TECHNICAL BRIEF

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The WRC operates in terms of the Water Research Act (Act 34 of 1971) and its mandate is to support water research and development as well as the building of a sustainable water research capacity in South Africa.

South African peatlands: Socio-economic value

A Water Research Commission (WRC) study evaluated the characteristics of peatlands and related processes

Background

It is globally accepted that ecosystems, as natural features in the landscape, provide environmental, social and economic benefits to associated communities. The value of ecosystems in providing these ecosystem services is becoming increasingly evident.

There is a growing recognition of the importance of the services delivered by freshwater ecosystems to human well-being. Ecosystem services are quantifiable benefits people receive from ecosystems.

Wetlands are highly productive ecosystems. Due to their ecological complexity, wetlands provide a variety of goods and services of value to society. These services can be described as services of nature, directly enjoyed, consumed, or used to yield human well-being.

Peatlands represent a third of wetlands worldwide, which contribute a range of ecosystem service. The most pronounced services are biodiversity conservation, water quality and climate regulation.

The addition of peat to a wetland allows these wetlands to have additional ecosystem services. The unique properties of peat allow for a variation in the dynamics of the ecosystem services provided, making peatlands major contributors to wetlands' increased capacity for climate, water quality and quantity regulation, biodiversity conservation and waste assimilation.

Peatlands cover about 3% of the earth's surface. The global carbon stored in peat is estimated to be about 500 billion tons, which is about 30% of the world's soil carbon. Furthermore, peat stores 10% of the world's freshwater.

Although peatlands are not common in South Africa where less than 10% of the wetlands are peatlands, some peatlands are unique. The Mfabeni Mire, for example, is 45 000 years old and is one of the oldest active peat-accumulating wetlands in the world.

The destruction of peatlands causes a visible and immediate degradation in the integrity of the aquatic ecosystems downstream of peatlands. This affects rivers and associated ecosystem health.

In South Africa, there is less knowledge about peatlands than other less sensitive and less strategic ecosystems. Thus, policy formulation and management decisions are not always grounded on a good knowledge base and may inadvertently lead to further destruction of these important ecosystems.

Therefore, the first step in effective peatlands conservation is to have accurate scientific baseline information to draft effective management guidelines and to define the socio-economic value of these ecosystems to society.

Through this research project, eight case study peatlands in the different peat ecoregions have been characterized, classified and mapped to compile an inventory and determine their conservation status. The socio-economic value of peatlands in South Africa was established using these scientific baseline values.

Study aims

The aim of the study was to evaluate the characteristics of peatlands and related processes and their contribution to South African wetland ecosystem services. The specific objectives of this project, were:

- To improve the existing peatland ecoregion model to identify potential peatland areas based on new recordings.
- To upgrade the existing peatland database, collect data of new recordings generated in the past 15 years as well as future related research on South African peatlands.
- To investigate the processes and factors driving peat distribution and accumulation in South African wetlands based on selected case studies.
- To investigate the potential of South African peatlands as a carbon sequestration mitigation mechanism.
- To demonstrate the socio-economic value of peatlands in South Africa, based on the concepts of ecological infrastructure and ecosystem services delivered.

Study results

Research findings confirmed that peatlands in South Africa are mostly groundwater-dependent ecosystems that occur in the wetter eastern and southern parts of South Africa. Isotope analysis and water flow measurements results support the fact that groundwater is the main driver.

The isotope signatures of the peatlands in both the interior and coastal regions strongly suggest that the source for the sustained baseflow is groundwater discharging in the wetlands; therefore, reiterating the importance of conserving groundwater recharge areas for peatland protection.

The potential of South African peatlands as a carbon sequestration mitigation mechanism was investigated by studying the ^{14}C ages of peatlands in South Africa. Peat accumulation during the past 50 000 years indicate variable conditions favouring peat formation in the Late Peistocene and Holocene, with a significant gap from 35 000 to 15 000 years BP. This gap is most likely linked to the colder and drier conditions of the last glacial maximum.

An ecosystem services approach was applied to demonstrate the socio-economic value of peatlands in South Africa. The study did not aim to put a total value on peatlands, but rather to demonstrate a range of possible peatland values at the hand of several models and case studies.

The ecosystem services identified as the most important peatland services were carbon sequestration, water purification, knowledge and education, peat as a commodity, hydrological regulation, tourism, recreation and spirituality. The carbon sequestration of peatlands was evaluated by estimating the annual carbon accumulation rates.

The storage ability was evaluated by estimating the current levels of carbon stocks in peatlands. Both estimations were done by acquiring specific physical data pertaining to various peatlands across the country, thus building on the scientific analysis conducted through this project.

