

SUMMARY DOCUMENT BASED ON A MORE COMPREHENSIVE SERIES OF WORKING DOCUMENTS



ENVIRONMENTAL SECTOR SKILLS PLAN FOR SOUTH AFRICA

**A SYSTEMS APPROACH TO
HUMAN CAPACITY DEVELOPMENT AND SECTOR SKILLS PLANNING**

SUMMARY DOCUMENT
BASED ON A MORE COMPREHENSIVE SERIES OF WORKING DOCUMENTS



environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

ABOUT THIS DOCUMENT

This Environmental Sector Skills Plan (ESSP) Summary Document is based on a more comprehensive set of working documents, listed below. It is complemented and extended by a document entitled Integrating the Environmental Driver into Sector Skills Plans in South Africa: An Enabling Document for all SETAs (DEA, 2010). All the documents are available on the Department of Environmental Affairs' Environmental Learning Forum website (www.envirolearningforum.co.za) or the Department of Environmental Affairs' website (www.environment.gov.za).

Systems Documents:

The ESSP Systems Documents are aimed at influencing and informing wider skills planning processes in South Africa. They are designed to ensure that the government's Medium Term Strategic Framework goal 'Sustainable Use of Natural Resources' is included in national skills planning and development processes.

- *Environmental Sector Skills Plan for South Africa: Summary Document. DEA, June 2010*
- *Integrating the Environmental Driver into Sector Skills Plans in South Africa: An Enabling Document for all SETAs. DEA, July 2010*

Working Documents (supporting and informing the Systems Documents):

The environmental sector is a complex, cross-cutting and emerging sector. No previous skills planning has taken place at a sectoral level in South Africa. The working documents represent the best available information, are primarily indicative, and outline areas for further research and development.

- *ESSP Working Document No. 1: Background and principles informing Environmental Sector Skills Planning in South Africa.*
- *ESSP Working Document No. 2: Understanding environmental employment in South Africa: A first attempt.*
- *ESSP Working Document No. 3: Drivers influencing environmental skills demand in South Africa.*
- *ESSP Working Document No. 4: Skills for leading and transforming the environmental sector.*
- *ESSP Working Document No. 5: Critical and scarce skills influencing performance in the environmental sector.*
- *ESSP Working Document No. 6: New environmental skills demands for mainstreaming environment into development and greening the economy.*

- *ESSP Working Document No. 7: Supply of environmentally aware graduates in South Africa.*
- *ESSP Working Document No. 8: Workplace skills planning and SETA based skills provisioning of environmental skills.*
- *ESSP Working Document No. 9: Providing for environmental sector skills development in South Africa: Issues of quality and relevance.*
- *ESSP Working Document No. 10: A short report on career guidance in the environmental sector.*
- *ESSP Working Document No. 11: System wide interventions needed to ensure proactive provisioning of skills to the environmental sector in South Africa.*
- *ESSP Working Document No. 12: Occupations relevant to environmental skills planning in South Africa.*
- *ESSP Working Document No. 13: An initial 'current status' report on Masters Degrees in the area of Environmental Management and Sustainable Development in South Africa.*

All these working documents are available on the Environmental Learning Forum (ELF) website (www.envirolearningforum.co.za) or the Department of Environmental Affairs' website (www.environment.gov.za), and will also be published in monograph format in a limited number. More Working Documents may become available on this website, since this is an ongoing initiative.

A working group within the Environmental Learning Forum, focussing on National Environmental Sector Skills Planning, has been formed to ensure that the ESSP is taken forward. Should you wish to join the ELF or the National Environmental Sector Skills Planning Forum, please contact:

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FOREWORD

The Department of Environmental Affairs (DEA) is mandated to ensure that South Africa effectively manages the environment and natural resources in a manner that ensures economic and social sustainability for current and future generations. The department's mandate is based on Section 24 of the Constitution, which states, inter alia, that all South Africans have a constitutional right to an environment that is not harmful to their health or well-being, and to have the environment protected for the benefit of present and future generations. **The constitutional imperative is further strengthened by a suite of national environmental legislation, regulations and policies.**

In providing leadership for policy implementation and ensuring effective service delivery in the environmental sector, DEA initiated a comprehensive assessment of skills demand and supply for the environmental sector, culminating in this Environmental Sector Skills Plan (ESSP). Understanding the skills demands in the environmental sector has not been an easy task, mainly due to the fact that environmental management and resource protection is **a cross-cutting issue**, requiring action by a number of sectors and all spheres of government, business and civil society. The demand for skills in the environmental sector is also increasing as new challenges arise and as new requirements for environmental management and sustainable development emerge. Most notable is the current emphasis on moving towards a green economy, which creates a need for a new set of skills to ensure efficient delivery.

This ESSP – the first of its kind in South Africa – describes the status quo with regard to the demand and supply of environmental skills and provides the best available information on scarce and critical skills in the sector at present. It also identifies new trends influencing skills development needs in the sector. The ESSP will complement the implementation of the environment sector strategic plan as well as the Delivery Agreement on Outcome 10 of the 12 Outcomes of Government's Plan of Action. Outcome 10 focuses on ensuring that the Country's environmental assets and natural resources are valued, protected and continually enhanced.

It is encouraging to note that South Africa's education and training institutions and systems are beginning to integrate environmental education and training issues into a range of disciplines and programmes. Accordingly, a new window of opportunity has opened to strengthen environmental sector skills development under the framework of the National Skills Development Strategy III, which pays attention to the government-wide Medium Term Strategic Framework objective of ensuring sustainable use of natural resources.

While there are positive signs that environmental sector skills demands are being considered, the ESSP illustrates clearly that more needs to be done to ensure an adequate supply of skills for a well-functioning, growing environmental sector. Leadership skills are needed, as are a diversity of environmental scientific and technical skills. Environmental economists, climate change modellers and soil scientists are but a few of the scarce skills identified in the ESSP. Environmental educators and trainers are also needed to provide for these new skills demands. Social and public participation skills are needed to ensure that society and communities everywhere can participate in environmental management and sustainable development actions and practices. The ESSP gives direction and sets out objectives showing how these challenges can be met. Provinces, local and national government departments and the private sector are all encouraged to draw on the broad directional guidance provided by the ESSP to direct their skills development planning at local and institutional levels.



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INTRODUCTION AND PURPOSE OF THE ENVIRONMENTAL SECTOR SKILLS PLAN

1. The Department of Environmental Affairs (DEA) is the lead agent for the environmental sector, and is mandated to ensure that South Africa effectively manages the environment for the benefit of current and future generations, according to the Bill of Rights in Section 24 of the Constitution. The DEA is mandated to implement international agreements on the environment, and to provide leadership, policy and institutional frameworks to facilitate effective service delivery in the environmental sector in relation to national environmental mandates as outlined in the National Environmental Management Act No. 102 of 1998 and associated legislation. There is an urgent need to give attention to the skills needed to fulfil this mandate, to improve service delivery and results-based outcomes as required by the governmental Monitoring and Evaluation Policy Framework.
2. The environment is a rapidly emerging sector, and **environment is a cross-cutting issue**. Environment as an economic driver is only now beginning to be articulated. Consequently, there is no dedicated ‘environmental’ Sectoral Education and Training Authority (SETA) in South Africa, and environment needs to be integrated into all SETAs. As yet, there has been no comprehensive skills development planning or analysis of skills development issues in or for the environmental sector¹.

Environmental skills planning in South Africa is currently *ad hoc*, fragmented, and re-active, and is characterised by inefficiency.

The resources available through the national skills development system have not, as yet, been adequately mobilised to address environmental sector skills demands. The environmental driver has not been adequately addressed in the National Skills Development Strategy I or II, or in earlier versions of the National Human Resource Development Strategy. This is due to a lack of comprehensive information on the skills needs for the environmental mandate, and a lack of a dedicated mechanism for dealing with environmental skills issues in South Africa. (See ESSP Working Documents No. 3, 4, 5 and 6.)

