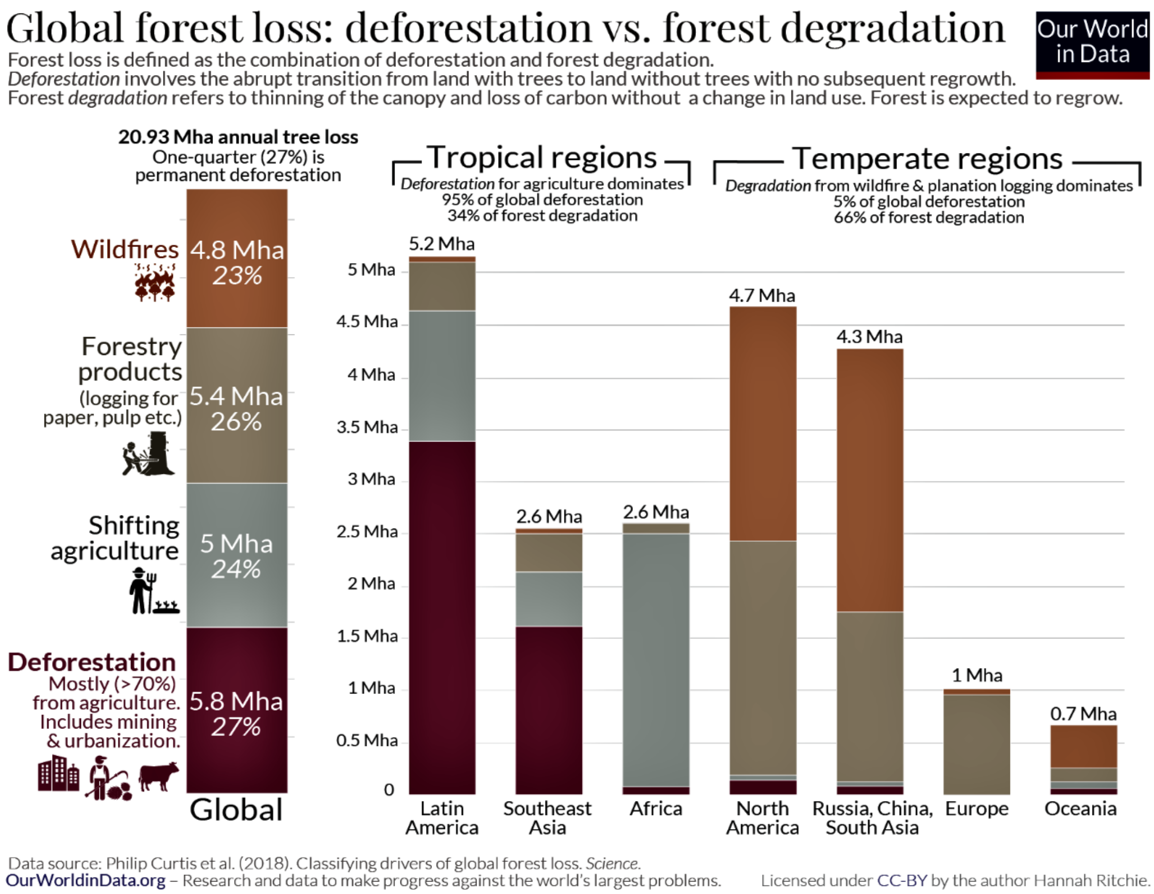


Figure 6B, Global Forest Loss

Additional Beginnings

A significant depletion of forest and the implementation of constrained deforestation stewardship had already occurred in Europe by 1600 or even earlier in BC timelines because of ship building, war, and other demands (2). Finding a mature tree anywhere in Europe or Asia by 1650 would have been a rarity, or at least as difficult as it is today everywhere (2). However, the Americas, and 'the colonies' had little demand to supplied forestry until it took to industrial scale shipbuilding. The shipbuilding industry was booming in the Americas by the 1710's. Mostly due to the available forestry materials being plentiful. By 1850's shipbuilders began running low on convenient forestry. At that time large wooden ships required large timbers and that required very mature trees. By the 1850's mature trees were all but gone on the east coast, along with other woods used in wooden ship construction. As a result, most of North America's east coast was now under constrained deforestation. By then another demand was created, building railroads to bring lumber from all directions to the eastern seaboard.

Railroad beginnings in the U.S. were to reach resources and for their strategic and economic importance. Wood was the leading resource sought, along with crops to feed and build the growing cities and to keep shipbuilding flourishing. However, railroad ties, construction of railroad facilities and using wood as fuel were a much larger demand on forestry resources than ship building, or any other reasons combined. The increased demand was for the physical construction of the railroads and the human expansion of territory. As a result, post 1850 lumber demand on the east coast furthered the impeding of CO_2 sinks as the second and more massive wave of forestry demand included the central and to a lesser extent, the western portions of North America. By the 1930's great depression, all America's convenient forestry was under constrained deforestation as demand continued to rise with population.

The great railroad expansion from 1878-1916 opened all the North American forests for business. By the 1890's a highly sizable portion of North American was clear cut. America had caught up with the rest of the world's constrained deforestation methods, especially in continental Europe and Asia who had arrived at constrained deforestation centuries earlier.

Not by the trees not being available for harvest; although, unconstrained deforestation was a factor, constrained deforestation was by far the more enduring of the two deforestation methods. FMS demonstrates this readily in tens of tonnes of fast cycle CO_2 abilities per acre being held by back by forestry demand into only pounds per acre with significantly less mature and therefore smaller trees being harvested. By 1950 we had used it all and were now subscribed fully to tree degradation and constrained deforestation.

Somewhere around 1950 humans were now applying in earnest unconstrained deforestation globally. Probably because we had entirely implemented constrained deforestation on all convenient forestry globally. FMS proposes global temperate forest regions were under constrained deforestation by 1965, followed by the tropics from 1980-2000. See Figure 2 and 6. The result, is demonstrated graphically in Figure 5, atmospheric CO_2 ppm begins exponential growth within atmospheric residence durations as an increasing factor towards atmospheric CO_2 accumulation. Constrained deforestation factors then allow global CO_2 emissions longer residence conditions, if not permanent, by the upward trend in global temperatures from 1850 on and presented by CO_2 residence. In simple terms, CO_2 has no other place to go so it remains within the atmosphere now.

FMS does not predict a CO_2 saturation point as a tipping point. Instead, FMS predicts global weather patterns will make that saturation point moot as Earth's surface becomes unlivable. It is also moot due to the runaway greenhouse gas tipping point which is already established but must also have a point of no return. Where that is, is unknown. But we now know it will be sequestration modeled and not an arbitrary United Nations temperature. Given where we are at today with only 3% sequestration available, it's sooner than later and three degrees could be way too much.

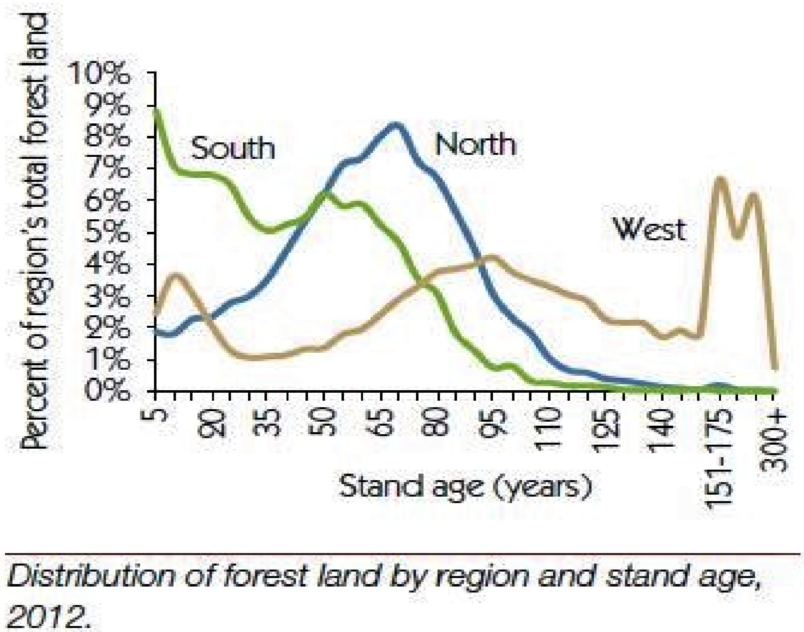


Figure 7 USDA Forest Service 2014, U.S. Forest Resource Facts and Historical Data. FS-1035

Basic FMS condition, Impeded Fast Cycle CO_2 Sinks:

Summary of figure 7; The graph refers to the United States. Note the percentage on left of graph, (y axis) its maximum value is 10%. America's entire forest can be described in age brackets under 10% in volume. It hasn't changed much from 2012 to today. On average, only 1 percent of stands are age three hundred years or more and provide excellent fast cycle CO_2 sequestration. Unfortunately, the majority of U.S. stands, or around 90%, are under 40 years of age, most of which fall into the 1-30 years old brackets (3).

FMS targets 30–40-year-old stands as the having the most marketable sequestration and potential for both E^3Lumber production and FMS fast cycle CO_2 restoration benefits. These are immature stands for sequestration but considered harvestable. They can provide a dual benefit in commercialization of FMSCO_2 and economic incentive to the stand owners. The point of figure 7 is just how immature forests are in prevalent and just how impeded their sinks are; they are impeded by millions of times from their potentials.

II. Part Two, "FMS Conclusions."

As an FMS term impeded fast cycle sinks can also be described as mathematically capable but physically kept from doing so. Describing the sequestration of carbon from CO_2 using fast cycle sinks is empirical in math, measurement, but not readily understood when referencing a renewable like wood. FMS offer the following to further define an impeded sink:

The problem with constrained deforestation is FMS can define carbon sequestration as not a renewable resource. First, post FMS; the removal of CO_2 from the atmosphere and sequestering it into biomass as carbon is considered by FMS as a nonrenewable resource. As FMS demonstrates sequestration is just as present as the tree. FMS also references that in model calculation. Sequestration of that tree or forest is without doubt found to be finite in amount.

Trees are renewable, so their sequestration must be renewable, right? That statement is what FMS defines as part of the climate changing conditions humans created because the answer is most definitely 'wrong!' Trees can be, but their sequestration is not a renewable. Sequestration is an easily limited, used, and, as FMS points out, a finite resource that is not renewable. The tree's biomass maturity governs its sequestration capacities.

Looking at fossil fuels in comparison, millions of years of heat and pressure are required to convert biomass into fossil fuels. So, they are not limited by biomass they are limited by time (as duration), and therefore are not considered renewable by any human definition. Forest or other biomass sequestration exhibits the same duration hampered characteristic to form. Sharing the same characteristic of time required in context to their valuation by humans passes the nonrenewable test. In FMS basics, woody biomass sequestration is a nonrenewable and a separate resource to its renewable biomass.

Alternatively, biomass may be accumulated above and deep within the ground, it requires eons of time to become relevant to fossil fuel. So, although the tree may be planted within the ground and grow over time, it takes more time than currently allowed for its maturity to become relevant to sequestration. Constrained deforestation harvests the world's sequestration crop before it can even bloom. That premature harvest is affecting all the world's occupants without prejudice. Sequestration value is a nonrenewable in all FMS regards. Thankfully, the two resource timelines are nowhere near the same duration and FMS can use that to its advantage.

Within the reasoning of that example is a demonstration of one of FMS's logics and one of its simplicities. FMS's climate mitigation efforts revolve around the time required by fast cycle sinks to recover. FMS empathetically states a tree is renewable, but trees are not renewable to sequestration volume unless the tree is given time to recover to its historical or preharvest state(s). Or as FMS summarizes the conditions, "it is (the tree, plot, region, or country) another impeded fast cycle sink under constrained deforestation. It should contain no other value to humans before sequestration value-it must always be treated as such."

With sequestration value termed as a nonrenewable, FMS's definition of what an impeded fast cycle sink can be summed up by Thompson's observation made while trying to find a way to best describe the scope of FMS. The outcome, "Forestry fast cycle sequestration is currently in a used-up and entirely depleted state, and nobody knows or they don't care."

FMS research has demonstrated forestry fast cycle sequestration is not running out, its already way out, even millions of percent out. This sequestration balance cannot be left like that for long without global consequences to animal life on Earth. It is out of our control but mitigatable. What is not mitigatable and unpredictable is volcano activity, or another form of major CO_2 releases that historically have meant only a bump in the road. With our current impeded sequestration, we have placed further jeopardy on our species should something like that happen. We have used up our atmospheric residence buffer that could and had historically offset those types of past events."

For additional details, see graphs Figure 3-5 and increasing residence time of atmospheric CO_2 in Figure 4 and contextual summaries in Establishing the Beginning...

Furthering Understanding of FMS.

Describing a fast cycle sink as an 'impeded' fast cycle sink should also be a readily acceptable extension of the basic impeded sink definition. The verb 'impeded' describes the negative influence on the sink's potential. Mathematically, FMS states the sinks sequestration ability is a delta minus the sink's current sequestration as an annual rate. The delta can be calculated using the various years of maturity of the tree within the Chapman-Richards Function to establish its current size and growth rate. Year over year size is equivalent to its weight times 0.467 which gives you its carbon weight in AMU's. Carbon content x 3.67 provides the amount of CO_2 AMUs converted by plant respiration as photosynthesis. There are plenty of empirical resources available that do an excellent job at estimating tree growth, weight and even sequestration rates. Using any of those empirical sources will model FMS accurately.

FMS Defined by Example.

An impeded sink can be the graphical difference between the delta from minus where the tree is at in age, minus where the tree could have been had it not been harvested previously or prior to current maturity size. Trees live 100's and even thousands of years. Older maturing trees can sequester 100's and even thousands of times more atmospheric CO_2 annually than an immature or younger tree. So, it is historical information to apply an age and size prior to the previous harvest(s) and age and size for an even earlier harvest and so on. Time between constrained deforestation harvests is FMS estimated to be between 30 and 50 years. Which means the sequester number can be added-up in a series for each time a tree has been harvested all the way up to the expected life span of that tree's species. In some cases, FMS's impeded terminology takes on 100's and even thousands of years to describe a current tree's impeded sequestration ability. See Impeded Sinks Metrics for additional explanation.

Owner class/ land class	Region			
	U.S.	North	South	West
	Million acres			
All owners	**766**	**176**	**244**	**346**
Timber land	521	167	210	144
Reserved forest	74	7	4	63
Other forest	172	2	31	139
National Forest	**145**	**12**	**13**	**120**
Timber land	98	10	12	75
Reserved forest	27	1	1	24
Other forest	20	0	0	20
Other public	**176**	**35**	**20**	**122**
Timber land	63	29	15	19
Reserved forest	47	5	3	39
Other forest	67	0	2	65
Private corporate	**147**	**29**	**65**	**53**
Timber land	111	29	61	21
Reserved forest	0	-	0	0
Other forest	36	0	4	32
Private non-corporate	**298**	**100**	**147**	**51**
Timber land	249	99	121	28
Reserved forest	0	0	0	0
Other forest	48	1	25	22

Figure 8 USDA Forest Service 2014, U.S. Forest Resource Facts and Historical Data. FS-1035

Private forests provided 88% of the Nation's (United States) timber harvest in 2011 (3).

Referring to Figure 8 above, 443 million acres are under contemporary forestry management and another sixty-six million under industrial management (3). In short, the combined 509 million timber acres are managed contemporarily for production. FMS demonstrates those acres are highly impeded fast cycle CO_2 sinks, and all are likely under constrained deforestation practices in one way or another. Very few forests exist globally that are not under or being threatened by constrained or unconstrained deforestation as demonstrated with the U.S. example in Figure 7 and 8. Global Forest age is thought to be less than or equal to the U.S.'s example of.

Modern forestry demand drives forestry management practices to inefficiency.

Contemporary forestry practices are to grow trees into a usable size as quickly as possible. That process is constrained deforestation and tree degradation. The result has been the use of smaller and smaller and more numerous trees because of constraining tree growth durations from the now abundant CO_2 fertilization. The resulting impeded fast cycle CO_2 sequestration is the general widespread result.

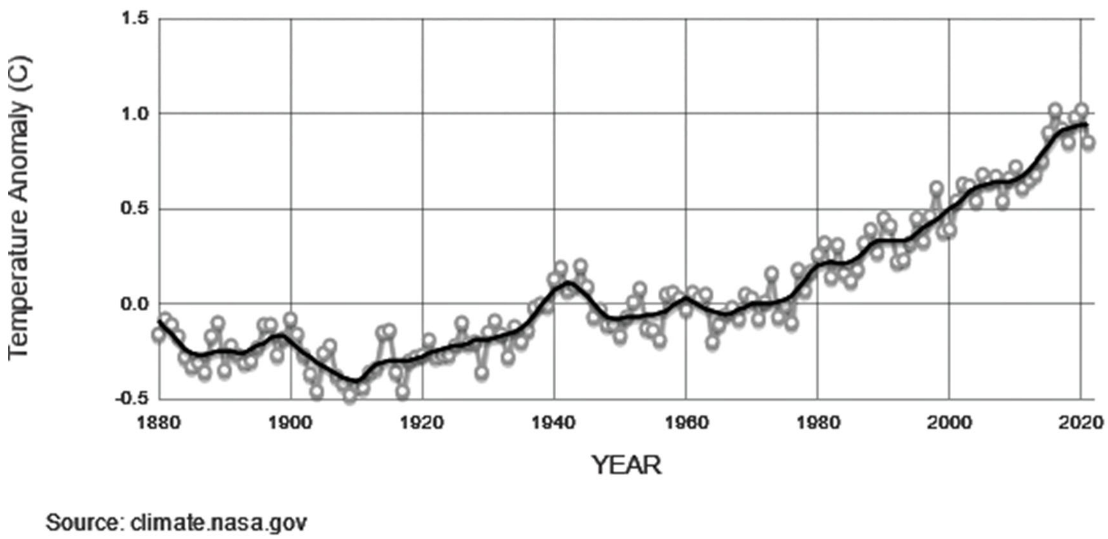
Respectfully, all 726 million U.S. forestry acres or more are highly impeded sinks. ALL at some point had been very mature and efficient fast cycle CO_2 sinks. Figure 8's 172 million acres are considered as 'other forest.' These other forests are mostly in the same predicament as commercial forests and under constrained deforestation practices. Finding an old growth forest that has not been logged since 1880 is difficult nationwide and impossible in most regions. Less than 1% of all U.S. forests contain old growth (three hundred plus years old). So, within the U.S. less than 1% of CO_2 fast cycle sinks have any tangible maturity. Initial FMS estimates indicate 90% of the global sinks are in worse condition globally. See Figure 2 and 6B for further perspective. Even many of the United States national parks have been logged. Only 1 to 3% of national forest has not been logged. So even protected public land is in constrained deforestation with very little protection.

When FMS applies its logic to 100's of millions of acres globally the resulting fast cycle sink impedance places all those millions of acres on the brink of full collapse due to the residual effect from climate change (runaway effect). As of this writing, humans have extended our demand on forestry far too much because contemporary forestry lacks both efficient technology like E^3Lumber composites and FMS's mitigation of damaging stewardship practices that only address demand and not supply. That has created an accumulated effect within globally impeded sinks that is understood by FMS as a more immediate catastrophe than current UN climate change modeling can predict.

Impeded Sinks Tipping Points.

Humans are quickly pushing the global climate toward an atmospheric tipping point. Many climate researchers predict if average temperatures increase to 3-4 degrees Celsius over preindustrial ages, we reached a point that there is no coming back from. Post FMS predictions concur that if 3-4 degrees occur the next fifty or even one hundred degrees may be out of human control. FMS's speculation is 3 degrees is too much and Earth's surface conditions will not be sustainable for trees or humans shortly thereafter. Atmospheric conditions will have traded homeostatic conditions for chaos. Between fires and wind damage Earth's surface life could succumb to unpredictable incumbents. It will also be too late for FMS. Instead of a decade or two it will take millenniums or more for the climate to reset itself to something other than a forest/animal supporting symbiotic relationship. Unfortunately, most if not all of that life will become extinct to extreme weather conditions and highly acidic water vapor as acid rain. FMS does provide further insight to this speculation.

Today, Earth can only employ less than 3% of its potential within fast cycle CO_2 sink capacities. As such, excessive CO_2 fertilization availability is the only condition that is saving us from an accelerating our runaway greenhouse effect . This runaway effect actually started around FMS's datum of 1850 and became locked in around 1950. It can be detected in Figure 5's timeline as CO_2 PPMs begin a steady upward trend. Figure 9's global average temperatures rising trend correlates Figure 9 to Figure 5 and FMS's acknowledgement. The extreme weather has already proven that case but Figure 5 and 9's widely accepted graphs (2 shown for Figure 9) demonstrate the temperatures upward trend and beginnings of FMS's datum (POST 1850, as that era's effects take hold).



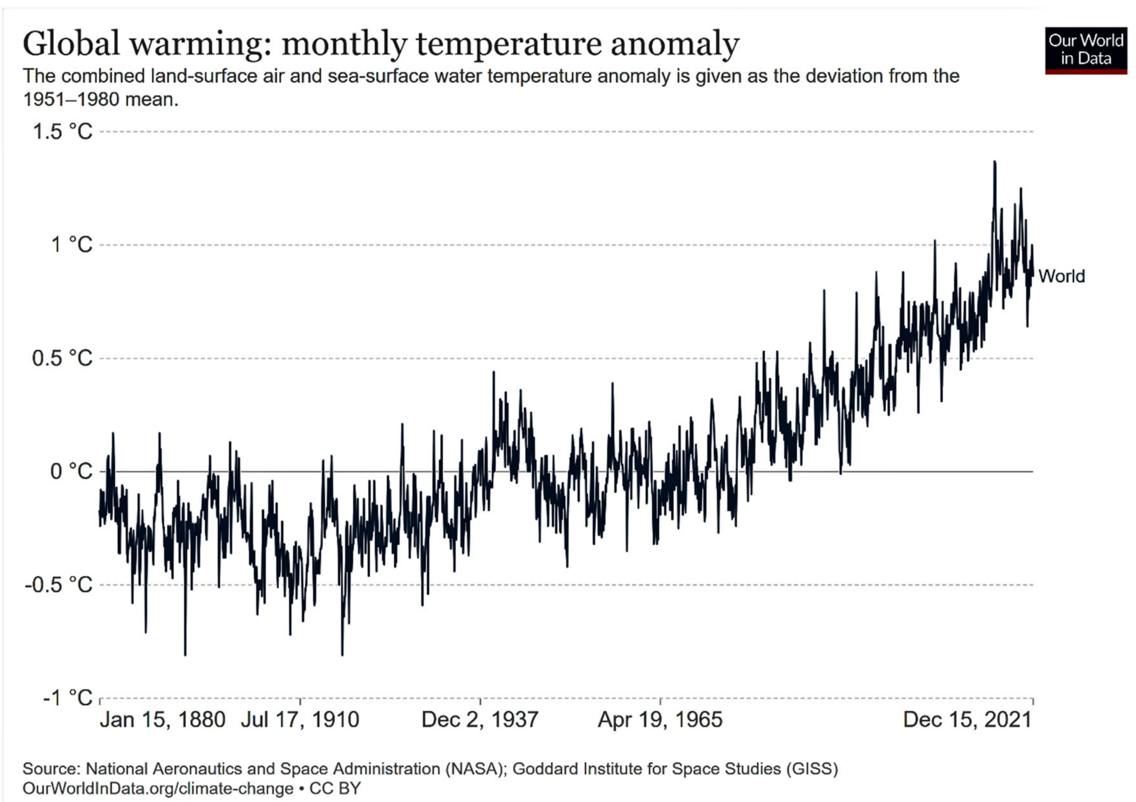


Figure 9 Temperature Anomalies, Runaway Greenhouse effect.

The last 30 years of afforestation efforts have planted millions of trees globally. Still, that is not near enough and is still speculated as constrained deforestation by FMS. Much of the planting by environmental organizations and governments has been completed on historically commercial timber lands and intended for future commercial purposes. The Paris Agreement lands may be an exception, but the afforestation process is highly suspect in many nations, to include North America. There have been many issues arising from reforestation efforts globally, where environmental and government organizations who oversaw the efforts have been caught selling previously funded afforestation plots for timber harvest. Prior to FMS, selling timber was not considered a dubious act and post FMS it still is not when under FMS stewardships like zero tolerance for clearcuts, inefficiencies, or CO_2 leakage accounting. Many nonprofit environmental organizations have done it and on a large scale because those organizations previously justified their actions under the wood is a renewable banner. Post FMS is in disagreement; wood may be a renewable but the tree's sequestration is not a renewable and therefore clear cutting is not a sustainable forest practice (see FMS renewable expanded definition).

It also became apparent that global afforestation efforts are headed or managed by wood products companies. Which is a smart move by them to appease environmental pressures and subsidize the cost of replanting their millions of clearcut acres annually. To post FMS standards that's diversion from our new knowledge and understandings.

Even prior to FMS we could recognize that a renewable resource does not automatically mean a sustainable resource. Many largescale afforestation practices are really constrained deforestation practices but titled politically correct. Post FMS we now recognize those as unethical and deceptive practices that set back all climate mitigation efforts, not just FMS. Whereas they could have significantly reduced climate change but were utilized to supply forestry product demand instead.

Unfortunately, those practices amplify FMS's datum created by those constrained and unconstrained deforestation practices. They'll eventually create the demise of commercial forestry. In the near future, FMS speculates humans may continue accelerating the tipping point where forestry sinks will not exist due to the undesired terra forming occurring from harvesting smaller and smaller trees as tree degradation (also See Wood Products).

The stewardship scenarios of using saplings (some under 10 years old) to maintain human forestry demand has been established over centuries and has worsened every decade. The result will be like Spain, which turned forest into savannahs after 1480. Because of forestry demand, the world is well on its way to the terra forming tipping point. If the same is allowed to happen globally, the atmospheric residence of CO_2 in PPM's will run away faster than depicted in Figure 5 from 1950 on. We can view graphically in Figures 5, 6a,6b-9 that humans tipped in 1850 and tipped the runaway effect around 1950; but there is no known way to estimate the point of no return without temperature correlations that FMS has yet to model. But it can be modeled now, post FMS.

