Sustainable Forest Management in the Context of REDD+

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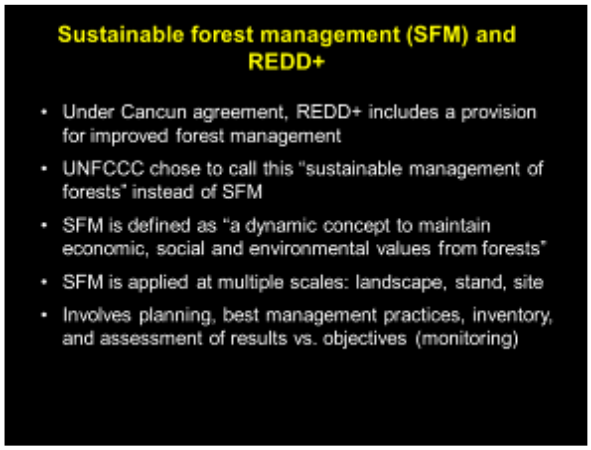
I was actually here last year, so I hope I will be able to present something different this year. My idea here is to talk about some of the ecological aspects. I actually changed the title at four o'clock this morning as I realized I am not really talking about sustainable forest management or all aspects of it, I am really talking about the ecological aspects.



Dr. Durst has already given a pretty good introduction to sustainable forest management and how this relates to REDD+. Of course, this all arose under the Cancun Agreements and this idea that REDD+ provides a way of bringing carbon out of the atmosphere and sequestering it on earth. The UNFCCC, for some reason, chose to call this "sustainable management of forests" instead of "sustainable forest management", which confuses everyone for five minutes until we realize that they actually meant the same thing.

Sustainable forest management is a dynamic concept. What that means is that we learn by

[1] Global Forest Expert Panel: http://www.iufro.org/science/gfep/

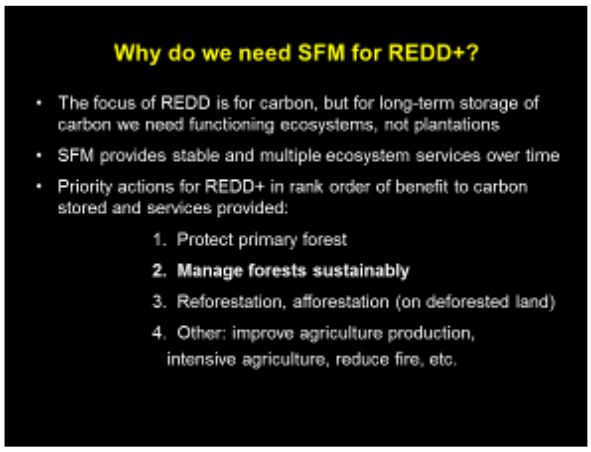
doing. Sustainable forest management is always going to change and we always learn from research and from measuring the way in which we have done forest management in the past.

When the Germans first defined sustainability, they were talking about sustainable tree management. They were not talking about sustainable forest management, because forests are ecosystems. They are comprised of a whole suite of species, not just the trees.

Sustainable forest management then is applied at multiple scales. We talk about sustainable forest management at the landscape and at the stand and then right down at the site level where we actually think about the silviculture of individual tree species.

My focus here is going to be on ecological aspects, but of course there are a suite of key components to sustainable forest management. You need good governance in place. You have to have laws and you have to have enforcement with those laws. Sustainable forest management is very much about planning. All of the things that we do with respect to sustainable forest management and the development of management plans is all about planning and the bringing in of the community and stakeholders at that point in time. It is an inclusive process that involves not just foresters, but also the community of people who will be affected and benefit from the forest.

We have the best practices that are used under management and monitoring assessment where we use the indicators that we have planned for to measure our progress, and then adapt our plan as a result of how well we have met those indicators or those objectives.

