

CHAPTER 5:

SCARCE SKILLS AND THE NATURE OF TRAINING PROVISION IN THE BIODIVERSITY CONSERVATION SECTOR

INTRODUCTION

The proposed human capital development strategy (HCDS) has to address the challenge of scarce skills in the sector especially of those at professional and managerial level. This is based on the NBF Strategic Objective 2, which identified the establishment and implementation of a human capital development strategy for the biodiversity sector to address transformation and scarce skills. The purpose of this chapter is twofold: firstly to address the extent to which it is possible to develop a profile of scarce skills needed in the sector given the poor quality of data; and secondly, to provide a description of the nature and type of training provision in the sector.

BACKGROUND TO SCARCE SKILLS

This section starts off with a definition of scarce skills as formulated by the Department of Labour's *Draft Framework for Identifying Scarce and Critical Skills*; it then considers a framework for identifying scarce skills which was developed by the HSRC (Erasmus, 2008) and assesses the challenges of implementation. A table is then given with potential skills requirements based on an analysis of the priorities, technology, knowledge and techniques flowing from key research literature specific to the biodiversity conservation sector, as well as a review of key policy frameworks in the biodiversity sector. This table represents the inferred skills needs and has to be subject of discussion and verification within the sector. It follows a similar analysis as that developed by the DEAT ESSP team (DEAT, 2009).

The NSDS requires the SETAs to identify scarce and critical skills in the research, development and submission of their Sector Skills Plans (SSPs), as contained in chapter 4 of the SSP. The Department of Labour (DoL) has drawn up an aggregate profile of the SSP data on scarce and critical skills to develop a National Scarce Skills List for South Africa. On release of the 2006 list, the DoL anticipated that in future it would aim "to provide a more concrete and less anecdotal picture of skills shortages that have been identified as contributing to blocking economic growth and development" (Erasmus, 2008).

The DoL offers the following definitions and process for establishing the size and nature of scarce skills in the *Guide for Development of Five-Year Sector Skills Plans and Annual Updates for 2005–2010* (DoL, 2005:21–22) and in the *Framework for Identifying and Monitoring Scarce and Critical Skills* (DoL, 2007:6–7) to direct SETAs in their identification of skills shortages:

Definition of scarce skills

As was the case with the definition of “human capital” in an earlier chapter, there are also variations on the meaning of “scarce skills”, despite its common usage. In the review of the SETAs (The Presidency, 2007:24), it was recommended that a “clear and standard definition” of scarce skills be developed. Thus, the *Draft Framework for Identifying and Monitoring Scarce Skills* (Department of Labour, 2007) is a guide to complete monitoring and reporting information on scarce and critical skills in the five-yearly SSP, or the annual update of the SSP. This framework incorporates the Organising Framework for Occupations (OFO), from which the following definitions were derived (DOL, 2007: 6–10).

“Skill” is defined as “the ability to perform competently the roles and tasks associated with an occupation”, based on the OFO (ibid: 6).

“Competence” is defined as having three characteristics:

- **Practical** competence is the ability to perform a set of tasks.
- **Foundational** competence is the ability to understand what one is doing, what others are doing and why.
- **Reflexive** competence is the ability to integrate or connect one’s own performance with an understanding of the performance of others; that is, the ability to learn from others and to adapt to changes (ibid:6).

An “occupation” is defined as a set of jobs or specialisations in which the tasks are very similar so that they can be grouped together (ibid:10). For example, under the natural science occupation are specialisations in specific fields of knowledge, including zoology, plant sciences and the like. Each occupation requires a particular skill level that is measurable, including

- a certain level or amount of formal education and/or training (e.g. an MSc at entry level)
- an amount of previous experience in a related occupation
- an amount of on-the-job training (ibid:10).

As indicated in an earlier chapter, the process of defining occupations under the OFO is aimed at standardising occupational descriptions in a transparent manner, despite all their complexities. This will allow for improved articulation of information on occupations between the different education systems, among firms, as well as the collection of data, including Statistics SA, the SETAs, company grading systems and so forth. Thus, the proposed HCDS should include participation in the OFO system in order to influence the manner in which occupations in the biodiversity-related occupations are defined.

“Scarce skills” are those occupations where there is a **scarcity of qualified and experienced people**, currently or in the future (ibid:6). There are two types of scarcity:

Absolute scarcity (or a genuine skill shortage) (Erasmus, 2008) exists when qualified and skilled people are simply not available which may occur when

- it is a new or emerging occupation and there are not enough skilled people available. In the case of biodiversity, for instance, qualified resource economists may be a new and emerging occupation.
- firms and organisations may have operational problems (productivity and quality for instance) as a direct result of a lack of suitably skilled people for e.g. more mistakes are committed, more supervision is needed to correct mistakes, wastage, and a decline in the quality of delivery(DOL, 2007: 25); or
- There are no people currently in education or in training to replace those who have left, due to normal attrition (death, resignation, retirement etc).

Relative scarcity exists when suitably skilled (qualified and experienced) people are available, but they do not meet certain employment requirements, including

- geographical scarcity – where skilled people are not prepared to work in certain areas, for instance, doctors working in the rural areas
- scarcity of equity candidates – where there are few candidates who meet the equity (race, sex and disability) and skills requirements
- replacement candidates are being educated and trained in the areas of skills required, but are not immediately available for recruitment and employment.

A key challenge and a concern is that, given the increased national focus on scarce skills in South Africa, there has emerged the tendency to conflate all skills needs with scarcity (DOL-GTZ, 2007:2). Therefore, not all skills needs are scarce, and in order to identify scarcity, the correct and standardised definitions must be used.

Further, Erasmus (2008) argues that one needs to understand the reasons for perceived skill shortages to assist in deciding on the most suitable interventions to address the deficit. Thus, the HCDS strategy has to outline the key reasons underpinning specific types of shortage in order to decide on the nature of the intervention. For instance, occupations that exhibit relative scarcity may be of immediate priority and the solutions may be relatively simple and immediately apparent. Where retention is the key problem, changes in the conditions of employment and the institution of a career path (demand-side measures) may be more appropriate. However, where occupations exhibit absolute scarcity it may require more long-term and in-depth processes in order to shift supply-side patterns, including long-term agreements with higher education, to increase education and training. Due to the time lag between enrolment and qualification (e.g. 6 years to qualify as a resource economist), a migration policy may be pursued in the meantime to fill the gap in the short term, for instance. It also helps to clarify why some vacancies are more difficult to fill than others. Therefore, the sector may have a combination of absolute and relative scarcity co-existing.

In Chapter 1, based on a review of terms used to describe the HCDS, two characteristics of scarce skills in the biodiversity conservation sector were provided:

- skilled professionals and managers were scarce

- skilled professionals and managers who were black (Africans, coloureds and Indians) were scarce

In the case of the first characteristic, none of the biodiversity sector policy frameworks indicated the specific types of occupation (professionals and managers are broad terms), the number of persons required, over what period and so forth. In most cases general references to scarce skills were provided, very few occupations were mentioned specifically and a few studies (the most pertinent being the studies on the decline in taxonomists¹) quoted.

There was more clarity on the second characteristic of sector scarcity, that is, of blacks with professional and managerial skills. However, even in this case, the numbers required, as well as the type of occupation, were not clearly spelt out.

Thus, there needs to be a plan that outlines the *range* of scarce skills, the *reasons* for the scarcity, the *numbers* required over time, as well as the *equity* needs or distribution over time. Only then is it possible to finalise the specific strategies needed in order to affect the required changes, given the macroenvironment, the current employment growth context and supply dynamics.

Later on, in the second part of the chapter, indicators of potential scarce skills will be discussed.

It is not within the scope of this report to explore competence, as raised earlier on in this chapter. However, an understanding of competence is useful given several references during the fieldwork about the low levels of competence among new graduates or even existing employees. In some cases, reference was made to weaknesses in young graduates' ability to read or write, lack of problem-solving ability and so forth. Thus, if interventions are to address these challenges, programmes such as internships and studentships that have a work experience component should be conducted and assessed on the basis of a scientific understanding of expected outcomes in terms of improvements in competence, at appropriate levels of specialisation and development. In this regard, the work of the new QCTO and the CEP in the sector will be important in terms of the quality assurance of work-based learning. At the same time, given the declining qualification profile of the core professional workforce, in addition to setting common qualification

criteria, a sector-wide agreement about the levels of competence required within a common set of occupations may be needed, as noted at the start of the chapter. This would include measurable skill levels that are common to specific occupations, including the required level of qualification, the level of appropriate experience and the amount of on-the-job training required in order to meet certain standards of competency. This form of standardisation will provide useful guidelines as to what is required in terms of curriculum offerings. In the engineering sector, there is a sector-wide approach to the development and accreditation of engineering qualifications. Thus, the ECSA acts as the accreditation body in the sector of all university and technikon engineering qualifications, as provided for in the Engineering Professions Act (Du Toit & Roodt, 2009:69). This acts as a Committee of Experts to ensure that qualifications meet the standards required for registration with the HEQC.

Identification and measurement of *critical* skills

While the brief of the proposed HCDS is not necessarily concerned with critical skills, it is a term that is often used interchangeably with scarce skills. In contrast to scarce skills, critical skills are skills *within* an occupation that are needed. There are two types of critical skills:

- key or generic skills, such as language or literacy, ICT skills, team work or cognitive skills (how to learn or problem solve for instance) (DOL, 2007:7)
- “top-up” skills that are specific to an occupation and may be new to the occupation flowing from recent changes or requirements, such as changes in technology, changes in legislative requirements and so forth (DOL, 2007)

Based on these definitions of critical skills, it would seem that often cited references to a lack of skills in existing staff refer more to *within-occupation* skill deficits rather than entire occupations. For instance, one of the key challenges raised during the fieldwork related the lack of project management skills and financial skills among conservation managers, which may have more to do with a *critical* skill shortage, rather than scarce skill shortages.

Interventions for dealing with critical or within-occupational skills gap may be very different to those for scarce skills. For instance, instead of long-term developmental

programmes, in-house or sector-based short skills upgrading courses to deal with specific skills gaps such as project management, report-writing, legal knowledge or ICT skills may be developed and offered from within the sector.

Therefore, Turpie et al (2008: 58) point to a set of critical skills or top-up skills among conservation management, including:

- “soft skills” such as communication with local communities, tourists and the public (social facilitation skills)
- an understanding of the regulatory and legislative requirements
- project management skills
- financial management skills

In addition, technical skills in a specialist area (which may include a formal qualification in the sciences) are required. However, all indications (the literature and the fieldwork) are that it is the set of top-up skills that are lacking in terms of the effective management of protected areas, and maintaining the balance between the commercial side (tourism), conservation and the developmental needs of surrounding communities. As indicated in the previous section on competence, standardised skills courses that are accredited will have to be developed (or if they are already in place to be quality assured and accredited) in order to ensure that all areas receive similar training. To determine the particular skills needs of individual managers, each may have to be assessed and placed on specific courses chosen from a menu of accredited short courses that have been customised to meet the specific and growing needs in conservation management. This intervention forms part of the overall development offering in order to improve the general efficiency in protected areas, as well as build long-term commitment among these managers.

The standardisation of terms and concepts

While to some it may appear that this focus on defining scarce and critical skills is rather pedantic (especially since they are also so complex), the common application of a standardised definition and interpretation will enhance planning, implementation and monitoring based on comparative indicators. For instance, there needs to be

certainty that the occupational descriptions used in the sector have the same meaning in all of the institutions for any reliable measurement of scarcity (DOL-GTZ, 2007).

Thus, the HCDS strategy has to include a provision that sets out the standardised definitions and use of a set of core concepts. This is in line with standard practice in the SETA environment where a lack of standardisation has been found to lead to confusion. There has been a recognition that even government departments do not use standardised definitions of scarce and critical skills (KNC & Associates, 2006:2), despite the definition put forward by DOL and outlined in the legislation. Therefore all sector stakeholders have to buy in to the process of standardisation.