Predictive modeling

FMS currently assumes 3-4 degrees Celsius is by far too high given today's excessive fires and weather extremes at today's 1.8 degrees. A simple doubling of temperature that should double the problems we are experiencing should be enough to alarm. However, FMS theorizes that doubling of temperature will actually be a base ten or ten times the problems.

FMS states there is no such thing as a climate expert who can predict beyond previously recorded experiences prior to FMS. Therefore, FMS's experienced based doubling method could be the only way to accurately predict the effects of increased global temperatures that is controlled within margins of variability. Why because FMS has a datum, a starting point. No other models do.

It makes sense that any current United Nations or other prediction of human adaptability to 3- or 4-degrees increases is highly misleading due to both human and Earth's biomes inability to adapt to those at any kind of norms. Pre FMS, it was impossible to predict accurately either outcome so FMS does not speculate beyond the terrible effects found by doubling today's temperature and doubling problems, but that is enough to alarm. FMS's hypothesizes that the problematic outcomes of increased global average temperatures will continue to be proportional by some increasing magnitude, base ten.

We do not because FMS points out the global temperature tipping point and runaway greenhouse effect tipping point will not change even if we could eliminate fossil fuel use today. That is entirely because it already happened, 1950. As further result, FMS models are contrary to conventional understandings of climate change. FMS demonstrates emphatically that it does not matter if the CO_2 emissions came from animal respiration, an automobile, decaying biomass, or a factory as much as it matters where those emissions go next. Which means all previous CO_2 mitigation efforts that have focused on elimination of GHG emissions will only postpone climate changing effects, they cannot eliminate atmospheric climate change on their own accords or even combined. The only way to mitigate climate is by removing CO_2 from the atmosphere with sequestration into carbon storage. The only way to do that practically, quickly, and economically is by FMS.

III. Part Three, Metrics

Standard Metrics

Tonne or Metric Tonne: defined as 106 grams, or 2,204.62 pounds (lb). and 0.907185
Mega Tonne is 1,000,000, one million metric tonnes
Giga Tonne is 1,000,000,000 one billion metric tonnes
In 2021 the world *CO_2* emissions were estimated at 36.3 giga tonnes of *CO_2 OR* AS simplified 36,300,000,000 metric tonnes of *CO_2*. OR as 3.63×10^{10} tonnes *CO_2*
Parts Per Million are used in atmospheric measurements of *CO_2* present.
The following documentation was used to form FMS Metrics but not exclusively.
Additional metrics were used from cites and references recorded within publishing:
Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry, Technical Bulletin 1939 published July 2014. USDA. *Marlen Eve, Diana Pape, Mark Flugge, Rachel Steele, Derina Man, Marybeth Riley-Gilbert and Sarah Biggar, Editors.*
Chapter 6 Quantifying Greenhouse Gas Sources and Sinks in Managed Forest Systems
Coeli Hoover, USDA Forest Service (Lead Author) Richard Birdsey, USDA Forest Service (Co-Lead Author) Bruce Goines, USDA Forest Service Peter Lahm, USDA Forest Service Gregg Marland, Appalachian State University David Nowak, USDA Forest Service; Stephen Prisley, Virginia Polytechnic Institute and State University; Elizabeth Reinhardt, USDA Forest Service; Ken Skog, USDA Forest Service; David Skole, Michigan State University; James Smith, USDA Forest Service; Carl Trettin, USDA Forest Service; Christopher Woodall, USDA Forest Service
The following metrics are not necessarily cited in this documentation but are used with FMS studies leading to FMS's conclusions. We mention the following metrics that are regularly consulted for modeling by their data descriptions. For the sake of time, we cite here alone.

Integrated Global System Model (IGSM): M.I.T's modeling use of quantitate analysis and predictions of climate change risks. FMS consulted IGSM for economic analysis of political efforts applied in climate change mitigation related to cap and trade.

Net primary productivity Ecosystem-scale apparent photosynthesis minus autotrophic respiration. FMS cites Dr Beverly Law, OSU forestry, Terrestrial Carbon Observations (GTOS-TCO) for clarification of how FMS models' net productivity in forestry to be more beneficial at maturity then replanting for obtaining FMS's optimal CO_2 sequestration and carbon retention.

Gross/net primary production Ecosystem-scale gross/net primary productivity when considered over longer time periods. FMS uses net ecosystem by projecting accumulated tree growth rates over decades and centuries to establish how tree maturity affects overall localized ecosystem to global climate health.

Respiration, the mechanism by which plants, animals, and microbes convert sugars into energy. CO_2 released by respiration metric is applied to forestry and forestry products by FMS in modeling wood product efficiencies in comparison to advanced woody biomass composites.

Autotrophic respiration is the sum of respiration by all living plant material in an ecosystem. FMS's focus is CO_2 fertilization within autotrophic respiration of typical forestry biome and modeled in relation to growth rates of mature trees to that of replanted forestry after deforestation events (clearcutting). Cite also, OSU's Dr Beverly Law et all. Her work on measuring autotrophic respiration of forestry is regarded by FMS models and context.

Photorespiration The oxygenation of ribulose 1,5-bisphosphate (RuBP) by the enzyme RuBisCO in the chloroplast. As a fundamental use and practice in biological respiration.

Dark respiration the release of CO_2 in the mitochondria, without the aid of light. Considered in FMS models of forestry constrained and unconstrained deforestation to estimate forestry recovery time frames required after.

Maintenance respiration Metabolism is required to maintain an organism in a healthy, living state. As a fundamental use and practice FMS considers this metrics data as it implies to a healthy or unhealthy forest to model the contrasting conditions. FMS has not modeled this yet.

Growth respiration Metabolism is associated with growth processes such as synthesis of new structures, nutrient uptake, N reduction, and phloem loading. Used to expedite the checking of tree growth rates cited by FMS charts and graphically in other's cited in FMS.

Heterotrophic respiration the respiration rate of all heterotrophic organisms (animals, fungi, and microbes). Mentioned in FMS to include human respiration estimate to determine if stopping fossil fuel use could end climate change. Heterotrophic conditions prevent non-FMS conforming climate change mitigations from becoming full mitigations.

Total ecosystem respiration is the sum of autotrophic and heterotrophic respiration. Is used by FMS to help estimate future volumes of atmospheric CO_2 in comparison to historical recorded volumes. Consulted for FMS's comparison of CO_2 atmospheric parts per million to global CO_2 emissions.

Carbon sequestration is the removal and long-term storage of CO_2 from the atmosphere. Metric is used as a fundamental and in practice for CO_2 sequestration and carbon storage.

Carbon sink or source the balance of flows of carbon between an ecosystem and the atmosphere over a given period of time as t. As a fundamental use and practice and by expanded definition as and impeded sink. This metric is further detailed in FMS as a fast cycle sink to demonstrate the annual cyclical nature of sinks in correlation to annual plant growth cycles. FMS model's this data throughout and provides further calculation for the impeded fast cycle sink.

Net ecosystem carbon balance is the balance of carbon entering and leaving an ecosystem through all pathways. FMS uses this metric in describing global sinks and as a fundamental use and practice.

Net biome production the net ecosystem carbon balance for a large ecological and temporal grouping, explicitly including effects from disturbances and management. Metric is used to help define FMS *CO_2* to C storage balance requirement and within impeded sink calculations demonstrating the impeded value to its potentiality over time.

The residual terrestrial sinks are the residual of anthropogenic emissions (including land-use change) minus the oceanic sink and atmospheric CO_2 growth. FMS considers this metric in fundamental use and practice. Most notably in citing ocean *CO_2* capacity and terrestrial land sink capacities. And establishing impeded sink conditions globally.

Net ecosystem production Gross primary production minus ecosystem respiration. Metric used to help estimate and optimize sequestration of forestry ecosystems as maturity in years increases.

Net ecosystem exchange Ecosystem respiration minus gross primary production. Metric is consulted to help estimate ecosystem carbon retention benefits of increasing sequestration from replant to maturity.

Modeled FMS Metrics, CO_2 to C Sequestration

CO_2 sequestration ability, during the fast cycle sink season or the growth season of any given plant (perennial not annual), tree, forest, continent, or planet can be measured proportional to the sink's linear maturity in years inversely proportionally to the square of its age (see FMS calculation and modeling for the inverse square law). In FMS conditions it is tree or forestry growth. That measurement is not exponential growth due to factors such as the trees' life cycle and environmental conditions like available water, nutrients, and solar placements that all affect the tree's growth. As the FMS focus, tree growth models are more logarithmic in that trees mature in years, their size becomes more linear; however, as maturity in years increase the maturity measured in years is proportional to their size while their sink capability increases logarithmically as defined by the Chapman Richards function (4). To summarize, the addition of new growth to the previous year's growth can be exponential but is limited by the factors mentioned. (4) The resulting growth is exponential like but better defined logarithmically with linear ages. This is nothing new and fundamental forestry science. FMS applies these empirical references to model a much bigger picture. It is done by compiling the effect by tree, then forestry plots, and then global forest hectors.

In FMS's most generalized terms 50 lbs. of carbon are sequestered by a typical tree (typical to commercial forestry plots) in its 30th year of maturity. This photosynthetic process is accomplished during the fast cycle sink period or simply defined as the tree's annual growth season. To sequester 50 lbs. carbon the tree photosynthesized the suns energy and used 163.5 lbs. of CO_2 as CO_2 fertilization pulled randomly from available atmosphere.

CO_2 AMUs as FMS derived can vary by the species growth rates and other factors. Typically, FMS uses species growth rates that are empirically published and/or the physical size the tree has obtained is measured. With numerous factors like available nutrients and solar exposure affecting published tables, field measurement is most accurate. However, the accuracy of most tables based on Chapman Richards Function have been determined mathematically accurate with Lio Zhao study with/without additional factors included (4). To this extent, FMS's annual sequestration rate is measured in Carbon AMU's or mols and is calculated by AMU conversion using Carbon =12 amu's and CO_2 equal to 44 amu's. Or 3.67 x Carbon AMU's = CO_2 AMU's (C 12 +O 16 +O 16 = CO_2 44). Tree growth rates are determined from a tabulated source based on Chapman Richards. (5) (6) (7) (8)

Metric and English Equivalents:

1. 0.404686 hectare (ha) = 1 acre (ac)
2. 2.54 centimeter (cm) = 1 inch (in)
3. 0.0283168 cubic meter (m3) = 1 cubic foot (ft3)
4. 1 Pound lbs. = 453.5924 grams g.
5. 1 Kilogram kg = 2.2046 pounds lbs.
6. 1 short ton = 2,000 lbs. = 0.9071847 tonnes (2,204.6 lbs.)

Conversion Units:

1. C to CO_2 conversion as (44 amu units CO_2 / 12 amu units C) = 3.67
2. CO_2 PPM (parts per million)

Metrics Considerations:

Figure 4 Metrics

We converted ppm's to tonnes CO_2 removed from atmospheric residence by cubic kilometer. So, 5.91 PPMs = 5,910 tonnes CO_2 per cubic kilometer and 59.4 PPMs = 59,400 tonnes CO_2 per cubic kilometer. Even a minuscule improvement applied to 2021's sequestered carbon's 2021 delta (5.91 PPMs) could reverse atmospheric CO_2 PPMs in residence.

Impeded sinks Metrics:

Impeded sinks in general terms from section FMS Basic Condition … in that example most forestry stands end-up impeded by 1,000,000's of percentiles. FMS refers to plots as impeded 95-98% in an easy-to-understand reference; although historically calculated and then applied to ratio it is typically significantly higher but how much to FMS is as arbitrary as how long has it been happening, FMS use's eons to describe how much and how long durations.

The 95-98% as being impeded maintains a rounded derivative based on estimated forestry turnover, depicted in Figure 7 with average age trees taken from Figure 7's data. In addition, all plants use CO_2 in respiration. FMS currently does not account for all plants and grasses. Their impacts can be highly significant but minimal in comparison to FMS's current focus on forestry.

FMS has documented that forestry alone historically and today can and has sequestered far more carbon than grasses, crops, or shrubs combined. The only entity that beats forestry sinks are ocean sinks. But oceans are also a large atmospheric CO_2 contributor. Oceans are vast sinks and also emitters but are increasingly more acidic as they participate in excessive CO_2 absorption due to today's high concentrations of atmospheric CO_2.

Woody Biomass Material Metrics

1. As a substitution, woody biomass materials are an advanced technological improvement to current industry and will by themselves enhance global $C0_2$ sequestration. Furthermore, advanced materials made from woody biomass can be the bridge to an expanded interdisciplinary climate change model. That is FMS's strong point, it shares to everything and everyone.
2. Woody biomass composites that FMS modeled are a 951% improvement over sawn or peeled lumber products use of biomass. As measured to the combined efficiencies in logging, forestry demand, manufacturing, shipping, and energy consumption. See calculated results.

3. Woody Biomass composites are zero waste manufactured. 100% of spoils return to material compositions during the manufacture of E^3Lumber not to energy production or waste.
4. FMS modeled woody biomass material offer a minimum of 1,900% environmental improvement as measured in fast-cycle CO_2 sequestration as sink restorations, sink additions, or existing forestry sink improvements over state-of-the-art. Sink improvement can be higher than millions of percentiles better than conventional forestry uses; however, those results can become arbitrary to the last known logging period of any forestry plot. See impeded sinks
5. Biomass weight efficiency is 3.2:1 (three point two to one) as biomass areas configured to its average mass density for component. Lumber or solid wood being = to 1 in mass density. Woody biomass composites can vary from 0.68 to 0.94 in mass densities. By area calculations divided by mass density a typical 3.2:1 (3.2 to 1) advantage in product weight, shipping energy use, and production efficiency ratio to wood products is demonstrated.
6. 3:2:1 weight advantage can also be adjusted to the current FMS estimated sequestered carbon weight per unit comparison as to the contrasting energy used and waste required to produce either product. Densities within composites apply a material bonus. Composites use less material as substrate when compared to solid wood. Supplementally, composites are lighter in weight and typically configured for improved abilities. Potentially this is what allows a portion of eliminating inefficiencies in forestry and results in significantly increasing tree growth cycles.
7. IE: weight measurement of lumber component / 0.43 as the average forest product to Carbon weight factor = pounds Carbon per lumber unit = woody biomass materials substituted for lumber unit weight / woody biomass material's mass density of the substituted like for like lumber unit x 3.2 / 0.43 as the average forest product to Carbon weight factor = pounds Carbon per substitute woody biomass material unit.
8. Sequestered Carbon per woody biomass unit is calculated as; (woody biomass materials finished unit weight – additive weight / units average mass density) x 0.43 as the average forest product to Carbon weight factor + (any additive weight x percent carbon contained)
9. Modern solid wood products do sequestrate carbon (as a finished product). Woody composites should be comparable even at lower densities with their adhesives. However, current reproduction of wood products leak multitudes of CO_2 from the many inefficiencies, waste biproducts, and high energy consumption. In comparison, composites consume much less energy to obtain or produce because of their efficiencies. The binder or resin can also be configured as an additional sequestering element (adding carbon to overall sequestered). Furthermore, energy to reproduce composites is often offset by eliminating the waste components of solid or peeled wood products. Therefore, composite efficiency of biomass is as high as 92% compared to wood products 40-60%, thus providing significant gains in all areas.
10. The permanence of woody biomass binders improving recycling and long-term carbon retention. The binders are structural rated, tool able, and waterproof. They also protect wood from moisture, insects, and can provide mold, mildew, and flame resistance. In all, the materials they are used in are 100% recyclable.
11. FMS has not incorporated adhesive weight per EStud. It is estimated at under a pound without any additional additives. Using a carbon black additive(s), the weight may

be increased to around 25% or more. As sequestered carbon we feel 0.60 lbs. within adhesive per EStud is not out of the question. As an additive to EWC's compressed woody biomass composites and composite assemblies carbon additives have not been tested.

12. Woody biomass composites are net carbon neutral and negative. The EStud product example is 2.75-3.15 lbs. in C weight as currently configured. The example uses permanent pressurized bonding for permanent C storage. The inclusion of the ecological expansion of fast cycle sinks places it far ahead of other net negative/neutral attempts or technologies. Not including the ecological expansions, the sample still produces net carbon negative/neutral characteristics by being highly efficient from forest to end use and in its use of renewable materials at almost zero waste, meaning it has the added benefit of not releasing CO_2 as leakage.

IV. Part Four, FMS Mitigation

FMS practices significantly increases forestry recovery durations while maintaining forestry demand. The key to FMS is increasing forestry annual carbon sequestration (as valuation and as biproduct to its use). FMS's is physically applied by forestry stewardship modeled to increase existing fast cycle sink capacities and to add new sinks everywhere possible. These efforts combine to mitigate atmospheric climate change, all of it.

FMS Mitigation Mission Statement:

FMS's mission statement is to end constrained and unconstrained deforestation practices with knowledge, force majeure economics, and the highly improved technologies of advanced woody biomass composites.

Restoring capacity of existing CO_2 forestry sinks greatly lessens atmospheric CO_2 residence time. Reducing atmospheric residence time is required to mitigate CO_2 driven climate change.

FMS understanding's stipulate that no practical way to accomplish global climate mitigation can be successful without developing economic incentives into lasting economic environments. Economic manipulation contributes to all FMS's proposed mitigation efforts. Economics also make-up the center of FMS's mitigation economic principia. The center is focused on the following monetization summaries:

- Monetization of FMS mitigation efforts are needed to create incentives for others to adopt FMS forestry stewardship. With incentives, FMS can create the economic force majeure to perpetually apply FMS mitigation constraints. Incentives are created and maintained with the following:
    - Commercialization of advanced woody biomass composites as lower costing substitutes for many high Green House Gas (GHG) emitting materials and products.
    - Sharing woody biomass composites net negatives to mitigate other industries high GHG emissions with the E^3CO_2 carbon credit created with woody biomass composites uses.

- Globally implementing FMS's advanced standards to carbon credits and offsets to afford more credibility within carbon markets.
- Increase availability of FMS's highly credible and insured carbon credit as the proposed FMSCO_2 carbon credit.
- Establish FMSCO_2 carbon credit and offset supply side with annual landowner incentives while establishing the FMS made credible demand side within cap and trade and volunteer markets.
- Firmly establish the FMSCO_2 carbon credit in contrast with non-FMS conforming rip-offs, truth shielding diversions, and frauds.
- Oversee government's use of FMS's standards in the establishment of carbon credit certification and cap and trade markets.

Mitigation Summaries

Earth's insufficiency of carbon sequestration has proven problematic in global weather events. High CO_2 PPMs in atmospheric residence is quickly becoming a model for a mass human extinction event. Commonly referred to as climate change, global warming, or human impact on the climate, these science-based concerns about climate change are well founded and constantly proved with simple observation. Unfortunately, ongoing misinterpretation of facts, politics, socially eccentric misinformation, and global economic concerns continue to dismiss science-based arguments by ignoring, dismissing, or even claiming climate change does not exist. Post FMS, all those ill-founded arguments are wasting the limited time humans have to adopt climate mitigation measures.

Today, climate change is still considered a looming crisis. FMS observations and data collection does not recognize climate change as just looming; climate change as a crisis started a millennium ago but formed its datum early to mid-19th century (1850). FMS's isolation of the climate changing datum and the new knowledge obtained around that datum ALL propose that humans have been pushing the limits of atmospheric CO_2 residence conditions. Humans today, and for around 30 years now, have been threatening to culminate their emissions and sequestration balance into expanding a runaway greenhouse gas effect for which there could be no recovery for thousands of years. Post FMS, it began in 1950 and has worsened every year since.

FMS explains mitigating climate change can no longer require a geopolitical endeavor because the cure no longer has the time for approval by committee, or intervention from global politics within governments big or small. FMS offers economic science as a component to a global solution. Entirely calculatable, advanced woody biomass composites substitute renewable for non-renewable resources, but unlike any misguided contemporary attempts these composites can be like for like, economic, and structurally based. So, although the use of advanced woody biomass composites can rapidly mitigate climate change, the end user or government will be unaware that their participation is saving the world from climate change. Because sawn and peeled lumber commodities are inefficient compared to advanced woody biomass composites and lack the consumer appeal of composites.

Advanced woody biomass composites components and methods further provide incentive towards ending climate change with global approaches in economics. These incentives cost nothing for economies to participate in and can provide economic stimulus for their participation. The economic nature of advanced woody biomass composites uses, or its production for profit is all that is required to gain both economic incentive and mitigation of climate change permanently. FMS accomplishes this by balancing condition one and two below:

Climate change is a well proven result of the two interrelated conditions below:

Condition One and Two

Condition one, Carbon is introduced into the atmosphere when released from stored or sequestrated carbon as a result of producing energy or materials with fossil fuels.[2] FMS's scope inverts current science conjecture that reductions of carbon emissions is the only solution to mitigate climate change. FMS recognizes that concept as having merit but not as a totality of the cause of climate change, FMS considers emissions as one input to its formulations. Emissions do not form a datum for climate change or climate mitigation because all life on Earth emits CO_2 in one form or another.

Condition two, Carbon accumulates within the atmosphere as a result of inadequate fast cycle sequestration, or the absorbing and subsequent storage of carbon released in condition one's emissions. FMS's focus is on condition two and the impacts of technology and physics as conservation laws. Advanced woody biomass composites patents and FMS recognize condition two as omnipresent. By doing so they propose solutions to balance CO_2 sequestration ratios with condition one's carbon emissions as CO_2. In similarity to advanced woody biomass composites discovery of net zero and negatives with their use combined with FMS. Those combinations propose balance by additional commercialization efforts through cap and trade and volunteer markets. One FMS mitigation effort is not reliant on the other, but each proposes further mitigation benefit to each other and global industries.

FMS proposes global solutions formed by FMS models. Although our economic theory is yet to be proven, the research and development into advanced woody biomass composites like E^3Lumber composites indicate positive effects on the targeted environmental faults. Therefore, the following statements are factual but not yet fully accepted practices of current industrial models or scientific practices. Hence, this FMS paper is written to inform the reader of fact-based new knowledge and theorized mitigation outcomes found in models.

The FMS theory that modeled a Profitable Stewardship is already grounded naturally and within capitalism. For such ambition as positive environmental, economy, and global society impression to be secured specific sources within markets must firmly tie to economic incentive. As such, that incentive requires viability from its source market(s). The Earth naturally, as do most economies, possesses those sources in the form of wood as renewable biomass. However, no Earthly economy has yet to use those renewable resources efficiently or with an FMS proposed valuation to sequestration capacities which is not a renewable. Human nature is to not embrace change until a challenge arrives that forces the issue. That challenge is now climate change mitigation, and the change is FMS.

The many reasons humans have yet to accomplish efficiency in wood biomass is evident in economics and science. A way to do so and gain economically as a lesser economy has not been presented, until now. As for the advanced or large economy, a serious lack of knowledge and the deferred practices of wood products to adopt technology hinders any

[2] This is not the only way carbon is released into the atmosphere. We define this way because it is a human influence on sequestration and to a lesser, release of carbon causing our global crisis.

efficiency advancements. With little room for further interpretation both reasons are well entrenched elements of current CO_2 sink degradation as global deforestation.[3]

Solution Description this paper defines a solution; however, it defines a solution as being of no small matter. Furthermore, solution explanations are subject to having their own individual merits that also combine attempts extraneously with other mitigation efforts. Importantly, FMS's solutions do not require extraneous mitigation efforts but admittingly those mitigation efforts can accelerate FMS's results. FMS solutions outcome are simple and made practical in its works, but the explanation is complicated by being a matrix of data and facts shown simultaneously to create FMS's matrix of results. Not demonstrating in this sort of interdisciplinary matrix presents the solution as a flat Earth and not the global Earth as it needs to be understood. So please bear with us as we begin.

Problem defined, Background.

Industrial age mass reproduced products residually mass produce negative environmental conditions. In broad terms, we continue to decrease human longevity in regard to Earth's occupancy. Available materials associated with industrial age production contribute towards these unintended results. Crops, automobiles, water treatment, consumer goods, computers, and all other human invented technologies have been influenced by mass reproduction standards first founded within industrial revolution. Each contributes to human influenced climate changes and or other environmental conditions. More recently, they continue to produce politically driven, and scarcely self-sourced mitigation or solutions other than absenteeism technics. In additions, engineered mitigations are avoided due to costs associated and affordability to both the lesser and greater economies GDP

The use of non-renewable fossil fuels can be measured as a human influenced release of carbon dioxide into the atmosphere. Whereas **photosynthesis** is the process in green plants and other organisms by which carbohydrates are synthesized from carbon dioxide and a source of hydrogen (usually water), while using light as their energy source. FMS describes photosynthesi**s** as CO_2 sinks. Lack of photosynthesi**s** applies certainty to both escalation and accumulation of atmospheric CO_2. As facts to human reasonable tests, science and other developments play vital roles in the accumulation of environmental culpabilities. Science's influence is significant in both defining practices within the current production and as defining consequences within negative environmental residuals. Standing sciences continue to influence markets as a basis of creating, perpetuating, and improving production without self-sourced mitigation as a requirement.

In contrast, environmental sciences assign most blame to previous physical science developments in sometimes contemptuous definition to demonstrate their negative environmental residuals that are not desired within the shared human condition. But to many ears deafened by profit, environmental science might as well be witchcraft in the fourteenth century. To be sure, both types of science are and will continue to be successful in confrontations without positive ground gained. Not without influence, or respectfully, guidance provided by this FMS paper as their common ground for the two sides to unpolarized and benefit. This paper does not take one science over the other. The paper

[3] These are not the only reasons. Historically, creating farmland, land clearing, and human population increase contribute. Deforestation is an environmental issue onto itself. Although E^3Lumber has a positive effect on unconstrained deforestation, because of its increasing tree growth as a mitigation factor, FMS has not closely studied the theory to its entirety.

applies both sides to classification: A. Provide a viable full mitigation solution and B. use capitalism to do so.