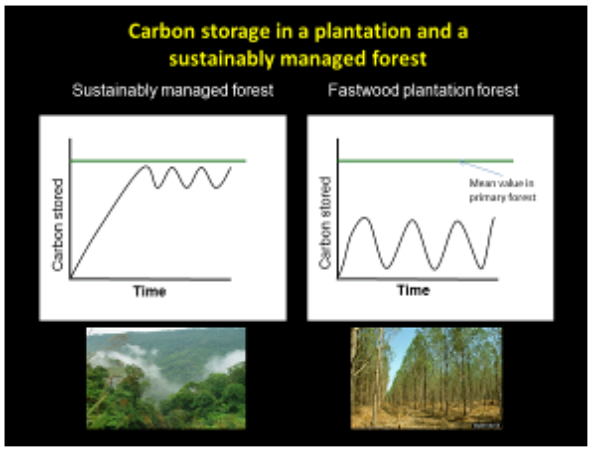


Why do we need sustainable forest management for REDD+? The focus of REDD+ of course is on carbon, but to enable the long-term storage of carbon; in other words, taking carbon dioxide out of the atmosphere and turning it into wood and soil carbon, we need functioning ecosystems, not just planted trees, not just plantations. Sustainable forest management addresses this idea of multiple ecosystem services that is a sustainable production of these over time.

In terms of the priority actions for REDD+, obviously we have protecting primary forest. A lot of research suggests that there is far more carbon in primary forests than there is in any other kind

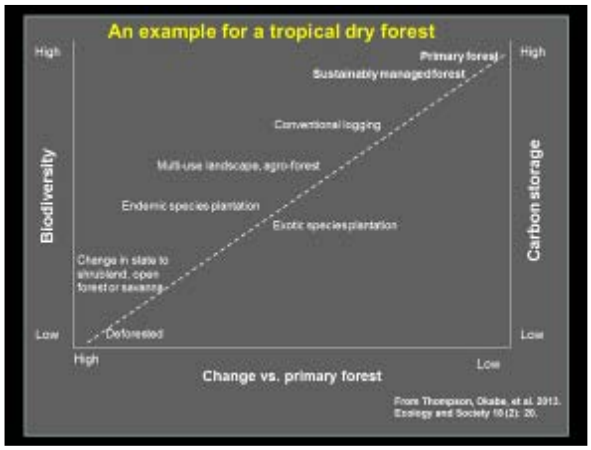
of forest. This is our first priority, but you are not going to protect everything. As Dr. Durst pointed out, it is extremely important for REDD+ that we manage our forests sustainably.

Beyond that, we can start thinking about reforestation, afforestation, and perhaps reducing the agricultural footprint on the landscape to reduce the amount of deforestation that goes on.

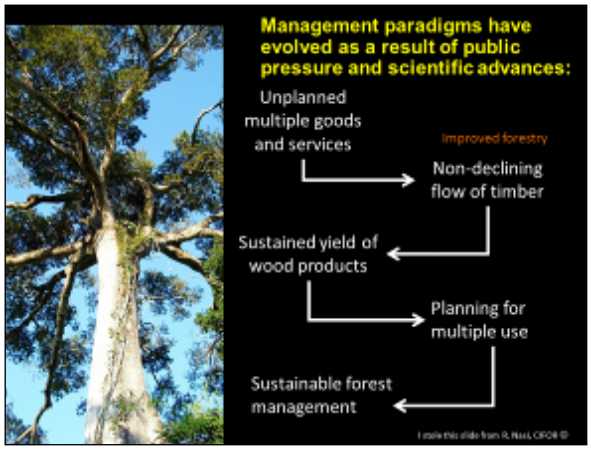


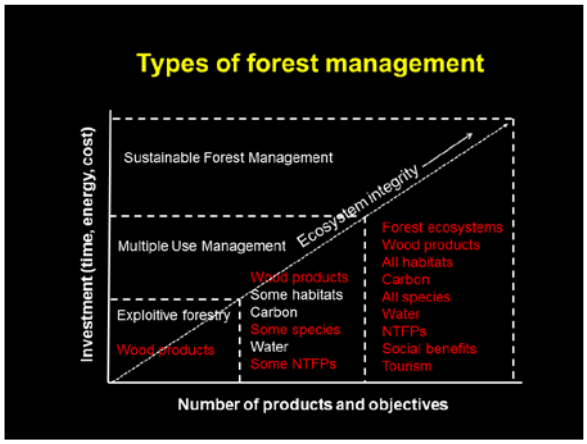
If we think about how carbon is stored in systems and how we might manage it, on the left side you can see a sustainably managed forest where carbon is the Y axis and the response of carbon to management over time. If we manage the forest properly, we can maintain a high level of carbon within that forest.

