

How to interpret the results

The map does not indicate the location of individual restoration sites, only wider landscapes where restoration opportunities are more likely to be found.

The map does not indicate or prescribe any particular type of restoration intervention (e.g. spontaneous regrowth or planting). All it does is to show lands with characteristics that indicate restoration opportunities.

Only pre-existing information was used. The accuracy of the results depends on the accuracy of the underlying datasets. Good information was available on land cover, land use, population density and other factors. Yet many factors could not be considered for lack of data, e.g. tenure arrangements and land-use dynamics.

The results must be interpreted with caution. The assessment is based on significant simplifications and the underlying information is both coarse and incomplete, sometimes also of low accuracy.

The results are globally consistent. Definitions and data are not particular to individual countries.

The spatial resolution (“pixel size”) of the analysis is 1x1 km. Many features of the landscape are not visible at that level of resolution and local context could not be considered. No ground validation was conducted.

The assessment is intended to guide further investigation of restoration opportunities at regional and national scales, where more detailed information is available.



Conclusions

Restoration opportunities are prominent on all continents. Many countries, not least in Africa, that have had their forests exposed to deforestation and degradation long ago will find rich opportunities to contribute to REDD-plus through forest landscape restoration.

Restoration opportunities may be found in an estimated 1 billion hectares of lost forests and degraded forest lands with an additional half billion hectares of potential restoration opportunities if boreal areas and croplands are considered. This 1.5 billion hectare total area is almost the size of Russia. Deforested lands and degraded forests and woodlands offer opportunities for mosaic type or wide-scale restoration. Additional opportunities, mainly for protective purposes, are scattered within the world’s croplands.

The restoration opportunities are typically not located in areas of ongoing deforestation and degradation; they tend to occur where degradation and deforestation have already made their mark.

Efforts to reduce deforestation and degradation are both needed, but in different places.

One of the most attractive features of this approach to restoration is its many co-benefits. The Convention on Biological Diversity at its recent meeting in Nagoya (October 2010) agreed a target to restore 15 percent of degraded ecosystems by 2020. In addition, the December 2010 Conference of the Parties of the UN Framework Convention on Climate Change adopted a decision on REDD-plus that sets a goal for all countries to slow, halt and reverse forest cover and carbon loss. This is to be achieved through reducing emissions from deforestation and forest degradation, conservation, sustainable management of forests and enhancement of forest carbon stocks, which includes restoration. These commitments provide practical opportunities for building synergies in implementation at the country level. Properly designed initiatives could bring benefits for biodiversity and climate while also improving people’s lives.

*The Global Partnership on Forest Landscape Restoration is a worldwide network that unites influential governments, and major UN and non-governmental organizations and businesses. Our aim is to accelerate the restoration of the world’s forests and degraded lands to improve ecological integrity and human wellbeing. We do so by building support for FLR, fostering learning and innovation, and providing resources for policy-makers and practitioners.*

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*More information can be found at [www.ideastransformlandscapes.org](http://www.ideastransformlandscapes.org) and [www.wri.org/restoring-forests](http://www.wri.org/restoring-forests)*



A World of Opportunity

The World’s Forests from a Restoration Perspective

A restoration perspective on the world’s forest landscapes

The world has vast amounts of degraded landscapes that are unproductive both to humans and to nature. These areas of historical and recent loss provide opportunities for future gain. But what is the extent of these opportunities and where are they located?

The Global Partnership on Forest Landscape Restoration (GPFLR) has begun to respond to these questions by mapping the extraordinary potential of these landscapes for restoration to address the challenges facing societies around the world today and in the future.

We have found that there are more than 1 billion hectares of lost or degraded forest lands worldwide where restoration opportunities may be found. Opportunities may extend to a total area of 1.5 billion hectares - almost the size of Russia - if boreal areas and protection of waterways and prevention of erosion in croplands are considered. With this comes substantial potential to not only sequester large volumes of carbon but also to help lift people out of poverty and reduce the vulnerability of rural people and ecosystems through restoration of forest landscapes.