Micro and macroeconomics have influenced sciences more than any technologies or any environmental mitigation effort. This is evident in free markets driven by products in supply and demand, and again demonstrated within closed, semi-closed, or monopolistic markets. The effects of which become influenced product availability, price structures, and all other market conditions to include human opinion. As such, global economies are monetarily indulged to practice within markets that can be influenced or gained from by negating mitigation of environmental negatives to protect uneducated opinion and profit.

FMS recognizes that all economies must participate in nefarious environmental practice when the concerns of economic derivatives for their society outweigh the negative impacts in paying an environmental usurer or changing an ego driven opinion. As such, the lesser of the GDPs in any market shall always seek economic derivatives that result from trade by accounting environmental policies as secondary policies. Therefore, environmental degradation is associated with monetary greed that is derived by geopolitical environment more so than any particular society actually being greedy.

Another concern of FMS is that greed condition is an ego driven opinion to protect profits. Opinions that are misguided or false are often placed publicly as propaganda in diversion or misinformation formats. The ego dispensing the propaganda is typically using their credibility to falsely educate or incite loyalty. FMSs tools to fight this are repetitive truth and empirical results but understands it is an uphill battle in today's socially eccentric societies.

Unfortunately, post FMS, most of today's mitigation practices involving forestry have uninformed promoters ignoring facts, laws of physics, and speaking incomprehensible technological buzz words to justify impractical mitigation schemes and promote non-sustainable practices as renewable. Post FMS, we'll encourage them to recognize those historically entrenched practices as truly uninformed. Prior to FMS, many were admirable in intent and effort, but post FMS they are just not accurate; not anymore.

As an example, forest replanting, emission recoveries, and elimination of fossil fuels are a part of today's universal climate mitigation efforts. By FMS observation, afforestation practices, biological sciences, and like efforts have only allowed global forestry to keep up with human demands, not climate repair. Post FMS standards they all fail by ignoring atmospheric climate change and FMS's defined CO_2 leakage. Those efforts in forestry appear to only seek to keep up and expand forestry demand while further promoting the engrained inefficiencies like FMS's observation of artificial demand. The efforts are firmly perpetuating constrained deforestation practices globally. This type of "fake mitigation" in order to supply demand is accepted as the global norm and has been since antiquity. Post FMS data now states, "It must stop, or we are assured future demise." Whether that is to the leader ignorance, or to our own, can only be decided by testament to a guess." FMS does not guess - it fights with knowledge and empirical data.

Mitigation Proposed Solutions

What is the value of a forest? To FMS and the FMSCO_2 annually surveyed carbon credit the valuation annually increases by the amount the forest converts CO_2 into sequestered carbon. That business model places the value of any forest beyond revenue derived from demand driven wood practices. With one good exception, advanced woody biomass composite production and sale to end-users. Products like E^3Lumber only require a miniscule percentage (8-10%) of a forest's biomass and the residual effect of selling the generated E^3CO_2 or $FMSCO_2$ credits provides landowner incentive and subsidy to supply material for E^3Lumber and let their trees grow. In theory, the combination creates an environmental and business modeled monopoly with force majeure. See Business Model Preamble

FMS establishes CO_2 emissions and carbon storage as relational properties, or as a balanceable. It is a homeostasis type of equation between said conditions one and two. FMS further defines that relationship relevant to the requirements identified by FMS concerning human CO_2 emissions and carbon storage due to adequate sequestration being impeded.

The carbon dioxide relationship promoted in the solution is not intended to negate current or future CO_2 mitigation efforts of condition one. Nor does it substitute condition two's-based solution towards negating known CO_2 reduction efforts to reduce condition one's well-established need for additional, credible mitigation efforts. However, there is no denying that reasonable and intelligent humans will spot that correlation and readily determine the inverse between condition two's solution and condition one's current situation are a stated possibility of lessening condition one's indirect non-FMS mitigation efforts.

In summary, given advanced woody biomass composites proofs within and then back calculated to condition two, mathematically that inverse does present as more than practical; then again, ending mitigation efforts of condition one is not a complacency FMS is willing to endorse and so FMS prefers to hedge the two very different mitigation efforts together in order to ensure positive outcome is obtained sooner rather than too late.

In contrast to current local governmental, world governing mandates, or pacts directing scientifically uninfluenced environmentalism to influence global markets can never mandate onto the lesser what the lesser has not to gain for itself, willfully. In practice, classification of incentives does by advancing the advanced and lesser GDP driven society without the advent or risk of a war's outcome. Furthermore, as the process is intended to be "uninfluenced" the lesser GDP society measured in current geopolitics becomes just as dedicated as the societies practicing either by economies or capitalism in the form of market participation within their own rules. The participating GDP lesser can in fact be either unknowing or knowing that it has fully subscribed with or without permission to adopt environmental practices as "Profitable Stewardism" but nonetheless participates willingly in exchange for derivatives or even more direct benefits.

a) The profitable stewardship model uses compositely formed biomasses to substitute sawn or peeled lumber products provides climate mitigation opportunity. It can also address the recent EPA pellet trade decision as wood burned for energy is considered carbon neutral, which by FMS standards is a falsehood but FMS mitigatable. Directly, Full Mitigation Science demonstrates otherwise within the lack of efficiency in burning wood for energy, FMS expanded definition and applied law of conservation, and renewable and sustainable definitions. Indirectly, full mitigation science can assume that implementing FMS will improve the practice by implementing carbon sinks proportionally with growth valuation and other caveats in supply chains. FMS efforts can mitigate that program and many others so it may become beneficial in renewable supply and net carbon zero in operation.

b) With the latest information of Full Mitigation Science demonstrating the fast cycle carbon sinks importance and as a function of long duration tree growth and combined with full mitigation's stewardship forestry practices like thinning and racking the pellet trade (pellets are composites) could become less than zero impact. However, pellet producers should be prompted economically into profitable stewardship forestry models to offset both their production and the customers use. As subscribers, pellet producers could become a key element in opening the currently choked off forestry canopies and overcrowded clear-cut replants to enhance $C0_2$ sink valuation.

c) Nitrogen accumulation to enhance sequestration. FMS stewardship promotes atmospheric nitrogen extraction and not supplemental ground applied fertilization. Thus, FMS, in theory can potentially reduce streams and river overabundance of nitrogen content brought on by excessive cropland fertilizer use.

d) Global clearing house for mitigation. FMS mitigation uses economics, deposits, and credits to perpetuate its stewardships. One fashion of this model is globally mitigating non-subscribers with subscribers economically. FMS policy technically promotes free riders but cures climate change. An acceptable and temporary trade off, a globally established clearing house can equalize across subscribers and monetize subscription to create incentives for free riders to eventually subscribe.

e) Influences, composite driven practices. Woody Biomass composites are a significant part of climate mitigation. It was through their development FMS was constructed. Their economic influence is yet to be understood by many but soon to be reconciled to the unsubscribed to FMS. Their economic power to fix forestry by fixing forestry products has been made wide open by wood products CO_2 leakage and the industry's lack of technology investment and foresight.

f) Allows thinning, tree retention, recovery. FMS has many forestry stewardships plans all of which apply CO_2 sink restorations above all else. FMS stewardship models must be highly adaptable to geographic regions and even differ within those regions by ecosystems. FMS stewardship relies on expertise and specialists to direct specific means to specific circumstances. But all means adopted are primarily promoting the long term or perpetual maturity of trees by ending constrained and unconstrained deforestation, specifically clearcutting, land clearing (entirety), and the non-mitigation of sequestration value when forestry is used by humans.

g) Stump farms, reforestation incentives timber lands. Stump farms present long-term opportunity for FMS mitigation. Unfortunately, as we now understand, it can take 20-30 years before a replanted stump farm becomes a carbon neutral entity. That reason is why FMS targets older tree plots for FMS. But in no way does the replant effort not fit FMS. Recently replanted clearcuts do not fit sequestration valuations for monetization or climate mitigation, yet. However, replants will be one of the first lowering of FMS mitigation standards that will come into play as funding becomes available. Until then FMS will focus on the largest benefit to climate and environmental mitigation possible, 30–50-year-old replants and natural forests. Those and older if possible.

h) Farms, ranch, city, town, communities (Arbor Foundation) (7). Urban replants can be FMS valued because no clearcut remnants are releasing CO_2. That makes large scale tree planting, even if not on the same piece of land FMS valued. Arbor day or similar foundations could find FMS tracking their surveyable efforts across land or international borders.

i) FMS is also proposing study in soil organic carbon storage to isolate empirical measurements so some types of crop and range lands can become FMS valued.

Mechanisms of FMS Mitigation

1) ⸙ Afforestation

FMS fully endorses replanting and afforestation efforts as means of restoration of unconstrained deforestation. However, replanting clearcuts for a future and immature harvest is by post FMS definition highly constrained deforestation. FMS seeks to end constrained deforestation with highly improved stewardship practices. Afforestation is a long-term but worthwhile effort to FMS. However, replanting a clear cut can take 20-30 years to equal the amount of CO_2 being released by the ground the sapling is planted in. (see Dr Beverly Law's work, Oregon State University)

2) ⸙ Advanced Woody Biomass Composites Introduction

⸙ Advanced materials as woody biomass composites substitute like for like or improve state-of-the-art sawn or peeled lumber products. Combined with FMS stewardship they can calibrate to a scientific net neutral, or even net negative, product modeling. These products combined with FMS practices encompass the only known potential for a full mitigation of past, current, and future fossil fuel use and other problematic CO_2 emissions.

⸙ The woody biomass composite advantage begins by being exceedingly efficient in the use of biomasses and the energy consumption to reproduce components. In comparison to today's wood products, their efficient processes correlate sometimes into 100's of times better ecologically and 1000's of times better for our climate. Woody biomass composites efficiencies can also significantly decrease demand loads on forest resources. They can do this without degrading forestry product demand by substituting current products with like and improved products. They can also increase forestry product demand in markets where woody biomass composites are useful where modern wood-based products are not, like steel, plastics, and concrete markets. Quality and price points of woody biomass composites over state-of-the-art wood products can also be a vast market improvement. As a result, a commercial advantage over sawn or peeled lumber products can be achieved.

⸙ Woody biomass composites can also allocate highly scalable and measurable differences within tree plots (forests). As a measurement, they are capable of extending forest recovery durations by economically ending constrained and unconstrained deforestation. Woody biomass composites use only 6-10% of a plot's biomass resources to substitute 100% use of the plot's resources in constrained deforestation use (as sawn or peeled products).

As further measurement, FMS managed plots allow tree maturity to extend by generations, not decades, and even longer while protecting economic environments. As an FMS outcome, woody biomass composites are one of the ways FMS makes possible the restoration of carbon sinks towards their potential to enhance CO_2 respiration leading to permanent CO_2 sequestration. The development of advanced woody biomass composites led to the development of FMS.

3) ⸙ Offsets and credits, FMSCO2 Bank

See Business Model Preamble

Key points to Woody Biomass Composite's Use

1. Allows forest recovery times to increase without degrading forestry demand.
2. Provides FMS stewardship opportunity to eliminate constrained and unconstrained deforestation.
3. Eliminates GHG emissions from today's highly inefficient forestry biomass uses.
4. Provides stewardship incentives for highly increased recovery durations.

5. Provides incentive for increased replanting of land as forestry reclamation and forestry purposed tracts with monetization of sequestration.
6. Restores fast cycle sinks by targeting existing plots best suited for immediate and measurable sequestration results with incentives.
7. Provides commercialization opportunity for an economic force majeure promoting atmospheric climate mitigating benefits.
8. Provides incentive for increased, perpetuating, and permanent carbon sequestration potentials as new and/or improving.
9. Increase forestry product demand with composite net carbon neutral/negative substitution of materials with significant quality improvements.
10. Incorporates new markets while still capable of increasing forestry recovery durations drastically.
11. Increases product quality while lowering product price points to more common use forestry products.
12. Expands sustainable and renewable carbon neutral practices with potential recycle abilities and low to zero waste logging and manufacturing.
13. Ends tree degradation.

Given time, advanced woody biomass composites promise to substitute much of those with net negative/neutral woody biomass materials or the FMS offset/credits they create. That can be accomplished under FMS because of the efficiency it applies to forestry demand. FMS uses larger mature trees and recycling to eliminate 80-90% of forestry demand while satisfying product and population growth. All while it mitigate climate change entirely.

Mitigation Technology, Advanced Woody Biomass Composites:

Advanced woody biomass composites as homogenous and heterogenous forms or assemblies and further disseminated into assemblies or as shaped or pressure formed assemblies that deliver superior biomass efficiency from the forest to end use comparatively speaking. Within preliminary FMS testing and models E3Lumber has demonstrated the following when compared to sawn or peeled lumber products:

Said composites can efficiently replace inefficiencies found within wood product manufacturing and use. State-of-the-art wood product inefficiencies are known as the following:

Effects:

The effects of Advanced Woody Biomass Materials on mitigation are numerous and relational. They include, but are not limited to, the following observations:

1. Woody biomass materials uses woody biomass solids and adhesives to form components verse solid or peeled wood components. Contemporary wood products are not predominant in efficiency, quality, and their production creates excessive resource waste and CO_2 release in comparison.
2. Advanced Woody Biomass Composites use forestry, per tree harvested, 90-95% more efficiently than state-of-the-**art wood industries and harvest less trees as result**.
3. CO_2 release from production of E^3Lumber products is 10-15% of current wood products.
4. Overall, woody biomass composites are a minimum of a 951% improvement in the initial environmental cost when compared to sawn or peeled wood products.
5. Woody biomass materials products release less CO_2 to produce and ship, compared to current wood products with a 3.2:1 weight advantage

6. Woody biomass materials store additional carbon within its water-based adhesive and can use carbon as an additive for additional net negatives within composition and adhesive.
7. Increased carbon storage with supplemental carbon biproduct additives to woody biomass compositions was made possible with newer technological advancements in adhesives.
8. Woody biomass materials can be used to build renewable material structures that are carbon neutral and negative. Their classification can be further defined as carbon accumulating with FMS practices in forestry stewardship.
9. The utilization of woody biomass materials repairs the significantly damaged global CO_2 fast-cycle sequestration sinks uninfluenced by borders or politics as capitalism-driven products. It can accomplish this without degradation to economies or invoking geopolitical politics with FMS's force majeure.
10. Woody biomass materials enables scaled Full Mitigation Science (FMS) for fossil fuel use within a micro (one acre, or country) or a macro (continent, global) scale.
11. The utilization of woody biomass materials promotes economic expansion of forestry use under profitable stewardship conditions. The effect authored by outlined Full Mitigation Science due to the greater forestry restoration and recovery to use ratios. Both renewal and the degradation of negative impact products were addressed while increasing forestry uses with woody biomass materials alternate market potentials.
12. Woody biomass materials use, as FMS defined, is modeled for positive carbon sequestration events now, in the future, permanently, and with global population and future wood product market expansions.
13. Pound-for-pound woody biomass materials are as strong as steel, highly superior in quality compared to current wood products, cost less to produce, and transport, and more efficient to use. They also build much higher and safer structures.
14. Woody biomass materials provide advancements in engineering that promote a wood industry shift toward advanced renewable materials from current nonrenewable and wasteful resource uses by replicating or closely resembling or improving the current physical properties of contemporary wood products.
15. Woody biomass materials offer a significant means of influencing global economic conditions with or without government or industry permission to implement positive climate changing conditions.
16. E^3Lumber's advanced woody biomass assembly's and materials can theoretically be recycled into new products and materials that are equal to or stronger than the originals. The adhesive solidified is 100% machinable, waterproof, and improves bonding conditions for additional adhesive applications.

Forestry Mitigation Components

Lessening forestry demand enough to allow forest recovery's times without degrading forestry product volumes.

It is not that humans should be globally restricted from forestry resources with abandonment like policies. As a fundamental part of being human, humans will always require forestry resources and should expand those renewable uses by expanding carbon sequestration with the knowledge and technology of advanced woody biomass composites and applying an increase to forestry sequestration valuation.

As FMS proposes; negative climate change is the result of forestry resources being used highly ineffectively and extremely inefficiently to available technology. Global forestry inefficiencies created constrained and unconstrained deforestation which has contributed more to climate change than the use of fossil fuels. Which is to say, fossil fuel use would not have been noticed by modern man's biome had fast cycle CO2 sinks not been impeded from historically provided levels. To reverse this well-established human course FMS suggests the following components:

Christmas Trees or Commercial Plantations?

Under FMS stewardship, FMS prefers Christmas tree like plantations to commercial tree plantations. Commercial tree plantations pack trees close together which is both good and bad. The motivation to do so is to promote tree height and inhibit lower limb development with the neighboring trees shading them. Tightly packed regen also boosts the density of the plot to compensate for mortality. Even so, close-in plantings eventually kill off the slower growing trees by their faster growing neighbors, a sort of Darwinism effect. Directly opposite to commercial regen plots, Christmas tree plots spread out plantings to promote limb growth. FMS recognizes the more limbs the more photosynthesis and the faster the tree acquires usable biomass. Advanced woody biomass composites utilize biomass, not logs, so proportionally use 92-96% of the tree than sawn or peeled lumbers 40-60%. Tree growth has other factors like available water and nutrients and FMS does not account for these in general publications but does so within applied forestry disciplines. Now for the good and an FMS conundrum in replanting trees densely.

A slight conundrum exists within FMS because thinning commercial plots is FMS recognized as a best practice to acquire lower cost and forest benefiting raw materials, Thinning also eliminates clear cutting/replanting which is FMS's main enemy because FMS understands those practices combined are 100% constrained deforestation practices. Yet, the thinning of a Christmas tree plot requires a longer duration before the canopy closes-up so initial thinning and seedling mortality is more difficult to manage. The conundrum is specifically that if everything were Christmas tree plots, the plots may not supply composite product demand without disrupting both biomass supply and sequestration goals. In reality, they could but harvesting those trees would be a constrained deforestation practice because their removal would not necessarily improve the plot's sequestration nor help future regen plantings mature, due to their not being situated closely together when planted. In parks and other areas that will not ever be thinned, generous spacing at the time of planting is by FMS standards a best practice. But the conundrum continues as pointed out by a fantastic study by Dr Beverly Law of Oregon State University.

Dr Law mentioned it can take 10-20 years (FMS speculates even 30 or more years for certain land types) for a typical replanted tree plot to transition from a carbon emitting plot to a carbon neutral plot. Replanted growth requires years to begin sequestering more carbon than the land is emitting. This is one reason FMS's constrained deforestation mitigation targets 20-30 plus year old plots. Mature plots are not only the most advantageous to sequestration valuations they can also supply biomass for advanced woody composites while improving its sequestration and biomass accumulation. It is even possible with FMS standards that recovery times between thinning is half a century, not just decades between the modern practice of clearcutting.

FMS speculates every 40-50 years most tree species in typical locations might allow the plot to be thinned. As an FMS standard, 85-90% of the plot's trees would remain on the plot and that percentage would decrease over time. Longer durations of time provide trees potential growth that increases their biomass. Larger volumes of biomass are to FMS's advantage because each thinning cycle duration can provide larger and larger trees. FMS stewardship means the majority of the plot's trees are not touched for centuries because of woody biomass composite's efficiency's using 92% or more of a tree's biomass that is by far more efficient than sawn or peeled lumber components that use only 40-60% and release all the forest stored carbon, and energy to produce them into the atmosphere. See Wood Products and Forestry for more details.

Timed correctly to FMS standards, each time the plot is thinned the sequestration of the plot can improve within a year or two later. The initial sequestration reduction for thinning can be fully offset by year two because thinning also promotes additional and new growth. Limb (mass and sequestration) production is encouraged by FMS standards by allowing more sunlight into the plot. All the while, the remaining trees are growing and so increasing their sequestration capacities and usable biomass. The thinned trees, under the right stewardship, are not missed and were likely being choked out of the plot by the stronger and healthier trees.

Trees within the FMS stewardship plot are also seeding new growth for future thinning's and future sequestration roles. No replanting of that plot could ever be required after stewardship thinning. Given the time FMS can allow between thinning, most tree species will naturally replace themselves. FMS stewardship promotes natural afforestation to supply sequestration and future thinning biomass but forestry regeneration naturally and unopposed is key to the arrangement. FMS can add 100's if not thousands of years to tree age within FMS managed forestry. The stewards of those forests will be empowered to manage it for sequestration, biomass, and biodiversity values.

Renewable and Sustainable

Is forestry a renewable resource? FMS says yes. Most everything from forestry is renewable, but FMS reminds us it might not be a sustainable resource. Not at current globally applied demand levels and not with wood products inefficiency's ruining the resources quality and quantity; So really the answer is NO, not without advanced woody biomass composites sustainability. Now for a related question that is the FMS theoretical quagmire.

Within FMS Thompson states what trees and forestry do, as sinks and sequestration, which are not a renewable - they are finite. That portion of the tree is a well-used-up resource that is in its final degrading phase. (For a Renewable Resource Refresher) But that only states part of much bigger and numerous problems to impose FMS mitigation. All of which were identified and affirmed by study of advanced woody biomass composites environmental benefits in comparison to the current wood product industry.

V. Part Five, Wood Products and Forestry Inefficiency's

Lumber's nominal measurement system, Artificial Demand. (9)

The modern practice of lumber measurement uses a 'nominal' measurement scale. FMS recognizes nominal measurement of lumber creating significant artificial demand on forestry.

Nominal measurements is an outcome to convenient forestry depletion. Studied by Smith and Wood in 1964 (9) (summarized) is a one side viewpoint of the industry. Post FMS's and also hindsight, the 1924 nominal measurements came from other motivations as well, mainly increasing demand and revenues. Hindsight also points to the two distinguishing factors, first, as the pre 1918 convenient forestry depletion of forestry fast cycle CO_2 sinks that created a sellable justification for nominal measurements to continue tree degradation. Second, nominal measurement practices went on to further entrench impedance of forestry fast cycle CO_2 sinks under highly constrained deforestation practices of today.

CO_2 sinks prior to then and now are still inadequate post FMS standards. Even with the regeneration of trees by replanting it is quite possibly both the beginning and the prolonging of CO_2 driven climate change due to the practice intensifying tree degradation. The nominal measurement timelines corresponding with intensified global temperatures cannot be dismissed easily. The relationship seems clear, the nominal measurement scheme greatly expanded forestry demand as population increased. It did not occur overnight or without help.

Timber barons of ole are responsible for this correction of sizing (as downsizing). Nominal measurement was forced onto the public with economics of a perceived lower price, which is actually higher. Its development was due to the timber companies having harvested most of the continent's 'mature' trees by the 1920-30's. From then on, these timber barons were left with only immature stump farms and regenerated growth to work with. Truly by the 1930's, all convenient forestry had been harvested twice before or even more but by the 1930, the west coast old growth was gone. Nominal measurement began in earnest somewhere in the 1920's and has perpetuated the industry into processing smaller and smaller trees since. Which leads to FMS's tree degradation.

Nominal measurement can be called greed, bad forestry management or what it really was, "answering the public's demand for forestry products with constrained deforestation and making money by doing it." Over the decades from 1900 on, the timber barons answered that demand by reconfiguring their mills for harvesting smaller and smaller diameter trees.

FMS respectfully recognizes that within 50 years and without an E^3Lumber substitute, human beings will be using regen sticks as lumber. Demands on forestry are relational and proportional to increases in population and demand. Since 1916's nominal measurement scale began, a state of decline in lumber quality was also brought on by wood product demand. That decline is one result of nominal measurements artificial demand forcing timber companies to process those smaller and smaller trees.

When a 2 x 4" was in fact a 2" x 4" piece of wood and not a 1.5" x 3.5" nominally measured piece of wood it was a perfect specimen as a building material. That is because the original size was globally engineered to act as a squared load bearing product. That fact is in direct contrast to the many factors that plague the nominally measured version.

As FMS research concluded, nominal measurements create artificial demand as one actual measured 2" x 4" lumber component (load calculation determinants) is equal to 1.25-1.5 multiples or even more of the modern nominally measured 2 x 4's as actually measured and sold as 1.5" x 3.5". That simply means to do the same work (as force or Newtons) you require not just 1.0 engineered 2x4 you need 2 each of the nominally measured 2x4's. So, a 96" 2x4 is 5.33 board foot. The nominally measured 2x4 is 3.5 board feet but to do the same job you need two nominally measured so you must buy 7.0 board feet from the timber baron since nominal measurement was implemented. A 20-30% sales volume increase. Brilliant; yes, but just how brilliant is it now post FMS's having pointed out the climate damage?

When introduced, nominal measurements were touted by timber barons and even government agencies (in capture) as resource saving when in fact, it is just the opposite. One could believe it could only be greedy because timber barons lowered the price of lumber to promote nominal measurement. They did that because they were now selling anywhere from 20-30% more in volume and could afford to sell more for less. Also, as Smith and Wood (9) mentioned in 1964, wood producers have always, "tended to emphasize price over quality." That statement is even truer today because of stiff competition in lumber markets, because eventually the nominal measurement profit center evolved into customary practice. People just accepted it, so it is stuck to us like bubble gum in our hair.

FMS understands nominal measurement decreased lumbers use with inefficiency. The practice in profit significantly increased forestry demand by 25-50% and has since retooled the industry many times for the processing of smaller and smaller trees. Quality is naught, quantity is everything and it shows more today than ever.

Respectfully, nominal measurement perpetuates fast cycle CO_2 impedance by restricting forestry recovery durations within ALL global forests used for contemporary wood productions. One positive residual that did appear from nominal measurement are composites sheets like particle and chip boards. These composites are today becoming more typical in use. Unfortunately, it is not because of forest efficiencies that composites are gaining over sawn or peeled lumber, it is because they can be made from even smaller and smaller trees. FMS mitigation addresses this by shifting away from sawn and peeled to composites and the effect was pleasantly unexpected.