3. This Environmental Sector Skills Plan (ESSP) – the first of its kind in South Africa – describes the current status quo with regard to demand and supply of environmental skills, and provides the best available information on scarce and critical skills in the sector at present from a supply and demand perspective (see ESSP Working Document No. 5). It also identifies new trends influencing skills development needs in the sector (e.g. new socio-ecological issues and directions, such as climate change; mainstreaming of environment into development;

¹ Note that ‘sector’ here is used differently to ‘sector’ as used by SETAs. It is used to denote a cluster of initiatives, public and private, that have the common focus of environment. When seen in relation to the sectors as articulated in the national skills landscape, environment is actually *cross-sectoral*. For the purposes of this document however, it was necessary to develop a composite understanding of skills issues relevant to the environmental mandate in South Africa, as this has not been adequately

served through a bottom-up SETA-based cross-sectoral approach, and in many cases environmental skills needs have simply ‘fallen through the cracks’. This attempt to understand the sectors’ skills needs will, however, need to be disaggregated back into the different SETA sector frameworks. See the document entitled *Integrating the Environmental Driver into Sector Skills Plans: An Enabling Document for all SETAs*, DEA, July 2010.

new science and technology directions in South Africa; and the green economy). It further provides guidance on improving environmental sector skills development planning and implementation within the national education, training and skills development system. It sets objectives for Human Capital Development Strategic Planning for the Environmental Sector, and provides guidelines for Human Capital Development Planning (see ESSP Working Document No. 1).

4. **Skills** as used in this document refer to occupational categories, but also to the **knowledge, values and skills** needed to fulfil environmental mandates. The ESSP uses the categories of **high**, **intermediate** and **entry level** skills to differentiate skills development needs. **High skills** refer to qualified personnel at levels 7-10 on the South African National Qualifications Framework (Bachelors degree and above); **intermediate skills** refer to qualified personnel at levels 2-6 on the National Qualifications Framework (Grade 9, FET and diploma qualifications) and **entry level skills** refer to personnel with level 1 (Grade 9/ABET level 4) and below on the National Qualifications Framework. **Scarce skills**, according to the definition of the Department of Labour, refer to occupations in which there is a scarcity of qualified and experienced people, currently or in the future, either because such people are not available (*absolute scarcity*), or because they are available but do not meet the employment criteria (*relative scarcity*). **Critical skills** refer to specific skills within an

occupation, and include generic skills (e.g. problem solving, report writing etc.), and particular occupational skills (e.g. using GIS). (See ESSP Working Document No. 5.) **Vacancy rates**, considered within a trend analysis period of five years, are used as proxy for identifying skills demands. Severe skills shortages are experienced when the vacancy rate exceeds 5%. According to Organisational Design and Human Resources Development Principles, acceptable organisational vacancy rate is 13%, while that of specialists' positions is 23%. A 22% vacancy 'norm' was used in this study, and vacancies above this norm were considered to indicate skills gaps, particularly if the pattern was consistent over a five-year period.

5. The **environmental sector** referred to in this document includes public, private, parastatal and Not for Profit Organisations (NPOs) across a range of SETA defined sectors. It covers the environmental focus areas of Air Quality, Waste and Chemicals Management, Pollution Incident Management, Environmental Impact Management, Conservation and Sustainable Use of Biodiversity, Marine and Coastal Management *as well as* cross-cutting support functions: Environmental Law and Compliance, Environmental Education, Training and Community Empowerment. It excludes water, since the Department of Water Affairs (DWA) has undertaken a similar study to establish skills development needs in the Water Sector, and because the study was initiated as the departmental mergers were being



planned. Similar information on skills needs is available for the water sector. Combined, these two strategies, along with the Human Capital Development Strategy planning being undertaken by the South African National Biodiversity Institute (SANBI), show remarkable synergies in terms of trends related to skills development issues. This indicates that the issues identified in this ESSP are **systemic, and affect the entire sector**². (See ESSP Working Document No. 11.)

6. The ESSP is linked to, and has informed a number of **Human Capital Development (HCD) strategies**, which provide for **micro-level or sub-sector skills planning and implementation** (see Diagram 1). A combination of broad-based sector skills planning and differentiated Human Capital Development Strategic Planning is necessary within a differentiated system of skills provisioning, which in the case of the environmental sector is differentiated according to key priorities and legislative mandates, but also according to specific skills demands at different levels of the system. The DEA ESSP has therefore already (in its process of development) influenced the design of a Human Capital Development Strategy for the Biodiversity Sector (led by SANBI); and the Department of Science and Technology's Global Change Grand Challenge Human Capital Development Strategy. Links have also been made to the Department of Water Affairs' Human Capital Development Strategy; and a Human Capital Development Strategy being developed for sustainable natural resource management in forestry, agriculture and fisheries. The ESSP has an associated DEA Human Capital Development Strategy that plans key interventions to support the five-year Strategic Plan for the Environmental Sector (2009-2013). To address the need for co-ordination of these skills planning efforts, a **National Environmental Sector Skills Planning Forum** (NESPF – see Diagram 1) has been formed with key stakeholders

² During the course of the ESSP development process, and its Human Capital Development Strategy planning, a National Environmental Sector Skills Planning Forum was formed involving ESSP researchers from DEA, the Skills Academy of DWA (i.e. both departments in DWEA), the Department of Science and Technology, and stakeholders in the Biodiversity Sector, as all have realised that the same issues are being raised in relation to the broader environmental sector and its skills needs.

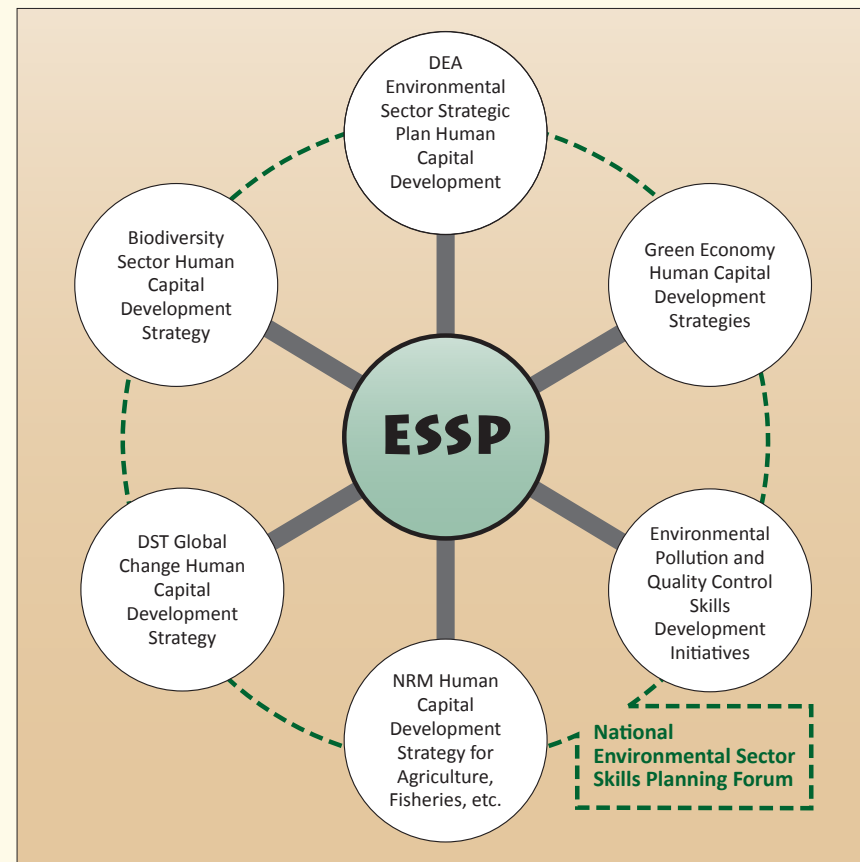


Diagram 1: ESSP links to human capital development strategies

involved in human capital development strategy planning to ensure synergy and efficiency. This process is demonstrating the influence of a document such as the ESSP on other skills development planning processes. A set of principles to guide Human Capital Development Strategy Planning is included in ESSP Working Document No. 1, and an excellent example of a good Human Capital Development Strategy linked to the ESSP, produced by SANBI for the biodiversity sector, is available on the biodiversity skills website (www.skillsforbiodiversity.org.za).

