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Natural resource management – an employment catalyst: The case of South Africa

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Abstract

Since 1995 South Africa has, among other things, established four natural resource management programmes. These public programmes are i) "Working for Water" – responsible for the management of water catchment through the clearing of invasive alien species; ii) "Working for Wetlands" – responsible for the rehabilitation of degraded wetlands; iii) "Working on Fire" – responsible for the implementation of integrated veld and forest fire management; and iv) "Working for Land" – responsible for the restoration of land through the introduction of endogenous species. Using historic operational records of these programmes' costs, labour intensities, and performance, we estimate their job creation potential, and through the expansion of the programmes, their potential to achieve different objectives from an ecosystem goods and services' perspective. We estimate that between 192 000 and 494 000 full-time jobs could be created over the next 15 years depending on the level of effort and the environmental objective. These jobs could lead to income flows into poor rural households of between US$2 and US$15 billion a year. Such figures are impressive and call for dedicated measures to unlock this job creation potential. Our figures also clearly indicate the strong linkages between reaching both environmental and economic development targets.

Introduction

Since 1995, following the country's transition to democracy, the South African government has developed a number of public programmes aiming at improving the country's management of its natural resources. The main objective has been to sustain the functioning of natural ecosystems and their productive capacity. Without jeopardising this overarching objective, it has become abundantly clear that natural resource management can, and should, also play an important role in the stimulation of economic development and alleviating poverty (Blignaut et al. 2007, Blignaut et al. 2008a, Blignaut 2009).

While sustaining the environment remains the main driver of these programmes, the job creation potential they represent provides an additional argument for their expansion. This advantage is even more pertinent when considering the challenge the South African economy is facing after shedding more than one million jobs since the start of the economic downturn in 2008. This has raised the official unemployment rate to 25% or 4.4 million people during the third quarter of 2011 (Statistics South Africa 2011). To offset these losses, new job opportunities will have to be created in under-developed sectors, and sectors that are less vulnerable to global economic fluctuations. Natural resource management is definitely one such sector. There is some uncertainty with respect

to the extent of this employment potential and how to take advantage of it. To address these concerns this paper seeks to clarify the potential to meet both environmental and job creation objectives, thereby achieving either a double or even a triple dividend (Letsoalo et al. 2007, Van Heerden et al. 2006).

To do so this paper first reviews the existing programmes in South Africa and their evolution, stressing the number of jobs created and the actual costs in the next section. The third section looks at the potential for long-term job creation according to a minimal and an optimal scenario, and estimates budget requirements. The final section concludes and proposes some policy implications.

History and development of the 'Working for' programmes

South Africa has a long history of integrated watershed management that dates back as far as the mid-1930s. At that time, conservation and restoration programmes were mainly operational in the Western Cape and KwaZulu-Natal focusing on the high rainfall areas in an attempt to protect the country's "water factories" (Van Wilgen et al. 1998). These initial efforts were later supported by the promulgation of the Mountain Catchment Areas Act (No. 63 of 1970) that spearheaded the removal of invasive alien plants from water catchments. This programme was later abandoned due to a lack of political support and funds. Nevertheless, it laid the foundation in terms of both science and experience of what later became known as the "Working for" programmes.

Currently there are five integrated yet distinguishable "Working for" programmes, namely Working for Water (initiated in 1995), Working for Wetlands (initiated in 2000), Working on Fire (initiated in 2003), Working for Energy (initiated in 2009) and Working for Land (initiated in 2010). Here we exclude the Working for Energy programme as, while it does have a natural resource management component, it also has other components such as biogas and solar water heating systems that fall out of the focus of this paper. Together the four remaining programmes aim to provide an all-encompassing integrated watershed management programme catering for clearing invasive alien plants (through Working for Water), restoration of wetlands (through Working for Wetlands), encouragement of appropriate fire management and combating wild fires (through Working on Fire), and re-establishment of indigenous vegetation in degraded areas (through Working for Land). While these four programmes have different operational teams on the ground as specialist knowledge and equipment differ, there is a high level of integration at top-management level to streamline interventions. A summary of the current scope and size of these programmes is provided in Table 1 below followed by a brief discussion of each programme.