The carbon sequestration potential of these lands once restored is equivalent or greater than that from avoided deforestation. This is not a replacement for the protection of existing forests. What this means is that the two measures must go hand in hand to deliver the maximum climate change mitigation benefit and to allow a greater number of countries with diverse situations to participate.

Forest loss and degradation comes at a high cost

Forests fulfill human needs for food, feed, fuel and timber. Human activities have caused more than three quarters of the world’s forests to be cleared, fragmented or degraded while a third have disappeared completely. Just one fifth of the original forest cover remains undisturbed in tracts that are large enough to maintain all their natural functions. This global landscape transformation has immense consequences for people, biodiversity, ecological functions and the climate.

Floods can devastate lowlands when upland forests disappear. Hurricanes can destroy coastal areas when protective forests disappear. Fires can burn unhindered when peatlands are drained. Agricultural productivity can suffer when land is exposed to wind and driving rains, eroding away topsoil. The disasters that grab headlines – from Pakistan to Russia, Haiti, Louisiana and Indonesia – are not only a consequence of isolated extreme weather events but also stem from a long-term erosion of ecological integrity.

The loss of ecosystem services harms local livelihoods and poverty further drives degradation. In much of the developing world, people are directly dependent on local natural resource extraction for their livelihoods, food, and cooking fuel. Degradation of natural ecosystems causes increasing scarcity of resources, deepens poverty, and fuels further degradation.

The tide can be turned

Deforested and degraded landscapes can be restored. Vast areas in Europe and North America have recovered from forest loss and are now managed for timber and other ecosystem services. China, India, Costa Rica and many others have embarked on successful forest restoration strategies. Restoration efforts in Niger and Sudan are slowing down decertification and restoring woodlands and livelihoods.

Restoration can stimulate economic growth in poor rural areas, as it has in Tanzania and elsewhere. Experience has shown that once poor vulnerable communities are given long-term secure rights over their resources they can turn degraded forest lands into healthy, productive and biologically rich assets within a few years.