On the other hand, we can just plant some trees and then we just get a pulse of carbon. The carbon is sequestered. We use it as paper. It gets put back into the atmosphere. We plant more trees. We use it as paper, and on, and on. You are not really sequestering carbon. What you are actually doing is taking carbon out of the atmosphere for a very short time period and then putting it back into the atmosphere. This is opposed to a sustainably managed forest where we take carbon out of the atmosphere and keep it there for a very long time period.



This is an example for a tropical dry forest, for instance, where I have two Y axes with biodiversity on the left side, and carbon storage on the right side. It is a suite of the ways in which we might view these forests. We start with a primary forest that we can manage sustainably, or we start doing conventional logging within that forest and driving the amount of carbon and biodiversity down with each one of the more intensive uses that we do with this land.

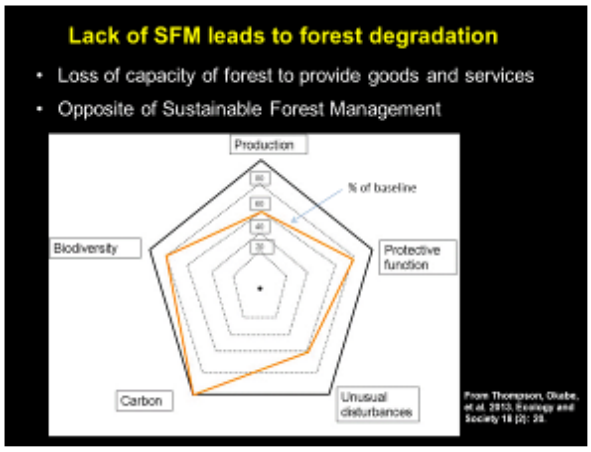




This is a slide from Robert Nasi. I think it shows very well the evolution of management paradigms as we went from unplanned use of multiple goods from a forest, through to improved forestry where we started talking about the German concept of a non-declining flow of timber, ultimately to a sustained yield of wood products, then planning for multiple uses, and then to sustainable forest management.

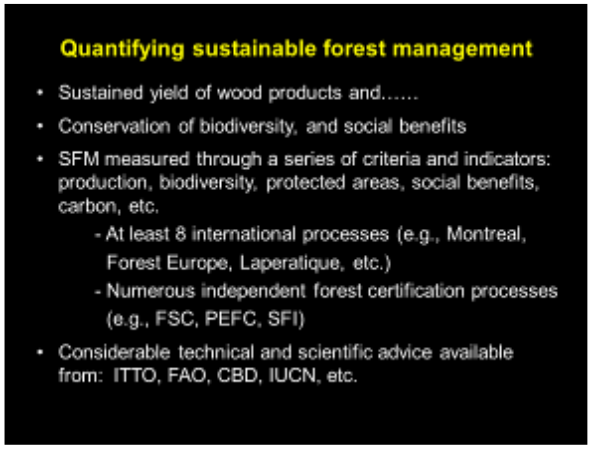
If we look at this in a different way, this slide talks about the improvement in the way in which we look at the ecosystem. Greater ecosystem integrity can be achieved with sustainable forest management as opposed to multiple use management where only some of the objectives for forest are actually managed for, whereas some other ones may come along by default, but we are not actually

planning for them. With exploitive forestry, a non-declining flow of wood product is actually the only objective that we are actually thinking about from the forest.



If we do not do sustainable forest management, we ultimately end up with a degraded forest or even a deforested forest, which is kind of the far end of the degradation spectrum. A degraded forest is a forest that has lost its capacity to provide the goods and services that we want to take from that forest. In a publication that I did with some number of colleagues from FAO and with Dr. Kimiko Okabe from FFPRI, we developed an operational framework by which we can measure forest degradation through a suite of criteria and indicators. Many of these borrowed directly from the way in which we would measure sustainable forest management in the first place.