METHODOLOGY AND CONSULTATION PROCESS

7. This ESSP is informed by a **wide consultation process** involving three national workshops, nine provincial workshops, internal DEA Branch workshops, and specific workshops with specific groups have been held to probe certain issues in more depth (e.g. HR managers, schools initiatives, career guidance, and Higher Education providers). More than 350 individuals from over 100 different stakeholder groups have participated in the process (see Appendix A), which has also been linked to the development of two other key Human Capital Development Strategy (HCDS) processes – the SANBI Biodiversity Sector HCDS, and the Department of Science and Technology’s (DST) HCDS for the Global Change Grand Challenge. The Department of Provincial and Local Government (DPLG)’s skills audit and competence development research was also consulted and included. Over 100 key interviews were conducted with stakeholders across the sector, from senior management to community level. A futures thinking workshop was hosted with the DST involving some of South Africa’s most respected scientists. Over 200 documents and research reports were analysed, and Workplace Skills Plans of over 50 organisations in the environmental sector were reviewed, along with all SETA Sector Skills Plans and the Sustainability Reports of 20 of the 32 Johannesburg Stock Exchange (JSE) Sustainability Reporting Index 2009 Best Performers (judged according to environmental performance). Data was obtained from the National Learner Records Database held by the South African Qualifications Authority (SAQA) and the Department of Education’s Education Information Management System (EMIS), and Higher Education Information Management System (HEMIS). These datasets were used to analyse trends in the supply of environmental graduates. (See ESSP Working Document No. 7.)
8. The most complex methodological problem encountered in the ESSP work was the collection of **accurate data on employment** in the sector, due to the fact that the National System of Statistics does not capture Standard Occupational Category codes to the requisite level, and no specific Standard Industrial Category exists for the sector. It was not possible to conduct SETA sector specific analyses of environmental employment and skills needs, although all SSPs were reviewed. Vulindlela datasets were used to identify public sector employment profiles and trends, but similar sets of data were not available for the parastatal environmental sector, environmental employees in the private sector and others. Various different strategies were therefore used to compile the sector profile which included use of annual reports, and workplace skills plans. Trends analyses were done where data existed, but even the Vulindlela data was unstable, as occupational categories have changed significantly over the last five years as departments have restructured according to new mandates and systems, particularly at provincial levels. The sector profile is therefore *indicative*, rather than precise. There is an **urgent need to engage with the National System of Statistics to establish adequate information management systems for accurately capturing and reporting on environmental sector employees. SETAs also need to make capturing accurate data on environmental employment and skills demands a focus of their ongoing research and monitoring.**



PROFILE OF ENVIRONMENTAL EMPLOYMENT BY EMPLOYER CATEGORY³

9. Due to inadequate statistical information, it was not possible to capture accurate data on environmental employment according to Standard Industrial Categories. It was, however possible to obtain a picture of environmental employment by considering broad employer categories. There are a number of different employer categories in the environmental sector. These include the **Public Sector**, **Private Sector** and **Not for Profit Sector**. The **Public Sector** was found to be a **significant employer of environmental skills**. A variety of national departments in the economic cluster employ environmental technical, management and scientific skills. Every province has a department that employs environmental technical, management and scientific skills. Best available figures (all figures are based on 2007/8 data) indicate that environmental employment figures for national and provincial public sector are in excess of 4 500 people employed at mainly high and intermediate skills level. If water is included, public sector employment of environmental skills rises to approximately 12 000 employees (excluding local government and water parastatals). There are also a number of national and provincial **parastatal organisations** with an approximate employment figure of more than 7 000 people (mostly employed at intermediate and entry levels, with some parastatals such as SA Weather Service and SANBI requiring more high skills). SANParks is the largest parastatal employer

in the environmental sector with over 3 000 employees. **Local government** is a large-scale employer in the environmental public sector, with most environmental functions being at the entry level. However, intermediate and high level technical, scientific, engineering and management skills are critical for effective service delivery. Best available information indicates that public sector environmental employment in local government stands at approximately 37 000 people, with 3 500 of these being senior and management level staff and 4 000 of these being technical staff.



³ For more details on this section see ESSP Working Document No. 2: *Understanding environmental employment in South Africa: A first attempt*.

The bulk of environmental employment in local government is at entry level. In total, therefore, **the public sector is a significant employer of environmental skills, involving approximately 48 500 people with responsibilities at high, intermediate and entry level** to manage and implement South Africa's environmental mandate. When figures for those employed in the water sector are added, this number will increase significantly. The fact that consolidated figures on this employment profile were not available indicates that little comprehensive knowledge is available on their skills needs.

10. The **Not for Profit Organisation (NPO) Sector** was also found to be a **significant employer of environmental skills**, although 2007/8 data was not available. A 2002 study indicates that total environmental employment in the NPO sector accounts for approximately 5% of employment in the NPO sector in South Africa, at approximately **33 000 people**. Again, up-to-date information on this sector and its employment profiles does not appear to exist in consolidated form.
11. While accurate data on employment in the **private sector** was not available, estimated environmental employment figures for the private sector are in the region of **150 000 employees**, many involved in the SMME sector (a search of the CIPRO database indicated over 10 000 companies with an environmental focus). Sampling showed an average of ten employees per company, although company sizes vary significantly – from single person companies, to larger companies with up to 3 000 employees. Similar employment figures are provided by the draft Environmental Goods and Services Study (EGS Forum, 2009). Big industry is also increasingly employing environmental skills, and it was found that the 105 companies that are submitting Sustainability Index Reports to the Johannesburg Stock Exchange annually, in 2008 constituted approximately 85% of the JSE's market capitalisation (i.e. the bulk of big business in South Africa). All sustainability reports show commitment to improving environmental compliance and management, albeit in varying degrees. A biodiversity sector study using the Labour Force Survey showed that the mining industry alone employs some 3 500 biodiversity related workers, of which 1 655

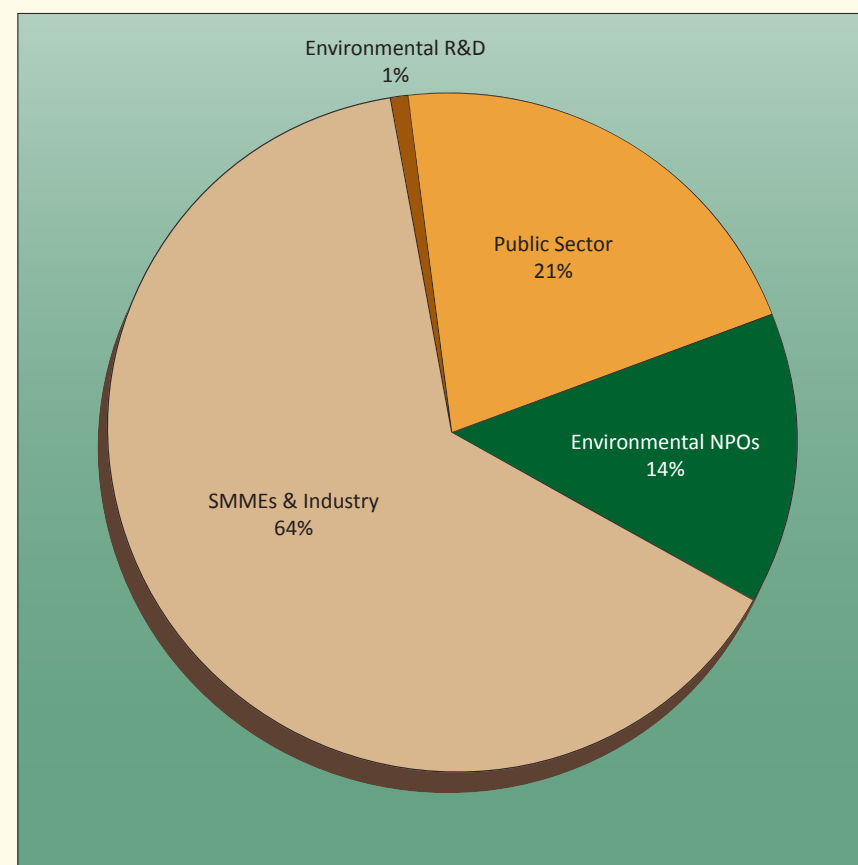


Diagram 2: Environmental employer profiles – employer categories

are high and intermediate level skilled people (HSRC, 2009). A more comprehensive study on environmental employment in the private sector is needed to obtain more accurate figures, **but indications are that the private sector is the primary employer of environmental skills in South Africa** (see Diagram 2).