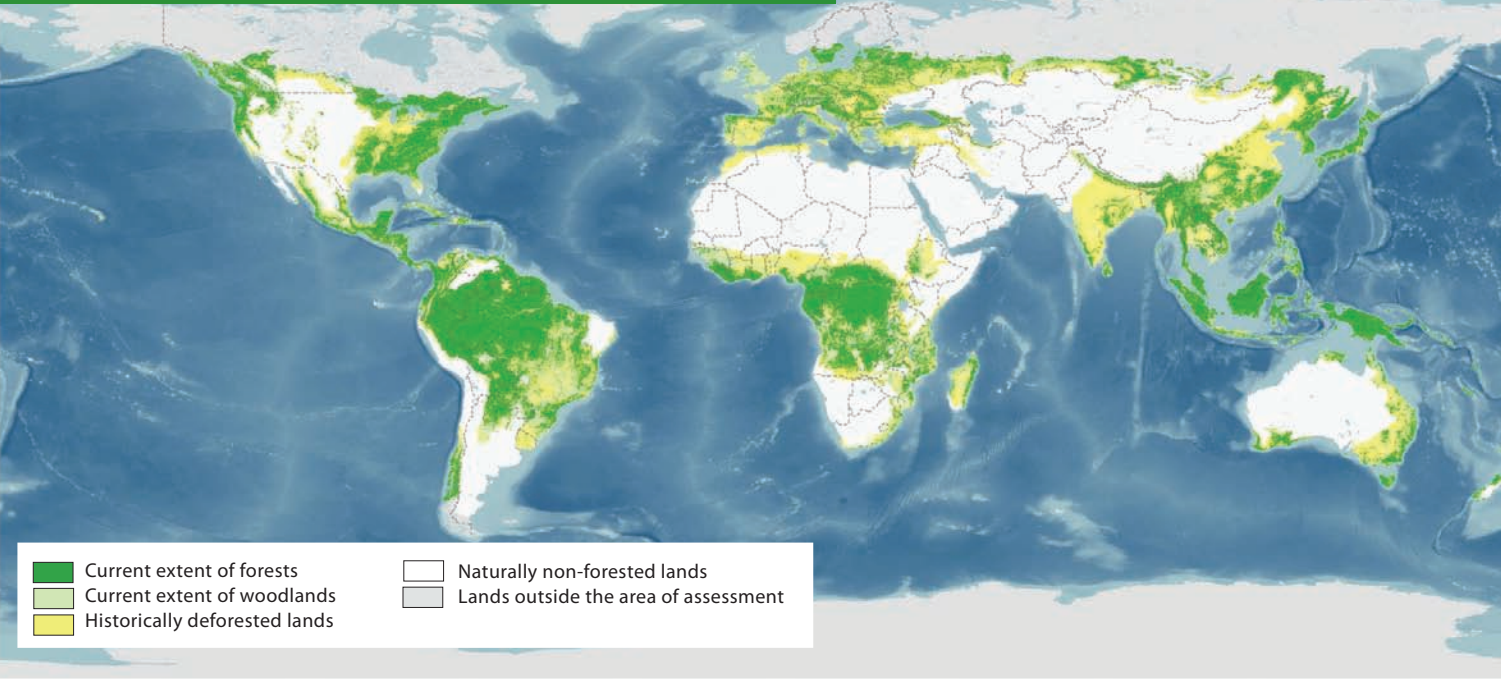
Restoration of forest landscapes

Forest landscape restoration (FLR) is an approach that is complementing and enriching more narrowly defined approaches to afforestation and reforestation that have been tried in the past. Central to this approach is the need to improve both human livelihoods and ecological integrity. FLR has the following characteristics:

- A focus on restoring or enhancing the functionality of a landscape (that is, its supply of ecosystem services)—not on maximizing new forest cover;
- Restoration applied to whole landscapes—not to individual sites. This allows trade-offs to be made;
- Local stakeholder participation in decision-making and implementation;
- Use of a wide range of restoration options that include active promotion of spontaneous (“natural”) re-growth of trees (e.g., by reducing the pressure from grazing and fire), as well as planting, though forest landscape restoration must not lead to conversion of natural forests and other important ecosystems into plantations;
- Land-use complexity and dynamics accommodated by adaptive management. Provision is made for monitoring and learning.

A landscape is a canvas to be painted according to societal needs. A restored forest landscape can be configured to accommodate a mosaic of land-uses including, for example, protected reserves, ecological corridors and stepping stones, regenerating secondary forests, well-managed plantations, and agroforestry systems (or other agricultural systems that make use of on-farm trees).

Current extent of forests and woodlands



Results

The extent of the world’s deforested and degraded forest landscapes is enormous:

1.5 billion hectares have been lost to deforestation. Much of what are croplands today were once covered with forest. Another 1.5 billion hectares have been degraded in the sense that they are significantly less dense than their biological potential.

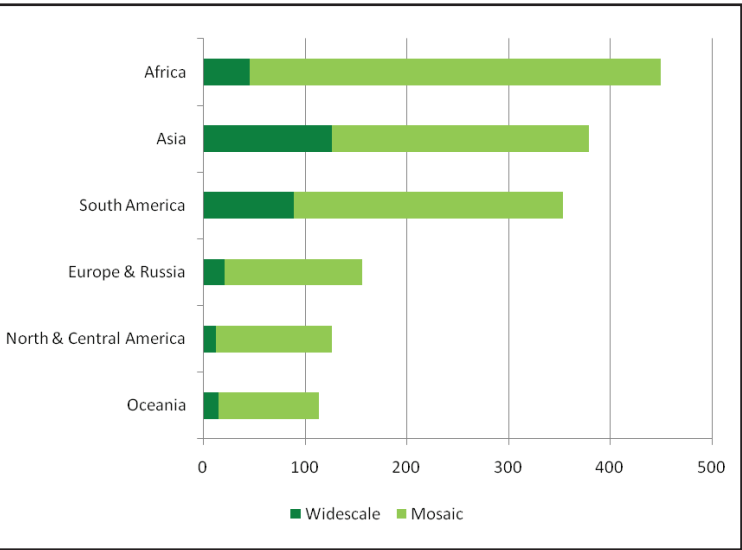
The opportunities for restoration are also abundant:

More than 1 billion hectares of lost or degraded forest lands world-wide where restoration opportunities may be found. Opportunities may extend to a total area of 1.5 billion hectares if boreal areas and protection of waterways and prevention of erosion in croplands are considered.