Table 1: Salient information about South Africa's four "Working for" programmes

Fiscal year 2009/10	Number of FTE*	Wages earned (000 US$)**	Budget (000 US$)**	Achievements
Working for Water	7 422	22 475	64 214	More than 2 million ha have been cleared since 1995.
Working for Land	348	1 308	3 737	1 700 ha have been restored.
Working for Wetland	1 514	3 319	9 482	516 wetlands have been rehabilitated between 2004 and 2010.
Working on Fire	2 012	5 429	15 510	The programme fought 1 628 fires in 2010, made 20 332km of fire belts, prescribed burning on 78 771 ha, manual fuel reduction on 343 ha, and covered 368 734 ha of fire-suppression (i.e. 14% of the fire area).
Total	**11 297**	**32 530**	**92 944**	

Source: Department of Water Affairs and the Department of Environment Affairs, unpublished data.

* FTE – Full-time equivalent; while the actual number of people employed by the respective programmes is much higher than the numbers reported here, we calculate an FTE as the number of person-days of work created by the programmes, divided by 230 days in a work year. The total number of people employed is much higher than the FTE number because few work for an entire year.

** All figures have been converted from Rand to US Dollar at a R/$ exchange rate of 7.5.

In October 1995 the then Department of Water Affairs & Forestry established the Working for Water programme (WfW), convinced of its economic efficiency and potential for job creation. This was a bold decision that was later vindicated (Van Wilgen et al. 1998, Binns et al. 2001, Turpie et al. 2008). The programme aims at clearing invasive alien plant species (IAPs) with mountain (water) catchments and riparian zones as the initial target, hence its name. The programme was created to combat the rapid spread of IAPs that continues to put increasing pressure on the country's water resources. Cullis et al. (2007) estimated that 4% of registered water use (consumptive use) is being lost as a result of the invasion of alien tree species in mountainous areas (high yield catchments), river banks and wetlands alone. If left unchecked, the loss will increase to more than 16% of registered water use. Le Maitre et al. (2000) estimated that 3 300 million m^3 surface runoff water is lost as a result of IAPs. This represents around 6.7% of the total surface runoff in South Africa. An additional challenge is that the invasive alien trees that are currently being used in the plantation forestry sector have a tendency to reduce the dry season runoff which can reduce the pollution dilution factor in some cases, thereby compromising water quantity and quality (Scott & Smith 1997; Everson et al. 2007). Furthermore, by suppressing the growth of natural vegetation especially in the grasslands, savannahs and arid zones of the country, IAPs reduce the carrying capacity and productivity of the land (Van Wilgen et al. 2011).

Working for Water was followed by the "Working for Wetland" programme in 2000. Its primary objective is the rehabilitation of wetlands that have been degraded or lost. At the same time, it focuses on maximising job creation, creating and supporting small businesses, while restoring the wetlands and the services that they support (Working for Wetlands 2005).

The next programme to be established was the "Working on Fire" programme, launched in 2003 to support land management agencies and private land owners with implementing integrated veld and forest fire management. Much of the country is dominated by fire-prone ecosystems that require occasional and well-managed fires to function properly. Furthermore wild fires can cause much damage to property and infrastructure if not brought under control. The primary focus of this programme is therefore to stop wild fires from becoming catastrophic through an integrated approach to veld and forest fire management (DEA 2005).

The latest addition is the "Working for Land" programme, launched in 2010, that aims to restore degraded land through the introduction of indigenous species. This programme originated from some catalytic pilot projects initiated in the Eastern Cape Province. During 2004 a project of the then Department of Water Affairs and Forestry embarked on a pilot restoration programme in selected sites across the Albany Thicket Biome in order to restore the natural functioning of the degraded areas, create livelihood opportunities for the rural poor and establish baselines and best management practices for entering the carbon market. Two main foci have emerged from this initiative: watershed services for high yield catchments, rivers and wetlands to reduce soil erosion and the siltation of dams; and carbon sequestration in an effort to contribute towards global climate amelioration (Marais et al. 2009). Initial results from the Albany Thicket Biome pilot projects show that the establishment of a local species *P. afra* (spekboom) has the potential to sequester carbon and restore the functioning of the ecosystem at a surprisingly fast rate (4.2 tons/ha/annum) for a semi-arid area (Mills & Cowling 2006; Marais et al. 2009).