12. The **education and research and development (R&D) sector** is also increasingly becoming a significant employer of environmental skills, currently conservatively approximated at **2 500 people**. Environmental

research currently constitutes 4.3% of total R&D in South Africa, but is a rapidly growing area, and environmental research skills are needed in other R&D areas. Environmental education is a new knowledge and skill area for all of South Africa's 350 000 teachers.

13. In summary, the best available (conservative) assessment of environmental employment in South Africa, by employer category, indicates that **environmental employment is a significant 'new' area of employment in the country**, and is linked to both new environmental policy and legislation (new mandates) and new opportunities for development and growth (see Table 1). Of critical concern, however, is the poor available knowledge of the profile and growth of employment in environmental occupations, which can only impede accurate skills planning. (See ESSP Working Documents No. 2 and 12.)
14. While the figures provide a relatively accurate indication of environmental employment, **a detailed national skills audit is needed to accurately assess environmental employment**. Figures provided by the Environmental Goods and Services Study (EGSF, 2009) also provide a current conservative approximate figure of 230 000 for environmental employment in South Africa, which verifies the

TABLE 1: CONSOLIDATED APPROXIMATION (CONSERVATIVE) OF ENVIRONMENTAL EMPLOYEES IN SOUTH AFRICA

Employer Groupings	Estimated numbers
National and Provincial Government (excluding water)	4 500
Local Government (environmental employees only)	37 000
Environmental Parastatals (national and provincial)	7 000
NPOs (NGOs, CSOs, CBOs)	33 000
SMMEs and Industry	150 000
R&D (including Higher Education)	2 300
TOTAL Estimated Employment in the Environmental Sector (excluding water, and teachers in schools)	233 800

findings of this study to some extent. If water employment figures are added, **the environmental sector is a significant sector – with economic impact as well as public good impact in South Africa – deserving of consolidated skills development planning and provisioning through the National System of Skills Provisioning.**



DRIVERS OF SKILLS DEMAND AND SUPPLY IN THE ENVIRONMENTAL SECTOR⁴

POLICY DRIVERS

15. **The Medium Term Strategic Framework (MTSF) of National Government** includes a strong focus on quality education, skills development, rural development, sustainable human settlements and the sustainable use of natural resources. Sustainable use of natural resources is defined as a specific goal. These issues are powerfully linked to poverty reduction; a social justice approach to sustainable development of South African society and economy; and the national system of innovation. These sustainable development objectives have their roots in the South African Constitution, which includes a focus on poverty alleviation, equitable access to natural resources, sustainable utilisation of natural resources for present and future generations, and the right to an environment that is not harmful to health or well-being. However, to address poverty while addressing related new development challenges such as climate change, water scarcity, new energy futures, sustainable human settlements, loss of biodiversity and natural resources, and vulnerability to risk, urgent attention needs to be given to strengthening the skills needed for achieving these development objectives. New development challenges such as climate change and water scarcity threaten to reverse development progress, thus driving the need for new skills to address this risk.

16. The National Environmental Management Act (No. 102 of 1998), the National Water Act (No. 36 of 1998), the National Environmental Management: Biodiversity Act (No. 10 of 2004) and a host of other associated legislation introduced **a people-centred approach to sustainable development** in South Africa. The National Framework for Sustainable Development (RSA, 2007) outlines the need for South African society to focus on efficient and sustainable use of natural resources; address human needs in ways that ensure that resources needed for long-term survival are not depleted for short-term gain; and ensure that socio-economic systems are appropriately embedded within a recognition of their relationship with ecosystems and ecosystem services. Recently, new legislation has been promulgated for Integrated Coastal Zone Management and Waste Management (amongst others). The South African situation is therefore characterised by a rapidly emergent environmental legislative framework which has particular skills needs. For example, the new Waste Management Act requires a re-skilling of all waste practitioners in the country to adopt a ‘cradle to cradle approach’ to waste management. The most widely cited skills needs associated with implementing legislation are: integrative and predictive skills; monitoring and risk assessment skills; specialist scientific and management skills; social and ethical skills (amongst others); compliance and inspection skills; *as well as* specific technical skills required for servicing particular legislative frameworks. The need to **mainstream environment** into all government departments, and into development planning, is driving the need for skills in the environmental sector.

⁴ For more details on these drivers, see ESSP Working Document No. 3: *Drivers influencing environmental skills demand in South Africa*.

MACRO-ECONOMIC DRIVERS

17. The DEA, together with three other government departments in the Economic cluster recently hosted a **Green Economy Summit**, with a view to grow the economy through the development of a **Green Economy Plan** by July 2010. This initiative seeks to outline a green economy path that will contribute to a gradual shift to greater environmental sustainability, focusing on mitigation in the short-to-medium term but resulting in higher levels of adaptation as South Africa moves to a low carbon economy in the long-term, dealing with critical issues such as climate change, the global economy, food security, water security and energy efficiency. The second version of the South African Industrial Policy Action Plan (IPAP 2) focuses on key areas for future development. The **emergence of a green economy** is included in IPAP 2, addressing key issues associated with South Africa's energy future. It seeks to grow economic activity (which leads to investment, jobs and competitiveness) in the green industry sector, and bring about a shift in the economy as a whole towards cleaner industries and sectors with a low environmental impact compared to its socio-economic impact. Biodiversity related 'green jobs' and waste management green jobs are both areas of potential for green economy development. Within the IPAP 2 are a number of key imperatives: reduce poverty; do more with less; make more of what we have; and reduce energy and water usage. These drivers, together with international trends towards a low carbon

future, are shaping industrial development policy, and associated skills development demands. Green economy strategy development is currently not being adequately matched with the **skills planning** necessary for the emergence of a green economy. Skills development must be seen as a core element of Green Economy Strategies. The emergence of a green economy, and its needs – particularly for economic and technological skills – is driving environmental skills needs. This Environmental Sector Skills Plan (the first of its kind in South Africa) will begin to address this need.

18. Besides new economic development possibilities associated with the emergence of a green economy, there are other **macro-economic drivers that are influencing skills demands** in the environmental sector. These relate to the need for *valuing resources*, the emergence of *green fiscal reforms*, and *quantifying environmental costs* associated with environmental risk and impact. While macro-economic trends are showing the impacts of the global economic downturn, increased understanding of the value of natural resources to the economy and its sustainability is raising the profile of environment within macro-economic planning and policy. While government revenue is declining, and the economic downturn is impacting on available jobs, there is potential for being more efficient and strategic with the country's resources. Savings in water and energy for example, can help to buffer other economic losses. The Treasury has costed externalities in a number of production processes, and is beginning



to implement green fiscal reforms to minimise these externalities. Valuing of natural resources is also providing new economic and development opportunities, and South Africa also needs skilled capacity for making use of global economic instruments for a green economy (e.g. the clean development mechanism). The value of natural resources for development is only recently beginning to be costed. For example, the Department of Environmental Affairs and Development Planning in the Western Cape have valued biodiversity in the province to be worth at least R10 billion per year – over 10% of the annual provincial Gross Regional Product. These new macro-economic trends are creating a demand for skilled resource and environmental economists, and environmental enterprise development, an area which is growing rapidly in South Africa and elsewhere. Currently the South African Goods and Services market makes up between 1% and 1.6% of the GDP and is small and fragmented, but it is also one of the areas that is projected to **grow rapidly** in the next few years (see demand side analysis below). The rapid growth of the Environmental Goods and Services Sector is therefore driving the need for environmental skills.

