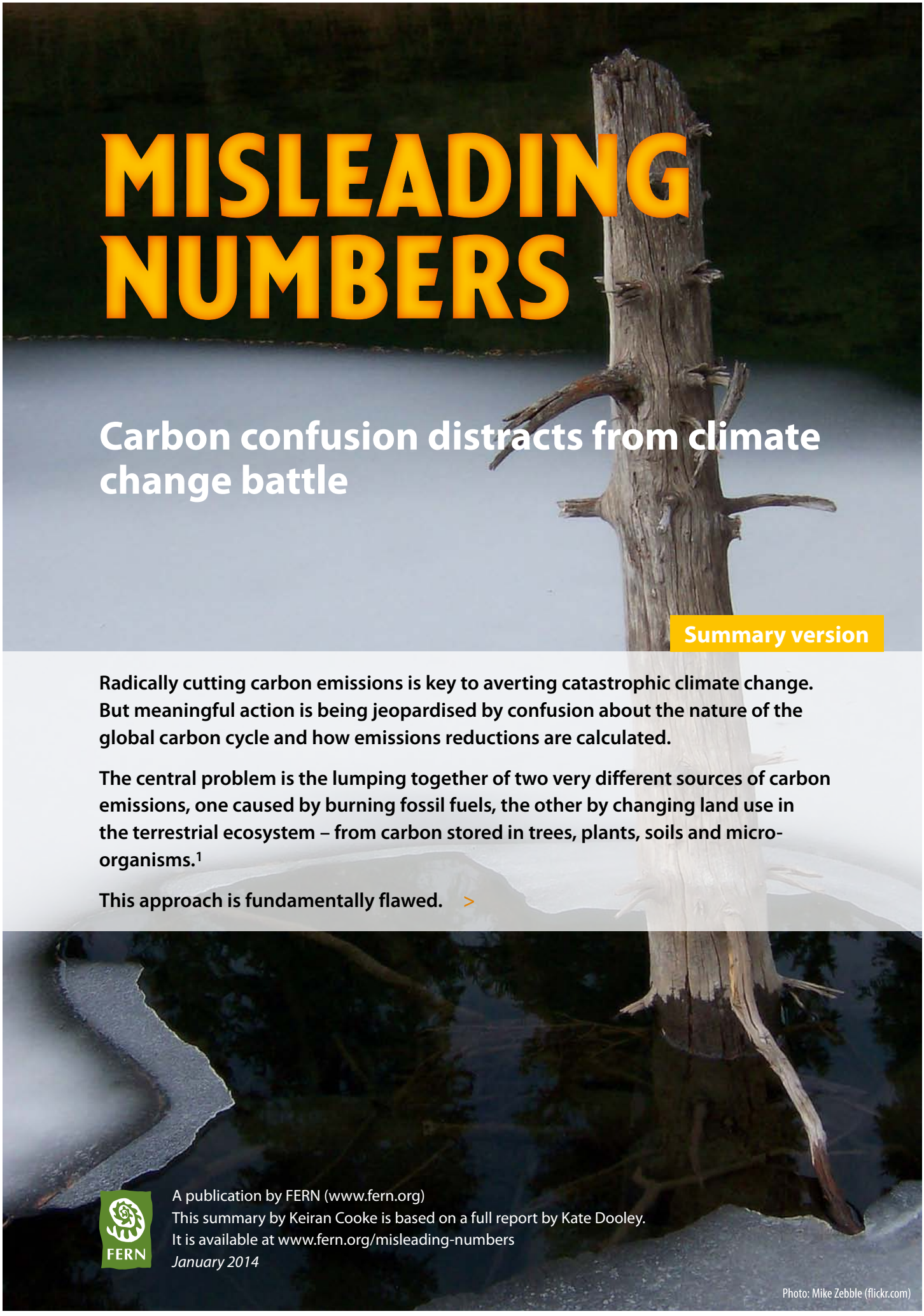

MISLEADING NUMBERS

Carbon confusion distracts from climate change battle

Summary version

Radically cutting carbon emissions is key to averting catastrophic climate change. But meaningful action is being jeopardised by confusion about the nature of the global carbon cycle and how emissions reductions are calculated.