While the current scope of these programmes is depicted in Table 1, what is their potential for job creation? Answering this question basically hinges on three pillars, namely i) the current level of degradation (such as the current prevalence of invasive alien plants in the case of Working for Water), ii) the potential future level of degradation given a historic rate of growth given no intervention, and iii) the magnitude and activities of the interventions envisaged in policy to manage the challenge.

Estimating the potential for job creation

The primary source of data used to estimate the current level of degradation and the potential future spread and distribution thereof is based on data collected by South African government departments: the Department of Water Affairs (DWA) and the Department of Environment Affairs (DEA). This primary data have been published in Marais and Wannenburg (2008), Kotze et al. (2010), Bhengu et al. (2009), and Egoh et al. (2008). This data have been augmented with unpublished operational data from the four programmes.

Based on historical evidence it is possible to derive the number of people (measured in terms of full-time equivalent (FTE) units[1]) required to clear one hectare of, for example, a densely infested eucalyptus stand. This has been done for various species along a gradient of infestation in various ecosystems, such as fynbos, grasslands and savannah. This exercise was repeated for wetlands, fire management and the restoration of areas denuded of indigenous vegetation. In essence this bio-physically driven approach to calculating labour effort, starts with the current observed levels of degradation and estimates of the on-going rate of change, which are converted into the number of FTEs (based on historic levels of effort) it would take to bring the level of degradation under control over different time periods. We not only factored in the different types and severity of degradation for the four respective programmes, but also geographic spread within provinces. In addition, we calculated the total cost of the four programmes for different time periods, based on the 2010 costs per person day of each programme adjusted by an annual rate of increase of 8% for forward projections to capture mostly inflationary pressure. The total income for people is estimated to be 35% of these total costs, with the exception of the prevention part of the Working for Wetland programme where the income for people represent 50% of the total costs. These percentages are based on historical programme records.

The model and assumptions

Two scenarios are applied across the following three time periods: the short-term, (years 0-3), the medium-term (years 4-7) and long-term (years 8-15). The first scenario (S1) is a conservative scenario based on the minimum efforts deemed to be achieved. S1 is more or less consistent with the current planning vision of the national and various provincial government programmes. The second scenario (S2) is much more ambitious and seeks to tackle the different environmental issues at a faster pace and may be equated which what is required from a bio-physical perspective. For both scenarios, the following assumptions are made per programme.

- *Working for Water:* The main assumptions relate to the rate of invasion and progress in clearing areas over time. S1 assumes a conservative rate of invasion (2% per year) and the clearing objectives are set to 2%, 15%, and 40% of the initial invaded area in the short-, medium- and long-term. S2 underscores a more aggressive rate of invasion, twice the one used in S1 (i.e. 4% per year), with more ambitious clearing objectives: 4%, 20% and 50% respectively. These estimates are based on the current area invaded (i.e. approximately 20 million ha in 2008, see Figure 1) as a point of departure, and the number of person-days required to clear an invaded area (including follow-up clearing).

1 All estimates of the number of full-time equivalent person-days have been calculated by provinces before being summed and translated into national full-time equivalent, based on a work-year equivalent to 230 person-days of work.

