LAND MATTERS FOR CLIMATE

REDUCING THE GAP AND APPROACHING THE TARGET

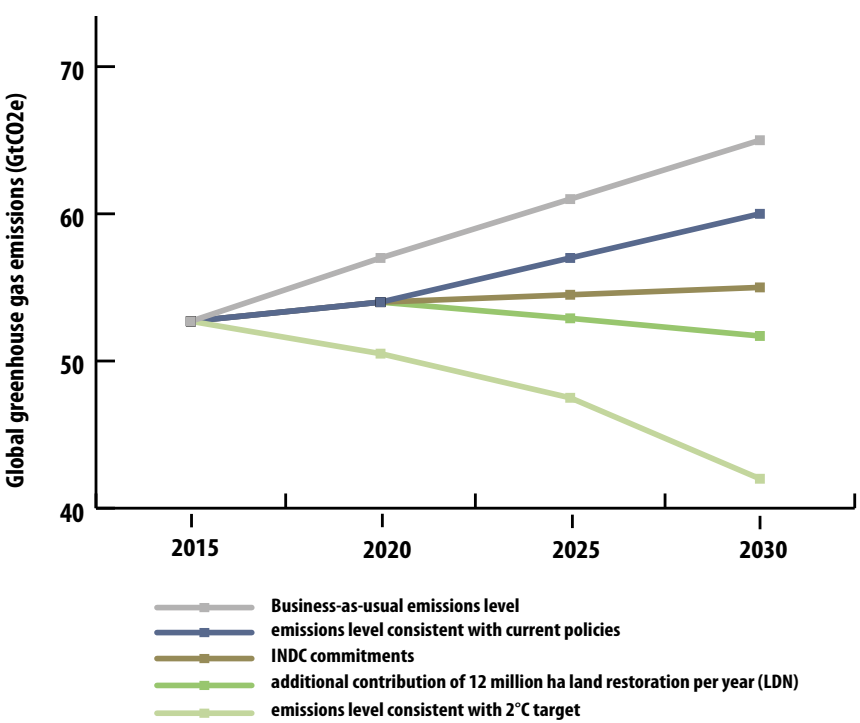
The land use sector represents almost 25% of total global emissions. These emissions can be reduced. There is also great potential for carbon sequestration through the scaling up, and scaling out, of proven and effective practices.

Improved land use and management, such as low-emissions agriculture, agro-forestry and ecosystem conservation and restoration could, under certain circumstances, further reduce the remaining emissions gap by up to 25%.

These climate-smart land management practices nearly always come with adaptation co-benefits. Their more efficient use of resources and inputs ensure greater food and water security, and build community resilience while, at the same time, sequestering carbon.

In this brief, we identify a key element in the climate change equation often missing in the current discussions. We offer an evidence-based argument that the mitigation potential of the land use sector, realized through land rehabilitation and ecosystem restoration activities, can make a significant and immediate contribution to reducing the emissions gap.

The emissions gap is the difference between the level of greenhouse gas emissions, consistent with meeting the 2°C target set by the Cancun climate change conference, and the emissions reductions that governments have committed to in their current policies.



The gap that needs to be closed in order to stay on target is currently estimated at 18 $GtCO_2e$ (gigatons carbon dioxide equivalent). This means that from the projected global emissions of 60 $GtCO_2e$, we need to come down to 42 $GtCO_2e$ by 2030.[1]

The commitments in the Intended Nationally Determined Contributions (INDCs) would only reduce emissions by around 5 $GtCO_2e$ by 2030.[2] This closes the emissions gap by less than 30% of what is required; so the urgent challenge now is to find the missing piece of the puzzle that helps to further reduce the remaining gap. While investment in low-carbon energy infrastructure is increasing, a more concerted effort, particularly in the land use sector, will now be required.

In the short to medium term, parallel actions are critical. Firstly, we must continue to improve the efficiency of current energy production and consumption, the major focus of efforts until now. Secondly -- and the premise of this brief – is that the adoption of more sustainable land management, rehabilitation and restoration, up till now largely untapped, would provide a rapid and low-cost reduction in emissions. This would not only help reduce the gap, but also provide significant benefits to the rural poor and other vulnerable communities.

Efforts to restore and manage our land resources more sustainably are highly site-specific yet, generally speaking, they will not require major infrastructure-scale investments. They will, however, require dedicated finance, enabling policies and incentives, and multi-sectoral land use planning.

The issue of opportunity costs or trade-offs with other forms of land use will often be the most important consideration. A predictable and stable price for carbon could provide new opportunities for climate-smart land management and development while financial incentives directly linked to emissions reductions and carbon sequestration in the land use sector could provide short-term livelihood benefits and help ensure long-term resilience.

Land matters for climate, its rehabilitation and sustainable management is critical to reducing the emissions gap and approaching the target. In the post-2015 world, the confluence of the development and climate agendas can now be leveraged to raise the profile of the land use sector in climate change mitigation and adaptation while, at the same time, addressing multiple global challenges.

PRIORITIES FOR ACTION

- **URGENT CHALLENGE: The emissions gap remains very significant and threatening, requiring actions above and beyond those currently being pledged.**
- **IMMEDIATE ACTION: Policies and incentives that promote sustainable land management, including enhanced carbon stocks through land rehabilitation and ecosystem restoration, may well be the missing piece of the climate puzzle that helps to reduce the remaining emissions gap in a demonstrable and cost-effective manner.**
- **SETTING PRIORITIES: The transition to climate-smart land management practices, including for example low-emissions agriculture, agroforestry and the restoration of high carbon-value ecosystems, such as forests and peatlands, will require sectoral coordination, multi-stakeholder engagement and new approaches to integrated land use planning.**
- **MULTIPLE BENEFITS: Adopting and scaling up more sustainable management practices in the land use sector not holds significant mitigation potential but very often provides short-term benefits in terms of land productivity and food security while, at the same time, helping to ensure the long-term resilience and adaptive capacity of the more vulnerable communities.**
- **MEASURING PROGRESS: An evidence-based accounting framework for carbon debits and credits will be essential for measuring progress in the land use sector. Future accounting frameworks will need to cover all land uses and land use changes in order to fully recognize its contribution to net carbon fluxes.**
- **NEW PARADIGM: Under one scenario to achieve Land Degradation Neutrality (Sustainable Development Goal target 15.3), additional commitments in the land use sector, namely to restore and rehabilitate 12 million hectares of degraded land per year could help close the remaining emissions gap by up to 25% in the year 2030.**

The challenges of addressing climate change are complex. To move from a global economy dependent on the use of fossil fuels for its rapid growth to one decoupled from fossil fuels is an enormous challenge. It requires a long-term vision that nurtures a dramatic transformation in production systems and consumption patterns, impacting all sectors of society. It is tantamount to creating a global partnership between governments, the private sector and civil society, the likes of which have never been seen.