19. Skills are also needed for **mainstreaming environment into development**. While the DEA has been designated lead agent for environmental management in South Africa, the DEA Strategic Plan for the Environmental Sector identifies 31 national departments with legislative environmental management responsibilities and functions. In effect, every department, ministry and industry in South Africa carries some responsibility (as outlined in legislation) for the environment and for implementing the National Environmental Management Act and its associated legislation and strategies, including the National Framework for Sustainable Development. **A mainstreaming approach implies that skills development initiatives need to be extensive and comprehensive enough to support the integration of environment into development across the state and in all spheres of private and civil society.** Mainstreaming requires both an environmentally literate citizenry and a workforce with the capacity to implement effective actions for sustainable development.

This implies a need for a broad and strategic framework for environmental skills planning, and the need to **integrate the environmental driver into national skills development planning, strategy and human resource development frameworks**. The environmental driver is currently under-represented in these key national strategies, a matter which requires **urgent attention**, since the National Skills Development Strategy III (NSDSIII) and the revised Human Resource Development Strategy for 2010-2030 are currently being finalised.

MACRO-ECOLOGICAL DRIVERS

20. Despite massive improvement and growth in environmental management and sustainable development policy and practice over the past fifteen years, the **macro-ecological environment continues to be characterised by environmental degradation, with consequences for human well-being, effective service delivery and future development and growth options**. It impacts on the livelihoods of the rural poor, and on sustainable and healthy urban settlements. To reverse this trend, and to address critical environmental issues – such as water scarcity, poor water quality and equitable access to water; climate change risk and opportunity; human vulnerability to increased ecological degradation and loss of resources; loss of biodiversity and ecosystem functioning; lack of capacity to absorb waste and pollution; insufficient clean energy and equitable access to clean energy; and land degradation and loss of soil productivity – requires **new skills** for environmental management, risk and opportunity assessment, and compliance management and monitoring. **All major national and international environmental reports point to the need for adequate skills to respond to an ever-more complex range of environmental issues and risks.** The ecological condition and the need for appropriate responses is therefore also an important driver of skills needs, which are technological, scientific, social and policy and management oriented. Environmental education and training skills are needed in higher education, further education and basic education, and in workplace learning contexts to teach people how to acquire these new skills.

21. In the face of new challenges such as climate change, the South African 10 Year Innovation Plan (DST, 2007) and the associated Global Change Grand Challenge National Research Plan (DST, 2010) highlight **the growing importance of developing skills for risk prediction and risk management; sustainability innovation; complex systems analysis; building system resilience; and adaptive management**. The Department of Science and Technology Global Change Grand Challenge National Research Plan (DST, 2010) states that “a complex system of non-linear interacting factors incorporating time-lags and spatial heterogeneity is unlikely to change in a smooth and predictable fashion when nudged in a particular direction ... it is not known where the thresholds for sudden changes in future lie, since the global environmental crisis at the beginning of the 21st century is in many respects unprecedented” (DST, 2010). The Global Change Grand Challenge National Research Plan emphasises the importance of developing skills that take account of the fact that the natural systems interact indivisibly with human systems, and that skills are needed to cope with and respond to a multi-faceted poly crisis constituted by interacting forces that arise when ecosystem degradation, global warming, declining fossil fuel reserves, resource depletion, waste accumulation, inequality, rapid urbanisation, and food insecurity interact. The Global Change National Research Plan (DST, 2010) is driving a need for inter-disciplinary skills, and for a ‘new breed of scientist’ and policy maker with both technical specialist skills and integrative skills. It is also driving the need for adopting **a pro-active, futures thinking approach to skills development** in the environmental sector – an issue that was raised throughout the ESSP consultation process in all consultations and in all provinces. To address climate change, South Africa has listed its Nationally Appropriate Mitigation Actions (NAMAs) and in order for the country to reach its goals of a 37% reduction by 2020 and 42% by 2025 below the business as usual scenario, South Africa will need to make substantial policy shifts in all key sectors. This calls for a Green Economy perspective in acting accordingly, and for skills development that can support the implementation of these mitigation actions.

SKILLS SYSTEM DRIVERS

22. A recent CSIR study shows that up to 79 000 Grade 12 scholars from South Africa’s rural provinces (Eastern Cape, Limpopo, KwaZulu-Natal, and Mpumalanga) *with matric passes in science, geography and biology* are not making it into the Higher Education system. This points to a significant loss of youth potential with skills to enter the environmental sector. Issues such as the ‘loss of youth potential’ and inadequate skills for servicing a new area of development and social concern in the country are both directly and indirectly related to the history and **quality of schooling** in South Africa. By now, the status of science and maths results in the education system are well known and have been widely published. For example, while the total number of Grade 12 mathematics passes increased from 95 000 to 149 222 between 1997 and 2007, less than 5% achieved a higher grade pass, and nearly 200 000 students failed Grade 12 in 2007. Few proceed to higher education, and in 2008 only 20% of the 333 604 scholars who passed Grade 12 achieved a university entry pass, and 2009 university results indicate that these passes may not be of an adequate standard for success in Higher Education. However, it is not only science and mathematics that are of concern or that serve as ‘proxy’ indicators for quality schooling; literacy results are increasingly receiving attention, as language is the foundation of all learning. South Africa currently ranks amongst the lowest in the world on basic literacy – 132nd out of 134 countries surveyed by the World Economic Forum. These historical difficulties in the education and training system are driving a need to improve the quality of skills development in South Africa.
23. Research into educational quality issues undertaken to inform the ESSP not only points to poor results, but also outlines critical issues associated with the **quality of science and environmental education** in the schooling and Higher Education system. Issues underpinning the poor quality of schooling are systemic and involve a range of factors, including: the foundations of learning are not being laid; poverty influences learners’ ability to succeed in school; children are hungry; and many teachers lack the necessary knowledge to teach, and to

keep up with the knowledge changes in society. The systemic nature of these issues is driving a need for expertise from the environmental education community to **strengthen the environmental focus in the curriculum**, as this can facilitate **improvement in educational quality and relevance**.

NEW SCIENCE AND TECHNOLOGY DRIVERS

24. International development trends show that the planet is entering a 'new development era' focussing on sustainability and low carbon futures as key drivers for development (see Diagram 3). This is in response to the global realisation that current development patterns are unsustainable and are depleting the resources necessary for future developments. These development patterns are also releasing significant international development and innovation