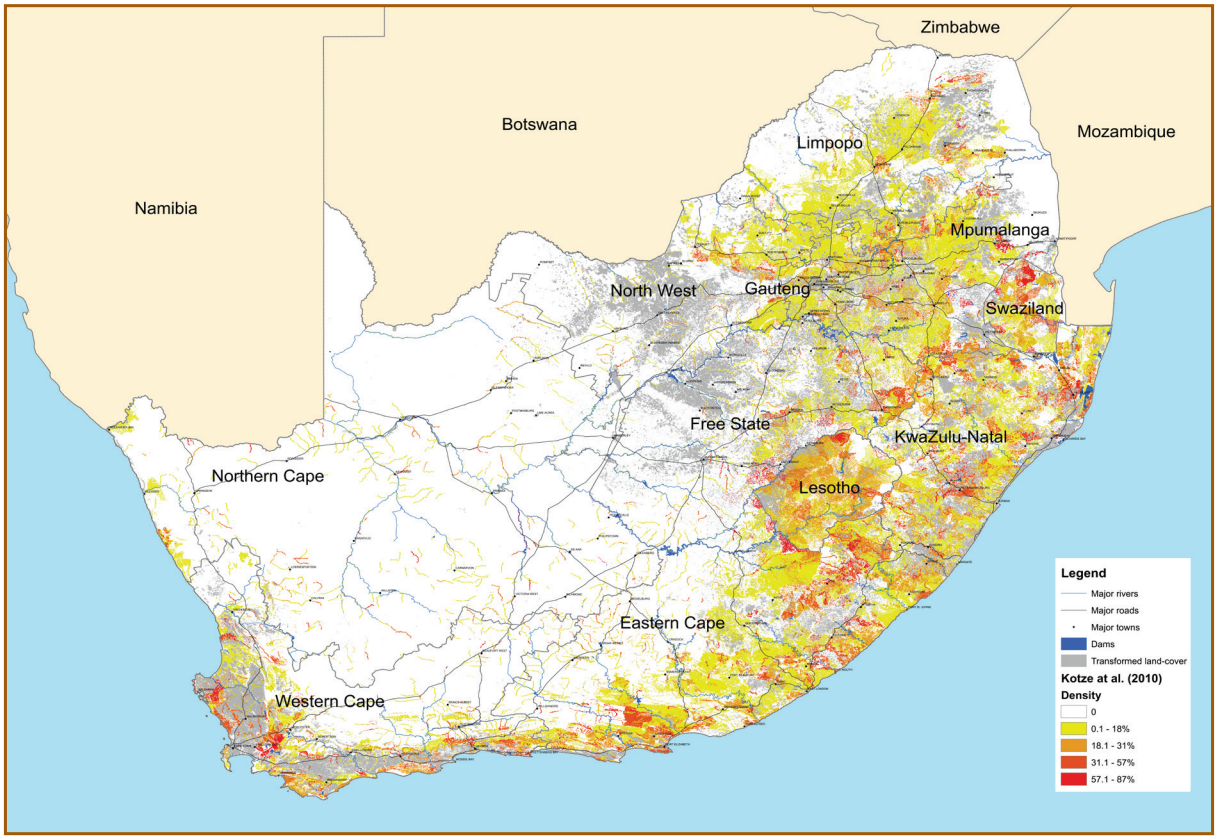

Figure 1: Extent of Invasive Alien Plants in South Africa (Kotze et al. 2010)

- *Working for Wetlands:* It is assumed that, for S1, this programme will grow by 20% per year in the short-term, by 30% per year in the medium-term, and by 5% per year in the long-term. For S2, more effort is made in the medium and long-term; the growth rates are respectively 20%, 50% and 40%. Also included in these estimates are jobs related to the rehabilitation of the wetlands, as well as those dealing with the prevention of wetland degradation. With S2, by the end of the long-term, (approx. 2025), the number of degraded wetlands will have been reduced to 23 000, i.e. about half of the current (2010) figures (Dini 2007).

- *Working on Fire:* The S1 scenario assumes that 50% of the fire area per year can be covered by the end of the medium-term and then activity stabilises. S2 grows this number to 75%. It should be added that it is extremely difficult to plan for integrated veld and forest fire management. Integrated veld and forest fire management includes a range of actions that include: fire awareness and prevention activities; prescribed burning; resource sharing and co-ordination; fire detection, fire suppression and fire damage rehabilitation at local, provincial and national levels; reduction of unwanted wildfire damage; and promotion of the beneficial use of fire. All of these activities may be required in order to establish a sustainable and well-balanced environment,

(FAO 2006). Most probably the single biggest sub-set of intervention is that of fire suppression and prescribed burning in fire prone landscapes.