One of the success indicators for the HCDS will be its ability to track and monitor progress based on an agreed set of indicators, defined in a standardised and uniform manner. Continued external funding will also be dependent on the validity of the monitoring data provided. One of the key weaknesses in the determination of scarce skills shortage and skills gaps in the entire environmental sector relates to poor data quality, and the absence of sufficient data to allow for the measurement of trends. Next, we consider a particular approach to the identification of scarce skills.

Approaches to the identification and measurement of scarce skills

Erasmus (2008) proposes a model for the identification and measurement of scarce skills, which draws on a report entitled *Indicators of skills shortages*, by Infometrics Ltd in which seven indicators are proposed in order to agree on the specific occupations that will appear on a list of skills shortages. The model contains three phases within which a number of indicators, the key agencies to conduct the assessments and the key data sources in South Africa are identified.

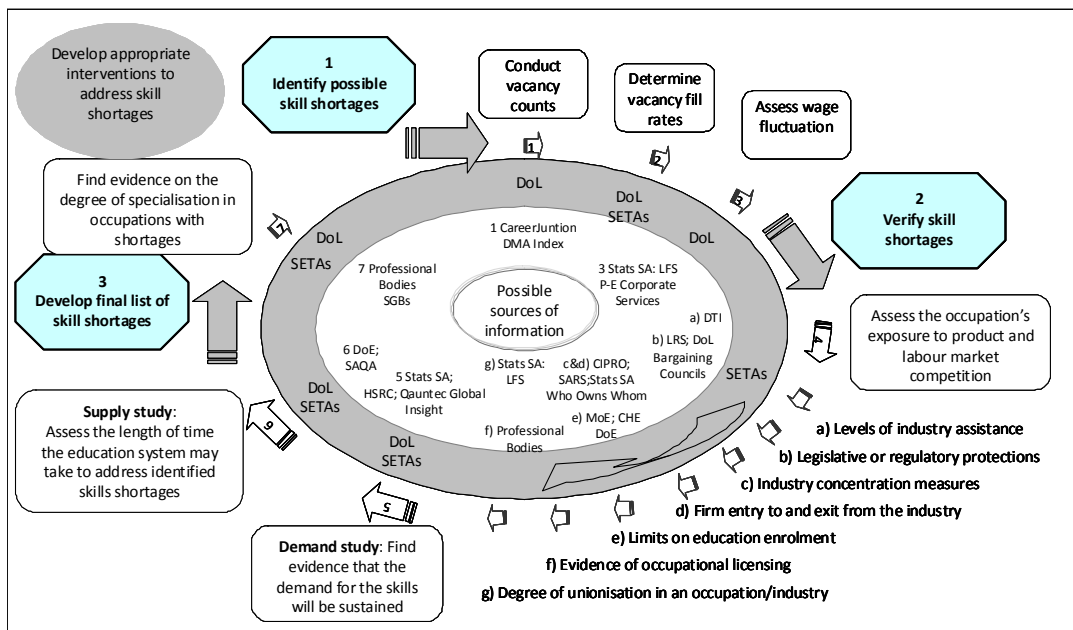


Figure 5.1: Proposed model to identify and measure scarce skills

Source: Erasmus, 2008

Erasmus argues that given the weaknesses of the South African data and capacity within HR, as well as in agencies such as the DOL (or now the DoHET which has taken over responsibility for skills development) not all of these factors may be easy to implement. Thus, it may be more feasible to consider those phases or aspects of the model that can be implemented given current data availability and their relevance. This model is derived from a developed economy context and may not be easily replicable. Erasmus proposes a three-phased approach drawing from the Infometrics' research:

Phase 1: Identify possible skill shortages

- Compare the *relative volume of vacancies* across occupations.
- Determine the *vacancy fill rates*, that is, how fast certain vacancies are filled within a specified period. In Australia, a fill rate of 80% (within a specified period) means that there are no skill shortages; in South Africa there are no standardised fill rates nor are there vacancy surveys which are the main tool through which fill rates are established.

- Establish any evidence of *excessive wage pressures* that may influence demand for certain occupations (e.g. excessive changes in wage trends may be an indication of the demand for certain occupations: the two main sources of income data are the PE Corporate Survey (at a cost) and the Labour Force Survey by StatsSA).

Erasmus argues that data on this phase may be collected by the DoL as part of their ongoing work on vacancies advertised in major Sunday newspapers.

Phase 2: Verify skill shortages

- Assess the occupation's exposure to product and labour market competition (e.g. the demand for a product or service may have changed; changes in legislation [e.g. Protected Areas Act] may shift the demand for a particular occupation up or downwards).
- Conduct a demand study to find evidence that the current demand for certain skills will be sustained, that is, that employment growth can be sustained.
- Supply study to find evidence on the length of time the education system may take to address identified skills shortages, that is, from the time of enrolment (assuming an accredited qualification exists) to the completion of the qualification.

It is argued that the SETAs should ideally be providing information on Phase 2, as well as SAQA, based on the learners' record database.

Phase 3: Develop a final list of skills shortages

- Consider evidence on the degree of specialisation in different occupations, meaning that the more specialised an occupation, the greater the likelihood of a shortage arising. For instance, conservation assessment requires an IT qualification and a science qualification, which the data has shown to be in short supply.

The above seven types of indicators should be developed and monitored for the following reasons:

- to establish whether any skills shortages currently exist (fill rates, vacancy counts and relative wage movements)
- to assess whether suitable (if any) policy responses are given to those skills shortages identified (institutional measures, occupational growth, education supply)
- to compile a list indicating those occupations or skills that tend to be exposed to a greater extent to shortages in the supply side (education supply, specialisation measures)

Currently, hardly any of the indicators noted in this proposed model are used to establish the current national Scarce and Critical Skills list. At this point, the vacancy counts are conducted by the DOL, but they do not conduct vacancy surveys, nor do they have standardised fill rates. Wage data of varying quality is available, but is not used to determine shortages. There is information on education supply, whereas the rest of the indicators are poorly developed in the country.

Therefore, the presentation of this model is to indicate what future possibilities exist for developing a more scientific and evidence-based process for the measurement of a scarce skills list. However, there are elements that may be useful in the short-to-medium term for implementation in the sector. Thus, the following alternative model is proposed to establish a sector database of vacancies that would serve several purposes:

- to circulate information about vacancies within the sector at an informal level
- to gather information about trends in vacancies as a proxy for scarce skills
- if possible, every organisation should indicate every six months, as a monitoring indicator, whether a vacancy has been filled – this could be a proxy for a fill rate
- conduct a labour market analysis of demographic and, if possible, of wage trends in the sector on an annual basis (ideally the relevant SETA should conduct such an analysis for each subsector within their scope)

- conduct a supply analysis of graduates and diplomates on a range of qualifications in higher education on an annual basis (a customised analysis can be supplied by SAQA)
- conduct an assessment of the success of sector-based measures to address past shortages on an bi-annual basis
- convene a community of experts (CEP) to evaluate the four sets of information, assess progress on redressing past shortages and agree on a list of scarce skills in the sector on an annual basis.

THE SECTOR ENVIRONMENT: IMPLICATIONS FOR SCARCE SKILLS

Chapter 1 provided an overview and analysis of the macro-context and its implications for the proposed HCDS. This section provides an analysis of the factors specific to the sector and the implications for scarce skills. Given the lack of verifiable evidence (substantial vacancy and turnover data as well as several in-depth studies) this approach is largely inferential and has to be verified by thorough discussion within the sector. Where possible, research studies that state specific occupations (even if not numbers) were included. This is an extension of the table developed by the DEAT ESSP team, which identified key skills based on sources identified. Key research documents were analysed as well as a range of legislative and policy frameworks in the biodiversity conservation sector, including:

- The National Biodiversity Strategy and Action Plan (NBSAP), which is a long-term and comprehensive 20-year strategy for the conservation and sustainable use of the South African biodiversity (DEAT, 2007:viii; DEAT & SANBI, 2009:19). The lack of appropriate human capacity was identified as a key constraint to implementation as well as “shortfalls in financial resources” (DEAT & SANBI, 2009, 110).
- The National Biodiversity Framework (NBF), a short-to-medium framework that is renewed every five years and provides a “framework for conservation and development” including the “most urgent strategies and actions” (33 in

total), and “roles and responsibilities of key stakeholders in the management of biodiversity for the period, 2008–2013” (NBF, 2007: v).

The abovementioned frameworks seek to implement the legislative provisions flowing from the legislation, including among others:

- The White Paper on Conservation and Sustainable use of South Africa’s Biological Diversity (1997)
- The National Biodiversity Act (2004)
- The Protected Areas Act
- other related legislation on the biodiversity conservation sector.

The key research reports included:

- The Foresight Biodiversity Report (2000) [see Chapter 1], which reported on research and development in the biodiversity sector with a futures perspective
- South Africa National Capacity Self-Assessment: Biodiversity (2008) is a thematic report that reviews the country’s capacity at systemic, institutional and individual level to implement its obligations in terms of the achievement of sustainable development under the United Nation’s Convention on Biological Diversity (Turpie & de Wet, 2008; i);.South Africa’s 4th report National Report to the Convention on Biological Diversity (CBD) [DEAT & SANBI, 2009].
- Other sources included the National Scarce Skills list (2004–2009) and results from the DEAT Scarce Skills Audit conducted in 2006.

FACTORS INFLUENCING SKILLS AND CAPACITY NEEDS

In this chapter the focus shifts towards sector factors, and specifically the impact of the sector environment on skills and human capacity needs. This analysis draws upon a similar analysis done as part of the DEAT ESSP (2009) development process which analysed a range of the factors included here. There is no attempt to rank these factors in order of importance.

Legislative and policy framework

The key mandate for the HCDS lies in Strategic Objective 2 of the NBSAP 2005, which is to achieve by 2013 “enhanced institutional effectiveness and efficiency to ensure good governance in the biodiversity sector”.

There are key legislative and policy mandates and statutory responsibilities in the sector and these result in multiple implications for capacity development. Firstly, it implies that accountability for capacity development occurs at the level of individual institutions, as well as jointly at sector level. This sectoral responsibility flows from the need “to ensure good governance” in a synergistic manner, as the responsibility for a reputation for good “governance” rests on the entire sector, not just individual institutions. Thus, the objective is not to have isolated pockets of capacity excellence nor widespread mediocrity, but widespread excellence in human capacity. Secondly, the effectiveness requirement implies a qualitative measure in the development and maintenance of high quality standards of competence in capacity development to ensure good governance. Thirdly, the requirement of efficiency refers to increasing the size of human capacity, as well to establishing efficient models of delivery and best practice examples.

The legislative and policy frameworks and the consequent statutory obligations constitute the most important *technical basis* for the types of skill, competency and capability required by the HCDS. For instance, the human resource costing for the implementation of the 33 priority objectives in the NBF has been calculated at about R4 billion over the five years of its implementation (DEAT & SANBI, 2009: 50). Related areas where skills development needs were identified include

- sound management of protected areas
- establishment and strengthening of conservation and competence among policy and decision makers in government, industry and the corporate sector
- developing capacity to implement NEMBA and conservation legislation at local government and municipal levels
- pressing threats to biodiversity (Rodwell, 2008, cited in Turpie & De Wet, 2008: 56)

Finally, the 4th national report to the Convention on Biological Diversity (2009:x) concluded that the “lack of capacity” had an adverse impact on “enforcement, research and monitoring”. Therefore, while the country may have a very laudable set of biodiversity legislation, the potential to realise the relationship between *policy intent* and *policy outcome* is closely bound up with its human capacity. The following list of factors is based on the DEAT ESSP analysis (DEAT, 2009).

Biodiversity losses

The continued and increased losses in plant and animal species contributed to an increased demand for protection of these species, especially threatened species. Thus, enforcement capacity is fundamental, but also research and monitoring capacity to establish the ongoing changes in the status of various species.

Expansion of protected areas

A related driver of skills demand was the expansion of the protected areas. In this regard a complex array of skills was demanded from conservation managers on the commercial side of tourism and from conservation itself in negotiating with communities and landowners.

GMOs and biotechnology

The use of genetically modified organisms (GMOs) and the development of the biotechnologies required increased monitoring capacity. Cultural uses of indigenous plant species for primary health among South Africans (80% of the population) also require increased protection and monitoring skills.