In conclusion to this section, additional demand inflicted on forestry resources by nominal measurements and keeping up with population's growth with that artificial demand strains current forestry and does not allow forestry recovery durations. FMS states recovery durations are critically required. Nominal measurement is another primary key to today's climate changing crisis. Nominal measurement contributes to FMS's primary statement about it not being the use of fossil fuels alone as the climate changing problem. Nominal measurement inefficiencies have become more significant since their now short-sighted introduction to expanding constrained deforestation practices. Nominal measurement has a significant impact on forestry resources that promotes impeded sinks.

The question arises to FMS, which had the larger impact on climate change, fossil fuels or nominal measurement? FMS attempts to state logically using Figure 5 that even the impeded sinks from 1850-1920's shows the value of sequestering CO_2 from the atmosphere, regardless of faster increasing CO_2 emissions and the known degradation to forest occurring. Although the trend for Figure 5's 1850-1920 CO_2 PPM's is increasing, the fast cycle sinks are still establishing peaks and valleys, demonstrating their potential while struggling for an unimpeded existence. So, fossil fuel emissions lose, because after 1920 nominal measurement increased forestry demand by 20-30% and by 1950's population numbers and forestry demand, sawmills began tooling down for smaller and smaller trees because of it. Had the nominal measurement sales gimmick never happened we might have had a few decades before tipping the runaway greenhouse effect in 1950. And accordingly, had they not been able to cut smaller trees in tree degradation confines they would have grown trees much longer and perhaps fixed climate change unintentionally as each timber baron went bankrupt because they gave away their raw material 50-100 years too early. Very wishful thinking.

Entrenched lumber quality and other inefficiencies.

As mentioned, lumber has always emphasized price over quality. In over one hundred years things have not changed, less one incredibly significant factor. Typically, lumber producers no longer have the option to not produce lower quality lumber. Minor exceptions exist, but most common lumber in the U.S. today is No 2 or much less. One hundred years ago, much of today's lumber would have been considered scrap. To FMS, the economic implications of inferior quality provide entry to markets that are otherwise barred.

To make quality lumber sawmills need large diameter trees (10). The only way to achieve this is with mature trees (75-125 years or older). Artificial demand created by nominal measurement had used up the last convenient forestry stocks of mature trees over a century(s) and one half ago. Today, the average saw log diameter is much less than what were common diameters in the Americas. Even tiny 16-18" diameters or less are now commonly used to make wood containing products. Unquestionably, harvesting smaller trees makes lower and lower quality solid wood products like lumber and veneers. These practices have and continue to degrade lumber due to cracks, warping, checks, knots, bug damage, crowns, fastener blowouts, heartwood, and fastener placement and acceptance are all inconsistencies that are more predominant in lumber than ever before. Lumber's deficiencies are increasing per board foot every decade. Smaller and smaller trees being harvested is one issue creating these issues and further explanation of constrained deforestation's effect due to tree degradation.

The waste from lumber's deficiency's creates significant CO_2 leakage that keeps ALL sawn and peeled lumber from FMS's extended definition of being a renewable resource. FMS extended the definition in attempt to classify the waste that is an FMS link to climate change but socially accepted as a 'renewable practice.' It is far from renewable because it is not sustainable. To further the example FMS offers the following.

Typically, 8-18% or much more of a 2 x 4 bunk (shipping unit of lumber) containing 294 studs at 96" in length is warped, twisted, and knot filled junk heading to a fireplace or landfill after its sorted at a job site. All 294 studs were supposed to be No. 2 or better gradable but maintaining that sawmill claim is impossible with small diameter trees and heartwood mixes. This is true anywhere in the world and with minor exceptions applies to ALL lumber board sizes purchased in bulk. In short, the lumber grading system is at best questionable and not consumer orientated. Moreover, the current grading system is advancing constrained deforestation by allowing producers to sell lower quality and higher grades. The consumer and our climate can count on this artificial demand waste as omnipresent because we all have accepted the practice as the norm. That is unfortunate and pointed out by FMS extremely late in the game; but knowing it now does allow woody biomass composites with their higher qualities and lower prices a very possible market entry.

Getting high quality from sawn or peeled lumber products is available but rare and becoming more of a unicorn by the day. Nominal measurement and cutting smaller and smaller immature trees are why. But those constrained deforestation practices also promote an even more damaging artificial demand.

As typical to the arts, around or exceeding 80% of a lumber board's nominal dimensions are used as safety margins within engineering's structural load calculations. These margins account for lumber's nominal sizing and inconsistencies in makeup like cracks, knots, bug damage, warpage, exactas. Unfortunately, the margins also account for lumber being a highly waste filled, CO_2 releasing product because any project that uses lumber requires 20% or less of what you have to buy (and use). FMS defines this as waste generated by nominal measurements artificial demand. In reality, 50-150% increases are suggested in lumber's safety margins within structural wood designs within any referenceable design criteria available.

Forestry to optimize log containing trees

Generically speaking, commercially orientated forestry practices are to replant regenerated "regen" trees after clear-cut harvesting. Regen planting is done as close as possible to compensate for the seedlings mortality rates. These rates could be remarkably high given the situation but 30-50% mortality is not uncommon. This practice mimics the natural seeding of mature trees less one particularly important fact FMS points out. The mature tree was removed during the clear cut and turned into lumber.

As a result, the mature trees absence(s) allows the hundreds of regen trees per acre to crowd each other for sunlight and other resources. The effect of this overcrowding promotes tree growth in height while impeding lower trunk limb growth. Commercial forestry growers do not want lower limbs because their presence is highly detrimental to producing quality saw-able logs. Saw logs are graded by purchase categories; so, more limbs equal less money. Unfortunately, the practice also actively promotes forest fires.

Fire risks were historically shielded from new growth and overall fire intensity was reduced by the mature trees blocking sunlight to reduce understory (burnable fuels growth) from the forests floor. Mature trees were also too tall for fires devastation to reach and many tree species actually need fire to seed new growth. FMS suggests that mature trees did not prevent fires, they controlled them.

In simpler FMS terms, the more limbs the more atmospheric fast cycle CO_2 sequestration. FMS forestry models do not include clear cuts or removing mature trees except to open highly mature canopies that require the next generation of trees or can improve sequestration. Doing so can increase the remaining trees, mature or not, sequestration and fully mitigates the lesser trees harvested.

Thinning harvest practices can be a forestry net CO_2 negative and that net negative can be used to offset products, lands, or industries. Typically, within the next fast carbon cycle, the additional sunlight available to regen and mature trees more than offsets the harvested, lesser trees with other positive residuals to other species who use the forest.

Logging to produce lumber containing products

Graded saw logs are how state-of-the-art logging enterprises earn money. As mentioned above, the less limbs the better the log grades and the more money the logger and timber owner earn. That also means the trees crown (top) and the limbs are biproducts of logging and considered waste by loggers and FMS's calculation of logging waste.

As a given, 40-60% of any tree harvested by logging to produce saw or peeler logs are waste to the logger. Which means 40-60% of the harvested tree releases CO_2 by being burned on logging site as slash piles or for energy production to perpetuate sawn lumber. Contrary to logging's resource use, FMS determines the CO_2 releases and the biomass wasted today is no longer required. Advanced woody biomass composites like E^3Lumber's use 90-96% (dependent on species) of a harvested trees woody biomass. Composites formed from woody biomasses can turn that waste into permanent carbon storage and reliable lower costing products. Under FMS guidelines, using the entirety of the tree harvest effort to produce these composites opens the possibilities of decreasing forestry demand by as much as 92%, while increasing the volume of products produced. See FMS Mitigation for further details.

The manufacturing of sawn or peeled commodities produces additional biomass waste.

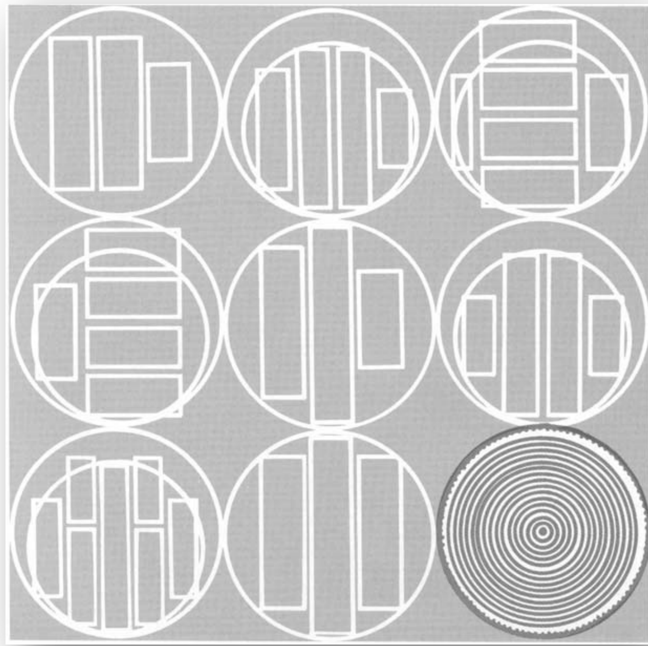


Figure 10, Complement of Factors Determining Lumber Recovery in Sawmilling (10)

Figure 10's illustrations are end views of saw logs to demonstrate lumber recovery waste post debarking waste. Internal circles are the log's taper from one end of log to the other. Rectangles represent various lumber components and the lines around rectangles are created by the saw blade's width known as saw kerf. A saw blade kerf must make a pass at each rectangle's perimeter lines to cut-out rough sawn lumber. Each pass creates more biomass waste to include into the piles created outside of the rectangles. In addition, additional tooling passes are also required to finish products resulting in more CO_2 releasing wastes. Advanced woody composites are capable of not producing any of these wastes.

Peeled lumber products do create less waste when processing logs. Which is more than offset by the rarity of good peeler logs that are creating more logging waste. During processing, the taper and typical 3-5" center post create the largest waste contributor in their production. But peeled lumber products use less tree than sawn.

Rough sawing products from a saw log creates biproducts in the form of bark, sawdust, and unusable tapered scraps as demonstrated in Figure 10 above (10). In sequence or steps of processing a log to lumber: 1 is to debark. Tree bark is typically burned to produce energy. Advanced composites can use some tree barks in their composition. 2. Rough sawn into rough board sizes, this process is time and energy consuming. It also turns as much or more than 30% of the saw log into waste. This waste is commonly burned to generate electricity to saw more logs, whereas some chips or dust created by sawing are occasionally used to make low-grade composites like particle board. Advanced woody biomass composites do not create these wastes by using the entirety of log. 3. Final shape by planer and cut to length to make the sawn lumber sellable in nominal dimensions. Doing so adds another 8-12% of log waste that is also burned for energy or low-grade composites. The production of woody biomass composites does not produce any of these wastes. In all, upwards of 30% of a saw log can be waste components that both waste forestry and release high volumes of CO_2 into the atmosphere.

Peeled lumber products like plywood sheets are produced from peeler logs and use much less of the harvested tree but more of the log itself when compared to saw logs. Typically, peeler and saw logs end up being close to each other's waste equivalence in their logging and manufacturing. Since advanced composites do not have these wastes their release of carbon as CO_2 in manufacturing is limited to the energy inputs to log, process and then place or store materials accordingly. Sawn and peeled products must also perform these acts and so in comparison woody biomass composites and sawn and peeled lumber both release CO_2 within these areas. However, the comparison ends abruptly when the waste is compiled. It is then that sawn and peeled lumber become significant CO_2 emitters and woody biomass sustains net zero to negative emissions. This effect can be described as almost zero waste manufacturing. Its woody biomass composites advantage that improves forestry all the way to the products warehouse.

End use wastes.

1. Up to 20% more material, as lumber, to frame will be ordered over the construction plan's requirements to account for waste created in cutting to length, forming, and quality issues. This waste is also a form of artificial demand. Alternates like advanced woody biomass composites are in this area can be equivalent in construction wastes; but advanced woody biomass composites are recyclable in construction waste form whereas wood product wastes are not and typically end-up in landfills or fireplaces. FMS research has isolated even more dominating waste than construction made possible by artificial demand.
2. Superfluous engineering safety margins due to extremely poor product consistencies create extremely high waste in lumber use. These margins are made involuntary by both nominal dimension, lack of lumber quality, and wood's inconsistencies in product make-up.

Inconsistency and quality issues combine to a minimum of 80% increase to it already artificially demanded wood materials. High margins (as percentage's) are required to safely engineer lumber constructions (11) and are a main culprit to this CO_2 releasing waste associated or spawned by artificial demand. The required margins are very often exceeded competently by 100 to 200% and even more in certain structural load calculations. Engineers really only need >25% of any given lumber board if it could be produced with the consistencies and strengths of advanced woody biomass composites. The environmental impact difference between lumber and woody biomass composites is recognized as an incredibly significant precursor for FMS's understanding of climate change. The difference can be so significant in lessening forestry harvest demand it posed the theory of FMS to be researched. FMS went on to calculate that elimination of those margins would be enough to allow forest recovery times unheard of in any age. All the while, that elimination still made it possible to supply modern and future forestry product demand.

Transportation of Wood Products

Advanced Woody Biomass composites can have a 3.2:1 weight advantage over lumber and peeled lumber products. The weight advantage relates directly to energy used and the cost of distribution. In example: lumber weight typically uses the conveyances weight capacity, whereas advanced composites are more prone to use the conveyances cubic capacity long before weight becomes an issue. In effect, 3 composites can ship to consumers in place of just one lumber component. Less weight means less fuel, fewer vehicles, with less wear, and tear are needed to transport composites. FMS recognizes the potential economic advantage of shipping more for less that comes with less CO_2 released in transportation of goods. The economic advantage is further applied to shipping distances. Extended finished composites shipping ranges are enhanced over sawn and peeled lumber products. See Economics Section for further detail.

VI. Part Six, FMS Calculation and Modeling:

FMS example scenario: Modeled

Scenario is to produce 1,000,000 nominally sized 2 x 4 (actual 1.5 x 3.5 x 96" which = 3.5 board feet) lumber studs or as their substitute 1,000,000 advanced woody biomass composites EStuds as a like for like substitute at 1.09 board feet each (using a known 3.2:1 ratio measured from prototyped EStud to its lumber equivalent).[2]

Within the example inputs we used various ecosystems as least possible inputs for specific input average, or if you prefer, a lowest common denominator is estimated from the numerous ecosystems that commercially grow trees. As an example, coastal Doug Fir trees can tower three hundred feet high, southern pine is something less than one-third of mature Doug Fir's height. So, we used the southern pine as logs and crown heights as input to show FMS's potential within the conservatism used to estimate. The law of large numbers applies to FMS accuracy. However, the intentional limiting of the type of tree (as constrained by height alone) should approach the lower limits of FMS modeling.

The below example requires 25,000 16" diameter, southern pine, and around 30-year-old trees on a 500-acre plot in the southern part of the U.S.

Forestry Inputs: Lumber

(6) DR. Coder's trees per acre average reflects state-of-the-art replanting and basal areas. This table is used to reflect the number of acres required to produce 1,000,000 lumber studs using the inputs from 1 and 2. Hence, the above scenario requires approximately 25,000 trees mentioned to produce the 1,000,000 lumber 2 x 4 studs on approximately 500 acres at 702 feet of basal area per acre.

1. FMS model input is therefore defined as five hundred acres at 70^2 feet of basal area per acre which is about fifty trees per acre that are sixteen" diameter and have produced four each, 16' logs per tree. In short, we hope a conservative estimate to keep acreage use high because basal rates at 16" DBH are up to Basil 140 regularly in tree plantations meaning trees per acre are typically double this estimate (one hundred trees per acre or more).
2. (7) U.S. Department of Energy is cited for carbon sequestration because they included both annual sequestered C tables and C to CO_2 conversion of 3.67. In addition, FMS forestry is more like DOE's urbanized planting suggestions then commercial plot sequestration rates found in (8) due to the openness, tree spacing, and limb production. Note: E^3Lumber materials extracted from commercial plots are FMS's first targeted raw material sources. Material extraction converts commercial plots to more urbanized than commercial sequestration rates.
3. According to (8) (7) FMS defines an initial environmental cost within sequestration sinks of producing 1,000,000 lumber studs. This endeavor cost humans 25,000, 30-year-old 16" Dia. Trees that were sequestrating CO_2.

4. FMS model input according to (7) again becomes: a 30-year-old, an FMS commercially grown tree annually (the year harvested) stored 52.7 lbs. of carbon x 3.67 as lbs. CO_2 conversion = 193.4 lbs. as sink, sequestering ability, of atmospheric fast cycle CO_2 on an annual per tree basis.

5. FMS input equates C into a 3.67 conversion or as 52.7 lbs. of C per tree x 3.67 CO_2 conversion = 193.409 lbs. CO_2. So, 1,000,000 lumber 2 x 4 studs as 4,835,225 lbs. of annual CO_2 sequestration sink ability is neutralized as the initial environmental cost of producing 1,000,000 lumber 2 x 4's: and, conservatively in references.

6. FMS does not project a final cost because it is now understood by FMS that lumber is both adding CO_2 to atmosphere and is infinitely detrimental to current and future fast cycle CO_2 sinks. Sequestration abilities and FMS is disruptive to the economically motivated publications saying otherwise. The want of atmospheric sequestration by current climate change conditions found within commercial forestry using dated lumber practices are destroying their industry and the worlds natural CO_2 sinks that are the only way to pragmatically fight climate change.

1. (12) **Petersen's lumber to tree measurements provides gross board foot measurements prior to milling. To accurately depict a net for a lumber 2 x 4 FMS also applies input number 1**.

1. FMS model input = 4 logs at 16' length = 62.5 board foot per log x 4 = 250 board foot per 30-year-old 16" diameter tree.

2. Accordingly, that also produces FMS input at 166 board foot of biomass waste from harvesting the tree without harvesting its crown or limbs.

3. 250 board foot in logs + 166 board foot in waste = 416 board foot available to biomass composites. 416 available / 166 used is 2.807 or 281% in biomass used or an additional 250 board feet per tree used by advanced woody biomass composites.

4. Within this portion of input, FMS does not currently account for the 416 board feet of biomass expansion at advanced woody biomass composites decreased density do to processing the tree into chips and grains of materials. As example E[3]Lumber uses electrostatically organized chips and grains (13) not solid boards therefore aeration occurs. Thus, 416 board feet becomes 416 board foot x 1.20 = 499.2 cubic feet to account for E[3]Lumber's less than lumber's mass density as lumber boards = 1 and advanced woody biomass composites mass density average around 0.80. This 20% aeration is estimated and not currently used in FMS model calculations. It does look to be a significant future addition to FMS forestry calculations once it is permanently isolated.

2. (10) Philip Steele's Lumber Recovery (Figure 10) pictorially demonstrates number of studs produced along with a notable example of woody biomass waste generated within contemporary sawmill operations. Input number 1 above indicates a gross production equal to producing a 2 x 4 board requiring 3.5 board feet of the tree. That gross figure **becomes 250 total board feet available per the 4 logs captured per tree / 3.50 board feet = 71.42 gross lumber 2 x 4 studs**. However, that is not possible and as demonstrated in this reference, the net lumber 2 x 4 studs after the best lumber recovery efforts of modern saw milling are around 70%. That is also not accurate because the 70% figure only produces rough sawn lumber not finished sellable lumber.

1. FMS input is therefore defined as a single tree converted into 2 x 4 lumber studs obtained from number 1's gross estimate of 250 board feet per tree.

2. FMS input is also defined as 30% of the 4 saw logs mass is waste from rough sawing and input as 75 board feet of biomass waste derived.[4] **So, 250 gross board feet less 30% = 175 board feet as rough sawn lumber 2 x 4 studs.**
3. FMS input is further defined as 8% waste generated from rough sawn board feet for cut to length and shaping of rough sawn lumber into sellable finished units. As demonstrated as 175 board feet - 8% = 140 board feet as net of finished lumber 2 x 4s available.
4. So, 140 board feet / 3.5 board feet per 2 x 4 = 40 lumber 2 x 4's produced per the entire 416 board foot available from each tree harvested.
5. Therefore 416 board feet – 140 board feet = 276 board feet is biomass waste.
6. Furthermore, 416 board feet / 276 board feet = 0.66 or 66% of the harvested tree's biomass is or will be releasing CO_2.
7. Carbon released is estimated at 0.43 (43%) of total dry weight of wood (7). (14)**Long leaf pine is 41 lbs. per cubic foot (12" x 12" x 12") / board foot (1" x 12" x 12") or 12 = 3.41 dry weight lbs. per board foot. Therefore, 3.41 dry weight lbs. per board foot x 276 board foot waste per tree = 941 lbs. dry board foot weight per tree. Thus, 941 lbs. per tree x 0.43 stored carbon conversion = 404.63 lbs. C per tree released in lumber production waste derived from wood biomass as 404.63 lbs. C x 3.67 CO_2 conversion = 1,485 lbs. CO_2 released per tree.**
8. In this example, 404.63 lbs. carbon are released per tree harvested and is not currently added to FMS calculations. FMS considers the entire tree as lumber's initial environmental cost because it releases doubles what a 2 x 4 sequesters.
1. As represented in g. a 3.5 board foot lumber 2 x 4 = 3.41 lbs. of C sequestered.
2. 3.41 lbs. of C x above section d. 40 per tree 2 x 4's = 136.4 lbs. C sequestered as 40 lumber 2 x 4's. Or as expressed in FMS's knowledge as a net positive by 404.63 released C – 136.4 lbs. C sequestered = 268.23 lbs. released C / 40 studs = 6.70 C x 3.67 conversion = 24.61 lbs. CO_2 released per lumber 2 x 4 stud. This does account for some production energy consumption but not harvesting, handling, or transportation CO_2 energy releases. As FMS indicates sawn or peeled lumber products are environmental killers.
9. As CO_2 released is estimated with amu of C = 12 amu O = 16 amu so CO_2 = 44 amu. Or 44.0095 g/mol or 0.09702433919489 lbs./mol. 6.023 x 1023 molecules. 3.67 conversion for pounds C to CO_2 is derived from the DOE's report (7). **More accurate conversions specific to mass density exist and need research.**

Forestry Inputs: E^3Lumber's EStud Comparison

A. Lumbers 1,000,000 stud FMS input = 4 logs at 16' length is 250 board foot per 30-year-old 16" diameter tree. 250 board foot of biomass used of 416 board feet available.

E^3Lumber's, 1,000,000 EStuds FMS input = a minimum of 92% of biomass used in tree harvest. Therefore, in this scenario E^3Lumber can use **382.72** board feet of the **416** available. As 1.52 or 152% increase in biomass harvest (logging) efficiency over lumber.
Lumber therefore uses all 23,000 trees EStud only uses 12.38% or 2,848 trees in this calculation. **20,152 trees remain.**

[4] The majority of this sawmill generated waste is burned to produce energy in order to run the mill. Some portion is also used to produce state of the art wood sheet composites. E3Lumber can use those substandard sheets within its hybrid assemblies and has prototyped such assemblies.

B. FMS input is defined as tree converted into 2 x 4 lumber studs obtained from number estimate at 71.42 from one tree's biomass. EStuds produced are a known 3.2:1 in board foot or biomass use with zero initial waste. [5] Therefore 71.42 lumber studs x 3.2 is 228.57 EStuds produced with the 250 gross board feet/3.5 x 3.2 and another 151.77 EStuds are produced from the 166 gross board feet of lumbers logging waste/3.5 x 3.2. **So, 151.77 + 228.57 = 380.34 E-Studs from one tree's biomass** (within this example). That is 8.86 times more and a highly efficient use of the tree's biomass. Or 886% more efficient use of biomass over lumber conservatively: As check to FMS, 416 Board feet per tree is available / 1.09 as the EStud board foot requirement = 381.65 EStuds per tree harvested. (+ 1.31 EStuds per tree or accurate to less than 1%).
C. FMS input is also defined as 30% of the saw logs mass as waste from sawmilling and input as 75 board feet of biomass waste derived.[6] Accounted for above in number 2 by using 3.5 board foot per lumber stud / 3.2:1 as 1.09 lumber stud to EStud ratio.
D. FMS input is further defined as 11% waste generated from gross board feet for cut to length and shaping of rough sawn lumber into sellable units. 16.5 board feet. Accounted for above in number 2 by using 3.5 board foot per lumber stud / 3.2:1 as 1.09
A. FMS input is therefore defined as 500 acres at 70^2 feet of basal area per acre which is about 50 trees per acre that are 16" diameter and produced 4, 16' logs per tree. In short, a very conservative estimate to keep acreage use high because basal rates at 16" DBH are up to Basil 140 regularly in tree plantations meaning trees per acre are typically double this estimate (100 trees per acre). EStuds, as demonstrated above do not require higher tree counts per acre. FMS prefers fuller, more limb containing trees for better sinks. Harvested thinning of current commercial plots as opposed to clear cutting of them is a portion of FMS's plan. FMS has the ability to force majeure that difference economically and profitably to current plot owners and EWC.
B. FMS input here is defined as an environmental cost within sequestration sinks of producing 1,000,000 lumber studs. This endeavor cost humans 25,000, 30-year-old 16" Dia. trees. As 1,000,000 E Studs EWC only uses 2,629 total trees. Leaving 22,371 trees still growing and acting as fast cycle CO_2 sinks.
C. FMS input according to (7) **again, this 30-year-old, commercially grown tree annually (the year harvested) stored 52.7 lbs. of carbon x 3.2 amu = 183.04 lbs. as sink, sequestering ability, of atmospheric fast cycle CO_2 on an annual per tree basis.** EStuds 22,371 remaining trees are still fast cycle sinks with no demand for their immediate harvest. 22,371 trees x 183.04 lbs. CO_2 = 4,094,787.84 lbs. CO_2 and still growing at nonlinear rates, almost exponentially.
D. FMS input equates to 1,000,000 lumber 2 x 4 studs as 4,576,000.00 lbs. of annual CO_2 sequestration sink ability as the initial environmental cost. FMS does not project a final cost because it is infinite over tree growth durations (and the cause of climate change). EStuds initial and final environmental cost is 481,212 lbs. CO_2 sink ability. It is also a final cost because once an acre or plot is conformed to FMS's environmental

[5] This outcome takes in account a mass density of lumber equal to 1 and EStuds prototyped estimated mass density estimated at 0.82. As lumber mass density decomposed into biomass grains.