Annual interventions in these two activities are totally dependent on weather patterns and therefore vary significantly between years. The current assumptions on the demand for integrated veld and forest fire management capacity are based on the fire prone biomes of South Africa, i.e. grasslands, savannahs and fynbos (see Figure 2). The key focus areas of integrated veld and forest management are ecological functioning, optimising productive potential of natural veld, and disaster risk reduction. The aims of these three foci though are not complementary and what might be good for the one is not necessarily good for the other. Further work on the demand for integrated veld and forest fire management is therefore still needed to refine our assumptions.

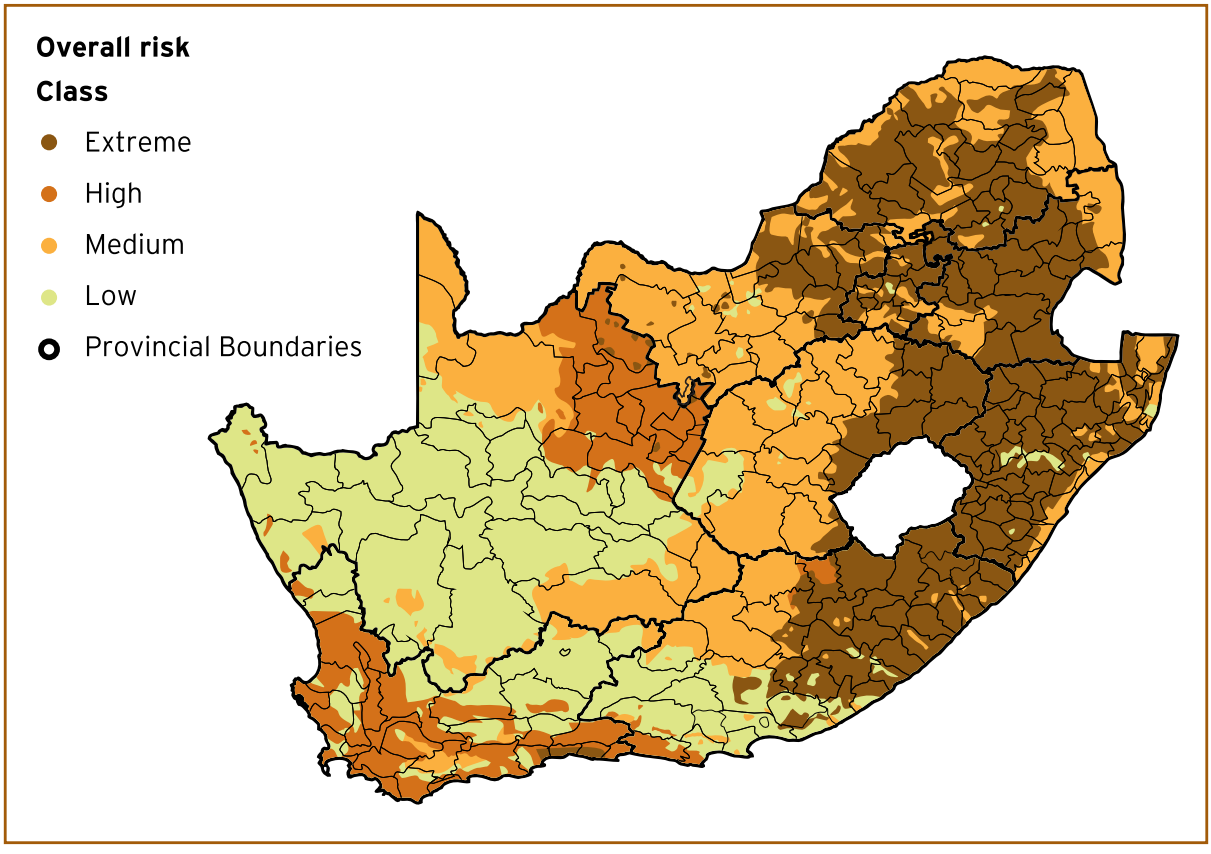

Figure 2: The National Veldfire Risk Map (Forsyth et al. 2010)