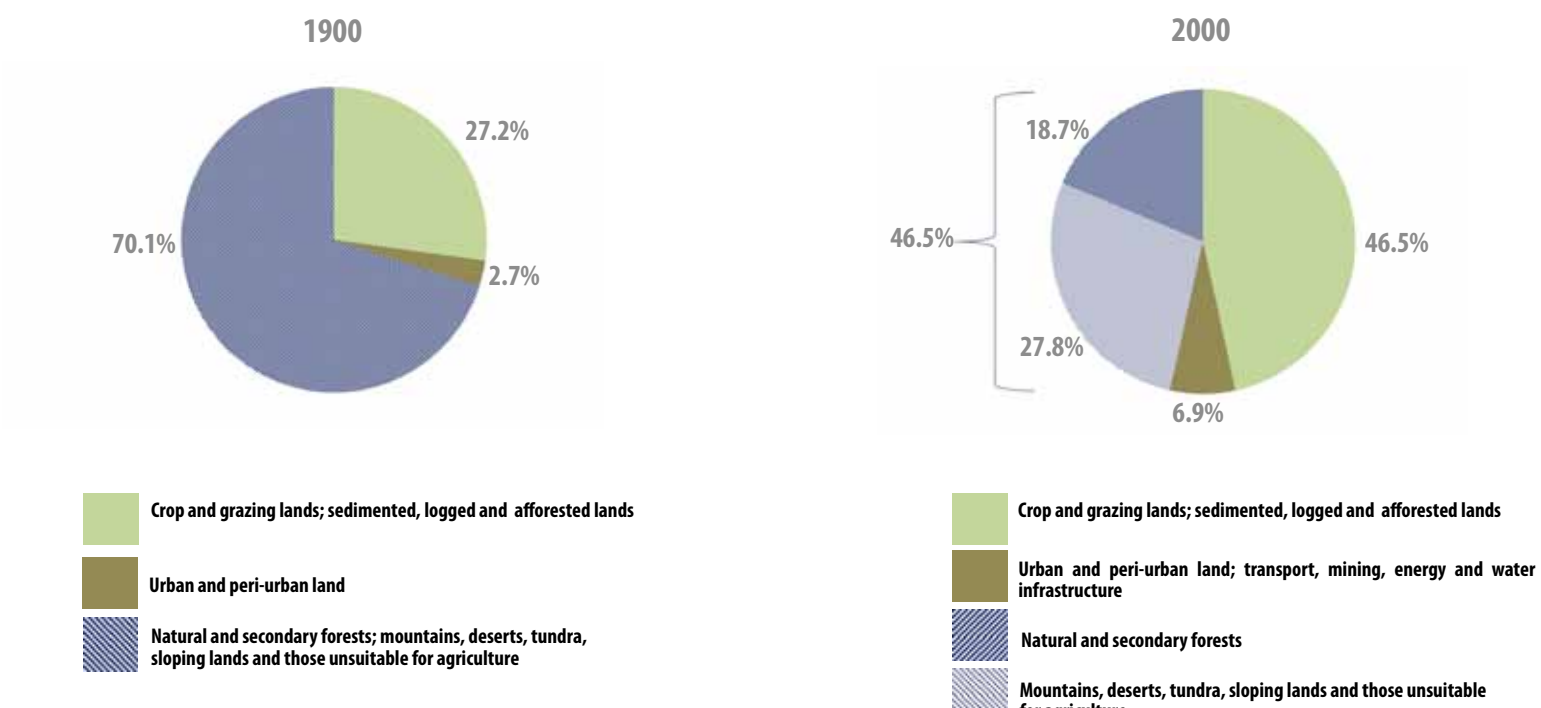
Staying on target to prevent a more than 2° C rise in global temperature will avoid a number of catastrophic tipping points for human societies around the world and will also require tremendous investment and behavioural changes. The Stern report on the economics of climate change estimated the costs of securing a safe level of emissions to be around 2% of global GDP.[3] This is certainly achievable, especially considering the much higher costs of inaction, i.e. the huge human and economic losses that would result from unabated climate change. So the challenge is to mobilize the financial resources, establish the administrative, policy and regulatory frameworks, and prioritize the most impactful and cost-effective actions in the shortest amount of time.

Much has been accomplished in the development of more efficient energy infrastructure and renewable technologies that now make them more competitive with traditional fossil fuels.[4] By contrast, other forms of carbon management, especially those related to land use change and land management, rehabilitation and restoration have been given less prominence. This brief makes the case that changes in management practices within the land use sector can substantially contribute to both climate change mitigation and adaptation. In many cases, sustainable land management practices can offer attractive economic opportunities in the short to medium term, particularly when the full suite of ecosystem benefits is considered.[5]

The total area of ice-free land on Earth is estimated at 13 billion hectares. Of this, about 46% is currently being used for agriculture and forestry; almost 7% is considered urban, peri-urban or modified by human infrastructure.[6] Estimates indicate that up to 25% of all land is currently highly degraded, 36% is slightly or moderately degraded but in stable condition, while only 10% is improving.[7] In the last two centuries, humans have converted or modified 70% of the world's grasslands, 50% of the savannah, 45% of the temperate deciduous forest, and 27% of the tropical forest biome primarily for farming and grazing activities.[8]

In twenty years (1985-2005), the world's croplands and pastures expanded by 154 million hectares.[9] This expansion has dramatically increased food production, but at the expense of many life-supporting ecosystem services on which our wellbeing, and that of future generations, depend. Agriculture is estimated to be the proximate driver for approximately 80% of deforestation worldwide,[10] resulting in a dramatic loss of water, carbon and other regulating services. Given the current trends in land degradation, and under a business-as-usual scenario, deforestation and other forms of ecosystem conversion are likely to continue in order to meet the projected increases in demand for food, energy and water in the next decades.