The central problem is the lumping together of two very different sources of carbon emissions, one caused by burning fossil fuels, the other by changing land use in the terrestrial ecosystem – from carbon stored in trees, plants, soils and micro-organisms.[1]

This approach is fundamentally flawed. >

A publication by FERN (www.fern.org)
This summary by Keiran Cooke is based on a full report by Kate Dooley.
It is available at www.fern.org/misleading-numbers
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Photo: Mike Zebble (flickr.com)

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The two are not interchangeable: it is a mistake to think that emissions from fossil fuels can be negated by increasing or protecting the storage potential of forests and other land based carbon. Nor is it possible to calculate the two in the same way.

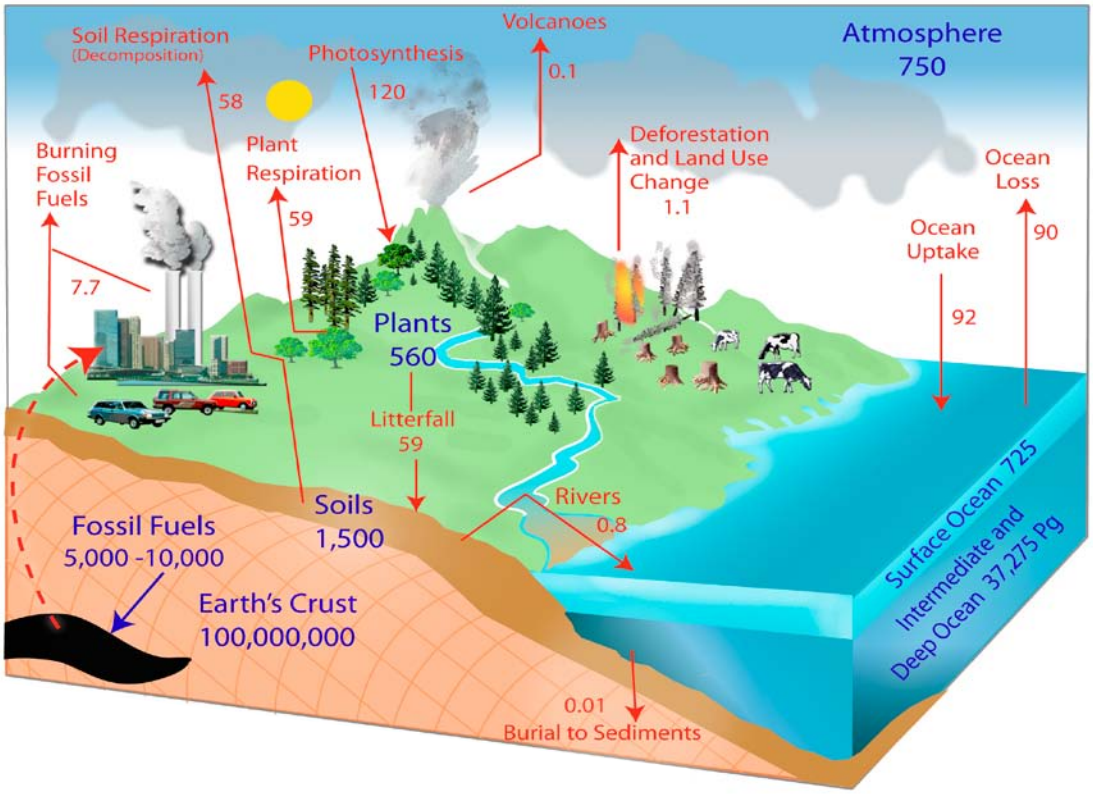
Fossil fuel emissions – from industrial and other processes – can be estimated and measured at source and calculated with reasonable confidence. Terrestrial emissions present a far greater challenge: they are distributed over huge areas and subject to large inter-annual variations, making them difficult to measure and virtually impossible to extrapolate, despite recent advances in measurement techniques.

Yet successive climate negotiations have treated fossil fuel emissions and terrestrial emissions as equals, accounting and bundling them together in a similar fashion. The EU is noteworthy in differentiating between the two in its domestic legislation. But others, including those framing post-Kyoto climate processes and designing mitigation measures, have been operating on a false premise. Such misguided actions could increase rather than limit fossil carbon emissions.