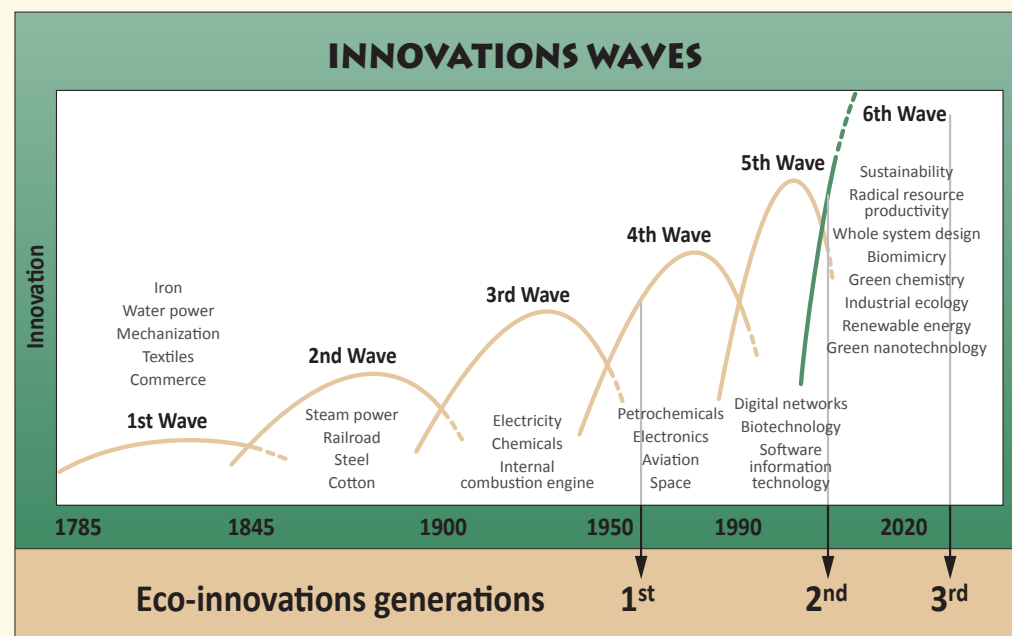


Diagram 3: Trends in development (Source: Montavaldo, 2009)

funds. For example, it is projected that investments in clean energy technologies totalled \$39 billion in 2005; expanded to \$55.4 billion in 2006; and will quadruple to more than \$226.5 billion within a decade (globally) (Montavaldo, 2009⁵). Similar trends are reflected in projections associated with the expansion of the Environmental Goods and Services Sector, which currently stands at ZAR 20 billion (1.7% of GDP), and which is projected to triple in the next five years (ESGF, 2009). **To make use of these new development opportunities, South Africa will need to give attention to the development of high level scientific and technological skills to drive such development.**

25. The **research, science and technology innovation** context is therefore also a significant driver of skills needs in the environmental sector in South Africa. In particular, it points the way towards a knowledge economy, which has significant skills planning implications. It is significant that three of the National Grand Challenges in the South African 10 Year Innovation Plan are focussed on environment related issues (bio-technology and sustainable use of biodiversity; global change, with emphasis on climate change and sustainability; and clean, affordable and safe energy technology). The DST envisages that South Africa can become a world leader in climate science and the response to climate change within a framework of global change, which includes social, economic, technological sustainability sciences, as well as earth system sciences. It sees the 10 Year Innovation Plan as having a significant role to play in addressing the Millennium Development Goals. The DST is currently investigating skills development needs (in partnership with the ESSP process), which can accelerate skills development in this area, and which can also service the innovation, governance and service delivery needs of the environmental sector. Improved science, technology, social and ICT skills are all necessary for building a knowledge economy and for addressing the needs of the poor, as envisaged by the DST 10 Year National Innovation Plan.

⁵ Montavaldo, C. 2009. *TNO International Collaboration Global Alliance Workshop on Climate Change and Adaptation Innovation*. Presented at the Department of Science and Technology Meeting on Climate Change Innovation, Pretoria, 18-19 March 2009.

DEMAND FOR SKILLS IN THE ENVIRONMENTAL SECTOR⁶

26. The ESSP identified a **number of key areas of skills demand** in the environmental sector, all of which are particularly significant to the efficacy of service delivery in the public sector, and which also affect efficacy and developmental competitiveness of the private sector. These are:

- **leadership skills** – supply and stability;
- supply and development of **scarce skills** where skills gaps exist;
- more strategic planning and provisioning for re-skilling and updating of capacity in key areas where **critical skills** needs were identified;
- development of **new skills for greening the economy, sustainable development planning and managing risk**, e.g. sustainable development planning and climate change risk assessment (new green skills);
- **skills for mainstreaming environment** into development (greening of existing skills); and
- **skills to develop and expand the sector**, which include Environmental Education and Training skills to ensure that there

is adequate capacity to deliver environmental training to an emerging and rapidly growing sector.

27. **Leadership skills:** there is a clearly expressed need for enhancing environmental leadership – particularly in the public sector, but also in the private sector. Current HR Oversight data shows high vacancy (between 25-30%) and turnover rates (approximately 25%) amongst senior management and professional management positions in the public sector, but this phenomenon affects the private and NPO sectors equally. Municipalities equally lack sustainable development planning and leadership skills, and stability in the leadership structures. **Not only supply, but continuity of leadership**, is therefore a critical issue that needs to be addressed. The ESSP research shows that there is also a potential link between instability in Human Resources support services, management and leadership, and effective recruitment and filling of vacancies in other areas – indicating the systemic impact of this issue on capacity. Data shows the following trends and issues that are worth noting here: **vacancy rates** in the public environmental sector have generally decreased in the past five years, except in the category of senior management (levels 13-16), which in 2007/8 were **high at 31%**. Based on past trends, simple regression forecasting shows potential increase in this category to a possible 38% in 2011/12. There is also some evidence that the issue of supply and continuity of senior management is being given attention, particularly at national level, but the scale and **systemic** and ongoing nature of the problem require ongoing attention and skills development efforts in the environmental sector.

⁶ For more details on demands for skills in the Environment Sector see ESSP Working Document No. 5: *Critical and scarce skills influencing performance in the environmental sector*, and ESSP Working Document No. 6: *New environmental skills demands for mainstreaming environment into development and greening the economy*.

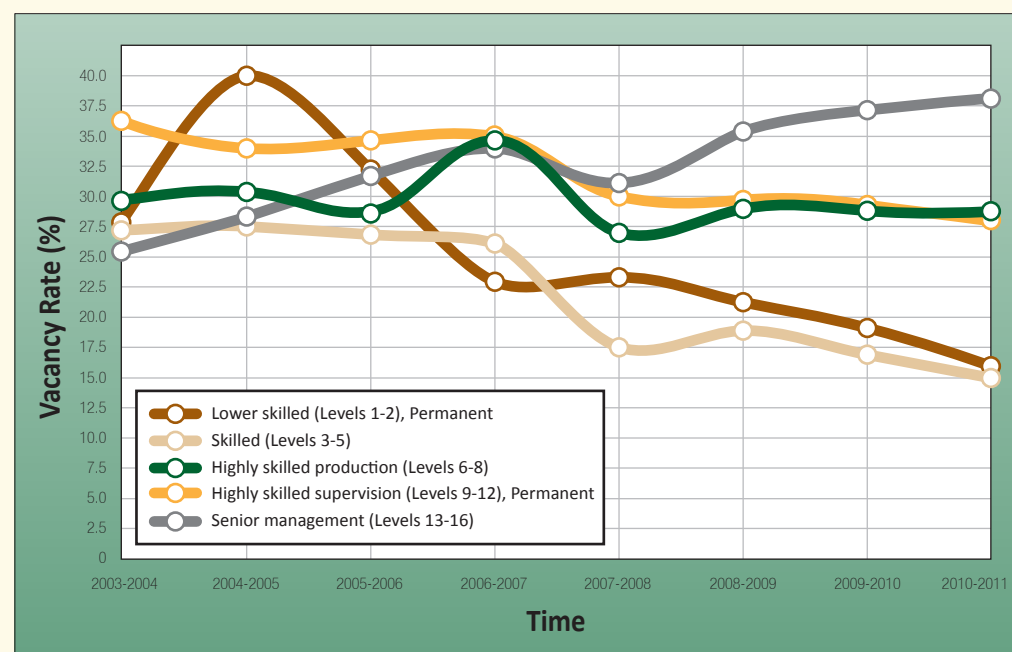


Diagram 4: Vacancy rates per selected salary bands (Economic Cluster data) between 2003 and 2008, with a three-year forecast
(R-squared values per programme: levels 1-2=0.32 ; levels 3-5=0.58; levels 6-8=0.01; levels 9-12=0.56; levels 13-16=0.66)