Figure 1: Land Use Change 1900 to 2000

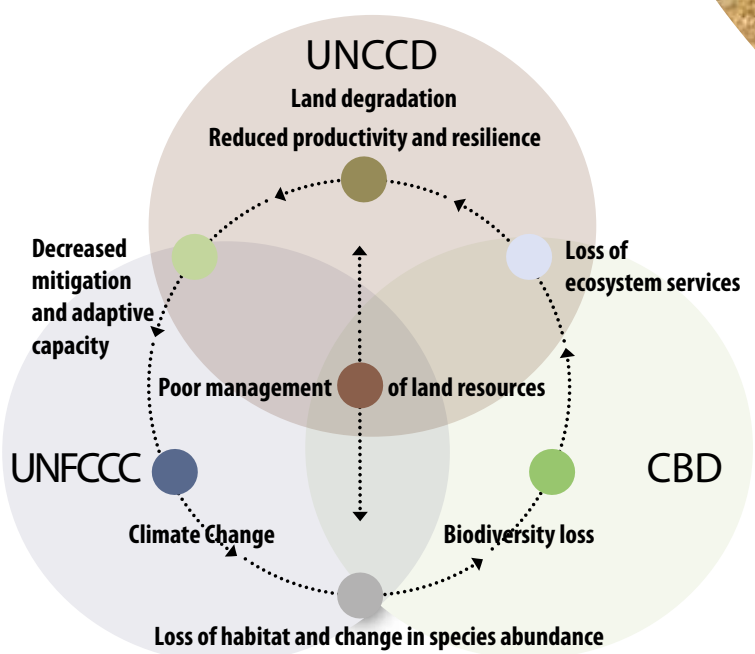


Ellis, E. C., Klein Goldewijk, K., Siebert, S., Lightman, D., & Ramankutty, N. (2010). Anthropogenic transformation of the biomes, 1700 to 2000. Global Ecology and Biogeography, 19(5), 589-606.

Hooke, R. L., Martín-Duque, J. F., & Pedraza, J. (2012). Land transformation by humans: a review. GSA today, 22(12), 4-10.

Since the industrial revolution, global emissions of carbon are estimated at 270 Gt (gigatons) due to fossil fuel combustion and 136 Gt due to land use change and soil cultivation. Emissions resulting from land use change come primarily from deforestation, the conversion or drainage of other natural ecosystems (e.g., wetlands), biomass burning, and the loss of soil organic carbon. Most notably, the depletion of the soil organic carbon pool has transferred 78 Gt of carbon to the atmosphere.[11] It is now widely recognized that poor management practices resulting in land degradation exacerbates the climate change process through increased emissions from cleared or dead vegetation and through the land's reduced sequestration potential.

Figure 2: Interlinkages between Land and Climate



Land degradation is both a cause and a consequence of climate change. Land degradation and climate change form feedback loops whereby intensive production increases emissions while the loss of soil and vegetation significantly reduces carbon sequestration (carbon sinks). The result is more carbon in the atmosphere feeding an energetic cycle of land degradation, biodiversity loss and climate change. To date, a great many of the synergies between land and climate have been negative. However, a vicious cycle can be turned into a virtuous one by reinforcing the positive elements of the relationship, helping to manage emissions on the one hand and adapting to climate impacts on the other. Adopting and scaling up sustainable land management practices would deliver important benefits not only for climate stability but for the farmer, the consumer and the environment.

Box 1: The Economics of Land Degradation

Land degradation is not a new phenomenon, nor is it confined to developing countries. Between 1931 and 1939, a series of droughts compounded by poor land management resulted in one of the worst disasters in United States history. While the term "climate change" would not be debated for another fifty years, it is useful to see what history can teach us about weather-induced disasters, disasters similar to those projected in many parts of the world today as a result of climate change.

In the case of the "Dust Bowl", intensive mono-cropping and the removal of perennial grasses resulted in the loss of top soil which was further aggravated by overgrazing. By the early 1930s, a series of droughts significantly reduced crop yields resulting in wind-induced soil erosion and dust storms. While the droughts only lasted one decade, the impacts were felt for several generations. Tight-knit farming communities became environmental refugees, pushed off the land and into poverty. The scale of the catastrophe was enormous. Some 35 million acres of farmland were ruined, over 100 million acres of top soil were lost and, by 1940, some 2.5 million people had been displaced. The relative economic loss which affected the national economy has been estimated at over USD 2.4 billion (USD 30 billion in 2007 dollars).[12]

Today, the global losses as a result of land degradation are estimated to be USD 6.3-10.6 trillion per year. Approximately 52% of the land used for agriculture worldwide is moderately or severely affected by soil degradation while 50 million people will face displacement in the next 50 years as a result of desertification and land degradation.[13] Land degradation represents one of the biggest human challenges of our time and yet too many people are still unaware that the cost of inaction is far greater than the cost of taking action.