[6] The majority of this sawmill generated waste is burned to produce energy in order to run the mill. Some portion is also used to produce state of the art wood sheet composites. E3Lumber can use those substandard sheets within its hybrid assemblies and has prototyped such assemblies.

stewardship standards EWC targets a different plot or tree plantation. Supplementally, E3Lumber components are 100% recyclable so EWC's raw material sources are influenced differently over time.

Advancing Duration of Model to 60 years:

The Examples Expansion will now equate population increase in thirty-years to be double of year 2022. Naturally assumed, the demand on forestry using state-of-the-art lumber practices also doubles; as assumed, those same practices have not changed in one hundred years**.**

A. FMS input equates double the forestry demand. Therefore 50,000 trees from initial 25,000 are now needed to produce 2,000,000 lumber 2 x 4's. Whereas, EStud demand on forestry does not double.

Producing 2,000,000 EStuds 30 years from now is influenced first by the E3Lumber recycling supply chains. Since FMS currently does not have culpable numbers for E3Lumber recycling we do not use them in FMS calculations. Their influence is certainly vast but to prove FMS's point, surprisingly, they are not required.

For this scenario FMS does assume that 30 years later the original 500-acre plot is up to FMS standards. Therefore, FMS is using the lower limit again and a worst-case scenario to produce the 2,000,000 E-Studs in comparison to the same lumber 2 x 4's. This example conservatively demonstrates FMS's full potential as a lower limit.

A. 23, 371 trees remained growing for thirty additional years. They are now 60 years old and during that year in the future each will sequester 138 lbs. of Carbon x 3.67 CO_2 conversion = as 506 lbs. CO_2 Sequestered annually.

B. The trees in this plot have grown to an average 25-30" in diameter and now contain approximately 1200 board foot in 4, 16' logs with 448 board foot of crown and limbs. In all, 1648 board foot is available to the EStud 1200 to lumber 2 x 4's. Per tree as 1200 board feet / 3.5 board feet = 342.8 in gross lumber studs x 3.2:1 (EStud mass density ratio) = 1,506.74 EStuds per tree. So, 2,000,000 EStuds required / 1506.74 = 1327.36 trees remaining are all that is required from the 35 years ago plot.

i. Additional thinning is performed to obtain those slower growing trees from that plot. That thinning opens the tree canopy up and allows the remaining 22,044 trees to further enhance sequestration sink efforts by growing in height and developing more limbs. The net effect is a state-of-the-art calculated and initial environmental cost of 1327.36 trees x 460 lbs. of CO_2 Sink ability = 610,585 lbs. of CO_2 Sink ability lost that year but that is highly incorrect. The interesting part of FMS is this future forestry demand has less than zero environmental cost. That is because within the same 12-month duration, those 22, 044 remaining trees more than make-up the 1327.36 harvested sink losses and then some. The thinning is a carbon net negative as an ecological improvement. That improvement allows more sunlight to reach the remaining 22,044 trees. As we know, the additional sunlight creates more photosynthesis activity and thus improves the plots sequester sinks because the trees are always looking for sunlight to promote their growth. The more growth, the faster cycle CO_2 sequestration.

Additional materials substituted by E3Lumber. Currently FMS lacks this input. However, additional demand is an implied outcome of woody biomass composite adoption.

FMS Forestry Output Summary

The tangibles of E^3Lumber's EM^2Material as defined by FMS:

1. Market demand on forestry is drastically decreased although E^3Lumber product demand can drastically increase with little to no effect on future forestry demand. As a result, forestry CO_2 fast cycle sinks exponentially improve as E^3Lumber demand increases its substitution of lumber. For replacement figures see vi)

a. Globally, accounting for existing fast cycle sink ability is unknow. However, the FMS demonstration of five hundred acres resulted in a factor of 9.51 and therefore a clear 951% improvement in the initial environmental cost. Plus, a real possibility of less than zero in future environmental cost. Therefore, saying the FMS E^3Lumber contribution is at least a 1,900% improvement to fast cycle carbon sinks is clearly demonstrated within the numbers.

2. The culmination of improving **forestry CO_2 sink abilities up to 1,900%** on the roughly 471 million commercial timber acres out of 741 million forest acres available and (15) within the U.S. alone is as follows. The below assumes E^3Lumber substitutes lumber production as an improvement not replacement.

i) 471,000,000 acres / 500-acre example = 942,000 timber plots sized at 500 acres.

ii) Initial environmental cost saving is calculated as lumber's cost of 4,576,000 lbs. of CO_2 sink ability – EStud's 481,212 lbs. of CO_2 sink ability = 4,094,788 lbs. of CO_2 sink remaining and as a 951% improvement.

iii) 942,000, 500-acre plots x 4,094,788 lbs. of CO_2 sink ability saved initially.
= $3.85729E^{12}$ or 1,928,645,148 tonnes of CO_2 sink ability (1.929 giga tonnes).

iv) As time passes the almost exponential effect occurs in sink enhancements from FMS tree growth models. To summarize this effect FMS applies the 1,900% improvement 35 years from todays 500-acre example:

v) 1.9 billion tons of CO_2 sink ability x 1900% = 36,644,257,812 tonnes annually (36.644 giga tonnes) and still growing almost exponentially.

vi) FMS considers current forestry sequestration rates as negligible due to their highly impeded nature and the improvements FMS calculates as a difference in environmental costs.

vii) The 471 million acres are represented as a majority of currently constrained deforestation managed reversed into FMS standards and do not reflect the initial environmental costs of producing lumber or using E3Lumber as a substitute. The results are meant to reflect a perfected FMS scenario applied to all acres and not reflect partially applied FMS results. Partial results are easy enough to obtain by reducing results in percentage of FMS not applied to those acres.

viii) The United States forests make-up 7.5% of the world's forests. (15) These numbers carried to global E^3Lumber substitutions of just one market known as sawn lumber become $3.536170879 \times 10^{12}$ of **tonnes** that's (353.6 giga tonnes) of annual CO_2 sequestration by sink restoration alone. Additional carbon released as *CO_2* over the same acres by substitution of woody biomass composites annually could be as high as fourteen giga tonnes of *CO_2* annually is one estimate. FMS has not yet locked that number down and it needs to further be compiled; however, the estimate is likely too low given forest decomposition from clear cuts and FMS described constrained deforestation inefficiencies in product productions.

ix) Model uses and their factors are constrained to achieve the lower limit to what it could be. Those factors include the height, and type of tree, 3.2 amu instead of 3.63 amu conversion. So, the model is in fact ultra conservative in establishing a lower limit and meant to demonstrate FMS's unlimited potential in establishing an upper limit.

Assumptions of FMS Modeled Examples:

1) An assumption of FMS is that a proportional use of E^3Lumber globally can **over correct** current climate change conditions. Which places humanity in a unique position of potentially being able to control the Earth's thermostat via a noncomplex but widespread mechanism. The over correcting of CO_2 sink abilities is part of the natural balance. CO_2 sinks self-regulate their intake to available atmospheric CO_2 by respiration as CO_2 fertilization. Before human impedance, fast cycle sink capacities exceeded planetary CO_2 emissions by as much as 100 to 1 and was not detrimental to forestry or humans. Plants adjust their intakes to the available CO_2.
2) Assuming FMS is only 10% correct in its modelling, the FMS/E^3Lumber combination still models to fully mitigate global past, current, and future fossil fuel uses. It does, however, require a significant increase in duration.
3) FMS results do indicate fossil fuel use in energy production are mitigatable proportionally to E^3Lumber or FMS commercialization. FMS does not specifically advocate the use of fossil fuels for energy production. FMS's official stance is to eliminate their use for energy as entirely practical due to unmitigable factors associated with their use and requirements for their use ingrained in supporting populations.
4) FMS assumes a position of advocating the use of fossil fuels for all the other benefits they bring to our societies; but, under highly improved engineered controls.
5) FMS can be applied to other environmental or engineering problems as well as lumber.
6) Globally, FMS is capitalism driven but FMS assumes technology and intellectual property transfers are potentially geopolitically problematic.
7) FMS assumes its commercialization is the sale of FMSCO_2 carbon credits and offsets to fossil fuel users. E^3Lumber's commercialization is consumer products and E^3CO_2. Both commercialization efforts are idealistically synchronized to the other, but FMS relies heavily on E^3Lumber's commercialization to generate E^3CO_2 credits. However, FMSCO_2 credits can be generated by landowner agreement through inputs like tree planting, timber companies, conservation nonprofits and wood industry in general.

Further consideration within FMS's Models.

FMS considers a decrease in CO_2 fossil fuel emissions may not translate into stabilization of atmospheric CO_2 PPM's. FMS predicts that CO_2 emissions from population growth, manufacturing, and agriculture expansions (as land uses) could offset any declining fossil fuel emissions. FMS references animal respiratory increases due to population and general CO_2 leakage in producing green energy products (to include wind, solar, and battery devices). Each of which will continue to rise in respective GHG emissions with population and could eventually equal today's fossil fuel emissions. As a long-term consideration of FMS, the globes increasing CO_2 emissions are demonstrated by Figure 5's observations. Although Figure 5's speaks with historical fossil fuel data an upward trend is undeniable in CO_2 emissions and PPM's. Human endeavors do account for a portion of these measurements. FMS forecasts the equalization of fossil fuels and human endeavor emissions to culminate (if unmitigated by FMS) into increased atmospheric CO_2 PPM's due to increasing residence time.

CO_2 accumulates within Earth's atmosphere during its **"residence time."** (16) The length of this time can vary greatly; however, CO_2 can be sequestered into carbon storage within 1-5 years through available, unimpeded, and natural fast cycling sink processes. Currently CO_2 residence time is almost perpetual according to data from Figures 3-4. The processes that FMS practices to restore sinks can significantly influence and reduce atmospheric residence time. Other processes, such as CO_2 absorption via soils and cycling into the deep ocean can take hundreds to thousands of years and are difficult to manipulate (although FMS mitigation efforts can positively affect these sinks as well, FMS research is still inconclusive as to how to accurately measure and model results).

One of the conclusions of FMS's understanding of residence time is fairly bleak. FMS study has concluded if humans stopped emitting fossil fuel CO_2 today but still subscribed to current fast cycle CO_2 impedances, it could take several hundred years, if ever, before the majority of excess CO_2 in atmospheric residence could be removed from the atmosphere (16) under existing sink impediments. As mentioned previously, human endeavor emissions are increasing and will eventually match today's fossil fuel emissions. FMS targets this and other residence time factors.

FMS's fast cycle CO_2 restorations can provide a logarithmic increase in sequestration that can proportionally reduce atmospheric CO_2 PPM's by decreasing CO_2 **residence time**. To further consolidate that conclusion, FMS's proposed improvements and restorations to fast cycle CO_2 sinks could exponentially present much greater opportunity for CO_2 molecules to sequester into woody biomass carbon storage sooner and should equate to decreasing atmospheric **residence time**. As an intended result, global CO_2 emissions measured annually and excess in residence are both sequestered.

FMS and use of an Inverse Square Law.

FMS uses an inverse-square law to define CO_2 sequestration as inversely proportional to the square of the maturity of a tree or forestry in years. The maturity of a forest increases by a square^2 $\propto$ sequestration. Or simply defined as CO_2 sequestration $\propto$ (Forest Age)^2 . Therefore, lower forestry ages result in less available sequestration. There is a positive note to this relationship in modern context; increasing forest maturity increases CO_2 sequestration ability.

VII. Part Seven, Basic FMS Economics

FMS results are not outliers or impractical solutions to climate mitigation. Like all programs that seek results FMS relies on economics. FMS states that global climate mitigation can only be made successful with economic incentives forming lasting economic environments. FMS's economic principia is meant to curb atmospheric driven climate change with an economic force majeure.

Economic Environments:

- The economics of woody composites should be calculatable in terms of all markets. Woody biomass is a readily available and renewable resource. Provided it can substitute as a composite for current wood industry products, like for like. The potential environment founded on efficiency and not artificial demand, impeded sinks, and constrained deforestation potentially mitigates the entirety of unbalanced sequestration.
- Pursuit of additional woody biomass composites now appears highly relevant to the wood industry's economic environment. The quality of sawn lumber is horrible due to tree degradation (constrained deforestation), due to smaller and smaller trees being harvested.

The nominal dimensional aspects are truly wasteful by creating artificial demand. The forestry practices are founded on instant gratification and not product quality or long-term planning. The economic environment formed is that of the wood industries, inefficiencies and wastes being passed as the norm. The environment precludes zero environmental benefits and serves as a GHG producer that could be responsible for one-third of CO2 within excessive atmospheric residence conditions as releases and the entirety of excessive CO2 residence in practices.

- The economies of current wood products have been successfully manipulated with capitalism as supply and demand. Systemically, the entrenched structure of the current industry and the corresponding public demand driving negative climate impact can be unentrenched with economic intervention and not requiring new or the expansions of law or policies. However, laws regarding constrained deforestation could be of future use in mitigation efforts. Advanced woody biomass composites higher quality can be held in contrast with current wood industry's practices and make consumerism, not laws a practical means of intervening economies to force change quickly enough to make a climate difference. Part of force majeure economics.
- Economic environments that provided access forestry resources to maintain FMS stewardship is required. As a component of FMS, it is how forestry demanded and how its resources are used and then replenished that is the smoking gun in human influenced climate change. Hence, human motivation to access forestry resources should no longer be influenced by sawn or peeled wood commodities. A positive economic environment based on incentives that curtail forestry access to FMS established or other efficient uses.
- Advanced woody biomass composites naturally apply economic incentive to not access forestry resources in climate changing inefficient manors. The woody biomass economic environment acts as either an economic deterrent in supply and demand or incentive in supply capture. The woody biomass composite product substitutions can effectively scale human forestry demand to the requirements of forest recovery durations as measured in longer tree growth durations for FMS. However, they do not hinder consumer forestry product supply in doing so because of their higher levels of efficiency achieved with woody biomass composites (as high as a 3 to 1 advantage).
- FMS does not advocate the use of fossil fuels but fully endorses the impracticable nature for a reduction to zero fossil fuel use within planetary energy requirements. The technologies to replace fossil fuel use entirely just do not exist, regardless of their potential yet. FMS fully recognizes current fossil fuel economic environments are both a singular FMS input and as a climate negative input that is a requirement to maintain current human populations. Fossil fuel reductions and substitutions are a priority issue to ongoing climate change mitigation. Moreover, fossil fuels are regrettably entwined to full mitigation science economic environments as outcomes. Current global carbon-based energy production and said composite reproductions are interrelated in adhesives and energy supply need for production. Lessening fossil fuel uses advances FMS mitigations hurriedly. However, FMS also reluctantly, and unexpectedly modeled an ability to offset fossil fuel uses with both woody biomass composites net negatives and FMS credits. Still, it is an imperative to human health and well fair that CO2 and other fossil fuel greenhouse gas emissions are reduced because of the instant positive potential on climate change and environment. FMS does not hypothesize any sizable manipulation in fossil fuel economic environments.

Greater Economies

- Least impacted economics with implementation of Woody Biomass composites is the greater economy (potential mitigation impact is large due to incentives). Solid wood dependent producers will remain dominate during composite substitution introduction and their ongoing development, but eventually solid and peeled wood could succumb to composites because of the long-term effects of constrained deforestation elimination combining with FMS driven economic environments. The greater logging markets (as commodity) are the primary opponent in the mainstay of solid and peeled wood commodities, but that environment can be transformed into composite manufacturing and as anticipated as an even economic trade-off. As wood products succumb to composite substitution the effect should multiply into FMS stewardship and climate mitigation. It should all trade equally into composite manufacturing but could become decisions made around machinery life cycles or by way of 63positioned increasing demand for the better than wood as woody biomass composites. Wood markets collapsing away from a non-FMS climate mitigating participant can also be an incentive to adopt woody biomass composites to remain competitive in developing woody biomass markets. Which FMS defines as force majeure economics below.
- Greater or lesser economies that increase composite demand applies an interesting macro effect. Conservation of forestry resources can increase even as demand for composite goods increases. By the reduction of sawn or peeled lumber by known inefficiencies and implementing composite substitution at the 3 to 1 component ratio completes a reduction of forestry use while increasing product volumes is possible. FMS projects this because of the higher quality and lower price points of the composites in comparison to current wood industry goods and their availability.
- Globally, composite demand increases conservation, sequestration, and equalizes market demand toward climate mitigation. Ideally, the greater economies providing offset opportunity to the lesser economies even-out as suppliers of biomass composites and biomass materials emerge. This effect should be measurable in the greater's conservation of their own FMS monetized forestry first. Though supply and the lessers increasing internal valuation of forestry; as such, the conservation of the lessers forestry resources is improved over time equal to the greater's monetized cap and trade position that offset the lessers setbacks or breaches. (See Lesser Economies below for referenced work).
- The initial economies of composite pricing provide greater demand for composites over traditional wood products which lower the cost to use and mitigates climate change. Commodities such as building materials are in price ratio to their usable demand. Ideally, the lower building materials costs the higher the increase in the number of building projects. The effect could increase the monetized portion of FMS while increasing woody biomass composite sales. In turn the relation could create an accelerated climate mitigation in both greater and lesser economies.
- Greater economies that lead implementation of FMS and embrace advanced woody biomass composites stand the most to gain globally. FMS commercialization creates cap and trade, domestic products with foreign market potentials. Advanced woody biomass composites can substitute into all known wood driven markets and many other non-wood driven markets with global economic advantages. Advantages are gained as market leader and then as a market maker with intellectual properties. Both avenues mitigate climate change exponentially and provide the impetus, to a greater economy. The many market

controlling conditions as a profit contending global market maker can be used to further FMS mitigation efforts in lesser economic environments profitably. Notably, FMS's potential commercialization could spark an economic environment as a highly credible carbon bank. This potential is currently being researched.

Lesser Economies

- As an example of a lesser economy. Brazilian, Venezuela, Ukraine, Vietnam, etc…Most non-EU or non-North American are lessers in ways, but one size does not fit all. Many lessers that FMS has considered are rain forest or tropic economies and usually have a high agrarian component to their respective GDP's. In addition, deforestation practices, or land use as unconstrained deforestation in lesser economies can be the only means for guaranteed expansion or access to other resources revenues. As a result, today's wood as raw material holds little real value because it is not producing a tradeable commodity, cash, or edible crop. Most forestry cleared by the lesser is typically burned in the place it was cleared from and a significant release of CO_2. Woody Biomass production potentially adds valuation to that forestry and implements biodiversity enabled forests as crop and forest lands. Woody Biomass or FMS incentives can go a long way into paying for forest stewardship. Woody Composite technology can also economically shift farmland clearing into more biodiverse practices and away from constrained and unconstrained deforestation by decreasing those other resources valuations. FMS offers an improving the lessers internal forestry valuations by increasing it over time to form an FMS economic environment that is intended to flourish perpetually. The effort is surrounded by monetized and ethically applied incentives to promote and pay for climate mitigation efforts to locals not governments. Global banking allows payment to individuals unregulated by questionable entities.
- As global demand for woody biomass begins the greater economies (Like USA) demand on forestry decrease (as artificial and general forestry demand is corrected). In effect, devaluing the greater's need for wood supply should equalize with the lessers becoming more abundant and available supply. The lesser is positioned to enter a level, as FMS equalized raw material market (lesser will likely have labor advantages). Valuation of their supply economically equalizes with the greater's decreasing supply making the lessers valuation increase. The lessers forests becomes worthwhile to not burn it in place but manage for their specific and incentive monetized greater good.
- Lesser economies have numerous sawn and peeled wood industries. Shifting or converting to woody composites is almost zero cost as the practice is dictated by machinery life cycles and therefore a monetary exchange or cost increasing upgrades are expected. The greater's investment into the lesser is also expected as it becomes practical to expand FMS stewardship's monetization of carbon accumulation. Over an abbreviated period of time export of both woody biomass fibers and finished woody biomass composites can add more value to the lesser's forests while providing FMS stewardship. Climate benefits are expected with both the greater investment and lessers conversions that are bolstered into action by FMS incentives emancipating both from constrained deforestation.
- Supplementally, greater empowered lesser economies with FMS and woody biomass composites are economically and environmentally incentivized to import from the other while offset sharing the others conversion. As FMS stewardship increases forestry sequestration and composite production, forestry valuations also increase. By adding value to any raw FMS managed material or sequestration supply climate mitigation is propelled.

- Loss of jobs or downside economic environments are not considered a factor in the lessers relationship with FMS. It is only a shift of labor into producing composites from current waste bearing process while thinning, stewardship, and sequestration practices substitute no longer required labor Composite assemblies (not materials) can require more labor to produce but typically gain efficiency in shipping and their use. Composite reproduction can be considered at a minimum a direct labor trade-off and the traded logging labor is transformed into climate benefiting efforts. All FMS based activities reduce CO2 emissions significantly in comparison to solid or peeled wood products of today.

Subscribed and unsubscribed economic environments

As subscribed, to FMS,

- As subscribed, FMS economic environments are formed into taking steps towards the substitution of wood or peeled lumber with woody biomass composites and FMS sequestration incentives. It is expected that subscribing entities will begin effectively controlling woody biomass markets (as forests) towards FMS's climate changing benefits rapidly. That control is also protected due to intellectual property laws FMS has applied to and by being proportional in FMS standards and stewardships guarding from within the greater's more advanced economies. Control in establishing markets is also believed to begin generating global demand in the unsubscribed but now incentivized lesser economies to adopt FMS processes.

Unsubscribed to FMS

- Capitalism driven free markets are the tools to mitigate climate from the unsubscribed, free riders. Those markets can benefit the unsubscribed via applied by subscribed mitigation offsets, IE mitigation of what the unsubscribed are doing wrong and applying economic pressure to subscribe by FMS driven incentives cast towards them. Like elimination or social outcaste, the products they produce under force majeure or incentives from FMS sequestration valuation.
- Servicing an established FMS market demand but abandoned or developed by subscribed can provide the unsubscribed opportunity to enter without bars to their entry. By engaging Full Mitigation Science efforts as still unsubscribed can further establish market for woody biomass and sequestration just not as readily. It does provide a step in the right direction.
- Not subscribing as a lesser economy also engages Full Mitigation efforts. As composite substitution demand globally increases the lessers non-composite export potentially decreases. It is entirely possible to eliminate non-subscribers from participating in global markets by devaluation of their supply which is in contrast to FMS goals. In effect, composite use and its production provides subscribers a lower cost to produce, distribute, and sell compared to current wood products. Non-subscribers, regardless of their organization have extremely limited ways to compete short of subsidizing their inefficient industry to match price points with their higher production costs involved. Eventually, producing lower costing FMS subscribers is a possible positive result from their eventual economic collapse from spending more to produce less. FMS has technology and advantage in knowledge to ward off government backed lesser economies who are unsubscribed.

Climate Mitigation Economics.

Any reality formed for mitigating climate change can become unrealistic if economic barriers can be easily erected and defended by those with the economic means to be economically motivated. Economics has been a curb in climate mitigation and will remain as such. FMS attempts to be contrary to those established and protected economic curbs. Economic environments are formatted within FMS planning to provide compensation to landowners, producers, and proposes additional incentives like profit with woody biomass composites.

FMS surrendered to curb soberness long before it was drafted from Thompson's research notes. Thompson understood that FMS might not be readily accepted by anyone. It is contrarian to engrained ideologies within the science-based publishments. Little ole engineer him telling a well published scientist "Well, here's your problem right there," is never an effective way to start a conversation with a highly specialized and well-funded PHD or organization economically set in their ways. Unfortunately, that's exactly what FMS does to some who are very economically motivated otherwise.

FMS's simplicity is as Occam's Razor points out. But failures to really good things are often afforded to much larger and better funded egos. FMS could be challenged by John Toole's described "confederacy of dunces-." formed-up and following some moronic internet influencer. In addition, the more Thompson worked on FMS the more he became concerned about those who have the economic means to be economically motivated and otherwise to facts that only confuse them further. That happen when he learned about some very nefarious corporate activities in the many supposed not for profit environmental organizations, which allowed the economically motivated otherwise to climate mitigation to turned them all into just another irresponsible but useful idiots. He decided FMS would need help navigating the rapids he could hear in the distance. And help with the waterfall made by captured politics and international borders. He eventually found potentially shielding forces by making his work in tune for sharing profit and by using international banking that are by aggressive competition becoming increasingly open to individuals within foreign countries having access from other foreign countries.

FMS's is built around honesty, integrity, and facts as its best practices; but, if those do not work to clear away the propaganda expected, the shield help develop a bigger picture, something to mitigate the nefarious produced entanglements expected…Economic Force Majeure.

Economic Force Majeure:

The goal of FMS's "Economic Force Majeure " is to implement woody biomass composites and FMS commercialization's so constrained and unconstrained deforestation practices are eliminated as quickly and as painlessly as possible. Planning revolved around sharing profit with subscribers and offsetting costs associated with conversion of industry to woody biomass composites. Force majeure is protected by intellectual property rights obtained by woody biomass and FMS international patents.

The scope of force majeure is to apply woody biomass composites and FMS whether:

1. Someone agrees or not,
2. Understands or not,
3. Gives permission or not,
4. Is within geopolitical boundaries or not.

In short, like it or not we are all going to fix climate change. -end of argument. Force majeure is not a new to human approaches when they are both practical and idealistic. If you are old enough, you will remember fixing the ozone layer using the same kind of method…Like it or not your getting rid of chlorofluorocarbons (CFC's) in your aerosol cans and limiting VOC's as well. The approach worked then and is still working today. That force majeure came just in time, but it differed from FMS in that the force was applied by politically implemented laws. FMS uses economics instead.

FMS is remarkably similar in its nature to eliminating CFC's by providing an actual cure. Thompson recognized FMS needed the same kind of implementation to get into place and then form a permanence to FMS efforts applied. At the time, he also recognized political will to create laws lacked ability for any serious climate mitigation implementation or any permanence. To work around the political issues and accomplish FMS it made sense that one must accomplish the same as ozone mitigation in some other way. Worse yet, Thompson knew applying FMS is a little more complicated than outlawing CFC's and restricting VOC's.