Of the deforested lands, two fifths offer restoration opportunities (some 600 million hectares, not counting croplands). One tenth is suitable for wide-scale restoration; the rest for mosaic restoration.

Of the degraded lands, two-thirds offer restoration opportunities (900 million hectares). A quarter is suitable for wide-scale restoration; the rest for mosaic restoration.

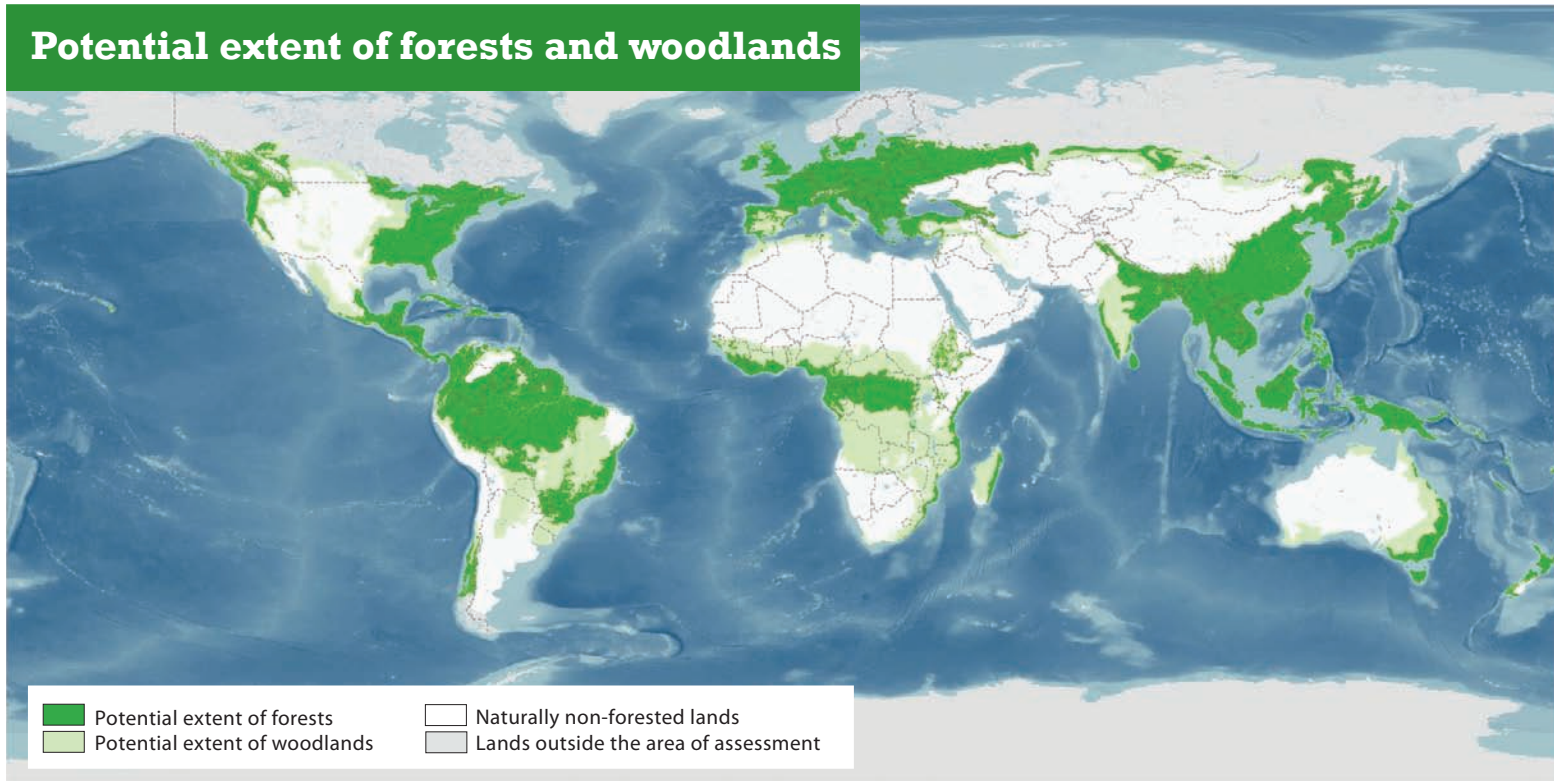
These areas should not all be restored in the same fashion. There is no one-size- fits-all solution. Each forest landscape is unique and needs its own restoration design which responds in a balanced way to societal preferences and needs. Lands that are currently used for crop production or grazing, for example, are not suitable for wide-scale restoration. They may, however, offer opportunities for restoration in mixed land-use mosaics. Many historically deforested areas belong to this category.