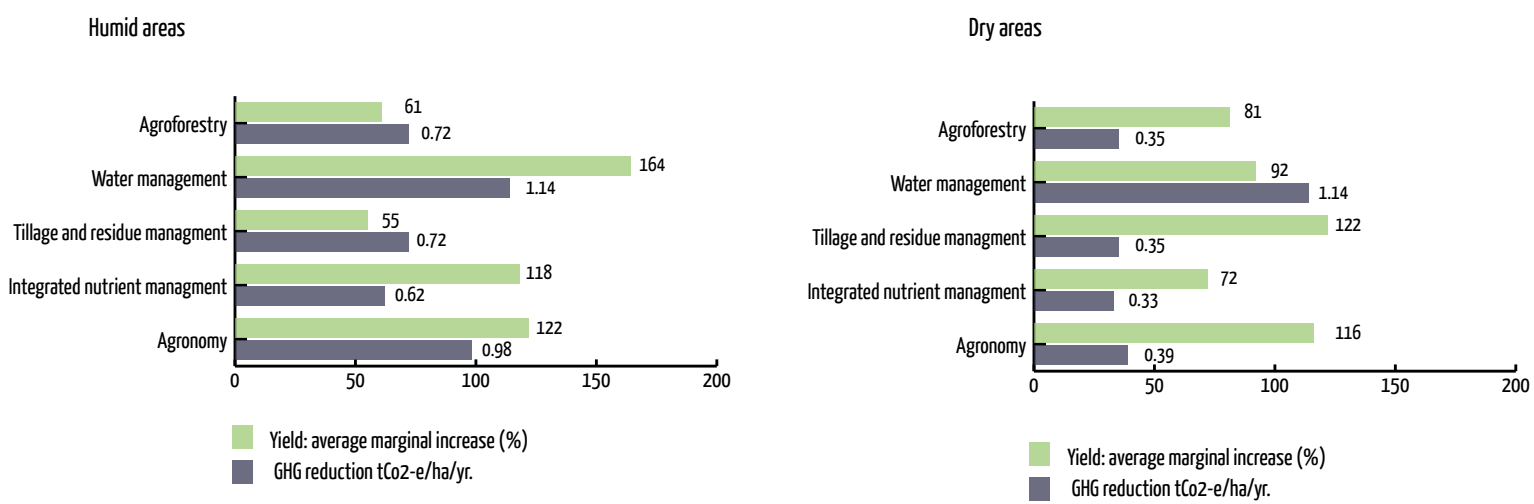
As the environmental realities of the 21st century become clear, we must recognize the stark fact that our global lands are fixed in quantity although not in quality. This simple fact is a compelling argument for us to become agents of change and begin managing our land in a manner that reflects its central importance to our future survival on this planet. Land and land resources (i.e., soil, water and biodiversity) underwrite the ability to grow, prosper, and sustain our very existence.

An important dimension of future land use decisions is the effect that land management, rehabilitation and restoration will have on our ability to adapt to and mitigate climate change. This presents a unique opportunity to transform policies (e.g., legislation, regulation, subsidies) that provide incentives and drive investment towards more sustainable, climate-smart land use management and planning

Indeed, the land use sector is quite unique with respect to mitigating climate change as it affords us opportunities to both avoid/reduce emissions and sequester carbon. There is a growing recognition that limiting global warming to 2° C above pre-industrial levels can only be realized if the mitigation potential of the land use sector is exploited in a more systematic and comprehensive manner. This largely untapped mitigation potential offers clear pathways of action that also contribute to multiple Sustainable Development Goals (SDGs) and targets, such as achieving Land Degradation Neutrality (LDN) .[14]

Striving to achieve the LDN target translates into meaningful climate action by: 1) protecting our natural carbon sinks like forests, grasslands and wetlands, 2) adopting and scaling up sustainable land management practices that reduce emissions, increase productivity and prevent further land use change, and 3) restoring degraded ecosystems for improved resilience and long-term carbon storage. These three pathways of action need not be expensive or complex. For example, it can take as little as USD 20 to rehabilitate one hectare of farmland in Africa using traditional agro-forestry, water conservation, and livestock management practices.[15]

Figure 3. Effects of SLM practices on productivity and climate change mitigation[16]



An increased appreciation for the mitigation potential of the land use sector would allow many developing countries to act quickly in halting and reversing land degradation, thus contributing to real climate action, poverty reduction and sustainable development. Climate-smart land management practices nearly always come with adaptation co-benefits. Their more efficient use of resources and inputs can ensure greater food and water security while land rehabilitation and restoration helps build community resilience and sequesters carbon.

The climate change negotiations will reach an important turning point in December 2015 when agreements on limiting emissions take center stage once again. The role of land -- as a key sector in closing the emissions gap (i.e., staying on target) and simultaneously increasing the adaptive capacity of communities and ecosystems -- must be explicitly recognized as an important pillar of this agreement and subsequent negotiations. The land use sector can and must play a central role in our fight against climate change. In this regard, land-based mitigation commitments must be strengthened and their contribution to reducing emissions and sequestering carbon fully accounted for.

The Cancun climate change conference set out the goal of limiting global warming to 2° C relative to pre-industrial levels. The Intergovernmental Panel on Climate Change (IPCC) has estimated that the amount of anthropogenic carbon dioxide that could be emitted over time to stay within the 2° C target totals around 3,670 $GtCO_2e$.[17] To date we have emitted about 75% of this total and thus the balance of the carbon budget currently stands at around 1,000 $GtCO_2e$. UNEP has estimated that to stay within budget, our emissions in 2050 will need to be 55% lower than 2010 levels, and shrink to net zero by 2080-2100.[18]

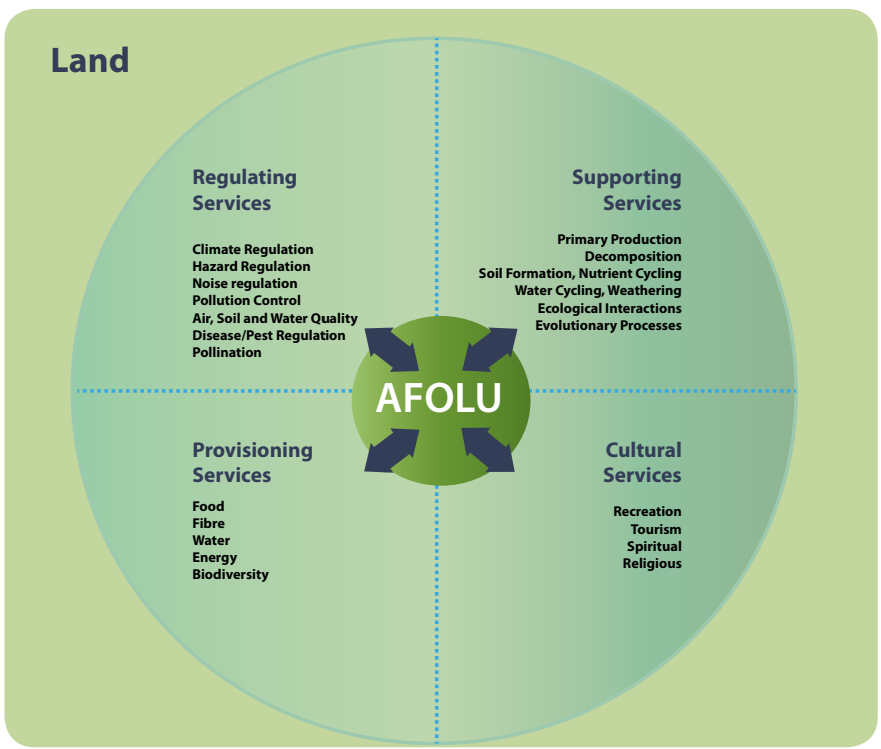
Time is of the essence: the more we delay necessary action, the more expensive future action will become. The emissions gap analysis provides a pragmatic approach to understanding the level of commitment (and fulfilment) needed to stay on target. The gap represents the difference between the level of greenhouse gas emissions, consistent with meeting the 2° C target, and the emissions reductions that governments have committed to. Estimates of the emissions gap are forecast at 7-10 $GtCO_2e$ in 2025 and 16-20 $GtCO_2e$ in 2030, based on existing reductions commitments.[19]