It is particularly concerning that the fundamental difference between carbon sources is confusing ongoing negotiations on Reducing Emissions from Deforestation and Forest Degradation or REDD+. Too much attention, time and money is being spent on trying to account for carbon emissions from forests. Rather than emissions, the focus should be on identifying the drivers of forest loss and quantifying their extent.

Furthermore, if the fundamental difference between fossil and terrestrial carbon is not recognised, then there is a clear danger that carbon 'savings' from changing land use – which cannot be accurately calculated and may only be temporary – will be used to justify the continued and irreversible combustion of fossil fuels. The result will be a cumulative increase of greenhouse gases (GHG) within a relatively short time.

2012 GLOBE Carbon Cycle Project, a collaborative project between the University of New Hampshire, Charles University and the GLOBE Program Office.



Units: Petagrams (Pg) = 10^15 gC

- Pools: PG
- Fluxes: Pg/year

Data Sources: Adapted from Houghton, R.A. Balancing the Global Carbon Budget. Annu. Rev. Earth Planet. Sci. 007.35.313-347, updated emissions values are from the Global Carbon Project: Carbon Budget 2009.

Understanding the differences

When it comes to terrestrial carbon stocks and fluxes, the word "accounting" is misleading, it is more accurate to talk about estimated figures

Carbon is essential for the creation and continuation of life. It is present in all living organisms: when organisms die the carbon is recycled – contributing to a process known as the carbon cycle.

The vocabulary of carbon can be confusing. Carbon is stored in pools (known as stocks), while the processes that transfer it from one pool to another are known as fluxes. Carbon pools that store carbon are called sinks, while those that emit carbon dioxide (CO_2) are termed sources. Stocks and fluxes vary widely from region to region as well as on an annual or even daily basis, with sinks turning into sources as a result of variations in climate.

There are three above ground carbon pools: the atmosphere, the oceans and terrestrial ecosystems. In what is a state of dynamic equilibrium, carbon continuously cycles between these pools, maintaining a relatively steady level of atmospheric CO_2 over time.

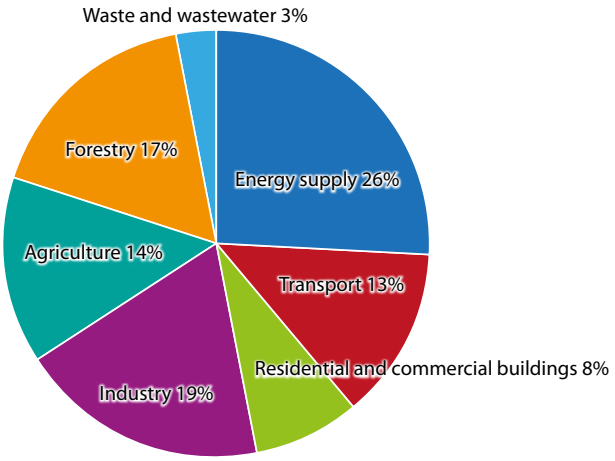
The only permanent stock or reservoir of carbon is the fossil carbon pool, accumulated over millions of years and stored underground. When this stock of below ground carbon is disturbed and exploited by humans the carbon cycle is disrupted. Since the start of the industrial revolution these underground sources of carbon have been mined and burned, releasing carbon into the atmosphere, causing climate change.

The world now combusts 400 years worth of accumulated biological matter in the form of fossil fuels every year,[2] with vast amounts of GHG – mainly CO_2 – being released, primarily the result of the burning of coal, oil and gas.

While for all practical purposes emissions from this below ground fossil carbon pool are irreversible, the same is not true for terrestrial carbon pools. Land based carbon stocks, such as forests, are highly reversible: their carbon is held for years or centuries at most and then recycled and returned to the atmosphere.

Studies have shown[3] that while it's important to limit carbon losses from the land in order to reduce global GHG emissions, the maximum amount of reduction that can be achieved from terrestrial sources is equal to only a small fraction of potential fossil fuel emissions.