Humans did not need the number of CFC infused products we used; so, their conveniences are not really missed. On the other hand, humans do need forestry and lots of it. Our survival has depended on forestry products for eons and will continue for eons more. Could we eliminate forestry demand until forestry could recover its fast cycle sinks? But that would mean no paper, no lumber, and no forestry economics counted on by millions of people. Okay, so we could but it would be a truly impractical decision and with advanced woody composite efficiencies it is a decision we do not need to make. So, we could but really do not need to eliminate forestry from our consumption; we just need to use it more efficiently and in the case of FMS economies, use FMS effectively enough to apply force majeure to convert its use positively.

Appling Force Majeure; Pinch Points:

1. **Quality, quantity, and price.** All things missing from contemporary sawn and peeled wood products, specifically lumber. See Wood Products and Forestry for detailed explanations of all three. Accepted by FMS economics as pinch points they can provide woody biomass composites entry into the markets coveted by current and very wasteful, climate killing producers. Biomass composites propose much higher quality for much lower prices while significantly restoring fast cycle sinks.
2. **Standards and rip-offs.** Carbon credits are self-regulated. Many offset and credit suppliers are actually controlled by the organizations who purchase and sell them for their own gain which has been recently established as the wood product industry using them nefariously. Or worse, plain ole crooks. By not too much stretch of the imagination and latest news reports the creditability of these powerful climate mitigations tools are all but being used-up nefariously. FMS set standards for offset mitigation that are empirical, unquestionable, irrevocable, and perpetual. FMS can provide credibility to current and future cap and trade markets and is attempting to work with governments to adopt FMS's future measurement standards and certifications. FMS want to be the first to achieve a universal and government approved accreditation for carbon credits, it should be a requirement. FMS is the only way to achieve that goal with both developing composite and credit standards. Not as an adversary but a loyalist that can demonstrate creditability in comparison to current credit offerings, rip-offs, and diversion schemes. Success in this economic environment can affix FMS solidly within incentivized and perpetuating landowner supply agreements that remove timber plots from constrained deforestation, land uses from unconstrained deforestation, and then into FMS's permanence.

3. **Forest recovery times.** As mentioned in Wood Product and Forestry Section current wood product manufactures waste forestry biomass for many reasons. That is apparent in FMS Calculation and Modeling. FMS considers this as an economic pinch point simply because contemporary wood producers do not recognize the value of long-term forestry recover times. That value is in growth over time or let us just say trees get larger over time. The current problem with producers is they are not interested in time. If they were, they would not throw away either the value of sequestration or tree biomass growth. Both of which build far more efficiency into forestry supply and as higher valuations.

In general terms, contemporary producers chase volume sales. The demise of their raw material inventory, the trees, means nothing. Harvesting smaller and smaller trees is the result and that is in contrast to their long-term bottom line. Unfortunately, that is acceptable to the short term and bonus calculated from quarterly report bottom line. Not to FMS.

FMS and woody composites build on efficiency. Forest to product is optimized for efficiency and in doing so creates forest recovery times measured in century's not decades. That also means force majeure by removing private land holdings from constrained deforestation and allocating them to composites and FMS stewardships promoting sequestration not clear cuts. When the sawn and peeled wood companies are again shifting to even smaller trees composites can be growing global forests larger and larger so that only a few percent of them can supply the future demand even 100's of years from now with only single digit percentages of trees harvested today.

4. **Recycling.** Woody biomass composite recycling is also possible and that extends FMS forest even further into the future. Advanced woody biomass composites are made from water based structural adhesives that when cured are 100% machinable. That makes them 100% reformable into the same or a differing shape. It has been proposed that recycling advanced woody biomass composites actually improves components strength by the increase of structural adhesive present. These potentials are a first in forestry and significantly improve forest recovery efficiency that FMS can take advantage of for sequestration valuations and their credibility.

5. **Transportation of Wood Products.** The pinch point created in shipping comes from woody biomass composite's efficiency in biomass use. Woody biomass composites are much lighter than what their intended to substitute. Typically, three compositely formed products can be shipped for every one piece of lumber. Although, not true in all cases the majority of woody biomass composites retain a significant weight advantage and all woody biomass composite substitutions of lumber have a 3.2 to1 advantage in shipping weight. The pinch point is created by woody biomass composite's ability to cube out transportation vehicles in place of sawn or peeled lumber products only using the vehicle weight capacity that leaves much of cubic capacity unused. Advanced woody biomass composites using that unused capacity extends product shipping ranges globally at cost effective levels.

6. **The Climate Changing Effect.** Climate mitigation potentials among general populations are significantly increasing with each new weather record. Today, over seventy percent of the population worldwide now subscribe to climate change and accept that something must be done. Unfortunately, much of that percentage cannot connect the dots between climate change and what needs to be done or their actions. Mostly, the general population is misguided by propaganda and media. FMS's structure addresses population disconnection with proposed awareness campaigns in education. FMS promotes volunteer participation in grass rooted messaging. Unlike similar climate awareness programs FMS is

not open ended, debatable, or directionless in its objectives so it should gain numbers in backing. The primary advantage FMS invokes in media's is made empirical in messaging. Although FMS's message can be at first difficult to believe its simplicity should provide foundation to its efforts. It is the accumulation of fact that forms FMS's message.

VIII. Part Eight, Corollaries

⸙ The clearing of forest in lesser economies is not a globally unmitigable deforestation disaster. That human practice of expansion does not have to be such an unpleasant experience for our world's climate. Because it is not the clearing of the trees that escalates CO_2 levels, it is the burning, rotting, or inefficient transformation of that biomass. The want for CO_2 sequestration by clearing forest is the culprit of climate change. It is not the act that promotes humanity, to feed populations or to gain economic stability that drives it.

Biomass generated by state-of-the-art clearing and logging into sawn or peeled wood commodities pronounces negative climate change initially, but not permanently if divided into globally scaled mitigation efforts. Advanced woody biomass composites can effectively decrease the demand for forestry resources by both economies and substitution. Thus, the Full Mitigation Model restructure of forest renewable resources can be shared globally. The valuation of state-of-the-art wood-based (as sawn or peeled) must diminish by substitution and accordingly, sawn, or peeled markets must become extinct or into no factor levels. Supplementary, the valuation of the ***951% improvement of carbon sequestration with biomass composite use*** *can increase the mitigation potential in a country not hampered by demand. If a greater economy or country is using FMS stewardship it will have sequestration available to lesser country's that do not but require clearing forestry or fossil fuels for their humanity. (we would hope until they too can transition to FMS).*

⸙ Trees removed for land clearing are found wanted within FMS's global carbon sequestration efforts, as sinks. That is also to say if today's forest sequestration deficit is left unmitigated by contemporary carbon reduction and technological efforts or, less effective mitigations appear later on the clearing site as crop production, immature tree harvesting, or some other form of constrained deforestation, climate change is accelerated towards the runaway greenhouse tipping point. Historically, all those acts have been less productive in carbon mitigation because of constrained or unconstrained deforestation. These acts imped sinks. The practices have perpetuated the world's CO_2 emissions into a growing and permanent atmospheric residence. Forestry's ability to sequester is in a highly out-of-balance state since the FMS datum of 1800-1850 tipped residence conditions. Restoring that balance is clearly absent in commercial practices within lesser and greater economies and unfortunately, it is also present in the reduction of CO_2 emission efforts. Reducing or reduction efforts do not address atmospheric residence or constrained and unconstrained deforestation and can only increase them.

FMS accounts for and can mitigate all those practices but realizes it can change nothing by direct enforcement. FMS does not stop most of these practices directly with laws, agreements, or policies that can be circumnavigated or ignored. Instead, Full Mitigation Science influences the humans performing the acts sequentially by economic environments with FMSCO₂ incentives and woody biomass composite markets with their higher quality and lower price points. In effect, an economic force majeure is also sought so like it or not, knowing or not potentially becomes FMS participation. FMS understands more can be gained by influencing Economic Environment's *positively than enforcing an environmental law, tax, or condition with negative connotations to company's and humans participating.* Full Mitigation Science's ***Economic*** Principia.

⸙ With the new knowledge of FMS's datum deforestation practices are further defined. There are now two types of deforestation understood, constrained and unconstrained… Each are now clearly understandable in their reference to climate change. They are also offsetable by greater and lesser economies current forestry resources and potentially are protected under FMS's economic principia and advanced woody biomass composite markets.

Climate change has already happened, and it was not achieved by practicing farmable expansions or fossil fuel uses. It occurred with the commercialization of trees to address forestry demand. Each of those practices tip climates behavior towards warming but FMS accounts for the more instant gratification those activities serve in influencing climate under demand driven principles. Specifically, demand for forestry and its land are now far more defined than previously documented. Full Mitigation Science mitigation addresses demand and supply activities by proposing affordable forestry conservation with efficient woody biomass composite products to build economies and the FMSCO_2 global markets to shore-up after trail breaking those efforts. These combinations succeeding commercially could result in restored CO_2 sinks that are managed in the near term as highly efficiently for sequestration growth, stabilization, and address forestry demand for centuries to come. Consequently, these efforts are currently attempted by accidental practices within some advanced economies with a shift to wood composites but are not fully present due to their expansions of constrained deforestation by cutting even smaller immature trees to support the efforts. That effort demonstrates that our society has taken and will continue to take the least amount of effort currently understood as an effective answer to and expand forestry demand. FMS mitigation efforts are therefore absent within all greater and lesser economies. Possibly because of the lack of FMS knowledge and its clearer definitions.

A melding of proportional limitations is made possible by FMS. Even without the economic environment's direct contribution, industrial contribution, or inability to regulate stewards. As both a practical means and insurance of Full Mitigation models, FMS provides to both subscribers and the unsubscribed an assist within global economic expansion or equalization. It helps as full mitigation for non-conforming entities as a global clearing house for sequestration that is established and regulated by capitalism. Also, it can act as income to lesser economies participants via entities subscribing to FMS practices, FMSCO_2 offset subscribers can build with incentives towards FMS standards. The incentive power of FMS on even limited acreages cannot be underscored enough in lesser economies. Supplementally, FMS acceptance within the confines of an international border's requirements is nullified since modern banking has extremely limited borders to both individuals and countries. FMS can use borderless banking to help its economic force majeure with one or many forestry stewards at a time.

⸙ Its not the clearing of rain forest causing damage to climate it is the available sequestration sinks within that forest that are found wanted. Again, FMS does not advocate the clearing of any kind of forestry. FMS promotes stewardship of forestry resources which includes thinning of forestry to open-up or remove canopies and the thinned residuals utilized. That allows forestry demand to be answered and actually improves sequestration by promoting sunlight, maturing, and growth in general. The practice also greatly reduces fire potentials and stages FMS forestry for additional human uses far better than nature acting without stewardship or humans in unrestricted uses like clear cutting. The reason, FMS confirms one mature tree can sequester more CO_2 to stored Carbon annually than 1000's of immature trees. Those immature trees, or crops under typical canopy do improve sequestration sinks over multiple decades but thinning excessive growth is a stewardship that improves that forests heath and sequestration. Otherwise, growth like limbs or regen is stunted by lack of available resources, mainly sunlight. (it is not a lack of CO_2!).

Rain forests, commercial forestry, and global forestry in general can vastly improve existing sinks while maturing others. Immature trees, which would die anyway, and crop residuals are also a raw material source for biomass composites. Rain forests can actually become healthier and a better CO_2 sink faster with thinning's which can improve biodiversity in general. OSU's Dr. Beverly Law's work enforces this practicality by demonstrating a replanted clear cut's soil requires at least two decades to stop adding carbon to the atmosphere and become net carbon neutral. From there on that plot becomes a sink, a net negative to the atmosphere and potentially an FMS sequestration asset.

Agriculture orchards or tree groves and even back yard trees can affix to FMS stewardship as well. Tree's producing food for humans is seen as an immediate opportunity for FMS to extended sequestration benefits to general populations. Commercial trees must be FMS managed for mature growth, use sequestration improvement thinning methods and not be in a rotational constrained deforestation practice. FMS's concepts remove trees from constrained deforestation by targeting existing young trees, regen, and providing generational stewardship to fully mature them and then keep them generating sequestration with biomass.

⸙ Sawn or peeled wood industry's replanting of clear cuts are overcrowded plots that waste soil, restrict nutrients, and create fire hazards. Current arts practice these densely packed replants to achieve growth in height and not limbs. Sawn and peeled lumber require these practices and result in only 40-60% of the biomass grown under those conditions being used (only 20% is used when accounting for below surface growth). Biomass composites and sequestration desire limbs and use 90-95% of biomass grown above the surface. As measured by OSU forestry, 65% of the harvested woody biomass's carbon is released into the atmosphere within 10 years. 100% of the non-harvested biomass is released. Again, neither figure account for the below ground (stumps and roots) emissions over the next two decades.

Lumber or peeled commodities require straight and limb free logs. These logs are typically cut from the base to well below the trees crown and leave the upper limbed portion of the tree's trunk, roots, and the limbs to go back into various carbon as CO_2 leakage waste. These practices release a majority of CO_2 in contemporary wood product productions and create enormous logging and processing inefficiencies. As defined by FMS, contemporary constrained and unconstrained deforestation practices induce climate change with their significant emissions of CO_2. Those emissions are further exuberated by the practices elimination and impeding of CO_2 sinks. *See FMS's CO_2 leakage definition.*

A Darwin like driven effect is sought in densely packed regeneration (replanting) plots. Faster height obtaining replants choke out the surrounding trees from sunlight. As they die off many things occur to release CO_2. First, the previous stumps and rots rot, next the dead from *overcrowding trees rot. Second, the plot becomes highly susceptible to forest fire because it is overcrowded and filled with dry and rotting debris from the previous clear cut (if not already burned off as CO_2 release) and later in the growth cycle the plots understory is filled with dead and dying trees initially used to promote height growth. These effects are currently encompassing the entire world's commercial forestry plots. Acre by acre humans have fully commercialized their forests to use younger and younger trees. This is a cause of climate change. While the plot contributes to atmospheric CO_2residence, they do not allow CO_2 sinks to obtain their potentiality with any reasonable maturity.*

These practices started and have been gaining since before Roman ship building and wood as fuel uses within convenient forestry. As of FMS's datum of 1850 human expansion further contributed to climate change to tip the scale towards undesired terra forming. Forestry demand is now perpetuating the impedance of global CO_2 sinks by 1,000,000% or more and in 1950 placed Earth in runaway greenhouse effect.

⸙ Sawn or peeled wood commodities are highly detrimental to global climate conditions because only small portions of the entirety of any tree harvested is typically used to produce those commodities. The majority of wood biomass accumulated to produce those products is typically burned for energy to produce them, burned as logging debris, or left to rot within the tree harvest area. All of which are currently CO_2 leakages contributing directly to atmospheric residence saturation. Current wood commodities as sawn or peeled are highly inefficient in using woody biomass use and highly efficient in carbon release, not storage. The contemporary production practices are not resource sustainable because younger and then younger trees are harvested every decade.

Advanced Materials in woody biomasses form highly efficient biomass composites that effectively store more carbon as net negatives and further that effect in a carbon accumulating affect within the FMS forestry managed for their materials. They in effect sequester more carbon than released in forestry use while storing conserving more carbon in their production. These advancements over sawn or peeled products are a result of efficiencies that provide conservation of CO_2 releases to produce forestry products.

By using less CO_2 in producing products, and as a resultant of advanced woody biomass composites recycling potentials, their production energy conservation, and by using woody biomass thousands of % more efficiently than contemporaries advanced woody biomass composites propose the only economically scalable and shovel ready carbon net neutral/negative product available anywhere. Since they can substitute for other materials these advantages can spread to other industries, just as well or even much better.

⸙ Efficient uses of woody biomass are currently found within state-of-the-art wood industrial composite reproductions. However, state-of-the-art woody biomass composites cannot replace a high percentage of sawn or peeled wood-based products due to inabilities within structural replication, moisture sensitivity, durability, and current restrictions brought about by lack of market investment. All of which are products of constrained deforestation practices. Furthermore, state of the art engineered wood products typically contains sawn or peeled wood component structures or logging practices that are subject to said inefficiencies within forestry and energy consumptions.

Advanced woody biomass composites materials are unlike contemporary composites. Advanced Woody Biomass Composites use technology enhanced systems and methods that specifically address the structural inadequacies of peeled or sawn wood products and other inabilities found within state-of-the-art composites. Typically, and in comparison, advanced woody biomass composites improve the characteristics of components and correspondingly, enhance final assemblies while promoting renewable materials into other nonrenewable markets like steel and concrete.

⸙ FMS's Full Mitigation model offers the substitution with advanced woody biomass composites for sawn, peeled, burned, or left to rot biomasses. But those actions are not required. That is part of FMS's plan to end negative human influence on climate change and doing so is an especially useful tool to mitigate climate change but so can FMS's other models without advanced woody biomass composites. FMS can with the FMSCO_2 offsets and credits.

It is not reinventing the wheel; FMS just makes all the wheels a lot rounder by addressing two problems, human demand for forestry and cap and trade failures. Further developments as spokes to those problem-solving wheels is also required but Full Mitigation Science's credibility becomes clearer with better standards in sequestration measurement and understanding of FMS's datum. Woody biomass developments and FMS established carbon markets current FMS models and years of woody biomass research and development can get the FMS message out and show its promise in changing our climate's future positively with certifiable credibility. We hope government certified standards.

⸙ Full Mitigation's influence on climate change is undeniable within its modeled outcomes. Preliminary FMS research work on mitigation models also signaled the greatness of humanity's domestication over their environment. But another surprise in the research was that FMS made forestry resilient to population increase and economies. Regardless of future populations or the economic means of the land's steward FMS still modeled climate mitigation.

The patent applications and The Full Mitigation Science publishing were formed as results of manipulating carbon and its storage into a balanced scenario. Doing so pointed out the accumulated inefficiencies within state-of-the-art wood products and their CO_2 leakages that are affecting our biome negatively; although, and at the time of FMS's concept, Thompson did not understand just how enormous that negative really was. He did understand wood product inefficiencies ranked pretty high as a result of economic environments created around them and knew climate had to impacted as a result. His focus at the time was an engineered solution to sawn wood was first needed and it had to be economically produced. Experience also dictated that anything as inefficient as the wood products he researched could be engineered more efficiently. He then provided an engineered solution with the advanced woody biomass composites and a year later the efficiency advancements then proposed bigger pictures. To his surprise when adding population expansions increases on forestry demand to the initial models those efficiencies made long term forest recovery increasingly more significant in duration. Appling those durations to sequestration and FMS was first conceptualized.

⸙ The Full Mitigation model uses capitalism to develop independent economies into Profitable Stewardship models. Incentives are employed as opposed to restrictions, sheriffs, and acts restricted by poverty's limitations.

Without suffering an economic downturn because, said composites cost less to produce, ship, or use so the economy trades dollars and is under force majeure into converting (with woody biomass composites as substitutes), like it or not, knowing or not. So, the only difference to economy is they are not releasing as much carbon by constrained or unconstrained deforestation practices and now are sequestering carbon in a highly efficient, scalable, and sustainable manor. Plus, being a said composite producer could be economic stimulating or made economic stimulating by increases in demands for finished said composite buildings or consumer goods. Potentially creating a net neutral boom that can offset other industry.

⸙ Sink improvements. The Full Mitigation model is made possible by the enlargement of available carbon fast cycle sequestration sinks by maturing those sinks to greater capacities. Said composites promote vast sink improvements.

Sink measurements within the Full Mitigation model are ***calculated first*** *as the initial sink improvement derived by the reduced forestry demand. That demand on forestry can be improved by 320% so only 8-to 30% (variable to population demand, 30% is max demand calculated and is a multiplier of three to today's human population) of any existing forest is used in comparison to state-of-the-art's 100%. Therefore, the benefit is regardless of human population increasing forestry demand.* ***A secondary sink*** *enhancement is then accounted as a reoccurring and fixed in duration calculation for the forestry sink left remaining as unused and maturing sequestrating (sink) forestry.* ***A third calculation*** *occurs as an accumulated sequestration is applied to an immediate function of calculation one and supplemented to project as a future impact by demand comparison to lumbers 100% tree use in the future. This calculation is fixed as current-state-of-the-art and as a future state-of-the-art (remaining the same) and in full contrast to said composites substitution percentages. Extremely high impact sink improvements are fully demonstrated and are preliminary proof of The Full Mitigation Science effect. As in, if sink improvements are conditioned to said composites sequestration events within my work, they* ***fully*** *mitigate global fossil fuel CO_2 emissions within an implied duration over an applied hector acre measure area, that is not that large given the scale of available forestry (estimated at 35 million).*

⸙ The Full Mitigation Model is constrained to forestry acres available and uses an average tree species that is typically used in timber growth plots as a pine species.

As example: 10,000 trees aged 30-125 years as an average pine tree in the pacific northwest and calibrated into a carbon sequestration model. This approximates 10,000 young trees thinned to 6,800 fully matured trees (60 years-old, plus) occupying approximately sixty-eight acres (100 trees per acre). At the lower range of this example are 3.5 million acres sequestering 3.5 million tonnes of CO_2 per 68-acre tract as 51,470 tracks or plots totaling $1.80947932 \times 10^{11}$ tonnes of CO_2 in its 60^{th} year. That is 180,947,932,000 tonnes CO_2 potentially sequestered. In ordinary form that is 180.94 giga tonnes CO_2. Which begs the question, can it really be that simple?

No, it is not. The worlds emissions of CO_2 for energy production alone in 2021 was estimated to be around 36.3 giga tonnes. But that is not the only source of CO_2 emissions. Animal respiration and crematoriums add in, producing a single electric car can add 12-18 tonnes and the same can be said for making a wind turbine. Even producing solar panels is extensively more in CO_2 emissions then they will ever substitute in use or their disposal. Forest fires release giga tonnes each year, war like in Ukraine even more. Agriculture to feed us and even our shelters *release CO_2 there is no getting away from CO_2 emissions and that reality forms a strength within FMS's simplicity that is just undeniable**, sequestration dependance**.*

Being sequestration dependent is human. Our existence alone produces abundant CO_2 in a variety of emissions. History has also demonstrated we sometimes produce CO_2 at exponential levels over exceptionally long and unending durations. FMS says that okay because we are pursuing betterment of the human condition, we are domesticating. FMS also states that our interactions with environment must be balanced and because of that fact we are CO_2 sequestration dependent less we unbalance naturally occurring CO_2 cycles within our closed environment (as biome). The effect of which turns out to be climate changing conditions sparked from our biome engineering. FMS applies logic in saying it is not the release of CO_2 from humans domesticating it is from *the unbalancing of closed system we are in capture with.*

⸙ There are approximately 509,000,000 acres of forestry land (3) (15) in the United States that could be reached by woody biomass composites and under the economic principals of the FMS's Full Mitigation Model. 471,000,000 million acres are used within FMS models to reflect the most immediate impact (15). All projected effects are projected within the CO_2 fast cycle*. As a plus, the Full Mitigation Model does not currently account for ongoing sequestration in other lands that is occurring naturally or woody biomass composites economically influenced sink improvements that occur outside of internal commercialization. Therefore, if those factors improve state-of-the-art sinks and are placed into the model as unaccounted forestry acres it is possible the acceleration of sink improvements is an extremely high multiple of current model. As crudely demonstrated, it is probable a factor of $6.9\text{-}e^5$ in magnitude that could further enhance the Full Mitigation Model outcome.*

⸙ Taking a position of profitable stewardship, or capitalism driven stewardship is the simplest known solution to human influenced and negative climate change. As demonstrated by using efficiency to improve the available sinks and adding sinks. In effect, composite reproductions, and their substitutions of sawn or peeled wood-based commodities or other nonrenewable commodities is a prescription that offers global climate change impact quickly enough to make measurable differences over both the short carbon cycle within forestry and short and long carbon cycle within oceanic durations. *As an economic extension, profitable stewardship is termed as taking control of global forestry growth cycles by commercialization using superior quality and overall higher efficiencies in resource uses. No consumer will desire sawn lumber as the quality and sustainability of said composites far exceed available sawn or peeled lumber products.*

⸙ Current wood product industries are the architect of their own demise. Sawn or peeled wood commodities quality and inefficiencies suffer from state-of-the-art forestry practices. *The industry changed from actual to nominal measurement and there by created an enormous artificial demand along with justification for highly reduced quality. Supplementary, they also created the new knowledge within Full Mitigation by modifying extremely good products into extremely wasteful uses of a renewable resource. Making state-of-the-art forests a barely renewable resource at best and undervaluing sequestration.*

⸙ Tree degradation is defined within Full Mitigation's relation to climate change. Sawn lumber quality, and forestry inefficiency are all engrained within the industry's global raw material supply. All three are direct results from harvesting smaller and smaller immature trees as defined by Full Mitigation as Tree degradation.

Forest recovery periods have been shortened to match global consumer demand and company profitability cycles. Which in current capitalism driven wood markets is expected. Changing those markets with commercialization of said composites and reducing the demand on current available forestry by E^{3}Lumber provides recovery times measured in lifetimes and not decades.

⸙ Sawn or peeled lumber is highly wasteful to forestry biomass to produce. *To produce state-of-the-art, the tree harvested is 40-60% in waste to produce a log. 20-30% of the log is waste to make boards, 4-6% of each board is waste to produce a finished board. 12-19% of boards produced are of such low quality they are unusable, but still sold within lumber units before ending up in a landfill. Another 8-18% of all boards are artificial demand because of project waste estimates. In all, said composites are 90-92% more efficient than sawn lumber or stated another way they are up to 320% more efficient with forestry biomass.*

⸙ Transportation of sawn lumber typically uses the full weight capacity of the conveyance vehicle. Transportation of said composites use cubic volume of the conveyance and rarely the weight carrying capacity.

⸙ Commodity driven lumber markets.