- *Working for Land:* While a desertification rate of 0.5% per year is assumed for both scenarios, the rehabilitation targets are different. For S1 rehabilitation ratios of 0.5%, 10% and 30% of the degraded land are assumed for the short-, medium- and long-term respectively. These ratios are increased to respectively 1%, 20% and 50% for S2. Desertification is generally caused by two broad categories of

land management action. The first is non-viable land transformation. This refers to land being transformed from its natural state into state that among others include intensive agriculture, mining and urban development. The second form of desertification is caused by unsustainable land use practices such as over utilisation of wood/forest resources, overgrazing and unsustainable fire regimes. Current desertification levels can be ascribed to historical as well as current socio-political decision-making. Over the last six to seven decades the most significant driver of desertification was over population of the former homelands.

Approximately 80% of the country's population was forced to live on 13% of the land during the apartheid era. This was simply unsustainable despite the fact that large numbers of people were migrant laborers working in other parts of the country. Figure 3 (a & b) shows current levels of land degradation and poverty levels across South Africa. According to the Environmental Management Act non-viable and illegal land transformation should be restricted to a minimum but it still takes place. The assumption on the low rate of expansion is therefore based on the above factors. The main focus of a land restoration programme would therefore be on correcting the wrongs of the past rather than stemming current expansion.