Chart 1: Global emissions by sector



From: http://www.redd-monitor.org/2009/11/04/20-of-co2-emissions-from-deforestation-make-that-12/

Furthermore, considering carbon storage on land as a way to 'offset' GHG emissions from the fossil carbon pool is scientifically flawed: there is a natural limit to the amount of carbon that can be held in the terrestrial carbon pool. And, over time, as global warming intensifies, these terrestrial carbon stocks could well become carbon sources.

The point is that reducing fossil fuel emissions remains the key element for stabilising atmospheric CO_2 concentrations.[4] Carbon emissions from terrestrial ecosystems have a finite mitigation potential, which is easily dwarfed by the amount of fossil carbon we could yet release.

Carbon measuring problems

'Reducing emissions in the land use sector cannot compensate for a lack of reduction in industrial emissions.'

Measuring how much carbon is stored and emitted from terrestrial sources is fraught with difficulties. There's no doubt that various techniques for measuring terrestrial carbon have become considerably more sophisticated in recent years. For example remote sensing – along with ground truthing – has been shown to have high levels of accuracy in estimating deforestation rates.[5]

However such techniques have severe limitations when it comes to the collection of data on carbon emissions. Land use change is generally considered the most difficult component when it comes to quantifying the global carbon cycle.[6]

In the case of forests, because carbon emissions depend not only on the area of forest cover change but also on associated biomass loss, remote sensing has been found to result in wide variations in emissions data, and conclusions can vary considerably.[7]

Simply converting measurement of forested areas to estimates of carbon stocks is fraught with error: in many cases uncertainty levels of 50 per cent or more have been reported.[8] Often, only parts of a forest are measured: to have a complete inventory all areas of forest should be surveyed, not just for tree type and levels of deforestation or degradation but also for above and below ground biomass, dead wood, litter and soil. To undertake such comprehensive surveys – in areas as big as the Amazon or Congo Basin – would be virtually impossible in terms of expertise, expense and time.

There is little or no historical data on emissions from terrestrial carbon stocks. This means that researchers often retrospectively project data using model simulations: again, this can result in inaccuracies which can become amplified over time.[9]

Fossil fuel deposits take millions of years to form, yet modern civilisation is digging them up and burning them at an alarming rate.

Photo Flickr.com / Eyeweed

There is also a lack of a common standards or operating procedures when it comes to estimating terrestrial carbon stocks. For example, very few countries include soil carbon or forest degradation in their forest inventories and, particularly in tropical regions, there are differing definitions of deforestation in various countries. This has led to recommendations that regionally specific carbon data should not be extrapolated to other regions and forest types.[10]

Politics often gets in the way of science, with government monitoring institutions designed to produce information aligned to government needs, rather than to the data needs of scientists.[11] Even 'official' data, such as government reporting on forest cover, used to compile global statistics for the for United Nations Food and Agriculture Organisation (FAO), is seen as unreliable.

In summary, counting land based carbon to a level of certainty that is comparable to emissions from fossil fuel is an impossible task: despite technological improvements, it's an imprecise business. Most important of all – it is a distraction from the main goal of cutting fossil carbon emissions, which are the main contributor to climate change.

Kyoto and onwards

The 1997 Kyoto Protocol set quantified and legally binding commitments to limit or reduce GHG emissions, with industrialised countries required to reduce emissions by at least five per cent below 1990 levels within the 2008 to 2012 period.

Carbon accounting of land use, land use change and forestry – or LULUCF – was included in the 1997 Protocol. However, the issue has been a contentious one: there have been concerns that complicated terrestrial accounting measures can lead to abuse, including industrialised countries using the system to disguise a lack of any serious effort on reducing emissions.

While UN climate negotiations have sought to tighten LULUCF accounting, the rules by which it is governed are still judged to be lacking proper transparency and riddled with scientific uncertainty: this has resulted in a significant under-reporting of emissions and an over stating of removals – commonly referred to as the "LULUCF loopholes."

Recognising the difficulties in calculating emissions from terrestrial sources, the EU has traditionally taken a cautious approach, choosing to omit LULUCF accounting from its own climate related emissions reduction commitments.