Science research funding

Reduced funding for science research was identified as a contributory factor to skills declines, with specific reference to NRF funding for the natural sciences. It was suggested that poor funding had an adverse effect on research projects at HE level, which in turn reduced the capacity to recruit students into the environmental sciences.

Ageing workforce and replacement demand

There is a perception that the scientific workforce in the biodiversity sector is ageing. Specifically, that half of the scientific workforce is over 50 years and entering retirement age. However, thus far this has not been confirmed with credible data. The LFS results did not confirm this assertion and suggested a workforce profile relatively close to the normal economically active population. However, this assertion may apply to certain sections of the workforce, for instance, perhaps half of all top scientists are over 50. Either way, it remains important that the sector calculates replacement demand, measuring trends in attrition (retirement, resignation, dismissals etc) by its demographic and occupational profile.

Extension work

Extension work in certain environmental subsectors (conservation, water affairs and agriculture) has become more specialised and needs more highly skilled employees.

Employment equity

The legislation on equity also creates the need to transform the sector with the employment of more black scientists and managers. The results suggest that substantial progress has been achieved in terms of the employment of black men. Despite much progress, the sector is still far away from meeting its target for black women. This remains a massive task over the next five years, as it is a male-dominated sector. The fact that there is a large proportion of women in managerial posts (41% in 2007) is masked by the fact that they are mostly white.

The supply-side data suggests that while there are increasing numbers of black graduates at all levels (less so at postgraduate level) and black women as well, the numbers are not sufficient. Further, the sector appears not to attract black postgraduates except at managerial level.

Socioeconomic imperatives

The biodiversity conservation legislative and policy framework requires that it benefit society and communities in particular in terms of the socioeconomic benefits its

activities confer. This requires an increase in the number of employees to deliver specific services as well as the nature of the skills required. The most common example cited is that relating to the increasingly complex array of skills required of conservation managers.

Regional and international obligations

The international and regional obligations of South Africa in terms of biodiversity have implications for the nature of bio-regional planning and work across geographical boundaries. The trans-frontier parks are an example.

Decentralised governance and changing skills requirements

The assessment conducted by Turpie and de Wet (2008) suggests that the decentralised model of biodiversity management across a range of public sector, NGOs and other organisations may have contributed to an inefficient distribution of technical and management skills in the sector. This view was echoed in the fieldwork. Thus, the validity of the contributory role of the decentralised governance model may have to be considered in the HCDS.

One view was that the decentralisation of conservation to the nine provinces (from the original four) had led to duplication of “funding, coordination, expertise”, and was a waste of resources. In addition, the multiple priorities of provincial departments meant that they did not prioritise conservation. If the governance model is over-stretching the current set of skills, a short- to medium-term intervention may be to consider alternative governance models that are not as skill intensive until sufficient additional skills capacity has been acquired.

Impact of conservation management model

An additional factor was that the contemporary biodiversity management model required a complex array of multiple skills (Turpie *et al*, 2008; Rodwell, 2008; WWF-SA, 2008; DEAT, 2009). Thus, in addition to the traditional specialisation in a technical field, conservation managers were required to interact with the public and local communities. So-called “soft” skills in communication, negotiation and social facilitation were also required. Other skills included understanding the legislative and

policy frameworks, project management and financial management skills. The multifaceted nature of the skills profile of conservation managers was also confirmed in the fieldwork, and this documentary analysis has confirmed to a large extent the range of specific skills required. A closer analysis of the multifaceted skills profile and the types of training required needs to be conducted in order to ensure that training provision becomes more demand-driven rather than supply-driven.

New areas of basic research

It became clear that there are a number of new areas in research that have gained prominence more recently. These include the economic valuation of ecosystem services, as part of the drive to understand and promote the social and economic importance of the sector. These may be areas of potential absolute scarcity, as education and training has not adjusted sufficiently to producing customised offerings for the sector.

The multidisciplinary nature of research and training

In line with the increasingly complex demands placed on professionals in the sector, the traditional uni-disciplinary approach to research and training may not be sufficient. The role of the social sciences, including sociology, economics (economic modelling and valuation etc.) has been elevated in terms of complementing the natural sciences. The extent to which these multidisciplinary demands are reflected in the nature of training provided is not clear. There are examples of such training (see Chapter 1) but it is not clear how widespread these are. In fact, multidisciplinary training and research may represent an new and emerging area of study and occupation. As such it may have implications for replacement demand, as the education and training system is not producing any such graduates.

Turnover and vacancies

In the scarce skills identification model, the monitoring of vacancy trends and fill rates were identified as key tools for the identification of scarce skills. While there are no standardised vacancy fill rates in South Africa, the DOL (2005:25) suggests that hard-to-fill vacancies (i.e. an advertised position that has remained vacant for 60

working days or three months, owing to failure to find a person who was appropriately qualified or experienced [or both]) should be regarded as scarce occupations. Therefore, monitoring of vacancy trends is important since there is a general perception in the sector that turnover is high and that vacancies are long term.

Turpie et al (2008: 57) suggest these underlying reasons for high vacancy rates and turnover in the sector:

- the small number of suitably qualified and experienced candidates
- the small number of previously disadvantaged employees for transformation targets
- uncompetitive salaries

An analysis of the Vulindlela database in the biodiversity *public* sector (Table 5.1) confirmed that the highest vacancy rate among the *biodiversity-related* occupations was for nature conservation and oceanographically related technicians/associate professionals (51.5%); life science and related professionals (50%); hydrologists, geologists and related professionals (44.5%); natural science professionals (36.9%); computer occupations (34.6%); veterinarians (31.7%); agricultural, oceanography, forestry and related scientists (31.2%); environmental professionals (28.9%); zoological and related professionals (24.8%); forestry and farming managers (20.2%); and horticultural technicians/associate professionals (20.2%). Given that these vacancy rates only cover one year, it is very difficult to make generalisations. It does confirm that there appears to be an intractable problem in the public sector. The vacancy rates are considerably higher than those found in the private sector, which tends to the mid-teens. However, while these vacancy rates are alarming, they have limited value since no trend analysis is provided. This is a potential knowledge gap for the HCDS in order to gain a fuller picture as to where blockages occurred in the system.

Table 5.1: Vacancy rates in the public biodiversity sector (2007/08)

Occupations in the public sector	Number of Posts	Number of Posts Filled	Vacancy Rate
Nature conservation & oceanographical related technicians	910	441	51.5
Life sciences related professionals	4	2	50.0
Geologists, geophysicists hydrologists & related professionals	348	193	44.5
Natural science professionals	853	538	36.9
Computer occupations	272	178	34.6
Generic professionals	5036	3385	32.8
Veterinarians	300	205	31.7
Agricultural, oceanography, forestry & other scientists	1415	974	31.2
Environmental health professionals	45	32	28.9
Agricultural related support	1915	1376	28.1
Generic managers	1442	1046	27.5
Biochemistry, zoology & life science technicians	1517	1110	26.8
Veterinary assistants	79	59	25.3
Biologists, botanists, zoologists & related professionals	137	103	24.8
Generic associate professionals	2902	2187	24.6
Administrative	13823	10954	20.8
Other occupations	30479	24304	20.3
Farming, forestry advisors & managers	356	284	20.2
Horticulturists, agricultural & forestry technicians	2797	2233	20.2
Archivists, curators and related professionals	4	4	0.0
TOTAL	64637	49611	23.2

Source: Vulindlela (2007/8)

Another way to verify the nature and size of vacancy rates is to provide a trend analysis as in Table 5.2 (Turpie et al, 2008:57). This analysis only represents two consecutive financial years, but is very insightful about changes over time and the possibilities of filling vacancies.

Table 5.1: Changes in staff turnover and vacancy rates in DEAT (2007–2008)

	2007	2008
Overall staff turnover	15.1%	31%
“Critical ² ” occupation turnover	11.6%	18.5%
Overall: Vacancy rate	28%	18.7%
Critical vacancy rate	25%	19.6%
Natural science related occupations	40%	20.6%
Nature conservation & oceanographic occupations	48%	41.4%
Regulatory inspectors	18%	13.9%
Senior managers	21.7%	19%
Average time to fill a vacancy: 6 months		

Source: DEAT, 2007 cited in Turpie & De Wet, 2008: 57

On the one hand, it does suggest that there was a doubling of turnover over the two financial years. Therefore, the rate at which staff was leaving was extremely high. Reasons for turnover were not clear, but given the sharp increase over such a short period it was most likely due to resignations and not entirely due to retirements, for instance. Contributory reasons suggested include increased work pressure on existing staff in the biodiversity and conservation unit, without concomitant increases in staff (Turpie et al, 2008:49). However, while turnover in scarce occupations started off a much lower base, it increased over the period from 11.6 to 18.5% in 2008. This was higher than the average turnover rate among executives in the private sector, which increased from 10.5 to 13.5% between August 2007 and July 2008.

However, an analysis of changes over time indicates that there was some progress in filling vacancies; there were also some occupations where vacancies were intractable and extremely difficult to fill. Thus, there were moderate to massive absolute declines in the vacancy rates, with the exception of nature conservation technicians and oceanographic occupations. In these occupations, the vacancy rates remained exceptionally high at 41% in 2008. The extent to which this has to do with the level of specialisation is not clear, but it may be a contributory factor. Thus, there were major improvements in the extent to which vacancies in certain occupations were filled, which is quite contrary to arguments that all vacancies are difficult to fill. The vacancy rate in natural science occupations declined by half, a substantial decline, but remained at levels much higher than in the private sector.

In order to assess the extent to which the changes in the vacancy rates imply scarcity, the fill rates used by Erasmus (2008:xix) are applied; thus, based on the New Zealand fill rate, that is, the proportion of vacancies that are filled within eight to ten weeks by a suitably qualified person. As indicated previously, South Africa does not have indicators for fill rates; however, if this standard fill rate is applied to the occupations in Table 5.2, vacancy rates of 13.9% and upwards existed, implying that the fill rates were 87% and lower. Thus, with the exception of regulatory inspectors, all other occupations would be regarded as having skills shortages. This indicates that, instead of regarding all skills needs as scarce, the application of vacancy rates

(and their opposite, fill rates) may be a more reliable method of establishing the veracity of claims of scarcity.

Information on vacancy rates in other parts of the sector were limited (Turpie et al, 2008:50-53). However, vacancy rates varied from 21.5% in SANBI to 53% in DWAF biodiversity posts. DWAF experienced a scarcity of forestry scientists. Enforcement capacity in DWAF was argued to be poor, given the high vacancy rates, with particular problems in the Eastern Cape, home to 60% of indigenous forests (ibid:53). Research institutions have indicated that emigration of skilled academics as well as the lower standard of students entering HE were key constraints. Vacancy rates for NGOs were not available.

As shown here, vacancy rates are important indicators of the potential existence of scarce skill occupations. They cannot provide information on critical skills, as critical skills do not represent occupations. They also show that a trend analysis (showing changes over time) may be more useful for showing the extent to which vacancies are filled. In this case, it became clear that (despite only two years of data) there were problems in filling vacancies in nature conservation technicians, oceanographic occupations and, to a lesser extent, in natural science occupations. This means that provisionally these three occupations may be regarded as scarce skill occupations.

The next section provides a preliminary scan of skills and human capacity needs based of an analysis of the research literature and the legislative and policy mandates in the sector. It is not a conclusive list and is merely indicative of what may be needed in the next five years. The list needs to be subjected to a process of verification, for instance using a vacancy assessment or other relevant information that may provide further insight.