This kind of diagram gives us a way of looking at various aspects of the forest, various criteria by which we might measure the way in which we are working on that forest land base in terms of production, biodiversity, the carbon that is stored, disturbances that happen, and then the protective functions of those forests.

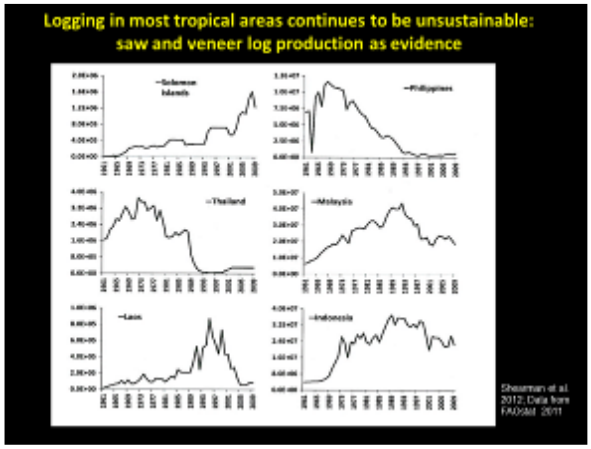


Dr. Durst talked a lot about quantifying sustainable forest management, so I am not going to

talk very much about that, except to say that we do it through a number of criteria and indicators that are all measurable. Some of these are measured remotely. Some of them are measured on the ground. Obviously, the best indicators are ones that we can measure remotely and that can be scaled up from our individual forest to a national level. There is a huge amount of technical advice available from various UN agencies like the ITTO, FAO, the CBD, and so on.

Sustainable forest management is mostly not practiced in tropical forests, which is where we are mostly worried about REDD+ and about deforestation. The emphasis in these forests is still on wood products; the non-declining flow of wood from these forests. Saw timber is still the main desired commodity, and maximizing short-term profits is the norm, which results in a tremendous amount of forest loss and forest degradation.

In a recent publication done for ITTO by Jürgen Blaser and his group suggested that more than 90% of tropical forests are being managed in an unsustainable way.



There is good evidence to this by looking at some of the FAO data. If we just look at saw and veneer log production, this came from a very interesting publication that made an analogy between

peak oil, which we have all heard about, and peak wood products. The actual publication was called something to the effect of have we reached the level of peak wood production in the world?

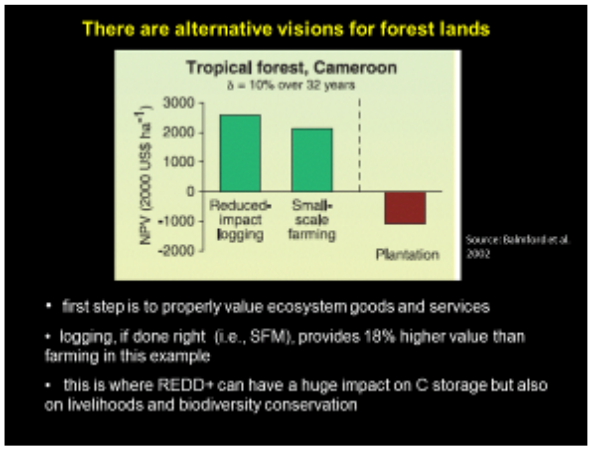
They went to the FAO database and looked at the decline in the production of saw and veneer logs from a number of tropical countries. What they saw for virtually all of them was that we have in fact passed some kind of a peak, suggesting that these forests are not being managed sustainably.

Why then is there not more application of sustainable forest management, particularly in the tropics? There are three groups of reasons. Poor governance is the lack of serious intent by governments and industry or communities to do sustainable management. High opportunity costs versus maintaining the forests as forests; in other words converting the forest to some other land use is usually perceived as being more valuable than logging the forest in a sustainable way. There is always difficulty with tenure. We also have illegal logging in areas with poor governance. There are a number of economic reasons all of which relate to the cost of doing sustainable forest management. There is a weak global demand, for example, for certified products. If everybody was asking for certified products, it would be fine, but they are not. The incremental cost of doing sustainable forest management; so you have to plan, you have to inventory, you have to monitor. All of these things add costs to your management of the forest. These costs then are viewed as too much of a burden for managing forest in a sustainable way. This all results in a lack of clear financial benefits for improved management.

