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ALPINE WETLANDS RESTORATION AND CLIMATE CHANGE

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SUMMARY

Lesotho's alpine wetlands are rare ecological features in Southern Africa. Their unique combination of peat-forming soil types and vegetation communities makes them worthy of international recognition.

Alpine wetlands are known to accumulate carbon through peat deposits. Wetlands play a significant role in carbon storage globally, containing a disproportionately high proportion of the world's carbon with respect to their proportional land coverage. Peatlands both emit and capture carbon dioxide and other greenhouse gases and the balance of these processes depends on peatland condition. In this way they regulate climate.

Alpine wetlands in Lesotho are in a poor condition. Their degradation status can be attributed to two main factors; the climate which has become drier over the years and overgrazing and trampling by livestock. Restored peatlands generally have less of an impact on global warming than degraded peatlands. Thus, restoration is generally beneficial from a global warming point of view.

KEY WORDS: alpine, carbon, climate-change, restoration, wetland.

BACKGROUND

According to The International Convention on Wetlands, Ramsar, wetlands are "…areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres".

Wetland ecosystems constitute a very important natural resource in Southern Africa and in Lesotho in particular. Lesotho contains some of the unique wetland ecosystems, the majority of which are associated with drainage systems. The high altitude catchments of Lesotho are extremely important as they are the largest watersheds in Southern Africa and are responsible for regulating 43% of the region's mean annual rainfall (ORASECOM, 2008).

Wetlands in Lesotho have a wide distribution. Almost all the wetlands in the country are in the high precipitation area of the mountain region and are commonly found in riverheads at high altitude and serve as origins of major rivers (DWA, 2005). Lesotho is well endowed with wetlands of varying types. Wetlands are variable in size, ranging from several square metres to

several square kilometres and cover approximately 1.36% of the total land area (Mokuku and Letsie 2001).

Peatlands are the dominant system in Lesotho and comprise of mires in the highlands region with high organic soils. Their unique combination of peat-forming soil types and vegetation communities makes them worthy of international recognition (Schwabe, 1995). The wetlands in general have low faunal diversity, which may be due to the harsh climatic conditions. However certain unique plants are associated with some wetlands, e.g., *Aponogeton ranunculus* (a vulnerable Drakensberg endemic plant).

OBJECTIVE

Joosten *et al*, 2009, argue that while covering only 3 % of the World's land area, peatlands contain 550 billion tonnes of carbon in their peat, equivalent to one-third of global soil carbon and to 70 times the current annual global emissions from fossil fuel burning (approximately 7,000 Mt/y in 2006 in carbon equivalents or 26,000 Mt/y in CO2 equivalents) ,(Hooijer *et a*l 2006). This is twice the carbon stock in the forest biomass of the world, and this means peatlands are the top long-term carbon stock in the terrestrial biosphere (Parish *et al*, 2008). Thus peatlands have the highest carbon density among all the soil types in the world and as such they are a very important "reservoir" of carbon. In this way, peatlands perform an important function with respect to climate change.

Fig. 1: Peatlands Regulate Climate

However, peatlands are fragile ecosystems. Overgrazing and livestock trampling are the main impacts on peatlands in Lesotho (DWA, 2005) and to some degree the alteration of drainage for roads. But this is minor on a national scale, as there are so few roads in the highlands. Overgrazing leads to a deterioration of the peat, leading to large-scale gully erosion and further degradation. Gully erosion leads to loss of water and carbon storage. Peatland degradation is currently one of the largest single sources of carbon emission from the land use sector. Mountain peatlands will be vulnerable to impacts from future climate change. This is likely to lead to more rapid degradation of peatlands and disruption of water resources and carbon storage (Joosten, 2009).

METHODOLOGY

The purpose of this study is to estimate the carbon storage in these peatlands. Previous studies have shown the extent and spatial distribution of peatlands in Lesotho. However the accuracy hasn't been determined, so while we now have an estimate of the area, we don't know how accurate it is. More importantly, we don't know the condition of the wetlands. We know where they are, but not the condition. This is a critical factor, especially to assess the carbon pools. The study will act as a characterisation and baseline as such information is unavailable. It will also help determine the current carbon storage of the wetlands and the extent of peat deterioration and degradation.

The basic issue is to determine the amount of carbon there is in a natural state of the peatlands .However most wetlands are to some extent degraded, therefore the study will determine how much carbon has been lost. To this end the study will develop a rating system to classify if a wetland is degraded and the extent thereof.

Peatlands have high organic carbon content and therefore contribute to carbon storage for which there is a high global demand. However there is still much research to be done, in the country, before this ecosystem service can be captured economically. The purpose of this research is therefore to undertake a characterisation study of the highland peatlands in Lesotho in order to estimate the amount of carbon stored in Lesotho's peatlands. An intact vegetation surface means that there is little peat carbon lost through erosion, and since rainwater flows mainly across the surface layers, little peat carbon is lost by being dissolved in water.

The Global Action on Peatlands defines peatlands as wetlands ecosystems that are characterised by the accumulation of organic matter "peat" which derives from dead and decaying plant material under high water saturation conditions.

Peat is an unconsolidated sedimentary material composed mostly of decomposed plants and degradation products that accumulated by natural processes in wetlands over thousands of years, and represents a large store of carbon captured from the atmosphere. Peatlands damaged by drainage can rapidly lose their stored carbon as carbon dioxide (CO2), but re-wetting these peatlands could increase emissions of other greenhouse gases (methane and nitrous oxide). Carbon storage and greenhouse gas emissions from peatlands are therefore of increasing relevance in leading efforts to address climate change (Natural England, 2010).

CONCLUSION

Peatlands both emit and capture CO2 and the balance of these processes depends on peatland condition. They may also be sources or sinks of methane and sources of nitrous oxide, both of which are more powerful greenhouse gases than CO2. The impact of peatlands on global warming is the result of the combined effects of all these greenhouse gases, which in turn depends on their global warming potential.

Peatland restoration can generate multiple benefits and this include peatland protection, reduced erosion and loss of stored carbon, improved water storage, improved biodiversity conservation and more resilience to climate change (Couwenberg, 2009).

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