

CHAPTER 7:

RECOMMENDATIONS AND CONCLUSIONS

INTRODUCTION

Each of the preceding chapters provided a background, a presentation of findings based on specific sets of data, implications and recommendations. The purpose of the concluding chapter is to provide guidelines on the most strategic issues to consider and the relative risks and opportunities relevant to the HCDS and implementation plan. The chapter suggests an approach through which the research findings may be integrated in the HCD strategic development process and a series of strategic principles. The next section proposes two conceptual frameworks for consideration: firstly, the professional development process and, secondly, the HCD development process. The final section considers the background to the research and presents a review of the main challenges, recommendations and knowledge gaps suggested by the triangulation of research findings. The rationale for each of the recommendations is not repeated here.

INTEGRATING THE RESEARCH INTO STRATEGIC PROCESSES

The proposed HCD strategy itself, in the choice of **strategic objectives**, the determination of a **hierarchy of strategic priorities** within each objective in relation to the needs and resource availability, specific **inputs, outcomes, costing, timelines**, allocation of **responsibilities**, as well as the determination of strategic **monitoring and evaluation indicators**, will be the subject of an in-depth stakeholder process. The final HCDS strategic framework may include, among other elements, the following:

- Vision and mission (the key values that underpin the development and implementation of the strategy, the nature of stakeholder cooperation and the desired end-state for the strategy in the next five to ten years)
- Strategic objectives (what needs to be achieved in terms of addressing scarce skills and transformation challenges)
- Hierarchy of priorities (a clear ranking of priorities attached to timelines)
- Specific and measurable outcomes related to priorities
- Key performance indicators and alignment with national strategic evaluation indicators

- Specific allocation of responsibilities and peer accountability
- Budget and costing – including funding strategy and identification of funding sources
- Monitoring indicators, reporting processes, evaluation indicators and long-term impact indicators

Once the main research findings and recommendations have been presented, an interactive engagement needs to occur. A SWOT analysis or any other interactive process may be considered to consider the key findings and recommendations in terms of their main strengths, weaknesses, opportunities and threats for the development of the HCDS, and may be based on among other things, the thematic areas investigated in this research report:

- Contextual factors in the macro- and sectoral environment
- Employment trends, opportunities and constraints in the sector
- Education and supply trends, opportunities and constraints
- Dynamics and constraints in the learning and development pathways of professionals and managers in the biodiversity labour market
- Consideration of selected knowledge and research gaps

Suggested principles for a sector strategy

The research was based on a specific brief and therefore not exhaustive of all initiatives or evidence that may be relevant to the HCDS. However, flowing from the research a set of key principles emerged that may be useful to consider in the development of the strategy and its implementation. The Green Paper on Strategic Planning, lessons derived from the poor implementation of the first HRDS-SA and the successes of the JIPSA programme all provided pointers in terms of sector-based strategies requiring diverse inputs and commitment from a range of different institutions.

The key to successful **planning** is to be **selective** in the **choice** and **number** of priorities, rather than being over-ambitious about the length and breadth of the agenda. This does not imply “cherry-picking” only those priorities that are most easily

achievable, but the ones that are most strategic to move the sector closer to the desired end-state; in this case a diverse professional and managerial workforce with the requisite skills and competence to optimally implement the complex biodiversity conservation mandate in the next five to ten years.

The key to successful **coordination** is to be inclusive and allocate responsibilities according to the comparative advantage, niche areas of **expertise** of specific organisations in the sector in a balanced manner. Importantly, if the sector is aiming to work towards transformation, it has to start the way it aims to continue. Therefore, it needs to be inclusive and representative of the entire spectrum of people, organisations and expertise.

The key to successful **implementation** is a **clear communication strategy** to promote and advocate the strategy among policymakers for buy-in, funding and support; among participating stakeholders for buy-in and networks; and to inform and communicate clearly. In addition, to develop realistic expectations among affected employees (professionals and managers) and their representatives (labour unions or staff liaison committees).

The key to successful **monitoring** of implementation is the development of **clearly defined and measurable indicators** that are related to the outcomes, and linked to verifiable data sources.

The key to the **sustainability** of the strategy is to ensure that there is active and visible articulation between the sector priorities and related priorities of strategic networks, strategic policies and actors in the macroenvironment, where tradeoffs may have to be made in terms of the socioeconomic mandate of the sector.

Implicit to any human capacity intervention is a commitment to a **developmental process** that is **sustainable**, an active commitment to the principle of **lifelong learning** and development within the mandate of the biodiversity conservation sector. Finally, for sustainability of the HCDS, a **transformative approach** in **institutional cultures** to accommodate and integrate a more diverse workforce, instead of “business as usual”, will be fundamental. Given this background the following conceptual frameworks are proposed for consideration in framing the HCDS.

PROFESSIONAL DEVELOPMENT CONCEPTUAL FRAMEWORK

The research has shown that the development of science professionals is an organic process, happening over the life cycle of the individual. The abbreviated life histories of the research respondents confirmed the well-known fact that there are no readymade professionals and that the love or passion for nature and biodiversity may start early in life, but may also be developed over time. The biodiversity conservation sector was not a sector “open” to blacks and women in the past, and thus the process of development is going to take time, with no quick-fix solutions.

Thus, HCD should have at its centre the principle of lifelong learning, the assumption that formal, nonformal and informal learning and experience are acquired over time. In considering the ideal-type candidate that emerged from the research interviews, one is led to consider a conceptual framework for professional development that may develop these qualities over time, instead of an expectation that readymade candidates should be easily available.

The “ideal-type” profile of the biodiversity candidate, as suggested by the fieldwork, consists of the following characteristics: 1) passion or a “calling” for biodiversity conservation or nature; 2) a relevant science qualification, preferably at postgraduate level; 3) work experience, or work-readiness (driving skills, writing skills etc); 4) so-called “soft” skills including communication skills, writing skills and maturity.

The research also showed that there were a number of processes and life experiences that motivated professionals to enter the sector, including

- childhood/ family experiences or later experiences and exposure to the area
- interest in biodiversity- and conservation-related subjects at school and/or HE
- role models and mentors at school and/or HE
- settling for a “second choice” qualification after the first choice could not be realised
- opportunities and informal networks, including friends, colleagues and so on.

The fieldwork suggested that while the sector may have clear ideas as to the type of candidate it required, the processes of study and career choices were often incoherent and left to chance, circumstance or networks. While coincidences will

always form part of individual development pathways, the HCD strategy should seek to create more deliberate opportunities and spaces in terms of information, opportunities for exposure to the sector, and formal networks to reach a wider section of the target population of science learners, students, graduates and professionals.

This more deliberate approach is largely aimed at increasing access to opportunities for those who may not have direct access to, say, informal networks. It also reduces the impact of chance on study and career choices. This is especially important because there are huge social and demographic differences between the “older” and mostly white professional workforce and the younger and mostly black, incoming professional workforce. For instance, at university, male (even black) science students may establish informal networks and acquire mentors with male science professors (mostly white) much more easily than female black students for a range of sociocultural reasons. Thus, a consideration of the more intangible dynamics is often not considered when designing mentorship programmes for instance.

Kraak (2004:1) defines HRD as the stages in the “life cycle of human development”, each stage occurring in particular institutional settings and subsystems including:

- transition to school
- transition from school and entry into the world of work
- movements within and throughout the working life and the labour market
- exiting the labour market.

Thus, as shown earlier, the first three stages of the Kraak typology emerged as key areas (from the primary research) where interest in the sector and the profession started and grew over time. Thus, the life cycle approach (or “cradle to grave” approach) may be at the foundation of the proposed HCDS, in order to develop a fully-fledged biodiversity professional organically over the long term, with various short- and mid-term outcomes. This approach also reflects that proposed in the SANBI HCD strategy (SANBI, July 2008) document, and discussions held between the HSRC and SANBI prior to the research.

Below is a slightly revised version of the Kraak typology, with some adjustments being made based on the research. There are three key stages in the professional development conceptual framework with accompanying levels:

- **Schooling**, which includes early childhood development (ECD), primary schooling (Grades 1–7 or GET), junior high (Grades 8–9 or GET), senior high (Grades 10–12 or FET) levels
- **Higher education (HE)**, which includes undergraduate level, honours level, master's & PhD level
- The **working life and the labour market**, which includes the entry-level professional, the mid-career professional, retirement professional and the post-retirement professional

The intention is to recognise that each of these stages is important, but not that the sector will have to give equal attention to each. It may intervene and support in a selective manner, based on an assessment of the priorities, internal capacity and resources. A selective approach is key to success, because the development of a biodiversity professional is subject to a range of other factors, dynamics, institutions and so on. Professional development is also not at the behest of the biodiversity sector alone, but in combination with many other sectors (often in competition with the biodiversity sector), the state, communities, economic and technological developments.

The developmental approach proposed here is in line with the requirements of the Employment Equity Act (DOL, 1998) to transform the professional workforce. Thus, the Act specifically refers to the advancement of those from designated groups (Africans, coloureds, Indians, women and people with disabilities) who are **suitably qualified**, as opposed to the advancement of designated groups purely on the basis of population group, gender or disability alone. The requirements for a person to be suitably qualified are found in section 20(3) which proposes four criteria. A person may be suitably qualified for a job as a result of any one of, or any combination of, that person's

- formal qualifications

- prior learning (in the absence of formal qualifications, to conduct an assessment of vocational or work experience in terms of the relevant NQF equivalent criteria)
- relevant experience, or
- capacity to acquire, within a reasonable time, the ability to do the job.

Implicit in this provision is that candidates from the designated groups may not arrive with the necessary suite of qualifications and skills, but may have the *potential to acquire* these over a reasonable time. A **developmental approach** implies that fundamental to the drive to increase the pool of black (and black women) professionals and managers is to *identify those with potential*, which would be in line with the intentions of the Act. This may apply to those entering the sector and those already in the sector. It also implies a **remedial approach**, as the assumption is that, given the challenges in the education system and in the labour market, the sector's interventions of necessity will be in support of other parts of the education and skills development system. The intention is not to reinvent the wheel by thinly distributing scarce resources over many areas and interventions, thus wasting resources and not up-scaling to optimal effect.

The HCDS occurs in a wider societal context, and cannot be seen to be acting in isolation if it is to enjoy credibility and elicit support in the wider science community, policymakers, the education and skills development system and communities. It will have to consider the wider context and forces it will have to contend with, influence, support and interact with. For the remainder of the next five years, the Green Paper on National Strategic Planning (if it is accepted) is likely to serve as the barometer of the effectiveness and efficiency of national and sectoral planning and implementation against which the proposed HCDS may have to align itself.

PROPOSED HCD CONCEPTUAL FRAMEWORK

The second conceptual framework that is suggested by the research runs alongside the professional development conceptual framework. The proposed HCD conceptual framework consists of an analysis of the major ideas or perceptions, legislative and/or policy frameworks, institutions, processes, resources and programmes across three domains. These are

- the **macro- or external environment** (the “big picture”), which encompasses systemic and structural forces, including curriculum development challenges, transformation imperatives, funding and so on
- the **sector context** where, in combination, sector stakeholders develop a more strategic interpretation of the possibilities of implementation, given structural and organisational forces
- the **micro- or organisational context**, which is where implementation of the HCDS happens, including allocation of resources, feedback on processes and so forth. This is the **core location for implementation and buy-in**. This is also the best location from which best practice models may be sourced and where the biggest risk to the process is located, as the nature of organisational buy-in will determine success or failure.

The two proposed frameworks act in sync so that, at each stage of the professional life cycle, aspects of each of the three domains may be in place. The example in Table 7.1 attempts to illustrate how a priority may be implemented within these frameworks. Please note that this example is for illustrative purposes only, and may not be a priority area in the proposed HCDS.