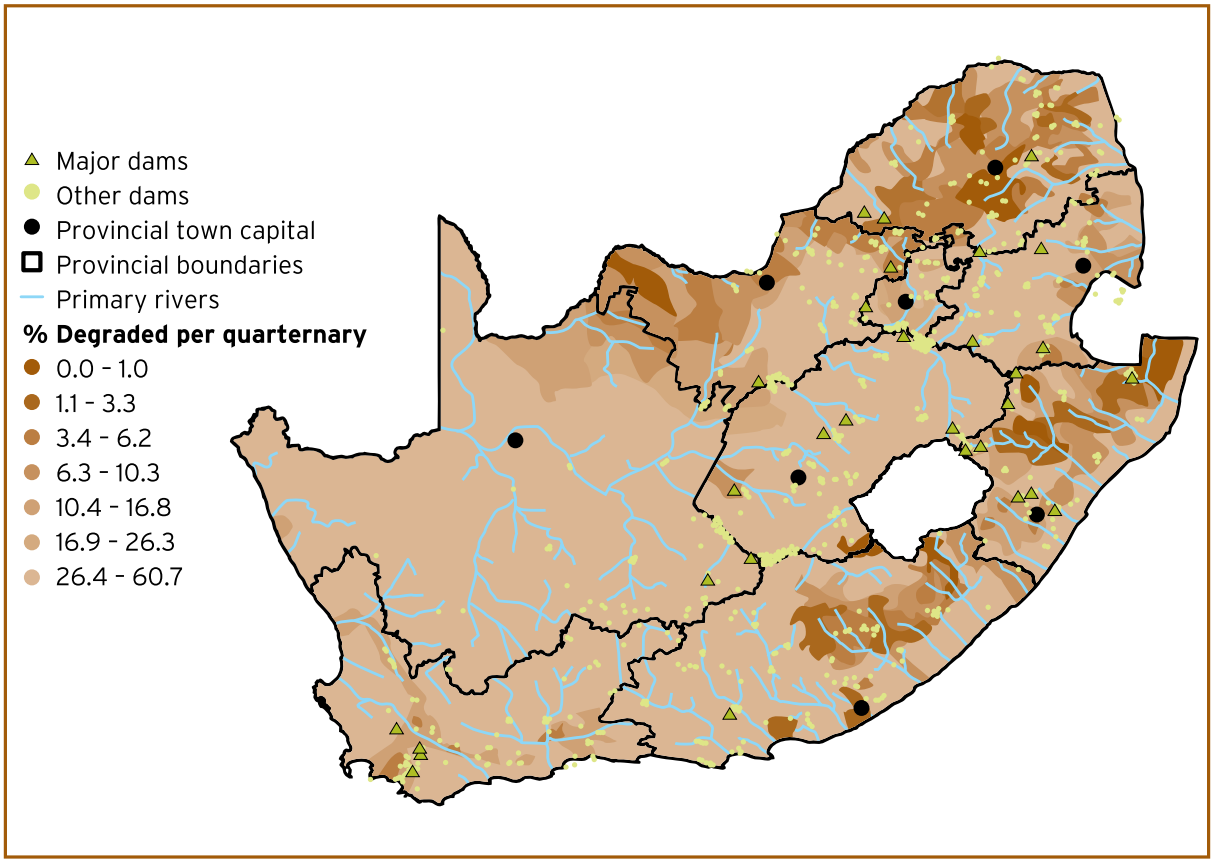

Figure 3(a): Extent of land degradation in South Africa (Benghu et al. 2009)

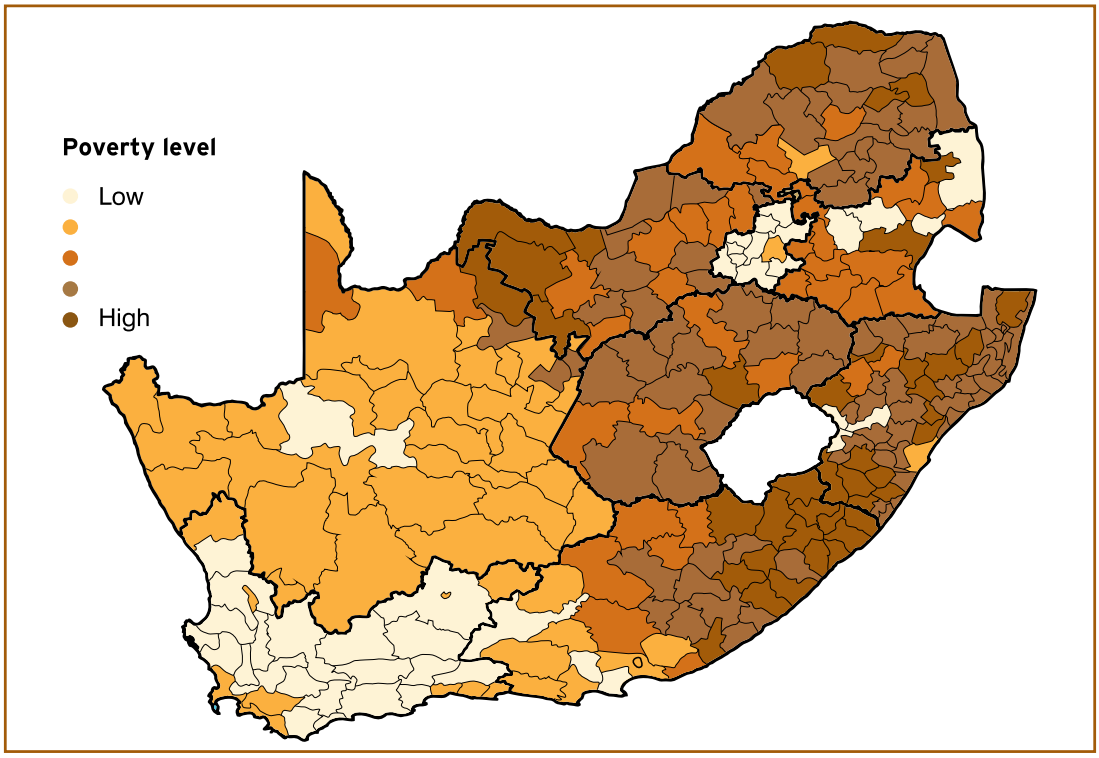

Figure 3(b): Relative Poverty levels across South Africa (Blignaut et al. 2008b)

Results

Based on the above assumptions the job creation under S1 amounts to more than 192 000 FTE's per year by the end of the long-term, i.e. about 2025 (Table 2a). This figure is dominated by the Working for Water programme that comprises about 58% of the total employment potential followed by Working for Land (33%). Working for Land is currently the smallest of the four programmes yet it has the potential to become the second largest given the extent of the degradation. Under S2, the job creation potential in FTE's per year surges to almost half a million with Working for Water comprising about 38%, Working for Wetlands 29% and Working for Land 22% (Table 2b). These figures have to be put in perspective in relation to the government's objective of creating 5 million jobs by 2020 (DED 2011), meaning that about 10% of this target could be met through natural resource management initiatives.