In its fifth assessment, the IPCC estimates that the land use sector accounts for approximately 25% of global greenhouse emissions. Of this, agricultural emissions account for 5.0-5.8 $GtCO_2e$ (50% of which is attributed to livestock production) while land use change (e.g., deforestation, ecosystem conversion) accounts for 4.3-5.5 $GtCO_2e$. The IPCC further estimated the total economic mitigation potential of supply-side measures in the agriculture, forestry and other land uses (AFOLU) sector at between 7.2 and 10.6 GtC02e per year by 2030.[20] Thus, the *prima facie* case for the land use sector to assume a larger role in mitigating climate change is obvious; yet exploiting its full potential continues to pose a number of governance and accounting challenges, including those that arise from managing non-point sources of emissions.

Theoretically, by reducing emissions to zero, the land use sector could close 100% of the total emissions gap by 2025 and around 50% of the gap by 2030. Studies suggest that the land use sector indeed has the potential to close the current gap by up to 50% by the year 2030.[21] By itself, this would represent a major contribution and achievement. If more assertive measures were concurrently taken to dramatically improve energy efficiency then there is more hope that the gap will be fully closed. This will of course require action across all fronts, including improved energy efficiency, more sustainable production systems, and changes in consumer behaviour. The potential of the land use sector, given the requisite policies and political will, could be activated immediately and at relatively low cost. Hence, there is an the urgent need to promote a more integrated land and climate agenda.

Land provides a multitude of functions and services which sustain and benefit humanity. These range from market-based services, such as food, water, energy and other traded commodities, to non-market services, such as carbon, water and climate regulation as well as less tangible spiritual and cultural values. In the last few decades, we have witnessed an unprecedented transformation in our ecosystems and landscapes resulting in critical reductions in, and sometimes the total loss of these vital ecosystem services.

Figure 4. Market and non-market services from the land use sector [22]



Due to current trends in land degradation, many land-dependent communities are failing to adequately cope with the impacts of climate change, especially the challenges of increasing water scarcity, droughts, floods, dust and sandstorms. Many livelihoods in the developing world are closely linked to the health and productivity of the land. Historically, the land use sector was often employed for a single purpose; however this is no longer a sustainable model. In the future, land will need to be increasingly managed in a manner that supports multiple functions and provides a broader range of services with new revenue streams. All aspects of land use affect or are affected by climate change. This places the land use sector in a unique position in the fight against climate change. The land -- its soil, water and vegetation -- represents a substantial opportunity to help manage greenhouse gas emissions and should therefore figure more prominently in strategies to address climate change.

Land rehabilitation activities around the world have already demonstrated the capacity to deliver increased productivity, climate benefits and improved water management (see Figure 3). Scaling up these efforts will require finance, supportive policies and an enabling environment. The LDN target in the SDGs is one vehicle to promote investments in local communities, empowering them to recover the lost productivity of their land and better absorb the shocks and stressors associated with climate change. While the mitigation potential of sustainable land management, rehabilitation and restoration is specific to the ecosystem type and its carbon carrying capacity, strategic interventions in high carbon-value ecosystems, such as forests and peatlands, would provide a host of additional benefits, including those for adaptation, water security and livelihoods. As such, the LDN target opens up important pathways to create more resilient rural communities.

As the impacts of climate change are now increasingly being felt around the world, it is apparent that we need to take immediate measures that increase resilience and help vulnerable communities adapt. The land use sector has the advantage of not only being able to play a significant role in mitigation but also in adaptation, often simultaneously and in the short-term. For example, low- and no-tillage farming systems that offer long-term carbon storage in situ also positively affect water retention; agro-forestry schemes that provide shade to mitigate heat also provide nutrients that increase soil carbon stocks; and the restoration of high carbon-value ecosystems serve as efficient and powerful carbon sinks per unit area. The potential for land to play a central role in addressing the twin challenges of mitigating and adapting to climate change is significant; even some of the more conservative estimates by those who believe that not all gains we indicate can, in practice, be realized, note that the confluence of benefits is high.[23]

Box 2 - Kenya: Climate and Food Security[24]

The Kenya Agricultural Carbon project involves 60,000 farmers cultivating 45,000 hectares to support farming that is more productive, sustainable and climate-friendly. After years of land degradation, many farmers struggled to grow enough food for their families. They are now using a wide range of sustainable land management practices to increase soil organic matter. In the long term, this should improve the water absorption, nutrient supply and biodiversity as well as help prevent erosion. Improved soils raise farm yields, improving food security and making agriculture more resilient to climate change.

To date, the project generates substantial benefits to farmers: improved farming practices have increased yields by 15 to 20%; over 30,000 smallholder farmers have been trained in sustainable land management practices; and in 2014 Kenyan farmers have received USD 65,000 in carbon revenue for environmental services under the Verified Carbon Standard (VCS) for sequestering carbon in soil. The credits represent not only a reduction of around 25,000 tCO_2e but an added layer of support and income to small and medium-sized landholders.

The experience so far has demonstrated how carbon financing can not only help in reducing emissions but also simultaneously increase yields and increase resilience. As farmers learn new methods to revitalize their land -- planting trees and crops, and harvesting in ways that produce natural nitrogen fertilizers in the soil -- they reap multiple benefits and are able to share their experiences with other communities. Pioneering carbon projects such as this one offer important lessons for scaling up landscape initiatives in the future.

Many of the pathways of action to achieve the SDG target 15.3 on Land Degradation Neutrality (LDN) are context specific, and their probable impact varies depending upon natural endowment, economic infrastructure, and the size and nature of the land use sector. The LDN target is predicated on protecting, sustainably managing and restoring the health and productivity of land resources. In the post-2015 world, it is expected that all countries will mainstream the global climate and development agendas into national planning, policy and investment frameworks. The land use sector should emerge front and center in all of these strategies, focusing primarily on land use change, land management and restoration, and land use planning.