Table 5.2: Preliminary assessment of potential skills needs (2009–2014)

	SOURCES		
	DACST (Foresight Biodiversity Report)	NBF/NBSAP (2007–2012) & strategic plan for environmental sector (2008–2013)	Other sources
Activity/priority	Develop and maintain a basic inventory of species with: -potential for commercialisation -subsistence use and informal sector trading -bio-indicators	SO3: Integrated terrestrial & aquatic management to minimise impacts: -develop spatial biodiversity plans -list threatened & protected ecosystems	Mapping of status of terrestrial & aquatic species (DEAT, 2009)
Techniques/technology required	Taxonomic tools: -intelligent robotic devices to collect and classify ecological data -user-friendly information systems -rapid assessment techniques to establish biodiversity status-DNA techniques -modelling tools to predict distribution & dynamics of biodiversity	Improve the biodiversity information management system	
Potential: Skills/human capacity needs	Scarce skills: Taxonomists Modellers Genetic/DNA specialists Extension workers and/or Agricultural economists (subsistence farming) Economists (SMME, informal sector)	Scarce skills: Bio-systematics Area-wide planners at the strategic, spatial/physical and species level (Wynberg, 2002) cited in DEAT ESSP, 2009a)	Scarce skills: Bio-informatics- 1000 needed (Scarce Skills List 2004–2009) Bio-systematics (KNC, 2006; Hebert et al, 2001) Taxonomists (Hebert et al, 2001; NRI, 2004) Physical curators

	SOURCES		
	DACST (Foresight Biodiversity Report)	NBF/NBSAP (2007–2012) & strategic plan for environmental sector (2008–2013)	Other sources
			Scientific curators Databasers Bio-regional planners Conservation assessment (KNC, 2006)
Activity/Priority	Monitoring global change & its impact by providing benchmarks against which to measure -the effects of changing land use and habitat destruction -fragmentation and its effects -effects of climate change		
Techniques/technology required	Remote sensing techniques, including -satellite data for habitat monitoring -animal electronic tracking -genetic tagging techniques to protect biodiversity -IT to support predictive modelling of the impact of 1) climate change; 2) changing land-use patterns; 3) GMOs; 4) invasive alien organisms		IT combined with natural sciences
Potential: skills/human capacity needs	Remote sensing geographers GIS specialists Geneticists IT software developers		Scarce skills: GIS and natural science (multidisciplinary) Geneticists/plant breeders (1000 estimated; Home Affairs Scarce

	SOURCES		
	DACST (Foresight Biodiversity Report)	NBF/NBSAP (2007–2012) & strategic plan for environmental sector (2008–2013)	Other sources
	IT systems developers		Skills list 2004–2009). Conservation planners (KNC, 2006: 8) HE courses: Database of multidisciplinary courses (postgraduate levels)
Activity/priority	Develop strategies for conservation & sustainable resource use: -understand utilisation levels -develop restoration methods in degraded ecosystems -measure impacts of ecosystem management	SO4: Human development & sustainable use of bio resources and equitable sharing of benefits Work with key production sector to minimise loss & degradation	Green Jobs Agenda (MTSF) Labour intensive natural resource management practices (marine, aquaculture, wildlife management, ecosystems, rehabilitation, etc) Zero tolerance to poaching of natural resources Sustainable local food production Sustainable water use ESKOM's BUILD programme Increased coal mining & nuclear power stations
Knowledge/techniques/technology required	Miniaturised monitoring Genetic tagging Modelling impact of disturbance Off-reserve conservation techniques	Wise practice guidelines for biodiversity friendly production of bio fuels and three other production sectors "Eco-red meat" certification	Develop guidelines for production practices Research on sustainable labour-intensive production techniques Water usage guidelines

	SOURCES		
	DACST (Foresight Biodiversity Report)	NBF/NBSAP (2007–2012) & strategic plan for environmental sector (2008–2013)	Other sources
	Methods to estimate sustainable utilisation Propagation methods (plants & animals) Storage techniques & DNA bank use	scheme Implementation of bio-prospecting regulations	Modelling impact of increased fossil fuel electricity generation (coal mining)
Potential: skills/human Capacity needs	Scientists (postgraduate levels) Ecosystem managers	Business development specialists Policy analysts and developers on new areas	Environmental scientists with specialisation in: -environmental impact assessment Water quality assessors Environmental auditors (THETA) Plant pathologists (quota of 1000: Home Affairs 2004–2009 Scarce Skills List). Veterinarians ³ (quota of 500 estimated in the Home Affairs Scarce Skills List) Production specialists (private sector secondments)
Activity/priority	Identifying and conserving biodiversity in protected areas	SO5: network of conservation areas	
Knowledge/techniques/technology required	Spatial techniques to identify priority areas Models for financing acquisition & management Develop acceptable sociocultural solutions Communication to policymakers	Mapping of expanded areas Establish & strengthen provincial stewardship programme	Local government capacity Provincial monitoring & enforcement capacity

	SOURCES		
	DACST (Foresight Biodiversity Report)	NBF/NBSAP (2007–2012) & strategic plan for environmental sector (2008–2013)	Other sources
	Understanding by conservation planners	Establish two new botanical gardens	Understanding the regulatory & legislative requirements (Turpie & De Wet, 2008)
Potential: skills/human capacity needs	<p>GIS specialists</p> <p>Banking & funding specialists</p> <p>“Knowledge brokers” (inter-disciplinary approach requiring scientific background and public relations/communications).</p>	<p>GIS specialists</p> <p>Monitoring specialists</p> <p>Environmental managers (multidisciplinary knowledge & expertise required).</p>	<p>Critical “top up” skills:</p> <p>Legal knowledge to implement laws</p> <p>Other management capacity (Rodwell, 2008; Turpie & de Wet, 2008):</p> <p>Multi-disciplinary skills, including</p> <p>“Soft” skills (social facilitation & engagement with local communities, tourists & public);</p> <p>Legal knowledge</p> <p>Project management</p> <p>Financial management skills</p> <p>Scarce skills:</p> <p>GIS specialists (DEAT Scarce Skills Audit)</p> <p>Environmental managers (multiskilled – technical & “soft” skills)</p>

	SOURCES		
	DACST (Foresight Biodiversity Report)	NBF/NBSAP (2007–2012) & strategic plan for environmental sector (2008–2013)	Other sources
			Forestry scientists (Quota for 500 agriculture & forestry scientists in Home Affairs list, 2008).
Activity/priority	Develop nature-based tourism: -research on innovative, theme-based packages -community-controlled ventures –ecosystems with tangible value	SO1: enabling policy & legal framework to integrate biodiversity objectives into economy	
Techniques/technology required	ICT for the production of: -electronic guides to fauna & flora -theme-based ecotourism packages		
Potential: skills/human capacity needs	IT specialists (software developers) Ecologists Tourism specialists		Tourism management Business management specialists (African Conservation & Training Ass., 2009)
Activity/priority	Value & value-addition	SO1: enabling policy & legal framework to integrate biodiversity objectives into economy	
Techniques/technology required	Resource economic techniques for monetary & nonmonetary valuation Biodiversity techniques for land use Techniques for economic value-addition to cultivated/harvested products	Partial economic valuation of biodiversity Land-use planning techniques	

	SOURCES		
	DACST (Foresight Biodiversity Report)	NBF/NBSAP (2007–2012) & strategic plan for environmental sector (2008–2013)	Other sources
		Fiscal instruments/market mechanisms developed and piloted	
Potential: Skills/human capacity needs	Resource economists	Resource economists	Economic modellers (KNC, 2006) Statisticians (KNC, 2006) Agricultural economists (quota of 500 in Home Affairs 2008 list)
Activity/priority	Develop equity & access to biodiversity resources Models for co-management (communities & authorities) Bio-prospecting in underdeveloped areas Models of land tenure system & biodiversity conservation	SO1: enabling policy & legal framework to integrate biodiversity objectives into economy Bio-prospecting Line fish status, recovery plans and ecosystem approach in commercial fisheries	
Knowledge/techniques/technology required	As above	Develop regulatory framework for access and benefit sharing (ABS)	
Potential: skills/human capacity needs	Ecosystem managers Social ecologists Biotechnologists	Bio-prospectors (to assess whether this is a new or emerging occupation)	Policy & planning managers (KNC, 2006) Biodiversity managers (THETA) Ecologists (THETA) Agricultural extension officers with

	SOURCES		
	DACST (Foresight Biodiversity Report)	NBF/NBSAP (2007–2012) & strategic plan for environmental sector (2008–2013)	Other sources
			<p>a technology focus (quota of 1000 estimated; Home Affairs Scarce Skills List, 2004–2009)</p> <p>Bio-engineers and bio-technologists (import quota of 500 in Home Affairs list 2008)</p>
Activity/Priority	<p>Develop capacity for biodiversity management</p> <p>Develop adequate human capacity</p> <p>Increase research output</p> <p>Develop trans-disciplinary approach</p> <p>Multifaceted approach to knowledge & expertise</p> <p>Research funding</p> <p>Maintain & strengthen training institutions</p>	<p>SO2: enhanced institutional effectiveness & efficiency for good governance</p> <p>Establish & implement capacity building programme to address transformation</p> <p>Establish & implement research strategy</p>	<p>Training programmes for emerging scientists in bio-systematics and taxonomists (Turpie et al, 2008:72)</p> <p>Adopt a partnership approach to coordinate biodiversity research (Turpie et al, 2008)</p> <p>Alternative energy</p> <p>Production technologies</p> <p>Integration of local IKS into biodiversity management (Ibid)</p> <p>Reduction in research budget-solutions (Ibid)</p> <p>Develop more Centres of Excellence in HE (Ibid)</p> <p>DST Grand Challenges (DST, 2007)</p> <p>Farmer to pharma (Indigenous pharmaceuticals/bio technology/IKS)</p> <p>Energy security (renewable energy</p>

	SOURCES		
	DACST (Foresight Biodiversity Report)	NBF/NBSAP (2007–2012) & strategic plan for environmental sector (2008–2013)	Other sources
			technologies) Research chairs (DST, 2007) Trans-disciplinary research (new areas)
Knowledge/techniques/technology required	Cooperative inter-disciplinary research programme to quantify & predict ecosystem structure & functioning Trans-disciplinary research programmes linking social and natural sciences Develop dynamic ecological-economic models to estimate socioeconomic value of ecosystem services Design & apply technologies in ecosystem restoration & rehabilitation techniques Develop education software to foster scientific skills in children(to use in museums & schools) New research areas including biotechnology, IKS & ICT		Multidisciplinary research (natural sciences and social science & biodiversity (Ibid) Pharmaceutics Biotechnology Energy specialists Environmental education & ICT (DEAT, ESSP 2009a) SANBI Biodiversity & Mainstreaming Directorate
Potential: skills/human capacity needs	Higher education curriculum design specialists Modelling specialists in ecological-economic estimation techniques Software system designers Educationists Biotechnologists Environmental managers with social & technical skills		Biological technicians (3000 estimated in the Home Affairs Scarce Skills list 2004–2009). Web-masters Educationists & curriculum planners Social ecologists (DEAT ESSP 2009a)

	SOURCES		
	DACST (Foresight Biodiversity Report)	NBF/NBSAP (2007–2012) & strategic plan for environmental sector (2008–2013)	Other sources
Activity/priority	Integration of IKS	SO1: enabling policy & legal framework to integrate biodiversity objectives into economy	
Knowledge/ techniques/technology required	Development of validation system for indigenous & Western approaches Techniques for commercialisation of indigenous products & processes Documentation of IKS relating to biodiversity management & conservation		IKS management skills (ACTA, 2009)
Potential: skills/human capacity needs	Intellectual property specialists		Legal professionals & legal drafters (KNC, 2006) IKS (need supervisors and managers [ACTA, 2009])
Activity/priority	Develop biotechnology products Testing of GMOs & impact on natural resources Public awareness of GMO process	SO1: enabling policy & legal framework to integrate biodiversity objectives into economy	
Knowledge/techniques/technology required	Bio-mapping systems Gene modification techniques for commercialisation of indigenous fauna & flora Bio-processing techniques for chemical products Tissue-culture techniques Monitoring & assessment techniques for bio-safety of GMOs Filing of biotechnology patents for local innovations		

	SOURCES		
	DACST (Foresight Biodiversity Report)	NBF/NBSAP (2007–2012) & strategic plan for environmental sector (2008–2013)	Other sources
Potential: skills/human capacity needs	Biotechnologists Patent legal specialists Monitoring (specify types of specialists required)		Legal professionals & legal drafters (KNC, 2006)

Source: Various. Author's own analysis.