Of course, as we move to global corporations, these corporations have no stake in the local forest quality at all. There is no incentive for forest workers to do the job better. They work at very low wages. Then there is this whole issue of knowledge and technical capacity. We need to be transferring more knowledge, more ability to developing countries, particularly in the context of sustainable forest management, but as Dr. Durst said, very much with respect to REDD+.

As Dr. Durst pointed out as well, the future for global forest conservation may be REDD+, but the fundamental issues, particularly in tropical forests, have not dramatically changed. There is still unsustainable forest use, there is poor governance, there are still issues with respect to rights and tenure, and forest loss continues as a result.

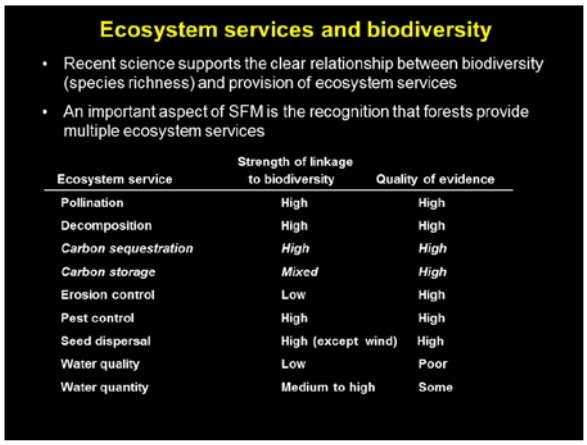
These are compounded by many new issues. Now we are talking about carbon-based management. NGOs talk about difficulty with sustainable forest management. That appears to be an excuse for business as usual. Biofuels, biochemical, and oil palms are a part of that.



There are alternative visions for forests and you can find many of these in the literature. This is one I pulled for tropical forest in Cameroon. If we think about properly valuing all of the ecosystem services that flow from that forest, including some of the ones that are not well valued, the actual value of sustainably managing the forest is more than the opportunity costs of turning that into an agricultural land base, and certainly a lot more than turning it into a rapid turnover fast-wood plantation.

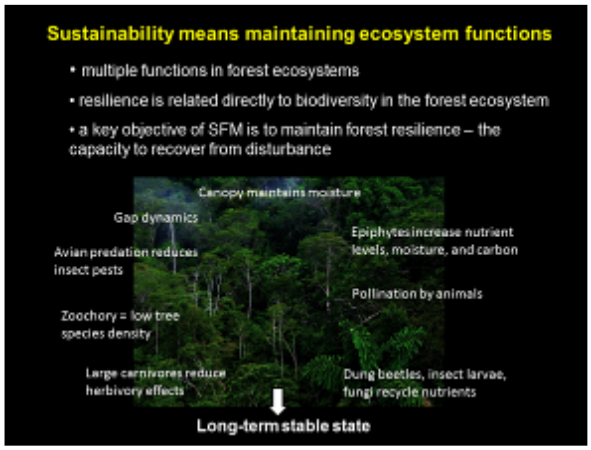
Logging, if done right, in this case provides about 18% higher value than some of the other opportunity costs. This is where REDD+ can have a huge impact on carbon storage, but on also

livelihoods and on biodiversity conservation.

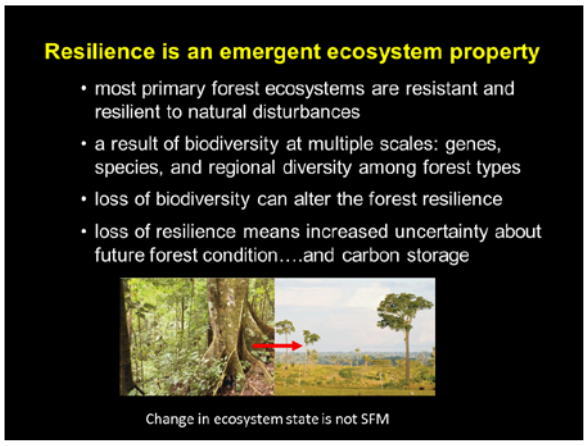


Biodiversity on its own is not an ecosystem service, but biodiversity actually supports virtually all of the ecosystem services that we take from the forest. There is a number of ecosystem processes that go on that are responsible for forest functioning; like pollination, decomposition, photosynthesis, pest control, and so on. All of these things that maintain a forest are all highly related to the biological diversity that resides within the forest.