Economically, the industry does not suffer from FMS. It is the conversion or the trading of dollars into accepting said composites that offers major improvement of quality that extends opportunity to current industry. To timber producers, the offset of less work and higher revenue per tree under Full Mitigation Science's economically driven efficiency is incentive. As I also speculate, the lower costs of said composites can stimulate building or consumer driven markets. Finally, just doing the right thing as a human is likely enough motivation.

IX. Part Nine, Sources and Cites

Cited also within document. The author wishes to express his deepest appreciation to all work that contributed to Full Mitigation Science. It is more numerous than listed here or within the document. The following cites are representatives of those works and serve sources of information themselves. Thank you, colleagues.

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X. Part Ten, Terminology and Explanatory's

Apparent Photosynthesis:

Carbon assimilated though carboxylation minus photorespiration of atmospheric CO_2.

Artificial Demand:

Constitutes demand for something that, in the absence of exposure to the vehicle of creating demand, would not exist. It has controversial applications in microeconomics (pump and dump strategy) and advertising.

FMS further describes as having to pay more for less with shrinkflation. In FMS forestry considerations it is nominal measurements impact on forestry. By decreasing the quantity sold per a previously established unit (a 2x4 board is FMS's example) while maintaining price. Beginning in the 1920's Timber Baron's used the diversion tactic to increase their board foot volume sold by compromising boards so you had to purchase two nominal sized boards to do the job of one normally measured board. Timber Baron's implemented nominal measurement's artificial demand to gain a 33% increase in volume board foot sales with a meager price per unit decrease to ensure its success. They could afford to because they were selling a lot more for a little less. The effect is they increased their volume by 33% and doubled profits. This is what created Timber Barons OR it can be argued the resulting board foot demand significantly increased the lumber producers (Timber Baron's) profit margins.

Although nominal measurement was promoted as a way to increase or prolong the supply of wood thus improving forestry; nominal measurement is deemed by FMS as a 1920's climate changing Ponzi scheme the US government fully promoted and endorsed under capture criteria certainly and possibly corruption criteria as well. Or as the result of all corruption or capture of US forestry; nominal Measurement could become the most climate damaging component of today's climate conditions. One hundred years later and post FMS Nominal measurement and other artificial demands helped decimated global forestry fast cycle sinks into the impeded states of today. Less than 3% of their capacities.

Atmospheric residence conditions:

Are created when atmospheric CO_2 or other GHG's have no other place to go but where they are stored in the atmosphere. Residence conditions are the storage volume and transferable conditions of CO_2 stored within atmosphere and have increased primarily due to the lack of terrestrial impeded fast cycle sink capacities. FMS defines available terrestrial forestry sinks are significantly impeded which increase residence conditions (as volume stored in PPMs) and atmospheric residence durations (as the time (t) CO_2 remains present within the atmosphere).

Atmospheric residence time:

The storage duration of CO2 or other GHG's within the atmosphere. Atmospheric residence time of CO2 is considered a mitigatable component of climate change by increasing the sequestration of CO2 from atmospheric residence conditions (see below). FMS points out atmospheric residence time has increased as the balance of emissions and sequestration depart from each other.

Basal Area:

Is the combined cross-sectional area of all the trees on an acre at 4.5 feet above the ground.

CO2 fertilization limitations:

The limitations within biomass to intake CO2 during photorespiration. Typically, these limitations are brought on by secondary requirements like available soil nutrients and water required for biomass growth.

Constrained And Unconstrained Deforestation: Forest Degradation difference

Deforestation defined by FMS is understood as two factors with differing effects. The third definition FMS provides of convenient forestry is more self-explanatory.

First, the reduction of CO2 sequestration by substitution of use or the clearing of forestry CO2 sinks from existence or unintended demise brought on by weather, fire, or biological event hereinafter is defined as UNCONSTRAINED DEFORESTATION. Ironically, FMS recognizes unconstrained deforestation to be partially responsible for increased but unintended climate demise.

Second, the unnatural and inefficient use of forestry and forestry stewardship that limits available CO2 sinks and also releases CO2 as the result of human demand for those unnatural and inefficient uses, hereinafter defined as CONSTRAINED DEFORESTATION.

Constrained Deforestation is opposed to the typical Forest Degradation definition whereas forestry use is expected to regrow into forestry normal. Constrained deforestation is forestry that is physically kept to never allow it to achieve a forestry normal or its potentiality in the recovery of its nonrenewable asset, CO2 sequestration. This effect is typically due to commercial harvest rotation timelines or unintended demise brought on by weather, fire, climate change, or biological event. Ironically, FMS recognizes constrained deforestation to be mostly responsible for increased unintended climate demise.

Congruently, unconstrained deforestation is a significant factor depleting available fast cycle CO2 sequestration sinks. FMS also recognizes that factor is mitigated with tree-developing by addressing constrained deforestation elsewhere. Inefficiency within constrained deforestation and the subsequent carbon releases from state-of-the-art wood products throughout Earth's tree-developing forests are economically controlled ecosystems and is a highly massive portion of climate change and the focus of Full Mitigation Science.

Convenient Forestry:

Forestry resources with easy human access. Adjacent to, its location, access in general, ample roads, railroads, public, the time required to haul resources, topographical ease to access and log, and the usability of biomass species available, are all examples of what makes some forestry convenient over other forests.

Chapman-Richards function:

Follows the form: $M = M_{max}\left(1 - e^{-t/\tau}\right)^{\gamma}$ where Mmax is the maximum mass achieved by the tree, forest or acres, excreta, e is Euler's number, t is time in years, τ is a constant inversely related to the speed of growth also expressed in years, and γ is an empirical, unitless parameter that affects the shape of the curve. (4)

Current Models using the Chapman Richards Function. All depict common or average forest conditions. As an accurate way to measure timber production and same age stand productions Chapman Richards is widely used and respected. However, accounting for how the tree is planted, within what soil types, and then matured under varying or neighboring canopy conditions is not readily obtainable.

As FMS defined, a tree planted in an open field develops by far more limbs than a tree planted close together with similar age trees in a regeneration plot or stand. A tree with more limbs grows faster, grows taller, grows for longer durations, and therefore can grow much more mass than indicated by basic Chapman Richards Function. How much more mass is yet to be defined.

Carbon or CO2 leakage

Carbon leakage occurs when there is an increase in greenhouse gas emissions in one country as a result of an emissions reduction by a second country with a strict climate policy. Carbon leakage may occur for a number of reasons: • If the emissions policy of a country raises local costs, then another country with a more relaxed policy may have a trading advantage.

Carbon Leakage is not just a county-to-county issue since carbon or CO2 leakage is also a source-to-source issue and governed exclusively by laws of conservation, within a closed system. See Laws of Conservation FMS summary for context use of this term

Wood Products as defined by FMS are carbon leakage. Contemporary use of constrained and unconstrained deforestation practices induces climate change also with their significant emissions of CO2 being higher than replanted trees occupying the same grounds (post clearcut). Those emissions are further exuberated by those practices embracing the elimination and impeding of CO2 sinks and other inefficiencies.

DBH:

Is the number of trees per acre by diameter. DBH is measured at 4.5 feet above ground level and on the uphill side of a tree.

Economic Environment:

Consists of external factors in a business market and the broader economy that can influence a business. You can divide the economic environment into the microeconomic environment, which affects business decision making - such as individual actions of firms and consumers - and the macroeconomic environment, which affects an entire economy and all of its participants.

Economic Principia, FMS:

More can be gained by influencing economic environment's positively than enforcing an environmental law, tax, or any condition onto non-subscribers or subscribers.

Furthermore, FMS understands that no practical way to accomplish global climate mitigation can be successful without developing economic incentives into lasting economic environments. Economically speaking, sequestration valuation is key to ending climate change.

Economic Force Majeure:

Force majeure translates from French as superior force. In English, the term is often used in line with its literal French meaning, but it has other uses as well, including one that has roots in a principle of French law. In business circles, "force majeure" describes those uncontrollable events (such as war, labor stoppages, or extreme weather) that are not the fault of any party and that make it difficult or impossible to carry out normal business. A company may insert a force majeure clause into a contract to absolve itself from liability in the event it cannot fulfill the terms of a contract (or if attempting to do so will result in loss or damage of goods) for reasons beyond its control.

FMS defines economic force majeure relative to climate change. As in, non-subscribers to FMS shall have no choice in making climate benefiting decisions due to the economic pressures FMS can apply from sequestration valuation and woody biomass composites. The pressures are developed from FMS incentives performing as market makers.

Undesired Terraforming:

An undesired or unintended result brought on by large-scale modification of native landmass, biomasses, or collectively an entire biome.

Fast Cycle CO2 Sink:

The annual growth cycle that plant life extracts atmospheric CO2 for use in photosynthesis typically between spring and fall. Referred to as "fast" due to its ability to remove atmospheric CO2 more readily with photosynthesis than other terrestrial sinks like oceans or soils that rely on solubility. FMS continuation, CO2 emitted into atmospheric residence can be removed by fast cycle sinks between one and five years later given the CO2 emissions and CO2 fast cycle sinks are in moderate sequester/emitted balance.

FMS Datum

FMS's datum point is located at the time human CO2 emissions had begun saturating available global fast cycle CO2 sinks and began limiting (by actual quantity sequestered measurement) year over year the global sinks capacity to sequester CO2. The datum formed in direct relation to constrained and unconstrained deforestation practices driven by human forestry demand

Global Biome Engineering:

Terraforming on a global scale to create an environment that includes geographical location and climate outcomes. Can include both positive and negative environmental consequences for species dependent on outcomes.

Human Physiology Releases:
https://www.globe.gov/explore-science/scientists-blog/archived-posts/sciblog/2008/08/11/release-of-carbon-dioxide-by-individual-humans/comment-page-1/index.html

FMS defines Human Physiology Releases as the release of CO2 by humans in normal respiration. In calculation, human physiology releases can further detail or transfixed into amounts of CO2 released by the portioned amounts of an accumulation of animal C weight-eaten C weight/animals life span (prior to being butchered) that humans consume.

- **Inverse-square law:**

In science, an inverse-square law is any scientific law stating that a specified physical quantity is inversely proportional to the square of the distance from the source of that physical quantity.-Wikipedia definition, justification below:

The inverse-square law generally applies when some force, energy, or other conserved quantity is evenly radiated outward from a point source in three-dimensional space (FMS this is maturity or age). Since the surface area of a sphere (which is $4\pi r^2$) is proportional to the square of the radius, as the emitted radiation gets farther from the source, it is spread out over an area that is increasing in proportion to the square of the distance from the source (FMS land use decreases sequestration increases). Hence, the intensity of radiation passing through any unit area (directly facing the point source) is inversely proportional to the square of the distance from the point source.

FMS's defined use, we apply Forrest Age as proportional to the CO2 sequestration ability of that forest. The older the forest the more sequestration it performs. The relation could actually be cubed initially according to Chapman-Richards growth model equation but highly susceptible to species deviations. One thing is certain about this FMS defined relationship, the more tree maturity the more CO_2 sequestration which corresponds to smaller and smaller tracts of land required to grow the relation over time. In additional hypotheses, that relation could include an inverse of the inverse relation because of the third factor, land use.

- **Impeded Fast Cycle CO2 Sink:**

Forestry fast cycle CO2 sink's that are restricted by human forestry demands from achieving recovery, maturity, or adequate growth durations that impede CO2 photosynthesis potentials. It is as simple as it can get in that forestry must mature to potentiality and human demand on the resource do not allow any kind of maturity to happen. As example:

- A typical 30-year-old pine tree sequesters 50 lbs. of carbon annually using apparent photosynthesis from 180 lbs. of atmospheric CO2. As an annual event the tree adds to its mass and increases its next annual fast cycle CO2 sink ability (for life year 30 to 31) by 7%. Or 7-10% per year the tree increases the volume of CO2 it can synthesize into sequestered carbon.
- At age 60, that same pine tree sequesters 141 lbs. carbon annually to its growth by synthesizing 517 lbs. of CO_2 from atmospheric residence.
- However, the pine tree within this example is typically harvested around 30-years of age. Contemporary harvest practices as a clear-cut of the tree's forestry plot. The tree is then replanted, usually three-four years later with three trees (due to tree survival rates). The surviving replanted tree only sequesters 1.4 lbs. of carbon the year after it's planted.
- FMS recognizes this process as human demand that impeded the tree's (as part of a forestry plot) fast cycle sink ability and more importantly, its potential. The impeded amount is from potentially 141 lbs. carbon to the replants 1.4 lbs. of carbon sequestered (517 lbs. CO_2 to 5.1 lbs. CO_2).

See FMS condition, Impeded Fast Cycle CO_2 Sinks for contextual reference.

Law of Conservation:

In physics, a conservation law states that a particular measurable property of an isolated physical system does not change as the system evolves over time. Exact conservation laws include conservation of mass and energy, conservation of linear momentum, conservation of angular momentum, and conservation of electric charge.

Law Of Conservation, FMS Summary:

FMS expands the law of conservation as the amount initially placed into an enclosed system, (CO2 or more formally C + O2 on Earth) as C quantities do not and cannot increase or decrease by anyway within the enclosed system (Earth-bound), it is impossible. Therefor Earth-bound systems producing or reducing CO2 suffer the same law of conservation restriction. (Earth bound) enclosed systems can increase or decrease amounts that are stored within various locations. The movement of amounts is by physical and equalizing transfer, a balance, and as a law of conservation they can only go one location to another but never more and never any less.

Therefore, FMS suggests the law of conservation emphatically. Earth's nonrenewable sequestration of CO2 and "C" storage is more critical to balance climate than CO2's production or reduction. Reduction and production are inputs and not the Prometheus humans need to influence climate change positively or negatively. The location of reduction or production as storage is critical to biome systems like climate. FMSs also defines the conservational laws constraints as the amount of CO2 that can be produced or reduced is finite in ALL non-FMS orientated mitigation efforts (systems that discount storage in sequestration mitigation). Because CO2 sequestration and "C" storage capacity is limited and found by FMS to be highly impeded from capacity (increasing storage). FMSs analogy of the conservation law determines the increasing of CO2 sequestration and "C" storage availability, and the duration "C" is stored is the only possible and legitimate CO2 climate mitigation effort available.

In short, moving "C" from one part of an enclosed system (in this case atmospheric residence) to another enclosed within the system location (in this case as biomass) is the only viable climate solution. Afterall, movement of "C" from fossil fuel into atmospheric residence is what needs to change. FMS demonstrates production or release of "C" is an input and ultimately where its stored as "C" is the Prometheus to mitigation. As mentioned before, had historical forestry fast cycle sinks not been impeded (sinks are also production) todays humans would not have had concern over "C" production elsewhere, production like fossil fuel use.

Adding fuel to FMSs law of conservation reasoning is that ALL mitigation attempts to substitute fossil fuel energy production, IE wind, solar, batteries cannot produce the same amounts of energy as fossil fuels without themselves releasing the equivalent of emissions. They just emit them in diverse ways than fossil fuel. Mostly, the energy used to produce enough of the substitute to equal fossil fuel output. Also, their maintenance, or even their deployment. Add them up and even after they are deployed in substitution to reduce emissions, you will still have climate change because those actions ignore the law. FMS refers to those emission as [CO_2 leakage]. FMS's point is Carbon or CO_2 leakage is not just a country-to-country issue its source-to-source issue and governed exclusively by laws of conservation, within a closed system. FMS tells us strongly, if CO_2 is produced in anyway it has to have production to responsible storage else, we have problematic climate change.

Marketable Sequestration:

FMS targeted sequestration capacities (and as year over year increasing sequestration rates) significantly impact atmospheric residence conditions as opposed to nonmarketable insignificant rates that are minimalistic in economic gratification. Marketable sequestration rates are in sufficient volume to financially achieve and maintain FMS economic mitigations efforts within market demands like carbon indices, credits, or offsets while allowing support of the supply market with landowners and other FMS stewardships like woody biomass suppliers.

Natural Afforestation:

Land process that is returning previously human used land to its native or wild state as forestry without human influences like replanting or fertilization. All aspects of growth are of nature driven consent and acceptance. This may include human stewardship in reinforcing lack of access, guardianship of the process, or soil cultivation (reclamation or restoration efforts) to allow process to govern itself.

Nominal measurement scale:

Is a measurement scale, in which numbers serve as "tags" or "labels" only, to identify or classify an object? This measurement normally deals only with non-numeric (quantitative) variables or where numbers have no value.

By FMS defined example: lumber 2x4s –used to build houses and other structures. The numbers 2 and 4 refer to the size of the board: a 2×4 is not actually 2″ x 4″ as it was engineered to be pre-1916. Since 1916 it is actually measure's 1-1/2″ x 3-1/2″. FMS defines nominal measurement as fake and as a deceptive trade practice used to artificially increase forestry demand and not a resource conservation effort it was touted to be since it actually produces artificial demand or paying more for less.

Occam's Razor:

Occam's razor, Ockham's razor, Ocham's razor, also known as the principle of parsimony or the law of parsimony, is the problem-solving principle that "entities should not be multiplied beyond necessity". It is understood in the sense that with competing theories or explanations, the simpler one, for example a model with fewer parameters, is to be preferred. The idea is frequently attributed to English Franciscan friar William of Ockham, a scholastic philosopher and theologian, although he never used these words. This philosophical razor advocates that when presented with competing hypotheses about the same prediction, one should select the solution with the fewest assumptions, and that this is not meant to be a way of choosing between hypotheses that make different predictions. Similarly, in science, Occam's razor is used as an abductive heuristic in the development of theoretical models rather than as a rigorous arbiter between candidate models.

One to Many Relationships:

One component to understanding Thompson's direction with engineering and experimentation is to understand internal and external relationships to Thompson's woody biomass composites. E3Lumber patent applications are important. Within those patents are many one-to-many relationships developed for the intention of climate mitigation. Realization of FMS began with those one-to-many relationships. Starting with initial woody biomass composites research and FMS experimentation growing from there into its first models.

The first of these relationships are the advancements in woody biomass composites, specifically adhesives and methods that postulated the many innovations within E3Lumber's materials, and assemblies. Those many relations included the ongoing development of renewable, recyclable, and renewable carbon net negative/neutral materials formed into usable composite forms. The current shapes are restricted to the substitution of lumber and peeled lumber products and have additional potentials to make everything from auto parts to recyclable fast food drinking cups. One of many relationships from woody biomass composites efficiencies over lumber proposed a better relationship with E3Lumber's supply chain as forestry improvements. Thompson uncovered some very practical looking forestry improvements which began outlining Full Mitigation Science's true abilities for mitigation. FMS one to many relationships then expanded mitigation potentials and defined them into models. The models of course pointed out FMS's climate changing Datum as forestry demand and also defined constrained and unconstrained deforestation.

Woody biomass composites provide many bridges to reach FMS goals. Substitution of sawn and peeled wood was not the only bridge but that particular one provided FMS its best-case scenario to achieve globally scaled climate mitigation. The modern forestry products relationship to climate change became undeniable with its own one to many relationships.

FMS's one to many bridgings' effect also provides teeth within FMS that binds forestry stewardship relationships with woody biomass composites potentials and economic driven climate mitigations. Its bite perpetuates those relationships with capitalism driven economics with ample input form FMS's force majeure economics. The highly relational result can reduce forestry demand by 80-90% and even more over time. The relation goes on to propose significant improvement in carbon sequestration as sink restorations in the thousands of percentiles. An impetus in the improvement of human occupied structures also become relatable to FMS sustainability and woody biomass composites higher qualities.

The larger of the teeth is of course the force majeure economics relationships, of which there are many. That force majeure comes in the form of the whether you like it or not, with or without your permission or knowledge, and not requiring political permission or regulations so FMS can cross borders without much in the way of discussion. The relationship formed there is possible by international banking that does not restrict access to money and are mostly blind to borders but not to their account holder's requirements. FMS's one to many relationships also form the FMSCO2 credit relationships as international cap and trade and private markets in both supply and demand economic relations. One to many is a best practice for describing FMS and E3Lumber. Other than the 1800-1850 datum no singular component stands out without other relationships as input or outputs.

- **Photosynthesis:**

The mechanism by which plants synthesize complex carbohydrates from light and carbon dioxide (CO_2).

Gross photosynthesis/True Photosynthesis: the sum of carbon fixed through carboxylation within the leaf chloroplasts (also referred to as true photosynthesis)

Apparent Photosynthesis: Carbon assimilated though carboxylation minus photorespiration

Net Photosynthesis: Gross photosynthesis, minus photorespiration, and dark respiration

Gross Primary Productivity Ecosystem-scale apparent photosynthesis

Profitable Stewardship:

PS, Profitable Stewardship is enhancement and creation of CO2 sinks under capitalism driven components as incentives to entice nonsubscribers towards FMS practices involving advanced woody biomass composite orientated forestry stewardship and to aid nonsubscribers to maintain FMS supplier practices under profit driven rewards.

FMS also defines profitable stewardship as monetizing a resource while improving that resource's availability.

It is a rare economic condition when resource use that answers it is demand, can actually improve that resource in characteristic and abundance without economic demise or abandonment of the resource. Advanced woody biomass composites, FMS stewardship models, and eliminating constrained deforestation can make all that possible.

How? The annual growth of a tree increases its sequestration valuation and biomass accumulation. To advanced woody biomass composites, the more maturity the more efficient materials become because the more volume is located in one place AND not as much volume is required to do the same thing it replaces <90%. Tree growth and advanced woody biomass composites lend themselves to higher efficiency in general but a shared higher efficiency specifically. To form PS, the more efficiency the more positive climate interaction resulting in less and less numbers of trees required to make todays wood or peeled products but even less are required for advanced woody biomass composite substitutions.

With sequestration, the more the tree's maturity increases the more the volume of annual sequestration increases and the more the living tree is monetized. The more the tree is monetized the less likely it is to be harvested. The trees forestry plot annual sequestration income (tabulated) can match or better its board foot or "pulp" value. More valuable alive than dead.

FMS's Profitable Stewardship (PS) addresses inefficiency in state-of-the-art forestry. Specifically, PS increases how long trees grow, under what type of canopy, and any other condition that promotes CO2 sequestration and residually biomass growth. PS addresses other issues like longevity of stewardship within economic environments of market demand by removing the tree from constrained deforestation.

Fundamentally to PS, the more biomass grown to maturity, the more photosynthesis afforded the more CO2 sequestrations occurs which results in more carbon that is stored and the more climate mitigation.

Renewable Resource, FMS's expanded definition:

To be considered by FMS as a 'renewable resource' the resource must be sustainable to its replenishment environment and its end use. FMS's sustainability evaluation includes the resource's ability to regenerate its carbon sequestration capacity and storage in at least a balance with carbon released when its used or deployed. Therefor,

1) The resource must be either a net zero or net negative in CO_2 released when put to use and be replenishable in CO_2 sinks in balance with the resource's consumption.
2) The resource must demonstrate a carbon balance. Determined by the balance of the resources use releasing carbon proportionally to the resource's replenishment of carbon storage.

Today's wood products are nowhere near balance and release vast quantities of CO_2 to manufacture not to mention they destroyed global fast cycle sinks doing this. Advanced woody biomass composites and FMS stewardships reverse those processes and substitute net negative and net neutral products as result.

Residence time:

The time required for emitted CO_2 to be removed from the atmosphere through natural processes in Earth's carbon cycle as a form of "t."

Runaway Greenhouse Effect:

The most extreme runaway effect is when a planet's atmosphere contains greenhouse gas in an amount sufficient to block thermal radiation from leaving the planet, preventing the planet from cooling and from having liquid water on its surface.

Another version of the greenhouse effect can be defined by a limit on a planet's outgoing longwave radiation which is asymptotically reached due to higher surface temperatures evaporating a condensable species (often water vapor) into the atmosphere, increasing its optical depth.[1] This positive feedback means the planet cannot cool down through longwave radiation (via the Stefan–Boltzmann law) and continues to heat up until it can radiate outside of the absorption bands[2] of the condensable species. (Wikipedia 2022)

FMS states we entered the first stage of the runaway effect in 1950. The only thing saving humans from a full-on extinction level event is the ongoing sacrifice of our oceans and the 3% of terrestrial sinks that remain.

Oceanic sequestration of CO_2 is an important part of earths biome. The acidic conditions created by overabundance of atmospheric CO_2 sequestered into the ocean is indication of runaway greenhouse effect. It's also one of the more concerning attributes in climate change. Excessive CO_2 in oceans is negatively impacting biodiversity and human food production from our number one source of protein, the oceans. The negative impacts are measurable and widely accepted without argument otherwise. They also demonstrate that oceanic CO_2 levels are moving towards CO_2 saturation levels hurriedly. If even isolated saturation is achieved anywhere within earth's oceans humans will have hit a point of no return in runaway greenhouse effect. The surface of earth will no longer be habitable with constant hurricane force winds, elevated temperatures, excessive water vapors and extremely aggressive and constant tsunami like waves. This phase is a precursor to excessive surface water evaporating into atmosphere vapor, which started in 1950 as well.

Another indicator of the runaway greenhouse effect is atmospheric wind relocation. The jet stream is formed by temperature differences between northern (polar region) and mid equator hemispheres. As polar temperatures continue to rise the equalization in temperatures between the warm air from the south and frigid air from the north is physically moving the northern latitudes jet stream incrementally further north. The relocation is allowing super heating in the southern oceans and stagnation in weather events that create more water vapor. More atmospheric water vapor equals increased storm intensities and durations and can also suck the jet stream temporarily and erratically further south bringing polar like weather to areas not used to freezing temperatures. It is thought that the highly erratic movement in the jet stream causes todays extreme weather events that are sure to worsen as atmospheric CO_2 levels increase atmospheric water vapor levels. As another indicator of runaway greenhouse effect the jet streams migration further and further north seems to indicate the equalization of temperatures from poles and mid latitudes. This could pose a collapse of the extremely aggressive weather of late which could be replaced with weather that can permanently modify Earth's surface weather conditions.

Sequestration Dependance:

FMS defined as CO_2 emissions are unavoidable and a required cyclical input to the environments producing, sequestering, and storing them in balance. Humans are sequestration dependent because of the closed system they exist within. Unbalanced interactions within the CO_2 cycles therefore cause extraneous conditions to form as both desired and undesired.