Table 7.1: Conceptual framework – biodiversity awareness in 30 primary schools in previously disadvantaged areas

Schooling stage	MACRO ("the big picture")	SECTOR ("the strategic sector" level)	MICRO/ORGANISATION ("the grassroots organisation")
Issue: creating an awareness of the importance of biodiversity conservation. Objective: In 2009–2010 target 50 schools in previously disadvantaged areas about the importance of biodiversity			
Primary (G1–7)	Ideas/perceptions: Biodiversity is important, but not a priority because the first priority is to improve international scores on literacy and numeracy since SA is last on the international list.	Ideas/perceptions: How can the sector incorporate relevant content on biodiversity in reading and writing techniques aimed at learners or teachers.	Ideas/perceptions: Eco-school books that can be used in junior primary for Grade 2.
	Legislative/policy framework: Curriculum framework	Legislative/policy framework: None applicable.	Legislative/policy framework: Discuss intellectual property rights with organisation X.
	Target Institutions: Department of Basic Education (DBE)	Target institutions: Education subcommittee of HCD to negotiate a formal agreement with DBE.	Target institutions: Board of Organisation X to give approval.
	Social /bureaucratic processes: Approval from national curriculum advisers to use proposed G2 primer to meet curriculum requirements.	Social/bureaucratic processes: Application to the DBE committee of curriculum advisors	Social /bureaucratic Processes: Example of book to be promoted.
	Resources available: Budget for textbooks has been allocated, but has already been spent.	Resources available/to be identified: Textbook publisher has agreed to print XX copies in return for [unspecified reward]	Resources available/to be identified: Eco-school books — no funding for distribution and printing Share-Net to be approached.
	Existing programmes: Textbook programme funded by Treasury	Existing programmes: Yes New programmes:	Existing programmes: Yes New programmes:

The HCDS will have most of its authority in the second (sector) and third (organisational) domains, that is, where the sector exercises control and has the ability to shape the processes and implementation. These sources of authority operate separately across organisations in the sector, within each stakeholder organisation and in combination. While the sector may not necessarily exert control at a macrolevel, it may manage upwards by leveraging access as needed, building on and complementing existing infrastructure and programmes, and work in conjunction with other structures similar to itself. This is where the idea of “champions for biodiversity” in “making biodiversity visible” is so important in the forthcoming period.

The next section summarises the key factors and dynamics affecting the recruitment, development, retention and exit of biodiversity professionals, as well as key recommendations arising from the research and available literature. It is structured around the life-cycle stages but at an aggregate level, for instance schooling, instead of ECD, junior primary and so on. In each life-cycle stage a series of challenges are outlined, followed by a recommended intervention as well as research/knowledge gaps. The rationale and background for each of the challenges are discussed in more detail in the relevant chapters and are not repeated here.

BACKGROUND TO THE RECOMMENDATIONS

The purpose of the research was to provide a statistical background on the key issues affecting the recruitment, retention, development and exit of qualified and experienced professionals and managers in the biodiversity conservation sector. This was done in support of the drive in the biodiversity sector to become a “sector of choice”, through the development of an HCD strategy, which would address the twin challenges of transforming the sector to be more representative and the problem of scarce skills by attracting and retaining qualified and experienced science professionals and managers.

The research methodology combined two interlinked processes: analysis of *quantitative* data (including official and administrative statistics and other secondary research data) as well as *qualitative* data derived from interviews and the analysis of documentary evidence. The biodiversity conservation HCD research process

coincided with the development of the Environmental Sector Skills Plan (ESSP) by the DEAT, and research data on the biodiversity sector was integrated into the HCD research as appropriate. Through a process of triangulation, the aim was to provide a more holistic and evidence-based background to the development of an HCD Strategy in the sector. It is important to bear in mind that the quantity and quality of data in South Africa are very uneven and not always comprehensive in nature, especially on employment trends. This is a perennial problem in South Africa, and not specific to this project. In order to ensure the validity and reliability of the results, various sets of data were triangulated and compared to arrive at the best possible estimates. Scientific research principles of design and analysis were used in the statistical analysis of the secondary data and in the collection and analysis of the primary data.

This research should be regarded as the start of an investigative process that would seek to reflect on changes in the broader context on a continuous basis and update sectoral intelligence in order to shape the HCD processes at organisational level. The research was not exhaustive, but provided a baseline set of information and data on the most fundamental issues. Inevitably it uncovered gaps in knowledge and information, which may be the starting points for future investigations to improve depth of knowledge and inform planning.

RECOMMENDATIONS

The recommendations are not ranked in order of importance. The final determination of a hierarchy of priorities is subject to factors outside the scope of the research team. However, as indicated at the end of Chapter 6, the research findings and recommendations may be considered within the framework of a SWOT analysis or any other form of interactive process in order to verify and start developing a hierarchy of priorities in the light of the available resources, risks, capacity, funding and so forth. The sector interventions have to be selective based on an assessment of its short-term needs, capacity and short implementation lead times (next 12 months); in the medium term (3–5 years) and in the longer term (6–10 years).

Naming of the sector strategy – human capital, resources or capacity?

Chapter 1 put forward a case for the use of terms other than human capital, including human capacity or human resources. The term “capital”, in its complex form and as applied to either natural or human capital, has normative value. Thus, in the production of ecosystem goods and services, mostly of a public goods nature, the larger proportion of the sector is not driven by the principles of profitability or pure economic or commercial returns on any investment in the development and preservation of both natural and human resources. While there are useful elements in human capital theory, its theoretical and practical application may not have sufficient relevance in South Africa or the sector in particular, given the poor relationship between education and economic growth and the lack of HR capacity to measure productivity gains from education investments and so on. Instead, terms such as human capacity or even human resource development are less contested in their normative value and may equally well refer to a long-term approach in the development of knowledge, skills and expertise among the existing and future professional and managerial workforce in the biodiversity conservation sector.

Recommendation: It is up to the stakeholders to decide which term will most closely align with the value system they wish to promote among themselves and in the public domain.

Developing a vision for HCDS

Implicit in the drive for an effective HCD strategy is that it should enable the sector to make a case for the social and economic importance of biodiversity conservation and achieve sustainable tradeoffs between development and biodiversity conservation. For this to happen this sector has to move out from under the scientific radar and **make biodiversity conservation visible**, to policy makers and politicians (on the benefits of sustainable development), to parents and learners (biodiversity as a career and study choice), to mining companies (on tax incentives for “green” technology production), to financiers (on funding business plans for indigenous plant production) and so forth. Given the economic recession, the end of which is as yet not in sight, the policy, fiscal and political spaces for trade off are decreasing.

Recommendation: The sector needs to develop an advocacy strategy to promote both the HCDS and the social and economic value of the sector. Promotional material must be geared to the media (radio and TV, print media), relevant departments and Parliament. The key focus is to situate the HCDS within the social and developmental role of the biodiversity conservation sector as a whole, instead of the HCDS only.

The second focus of the advocacy plan is to foreground the proposed HCDS as part of the national education and skills agenda, as a strategic means to increase the space for tradeoffs between development *and* biodiversity conservation in a more sustainable manner. For the HCDS this means that the way that the sector strategy is framed and presented should illustrate very clearly the tangible benefits of the HCDS to the national agenda on education, skills and socioeconomic development.

Promotion of the public image of biodiversity

With regard to the promotion of the social and economic importance of the biodiversity conservation in the life of the nation, scientists (in the fieldwork) felt that despite the growing acknowledgement of the importance of the sector, the sector was still not capturing the imagination of politicians and communities in a positive way. Some thought this was due to the lack of a “people-centred” approach to biodiversity and a predominant focus on plants and animals. One recommendation was to consciously develop **champions for biodiversity**, that is, prominent public

figures whose main task would be to raise the profile of the sector in terms of its relevance to society and its role in the life and development of the nation.

The multifaceted nature of transformation

In considering the macroenvironment, the underlying mandate guiding the biodiversity conservation sector is to maintain the balance between development and biodiversity in a transformative manner. Thus, the National Biodiversity Strategy and Action Plan (NBSAP) (DEAT, 2005) defines its overall goal as the conservation and management of South Africa's biodiversity (on land and in water) to ensure sustainable and equitable benefits to the South African population in the short and long term. This transformative approach may manifest itself in three ways, as summarised in internal sector discussions on capacity development (Raven, 2008).

Firstly, the workforce in biodiversity conservation institutions has to become more diverse and representative of the South African population. Secondly, the culture of biodiversity conservation should shift from being exclusionary and sanction-based, that is, from "fences and fines" to being inclusive of the whole population, integrated and people-centred. Thirdly, in order to develop a common vision of biodiversity, conservation collaboration and inter-institutional relationships should be encouraged. It is this transformative vision that should be kept upfront when considering the diverse challenges and tradeoffs presented by the macroenvironment.

Recommendation: The above really refers to a way of working as well as the image and values that the sector wishes to project. The three features of transformation are not new to the sector, yet it appears that it has had difficulty in making transformation not just about fulfilling the numbers (for e.g. how many black managers? how many hectares of land transferred?) but also about the societal values and image that it projects.

Macroenvironment: risks and opportunities

The macroenvironment is currently in flux, and the planning framework articulated in Vision 2025, as proposed by the National Planning Commission, presents the biggest opportunity for inter-institutional building, collaboration and advocating of the HCDS within the MTSF focus on education and skills development.

Recommendation: the sector should assess whether it would like the HCDS to track closely and be aligned to both the MTSF (in terms of its implications and opportunities) and the Planning Commission, and how this should be done.

The implications of the economic downturn

The recent economic downturn implies that less money may be available for the implementation of the HCDS, as government departments reduce and reprioritise expenditure, while other organisations in the sector experience further cuts in grant, government and other funding. The second risk is that environmental sustainability and natural resource management may slip lower down the social and economic agenda. The opportunity here is that there is a more upfront commitment by government to education and skills development as the “bedrock” to grow the economy and meet social and developmental priorities.

Recommendation: The HCDS of the biodiversity sector must be framed and promoted as **part of the national agenda on education and skills development** with a clear outline of the **tangible benefits** to the national developmental agenda if funded partly or fully. A similar approach should apply to external funders. The objective would be to use the HCDS as a **strategic means** to increase the space for tradeoffs between development *and* biodiversity conservation and to keep sustainable biodiversity conservation on the national agenda.

Strategic linkages to government strategies

Vision 2025

The proposed National Plan will set a clear 15-year development path for the country, and if endorsed, Vision 2025 may provide more opportunity for policy articulation, both in policy development and policy implementation.

Recommendation: Engagement of the proposals in the Green Paper, and eventually the White Paper, will be essential to influence and shape the final agenda for the development path for the country..

The National Planning Commission

The Green Paper on Strategic Planning released in 2009 presents a coordinated approach to national and sector-level planning. If the recommendations are accepted the NPC will become the “one-stop shop” for integrated and coordinated planning across all spheres of government, with implications for NGOs, NPOs and the private sector as well. While the various policy and legislative frameworks discussed in Chapter 1 will still be applicable, coordination and articulation are meant to be enhanced under the NPC.

If the principles of strategic planning, as well as the idea of Vision 2025, are accepted all spheres of government will have to develop sophisticated planning capacity as well as implementation capacity, which will affect NGOs and the private sector as well. In preparation for this, the HCDS may need to decide to assess whether it will strategically orientate itself to these planning principles. The planning principles are all geared to articulation, that is, for HCD priorities to speak to strategic policies and priorities affecting the mandate of the biodiversity sector, other departments (mining, trade & industry, agriculture, science & innovation) and so forth.

Recommendation: It is important to consider how a strategic relationship be developed between the HCDS leadership structure and relevant stakeholders in the NPC, either at an institutional level or sectoral level, and the way in which it will be pursued.

Based on a consideration of the macro-issues (outlined in Chapter 1) and the underlying principle of integrated strategic planning, the sector will need to decide how to develop articulation between the

- strategic HCDS sector plan and the independent HCD plans of biodiversity organisations and other environmental subsectors (based on the DEAT ESSP process)

- HCD strategic priorities related to the strategic priorities of the basic education and higher education frameworks
- HCDS strategic priorities and how these relate to sectoral inputs into the NSDS III (to be developed in 2010 and finalised by March 2011)
- HCDS strategic priorities and selected priorities or interventions in the R&D strategy
- HCDS strategic priorities and selected priorities or interventions in the national HRDS-SA (not yet finalised) and the HRD strategy in the public sector
- HCDS strategic priorities and tradeoffs that the biodiversity sector may have to develop with regard to the priorities of the MTSF, the NIPF, the NIP and the Spatial Development Plan, all of which may be coordinated *via* the NPC.

The Human Resource Development Strategy

The HRDS-SA represents an opportunity for the sector to link with strategic departments, including the newly created Department of Higher Education and Training (DoHET) and the Presidency across all systemic efforts to improve delivery of education and skills development and to build inter-institutional relationships. The HCDS should attempt to function in conjunction with the HRDS-SA strategic priorities when these are released, and complement them by developing cooperative relationships with key partners.