While legislation has now been set out for an EU wide accounting framework for LULUCF, this will not be used in calculating the EU's stated aim of achieving an overall 20 per cent reduction in emissions by 2020. The European Commission says it will only consider proposing GHG targets for agriculture and forestry "once the accounting rules have proven their worth." [12]

REDD+

REDD+ forms part of a 2010 UNFCCC agreement to "slow, halt and reverse forest cover and carbon loss."13 Under REDD+, developing countries receive payments for reducing deforestation and forest degradation, conserving forests and enhancing existing forest carbon stocks.

So far, negotiations on the implementation of REDD+ have focused on how to measure progress and calculate payments and whether this should be based on a broad package of social and environmental indicators or on emissions. Dealing with the complexities of instituting an emissions verification process was for some time a deeply divisive issue.

Many governments, and nongovernmental organisations (NGOs), advocate establishing a broad definition of progress and performance in the REDD+ framework. They argue that trying to comprehensively measure rates of carbon release and storage in forest areas is a difficult – perhaps impossible – task and focusing on emissions reductions as the sole determinant of performance will incentivise the wrong action. Instead results should be defined more broadly – in terms of improved policies and actions that address the drivers of forest loss.

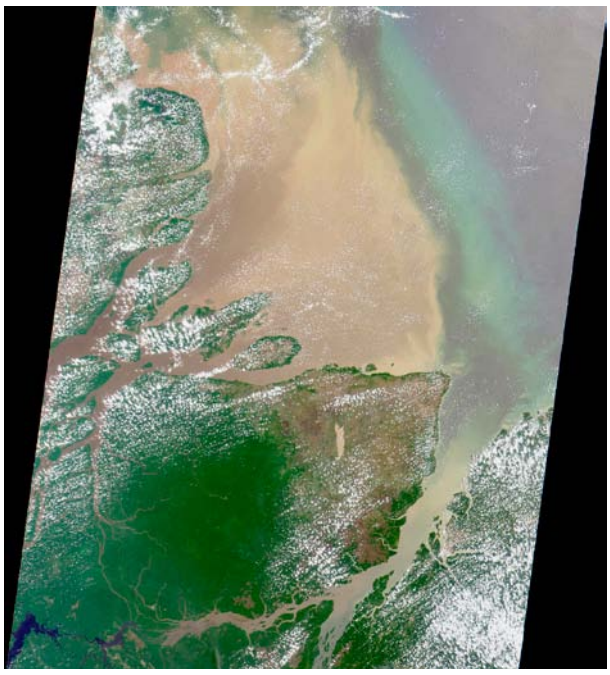
There are others who say performance must also take account of measures to improve governance and respect for international obligations on human and indigenous peoples' rights. Meanwhile, a growing movement of environmental and indigenous peoples' organisations and governments are rejecting REDD+ mechanisms entirely, saying they are based on the marketisation or commodification of forests, rather than respect for forest peoples. Such moves, they argue, will not do anything to curb forest loss.

Conclusion

To be successful, policy makers should focus on measuring forest loss itself, rather than on emissions from that loss.

Ongoing climate negotiations, particularly those aimed at forming a meaningful post 2020 climate strategy, should be used to reassess the role of terrestrial or LULUCF accounting in calculating carbon emissions. It is especially important that such a reassessment ensures that forest carbon accounting does not detract from action in cutting back on fossil based carbon emissions.

To be successful, policy makers should focus on measuring forest loss itself, rather than on emissions from that loss. Improving knowledge of forest cover and loss are a critical element in reducing forest loss and of managing forests sustainably. Such an approach will be of far more benefit in the fight against global warming than one indulging in complex and ultimately uncertain measuring systems associated with forest carbon stores.



Satellite photo of the mouth of the Amazon river

Photo: Image courtesy NASA/GSFC/JPL; MISR Team

Undue emphasis on cutting land based emissions is not helpful in the fight against global warming. The problem of GHG emissions can only be solved by radically curtailing fossil fuel use and leaving carbon safely below ground.

Endnotes

1 See p. 6 of full report written by Kate Dooley: 'Misleading numbers – the case for separating land and fossil based carbon emissions' available at www.fern.org

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