A PRELIMINARY ASSESSMENT OF SCARCE SKILLS NEEDS

Table 5.3 provides a preliminary scan of potential scarce skills and human capacity needs arising from an analysis of the key biodiversity legislative and policy frameworks, as well as strategic research and development documents on the key priorities or activities and the types of knowledge, techniques or technology required. There is an attempt to group together the various priority areas in terms of their similarities and overlaps. Where specific skills and human capacity needs are linked to specific operational needs in the sector, these are cited and linked to a source.

Background to the scarce skills analysis

This analysis provides a baseline analysis and, in conjunction with the employment analysis, the supply-side analysis, the fieldwork results and the DEAT ESSP, information should be tested in the stakeholder process which commences after the finalisation of this report. The preliminary analysis presented here reveals that there are still key gaps in terms of a determination of absolute versus relative scarcity of skills, a determination of a hierarchy of scarce skills and an indication of the size of the skills needs. Critical skills were identified (or re-categorised) as the case may be.

The overview draws on the analysis done in the DEAT ESSP process (2009a), based on key sources of data in the sector. The Foresight Biodiversity Report, although now outdated, was used to further explore the themes suggested in the DEAT ESSP analysis to create the building blocks for the preliminary analysis on scarce skills in the sector.

The Foresight Biodiversity Report (DACST, 2000) formed part of a 12-sector investigation for the National Research and Technology Foresight Project. Thus, the report sought to provide a background and future scenario in terms of research and development (R&D) for the sector. In its recommendations the report emphasised the need for investment in the “development of scientific and human capacity” (DACST, 2000:43). Underlying these key capacity needs were a number of R&D activity areas from which human capacity and skills development needs may be derived.

The inferential process followed to establish an overview of the key mandates and the determination of resultant knowledge, techniques, technologies and potential skills development needs is a tentative process due to the complexity of the process and the lack of numbers attached to most of the data sources.

Firstly, very few of the sources clearly delineated the difference between scarce and critical skills, and these differences had to be inferred. Secondly, very few sources were specific in describing the specific types of occupation (by name) that were experiencing scarcity, except for a few where small-scale studies had been conducted, such as taxonomy and the obvious need for ICT specialists. Therefore, in certain cases, further discussion may be needed to determine what types of occupation may be appropriate given experiences in the sector.

Hardly any of the sources specified the updated numbers required (the taxonomic study needs updating) or numbers anticipated in the next five years, at least for the life of the NBF. An exception was the Scarce Skills List 2004–2009, published by the Department of Home Affairs (2008), which lists skills quotas for importation (Daniels, 2007:44). However, in this case some of the scarce skills cited applied to other scientific fields as well (such as veterinarians), and were not specific to the biodiversity conservation sector. There is an intergovernmental process that is followed to produce a scarce skills list which feeds into the skills quotas that are finally determined by the Department of Home Affairs. Every SETA has to submit a sector-based scarce skills list which is then aggregated into the DOL scarce skills list, together with inputs from other departments such as the DTI, the Department of Minerals and Energy and so forth. The work permit quotas agreed to by Home Affairs are generally smaller compared to the numbers indicated as scarce in the consolidated skills list developed by the DOL. The HCDS process needs to engage (perhaps through the DEAT and the relevant SETA) in the process of determining the scarce skills listed for submission to Home Affairs, should it consider the importation of skills as part of the strategy.

Discussion of preliminary skills needs

The DEAT ESSP process made a number of conclusions in terms of the nature of skills requirements, which formed one of the building blocks for this preliminary

analysis. Unlike the ESSP analysis, this analysis only focused on the medium to high skill levels, NQF 5 and higher. However, it does consider the fact that the actual qualifications profile in the target HCD group is lower than NQF 5.

The DEAT ESSP analysis concluded that there was a shortage of skills at all three skill levels: **low, medium and high**. There were **biodiversity planning needs** at three levels: at **strategic level**, where biodiversity is incorporated in policies and programmes; at **spatial or physical** level; and at the **species** level (Wynberg, 2002). The skills needs were both **technical and social**. Some of the commonly found problems were concerned with adaptation to and mitigation of climate change; holistic and interdisciplinary approaches to biodiversity research and action; modelling involving complex mixes and long-range modelling, and **foundational, applied and reflexive** competencies on technologies. Social and financial skills as well as project management skills were also needed.

The preliminary scan confirmed much of the above and the following categories of scarce and critical skills were identified:

Technical scarce skills

Absolute scarcity in new or emerging occupations or interdisciplinary areas:

- Resource economists (indications that there are 10 resource economists in the country)
- Bio-prospectors (assess whether this is a new or emerging occupation)

Combined IT and natural science qualifications (small numbers in supply and slow growth):

- Predictive modellers – use of IT to predict the impact of climate change, changing land use patterns, GMOs and invasive alien organisms
- Conservation assessment – combination of IT and natural science qualifications; currently small numbers are produced and lag time in supply provision
- Monitoring specialists – combination of mathematics/statistics and biodiversity qualifications at a postgraduate level

- Plant breeders/geneticists – the Home Affairs quota list provides for the importation of 1000 foreigners
- Taxonomists /bio-systematics – importation quota is 1000
- Forestry technicians – importation quota is 500
- Agricultural economists – importation quota is 500

Relative scarcity (supply size is inadequate and lack of employment requirements):

- Appropriately qualified African scientists
- Appropriately qualified African women scientists
- Training programmes in bio-systematics
- Remote sensing geographers
- Agricultural bio-scientists (focus in the provincial departments)
- Bio-scientists
- Environmental scientists
- Reserve managers
- Nature conservation scientists
- Veterinarians
- Bio-regional planners
- Social ecologists
- GIS specialists
- Bio-technologists and bio-engineers – importation quota of 500
- Agricultural extension officers – importation quota of 1000

Other combined /interdisciplinary skills:

- Sociologists
- Patent lawyers (e.g. to patent biotechnology products)
- Legal drafters/legal professionals

Critical skills identified

Social and high-level communication skills are required in the following occupations fields:

- Conservation managers responsible for facilitation of livelihoods of communities in protected areas; negotiation with landowners and so on.
- Senior scientists or communication specialists to act as “knowledge brokers” in communicating science research results and promote the social and economic importance of the sector.

Management skills (financial, project management, tourism management, business management) are required:

- Conservation managers. who have to ensure commercial viability of eco-tourism facilities, trans-frontier parks and socioeconomic needs of communities

Legal skills (knowledge of the current legislative and policy frameworks is required) among

- conservation managers and provincial stewardship to ensure that effective enforcement occurs in protected areas.

This preliminary scan represents a summary of the key scarce skills (absolute and relative) as well as the critical within-occupation skills required. The process of assessing the veracity of the preliminary scan and the ranking of the relative importance of each identified need has to be part of a stakeholder process. Thus, a group of knowledgeable people in the sector needs to establish the extent to which the occupations listed are not double-counted, and that there are verifiable vacancy trends data available against which to measure the preliminary list and refine it in terms of the factors outlined below. In South Africa, there is as yet no standard procedure for developing scarce skill needs. However, a combination of interactive techniques, including expert discussion groups, backed up by some empirical research (sector studies) and statistical trend analysis (on vacancies, supply and employment trends), provides the most effective approach to derive an outline of

scarce skill needs. None of the SETAs have as yet been able to develop forecasting techniques that are standardised and widely used (DOL-GTZ, 2007).

The key factors against which to assess the preliminary list of scarce skills in the *verification* and *prioritisation process* include the following, among others:

- The relative decline in employment growth in the sector over the last seven years and the depressing effect on income as a result of the economic recession
- The availability, size and duration of alternative funding to sustain capacity development
- Possibilities for cross-subsidisation or joint appointments in certain areas
- Limits on new graduates/diplomates (recruits) unless existing vacancies are funded and not frozen
- The decline in the overall qualifications profile of the existing workforce
- The capacity to develop an in-house process of skills upgrading “growing your own timber” in the existing workforce to fill some of the more immediate skills gaps and improve delivery

The nature of supply at the universities indicate that, in the sector

- there are more graduates (and black graduates) qualifying in biodiversity-related qualifications, but not of sufficient scale
- the sector has not been successful in attracting postgraduates and black postgraduates especially
- the economic recession is likely to have a dampening effect on the supply patterns as fewer students enter HE due to financial constraints
- the pattern of declines in internal training provision, the sub-optimal quality of training provision, the decline in training expenditures in the public sector
- the nature and size of education and training providers and the relevance of the courses they offer.

An import quota on certain skills in the medium term linked to a mentoring programme towards transformation could be considered. Note that, in South Africa, the employment of candidates from other parts of Africa or other Africans with permanent resident status does not meet the national equity standard, that is, the development and employment of South African blacks, women and people with disabilities.

Emerging profile of the biodiversity conservation professional and manager

One of the key features that emerged from an analysis of the key legislative and policy mandates relates to the levels of knowledge and complexity required by contemporary biodiversity professionals and conservation managers. There were constant references to the multifaceted nature of the expertise required largely as a result of the development path chosen by the state, and the role of biodiversity in social and economic aspects of South African life, whether in industry, primary health care, tourism, cultural practices and so forth.

The key priority is to make public and evident the social and economic importance of biodiversity conservation in public life, whether government, industry or corporate sector. Thus, it appears that one of the fundamental shifts has been from uni-disciplinary training (the conventional focus of all HE training especially in the natural sciences) to multidisciplinary HE curricula, traditionally the terrain of the social sciences. The link between branches of social sciences (sociology, economics, and psychology), the commercial & management sciences (tourism management, business management, value chain management) and the natural sciences was becoming more evident in new areas of work, such as economic valuation of ecosystems, bio-prospecting, ecology and so forth. In the new skills areas, the existing education and training system may not be prepared in terms of expertise in curriculum adjustment, design and planning.

A multidisciplinary manner of working together follows from having to balance the trade-off between development and conservation. Silo-like operations may not be an option for scientists trained in the traditional manner.

The research indicated that professional scientists required a combination of the following:

- Traditional technical skills (preferably a postgraduate degree in science subject to a sector agreement on minimum entry requirements)
- Policy development and/or facilitation knowledge and expertise, and
- The capacity to implement, but in a manner that facilitates social engagement and facilitation with the varying stakeholders and communities
- Flexibility to work in a multidisciplinary manner or acquire a qualification in the social sciences or even mathematics (for monitoring specialists)

Senior scientists should have mentoring capacity to supervise and mentor students or junior staff and associate professionals may require a scaled-down set of requirements, subject to minimum qualifications. Similarly, the environmental manager has to be multiskilled including

- traditional technical skills (specialised science or environmental qualification)
- legislative and policy knowledge
- social facilitation and negotiation skills
- effective management skills including project, and financial skills
- ICT skills.

The following table summarises skills needs based on discussions in the provincial protected areas, largely confirming the trends and dynamics established thus far.

Table 5.3: Province-based capacity needs in protected area management (Institute of Natural Resources, 2004, cited in DEAT, 2009b)

KZN	<ul style="list-style-type: none"> • Monitoring and evaluation • Vertical communication and interaction • Participatory and cooperative management approaches • Need for a shared vision between the nature conservation board and the provincial administration • White staff members feeling insecure • Vacancy rates ranging between 10 and 15%
Northern Cape	<ul style="list-style-type: none"> • Management skills • Stakeholder engagement • General and natural resource economics • Community-based natural resources management
Limpopo	<ul style="list-style-type: none"> • High staff turnover • Delayed replacements • Under-qualified staff leading to internal conflicts • There is a need for affirmative action at the middle and senior level positions in the province
Mpumalanga	<ul style="list-style-type: none"> • Staff shortage in critical posts • Nature conservation • Understanding policy, legislation and criminal and legal procedure • Computers and communication • Conflict management and stakeholder engagement
Western Cape	<ul style="list-style-type: none"> • Directorate is 20% understaffed • Need for affirmative action at middle and senior management levels • GIS and computers • Data collection and monitoring • Management planning • Nature-based tourism and marketing management
Free State	<ul style="list-style-type: none"> • Under-qualified staff • IT, database management and GIS • Cooperation and communication
Eastern Cape	<ul style="list-style-type: none"> • Shortage of affirmative action scientists • Serious understaffing and under-funding • Lack of career opportunities to advance • People skills to engage local people on land claims
North West	<ul style="list-style-type: none"> • Funding levels have fallen to 15% of their 1994 level (by 10 million) • Very high staff turnover • Working with international legislation such as CITES and other conventions, biodiversity inventory • Spatial planning and general conservation management

Source: DEAT ESSP, 2009.