The public infrastructure investment programme (PIIP)

The potentially harmful effects of the infrastructure programme on ecosystems is mitigated by the commitment under the MTSF to undertake such expansion while “considering environmental sustainability” and “pursuing maximum employment impact”. The programme is ongoing, from 2009 to 2012, so immediate responses are required. The BUILD programme by ESKOM has similar implications for which a more long-term assessment of current capacity and future skills development interventions may be needed.

Recommendation: Consider the development of a dedicated subgroup to understand the impact of PIIP and shape HCD responses at national, provincial and local level,

with supporting information from the research community. Part of its task would be to model the potential effect of the PIIP, either as part of the proposed research strategy or as a direct output of the HCDS. A scan should be conducted of current organisational responses to PIIP and gaps in the types of capacity that may be needed, including monitoring and environmental impact assessments among others. In the short term, monitoring capacity may be needed based on short-term skills programmes. The implications of the PIIP should be factored into the final scarce skills list.

Knowledge gap: There needs to be an overview of responses of participating organisations in PIIP that may already have responses and capacity gap analyses. Modelling of the results of the environmental impact of the PIIP should take place.

ESKOM's BUILD programme

The massive capacity generation of electricity will impact on the sector via increased coal-mining activity and nuclear power generation, as well as the location of new plants.

Recommendation: This issue is closely linked to the response to the PIIP. The biodiversity sector has developed capacity to deal with the impact of mining and nuclear energy, but the increased rollout based on the BUILD programme will require research input that models the projected impact in terms of the geographical spread (spatial impact), water usage, wastage and so forth. There is a need to develop articulation in terms of input into the Spatial Development Plan, which will fall under the NPC (subject to endorsement of the Green Paper on Strategic Planning).

MTSF commitment to sustainable NRM use

The full-scale implementation of the IPAP under the MTSF includes a commitment to balance increased industrialisation, “advanced manufacturing” with “cleaner low-energy technologies and green jobs”, as described in the MTSF priority on sustainable resource management use. This implies the development of technologies, techniques and guidelines to ensure sustainable food production techniques, efficient energy use and a zero-tolerance approach to unsustainable resource exploitation.

Recommendation: Form a task team with other environmental subsectors to jointly consider approaches to technology and knowledge development. This may fall outside the HCDS and other relevant structures for innovation and researchers may need to be drawn in to assess the current status of sustainable production technologies and so on.

Information on existing programmes developing sustainable production techniques should be consolidated to determine the types of capacity and skills required, including policy, research, technological and implementation capacity within the biodiversity conservation sector. The development of the biodiversity research policy will be key to scanning local and international best practice on technologies and techniques and the development of partnerships for knowledge and innovation transfers with relevant countries.

The “green economy”

The MTSF has a more nuanced view of sustainable development compared to that of the NIPF and to a lesser extent the NIP, both of which emphasise a more overtly commercial approach to the role of biodiversity. However, taking the lead from the MTSF, the idea of the “green economy” may also shape and direct them (NIPF and NIP) and the DTI to more environmentally friendly interpretations. Improved articulation of government policies presents an opportunity for the sector to discuss the possible tradeoffs with regard to bio-prospecting, indigenous knowledge, indigenous pharmaceuticals, energy security, mining and so forth.

Recommendation: Explore opportunities (including DTI, DST and DWEA) for joint research in the development of technologies for the so-called “green economy” including, as mentioned previously, the development of sustainable production techniques, guidelines for sustainable use and monitoring and enforcement. Bio-prospecting is clearly key to the HCDS and an assessment of existing capacity and future research, policy development, production techniques and legal knowledge is important. Patent rights and protection of intellectual knowledge are growth areas, and the extent to which additional capacity could be developed in terms of top-up courses for conservation managers should be investigated. The CSIR’s experience in this regard may be useful.

The next two sections look at two important policies with direct implications for the sector, that is the NIPF and the NIP, and their inter-relationship with the priorities set out in the MTSF. The HCDS will have to consider capacity needs at two levels to engage in this process: one, capacity to engage effectively with all three policy frameworks, the associated departments and institutions on implications for the sector and possible tradeoffs, and two, identify the size and nature of skills capacity to develop alternative, “greener” techniques, practices and technologies as part of the industrialisation path.

The impact of the NIPF

There are contradictions in the apparent commitment of the MTSF to sustainable natural resource management use and the relatively unfettered “deepening industrialisation path” adopted in the NIPF. These contradictions need to be engaged, and in the process tradeoffs may be required from all stakeholders involved.

Recommendation: A range of intergovernmental engagements (e.g. with the DTI) may be necessary in order to estimate the implications the NIPF would have for skills development. A more proactive approach to the tradeoffs may need to be adopted instead of a reactive approach. This implies a need for improved communication and negotiation skills among senior scientists in order to engage in these discussions.

As shown earlier on, the determination of skills capacity needs is likely to go hand in hand with the development and implementation of research policy in the biodiversity conservation sector. Thus, there may be scientific research gaps on sustainable production techniques and economic valuation techniques for instance, without which it would be difficult to determine the implications for skills, knowledge, technical gaps, potential curriculum and course content where required.

DST collaborative initiative

There is an overlap between DST activities and the sector that needs to be explored; alternatively, existing collaborations could be extended and transformed to fit the HCDS objectives.

Recommendations: The following are areas of possible collaboration:

The commercialisation of natural resources initiatives:

- as noted under the previous point on the “Green economy”, research collaboration will have to be considered to develop alternative techniques.

Educational capacity-building programmes for learners and students, including the NYS initiative (work readiness programme) , the learner and teacher camps (YiSS programme).

Up scaling sector participation in the postgraduate capacity-building initiatives where possible, or emulating these initiatives where feasible

The SA Research Chairs Initiative – to assess the way research chairs could promote the development of trans-disciplinary research on new and emerging research areas such as ecological-economic modelling for instance

Assess the extent and nature of HCD interventions currently being funding through the NRF, and how these could be extended and improved given anticipated budget cuts.

Knowledge gaps:

- More information is needed on the NYS initiative and its potential as a work readiness programme for science graduates.
- More information is needed on the Public Understanding of Science initiative to develop an understanding of what improves communication with the public on the importance of science and science studies.
- The development of a profile of all the DST-related programmes (related to HCD) that biodiversity institutions are already involved in (e.g. the number of DST internships in the sector), and feedback on the value and success of these interventions. Where appropriate these programmes could be assessed

for replication, depending on resource availability. One example of replication was the DST adoption of the SAICA model of camps for learners to improve performance in mathematics and science.

Budgetary cuts and flagship projects

Based on the MTEF, projected trends budgets are likely to be adjusted downwards. This is likely to affect recruitment demand negatively, exacerbating existing declines in employment growth in the sector over the last number of years as indicated in Chapter 2. This implies that the HCDS may have to prioritise the scope and hierarchy of its priorities very carefully and which of its interventions to bring to scale and the HCD choices of a flagship project.

One of the key growth areas for investment is the trans-frontier and protected areas, as indicated in the DEAT budget votes and commitments under the MTSF. Based on the results of the fieldwork and in the literature, capacity development in these areas is likely to have very significant effects in the range of communities affected, eco-tourism possibilities and transformation possibilities.

Recommendation: If the sector had to settle on a flagship project, the trans-frontier and protected areas would probably be one to consider for its potential to attract funding and to showcase the delivery of socioeconomic effects through improved capacity building among black reserve managers, professionals and technicians in these areas. Thus, an assessment needs to be done about the feasibility of these areas as a possible flagship project. Recommendations on proposed education and training for these employee categories follow later on.

The next section looks at recommendations based on the life cycle stages. Where appropriate recommendations related to other macro-factors such as the NSDS will be integrated.

Education and supply-side interventions

Schooling

Employment in the sector has been declining (see Chapter 2) and in the face of the current economic recession it is not likely to improve. Thus, recruitment demand is likely to slow down even more. Therefore in the short to medium term it is unlikely that the sector will embark on a major recruitment drive for new learners. In the interim, it is likely that the focus of the HCDS will be on the development and extension of internal capacity (the existing workforce) to become more efficient and effective in delivery rather than massive injections of external capacity (new recruits).

Therefore, any investment in schooling is likely to focus on the long-term improvement of information and knowledge on the sector image, as well as the support and up scaling of existing biodiversity-related initiatives or other strategic initiatives. Thus, once the economic turnaround arrives and is sustained, priorities may once again move to a more in-depth focus on schooling.

The promotion of the profession

The fieldwork showed that there are several entry points in the life cycle of professionals, including childhood and schooling, to promote and motivate subject choices and study fields that may create an awareness of biodiversity-related professions. These professions are not always regarded as professions of choice in terms of the image projected, and this is related to perceptions of low salaries and the “khaki” image. Furthermore, in terms of the type of career information available, this is often of a technical nature (subject choices and marks) and does not inform learners about the lifestyle, conditions and challenges of becoming a ranger, a conservation manager or a scientist. In addition, it is not always clear the extent to which initiatives such as career exhibitions result in appropriate subject and study choices. Nor is there evidence that eco-schools positively affect the study and career choices of young learners. The research confirmed that school subjects related to the biodiversity sector should be promoted in interesting ways.

Knowledge gap: It was not within the brief of this research to assess the extent to which environmental education initiatives (including eco-schools etc) contribute to

subject, study field and career choices. It is recommended that, given that these programmes are widely known and accepted in the sector, that an evaluation be done, focusing not on their capacity to raise awareness of biodiversity, but their capacity to shift learners into the life sciences.

Training provision: environmental education and awareness

Environmental education contributes substantially to the awareness process, but the research identified that there were systemic capacity constraints in environmental education including a lack of coordination among the various service providers and the absence of a common framework in terms of quality, standards and curricula. Questions have also been raised about the quality of accredited training providers in the sector.

Recommendation: A subcommittee should consider questions regarding the nature, relevance and quality of training and other environmental programmes in the sector, as well as issues of coordination and quality assurance.

Recommendation: SANParks currently conducts a large-scale environmental education programme for learners, but the DEAT budget shows that the numbers are likely to remain fairly stagnant for the rest of the MTSF. It may be important to assess the role that this programme may play in terms of shaping the subject and career choices of learners and students, given its size and target group.

Recommendation: The research confirmed the importance of role models and mentors in study and career choices. It was suggested that careers information include the development of life and career histories of outstanding rangers, conservation managers and scientists, in order to bring the sector alive instead of focusing primarily on subject choices and entry requirements. Innovative and interactive electronic media formats should be considered, drawing from the work of the SANBI Mainstreaming Directorate.

A recommendation from the fieldwork was to mainstream the relevance of science subjects at school level.

Knowledge gap: In the longer term the HCDS may consider a study investigating the way young graduates and learners perceive the sector in terms of career and development opportunities for young professionals.

Lessons from the YiSS

The YiSS programme conducted by the DST is one of their strategic initiatives for creating an awareness of SET, improving performance in mathematics and science and encouraging entry into SET careers. It is modelled on similar camps run by SAICA, which have been successful in increasing the number of black and women students studying and working in accountancy-related fields.

Recommendation: There is an extensive list of recommendations in Chapter 3, which may be consulted for future reference. It is proposed that the sector links up with SAICA to draw on its experiences regarding the role of these interventions to improve entry into science professions.

Poor competency rates in numeracy and literacy

South Africa has consistently performed poorly in international benchmark tests on numeracy and literacy in GET.

Recommendation: It should be ascertained whether there is a role for the biodiversity sector in efforts to improve teacher quality and learner performance in mathematics and science. The key caveat to building a relationship with schools to improve the quality of mathematics and science performance and subject choice is that the benefits will accrue to other sectors and occupations as well. Thus, it would be an intervention aimed to benefit the broader public, whether at Grade 9 or higher levels. The Dinaledi schools programme (referred to in Chapter 3) is a government initiative and, in conjunction with the Department of Basic Education, the sector may consider supporting a group of schools as part of this initiative.

Influencing study choices

The fieldwork and lessons from the YiSS suggest that factors underpinning study choices are multifaceted, and often choices are made on the basis of no or partial information. The availability of funding, as well as coincidence or circumstance, may play a role in subject and career choices.