Three additional dimensions should be highlighted here. First, in both scenarios, the FTE figures will be sustained beyond the long-term date as the extent of the environmental issues will not be entirely addressed. Second, the gross income for people employed of between US$2 and US$15 billion per year respectively would flow mainly into poor rural areas where economic opportunities are scarce. What remains unknown today are the spillover effects of such income flows on rural development, particularly in terms of indirect economic activity and job creation. Third, there are spinoffs related to capacity-building and youth, disabled and female employment as these "Working for" programmes can target these marginalised sectors.

Table 2a: Job creation potential of up-scaling the "Working for" programmes of South Africa (Scenario 1)

	Short-term (0-3 years)			Medium-term (4-7 years)			Long-term (8-15 years)		
	Number of FTEs over term	Wages earned	Total budget requirement	Number of FTEs over term	Wages earned	Total budget requirement	Number of FTEs over term	Wages earned	Total budget requirement
	#	US$ Million	US$ Million	#	US$ Million	US$ Million	#	US$ Million	US$ Million
Working for Water	15 416	58	165	42 979	254	725	111 632	1 120	3 201
Working for Land	3 485	13	37	23 941	143	408	63 749	703	2 010
Working for Wetland restoration	1 266	6	16	4 936	34	99	6 945	83	238
Working for Wetland prevention	509	2	3	2 115	11	22	2 976	26	53
Working on Fire	3 239	10	29	7 042	35	101	7 042	61	173
Total	**23 915**	**88**	**251**	**81 012**	**477**	**1 354**	**192 344**	**1 994**	**5 674**

Table 2b: Job creation potential of up-scaling the "Working for" programs of South Africa (Scenario 2)

	Short-term (0-3 years)			Medium-term (4-7 years)			Long-term (8-15 years)		
	Number of FTEs over term	Wages earned	Total budget requirement	Number of FTEs over term	Wages earned	Total budget requirement	Number of FTEs over term	Wages earned	Total budget requirement
	#	US$ Million	US$ Million	#	US$ Million	US$ Million	#	US$ Million	US$ Million
Working for Water	33 214	124	356	68 782	406	1 160	190 297	1 909	5 455
Working for Land	6 970	26	75	47 881	285	816	106 248	1 172	3 350
Working for Wetland restoration	1 266	6	16	13 459	94	269	141 877	1 699	4 854
Working for Wetland prevention	509	2	3	4 325	22	45	45 593	403	806
Working on Fire	4 120	13	37	10 563	53	152	10 563	91	260
Total	**46 079**	**171**	**487**	**145 011**	**861**	**2 441**	**494 578**	**5 275**	**14 725**

Conclusion

Responding to environmental degradation by restoring and managing South Africa's various ecosystems has a very high employment creation potential. Based on historical records of the four "Working for" programmes implemented in South Africa, we estimate that 192 000 sustained jobs could be created by 2025 if minimum environmental objectives are set. This figure increases to about 500 000 if the prevailing environmental challenges are to be addressed much more actively. Natural resource management could therefore make a substantial contribution toward the government's target of five million jobs by 2020. These figures do not take into account other natural resource management programmes such as Landcare and other ongoing or required conservation efforts.

To meet both environmental and employment objectives the main challenge, however, remains the financing of such activities. In the 2012/13 financial year, these programmes are funded predominantly from the fiscus to a value of approximately US$2 billion. A huge financial effort is needed to meet both environment and employment objectives, which amounts to between US$6 and US$15 billion depending on the protection and restoration efforts engaged. No single financing option will address the challenges in natural resource management and the provisioning of ecosystem services.

As is the case in most other economic sectors national governments and international agencies must intervene to unlock the true potential of a sector. Mechanisms are now needed to implement incentives and disincentives to unlock private sector investment in the market. Overcoming this challenge successfully would not only to release a large number of jobs into the market but also improve the quality and quantity of our ecosystems.

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