28. Environmental leadership skills in the provinces and in local government: Provinces (vacancy data compared over a five-year period from 2002/3-2008/9 in departments responsible for environmental affairs as proxy for skills needs) appear to be particularly affected by the issue of leadership skills. The Eastern Cape province has high current vacancies in the highly skilled category (over 40%). Free State province shows a consistent increase in vacancy rates across all levels, including senior management (33%), and highly skilled production staff (21%) over a five-year period. KwaZulu-Natal shows consistent vacancies of 28% amongst senior management over a five-year period. Limpopo province shows increases in vacancy rates over the past five years in senior level skilled positions (21% increase) with

an increase in turnover rate over the five-year period. There has been significant change and re-structuring in the Northern Cape and North West provinces. In the Northern Cape vacancies have increased in all employment categories over a five-year period, including highly skilled production workers (40-50%), supervision (35-45%) and senior management (25-35%). The North West province shows a decrease in vacancies amongst senior management, but still has high vacancies in the highly skilled band (36%). Western Cape also has high vacancy rates at skilled production levels (34%) and supervision levels (31%). The Gauteng province environment programme had high vacancies (42%) in 2008/9, with a 32% vacancy rate at supervision level. There has also been a 24% increase in senior management vacancy rates over the five-year period. Mpumalanga is the only province that seems to have reduced vacancies since the 2003/4 period, in all categories except senior management. Overall this reflects an **unstable skills and service delivery environment**. Provincial and national public sector data shows that, for environmental sector skills planning, different provinces have specific needs, but there are also **common challenges faced by all provinces**. Vacancies and stability in the HR directorates appear to have a significant impact on stability in the rest of the HR system. While specific quantitative data was not available on the local government situation, qualitative data indicates **similar issues at local government level**, where LGSETA listed a shortage of 250 Local Authority Managers in their scarce skills list, noting **high vacancy rates** as issues of critical causal concern. **The systemic nature of this problem indicates a need for a national drive to increase environmental leadership skills in South Africa, and to retain leadership skills particularly at senior management levels, where turnover is high, to ensure greater stability of senior management and leadership.** (NOTE: A norm of 22% vacancies was used and only those above 22% are reported, particularly where consistent vacancies occur over a five-year period.)

29. Scarce skills in the environmental sector: The ESSP research found a **consistent pattern of scarcity in environment related occupations**, which is affecting the public sector's capacity for service delivery and

the private sector's capacity for competitive growth and development. It found that only some categories of scarcity were indicated on the Department of Labour's Scarce Skills List. The environmental sector is affected by absolute scarcity, as well as relative scarcity. It also found that *specific areas of scarcity exist* for different focus areas in the environmental sector (see Appendix B for a more comprehensive list of scarce skills identified). More detail is available in ESSP Working Document No. 5, and in the document entitled *Integrating the Environmental Driver into Sector Skills Plans: Enabling Document for all SETAs* (DEA, 2010). In particular, there are three categories of scarcity that were most pronounced:

- 1) **Environmental scientific skills:** These include soil scientists, ecologists, environmental and resource economists, taxonomists, climate change scientists, biotechnologists, etc. (see Appendix B). There are currently vacancies for **over 800 environment related scientists in the public sector (national and provincial government) alone** (excluding water). This figure stands at over 600 if the current 'average' vacancy rate of 22% for the Economic Cluster is used as normal proxy. The vacancy trends are **consistently high** (indicated in a five-year trend analysis), and it appears that it is particularly difficult to fill these vacancies at **provincial and local government levels** – national departments seem to be more able to fill these vacancies, although national parastatals such as the Weather Services and South African National Biodiversity Institute continue to report difficulties, and vacancies in the national environmental department are higher (29%) than average vacancy figures for the economic cluster (22%). A trend analysis of vacancy rates **shows consistent levels of high vacancies in critical environmental occupations**. Due to structural changes, it was not possible to undertake trend analysis for all critical environmental occupations, but vacancies for Natural Science related occupations increased to a high of 47% in the 2006/7 period, but are declining. In 2007/8 Natural Science related occupational vacancies stood at 37%, indicating a drive to fill these vacancies. This is reflected in workplace skills planning of

provincial departments, where efforts are being made to provide bursaries and internships for environment related scientific positions. The issues associated with scientific skills shortages seem, however, to be particularly acute at provincial level, with the Eastern Cape showing 59% increase in vacancy rates in the five-year period; the Free State province seems to have cancelled the function of Biochemistry, Zoology and Life Sciences Technical Skills, which had a 50% vacancy rate five years ago; vacancy rates

TABLE 2: HR VACANCY DATA RELATED TO CRITICAL ENVIRONMENTAL OCCUPATIONS IN THE PUBLIC SECTOR (AS OF MARCH 2008)

Occupations	Number of posts	Number of posts filled	Vacancy rate (%)
Agriculture, Animal, Oceanography, Forestry and other sciences, Permanent	1 415	974	31.2
Biochemistry, Pharmacology, Zoology and Life Science technical, Permanent	1 517	1 110	26.8
Biologists, Botanists, Zoologists and related professionals, Permanent	137	103	24.8
Natural Sciences related, Permanent	853	538	36.9
Nature Conservation and Oceanographical related technical, Permanent	910	441	51.5
Chemical and Physical Science technicians, Permanent	84	60	28.6
Geologists, Geophysicists, Hydrologists and related professions, Permanent	426	205	51.9
Meteorologists, Statistical and related technicians, Permanent	13	8	38.5

(Source: Vulindlela HR Oversight Data – Economic Services – extracted from DEA 2007/8. Only categories with vacancies above 22% were selected. This excludes skills needs in parastatals, NPOs and the private sector)

for these functions have similarly increased by 18% over the five years in KwaZulu-Natal; Natural Sciences related vacancies are at 30% in Limpopo province, at 57% in the Northern Cape and at 31% in the Western Cape (2008/9 HR data). In all cases, vacancies were higher in the 2008/9 period than in the 2003/4 period. The local government SETA indicates scarcity of over 300 environmental and water engineers; and SANBI has identified a need for biodiversity research and climate change specialists, amongst others (for more detail, see the biodiversity sector Human Capital Development Strategy, on www.skillsforbiodiversity.org.za). There is particularly a **need to develop capacity of black women scientists and engineers, given their historical marginalisation** in the system.

- 2) **Environmental technical skills:** Local government SETA skills planning and the Vulindlela HR database analysis reveal a shortage of **over 1 500 environmental technicians in South Africa at present** (over 1 200 if 22% vacancies are the 'norm') – indicating a severe shortage of technical skills in the public sector, where such skills are critical to service delivery. In the public environmental sector, a vacancy trend analysis shows that oceanographic and conservation technical occupations demonstrate a worrying increase in vacancies over a five-year period, currently (2008/9 data) standing at 50% and predicted to rise to 55% over the next three years. This is particularly an issue in the public sector at provincial level, with vacancies in these technical positions increasing by 59% in the Eastern Cape (currently in the region of 80%); 62% increase in vacancies in these positions in the Free State; 18% increase in vacancies in KwaZulu-Natal; 30% increase in vacancies in Limpopo province; 25% increase in vacancies in these technical occupations in Gauteng province, where current vacancies are 39%; while Northern Cape has reduced its vacancy rate in this category. Mpumalanga, which has been able to bring down its vacancies over the five-year period, has *reduced* its vacancy rate in these occupational areas by 39%. The shortage of environmental technical skills requires urgent intervention.

The range of technical shortages include air and water quality monitors⁷; compliance officers; waste management technicians; biodiversity and oceanographic technicians; technical skills for servicing a low carbon energy economy; urban and rural planners; water plant operators, etc. (see Appendix B). In the private sector, companies constantly report lack of technical skills for cleaner production, carbon emissions reduction, and water and energy efficiency, a point that was also noted in the Green Economy Summit documentation. Municipalities are short of water, sanitation, air quality and waste management specialist technical skills, and capacity for planning and implementation of sustainable human settlements and/or sustainable rural development. **A more detailed study on the exact nature of this technical skills shortage in the environmental sector is urgently needed, with specific reference to where training for these technical skills is being provided, the quality of such training, and whether such training is sustainable in relation to increased demands for environmental technical skills**⁸ (e.g. in FET colleges and Universities of Technology). ESSP research shows that these shortages are related to a mix of factors, inter alia: (a) actual skills shortages; (b) budgetary constraints; (c) management capacity to support the use and development of these skills in workplaces; and (d) mismatches between supply and demand for skills.