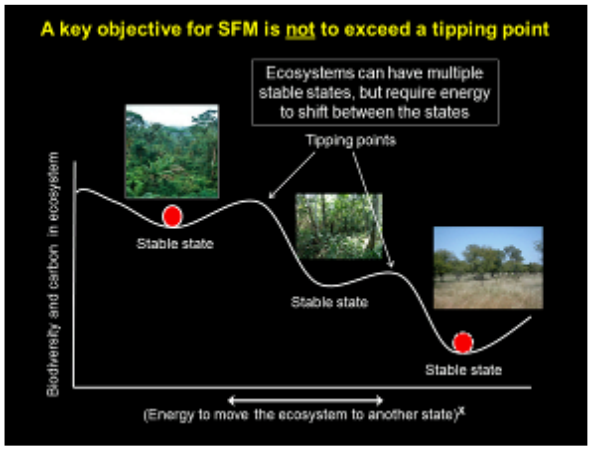
An important aspect of sustainable forest management is the recognition that ecosystem services are key components that flow from forests, but that these are all provided by biological diversity that must be supported and maintained.



Sustainability means maintaining ecosystem functions. It does not mean maintaining an even supply of wood. It means maintaining ecosystem functions within the forest. These are some of the key processes that go on within the forest and these processes are directly related to the resilience of the forest. And sustainable forest management is about maintaining forest resilience; the capacity of the forest to undergo some change, but always come back and provide the ecosystem services that we anticipate from that forest.

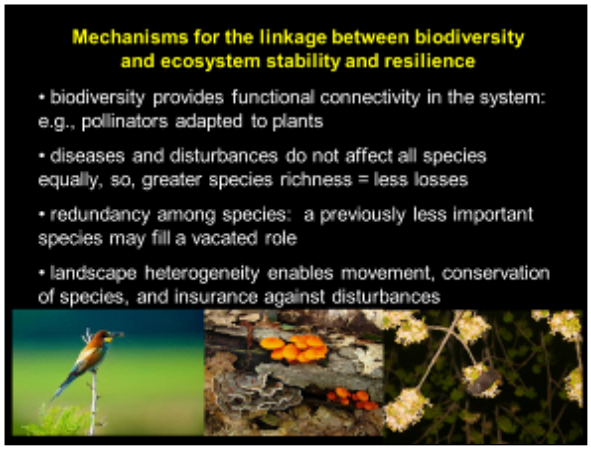


Resilience is an emergent ecosystem property. Most primary forests are resistant and resilient to natural disturbances, and this is as a result of biodiversity at multiple scales, from genes right up to landscapes. The loss of biodiversity could alter forest resilience. This loss of resilience then means that the ecosystem may well change states, resulting in a reduction in ecosystem services that it provides, and undoubtedly sequestering far less carbon. This one example of Amazon wet forests being turned into tropical dry forest as a result of unsustainable logging usually followed by burning and shifting cultivation.

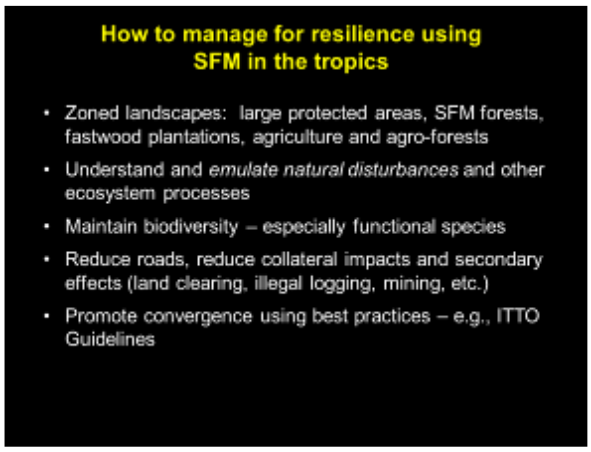


A key objective for sustainable forest management is not to exceed these tipping points that drive the system into a state that we do not want. If we think about the ecosystem as that marble in the valley, you can move the system up towards the tipping point; but if you pass it then it will fall to a different stable state below. Ecosystems do exist in multiple stable states. The lower the state is, the less the biodiversity is within that system, the less ecosystem goods and services, and the less carbon that you are going to get out of the system, until you may push it so far that you have almost no carbon within the system compared to what might have been there in the first place. Moving an ecosystem between states requires energy input and so recovering a degraded forest is difficult and may be

expensive.