Many of these factors and dynamics were echoed in the fieldwork results, thus indicating that not much has changed since 2004 when this report was written.

NATURE OF AND EXPENDITURE ON TRAINING PROVISION

This section provides an overview of the nature of and expenditure on the provision of training in the sector. The focus is primarily on government departments, given the available data.

Participation of government department in skills development

Participation of government departments that belong to the Public Sector SETA (PSETA) through the submission of WSPs and ATRs is very poor. Of the 34 national departments, only 12 submitted WSPs and ATRs; among the 102 provincial departments only 72 complied with these requirements (DOL 2008a). While there were no specific data on participation of organisations in the biodiversity sector, their compliance levels are not likely to be any better than those of government departments associated with the sector. In the interviews that were conducted as part of this research, it also emerged that strategic organisations in the sector were not submitting their WSPs and ATRs. This may have to do with the perception that the SETA system is inefficient, is not representative of the sector, or not responsive to sector-specific needs. However, a lack of institutional data also hampers the ability to measure the size and nature of skills shortages (where they do exist) and to plan adequately.

Expenditure by government departments on skills development

Public sector organisations belonging to the PSETA have to spend a minimum of 1% of their personnel costs on skills development, instead of paying skills levies like private sector organisations. The next table summarises training expenditure of government departments with a biodiversity component, whether partly or fully, for 2007/08. It shows that with the exception of the Department of Water Affairs and Forestry (DWAF) (before the April 2009 restructuring), all departments spent more on actual training than the 1% equivalent of their payrolls. However, given the broad scope of government departments, which may include economic affairs, tourism and agriculture for instance, it was not possible to separate expenditure on biodiversity-specific training as opposed to other training. Nor is it possible to comment on the type and relevance of training offered. However, on the basis of this information

there is at least a compliance-driven approach. In future, in order to trace the impact of expenditure, it may be useful to have a fuller analysis of the size and nature of training expenditure on biodiversity-related training.

Table 5.4: Training expenditure of government departments in the biodiversity-related sectors (2007/08)

Department	Province	1% of personnel cost	Actual expenditure
Water Affairs & Forestry	National	105 805 218	15 736 938
DEAT	No information		
Tourism, Environment & Economic Affairs	Free State	1 050 000	2 181 988
Environmental Affairs & Developmental Planning	Western Cape	511 153	750 573
Agri, Conservation & Environment	North West	2 926 310	3 074 144
Agriculture, Conservation & Environment	Gauteng	1 641 084	6 921 000
Economic Development & Environmental affairs	Eastern Cape	3 199 592	3 279 000
Eco Development & Planning	Mpumalanga	420 280	1 345 496
Economic Development, Environment & Tourism	Limpopo	2 514 290	11 747 977

Source: DOL 2008a:16

The assessment report (Turpie et al, 2008:58) suggests that training provision in the sector was “sub-optimal” in terms of expenditure and quality. Thus, it echoed a general criticism raised in terms of the skills development system, that training expenditure was compliance-driven to meet legislative requirements. Secondly, echoing another critique was the supply-driven nature of training, instead of being responsive to the specific training requirements of a sector. If one considers the training expenditure trends suggested in DEAT (in Table 5.5), it becomes evident that both critiques are applicable.

An analysis of DEAT figures shows that training expenditure as a percentage of compensation (payroll) declined from 4% in 2005/06 to 1% in 2007/08. Thus, even though current training expenditure was compliant with the recommended minimum required in the public sector, the drastic cut may indicate that training in DEAT has

become a cost-saving item, and has declined in importance. The number of employees that were trained dropped by more than 50% over the period. Estimated expenditure for the medium-term framework was set to stay around 1% and even lower. This does not bode well for skills development prospects of current employees in the DEAT. This decline is anticipated despite the range of new responsibilities (and capacity required) flowing from the policy and legislative framework.

Table 5.5: Estimated expenditure on training by DEAT (2005/06–2011/12)

	Anticipated outcome			Adjusted appro- priation	Medium-term expenditure estimate		
	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Compensation of employees (R million)	209.7	262.5	342.2	413.2	432.8	477	514.4
Training expenditure (R million)	8.3	3.8	3.4	3.7	3.9	4.1	4.5
Training as percentage of compensation	4.0%	1.5%	1.0%	0.9%	0.9%	0.8%	0.9%
Total number trained in department (head count)	342	153	160	-			
of which:							
<i>Employees receiving bursaries (head count)</i>	23	32	32	-			
<i>Learnerships trained (head count)</i>	12	22	22	-			
<i>Internships trained (head count)</i>	89	94	100	-			
Households receiving bursaries (R million)	0.4	1.3	1.3	1.5	1.6	1.8	1.8
Households receiving bursaries (head count)	17	44	50	-			

Source: Vote 25, Treasury (2009: 590)

The table shows that there was an increase in the number of employees receiving bursaries, as well as the number of learnerships and internships. However, it appears that the numbers remained static over the 2006/07–2007/08 period, with no anticipation of increases. This is contrary to the DEAT skills audit (KNC & Assoc., 2006:3) conducted in 2006 which recommended the use of skills development, bursaries, internships and other forms of development to address scarce skills problems related to recruitment and retention. Also, the declining trend in training provision was contradictory to the increased demands placed on existing staff, flowing from the legislative and policy framework. Turpie et al (2008:57) found that increases in the legislative mandate were not followed through in terms of increased financial and human resource capacity.

A priority challenge for the sector is the under-appreciation and lack of public awareness of the social and economic importance of biodiversity conservation. Environmental education contributes substantially to this awareness process, but systemic capacity constraints in environmental education were identified (Turpie et al, 2008:73). These related largely to the lack of coordination among the various

service providers, as well as the absence of a common framework in terms of quality, standards and curricula. The assessment report indicated that questions have been raised about the quality of accredited training providers in the sector (Turpie et al, 2008:58). However, no specifics were raised as to the types of provider except insofar as it related to the general quality of offerings and the relevance of training. A sub-committee should consider questions with regard to the nature, relevance and quality of training and other environmental programmes in the sector, as well as issues of coordination and quality assurance. A specific area suggested coordinated intervention related to the quality assurance and coordination of training of conservation managers, as the evidence suggests the need for customised training to accommodate the multifaceted skills needs given their multiple responsibilities.

NATURE OF TRAINING PROVISION

In the face of claims of scarce and critical skills shortages, it is important to assess the extent to which organisations in the sector are addressing these needs based on the nature of training provision. This section provides the results of a documentary analysis of the nature of training provision in the 16 organisations that participated in the research.

Scope, nature and limitations of data

The key sources of data were human resource development (HRD) information from statutory reports, which included WSPs, ATRs, and Employment Equity profiles and any other relevant training documentation and related policies. There were many gaps in the information as some participating organisations did not complete WSPs for submission to their respective SETAs, or where they did complete WSPs, they did not submit them to the research team. In some cases, where the sampled organisations (or their training or HRD department) did not participate in the research interviews, the research team accessed organisational annual reports in order to gain some idea as to the nature of training provision. Owing to the unevenness of the data it was not possible to derive trends. Where possible, data collected in the DEAT ESSP were presented as well. Also, at times the information covered employees

beyond those targeted specifically in the HCDS for the biodiversity sector (NQF 5 and higher).

The information gathered is not completely comparable across all organisations, as we did not possess *all* the information of *all* the organisations. This exercise suggests that, in order to be optimally informative, there is a need for an extensive skills and training profiling of the sector to facilitate appropriate recommendations on sector skills needs.

The organisations were grouped by organisational type (see the key in Table 5.7) and a profile of each was developed, depending on the scope of information available. Each profile may include an aggregate skills profiles (in terms of race and gender where available) and the nature and size of training provision.

The public sector training and skills development information was subdivided into four provincial government departments, two local government Institutions, two HEIs, one SETA, two NGOs/NPOs, four parastatals (3 national and 1 provincial), and one private sector organisation. A key limitation was that the information often covered occupations well beyond professionals and managers with NQF 5 qualifications and higher. Further, the WSPs and ATRs did not present occupational information in detail, and were often as broad as that presented in the LFS (see chapter 2 on employment).

The DEAT ESSP covered all occupations, whereas in this analysis only those at NQF 5, skilled and highly skilled were covered.

Table 5.6: Explanatory key to identify participating organisations

Institutional type	Name
Provincial government	1. Provincial Government 1 (ProvGov1)
	2. Provincial Government 2 (ProvGov 2)
	3. Provincial Government 3 (ProvGov 3)
	4. Provincial Government 4 (ProvGov 4)
Local government	5. Local Government 1 (LocGov1)
	6. Local Government 2 (LocGov2)
NGOs and NPOs	7. NGO/NPO1
	8. NGO/NPO2
Parastatals/ research institutes	9. Parastatal/Research Institute 1 (PARA1)
	10. Parastatal/Research Institute 2 (PARA2)
	11. Parastatal/Research Institute 3 (PARA3)
	12. Parastatal/Research Institute 4 (PARA4)
Private sector	13. Private sector institution (PRIV1)
Higher Education Institutions	14. Higher Education Institution 1 (HEI1)
	15. Higher Education Institution 2 (HEI2)
SETA	16. Sector Education and Training Authority 1 (SETA1)

PROVINCIAL GOVERNMENT

The data suggest that in provincial government departments training needs were not always explicitly defined, and often there seemed to be a mismatch between the identified skills needs and priorities and the actual training being conducted. This finding echoes similar challenges identified in the fieldwork interview process.

The next section analyses data based on four provincial government institutions (PG1-4).

ProvGov1

Skills profile

This organisation had a *Training and Development Policy*, and had developed a *Workplace Skills Plan* and *Annual Training Report*. Furthermore, they established a change management programme and instituted teambuilding sessions.

The majority of employees were at the “unskilled and defined decision making” level (267), followed by 215 employees at the “middle and junior management” level. The minority was at top management level. The majority of employees were African males aged between 35 and 55. It was not possible to provide an analysis of the age profile of those in managerial and professional occupations, owing to the potential for risk of losses of valuable knowledge and skills especially at senior levels.

Training

Table 5.7: ProvGov1 number of training beneficiaries (2009/10)

Occupational Group	2009/10	%
Top management	20	4%
Senior management	29	6%
Middle and junior management	72	16%
Semi-skilled and discretionary decision making	153	34%
Unskilled and defined decision making	178	39%
TOTAL	452	100%

Source: ATR 2009/10

For the period 2009/10 most of the training was received by those at unskilled and defined decision-making level (39%), and the minority targeted at top and senior management level (4 and 6% respectively).

The total training budget for 2009/10 was R1 556 000, and an additional R1.5 million had been allocated for ABET training (THETA funding); a bursary budget of R750 000 was allocated as well as a learnership budget of R897 000 (also Theta funds); and an internship budget of R80 000. Much of this had been spent except for the

learnership budget of which only R65 000 had been spent on learnerships. This underlines the fact that there is funding available through the SETA (across all NQF levels), but organisations often do not access it and, when they do, the money is not spent as was the case here.

The internship budget was tiny in comparison with the rest of the budget items, which means that very few young graduates could gain work experience, another key problem in the biodiversity sector. It may be assumed that bursaries were allocated for HE students. However, internally not much training was provided at managerial level.

In terms of its commitment to skills development, this organisation had a performance management system for addressing training priorities, and required that employment equity targets, training and development initiatives formed part of all management and supervisor contracts. This is an important mechanism in terms of promoting the importance of skills transfer and equity belonging together, rather than being seen as competing options. The organisation also attempted to address the racial and gender disadvantages within the organisation by requiring that the WSP was aligned to the employment equity policy. In this regard, the WSP was required to reflect specific allocations for an accelerated training programme related to employment equity programmes commencing in 2009. Furthermore, the organisation has also recognised the link between adequate and appropriate training and retention by promoting the provision of “job-related and career-related development opportunities for staff”. The extent to which this was the case in practice was not immediately clear from the information.