Recommendation: The chapter on learner study and career choices indicated that the most effective way to shift quality learners into the sector may be a dedicated programme (such as the initiative conducted by the accounting profession through

the South African Institute for Chartered Accountants [SAICA]), which literally takes students from school to university through the provision of financial support (bursaries) and active mentorship until they land up in the workplace. The DST runs a Youth Incentive Scheme where students who receive bursaries are bound by a set of conditions, including having to attend the YiSS camps as mentors to learners, agreeing to complete their studies, and remaining in the country and in the profession.

Some of the respondents in the research indicated that any kind of support should be given to any learner who has the enthusiasm and the willingness to work. It is assumed that there will be a “weeding-out” process that will determine those who will fall out along the way and those who are more likely to remain or move into the sector in the long run.

Higher education

Undergraduate qualifications in biodiversity-related fields grew at an annual average rate of 5.2%, just below the sector’s overall growth rate of 5.8% (see Table 4.2). The results suggest that the sector has access to a sizable number of entry-level graduates. Output of National Diplomas grew the fastest (10.7% p.a.), but from a very low base. The slowest growth was observed in honours/masters, increasing at a rate of 3.3% on average, considerably below the sector which was at 5.8%. Thus, compared to earlier on in the period, fewer students were proceeding to honours/masters on completion of undergraduate degrees. This is further supported by the widening gap between the supply of degrees and honours/masters supply. This confirms concerns in the field that postgraduate supply at this level is in short supply, both in the biodiversity sector and on a national level. While the supply of doctoral qualifications increased by 6.5% on average over the period, it stagnated in the latter part of the period under investigation. The number of postgraduates remained insufficient as, in 2007, the biodiversity pipeline had just under 1 000 honours graduates (54% black) and 500 master’s (46% black) available to the entire economy. Therefore, the supply patterns suggest that the scale of increase may not have been sufficient (given competition from other sectors).

Chapter 2 on employment trends showed that the share of associate professionals and core professionals with degrees declined over the period. The proportion of associate professionals with an NQF 4 level (equivalent to matric) more than doubled, from 11.4% to 26.2%. These results also confirm the point made earlier on that, despite limited improvements in the supply system, blacks with first or postgraduate degrees were not entering the sector.

The research confirmed that finding black candidates with the requisite master's qualification was generally regarded as difficult. Getting the "*cream of the crop*" with either a masters or a PhD degree, that is, top black postgraduates, was regarded as even more difficult. The data suggest that, when they did enter the sector, they did so in managerial positions.

The reasons for the lack of movement into the sector are not always clear, although the research indicates that there is a perception that the sector is a low-salary environment and that attractive offers from outside the sector may play a role.

Progression into postgraduate qualifications

The proportion of biodiversity postgraduates has been decreasing, while the proportion of postgraduates in SET and higher education in general has been increasing since 2000. This drop in postgraduate proportions in biodiversity-related fields of study is as a result of a decrease in the proportion of honours and master's degree graduations which feed doctoral studies.

A key challenge is that the decline in economic growth (1.2% for 2009) is likely to drive down enrolments and graduations, as students cannot afford to do postgraduate studies or they have to seek employment owing to increased financial stress in families. This is a particular problem in black families and was confirmed in the research.

Recommendation: The sector needs to consider a programme that will facilitate and support the transition from honours to master's for a targeted group of black students at a selection of universities. However, this needs to be preceded by an overview of similar programmes (bursary, internship, studentship of honours, master's and doctoral students) currently being undertaken by institutions in the sector in order to calculate potential supply, their demographic profile, the type of courses being

undertaken, and the lag time between registration and completion. Thus, there needs to be an assessment of the potential supply patterns and which areas of specialisation will determine the extent to which a sector-wide process will be required. Also, once the assessment of scarce skills needs is done, any extra capacity that is needed would determine the size and nature of this programme, as well as funding requirements.

The NRF has a top-up funding scheme which complements bursaries awarded by organisations so that students receive enough money to survive. Financial support that is inadequate in terms of living needs of students will result in them having to find employment, potentially jeopardising their chances to complete their studies.

Risk: The declining recruitment demand in the sector implies that the sector may not be able to employ graduates who have been recruited to take part in this programme. If there are organisations in the sector that are able to train above equilibrium (i.e. to train more than is needed), they could take on this type of support programme.

The supply–skills mismatch

The fieldwork research and the documentary analysis indicate that the qualifications attained in HE are often regarded as inappropriate in terms of what is required in the workplace. Thus, there appears to be a mismatch between what is required in the workplace (given new and complex policy demands) and what the universities and other providers offer. There were differences in the way this apparent mismatch was interpreted. On the one hand, some qualifications were regarded as too generalist in nature and as not enabling graduates to engage in technical fields of research or to address problems in the working environment. On the other hand, others argued that the current output of qualifications was too discipline-specific and did not meet the multidisciplinary knowledge and expertise required, given the new and complex demands of the workplace. Thus complex skills mixes across the social sciences, natural/life sciences, ecological-economic modelling and resource economics were cases in point in the development of a new generation of professionals.

Recommendation: The sector needs to develop a partnership with strategic HE institutions in order to discuss the new and changing operational requirements and

their implications for curricular reform, as well as the use value of existing qualifications in the labour market. Specialists in the field need to engage with curriculum designers in finding ways in which existing qualifications may be modified to make them more suitable for the changing demands.

Recommendation: Prior to such an approach an audit of the most common qualifications that are currently held and acquired by entry-level associate professionals and professionals needs to be carried out. This is especially important for first degrees, honours and master's degrees. A committee of experts should consider the qualifications based on their general utility in the field as well as their application to scarce skills fields. Once the qualifications have been ranked, a discussion with the HE may resume in order to assess and give feedback on possibilities for reform.

Recommendation: Communities of Experts (CEP) under the QCTO are similar to professional bodies regarding their cooperation with the CHE on the theory and experiential learning required for professional registration. The professional association in the engineering sector (ECSA) is such an example. This body helps to determine, through an assessment of various university courses, the appropriateness of theoretical offerings. It determines the number of working hours a person should spend in a working environment before that person is ready for registration. In the absence of a professional association the CEP may take over this role.

Knowledge gap: Information is needed on CEPs as well as more detail on how they work and the requirements for establishment and membership.

It is proposed that more information be gathered among a wider range of HEIs on the same areas covered in the research. Additional areas may include, among others, the nature and work-relevance of current courses and curricula, turnover of lecturers and sector–HEI cooperation, especially with those that are outside the main centres and/or specialising in biodiversity-related research and study fields.

Knowledge gap: The SET 4Women advisory committee in the NACI (National Advisory Council on Innovation) commissioned a study on women role models, tracing their life and career histories to illustrate the obstacles and challenges faced by women scientists in the SET field (Maree *et al*, 2008). This model of investigation

may be replicated to understand the dynamics in the development of role models, to profile specific types of role models, such as blacks and women (outstanding scientists and conservation managers) and to develop as a marketing tool. Finally, there is a need to investigate the dynamics of black women who have obtained master's degrees but do not proceed to doctoral studies in biodiversity-related study fields.

Quality of formal training

The research has shown that both HR managers and scientists identified a major weakness in terms of the quality of new graduates (with an undergraduate or honours degree) in terms of the quality of their formal training, their lack of work experience and the lack of funding to improve the employability characteristics of new entrants.

Recommendation: The NSDS and the SETA system appears to be one of the sources of support that has been under-utilised for a range of reasons, including the confusion over the scope of coverage, the bureaucratic burden, perception of poor service delivery and the focus of the SETAs on the lower skills levels.

As part of the HCD strategy it may be feasible to explore the extent to which the sector can become more of a driver of the SETA strategies and priorities, and use the opportunities this presents to a larger extent than may have been the case thus far. The NSDS and SETA system (given the realignment with the FE and HE sub-system) represent important opportunities, including

- more relevant, better quality training and training providers (non-university)
- accessing funding through the SETA system
- building sector partnerships with FE and HE institutions at NQF levels 5 to 10
- developing a workplace-based work experience component in all forms of training
- establishing a dedicated sector subcommittee on skills development to build and monitor this relationship, reflecting all the stakeholders from NGOs, parks and relevant HE departments.

In return, the sector will have to jump through some bureaucratic hoops, making more optimal utilisation of their HR departments and using the advice of a network of experienced consultants already in the sector. The mindset will also have to change, that is, shifting the prevailing idea of dismissing the SETAs as being for those on lower skills levels, NQF levels 4 and lower. Learnerships may be registered at NQF 5 and higher, and the establishment of the new Quality Council for the Trades and Occupations (QCTO) will ensure that all qualifications are vetted and registered on the basis of agreed standards in cooperation with the Higher Education Quality Council (HEQC). The QCTO will quality assure, accredit and register qualifications that are occupationally based. It will also allow for progression within, and articulation between, occupation-based skills development and further and higher education to a much higher level. Many higher education professional qualifications (degrees) related to the biodiversity sector will still have to be quality assured and registered by the HEQC. These are two institutions that will be essential in developing partnerships in the next five years in order to start shaping the type and quality of the qualifications produced by the education and skills development systems.

Recommendation: Firstly, in order to close the gap between the sector skills needs and the nature of provision, a review of training providers (both public and private, higher and further education) relevant to the sector should be carried out.

A review of the SETAs has shown that training providers tend to drive the supply of training in sectors, which would seem to be the case with HE providers as well. There are many problems with regard to the link between the biodiversity conservation sector and the providers. In the THETA, training has been largely geared at NQF level 4 and below. However, professionals in the sector require training at the NQF level 5 and above.

There are two key issues to consider here: Firstly, the establishment of a SETA in the natural resource management sector could still be pursued in the light of the shift in the skills development function from the Department of Labour to the Department of Higher Education and Training (DoHET). Based on the last report on discussions with the DOL, the sector submission was not received positively. A scan of the sector submission has shown that it focused more on the perceived failure of the NSDS to take sustainable development in its objectives into consideration, rather than the

need to establish a SETA with a relatively narrow scope. The HCDS should consider another submission, including a careful framing of the benefits of a SETA in the broader environmental sector or natural resource management, rather than a critique of the system as a whole. The re-establishment process (possible consolidation of SETAs) and the conclusion and promulgation of the NSDS III is likely to take place in the period March 2010 to April 2011. All of these processes are likely to be accompanied by legislative changes. Thus a proposal for dealing with skills development and training in the sector, including the possible establishment of a natural resource management SETA (among other options) could be considered and tabled in this period.

Recommendation: The second area of intervention revolves around the establishment of accredited training providers, and the types and quality of training courses at NQF levels 5 and higher related to the sector. The learnership results (see Chapter 4) show that there were very few learnerships at NQF 5 level in the sector, largely as a result of a lack of learnership registration by the sector itself. There should be a more coordinated approach to defining what type of course is needed, and the content and quality thereof, given the improvements in the learnership system. The research has shown that there are ongoing initiatives in biodiversity organisations with regard to the provision of training, both in terms of formal courses and/or vocational or experiential placements, including students who have completed or are in the process of completing their undergraduate or postgraduate degrees.

One example is the Conservation Leadership Group (CLG) aimed at providing BTech students with experiential learning on conservation and their placement at other institutions in the sector. The up-scaling of initiatives like these based on an assessment of the educational value (for accreditation purposes) may be necessary, coalescing in a national work experience placement programme such as those done in JIPSA.

Recommendation: Develop a sector database of education and training providers containing information on courses, accreditation status and so forth. This may then be drawn off the SAQA database for accredited providers.

Lack of funding

The second area of intervention relates to funding for capacity and skills development. The lack of funding for the sciences was a complaint raised across the board in the fieldwork, although the participating NGOs and the universities in particular appeared to have less of a financial cushion compared to organisations with state funding. In light of the economic recession, the effects of which may continue to reverberate in the shrinking revenues (whether from state coffers, private sector or grant funding), alternative sources of funding need to be explored.

Recommendation: The issue of funding has to be dealt with in the longer term and at a macrolevel, with regard to the NRF, for instance. However, participation in the SETA system may create new opportunities in terms of accessing skills development funding from the SETAs and the National Skills Fund. The SETA system provides three sources of funding for organisations that submit WSPs: discretionary grants, learnership allowances and work experience grants. This applies to all SETAs, although those government departments belonging to the SETAs in the public sector do not need to submit WSPs. However, they (government departments for instance) are supposed to dedicate 1% of their payroll to training. The SETAs pay registered learners a stipend (the training allowance). Organisations may also apply for discretionary grants which are paid to employers to cover the costs of training. The funding of training through accredited providers (that are vetted by the sector) in areas on which agreement could be reached by a training stakeholder group (in the absence of a natural resource management SETA or alternative SETA) should not be a barrier.