LAND USE CHANGE

Land use change causes half of total annual global emissions in the AFOLU sector globally. It represents the majority of total emissions in developing countries that are losing significant forest cover. Avoiding emissions by retaining naturally occurring carbon in soil, sedimentation and vegetation is a first and necessary step to closing the emissions gap. At the same time, sustainable land management practices that increase productivity in working landscapes are key to avoiding further ecosystem degradation and land use change that increases emissions and diminishes carbon sinks.

Global soils act as a large "safety deposit box" for carbon. In fact, more carbon resides in soil than in the atmosphere and all plant life combined: some 2,500 billion tonnes of carbon in soil compared with around 800 billion tonnes in the atmosphere and some 560 billion tonnes in plant life.[25] However, due to the poor management and intensive cultivation of soils, we have lost between 25-75% of the original stocks of soil carbon.[26] Keeping this valuable, renewable asset healthy may become the most important driver of our ability to sustain life on earth.

Forests, peatlands and mangroves represent high carbon-value ecosystems. Reducing the rates of loss and degradation of these natural ecosystems offer cost-effective strategies that deliver immediate climate action. For tropical forests, which have the largest carbon pool, their preservation would reduce emissions by 1.3 - 4.2 $GtCO_2e$ per year in 2030.[27] It is thought that 25-30% of all terrestrial carbon is in peatlands and, by conservative estimates, the decomposition of drained peatland generates 1.3 $GtCO_2e$ emissions per year.[28] Mangroves ecosystems have, until recently, experienced tremendous degradation which accounts for a more modest level of emissions, in the range of 0.07 to 0.42 billion tons per year.[29]

Drylands are also of special importance. They make up some 41% of all land and include a wide range of unique habitats. While drylands often contain relatively low levels of carbon per hectare, the sheer extent of drylands offers scale opportunities for potential carbon storage and improved climate adaptation for poor rural communities. Drylands are especially vulnerable to climatic change and desertification that contributes to global warming through increased emissions and the loss of carbon storage potential. Degraded drylands are less able to store water and, in a vicious cycle, the impact of climate change on water availability further threatens these fragile communities and ecosystems.

LAND MANAGEMENT AND RESTORATION

There are many opportunities for the land use sector to actively reduce emissions in the short to medium term. In agriculture, the potential amount of reduction is estimated at 2.3–6.4 $GtCO_2e$ per year in 2030.[30] Much of this could be realized through sustainable land management practices such as conservation tillage, combined organic/inorganic fertilizer application, and reducing flooding and fertilizer use in rice paddies.[31] Moreover, carbon and methane emissions could be further reduced by nearly 3 $GtCO_2e$ by lowering the levels of meat consumption and food waste.[32]

Agroforestry systems in production landscapes have the potential to sequester from 1.06 to 55.77 tCO_2e per hectare for biomass and from 0.17 to 1.89 tCO_2e per hectare for soil carbon annually.[33] It should be noted that while most agroforestry systems remain at the low range of carbon sequestration, they have several distinct advantages over monoculture systems in terms of their long-term sustainability and resilience to climate change and other stressors. To be clear, agroforestry is focused on increasing the function and quantity of trees in agro-ecosystems; it is not a strategy to convert natural grasslands and forests to carbon farms.

Box 3. Latin America: Integrated Silvopastoral Approaches[34]

The objective of this GEF-funded project was to assess the potential for silvopastoral (forest grazing) systems to rehabilitate degraded pastures, protect soil health, store carbon, and improve biodiversity values. And at the same time, develop mechanisms for payment for ecosystem services (PES) that would benefit farmers and communities and thus inform policy-making on land use and socio-economic development.

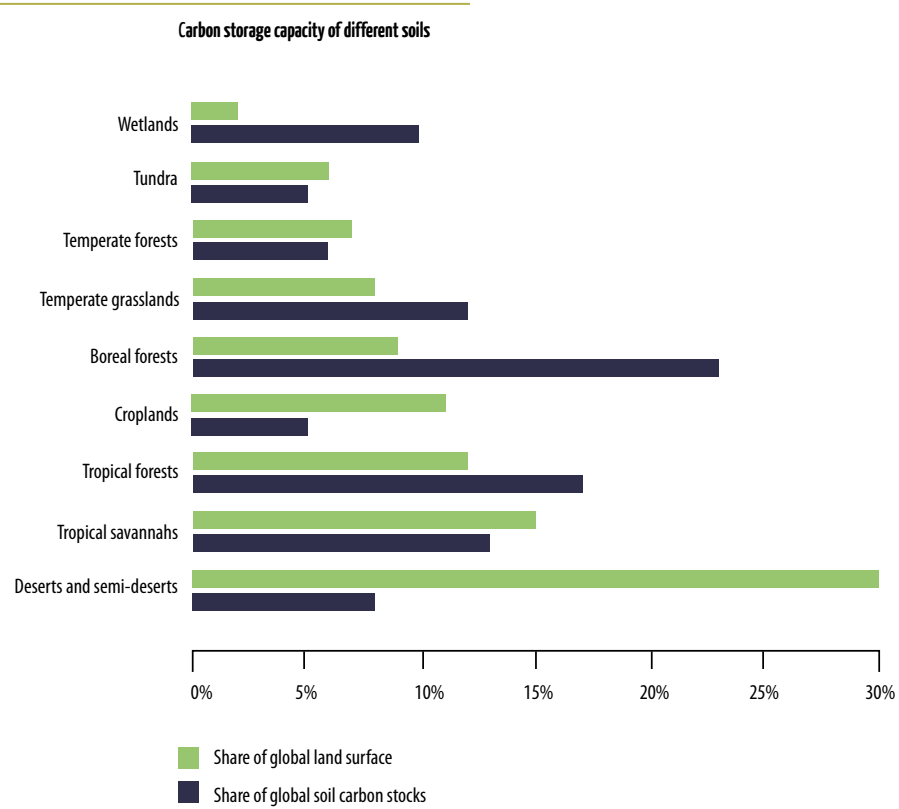
From 2003 to 2006, cattle farmers from Colombia, Costa Rica and Nicaragua received between USD 2,000 and 2,400 per farm (10-15% of their net income) to implement the programme silvopastoral systems. Subsequently, the area of silvopastoral land use (e.g. improved pastures with high density trees, fodder banks, live fences) increased significantly resulting in a 60% reduction in degraded pastures in the three countries. The environmental benefits associated with the project include a 71% increase in carbon sequestered (from 27.7 million tCO_2e in 2003 to 47.6 million tCO_2e in 2006), significant increases in milk production and farm income, increases in bird, bat and butterfly species and a moderate increase in forested area.