Some of the mechanisms then for the linkage between biodiversity and ecosystem stability and resilience are that biodiversity provides a sort of functional connectivity within the system. For example, pollinators adapted to certain plants. If you lose the pollinator then you lose plant as well. Diseases and disturbances do not affect all species equally, so the larger number of tree species, that is, greater species richness; if there is a disease that moves into this particular forest, you have less loss if there are multiple species. Then there is this idea about redundancy among species. Many species perform the same functions. Some of them are better at it than others. If you lose some of them, you do not necessarily lose the function within the forest. Finally, landscape heterogeneity enables movement and conservation of species across the landscape.

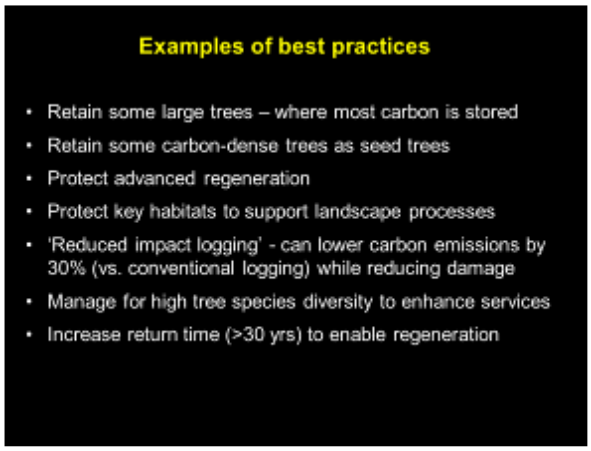


How would we manage then for resilience using sustainable forest management in the tropics? One of the first things that we might do in a broad landscape then would be to zone it using large protected areas, areas where we manage the forest sustainably, and areas where we might have fast wood plantations which might offset some of this deforestation that might otherwise go on. Obviously we

need agriculture and agro-forests within those systems to provide food for people.

One of the key aspects of sustainable forest management is to try and emulate natural disturbances; understand the way in which natural ecosystem processes occur, and then to try and emulate that or mimic that with our forest management. It is important to maintain the key functional species. To reduce roads; to reduce collateral impacts and secondary effects of land clearing, illegal logging, mining etcetera that follow with roads. Ultimately, we want to promote ecological convergence; in other words, not to exceed tipping points by using best practices. There are many guidelines such as those provided by ITTO.

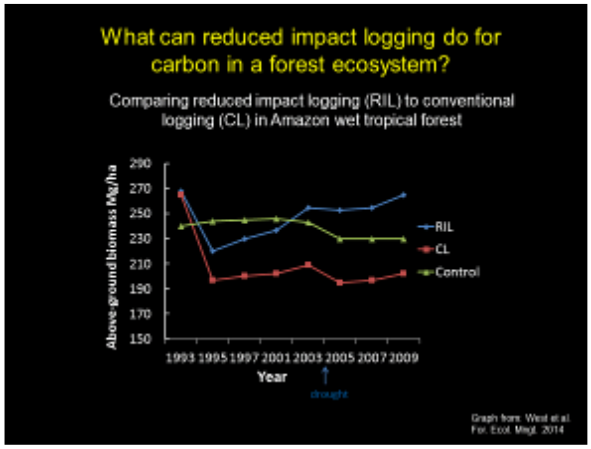
This concept of emulating natural disturbances as a part of sustainable forest management is not a new concept, but is not well practiced in tropical forests so far. The idea is to try and understand natural processes that occur within these forests and then try and mimic those with management practices. For example, in tropical wet forests, wind often results in sort of a gap-phase dynamics within that forest. Individual trees or groups of trees are knocked over by wind or just die on their own. This suggests then that we can probably log using small areas within that forest to remove wood products. Clear-cutting, which is on the left there, or large-scale selection harvesting in the middle, are not mimicking this kind of natural disturbance that occurs within these forests. In tropical forests, particularly wet forests, limited selection harvesting is clearly recommended as adapted and modified to local processes and the local species. This will only work with strong governance.