Recommendation: The National Skills Fund already allocates bursaries for students in HEIs, especially those in scarce skills programmes, including the natural and environmental sciences, at undergraduate and postgraduate levels. Thus, through sector agreements (which could be facilitated by the SETA involved), agreements with FET and HET institutions may be concluded to facilitate bursaries for such students. This may deal with the current problem where black students, owing to family responsibilities, take on employment after completion of undergraduate or honours qualifications.

The effects of the NRF PhD programme need to be considered and the extent to which it may result in the unintended consequence of privileging PhD studies to the disadvantage of those studying towards a master's qualification.

Lack of work experience among recent graduates

The research has shown that organisations have certain expectations in terms of the work-readiness and work experience of new graduates and entry-level professionals, who are often lacking in this regard. At the same time, the workforce is ageing and existing senior scientists do not have the time for mentoring, while organisations do not have funding for such initiatives.

Recommendation: The NSDS offers work experience grants which the SETAs pay to employers who offer work experience opportunities to young people in scarce and critical skill areas (DOL, 2008:39) and these could contribute to the cost of internship programmes. The DST and the ETDP-SETA also offer internship programmes, where costs are covered. The sector should investigate these sources of funding for those organisations who cannot fund work experience placements, as part of a national work experience placement programme in the sector

Recommendation: Registration of a qualification on the QCTO allows for the inclusion of a work-experience component in the acquisition of science-related qualifications, for example in a post-degree qualification. Thus, the sector should explore whether universities or the HEQC would agree to the inclusion of a period of in-service training. This could be an opportunity for education and training providers in the biodiversity sector to register for qualifications that are more occupationally-directed than is currently the case. The viability of such an approach may be an area to be explored in the proposed HCDS.

Recommendation: The NSDS also provides for the development and support of Institutes of Sectoral and Occupational Excellence (ISOEs). These are education and training providers that offer skills programmes in scarce and critical skill occupations that are quality assured, cover the country and reach disadvantaged communities (DOL, 2008: 44). Given its provincial spread, the biodiversity sector may be well placed to support the development of an ISOE in the sector..

The development of a selected group of training providers that is geared to skills development in the sector, or in an alliance with other public and private education and training providers, could provide the basis for an ISOE in the sector. Such a venture has the potential to provide relevant courses, high quality qualified students and employees to the sector in the remote provinces closer to disadvantaged communities, thus reducing the provincial drain of talent to the larger provinces such as Gauteng, the Western Cape and KwaZulu-Natal. The feasibility of such a venture should perhaps be explored in the longer term.

Recommendation: There are existing forums in the biodiversity conservation sector that bring together education and training providers, such as the RCE (Regional Centre of Expertise on education for sustainable development) and the proposed Environmental Learning Forum (ELF) (WESSA 1, undated). One of the outcomes of the ELF discussions was the accreditation and registration of the level 5 National Certificate: Environmental Education, Training and Development Practice qualification in February 2005 (WESSA 2, undated). The duplication of effort through multiple networks needs to be reviewed. At the same time, it may be appropriate for professional development to assess the needs of a network of providers for the facilitation of qualifications higher than NQF 5.

Knowledge gap: Until now no academic value has been accorded to the experiential components of training. The exceptions are the build professions, including engineering and architecture, and the medical professions, where professional registration requires particular types of work experience and a minimum number of hours in the workplace at entry-level. The newly gazetted QCTO for the skills development sector will hopefully address this gap. However, it may also be one area to investigate in cooperation with the HEQC to set minimum standards and requirements in terms of practical work exposure and the competencies for new graduates who enter into internships. Quality assurance of the theoretical, vocational and experiential features of internships, studentships and other experiential programmes for new graduates and diplomates should ideally be conducted so as to ensure that the exposure does not amount to a form of cheap labour.

Working life and in the labour market

The increased output of those with national diplomas clearly contributed to the increasing employment of such staff. However, this is the lowest qualification applicable to those in associate professional jobs. Chapter 2 on employment showed that those with a national diploma tended to take on professional jobs instead of associate professional jobs in biodiversity. Thus, the employment of core professionals with a national diploma doubled from about 10 to 21%. Even more worrying was that the percentage of professionals with an NQF 4 and less also increased from 9 to 13%. At the same time the proportion of professionals with a degree or a postgraduate degree declined. This implies that the sector was not able to attract honours and master's graduates coming out of the system with biodiversity-related qualifications; the sector had to settle for less it appears. Worryingly, the research suggested that one third of professionals (34%) in 2007 were taking on responsibilities that should ideally have been done by someone with an honours degree or higher. This partly explains why respondents in fieldwork, DEAT ESSP research and others have raised questions about the competence of biodiversity conservation officials at all government levels for instance. The lack of enforcement capacity was often raised as a concern.

The entry-level professional

Interviews revealed that core biodiversity organisations intend to increase their core biodiversity staff complement (core managers, professionals and associate professionals) by around 3.4% and generic staff complement by about 0.6% over the next five years and to employ more individuals from designated groups, especially black women. Currently, there are few black women with sufficient work experience and graduates lack specialised and work-specific skills.

The qualification levels of associate professionals are also decreasing, but with the poor quality of the national diploma programme and poor throughput rates it is not surprising. Opportunities to obtain experiential practical experience in the labour market seem to be a major problem that hampers national diploma students in completing their qualifications.

Recommendation: Organisations need to start growing their own timber by first providing more opportunities with regard to learnerships as a stepping stone to upward movement; secondly, by providing experiential training opportunities to enable national diploma and BTech students to complete their qualifications; and thirdly, by mentoring new graduates with degrees and honours degrees to attain work-specific knowledge and a good grounding by being part of a team on relevant projects in order to progress towards masters' and doctoral degrees.

Knowledge gap: The consolidation of evaluation studies on factors that impact on the effectiveness of mentorship programmes.

Professional registration

The SACNSP is a professional council for the registration and accreditation of natural scientists in the country. The council has been heavily criticised in Parliament for its declining membership, challenges in financial management and governance, and apparent lack of representation of black and women scientists (PMG, 2007). Currently there are more black and women graduates than previously and perhaps membership especially among these graduates needs to be encouraged to promote professionalism and stimulate engagement and growth in the sector. If registration with the SACNSP becomes compulsory, more exact data on employment figures may become available to do future planning.

In the engineering industry, the Engineering Council of SA (ECSA) plays an important role in setting standards in terms of qualifications and candidate registration. Importantly, entry requirements into specific levels of employment are standardised in order to ensure that professional standards are maintained. The declining qualifications levels in the biodiversity sector are of concern and professional registration with a reputable professional association may be one way to stop the decline.

The sector employs a range of individuals with science qualifications, but who are not practising scientists; therefore registration may not be of any value to them.

Recommendation: The sector should investigate the extent to which it is feasible to promote professional registration, and any benefits that may accrue from registration.

The mid-career professional

The biodiversity *core* managers, that is, those managers with biodiversity-related qualifications (excluding the *generic* biodiversity managers) are not representative of the labour force, as currently two-thirds are white. Among the black core managers, more black women are required. At the core professional level, more black professionals are also required, but to a lesser extent than at managerial level. Even more black women are required at the core professional level than at the core managerial level. Conversely, most transformation has occurred at the core associate professional level with the majority now being black and with more women than men.

Recommendation: The progress towards equity should be monitored and a fast-tracking programme established to advance more blacks and women from the associate professional group into the professional level, through studentships for those requiring higher qualifications.

Career paths, staff turnover and low salaries

Experienced and qualified core professionals with relevant qualifications and work experience are leaving due to poor salaries, boredom with the lack of variety in responsibilities, transformation, ceilings in their career paths and/or the lack of a career path, and the managerial bias in existing career paths. There is a degree of skills and employee rotation in the sector, as both young and older, experienced professionals leave for other parts of the sector. There are too many managers in certain subsectors and comparatively fewer practising science professionals, as advancement into management is the conventional path of progression. The research indicated that one of the concerns among scientists was the privileging of managerial responsibilities over knowledge skills in the career pathing systems.

Recommendation: There is no specific sector-based solution to low salaries and salary parity (at HEIs) due to different organisational funding bases and employment practices.

A number of specific recommendations for consideration were the following:

- Instead of vertical career paths, in smaller organisations horizontal career alternatives could be introduced, such as more individual and challenging projects, increasing flexibility to choose individual projects and so forth.
- Networking opportunities should be created within organisations, including local and international conferences and clear policies about attendance and so forth.
- Conditions of employment should be reviewed to reduce the perception that the biodiversity sector is a low-pay sector. This is a sensitive area where organisational confidentiality is key.
- Sabbaticals for mid-career professionals should be introduced with secure funding and clear requirements.
- Professional expert exchange programmes aimed at senior professionals who could work for limited periods in interesting projects in related organisations; the purpose would be to provide expert support, skills transfer and capacity development in other parts of the sector that may not be able to fund an independent programme.
- Investigate options for a career path system, or the universal principles of such a system, that is transparent and can be shaped according to the needs and practices of different organisations. If possible, different organisation career paths should ideally talk to each other, at least to the extent that this is possible. The CSIR career ladder was mentioned consistently, and an extract from its career guide is offered as an illustration.

The CSIR (2006) has a four-stage career model for knowledge-based workers, and describes the criteria for progression from one stage to the other in terms of the competence required and based on a defined assessment process. There are distinct career ladders for employees involved in research and development, including:

- the research career ladder which includes candidate researchers, researchers, senior researchers, principal researchers and chief researchers

- a career ladder for those involved in knowledge application, such as technology transfer, and routine and nonroutine knowledge-based services
- a career ladder for staff in research support, for example the operation and management of equipment, facilities that require innovation and so on.

The CSIR (2006:13) states that the career ladder system also seeks to address the idea that the traditional management path is the main route to career progression, which may not suit everyone. The nature of the CSIR career pathing system is driven by its core activity, research and development. This implies that each organisation, depending on its core activity (and of course funding etc), will shape and adjust its own career path accordingly. The philosophy, underlying principles, progression criteria and processes need to be transparent and communicated to, and understood by staff.

Employment demand for conservation managers

The research suggest that the demand for conservation scientists will increase by about 9.1% over the period 2008/09 to 2013/14, the single largest increase in the sector. Chapter 1 highlighted the fact that protected areas are anticipated to grow, requiring much greater capacity, including conservation scientists. However, this rate is nearly double the rate of increase in new graduates, suggesting possible bottlenecks in getting new entrants into the field, as there are not many experienced conservation scientists in the system.

Budget allocations to the trans-frontier and protected areas remain high until 2012, barring the effect of budget cuts resulting from the recession. Furthermore, ascertaining employment demand in this occupation is vital for determining the viability of developing a marketing and recruitment campaign to increase the available pool of conservation managers.

The multifaceted nature of the skills profile of conservation managers was also confirmed in the fieldwork, and the documentary analysis confirmed to a large extent the range of specific skills required. These include

- “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 and
- financial management skills.

In addition, technical skills in a specialist area (which may include a formal qualification in the sciences) are required.

Recommendation: Standardised skills courses that are accredited will have to be developed (or if they already in place to be quality assured and accredited) in order to ensure that all areas receive similar training. In order 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.

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 than supply-driven. A scan of education and training providers that train conservation managers needs to be conducted in order to determine supply capacity in the sector.

A subcommittee should consider questions regarding the nature, relevance and quality of training related to the quality assurance and coordination of training of conservation managers, as the evidence suggests that there is a need for customised training to accommodate multifaceted skills needs.

Impact of the conservation management model

A key concern raised during the research was that the decentralised model of biodiversity management may be a contributory factor to an inefficient distribution of technical and management skills in the sector. This is an issue that was raised in the fieldwork, the validity of which may need to be considered in the HCDS. If the governance model is overstressing the current skills available, a long-term intervention may be to develop alternative governance models, that is less skill-intensive, while additional skills capacity is developed in the meantime.

Career paths for conservation managers

DEAT expenditure patterns highlighted a heavy reliance on the employment of consultants in the development of the trans-frontier conservation and protected areas. At the same time, the research indicates that there is a high turnover among conservation managers and many problems were raised in terms of levels of authority, pay parity and the absence of career paths.