Other demonstrated environmental benefits of silvopastoral systems included the improvement of water infiltration, soil retention and productivity, land rehabilitation, and the reduction of fossil fuel dependence (e.g. substitution of inorganic fertilizer with nitrogen fixing plants). The project has successfully demonstrated the effectiveness of introducing payment incentives to farmers and in increasing the awareness of the potential of integrated ecosystem management for providing critical climate and environmental services.

Forests also act as a global sponge for carbon dioxide by capturing emissions from other sources. It has been estimated that forests are capable of absorbing approximately 10% of all global emissions by 2050. The total global area available for forest restoration is conservatively assessed to be 570 million hectares, and if reforested, this would result in the accumulated sequestration of about 440 $GtCO_2e$ of above ground carbon.[35] As with other efforts aimed at ecosystem restoration, it is important to realize that competing land use options need to be considered, such as for agriculture/livestock production, mining, and urban development.

The restoration of peatlands offers perhaps the greatest and most actionable opportunity for carbon sequestration. While peatlands only cover 3% of the global land area, they contain the equivalent of twice the carbon stock of all forest biomass worldwide.[36] A quarter of the world's soil carbon is held in peatlands. In addition to the carbon benefits, restoring peatlands provides other important benefits to biodiversity, ecosystems and human communities. Many peatlands play an important role in filtering and regulating water flows into streams and reservoirs thus impacting the quality and quantity of drinking water. Immediate action to rewet and restore degraded peatlands is well within reach for many of the large emitting countries.

Figure 5. Soil carbon storage capacity by ecosystem[37]



LAND USE PLANNING

Integrated land use lies at the heart of sustainable spatial and economic development, thus land use planning must be mainstreamed into climate/energy (INDCs), development (SDGs) and economic (GDP) planning. The most prominent land use dynamics at the global scale are due to the trends in and impacts of climate change, population growth, energy transition, and urbanization, all of which are strongly interconnected. Thus, climate smart land use planning is not only required in the rural sector but at the landscape scale which accounts for its interface with urban, peri-urban and other areas impacted by infrastructure development.

Multiple demands for land use are inevitable where public and private concerns exist and where diverse land uses and a range of stakeholders are present. Strong and enduring institutions are required to engage stakeholders, optimize trade-offs and ensure a transparent administrative process. In this regard, land potential evaluation could be used as a key tool for sustainably increasing productivity and optimizing trade-offs.[38] Long-term concerns such as climate change may not always rise to the top of the agenda and may be displaced by more immediate needs for food security and economic growth. However, by adopting sustainable land management, whether for mitigation or adaptation purposes, activities in the land use sector can very often be fully consistent with the delivery of multiple socio-economic benefits.

The evidence shows that minor changes in planning and design protocols, such as increased coordination among sectors, improved weather and climate proofing, or land rehabilitation projects, can offer significant medium to long-term benefits. The current discourse on land use planning focuses on a collaborative approach between governments and a wide variety of stakeholders and often entails negotiating difficult political and governance issues. Ultimately, a great deal of the responsibility for "climate-smart" land use planning will fall on local governments and communities but the private sector also has a role to play. The challenge is to increase the capacity of land use planners to identify low-cost mitigation opportunities and manage resilience to climate and weather-related risks at progressively larger scales.[39]

REHABILITATING 12 MILLION HECTARES

A practical and scientifically-sound proposal to reduce the emissions gap and approach the 2° C target is now required to guide the climate negotiations. The proposal here is based on the conservative estimate that we are losing 12 million hectares of productive land annually to land degradation and desertification with a similar figure for forest loss. New commitments to achieve Land Degradation Neutrality could entail restoring and rehabilitating 12 million hectares of land per year, with additional measures in nature conservation, ecosystem restoration and sustainable agricultural/livestock management practices, in order to get closer to the 2° C target. For most countries, land use sector activities being proposed here should be undertaken in addition to current mitigation commitments.