Where there were data gaps, peatland experts were consulted and ranges were determined. In this way, data required was inferred across regions to ultimately demonstrate the value of peatlands across South Africa.

In terms of their carbon storage ability, the stock was estimated to range between 4.2 million tonnes and 431.5 million tons. Estimates of the accumulation rates changed between about 2 500 and 45 000 tons of carbon per year. Although compared to global figures the climate regulation ability is not remarkable, South African peatlands do play a substantial role in storing and sequestering atmospheric carbon.

The value of carbon stocks present in peatlands displayed a proxy worth an average of R13 billion, possibly being worth as much as R191.8 billion. The annual sequestration value of peatlands was estimated to be between R5.6 million and R19.8 million a year.

Based on these results, the scope for payments for ecosystem services schemes based on the carbon accumulation services alone is relatively low compared to the growing biomass carbon storage schemes such as the Spekboom project in the Eastern Cape. However, the ecological infrastructure value of peatlands increases by more than an order of magnitude when the additional ecosystem services are added.

The water quality (water purification and waste assimilation) service provided by peatlands demonstrates a very significant value. An estimate based on the Klip River Peatland south of the Witwatersrand indicates that the water purification value from an ecological infrastructure perspective could be as much as R179 billion. This does not include any other South African peatlands.

Thus, the waste assimilation service value will almost certainly be larger than R179 billion, making this service potentially more valuable than the carbon sequestration service for peatlands.

Compared to global abundance, peatlands are an extremely scarce ecosystem type in South Africa, with only 1% of total wetland area being peatlands. The regionally distinctive characteristics and local variation in floral composition of

South African peatlands influence the substitutability value of these systems.

The value is further enhanced by the knowledge service potential present in peat, which is largely unequalled by any other terrestrial source of paleo-environmental data. Substitutability in economics in the degree to which one goods or service is substitutable for another goods or service.

In the case of very scarce resources, substitutability is limited; in extreme cases, this would negate the determination of an economic value. A landmark case was the St Lucia heavy minerals environmental impact assessment completed in 1996, which determined that Lake St Lucia was so unique that mining-related risks could not be allowed.

The same case cannot be made for all peatlands, as there are many across the country; however, on a case-by-case basis, there may be peatland systems that are so unique that a case for zero degree of substitutability could be made.

The irreplaceability value should be handled with caution when valuating peatlands economically, but this value should not be ignored when making management decisions as the value is highly significant.

Significant cropping within some of South Africa's peatlands has been seen; however, at the time of the study, insufficient data did not allow for the value provided by this service to be demonstrated. The commodity price of peat stocks and peat accumulation was estimated as being as much as R6 billion and R0.6 million per year respectively.

These values are relatively low when compared to the cumulative economic values indicated by other services. This finding is highly significant as it indicates that the gain of revenue through peat harvesting is miniscule when compared to the loss of revenue due to replacing services lost through peatland degradation.

The quantification and valuation of the hydrological regulation and cultural services includes tourism, recreation and spiritualism were not possible due to limited data. That is not to say that the services do not exist.

Conclusions

The study has therefore demonstrated the value of services provided by South Africa's peatlands. Peatlands are more valuable due to the presence of peat stocks within them. Based on the services evaluated and the available data, the value of the cumulative services provided by South African peatlands was estimated to be as high as R174 billion, expressed as an ecological infrastructure value. This means that for every R1 of carbon storage value, approximately another R12 can be added for other ecosystem services. This value equates to approximately R5.7 million per hectare.

This is a substantial value that must be considered when making decisions regarding peatland management in South Africa to conserve and sustain peat and peat-forming conditions within them. South Africa's peatlands are already at risk through various land-use practices. These include alterations of water courses and water tables, encroachment of infrastructure, urban and industrial effluent, extraction (peat mining), and agricultural land transformation.

These activities degrade peatlands, resulting in the exposure and subsequent loss of peat and peat-forming conditions.

The high economic value displayed has illustrated the importance of peatlands in the socio-economic landscape of South Africa. In addition, there is also a major intrinsic value attached to the irreplaceability of these features that cannot be ignored.

This investigation has highlighted the importance of the protection, sustainable use and maintenance of these natural features.

Further reading:

To order the report, South African peatlands: Ecohydrological characteristics and socio-economic value (**Report No. 2346/1/17**) contact publications at Tel: (012) 761-9300; Fax: (012) 761-9300; Email: orders@wrc.org.za or Visit: www.wrc.org.za.