Recommendation: In line with the career path proposals for professionals, discussion should begin about the development of an effective career path for conservation managers or the basic principles of such a career path..

Transition from middle management into senior management

Professional and middle management occupations are often the “feeder” occupations in the transition to senior and top management positions. Thus, with regards to the biodiversity sector, in the design of career paths, succession planning, development and retention, this transition between the professional and managerial occupations will be a key area for constant monitoring of progress towards a more diversified, skilled workforce.

Retirement and post-retirement professionals

The research suggested that there are not enough experienced professionals to act as mentors; mentorship is viewed negatively; there are no rewards for mentoring; mentoring is associated with adverse implications for transformation and on retirement skills are lost permanently to the system.

Recommendation: Develop a mentorship programme that includes senior professionals who are closer to retirement (e.g. 55 years and older) and/or establish a special post-retirement programme that is aimed at reducing the burden of mentorship (partially) on other senior professionals. This would allow for the less experienced core workforce to progress up the ladder. More core professionals in the age group 50 to 64 years of age are required to help with the necessary mentoring. In the municipal sector, JIPSA and the DBSA have developed a post-retirement programme aimed at bringing in older, retired and often white engineers to assist in capacity development in local government.

Transformation

The research confirms the view that the sector workforce at managerial and professional level is still predominantly white (see Figures 2.9 and 2.11). For the periods 2000 to 2003 and 2004 to 2007, the overall white share of employment declined to 59%, largely as a reduction of the white male share by close to half its original size. The major beneficiaries of this change were black women, whose share more than doubled, and white women whose share nearly doubled (albeit from a very low base). Black male managers had a negligible increase in their employment share, although it was still larger than either the share of white or black women. So, the core managerial category remained a predominantly male category (59.2%), but with significant gains made by women.

Among core professionals, the results suggest that while there was a slight decline in the male share of employment over the two periods, this category remained predominantly male. The key shifts among core professionals were in the decline of white males, which appeared to have accrued to black females (a tripling in numbers from a very low base) and to a lesser extent black males. Thus, by the second period, the black share among core professionals improved to 47.9% from about 29.7%.

Among associate professionals, there was a dramatic shift towards females, who constituted 42% of this category by 2007. Black females almost doubled and the proportion of white females improved from none in the first period to 13% in the second period. However, males still form more than half of the associate professional category. The dominant black share is explained by the fact that this type of employment represents entry-level scientists (often with a national diploma, undergraduate or honours degree). Therefore, if these occupations are regarded as feeders to the core professions, the results suggest that black males have a greater chance of breaking through that ceiling compared to black females. However, black females appear to be catching up as the dramatic increases in this category over the two periods suggest, and represent a group where there is enormous potential for capacity development.

These patterns of employment of blacks and women are indications of progress towards achieving equity. Based on an estimate of the economically active

population in 2005, it would seem that while progress has been made by black women, they are still severely underrepresented in the sector. It was only among associate professionals that black women constituted the second largest proportion (after black men), confirming their relatively low status in the sector. Black men, on the other hand, are closer to their EE targets, except in the managerial occupations.

Recommendation: The sector transformation focus has to shift slightly to invest more in the development of black women, and to address their particular skills needs in the professional occupations, an area where black women appear to have fared the worst.

Recommendation: The EEA specifies that organisations develop an EE plan with specific targets. The feasibility of developing a sector-based employment equity plan needs to be considered, with due consideration for organisational requirements, differing demographic profiles across provinces, as well as the differential supply of graduates. Thus, employment equity targets in the Western Cape may be very different to those in Gauteng, given a differentiated population. Alternatively, if sector targets are not set it needs to establish a basis on which to measure progress; for example, if organisations have institutional targets, their progress will be measured at an individual level only.

Factors impacting on retention

Organisational culture and transformation

A key challenge in the sector is the retention of skilled staff and black professionals. The research suggested that a declining retention rate was often closely associated with the “organisational climate and culture”. These studies cited the following as contributory factors:

- Slow EE progress in management and other departments
- Low commitment to EE and lip service paid by top management
- Ineffective consultation and communication about EE progress and implementation

- A lack of cultural sensitivity where new recruits were expected to assimilate into the existing organisational culture
- An organisational culture that does not value diversity
- A white male-dominant organisational culture that excludes black recruits (through informal and formal networks)
- The practice of “tokenism” and failure to devolve real responsibilities to black recruits
- A lack of systematic talent management of black staff
- A lack of black mentors and role models

Thus, while the HCDS at sector level may be aspiring to greater diversity, the organisational cultures at micro level may not be that welcoming.

Recommendation: Assess whether the goal of the HCDS is purely to meet the targets as set out in the legislation, that is, compliance mode, or whether the sector is working towards building a sectoral culture that integrates blacks and women in a more substantive manner. Therefore, an important consideration for the HCDS may be that even if the equity targets are met, organisations themselves may not be ready to receive black and women staff in a manner that is not alienating, but one of integration.

Employment conditions

Recommendation: The sector needs to assess whether the types of employment arrangement (contracts, fulltime etc) and working cultures in the sector are effective mechanisms for building employee commitment and long-term development among the knowledge workers, the larger proportion of its professional workforce. The research shows that salary is becoming an issue. While salary and other employment conditions are clearly elements of an employment mode, the duration of contracts, training offered, career paths, levels of discretion and development opportunities are substantial elements to consider as part of an overall package of opportunities for developing commitment. Thus, contract- or productivity-based employment arrangement for knowledge workers with scarce skills may not be the ideal way in which to attract or to retain such staff in the long term.

Declines in the qualification profile

The low rates of past and future employment growth, whether LFS data, Vulindlela public sector or the participating organisations, are worrying in light of the HCDS. Organisations that took part in the fieldwork indicated that they intend to increase their core biodiversity staff complement (core managers, professionals and associate professionals) by around 2% over the next five years, while the support staff component (the generic component plus administrative staff, computer related occupations and other occupations) will decrease slightly by 2%. Future increases will mainly be among designated groups, especially black women.

The only group that is expected to grow in employment is the associate professional group. At the same time the average qualifications profile of core professionals was declining, whereas the sector (as indicated in the fieldwork) was expecting first degrees and postgraduate degrees at entry level. Over the two periods (2000–2003 and 2004–2007) the employment share of first degrees and postgraduate degrees remained fairly constant with just over 60% of all managers. There was an increase of about 6% in the number of postgraduates; however, over time the share of those with a National diploma dropped and was replaced by managers with a general education level.

Among professionals, the decline in the level of qualifications was even more worrying. The share of those with NDipl doubled from 10.5 to 20.8%. At the same time the share of PG and first degrees dropped by 6% respectively. The share of those with FE -level qualifications, that is NQF 4, increased nearly three times. The result of this disjuncture in qualifications and responsibility is echoed in other research indicating that the levels of enforcement competence are often low. The high levels of expenditure on consultants in the DEAT (see Chapter 1) further indicate that competence deficits may be compensated for by consultants. The fact that this expenditure is also largely focused on support for the protected areas adds further urgency for more long-term solutions since these areas are regarded as the growth points in the sector.

The occupational ratio

The data shows that in some subsectors there may be a disjuncture between the skills profile and their functional responsibilities in terms of their biodiversity mandate. Also, the ratio of core managers to professionals to: associate professionals may not be optimal for carrying out their specific mandate or core activity. For instance, the R&D subsector had proportionally more managers than junior associate professionals although its core activity is research. Central government had a slightly smaller managerial workforce than either their core professional and associate professional workforce. Respondents in the research often raised questions about the competency levels of officials in provincial and national government in terms of knowledge and skills in the enforcement of the legislation.

Recommendation: The employment analysis suggests that a baseline model of the “ideal” mix of core occupations may be useful. Therefore, depending on the specific functional responsibilities, a ratio of managers to professionals to associate professionals may need to be developed. This occupational ratio will represent the most efficient distribution of skills and, depending on technological changes, may also change over time. This model would have to be in line with the functional responsibilities of the various subgroups of organisations in the sector to ensure achieving effective and efficient governance in the biodiversity conservation sector, as per strategic objective 2 of the NBSAP 2005.

Knowledge gap: International best practice in regard to optimal occupational ratios may need to be investigated.

Recommendation: Conduct research to establish the optimal occupational ratio in the NQF 5 and higher workforce. Develop a baseline model of the “ideal” mix of skills required, based on the specific mandate.

South Africa has not developed a standardised forecasting model on a national or a sectoral level and this reduces the national capacity to predict skills and capacity needs on an ongoing basis.

Recommendation: specific professions should be identified and occupational forecasting be conducted after a review has established that there are sufficient

trends data available. There are international models available for conducting occupational forecasting, which are similar to that as used in the HSRC report on scarce skills and key professions. Sectoral forecasting may be developed over time, as the scope and nature of data on more occupations improve.

Measurement: Conduct a census of all companies and employment figures on an annual basis drawing from the statutory reports (including the employment equity report).

“Growing your own timber” programme: internal skills upgrading

The low employment growth anticipated in those biodiversity organisations that participated in the research implies very little room for recruitment in the foreseeable future. The LFS data showed that, in the period prior to 2007, employment was growing at a negative rate, -1.9% . This happened during a period of general economic growth, implying that under the current adverse economic conditions there is not much chance of a general upsurge in employment. In addition, the declining qualifications profile suggests that core professionals are increasingly being employed in positions that require qualifications higher than they possess. This has implications for the levels of productivity and the standard of work performed and places the goal of effective and efficient governance that is the basis for the development of the HCDS in jeopardy.

The overall skills level of the existing workforce needs to be improved, since it is evident that the influx of newly qualified postgraduates is not going to be extensive. Therefore, the feasibility of a skills upgrading programme on two levels needs to be considered: an honours to master's stream and a diplomate upgrading programme. The proposed skills levels must be considered on the basis of the needs of the sector and the final scarce skills list.

Recommendation: A qualification/skills audit should be conducted in order to establish the distribution of all qualifications. Unfortunately, the LFS does not disaggregate postgraduate degrees and an audit may be needed to verify the results. The DEAT skills audit (the detailed report was not available) may provide a useful starting point, that is, if a qualifications profile was drawn up. The skills audit will provide a more detailed profile of qualifications, as well as the numbers involved.

An overview of all existing similar programmes in the sector that have been successful in this type of internal development needs to be scoped and considered for replication.

Skills upgrading: National diploma graduates

The key challenge for the biodiversity sector is to deal effectively with the fact that it absorbs a large proportion of diplomates employed as core associate professionals (34.3%) and a growing proportion employed as core professionals (20.8%) (see chapter 2). Intervention at the Ndipl level is advisable, since the poor throughput rates imply that the quality of the diplomates may be compromised. There was some evidence to this effect in the fieldwork in terms of the reportedly low levels of literacy and skills among newly employed diplomates. A skills upgrading programme of diplomates should be considered.

Recommendation: The sector should consider the development of a learnership at NQF level 6 to upgrade the skills levels of a group of diplomates. There are successful examples, such as the SETAs in the finance and chemical sectors. The QCTO in the sector will be responsible for quality assurance and a sector-based CEP has to be established to ensure that the curricula reflect the needs of the sector. Learnerships will be targeted at employees, who may have to undergo a selection process to enter the programme. Learnership allowances are paid by the SETA and subsidise part of the learners' salary. The HR or training departments of institutions could play a key role in facilitating these processes.

Transition from honours to master's

Interruption of the honours–master's growth path appears to represent the biggest constraint to growth. This is echoed in a number of recommendations cutting across the HRD strategy and the National Innovation Plan for studentships, ranging from four-year graduate programmes to increase the numbers of master's graduations, a government-funded four-year BSc Honours programme, and a four-year government-funded PhD programme. These are potential sources of funding, as well as the bursaries funded by the NSF.

There has been a steady decline in the share of postgraduates employed in the sector. This suggests that there is a systemic problem in getting postgraduates into biodiversity employment, partly because the supply is insufficient, but also because the sector is clearly not attractive to them. However, there is a pool of employed professionals already in the sector who do have first degrees or postgraduate degrees. Although the LFS does not disaggregate postgraduate qualifications, it may be assumed that at least 60% (of the postgraduates) had an honours based on the supply-side figures (see Figure 4.6). Therefore an internal honours–master’s development programme may capitalise on existing potential.