The restoration opportunity area is fairly evenly distributed among the world’s continents; more so than the deforestation process. Africa has huge potential for mosaic restoration while only one tenth is suited for wide-scale restoration. Asia and South America have bigger potential for wide-scale restoration, despite having a smaller total opportunity area.



## Potential extent of forests and woodlands



## How the assessment was made

The assessment builds on a preliminary assessment conducted in 2009. This further and more in depth analysis benefited from additional data sets, particularly related to agricultural lands. The assessment was carried out through a sequence of steps, each building on the preceding one.

The first step was to map where forests and woodlands would grow according to climactic conditions, if not interfered with by humans, i.e. their potential extent. Unsuitable lands such as arctic, desert, grassland, and alpine areas were excluded. The northern (boreal) region was also excluded due to lack of information for a detailed assessment and funding. Remaining lands were classified based on maps of the world's ecoregions.

The second step was to map where forests and woodlands grow today, i.e. their current extent. Forest maps were derived from satellite imagery with a global resolution of 250 meters.

Third, lands with potential for restoration were identified by comparing the maps of potential and current forest extent in light of information about current land-use. Intact forest landscapes and managed natural forests and woodlands were considered to have no need for restoration.

Fourth, lands with a low likelihood of offering restoration opportunities were identified by mapping human pressure as a combination of population density and land use. Deforested and degraded forest lands were divided into three categories:

- Lands with intensive human pressure were assumed to offer opportunities for protective restoration. These include lands with high population density (more than 100 persons per square kilometre), lands that are used to produce crops, and urban areas.
- Lands with some human pressure were assumed to offer opportunities for mosaic restoration. These are lands with population density between 10 and 100 persons per square kilometre.
- Lands with low human pressure were assumed to offer opportunities for wide-scale restoration. These are lands with a population density of less than 10 persons per square kilometre.

The result is a restoration opportunity map, or more precisely, a map that shows lands where the likelihood of finding restoration opportunities is high.

The map also shows tropical areas where tree cover has been lost during the period 2000-2005. The loss was detected using global 500 metre resolution satellite data with a sampling of 30 metre data and is a good approximation of recent tropical deforestation.

## Some important terms



*Temperate forest, Spain*

Photo:Flickr.com/photos/bcnbits/1906433949/

**Forest** – Ecosystems dominated by trees. Forests with a canopy cover of at least 50 percent were considered to be closed forests, while those with a less dense canopy were considered to be either natural woodlands and degraded forest. Lands with a canopy cover of less than 10 percent were considered to be either naturally non-forested or converted former forests or woodlands.



*Degraded forest (Papua New Guinea)*

Photo:Flickr/kahunapulej (Michael Johnson)

**Forest degradation** – Generally understood as a process that leads to a reduction in the volume and canopy cover of trees, a reduction in biomass, reduced biodiversity, and/or a reduction in the ecosystem services provided by forests (e.g., timber production, erosion protection, carbon sequestration, etc.).



*Mosaic of forest and other land-uses (Uganda)*

Photo:Flickr/Weesam2010

**Forest landscape** – A broad, typically heterogeneous land area characterized by forests, but which may also contain a mosaic of vegetation types and human elements such as land-uses and settlements.