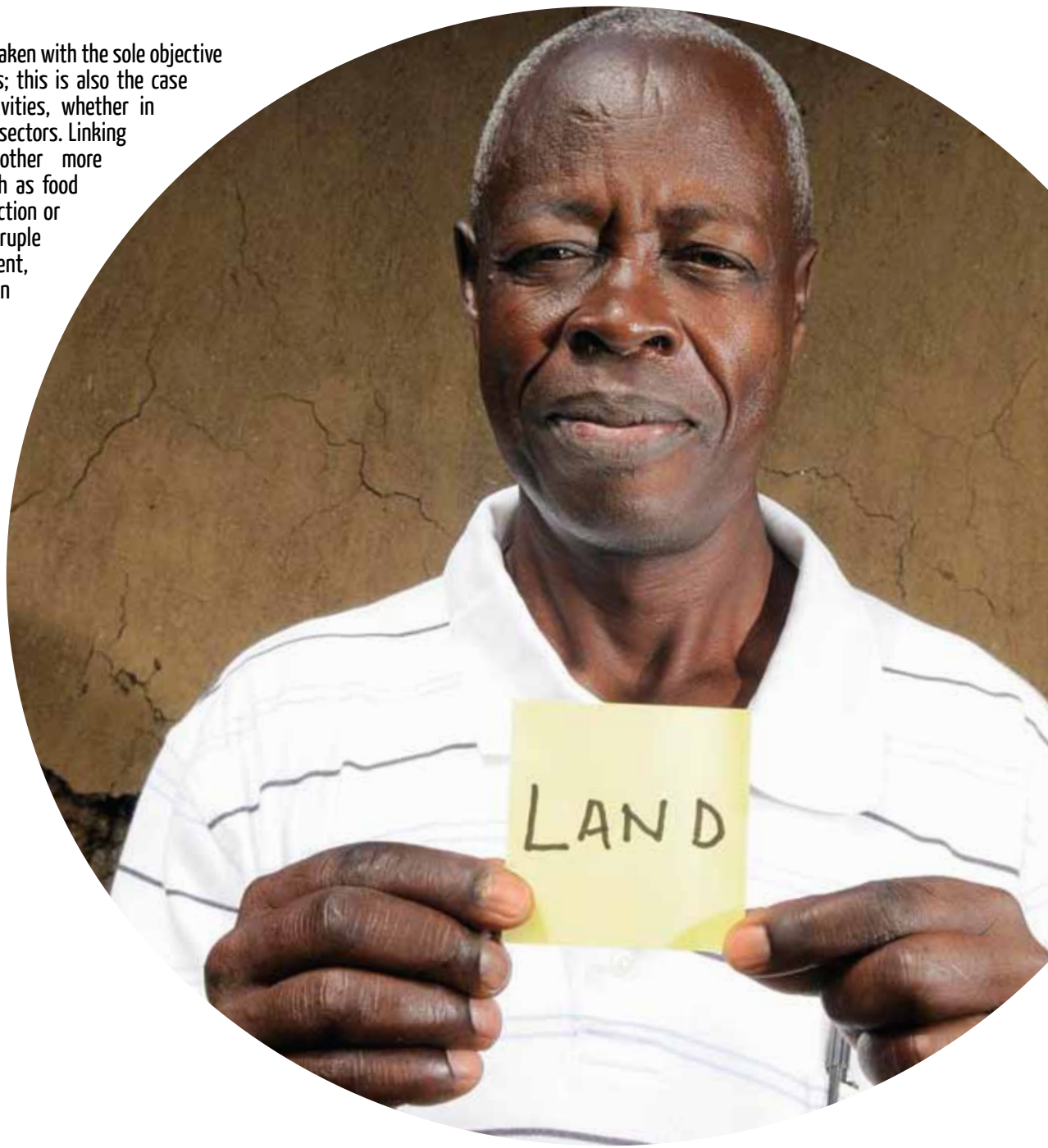
Land rehabilitation and restoration activities, as specified below, can help close the estimated emission gap of 13 $GtCO_2e$ anticipated at UNFCCC COP21 by up to 3.33 $GtCO_2e$ in 2030. This is roughly 25% of the emissions gap. In other words, the mitigation potential of this additional land rehabilitation equals two thirds of the expected emissions reduction pledges of all INDCs in the year 2030. Furthermore, additional benefits related to improved biodiversity conservation, soil fertility, water retention, and yield gains makes land rehabilitation a significant contributor not only to climate change but to the overarching Sustainable Development Goals related to the environment, poverty reduction, and food and water security. The mitigation potential of rehabilitating or restoring 12 million hectares of land is 0.33 $GtCO_2e$ per year. This amount of carbon could be sequestered annually for around 20 years until the soil carbon pool reaches its new equilibrium. Thus, by restoring 12 million hectares of land annually over a period of 10 years (2020-2030), an annual mitigation potential of 3.33 $GtCO_2e$ could be realized in 2030. This includes reduced emissions and increased carbon sequestration in both soil and biomass.

Table 1: Land rehabilitation/restoration to reduce the emissions gap and approach the 2° C target

Land rehabilitation commitment	Area in ha	Annual mitigation potential in tCO_2e/yr[40]
Restoration of degraded land	4.000.000	17.280.000
Restoration of organic soils (wetlands)	4.000.000[41]	255.400.000
Reforestation	4.000.000	60.000.000
Total	12.000.000	**332.680.000**

Few activities, in any sector, are undertaken with the sole objective of reducing greenhouse gas emissions; this is also the case for conservation and production activities, whether in agriculture, forestry or other land use sectors. Linking long-term climate benefits with other more immediate and tangible benefits, such as food and water security, rural poverty reduction or biodiversity conservation, can be a quadruple win: for the environment, for development, for economic growth and for human security.

In this brief, we argue that the missing piece of the puzzle in our struggle against anthropogenic climate change has long been ignored; literally the ground we stand on. Sustainable land management, rehabilitation and restoration, under a new paradigm for integrated land use planning, provide immediate, cost-effective, and potentially large-scale mitigation benefits. With the appropriate forward-looking policies, adequate finance and incentives, and strong political will and ambition, the potential of the land use sector can unleashed with proven technologies and practices that contribute to a more stable and resilient world.



This brief on the land-climate nexus is an initial contribution to the development of the Global Land Outlook (GLO) as a new strategic communications product. This in response to the mandate of the UNCCD secretariat to continually seek innovative approaches and products that increase awareness of desertification, land degradation and drought issues in the context of sustainable development.

It is expected that the GLO will take its place alongside the other outlooks such as the CBD's Global Biodiversity Outlook (GBO) and UNEP's Global Environmental Outlook (GEO). Like these products, the GLO will not be technical or scientific assessment of land degradation and restoration.

Bringing together a diverse group of international experts and partners, the UNCCD's GLO will provide strategic analysis to address future land management challenges in the context of sustainable development, including:

- food, water and energy security;
- climate action and biodiversity conservation;
- urban and infrastructure development;
- land tenure, gender and governance; and
- migration, conflict and human security.

As the first comprehensive outlook on the status and trends in the use and management of land resources worldwide, the GLO will provide a platform to facilitate insightful debate and discourse on a new and transformative vision for land management policy, planning and practice at global and national scales.

The premise of the GLO is that land and land resources comprise a finite stock of natural capital, and that the increasing demand for terrestrial ecosystem services is negatively impacting the quality and quantity of land: we are consuming our core capital instead of living off the interest it produces. The vision of the GLO is that land use, management and planning can be transformed in order to better optimize the trade-offs and synergies in the provision of these services, therefore being policy-relevant and informing investment decisions.

Some of the unique communications elements of the GLO are: 1) working papers series – supplementary contributions with an expanded format and an additional vehicle for disseminating their analyses; 2) scaling up best practices – a new vision for replicating and expanding sustainable land management practices to achieve multiple development objectives; and 3) land management indices – a mechanism to use existing indicators to compare land management systems across countries.

The 1st Edition of the Global Land Outlook is expected to be published in late 2016 or early 2017 in print and digital formats.

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