The implications are that the HCDS may have to start off with a large-scale upgrading programme from within the sector. The target group would be core professionals and managers which is where the greatest potential lies.

Recommendation: Those with honours degrees present the best chance for upgrading in terms of the attainment of a master’s degree. The second level of upgrading has to happen among professionals with a first degree and this may be considered in the longer term.

Recommendation: the sector will have to target a number of HEIs to develop a master’s programme that is responsive to the needs of the sector. There are a number of scarce skills areas that have been identified as needing development including taxonomy. The scarce skills verification process may be able to assess a number of fields where an master’s programme may be feasible; alternatively to assess whether there are any existing programmes that are feasible.

Transition to PhD programme

The supply data shows that black men have made great strides in attaining doctorates (Table 4.9). They are also well represented in the sector and within sight of the EE targets (see Table 2.8). However, the biggest bottleneck is for black women to move from masters into a doctoral programme; a lack of transition that is common to all fields of study. Black women are also very far from the EE target in the sector (Table 4.9).

Recommendation: The sector may need to consider a special doctoral programme for black women, partly because of the phenomenon of “pipeline leakage” identified

in the literature. The fact that there are many black women completing master's programmes in biodiversity-related fields indicates that there is potential for advancement. The results from an investigation by the SET4women programme should be followed up to find out how to set up a specialised programme at this level.

Risks: Doing a postgraduate programme on a part-time basis is difficult. Experiences within the sector must be shared in order to find the optimal conditions for completion. In order to participate in these programmes certain employment conditions may have to be attached, including staying in the sponsoring organisation for a specified period after completion of the qualification.

Mentorship programme for postgraduates

In order to reduce the risk associated with the completion of a postgraduate degree while employed, a mentorship programme has to be implemented.

Recommendation: The results from the fieldwork suggested the employment of retired scientists (or those who are about to retire) to conduct mentorship. An additional source of capacity is the recruitment of a number of foreign scientists in areas where absolute scarcity has been identified as part of a mentorship programme attached to research programmes. These researchers would need to be incentivised with regard to joint journal publications and so on.

Knowledge gap: Information and best practice on mentorship programmes and information based on a systematic evaluation of a mentorship programme need to be collected to provide guidance on the best way forward.

Nature and quality of training provision in the sector

The research has shown that there are concerns with regard to the fact that current training provision in practice appears to be inadequate despite claims of a skills shortage. In addition, training is generic and not geared towards stated needs; declining numbers of professional and managerial staff are being trained; training expenditure is just 1% as per requirement and declining over time; the quality of training courses not always clear; and the rationale for courses is not always clear. Furthermore, there is often a qualitative gap, as in some cases, specialist skills were

identified but the training offered was of a generalist nature. This may be due to the offerings available, which is often determined by the training providers.

Recommendation: Training provision for professionals, managers and associate professionals should be monitored against the HCDS agreement in order to track institutional responses. The indicator should include accredited, NQF-level training.

Recommendation: Develop a database of training providers and courses (excluding university providers); promote accreditation; and consider drawing up a list of recommended training courses for top-up skills.

Recommendation: Investigate the factors that determine the choice of training courses among a sample of HR or training managers.

Recommendation: The sector should consider the development of a sector database of biodiversity-related courses provided at a 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 university courses (and graduate supply) relevant to the sector for the period 2000 to 2007.

Recommendation: One of the key interventions should be to close the gap between the type of skills the sector needs, and the type of training provided. Now that there will be three quality councils, dialogues within the sector and with public and private providers of training are very important.

An example of closing the gap between what is required at work and what universities offer is the Applied Bioremediation: Theory, Design and Practice, a two-week course offered by the University of the Witwatersrand's School of Animal, Plant and Environmental Sciences and the School of Molecular Biology and Cellular Biology. This is part of the applied MSc Biotechnology degree (Weyersbe, 2009), and part of a partnership between Wits, a mining company and THRIP. As part of this partnership, up to 43 honours, master's and doctoral students have gained work experience in projects on ecosystems, conservation and environmental impacts.

Identification and monitoring of scarce skills

One of the key objectives of the HCDS is to address the problem of scarce skills in the sector. Chapter 5 provides an overview of the key concepts and processes

fundamental to identifying scarce skills and critical skills. This process has to start from the assumption that the same definitions are used as proposed by the Department of Labour Framework on Scarce Skills.

“Scarce skills” are those occupations where there is a **scarcity of qualified and experienced people**, currently or in the future (DOL, 2007:6). There are two types of scarcity:

Absolute scarcity (or a genuine skill shortage) 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 (e.g. productivity and quality) as a direct result of a lack of suitably skilled people, for example more mistakes occur, more supervision is needed to correct mistakes, wastage, and a decline in the quality of delivery, 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 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. Therefore, not all skills needs are scarce, and in order to identify scarcity, the correct and standardised definitions must be used.

The sector does not have a consolidated profile as to the nature, numbers and types of scarce skills required. It does know that it requires blacks, but it does not have specific targets as to the number of Africans, coloureds and Indians, or in which specific professions. This is largely because the sector has not explored its institutional mandates sufficiently in order to develop an overall idea of the skills gap: where skills audits have been conducted, they have not been consolidated in order to establish patterns across various institutions. The DEAT skills audit (based on the report available in the public domain), for instance, did not provide in any detail as to the type of skills required. Audits in themselves are not sufficient unless they extended to include a projection of skills needs. The manner in which vacancy information is presented in the sector also does not assist in providing a better understanding of the needs of the sector.

Knowledge gap: Establish which institutions have conducted skills audits and whether the information (aggregate results) is available. The combination and comparison of a series of skills audits may provide useful baseline data for analysis.

There is a gap between claims of a skills shortage or scarce skills, and a coherent profile as to the nature, size and dynamics of this shortage.

In this study the Labour Force Survey data were used to develop an aggregate profile of trends in the workforce. However, the LFS data do not lend themselves to an understanding of the nature, size or dynamics of scarce skills. Therefore, as an alternative, the research team conducted a scan of the legislative and policy frameworks and developed a **derived** profile of what kinds of skills may be needed in terms of the biodiversity mandate. However, this process could not specify numbers, nor project the gap between existing skills and future skills needs (5–10 years into the future). In order to address this gap, during the fieldwork, organisations were asked to complete an occupational gap analysis, and a limited analysis is provided in Chapter 2 on employment trends.

An interim approach for deriving a preliminary list of scarce and critical skills, using the definitions as outlined earlier on, is supplied in the report (see Chapter 5).

Proposed interim approach to identifying scarce skills

There is no reliable model in South Africa for determining scarce skills (see Chapter 5). This alternative model proposed in this report includes a number of elements that may be useful in the short-to-medium term for implementation in the sector, using vacancy data as a basis complemented by a labour market, employment and supply analyses as well as the monitoring of interventions to address scarce skills. Thus, the following alternative model is proposed for establishing a sector database of vacancies that serve several purposes:

- To circulate *information* about vacancies within the sector at an informal level
- To gather information on *trends* in vacancies as a proxy for scarce skills
- To distinguish between scarce skills and all other skills needs

If possible, every six months every organisation should indicate whether its vacancies had been filled – a proxy for a fill rate as a monitoring indicator.

Vacancy rates are an important tool for identifying potential skill shortages. However, in South Africa there are no standardised fill rates or vacancy surveys and vacancy rates need to be captured over time. From the limited data available in the public sector it does appear that there are biodiversity-related occupations that may constitute scarce skills. The government department vacancy rates are considerably higher than that found in the private sector, which tends to be in the mid-teens. The data in the rest of the public sector organisations and NGOs are not available over sufficient time periods to make any definitive conclusions.

A labour market analysis of demographic and, if possible, wage trends in the sector should be conducted on an annual basis (ideally the relevant SETA should conduct such an analysis for each subsector within its scope).

A supply analysis of graduates and diplomates should be conducted on an annual basis on a range of qualifications in higher education (a customised analysis may be supplied by SAQA).

On a bi-annual basis, an assessment of the success of *sector-based measures* to address past shortages should be conducted

Also on an annual basis a *community of experts (CEP)* should be convened to evaluate these sets of information, assess progress on redressing past shortages and agree on a list of scarce skills in the sector.

The basis of the HCDS implementation 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* target or distribution over time. Only then is it possible to finalise the specific strategies needed in order to effect the required changes, given the macroenvironment, the current employment growth context and the supply dynamics.

For the preliminary list of scarce skills, refer to Chapter 5, section 5.2.

Skills quota: absolute scarcity

The skills quota system applies to a range of scientific fields including the biodiversity conservation sector. There is an intergovernmental process that is followed to produce a national scarce skills list and skills quotas which are finally determined by the Department of Home Affairs. The skills quota system may be applied in a few occupations where it has been established that absolute scarcity exists.

Recommendation: Should the sector decide on limited skills importation, it may need to collaborate with one or more of the SETAs to supply inputs and motivations on potential skills quotas for the biodiversity sector. Such information will form part of the sector-based scarce skills list, which would then be aggregated to the DOL scarce skills list.

Summary of scarce skills verification process

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

- the relative decline in employment growth in the sector over the last even 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 of 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 and of professionals in particular
- the capacity to develop an in-house process of skills upgrading “growing your own timber” of the existing workforce to fill some of the more immediate scarce skills gaps and improve delivery.

The nature of supply at the universities indicates that

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

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

The final section provides a summary of suggested high priority areas.

Suggested priority areas in the HCDS

- Establish an interim scarce skill list.
- Establish and phase in a programme of “growing our own timber” to upgrade existing skills levels in a number of scarce skills areas among existing professionals, associate professionals and managers, with a focus on blacks and black women.
- Link the upgrading programme to the employment equity plan, whether at sector or institutional level.
- Consider a flagship project on the development of reserve conservation managers in terms of the suite of *critical skills* required to operate optimally in the protected areas, given the increased expenditure by government and the importance of these areas in terms of eco-tourism.
- The development and accreditation of a learnership at NQF 6 level to upgrade the skills of NDip professionals and associate professionals, through agreements with a SETA and an HE institution.
- Develop a mentorship programme (linked to the upgrading programme) that has an incentive system attached, focusing on retirees and those entering their retirement years.
- Curriculum development should take place focusing on a selected number of university qualifications to become more responsive to the changing requirements flowing from the policy frameworks. The final scarce skills list should identify a selected number of occupations geared to the development of professionals and associate professionals which should be shared with HE institutions.

The development of key principles for career paths:

- Career path for reserve managers
- Career path for professionals (science – research/technical)
- Career path for managers (science – management)
- Career path for generic managers

- Review of conditions of employment
- Review of salaries – benchmark key professions against similar organisations
- Review of pay parity across government departments (national, provincial and local)

Principles of articulation, economies of scale and partnerships

One of the key lessons from the NSDS was that it had too many strategic priorities and developed too many key performance indicators. These priorities drifted into other areas that were not part of the original skills development agenda, for instance new venture creation, job creation and the like. A return to fundamentals, including a selected range of core objectives or key indicators related to the biodiversity mandate is likely to have greater success than dispersed activities and resources. Strategic interventions, applying economies of scale rather than dispersed interventions, are more likely to have systemic impact rather than fragmented inputs and dispersed outputs.

Role of the human resources function

The human resources function will play a key role in supporting and designing staff development policies, and monitoring and facilitating their implementation. A range of organisational policies were offered as examples. These include, among others,

- recruitment and hiring policies
- staff development policies, including research professional development policies, exchange and sabbatical policies, a mentorship policy
- student support policies, including internships, studentships and bursary policies
- career development policy
- scarce skills allowance policies and so on

Training data is collected via the WSPs and the ATRs, but the current reports provide planners with very little insight into the skills capabilities within the sector, or about scarce skills. The sector has to decide whether there is a strategic role for HR

in this regard. It would appear that the role of HR thus far has been in policy development.

CHALLENGES OF DATA (QUALITY AND QUANTITY)

An effective HCD strategy is dependent on high quality and comprehensive data. The key sources of data on the sector labour market include official labour statistics (LFS and Census), small-scale occupational or subsector studies (e.g. the study on taxonomy or bio-systematics), administrative data (Vulindlela public sector, WSPs and ATRs), other nonformal sources and anecdotal information.