Sequestration dependence as defined within FMS terminology is the source of FMS's simplicity that resolves FMS conceptually to be both true in direction and correct in its assumptions that humans living on Earth are highly sequestration dependent.

Sequestration Value:

FMS describes the sequestration of CO_2 into biomass as sequestered carbon. The ability to sequester CO_2 within climate mitigation is described as an economic value. Climate Mitigation sequestration value is established as a macro benefit or deficient as measured by climate requirements in balance, over abundance, or deficient. Whereas sequestration economic value is derived by both the current CO_2 amount the biomass has or is sequestered as carbon OR the amount it can sequester in a future period. Typically, sequestration valuation is monetarily established by atomic mass units of CO_2 (44 amu's) to achieve Carbon's 12 amu's sequestered. Sequestration value is then the amount of value in climate mitigation established by human needs. Or the monetized CO_2 sequestration valuation on what a forest has done to date in carbon sequestered and what its capable of sequestering in CO_2 the future.

The Three Method:

Abstract

As a simple matrix allowing given or focused variable descriptors their own best practices in relation to the model's objectives and as a determinate for an opportunistic manipulation of data arranged vertically and horizontally by the modeler. The effects within the scoring matrix are generated by interrelated data of row descriptors to the column's parental data as primary descriptors. As an outcome is defined by the standard deviation shared between both row and column, the Three Es method applies critical thinking, theory, organization, and static criteria for interdisciplinary goals. By the use of suitable inputs it can also help to define a known solution in reverse, as cause and effect or as a reverse engineering instrument.

References

No known references to the Three E method are found. However, the author recognizes the simplicity of such a matrix and scoring model must relate to the work of others. Unfortunately, the author is unaware of sources that relate to the Three Es but feels such a source is highly likely but without knowing the proper nomenclature it has been difficult to matchup.

Scope

As the author's thinking tool or processing of data, the Three E method is not restrictive to any category or direction. Being the authors method of modeling circular references, as spinning thoughts occur, towards a complex solution. Because the three Es tally simultaneously as interrelated concepts it provides quick and straightforward ways to further rationalize differing concepts to cause or effect. The rows and column descriptors and their scores are constrained to relational entries but are highly manipulatable within either descriptor column or row.

The author uses this format as a simplified but functional model to influence categorical organization to help define interdisciplinary goals as they relate to one and another. It also helps to define design specifications. It is the authors train of thought, sort of a three-dimensional thought process to enable hen pecking of significant data.

Three Axes, X axis = column primary category descriptor, Y axis = row correlation descriptors, Z axis = Scores as row X and column Y totals.

X = Z, Y = Z, Z>0 (X=Y) Z< 0 (X=Y), unbalanced score as (X<Y)

Model Example

Three Es, Product Development

	Economics		Engineering		Environmental		Row Total	Correlations of Rows to Columns
1	Cost to Produce	5	Reproduction ease	-5	Low to no impact production	5	**5**	Production of Item, importance
2	Economic Environment impact	5	Product Influence	5	Environmental impact +	5	**15**	Macro impact, as business model
3	Economic Environment impact	5	Product reliability	5	Social perception +	5	**15**	Micro Impact, as human assessed
4	Materials Available	5	Raw Materials type	-5	Renewable Materials	5	**5**	Material used
5	Consumer Market Volume	5	Features	5	Sustainable Materials	5	**15**	Material features
6	Industrial Markets	5	Forms or Models	5	Reusable Materials	5	**15**	Material Forms
7	Markets, Entry Efficiencies	5	Intuitive Efficiency	5	Efficiencies	5	**15**	Determinable Efficiencies
8	Regional	5	Optimization Standardization	5	Material Waste Reduced	5	**15**	Integration and restrictions
9	Global	5	Distribution, logistical	0	Positive Global Impact	5	**10**	Capitalism for benefit
10	Overall	5	Product or Method Rating	5	Friendly	5	**15**	Overall Column Ranking
18					**Balance Check**		**125**	**$Z2_{max}$ = 50 $Z1_{Max}$=15**
19	***Z2 total***	***50***		***25***		***50***	**125**	**Balance Check**

Rows are relational as are the columns. It is a thinking tool presented as a model.

Use of output

Lower engineering score indicates design criteria will be influenced by adjacent row descriptors:

Row 1 Engineering Reproduction ease is 10 pts out of balance therefore left and right columns as cost to produce and low to no environmental impact are more significant to reproduction ease. The -5 Reproduction ease score is due to lack of caring, at this theoretical point, how easy it will be to reproduce. Overall correlation, Production of item, importance; is less significant to higher scored row to column correlations. Just as Economic and Environmental columns totals are more significant than Engineering columns total. As a design specification: A low cost to produce with a low to no production created environmental impact is required.

Raw material type is 10 pts out of balance, therefore availability of materials and being renewable are important. The -5 Raw materials type is again lack of care of the type of material used provided it fulfills the other columnar obligations.

Distribution, logistic is 5 pts out of balance, therefore, left, and right columns of Positive Global impact economically and environmentally both becomes significant. Engineering distribution, logistics as 0 or neutral is because the distribution and logistics problems are well known as important but not critical for product design decisions.

In this scenario, the Three Es are demonstrating a manipulated scoring that presents Engineering is needed to balance rows to column. Thus provides a starting point as criteria. It can be manipulated by reorganization of scoring to reflect a need in any column to again balance all columns.

- **Tree degradation:**

FMS defines tree degradation as an extension of forest degradation brought on by forestry product demand. The cutting of smaller and smaller trees diminishes the tree maturity and size and the land's ability to regenerate naturally. This makes for lesser quality sawn or peeled wood products, devaluation of sequestration, and ultimately impeding of CO2 fast cycle sinks.

The tree becomes lesser valued the smaller it is at harvest. So, more are often harvested to makeup the inefficiency in maturity. As an unnatural occurrence economically and biologically tree degradation increases as demand increases which perpetuates the effects. FMS's advanced woody biomass composites reverse tree degradation with efficiencies found within their production.

- **Uninformed stewardship:**

Stewardship practices create climate change conditions by unknowingly practicing in forestry (biomass) management to increase or supply human demand. Unknowingly implementing economic driven management of forestry and not entertaining an engineered use of forestry's other potentials like carbon sequestration or improving efficiencies. Conducted for profit but not being aware of FMS stewardship that promotes forest recovery while addressing demand requirements with efficiency and sufficient recovery durations. Constrained and unconstrained deforestation is the significant result of uniformed stewardship practices managing forests.

Business Model Preamble

FMS strives to provide industries with the technology they need to become carbon neutral but not as a definitive circumstance to their full mitigation. FMS outputs can readily offset industries that lack carbon neutral or negative technology. Applying FMS offsets to any industry can point them in the right direction(s) by helping to isolate the technology needed, pointing out efficiency improvements, and/or highlighting where economic improvement lay. The Three E Method can provide some guidance in those efforts to help think about climate change, technology, and economic relationships.

Scalable Mitigation Efforts

FMS begins with two interrelated means composed of one-to-many relationships:

First, engineered technology, like E^3Lumber, forms a bridge to both economic and environmental sustainability within FMS guidelines. This process is again loosely defined in the "Three E Method." The Three E's are manipulated by industry and its desired climate positive.

Second, FMS can assist industries still requiring technological breakthroughs to mitigate emissions or other environmental negatives using offset credits (such as carbon credits). FMS uses an interdisciplinary structure to achieve industry dependent mitigation with or without technological breakthroughs or inaccessible industrial developments. The relationship forms an economic environment to achieve environmental (climate mitigation) equilibrium as forestry sequestration becomes an FMS commodity balanced with non-forestry related emissions. FMS's empirical measurements can produce more permanent sequestration value than any arbitrary offset available due to its commodity like landowner agreements.

Proposed mitigation includes but is not limited to:

- Advanced woody biomass composites as net neutral/negatives used within the industries components. Also known as E^3Lumber.
- E^3CO_2 credits or offsets from advanced woody composite use can be shared outside of E^3lumber program.
- $FMSCO_2$ credits or offsets from FMS establishing forestry sequestration valuations and E^3Lumber supply chain devoted forestry.

Each of which respectfully apply, advance, and/or sustain numerous bridges to FMS's environmental potentials that can establish or promote FMS's mitigation efforts with stewardship and apply economic force majeure. All without economic negatives to current forestry users.

It should be noted that the E^3CO_2 carbon credit is a derivative of E^3Lumber's supply chain and proportional to E^3Lumber's production and subsequent end use tracking. Whereas $FMSCO_2$ is an actual physically produced credit commodity tied to a land holding's previous year carbon sequestration valuation like a crop or commodity contract, or commodity future. It is encompassed by land agreements and security deposit to produce it and insure its credibility. Furthermore, $FMSCO_2$ is produced like a 'commodity' to be both perpetual in sequestered carbon and scalable to future credit/offset market buyer's offset requirements. Finally, $FMSCO_2$, and the combined E^3Lumber/ E^3CO_2 can each independently contribute to the economic force majeure FMS practices can create. The first means of scalable mitigation relates more to the E^3Lumber/ E^3CO_2 one to many relationships but pales in comparison to $FMSCO_2$ potentials.

At the risk of further complicating FMS's one to many relationships, the offset or credit derivative of FMS's economic force majeure also presents in two interrelated forms:

First form:

Typical Three E derived technology allows an industry removed from forestry to offset a practice where they currently lack the technological ability to mitigate or balance their GHG emissions. As an example: Manufacturing a typical electric powered automobile with four hundred miles of range requires anywhere from 12 to 16 tonnes of CO2 to be released into the atmosphere. Using 12-16 FMSCO2 credits to offset those CO2 emissions makes the manufacturing of that automobile a carbon neutral production. Applying 20 FMSCO2 credits make it a carbon negative production and could also offset the finished automobile's energy requirements obtained from nonrenewable (fossil fuel generated) electricity. FMS's forestry applied sequestration allows FMS to offset cap and trade and volunteer markets from other than wood industries. FMS sequestration valuation goal is unimpeded sinks, those unimpeded sinks create value in both climate mitigation and monetization.

Forestry stewardship applied by combining E3Lumber and FMS's technology bridge is another example of this first relational form. As example: The hood of a vehicle could be made from E3Lumber's net negative/neutral EM2Materials. That lowers the production emissions of the vehicle. The materials net negative is deducted from the vehicle's overall emissions to produce it. As an expanded example, net negative/neutral product substitutions can still produce the E3CO2 carbon credit as a desired result of highly increased efficiency derived by E3Lumber material and engineered technologies. These efficiency improvements across the wood products industry produce a highly improved stewardship model and opportunity within forestry resources, economic environments, and manufacturing which can be applied as an empirically measured offset or credit to any industry lacking standalone greenhouse gas mitigation ability or will. Because of FMS's economic force majeure, this can be accomplished globally, with or without the consent of a naysayer and by substituting materials used to build most anything.

Second form:

The FMSCO2 carbon credit/offset is produced by implementing FMS stewardship with or without GHG technology advancement input like carbon net neutral/negative components. Proportionally, FMS standalone mitigation does not require the technological improvements to generate highly scalable GHG mitigation. Admittingly, GHG technologies that expanded GHG efficiencies can greatly enhance this second means/second form as it does in the first form. And they could help replicate other previously mentioned forms by production and combination of all three potentials like E3Lumber, E3CO2, and FMSCO2. However, FMS can demonstrate FMSCO2's climate benefits can be driven by already established economics engines independent from FMS's other efforts. Economic environments like cap and trade and voluntary markets that implement FMSCO2 credits can create a standalone demand side while FMS lands/landowner agreements can stock a supply side with sequestration valuation. Having the demand and supply side can potentially enact FMS's economic force majeure to develop and sustain an economic environment in direct relation to climate mitigation goals.

Overall, economic environments created with FMS and/or woody biomass composites are the future of mitigating climate change. Together or separately, each can create economic force majeure for environmental/climate stewardship and enforce sound climate practices gracefully amongst free market competitors.

Another force majeure is possible with FMS's newfound knowledge. That knowledge implicitly teaches all of us that no other viable solution to mitigate climate change exists beyond what FMS and E3Lumber's can offer. Knowing FMS's datum and acting from it proposes a cure and not just prolonging treatments. First it does so by addressing participants within economic environments favorably. Second, FMS addresses engineering with practical, existing technology and not undeveloped future technology. Third, FMS mitigation creates environments with sustainable and perpetual solutions that are generational by removal/postponement of instant gratification policies from forestry.

XI. FMS History

From 1996-1999 Thompson studied and experimented with wood-based composites but commercially available adhesive lacked the abilities needed plus the material economics did not align; consequently, the products he developed on paper could not yield the desired engineered wood. Decades later, he recognized the additional potential of woody biomass composites as he experimented in reverse engineering and a way to itemize thoughts, his "Three E" method took shape. In January 2019, after 6 years of work, Thompson provisionally patented E^3Lumber which progressed into numerous patentable innovations by 2022. He attributes the additional innovations to new adhesive technologies, the decreasing quality of lumber materials, and skyrocketing lumber prices. The first actual FMS thesis was formed by Thompson in March of 2017 and it has since been revised after obtaining comparable results during formal modeling. FMS's first draft for edit and review occurred in June of 2022. By Mid-September of 2022 FMS was published.

Keep in mind that research and development efforts with advanced woody biomass composites (E^3Lumber) inspired FMS. Those woody biomass composites are slated to be produced by Engineered Wood Company (EWC) and marketed as environmental substitutions for sawn and peeled lumber products in the near future.

The discovery of woody biomass's numerous efficiencies over contemporary biomass use sparked FMS as an entirely separate research project. Eventually FMS graduated into basic comparison models between wood products and the woody biomass composites he had developed. Study of the basic FMS models pointed to a highly significant potential of atmospheric CO_2 mitigation…much higher than he anticipated. See Wood Products and Forestry section for more information.

Initially, Thompson had difficulty believing the results due to the levels of CO_2 sequestration in forestry using advanced woody biomasses efficiencies (E^3Lumber) modeled in comparison to atmospheric CO_2 parts per million. FMS's woody biomass use eliminated CO_2 PPM in atmospheric residence very quickly. At the time, he lacked contextual relevance for the effect to justify the outcome from only the substitution of wood products to his wood composites. It took a while for him to discover why that was possible and understand why no one was talking about it or doing it commercially.

The FMS scenario created a highly elevated forestry carbon sequestration model that gained over the extended growth durations resulting from E3Lumber's highly efficient use of forestry. He knew composites provide an unusually high forestry recovery duration that he could explain; but he had stumbled into a bigger picture he could not readily explain.

Thompson started to CO2 emissions were not alone in significantly contributing to climate change. Just how significant he began to understand. He first suspected climate change had a closer tie to forestry than currently believed, specifically to the CO2 atmospheric residence conditions we all know as climate change. But were they caused by fossil fuel use or something else?

It was in spring of 2020 that Thompson realized the 'if and what's' in his climate theories were becoming an "it." So, he continued his research and really started thinking the 'it' was by far a more significant input to atmospheric CO2 than previously believed, by anyone, to include himself.

Tying it all together was problematic for Thompson. His theory required historical research like anthropology, history, and combining data with which he was initially unfamiliar with and was not readily available for alignment with other sources. Months later he successfully modeled FMS graphically by combining data types. That because of the datum that pointed out 1850 in the aligned data. It was within those first graphs Thompson isolated "it" the 'actual' cause of climate change, the datum. He named and defined it as the climate changing 'FMS Datum.' What he accomplished was to isolate, to the year, when the climate changing switch had been flipped (1800-1850) and it was not what everybody else believed. Thompson himself was also a doubter until he could prove it in more than one way.

Thompson was not readily accepting his newfound FMS knowledge. Still, FMS had a datum and so he continued his proofs and furthered his research on the environmental impact of production and use of advanced woody biomass composites.

When he updated his previous modeled comparisons from contemporary wood products, the potential climate impact was truly unbelievable and a eureka moment. As his research and product development continued, Thompson began contemplating larger scale mitigation ideas, as he checked and rechecked his work. These ideas seemed to develop and mature alongside the scrutiny of the previous "unbelievable" work. He documented the mitigation practices he formed into the final FMS's hypotheses while using the datum's model. Although he still did not completely accept his results, he began forming basic climate change models around his patent pending composites. It was then FMS's highly significant effects on CO2 residence conditions were documented, so he and colleagues could double check what he was seeing and not believing, because it couldn't be that simple, or could it? FMS needed further validation to go any further, so he spent months reviewing to define what he still did not believe. And define he did.

His models used FMS's main focus to counter its own datum of the loss of balanced sequestration to emissions. At that time, he referred to it as "the modification of contemporary forestry use with advanced woody biomass composites." That later proved to be a mitigation effort, not the underling principal of FMS. The new, more widespread modeling spreadsheet models provided Thompson better understanding of climate change and the role of forestry. But it lacked correct definition.

Unfortunately, Thompson's newfound knowledge still was not taken seriously by himself. He did not believe his own results could be accurate; being so contrarian in nature to everyday statements about climate change. Particularly, the knowledge that establishes climate change's datum point (around 1800-1850) and suggests human forestry demand as the root cause. Never mentioning his finding to his colleagues, he checked and double checked his sources and math, which actually deepen FMS's mitigation potentials. Over a year later, he accepted he was correct because he could find no way to disprove the conclusions so he moved forward. The next study correlated anthropology data to atmospheric PPM's records in ice and compared them to CO_2 emission data. It was not until Thompson could contextually explain the datum construction was composed of his defined "constrained and unconstrained deforestation" practices that he began to take his finding with the utmost seriousness. He began to recognize exactly what the work was yielding: reality and truth.

Once he had settled on the historical facts and the models as accurate, he began mentioning them to his friends, family, and colleagues. All of whom, like him, were highly skeptical. He clarified his message to help explain. He started with, "human forestry demand has impeded fast cycle CO2 sinks to a point that is entirely unacceptable based on and by 285 million years of previously established ecological covenants that balance CO2 emissions with plant respiration. That is the significant contributor to climate change, not the industrial revolution or fossil fuel uses alone. Climate change is forestry demand and that caused constrained and unconstrained deforestation in land uses that have caused the global cycle CO2 sinks to be less than single digit capacity remaining, the sinks have been degraded over a million percentile from their potential." He went on to add, "forestry in one regard is the regeneration of biomass. By current definition forests are a renewable resource. FMS can demonstrate it must be regarded as a resource twice before defining it a renewable. Because, as it turns out, forestry sequestration is by in large more important than forestry regeneration. Forestry given over to demand and not serving both stewardships is climate change. Demand driven practices can now be defined as constrained or unconstrained deforestation which are neither renewable nor now historically established as sustainable. My research demonstrates a certainty to the outcome of doing otherwise as eminent runaway greenhouse effect. Unfortunately, we are closer to that then pre-FMS knowledge informs us."

By the last part, facial reactions were enough. The message was not working. A universal mental hump has been formed by intuitionalism of emissions being the primary climate change message; carbon emission is the thing that causes climate change is engrained into society. But this message is not the whole story and only a small part of it. Sequestration to emissions balance is the important thing, and the impacts created by traditional forestry are far more significant and negative to climate change. Earth emits seven hundred billion giga tons of CO2 naturally, in comparison, humans emit a paltry thirty giga tons in the same time frame, its impeded sequestration not emissions causing climate change.

Part of his message. “My current hypothesis includes the current international prediction of a 2 degree rise in average global temps. FMS states empirically that the international prediction is far too high. The residuals of that average temperature increase could erase entireties of forests with wildfires, biological expansions, and severe weather damage that can establish even more CO2 released directly into residence conditions. CO2 just cannot be sequestered anywhere; it has to have a compatible place to go. Those forest damaging processes will significantly add to atmospheric CO2 PPMs, instantly in some cases like fire. It all goes towards an uncontrollable effect, as a runaway greenhouse effect. Earth has already established. 1.5 degrees, more could further tip the scale towards significantly strengthening a dismal planet to human life relationship. It could even happen at a much lower temperature. Right now, we should do everything possible to avoid that extinction level event.

Thompson learned the message is as important as his work turned out to be. Undoubtedly, FMS is not going to be easily advertised because in this day and age it is not about the audience’s intelligence, it is about the beliefs they have been guided to. How can truth be represented in so many credible ways, and still become so opinionated and wrong?

In development of FMS stewardship and mitigation practices, Thompson developed an offbeat philosophy to work from. Within his study of the ongoing or current climate change mitigation efforts, he observed a pattern of group think. He determined quickly that most, but not all, climate mitigation efforts are highly noble in emission reduction efforts. FMS knowledge can now dictate those efforts cannot accommodate full mitigation even when combined. To Thompson, many of the contemporary efforts were lacking in practicality and most suffered an FMS refined definition of significant CO_2 leakage in comparison to what they could reduce, substitute, produce or save. His study made it abundantly clear that FMS knowledge is highly significant if climate mitigation is truly desired. Popular mitigation efforts said otherwise, but Thompson’s determined current mitigation efforts could provide validity in the reduction of atmospheric CO_2 emissions, where most efforts fail in practicality and scalability and are unsuccessful in removal of resident atmospheric CO_2. Nor do they typically deal with longer term projections like increased population or the residuals of past human conduct that have provided today’s climate changing events.

Contemporary mitigation that does not underscore post FMS knowledge all seems to commonly fail first at practicalities, like fully replacing fossil fuels, and then they ignore the laws of conservation, LOC’s. The majority and most popular leaked more CO_2 to make and implement then they can ever positively displace from the atmosphere. Many also exhibit some form of no sustainability by not yet understanding FMS and actually are making climate changing problems worse. Thompson found that without post FMS sequestration efforts to offset them, NONE of the efforts he researched could really achieve their intended potential and seemed more political or perceptional clean up than applicable to actually making things better in the short or long term.

With those discouraging findings, Thompson further defined FMS with, “the laws of conservation FMS defined should apply to all climate change mitigation efforts. To believe micro projects like electric cars, solar panels, or wind generation can produce a macro solution in global climate change is made unreasonable in CO_2 leakage, sustainability, and scalability (as economics); to understand them as inputs as FMS does is correct because the efforts discount the laws of conservation and only create a blind faith in achieving a globally desired climate change results.” The balance required in the conservation equation is only fulfilled by providing CO_2 (and other GHG’s) a place to go.” See LOC summary for additional details.

With that knowledge, Thompson set out to further define FMS knowledge into solutions to mitigate climate change. Since FMS had been started with advanced woody biomass composites efficiencies and he had already environmentally modeled their net carbon neutral and negative potentials, he began exploring the economics of implementing them. While doing so, he determined that previous geopolitical climate work had already produced offsets or credits, and those efforts currently lacked post FMS understandings and as a result suffered from creditability decline. He realized those efforts could be enhanced under FMS models. So, he added to the biomass composite reproductions another commercialization that could provide permanence and legitimacy to cap-and-trade credits and offsets, the E3CO2 carbon credits. Based on advanced woody biomass composite production, the E3CO2 credit also provides shared opportunity for use in other outside mitigation efforts. He determined the environmental gains of the composites could make net carbon neutral, or negatives, out of anything while creating an economic force majeure for climate change mitigation. By sharing the biomass composites efficiencies and FMS stewardship the E3CO2 credit’s ability to share its carbon gains sparked another question. Why only with the composites, could FMS by itself be commercialized?

That idea modeled FMS into a sole commercialized effort (without composites) as the FMSCO2 carbon credit. Initially, by combining composite efficiencies with E3CO2, Thompson proposed the sharing of efficiency to other industries that needed offsets. With FMS’s FMSCO2, he developed a way to manipulate FMS’s climate changing datum much faster. It is faster because it is not reliant on woody biomass composite sales to create the E3CO2 carbon credit sales it uses commodity contracts to make it as real as the food you eat.

Thompson realized for FMS or composite economics to arrange in force majeure they needed three ways to create those desired economic environments, to force environmental stewardship by making it incentivized. To his understanding, to correct climate change with scale, an economic force majeure is required in order to have an impact significant enough to make a global difference. FMS research into mitigation economics presented a solution.

As Thompson mentions, “FMS datum manipulation is rationally, economically, significantly, and environmentally supportive while it scales-up contemporary mitigation efforts as it pays its own way.” FMS mitigation efforts are therefore the way again, with or without its woody biomass composites, anyone’s permission, or anyone’s acceptance or denial of scientific facts. Economic influence is the key to accomplishing climate mitigation, there is no doubt about that.

Thompson suggests contemporary CO2 leaking mitigation efforts acquire FMSCO2 credits to offset CO2 leakages and/or unsustainability. Doing so could lend FMS credibility to those efforts and monetize FMS’s efforts. High creditability is structured into the

FMSCO2 credit/offset because it demonstrates as more of a commodity than current credits and offsets can. Because of the FMS program correlation with creditability, Thompson furthered mitigation efforts by describing the FMS economic business model. Its goal is profit, in order to maximize FMS mitigation again with force majeure economics. Its key is the FMSCO2 credit.

Thompson locked FMSCO2 to annual and empirical measurements that monetize sequestration for landowners so they do not clearcut. That monetization is passed on to landowners who are practicing FMS stewardship and, by way of, they are eliminating constrained deforestation practices and restoring fast cycle sink capacities. Annual monetization is key and permanently associated to the land's annual sequestration. Transactions are also guaranteed against breech, natural or flagrant, by recurring deposit assigned to the land, not the land's owner. As a result, FMSCO2 is able to maintain perpetuity in carbon storage by offsetting any breach immediately to other lands. This new style credit proposes to establish high credibility and improved standards to existing and future carbon markets. FMSCO2 was partially engineered to enhance an existing global carbon reduction system that has been proven effective but suffers from credibility. With FMS's knowledge and FMSCO2 newly established standards, those existing markets could suffer additional loss of creditability, which is not an outcome FMS intended.

Thompson proposes the shake-up FMS proposes is a good thing. More directed help in climate mitigation efforts is needed. Most of the world's efforts are lost in the treatment of symptoms, and not fixing the actual cause. FMS fixes the problem, all the problems associated with climate mitigation.