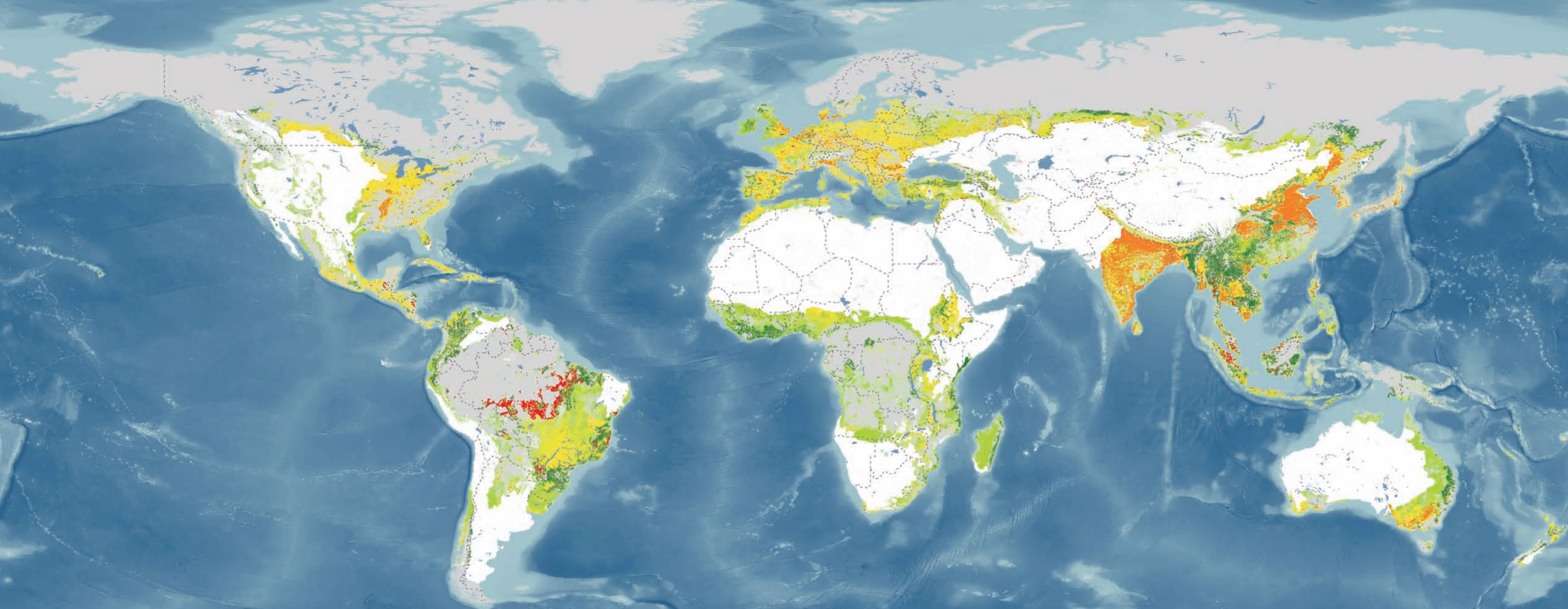


*Tree seedling nursery (Kenya)*

Photo:Flickr/thisisexcellent (Excellent Development)

**Forest landscape restoration** – An active process that brings people together to identify, negotiate and implement practices that restore an agreed optimal balance of the ecological, social and economic benefits of forests and trees within a broader pattern of land- uses. This falls under the enhancement of carbon stocks in the December 2010 UNFCCC decision on REDD-plus.





### Opportunity Areas for Forest Landscape Restoration

- Wide-scale
- Mosaic
- Protective, within rainfed croplands
- Protective, within irrigated croplands

### Other Areas

- Recent tropical deforestation (2000-05)
- Urban areas
- Forest without restoration needs; Lands outside the assessment area
- Naturally non-forest lands

## Forest Landscape Restoration Opportunities



Countryside and rice paddies around the Sam Neua (Laos)  
Photo: Flickr/Adam Jones

**Mosaic Restoration** - Deforested and degraded forest lands with medium to high human pressure. Mosaic areas include other land-uses, e.g. agriculture.



Recovering forest (Costa Rica)  
Photo: Mongabay.com

**Wide-scale Restoration** - Sparsely populated deforested and degraded areas where the pressure from competing land-use is low and forests can grow more freely.



Restoration along waterways in Kansas (USA)  
Protective Photo: Kansas Forest Service

**Protective Restoration** - Densely populated and altered landscapes where most land is being used for food production or settlements.