The official labour statistics series (LFS), as well as the Census, have substantial limitations for end-users, including the biodiversity conservation sector and researchers. The data are not well designed, and do not allow for trend analysis on employment, occupations, study fields and so forth. The biodiversity conservation sector is a cross-cutter sector and a proxy variable has to be developed. It is proposed that, in order to facilitate future comparison, the definition used in this report be regarded as the baseline in the absence of more detailed information in the LFS or changes in the demarcation of the sector. Despite its weaknesses, the LFS remains the most representative source for trend analysis in the sector.

Small-scale occupational/subsector/organisational studies have to be repeated in the same occupation; otherwise the information becomes outdated and does not allow for trend analysis. Anecdotal evidence is useful for highlighting specific dynamics for follow up and verification. However, on its own, anecdotal evidence may be very context-specific and not reliable for planning purposes.

Administrative statistics collected by institutions are important for verification purposes, but in order to be comparable across a sector, a number of requirements apply. These include the use of the same definitions of key concepts, the same time periods, agreement on the use of concepts (such as occupations etc) and regular updating at specific times. This research found that the administrative statistics collected in the sector contained many gaps and weaknesses (e.g. the WSPs were not standardised, the occupational categories were too broad for employment or skills analysis and the reports varied in the amount of information provided).

Longitudinal data is needed in order to draw any conclusions about dynamics and make any claims about trends in the sector. Cross-sectional information (data collected at one point e.g. year 2000) is not useful for planning, monitoring and evaluation purposes. However, in the absence of longitudinal data (e.g. tracking the same or a similar sample of companies over time using the same indicators), a series of cross-sectional data may be used as an alternative.

Recommendations on data:

On the sector definition: Statistics South Africa needs to capture industry data at the 4-digit level so that researchers and decision-makers are able to demarcate and define various occupations and sectors with more accuracy.

On the occupational definition: Statistics South Africa needs to capture occupational data at a 6-digit level. The newly established OFO will require much more detailed information in order to build coherence between the skills development, the NQF and company occupational grading systems.

A specific problem exists with regard to managers in the various sectors, as they are given the same title irrespective of the industry in which they work; unlike many other occupations, managers are not easily distinguished as belonging to a specific sector.

On the sector OFO system: The sector should participate in the OFO system, especially at a SETA level where definitions of all the biodiversity-related occupations will be concluded. In order to ensure that the final definitions are responsive to the sector needs, the sector needs to shape and influence the final set of definitions based on practical experience and capacity to implement and integrate into HR systems.

This could be preceded by a briefing by experts who are familiar with techniques for adapting the standard OFO to sector-specific requirements. Ideally, this should be done in conjunction with relevant HE departments, as agreements on levels of qualifications (to meet specific standards of competency) need to be agreed on.

On study field definitions: Statistics South Africa needs to separate various fields of study (similar to the way tertiary institutions define fields of study).

Create a **data quality and monitoring subcommittee** that will be responsible for monitoring the need for data, as well as updating data, liaising with the relevant

authorities and giving feedback on scope and quality challenges. It will be required to work with organisations to improve the quality and scope of data that flows into the M&E framework and it will also need to deal with confidentiality issues.

Administrative statistics such as WSPs and ATRs should be completed by organisations, not just to comply with the law (“tick the box” attitude) but as a planning tool that could be fed into the HCD planning system. The problems with the current system of information collection are acknowledged, but the WSPs also help to open up opportunities for accessing SETA and NSF funding. The uneven quality of the administrative data gathered at organisational level is an issue that should be dealt with in the HCDS and fed back to organisations. Administrative data is important insofar as it may be used for triangulation purposes (subject to the standardised use of indicators, however), as well as planning, monitoring and evaluation (M&E) processes, which would otherwise be impaired.

General recommendations on data:

The limitations of labour statistics and educational statistics are widely known and are discussed in the respective chapters. However, in the absence of large-scale comprehensive data sources that have been collected in a scientific manner, existing official sources remain a reliable source of data. These are widely used, but conditional on the use of accepted statistical procedures and cautionary notes regarding the extent to which the results are generalisable. Comparisons and triangulation with comparable sources are important where appropriate.

Therefore, the HCDS of the biodiversity conservation sector needs to put structures in place for measuring and reporting on the nature, size and trends in skills needs, including scarce skills needs, on a regular basis.

Inter-institutional relationships with key departments to lobby in support of efforts to improve the scope and quality of data will be important. These include cognate sectors in the SET field, the DEAT, the DST and the newly established Planning Commission in the Presidency.

In conclusion, the recommendations outlined here are the result of a triangulation of findings generated in the research process, but are not necessarily exhaustive.

GUIDELINES FOR A MONITORING AND EVALUATION FRAMEWORK

“What gets measured, gets done”

This is the introductory quote to the Green Paper presented by the Presidency in line with efforts to improve government performance (The Presidency, 2009). In his presentation of the new Green Paper to the cabinet, the newly appointed Minister for Performance Management Monitoring and Evaluation (PME) focused on a delivery chain approach to implementing national priorities.

These may be summarised as a delivery chain of 1) outcomes; 2) outputs; 3) activities; and 4) inputs (The Presidency, 2009).

The active implementation of an M&E strategy (and not just the intention) is likely to loom even larger in the post-April election government. Given shrinking state revenues, the allocation of revenue is likely to be more closely linked to evidence-based performance claims. Thus, integrating the efforts of the HCD strategy in line with the standards required by the newly established Planning and Monitoring and Evaluation Commissions, based in the Presidency, will be important both strategically and for funding purposes.

The underlying purpose of M&E is to build a causal relationship between an intervention and the desired outcome or change. As noted in the Green Paper on M&E (The Presidency, 2009), to assume a simple linear relationship is not theoretically sound. For instance, if the sector decides on a nationwide internship and mentorship programme of 200 interns over the next five years (with an entry-level honours degree), this intervention will not occur in isolation: it will have to factor in possible confounding effects and the unintended consequences of

- the external environment (declining government funding and bureaucratic NSF procedures)
- the sectoral context (some organisations may want to focus solely on honours, others on master's qualifications)
- the organisational context (NGOs may feel that they do not get a return on their investment in training, as their interns leave for other parts of the sector that offer bigger salaries)

- the individual context (older and white scientists may feel that they are not rewarded for mentoring and that mentoring may pose a threat to their own job security).

Thus, built into the system must be a risk assessment as well as an incentive framework (at organisational level and/or within organisations) reward those who actively participate and meet the targeted outcomes. However, often the risk assessment is only done at the start of the project. There should be a continual update of the risks of an intervention during its implementation phase, as the surrounding contexts may have changed in the intervening period.

One of the key working principles of JIPSA was peer accountability that brokered a partnership approach, but also forced partners to “compete to excel”. The exact processes through which peer accountability may become part of the HCDS implementation process has to be considered, as well as the manner in which this principle may be linked to an incentive framework. Should the principle be accepted, any claims to performance will have to be backed up by clear and appropriate evidence inline with standardised indicators agreed to in the sector.

Monitoring data must be collected which measures progress over specified time periods, and on agreed and standardised indicators. However, data should have a purpose, and there must be a conceptual (and agreed) understanding of what data will be used for. Otherwise, some collected information becomes useless, unnecessarily increasing the administrative burden on stakeholder organisations. There should be a direct relationship between the monitoring (or evaluation) indicators and the outputs that they measure. This is a quantitative measure. The outcome measure is generally more qualitative and can only be measured through an impact study. There are outcomes that are short term, medium term or long term and every outcome must have a timeline attached to it, and funding and resources to measure progress must be allocated when in the design phase of the HCDS. This means that the M&E process for each outcome must be put into place at the beginning of the HCDS process, rather than at the end, in the middle or never, as is often the case in practice.

Principles of effectiveness and quality (for instance, does the intervention substantively meet the agreed norms and standards?; does the intervention attract

organisations or people?), and efficiency (numbers, pace, delivery chain, is it delivered in line with the time line?) and sustainability (can it be up-scaled? is it widely acceptable as a model? does it build on other efforts? does it lend itself to partnerships to share the burden of resources?). Given the focus on developmental issues in the biodiversity sector, there is a wealth of existing experience and expertise to develop M&E systems so as to ensure inclusivity, effectiveness and efficiency.

The following framework (see diagram below) provides the conceptual basis of an M&E study and are inline with that suggested by the proposed M&E framework in the Presidency. The broad elements of the evaluation framework may be as follows:

Inputs – resources, training and human resources that provided the initial impetus for the project. In this project these would include, among others, specific inputs by the HCD organising committee for instance.

Outputs/deliverables – these are specific activities or services that are delivered, such as student bursary programmes. Key institutional processes and stakeholder processes involved in facilitating the above inputs and responses to them are included as well.

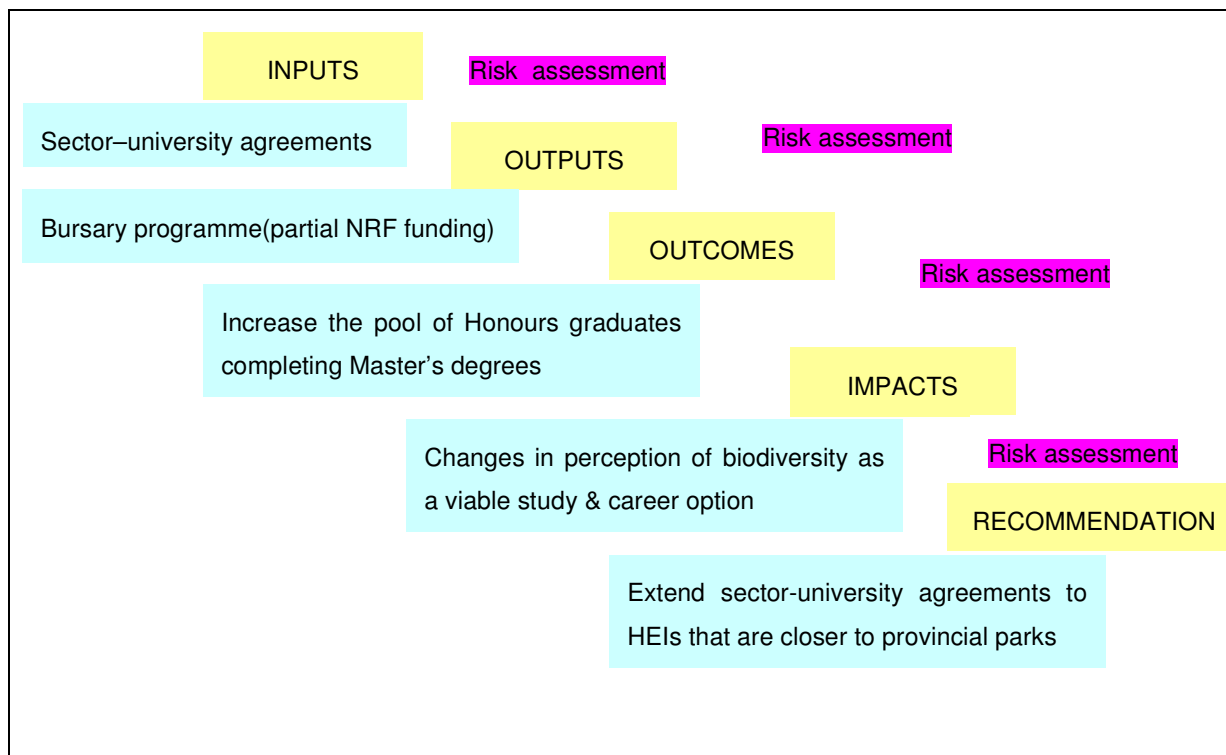
Outcomes – these are specific changes that are anticipated by the project, including for example, the increase in the pool of black students in three HEIs.

The **impacts** as envisaged in the purpose of the project would be evaluated over time. These could for example refer to shifts in the attitudes of students in their study choices before and after an intervention.

There have to be **recommendations** that emanate from the above to assist in future planning, adjustment and continued development of the project.

Risk assessments may be conducted at any point in the process, but preferably throughout the process, as suggested in the suggested framework.

Figure 7.1: Suggested guidelines for an evaluation framework



Source: adapted from Vass & Phakathi, 2005.

CONCLUSION

The HCDS in the biodiversity conservation sector will come into being during very challenging times; presenting many risks but also many opportunities. It is hoped that the background research provides an evidence-based and contextual background to inform difficult choices to be made with regard to those interventions that would most effectively address the challenges of scarce skills, transformation and the recruitment and retention of suitably qualified professionals and managers in the biodiversity conservation sector.

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