ProvGov2

Skills profile

The majority of employees was at the semi-skilled and discretionary decision-making level (54% of total number of employees). African males dominated top and senior management, but the actual numbers were very low. White and African males dominated the professionally qualified and experienced specialists and mid management occupational category. This was in line with the LFS results.

Training

Table 5.8: ProvGov2 training beneficiaries

Occupational group	2007/2008	%
Legislators, senior officials, managers and owner managers	4	1%
Professionals	212	28%
Technicians and associate professionals	65	8%
Clerical and administrative workers	56	7%
Service and sales workers	386	50%
Skilled agricultural and fishery workers	0	0%
Skilled workers, craft and related trades	1	0%
Plant and machine operators and assemblers	1	0%
Labourers and elementary occupations	3	0%
Apprentice and section 18(2) learners	40	5%
TOTAL	768	100%

Source: Annual Report 2007/8

Table 5.9 shows that professionals received the second-largest proportion of training (28%) after service and sales workers (50%).

ProvGov3

Skills profile

The majority of this workforce was classified as “other” (601 out of a total of 717 employees), which made comparisons very difficult. However, what we could gather from the available information was that there were very few staff members at top management (6) level, largely dominated by African males. Males also dominated middle management (84%).

Training

The organisation reported that training provided was mostly of a generic nature. Of the 16 courses presented, four were specific. Also, there were a total of 16 bursaries

offered, of which again about 25% were specific and the remainder of a generalist nature.

ProvGov4

Skills profile

The majority of employees in this organisation was male and, more specifically, African male. In terms of the skills profile, the majority of this institution's skills was at clerical and administrative worker level (341 of a total of 777 employees) and of these the majority was female (153 out of 341). This confirms the DEAT ESSP findings that the majority of females in this sector was at clerical and administrative levels. A minority of employees was coloured and/or Indian male. A minority of employees was at the managerial level, most of whom were African male.

Training

Table 5.9: ProvGov4 number of training beneficiaries (2007/08, 2008/09)

Occupational group	2007/2008	%	2008/2009	%
Managers	43	7%	24	5%
Professionals	81	13%	81	16%
Technicians and trade workers	165	27%	147	29%
Community and personal service workers		0%		0%
Clerical and administrative workers	257	42%	224	45%
Sales workers		0%		0%
Machine operators and drivers		0%		0%
Labourers	62	10%	25	5%
TOTAL PERMANENT	608	100%	501	100%
Non-permanent	66			
GRAND TOTAL	674		501	

Source: Annual Training Report 2008/9 and Workplace Skills Plan 2009/10

As the above table indicates, training over the period focused on the clerical and administrative level. The second largest proportion of training was at technicians and trade level, followed by training for professionals. There was an increase over the

period in training for professionals, whereas that for managers this declined by 2%. Thus, the organisation's training priorities remained fairly constant, even though the numbers fluctuated slightly. In 2008/09 most of the training provided was at NQF level 6–8, but this was at the clerical and administrative worker level (307 out of total of 354).

Trends in provincial government departments

Skills profile

The majority of top and senior managers were African males, but the numbers were generally very small. Males were a substantial majority in lower management positions, and white and African males dominated the professionally qualified and experienced specialists and mid-management. The majority of employees was in their mid 30s and above. The majority of managers was African males, with a minority of either Indian or coloured Males, while white women dominated management positions among women. Women were in predominantly clerical and administrative functions. This analysis was made difficult by the fact that in the professional category it was not possible to separate out core biodiversity professionals from other professionals in line with the rest of this report.

Training

Across all institutions most of the training was aimed at the lower occupational levels (unskilled and defined decision making level, service and sales worker level, clerical and administrative levels), with much less training being offered at senior management and professional level. Most of the training appeared to be generic, and not specific. In addition, where there was historical information available, it suggested that these training priorities had remained fairly constant over at least the past five years.

An overview of the types of training programme offered by these organisations showed the following:

Organisational initiatives: Development of a performance management and development system; instituting a training and development advisory committee;

instituting a Strategic and Annual Performance Plan 2008–2012; skills audit to feed into a training plan (a total of 307 job profiles were compiled)

Generic organisational training: Induction, orientation, and internship/learnership training programmes, departmental capacity building, Covey training, management leadership programmes, as well as putting processes in place to improve organisational climate, ABET training, training interventions as defined in their relevant WSPs

Management-specific skills: Middle management forum; management and supervisory skills

Networking and interaction: Career exhibitions, Batho Pele awards scheme

Specific training: Environmental inspector training, business communication, financial management, project management, computer literacy

We also found that, in many instances, there was a mismatch between the planned versus actual beneficiaries of training. The DEAT process also identified the same problem with regard to a training mismatch in that actual training provision did not match the intended skills training, both in terms of numbers and short course offerings.

Skills needs

Not all institutions identified scarce or critical skills, despite half of the participating organisations identifying that as a need. Among those that did specify scarce or critical skills the following were identified: middle and junior management, and appropriately qualified and experienced African scientists.

Occupations: Nature conservators/nature conservation scientists, reserve managers, veterinarians, environmental scientists and agricultural bio technicians and economists

Specific and technical skills: Law enforcement, environmental management inspectorate, environmental law, chainsaw, GIS, ecological monitoring and modelling, skippers training, advanced spatial tools, customer service, MDP: managers, conservation management, herbicide and alien plant control, strategic

marketing, comprehensive hazard identification and incident prevention, assessor, asset management, industrial relations management

Generic skills: Computer literacy, Pastel Partner and Pastel Evolution, payroll update courses, fire arms competency, tractor operation, commercial driving, facilitation skills, HIV/AIDS workplace management, counselling skills, negotiation skills, first aid, fire fighting

The need for adequately experienced African scientists was constant throughout these institutions. Another notable aspect related to the importance of the retention of valuable knowledge and skills of older employees. Lastly, the strategic training priorities often did not coincide with the skills needs as, once again, the training offered was generic, whereas the specified skills needs were very specific. The rationale for this mismatch was not very clear, but the type of training offered may depend upon the available skills offerings, which may not always coincide with the needs of organisations. This is a key area where the HCDS may need to provide some guidance on the drivers of skills development programme, in order for them to be more demand-driven, rather than supply-driven, which is also one of the criticisms of the current SETA system (The Presidency, 2007).

LOCAL GOVERNMENT

This section refers to the information and data available for two local government institutions.

LocGov1

Skills profile

The majority of this institution's staff was in the core occupations and the remainder in support occupations. The qualifications of employees in core occupations were all above degree level, and those in support occupations had qualifications below and up to honours degree level. White women dominated the management positions.

Training

There were a number of training initiatives including 1) internships, and 2) generic training in computer programs. There was an acknowledgement that the organisation provided more access to generic training than to specialist training.

Skills needs

Based on the interview data, there seems to be a high turnover, and thus quite a few vacancies. The organisation had difficulties in filling these vacancies, as it argued that there were no employment equity candidates available.

LocGov2

Skills profile

The data available were not useful.

Training

Table 5.10: LocGov2 number of training beneficiaries

Occupational group	2005/06	%	2006/07	%	2007/08	%
Leadership and governance	296	25	602	23	269	23
Senior officials and managers	54	5	72	3	17	1
Professionals	247	21	345	13	95	8
Technicians and associate professionals	151	13	413	16	186	16
Clerks	203	17	462	18	154	13
Service workers	130	11	209	8	55	5
Agricultural and fishery workers	5	0	42	2	30	3
Craft and related trade workers	31	3	214	8	87	7
Plant and machine operators & assemblers	24	2	89	3	68	6
Labourers and related workers	50	4	127	5	221	19
TOTAL	1191	100	2575	100	1182	100

Source: WSP & ATR (2005–2008)

Table 5.11 indicates that much of the training provided was at the leadership and governance level, although the numbers declined sharply in the last financial year. There has been a steep decline in the training received by professionals and associate professionals in actual numbers over the past two financial years. Thus, training provision appears to have deteriorated sharply over the period.

Trends across local government institutions

Skills profile

Based on interview data and available institutional data, the majority of staff was in core occupations.

Training

This section only reported on training data from one local government institution, as these were the only available data and thus could not be used for comparative purposes.

In general, there were some organisational policies worth documenting. The study assistance policy set out clearly the company's definition of a career path. It also identified a focus on ensuring gender equality, and a human resources development strategy with four strategic objectives, most of which seemed to have been drawn directly from the NSDS II with very little customisation according to organisational needs:

- Critical skills for sustainable growth, development and equity
- Promoting and accelerating quality training for all in the workplace
- Employability and sustainable livelihoods through skills development
- Assisting designated groups to participate in integrated learning and work-based programmes

However, this organisation also had a recruitment, selection and retention policy, and it made explicit the link between training and retention through nonremunerative methods: 1) continuous skills development; 2) career-pathing; 3) a safe and healthy

working environment; 4) a participative and inclusive culture; 5) succession planning; 6) assisted education scheme; 7) mentoring; and 8) performance awards

Skills needs

Unfortunately no needs or critical skills were explicitly identified by either of these organisations.

NGOs AND NPOs

This information reflects the available data for two NGOs and NPOs.

NGO/NPO1

Skills profile

There were no available data for this organisation on this aspect.

Training beneficiaries

In 2008 this organisation managed to offer a total of 43 training courses to its employees. There were 21 training beneficiaries in this year in the following types of training, much of which was administrative in nature:

- seven financial training courses were attended (six beneficiaries)
- 12 administrative and secretarial training attended (11 beneficiaries)
- 21 generic management training attended (10 beneficiaries)
- three MS Office training courses attended (1 beneficiary)

In 2009 the organisation offered 19 training courses and the majority of training beneficiaries were white females.

NGO/NPO2

Skills profile

The majority of employees were at project manager level.

Training

Table 5.11: NGO/NPO2 number of training beneficiaries

Occupational category	Basic entry level	Intermediate level	Advanced level
Computer course	1		
Project management		11	
Basic bookkeeping	3	1	
Finance, accounts & budgets		2	
Understanding VAT			1
TOTAL	4	14	1

Source: Annual Training Report 2008/9

Much of the training offered was at an intermediate level (14 out of a total of 22), and all were of a specific and administrative nature, including project management training (11 out of 21). Four staff members received training in basic bookkeeping; two in finance; one in basic computer training; one in computer skills and one took driving lessons. Three training programmes were offered:

- Experiential training offerings for learners at the organisation
- Eco-school programmes with a primary school focus
- One year post-matric programme

Trends across NGOs/NPOs

Training

In these NGOs/NPOs the majority of training was offered at intermediate level and was of an administrative nature. Together, these two organisations offered a range of training and development programmes, including

- experiential training offerings
- an eco-school programme
- environmental awareness programmes in previously disadvantaged communities in South Africa (aimed at capacitating aspiring conservationists from these communities).

- wildlife conflict prevention group, aimed at reducing human–wildlife conflicts through training, education and extension work with landowners.

Skills needs

Project management skills were regarded as a critical skills need.

General

The types of organisation, probably due to their size, placed a higher premium on good managers, which may explain why project management skills and more generic human resources skills were emphasised.

PARASTATALS AND RESEARCH INSTITUTES

This section reflects the data available for a total of four parastatals/research institutes.

Para1

Skills profile

In 2005/6 the number of staff with degrees at masters and PhD level was 26% of the total employees, rising to 30% of the overall workforce by 2006/07. The majority (66% in 2006/7, 67% in 2007/8, and 70% projected for 2008/9) of staff fell in the Science, Engineering and Technology (SET) category base. This is a male-dominated organisation, and the proportion of women remained constant at about 30%. It was argued that this was linked to supply-side factors, and outside the organisation's control. This organisation had a comprehensive performance management system facilitating career pathing, which set out clear links between capacity development and performance.

Training

There were no data available.

Skills needs

There was a distinct need for appropriately qualified and experienced African and female scientists.

Para2

This organisation had 592 permanent and 91 contract staff members as stated in their 2007/8 Annual Report. This profile, it claimed, had an impact on training in terms of the communities it served as well as the education and development of its staff. Thus, through its community training and education initiatives, it sought to create an awareness of, and interest in, new recruits for entering the biodiversity sector.