Some of the best practices that we might think about in tropical forests would be retaining some large trees, because this is where most of the carbon is actually stored within that system. In tropical systems it is not in the soil, it is actually in the aboveground biomass, as opposed boreal forest, for example, where most carbon is actually in the soil.

Many tree species are what call carbon-dense. For example, you can think about all the hardwoods that are high valued such as rosewood, mahogany, or îpe. All of these species are high carbon-dense trees. We can maintain some of these as seed trees to allow for the production of subsequent generations under an SFM approach.

SFM will also work to by protect advanced regenerations. As the gaps form, trees come up and we protect those while logging. We protect key habitats to support landscape processes. We started to use reduced impact logging because this can lower emissions by as much as 30% versus conventional logging within the same forest types. We manage for high trees species diversity to enhance services, and increase return times to maybe greater than 30 years at least to enable proper regeneration within these tropical ecosystems.

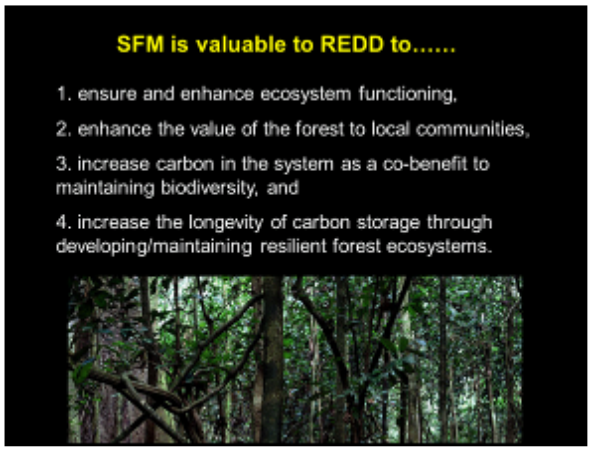


When we talk about reduced impact logging, we ask the question, "What could it actually do

for a forest system?" Reduced impact logging as compared, in the Amazon, to doing conventional logging on the same sites is illustrated in this graph. It actually showed that the reduced impact logging had recovered more than 95% of the biomass within 16 years, if it is done properly, whereas conventional logging had only recovered less than 10% done on the same site. Reduced impact logging, if done properly, enables more carbon to be maintained within the system, enables more carbon to be recovered more quickly.

For all of this, there is the need for more science. When we talk about SFM as a dynamic concept, we talk about constantly changing what we do based on what we have learned. We need to understand more how ecosystem services are affected by individual species, by the density of those species, by biomass, and by the interactions among species within the systems. We need to understand the optimal scales for delivery of ecosystem services. Do we need to worry about ecosystem services being delivered over 10,000 hectares, 20,000 hectares or are small scales best?

We can do a lot better by improving silviculture for forest restoration if we are going to do sustainable forest management. Understanding functioning in novel forest ecosystems is important now because the vast majority of systems now are secondary forests. Secondary forests are by and large novel ecosystems in which we do not really understand the processes very well. We need to learn how these forests are actually functioning if we are going to recover and manage them properly. Ultimately, defining ecosystem thresholds is essential so that we do not push forests beyond a threshold into a new state; one in which we do not understand and cannot manage properly.



In conclusion, I would say that sustainable forest management is valuable to REDD+ to, first of all, ensure and enhance ecosystem functioning. In other words, to maintain the processes that go on that deliver ecosystem services from that forest; to enhance the value of forest to local communities that would benefit from the services; to increase carbon in the system as a co-benefit to maintaining biodiversity, keeping in mind that biodiversity is what gives you the benefit of carbon in the first place; and then increasing the longevity of carbon storage through developing and maintaining resilient forest ecosystems. In other words, avoid pulses of carbon on the landscape from plantations, but rather ensure a continuous measure of carbon stored across the landscape in a sustainably managed forest.