Skills profile

In terms of the permanent employees' skills distribution, the majority of employees was at the semi-skilled and discretionary decision-making level, while a minority of employees was at top management level. On the other hand, the profile of the contract employees differed to that of the permanent workforce, where the majority of employees was at the skilled technical and academically qualified level – about 65% of all nonpermanent employees. This means that the employees leading the organisation were all in contract positions and were more likely to leave.

Training

Table 5.12: Para2 – Number of staff attending training

Occupational group	Male				Female				TOTAL
	A	C	I	W	A	C	I	W	
Top management	0	0	0	0	0	0	0	0	0
Senior management	1	0	0	2	1	0	0	0	4
Professionally qualified and experienced specialists and middle management	7	2	0	31	3	2	1	30	76
Skilled technical and academically qualified workers, junior management, supervisors, foremen and superintendents	15	7	1	6	8	15	1	23	76
Semi-skilled and discretionary decision-making	84	68	1	2	30	24	1	12	222
Unskilled and defined decision-making	95	36	1	0	17	6	0	0	155
TOTAL	202	113	3	41	59	47	3	65	533

Source: Annual report 2007/8

The table indicates that 533 staff had attended training programmes in 2007/2008. Training was concentrated in the lower levels and very little training occurred at top and senior management levels. However, a sizable number of associate and professional staff received training. Among professionals, whites were the main recipients of training, which probably reflects on the workforce profile at this level.

Skills needs

Based on the information in the annual report, it was not clear exactly what the greatest skills needs were. However, most of the experiential training seemed to be offered at a lower level, with far less at the more professional levels.

Para3

Skills profile

The latest available data (2006/7) from this organisation indicated that the majority of employees were male and at junior management level with very few at the top management level. The majority of employees were coloured males at junior management level.

Training

This organisation had quite an array of training, education and capacity-building initiatives; which are included in the summary across parastatals.

Skills needs

The organisation identified strategic human capital management as being key to its future success and identified the following priorities:

- Supporting human capital initiatives
- Accelerating broad-based black empowerment and employment equity
- Advancing a culture of excellence in skills development and lifelong learning

Para4

Skills profile

In this organisation the majority of workers were elementary workers (1282 of a total of 3396 workers, mostly coloured and African). Relatively few of the employees were managers (55 of 3396 workers) most whom were white (20) and African (19) males. Very few were at NQF levels 6–8 (48). Thus, as was also noted in the DEAT ESSP research, this implied that “the organisation would depend heavily on its intermediate levels skills for the day-to-day management and effective functioning of the organisation”.

Training

Table 5.13: Para4 – Number of training beneficiaries

Occupational group	2009/2010	%
Clerical and administrative workers	124	6
Community & personal service workers	105	5
Elementary workers	1300	68
Machine operator and drivers	15	1
Managers	65	3
Professionals	76	4
Sales workers	184	10
Technicians and trades workers	52	3
TOTAL	1921	16

Table 5.14 shows that 68% of training was at the elementary level, with between 3 and 5% taking place at managerial and professional level respectively.

Trends across parastatals/research institutes

Training

As noted before, training was concentrated at the semi-skilled and/or elementary worker level. While smaller numbers of professionals were attending training, this may be counter posed against their relative proportions in the workforce as a whole. Given that the research could not compare the number of professionals to the number of professionals receiving training, it is difficult to make any conclusions about the importance of training at this level among these organisations.

An array of programmes was offered at these organisations, including:

- **Capacity development:** bursary, studentship, internship opportunities, and post-doctoral programmes, sabbaticals and exchange programmes, research professional development programmes (transformation focus), induction programmes

- **Youth development programme** (focusing on environmental literacy, skills development and twinning programme), school-level intervention
- **Policies, policy development and committees:** Integrated employment equity and training and development committees, competency definition workshops (entails defining the competencies for each job function), a five-year organisational employment equity plan
- **Leadership:** Management and leadership development programmes, self-empowerment programmes, junior management development programme.
- **Interaction:** Nocturnal star-gazing events, collaboration with international biodiversity projects and exhibitions, interaction with universities, museums and research organisations, training of science graduates in collaboration with a number of SA universities, co-supervision of postgraduate students, and presenting short courses in university programmes, staff spending time in other NGOs on a short-term basis
- **Material:** Natural history booklet, natural history courses

Skills needs

In these organisations there was a recognition of a distinct need for appropriately qualified and experienced African and female scientists. One organisation specifically identified vacancies that are difficult to fill. These were both at NQF level 5 – a skills development manager and a principal research scientist.

PRIVATE SECTOR

There was one private sector organisation in the sample. Most of its employees (responsible for biodiversity) were employed as environmental professionals, who may have some responsibility for biodiversity-specific functions. Thus, no further analysis was conducted.

HIGHER EDUCATION INSTITUTIONS

This section reflects the data available for two HEIs.

These organisations did not have WSPs to reflect staff skills needs in their specific departments; however, a short overview of the types of training offered at HEIs is provided.

There appears to be a realisation of the growing importance of establishing biodiversity and conservation as a distinct field or niche area. One of the institutions, for instance, had a Biodiversity and Conservation Biology Department, which falls under the Faculty of Natural Sciences. This department was formed as an amalgamation of the former Botany and Zoology departments, in recognising the ideal positioning of South Africa in terms of access to particular types of biodiversity resource.

The other university to some extent still reflected historical divisions, as biodiversity and conservation were located within the faculty of Natural and Agricultural Sciences, and a School for Biological Sciences as part of the Department of Zoology and Entomology. The supply chapter (Chapter 4) and appendix contain a detailed analysis of biodiversity-related courses at each HE institution in the country as well as the distribution of students that have qualified.

IMPLICATIONS OF TRAINING PROVISION

This section to a large extent confirmed by the general demographic profile of the sector found in the LFS results (Chapter 2) in that the sector is male-dominated, especially at management level, by white and African males. In terms of the nature of training required and offered the following were found:

- **Need for African scientists:** The need for appropriately qualified and experienced African scientists was a constant expressed across all institutions in the sector. Despite the male-dominated nature of most of these organisations, only two indicated that they needed African and women scientists.
- **The apparently low level of training provision for professionals, associate professionals and managers:** The data could not assist in

figuring out whether the training offered at professional level was appropriate to both the size and needs of the professional workforce. However, given the expressed need for African scientists, the apparently low level of training offered may in fact exacerbate the skills shortage at this level. It is recommended that one of the monitoring indicators in the HCDS include the monitoring of training offered to professionals, managers and associate professionals in order to gauge institutional responses.

- **Scarce skills identified:** in provincial governments the specific scarce skills identified included nature conservation scientists, reserve managers, veterinarians, environmental scientists and agricultural bio-scientists and economists. Middle and junior management were also identified. This confirms the overall types of scarce skill occupation arising from an analysis of the policy frameworks in Table 5.3.
- **Disjuncture between skills needs identified and training offered:** Although skills needs were often identified as specific, the training offered tended to be of a generic nature. This was the case even where organisations identified scarce skills needs. Furthermore, where training corresponded to the skills needs identified, it was often not aimed at the correct levels. The extent to which organisations chose training courses based on what is available, rather than what they needed, is an area worth exploring through the HCDS process. This disjuncture appears to be common to most of the organisations participating and highlights a particular weakness in the education and training environment in this sector.
- **Training expenditure is compliance-driven and has sub-optimal outcomes:** Actual provincial and national expenditure on training is in line with the minimum requirements, but substantively the actual provision of training appears to be sub-optimal in terms of declining numbers of staff trained, or declining professional and managerial training, or provision of training that is not responsive to training needs. The evidence suggests that there is no discernible progress being made in the current provision of training to meet scarce skills needs on the basis of data at hand.

It is recommended that the HCDS investigates the factors that determine the choice of training courses by means of interviews or a short questionnaire submitted to a sample of HR or training managers, as well as the main education and training providers in the sector. The sector should consider the development of a sector database of biodiversity-related courses provided at provincial and national level in terms of their relevance to the needs of the sector as outlined here. The supply chapter provides a list of courses relevant to the sector for the period 2000–2007.

The preliminary scan of scarce and critical skills needs has to be the subject of a stakeholder process which will verify the proposed list, and rank identified needs in terms of a series of factors arising from an analysis of the macroenvironment, the supply and employment analysis, as well as the analysis of training provision in the sector.

CONCLUSION

A key challenge for the HCDS will be to identify and measure the extent and nature of scarce skills and to some extent critical skills as well. However, it appears that even where scarce skills are identified, the provision of education and training is often of a generic nature and not responsive to the training needs identified. These interlinked processes (of identifying needs and responsive training provision) are important for effective planning, the development of suitable training courses and offerings, and greater efficiency and effectiveness in service delivery in the sector.

REFERENCES

African Conservation and Training Association (ACTA0. (February 2009). Southern African Wildlife College training needs and niche analysis. Unpublished.

Daniels, R. (2007) Skills shortages in South Africa: A literature review. DPRU *Working paper 07/121*, May 2007.

Department of Environmental Affairs and Tourism (DEAT). (2004). National Biodiversity Strategic Action Plan Stocktaking Report: Final Draft

Department of Environmental Affairs and Tourism DEAT (2008) *Strategic Plan , 2008 – 2013*. Pretoria; DEAT.

Department of Environmental Affairs and Tourism & South African National Biodiversity Institute (DEAT & SANBI). (2009) *South Africa's Fourth National Report to the Convention on Biological Diversity, 2009*. Pretoria: DEAT.

Department of Environmental Affairs and Tourism (DEAT). (2009) *ESSP biodiversity data response sheet: Trends, scarce skills and skills gap*. Pretoria: DEAT.

Department of Home Affairs (2008) *Immigration Act (13/2002): Specific professional categories and specific occupational classes*. Government Printers: Pretoria.

Department of Labour (DOL). (2005) *Guide for the development of five-year sector skills plans and annual updates for 2005-2010*. Pretoria: DoL.

Department of Labour (DOL). (2007) *Draft framework for identifying and monitoring scarce and critical skills*. Pretoria: DoL.

Department of Labour (DOL). (2008a) *NSDS Implementation Report 01 April 2007 0-31 March 2008*. Pretoria: DOL

Department of Labour-GTZ (2007) *Scarce and critical skills*. (National Skills Authority: briefing paper). DOL and GTZ.

Du Toit, R & Roodt, J. (2009) *Engineers in a developing country*. Pretoria: HRSC.

Erasmus, J. (2008) *A multiple source identification and verification of scarce and critical skills in the South African labour market*. Pretoria: HSRC.

Herbert, DG, Smith, ML & Scholtz, CH. (May 2001). Taxonomy and systematics research in South Africa: vital research facing a crisis in capacity and resources. Unpublished.

Institute of Natural Resources. (2004) *National Biodiversity Strategy and Action Plan stocktaking report*. Unpublished.

KNC & Associates. (2006) *Scarce Skills Audit: Draft report to the DEAT*. Johannesburg: KNC & Associates.

Kraak, A. (2008) *Mapping the terrain*. Proposal commissioned by the German Technical Co-operation. Pretoria.

Rodwell, L. (September 2008). *Feedback report to participants on re-developing the Tony and Lesette Lewis's funding strategy around priority areas for conservation in South Africa*. The Tony and Lissette Lewis Foundation South Africa: Johannesburg.

The Presidency. (2007) *SETA Review*. Report produced by Singizi Consulting.

WWF-SA (2008) *Minutes of Strategic Planning Workshop*. Environmental Capacity Development Programme. WWF.

Turpie, J & De Wet, J. (2008) *South African national capacity self assessment*.

Wynberg, R. (2002). A decade of biodiversity conservation and use in South Africa: tracking progress from the Rio Earth Summit to the Johannesburg World Summit on Sustainable Development. *South African Journal of Science* 98:233–243.

¹ The taxonomy study was based on statistics dating back to 1999, and are therefore very outdated at the time of writing.

² The DEAT definition of “critical” skills is similar to the official or DOL definition of “scarce” skills, that is occupations that are scarce.

³ The Scarce Skills List does not specify in which sector each scarce skill occupation is estimated to occur. Occupations such as veterinarians are likely to extend beyond the biodiversity sector.