- 3) **Skills in the public sector:** While not the only focus, a key focus of the ESSP was to understand skills development demands in the public environmental sector. As described above, the following issues emerge from the national and provincial profiles of key environmental functions: the need for greater

⁷ It was not possible to differentiate the water figures from waste and other environmental technical functions in this data, hence figures here include some water skills needs.

⁸ It was not possible to obtain a refined enough analysis on this skills demand in the ESSP research, but it was clear that this is a key area of scarcity that requires further and immediate attention.

alignment of skills development initiatives at vertical and horizontal governance levels; high turnover of skills, particularly in the highly skilled and management categories; the need to address the ‘emptying’ of scientific skills in the public sector; the need to address technical skills shortages in the public sector; and the need for addressing environmental leadership skills shortages and stability of employment (reduction of high turnover rates). The public environmental sector, in the Environmental Sector Strategic Plan (2005-2013), identifies various priorities for environmental skills development at provincial and local government level, which include: the need to build capacity across the waste management sector for cradle-to-cradle approaches; remediation skills; training of air quality specialists; air quality control officers; training of municipal officers in licensing and atmospheric emission avoidance; compliance monitoring and enforcement officers; training across spheres of government in pollution incident management; strengthening of capacity within mandated agencies for environmental impact management, particularly to ensure consistency of quality in the EIA process and to use a wider range of Environmental Impact Management (EIM) tools; training of regulators to understand EIA legislation and procedures; report writing; training for type 1, 2 and 3 conservation activities; conservation research skills; capacity development for spatial biodiversity management, assessments and compliance; capacity for monitoring of fish stocks; climate change risk assessment in marine environment contexts; and fisheries control officers. Of particular concern is inadequate capacity for enforcement and compliance, and severe technical skills shortages exist for these functions. Skills to educate the public, and strengthen their empowerment and participation in local environmental management and sustainable development actions, was also emphasised throughout. From this, it is possible to see that **a range of skills demands exist for enabling risk management, service delivery and public participation in the environmental sector.**

30. **Critical skills gaps:** Almost every environmental sub-sector identified different types of critical skills gaps relevant to their areas of specialism. It was possible to identify certain critical skills gaps that are relevant *within sub-sectors* (see ESSP Working Document No. 5 for more details of these). While it is not possible to document all these here, it is possible to identify a number of **common critical skills gaps** that were identified across the environmental sector (see Table 3).

TABLE 3: CRITICAL SKILLS GAPS IDENTIFIED ACROSS THE ENVIRONMENTAL SECTOR

	Identified common critical skills gaps (across environmental sub-sectors)
High skills (Senior Management)	◆ Leadership skills ◆ Risk assessment and risk management ◆ Environmental law and policy skills ◆ Organisational development ◆ Integrative skills (e.g. policy and science)
High Skills (Middle Management)	◆ Human Resources management skills (including mentoring and coaching skills) ◆ Environmental law and policy ◆ ICT skills, including use and interpretation of GIS and modelling technologies ◆ Project management skills ◆ Research skills ◆ Report writing skills
High Skills (Technical Professional)	◆ Environmental law and policy ◆ ICT skills, including use and interpretation of GIS and modelling technologies ◆ Integrative skills (e.g. ICT and science; science and policy etc.) ◆ Monitoring, modelling and evaluation skills ◆ Report writing skills

Priority skills development programmes identified that could service the entire sector include:

- Environmental law and policy
- Integrative skills programmes
- Mentoring and coaching
- ICT skills programmes, including use and interpretation of GIS and modelling technologies
- Sustainable development planning
- Monitoring, modelling and evaluation of environmental change
- Green procurement and green economy planning skills
- Environmental ethics and social justice practices in the environmental sector.

31. **Transformation related skills demands:** In the public sector, significant progress has been made in achieving transformation targets, with an average 80:20% Black:White ratio recorded in 2008/9 employment data (current employment, excluding vacancies). In the category of *legislator, senior official and management*, Black South Africans (a category used to include male and female Black Africans, Coloured and Indian people) make up 81% of the public sector workforce in the Economic Cluster as a whole. In the environmental sector, 74% of the workforce in this senior management category are Black South Africans. In the category of *professionals*, Black South Africans make up 85% of the professional workforce in the Economic Cluster as a whole, with male Black South African professionals at 44% and female Black South African professionals at 32%. The Environmental sector (a sub-sector of the Economic Cluster) seems to be slightly 'behind' the economic cluster as a whole in terms of transformation figures at senior management and professional level, with 78% of professionals being Black South Africans, with male Black South African professionals at 31% and female Black South African professionals at 29%. This is indicative of a shortage of senior

managers, and professionals at these levels for the environmental sector specifically. Senior Professional transformation figures differ from elementary occupation transformation figures, where 99% of the workforce is Black South Africans. **While progress has been made in terms of ensuring employment equity, there is still a need to pursue transformation targets, particularly at the level of legislators, senior managers and professionals in the environmental sector.** There are positive indicators that the sector is able to attract women professionals, and progress is being made with employment of women at senior management levels. Men tend to dominate the elementary occupations. The need for more Black senior managers, legislators and professionals is reflected across parastatals, the NPO sector and the private sector. However, the HSRC (2009) argue against simplistic approaches to transformation based on 'filling quotas'. They argue for a more comprehensive and sustainable approach to transformation that moves beyond quotas, to include cultural changes in institutions so that diversity is valued and integrated into the heart and mission of institutions. ESSP research revealed that, due mainly to an inadequate supply of skills for transformation and the rapid pace of transformation in the sector, the environmental sector's approach to transformation is still couched mainly in the paradigm of needing to fill quotas. As progress is being made on this front, approaches to transformation can be expanded through systems approaches to Human Capital Development that also take into account a wider range of transformation strategies. A wider range of transformation strategies are showing benefits in terms of retention, as cultures in workplaces are one of the important determinants of retention.

32. **New skills demands: Green Economy Skills Development Planning and Provisioning** – an initiative to formalise the **Environmental Goods and Services (EGS) Sector** in South Africa points to a conservatively estimated increase of over 130 000 jobs in the EGS sector over the next five years (EGSF, 2009). This is in line with international growth projections for jobs in the EGS sector, particularly in areas such as energy efficiency, new energy technologies (production and installation), waste reduction, water technologies and water

management, and sustainable transportation. In South Africa, the Department of Trade and Industry (DTI, 2009) reports that new job creation possibilities exist in initiatives to formalise the recycling industry (up to 140 000 jobs – phased in over a period of time – as indicated in the Green Economy Summit declaration). Similar potential is being projected in provincial economic strategic planning initiatives – for example, a draft Gauteng Green Economy Strategy research report (2009) predicts up to 150 000 possible jobs. Each of these Green Economy Strategies requires specified skills planning, **to be developed and costed in tandem with the economic strategy planning**. The ESSP research found that **emerging green economy plans were not yet incorporating skills plans, and that there is a need to give further attention to green economy skills planning in/for the sector**. Besides the creation of new green jobs, there are also needs for **re-skilling, or the greening of existing jobs**, as outlined in a recent set of skills development studies for the Built Environment Sector, and in initiatives to, for example, ensure more sustainable forestry and mining practices (amongst others) – see the document *Integrating the Environmental Driver into Sector Skills Plans: Enabling Document for all SETAs* (DEA, 2010). For more information on new environmental skills demands for mainstreaming environment into development and greening the economy, see ESSP Working Document No. 6. **Case studies of greening existing skills need to be developed by the various SETAs**, to demonstrate how environmental skills planning is being mainstreamed into development.

33. **Expanded Public Works Programme (EPWP) Phase 2 skills development:**

The EPWP is starting a Phase 2. This is a significant job or work opportunity creation initiative in South Africa, with potential also to enhance skills, or provide access routes to gainful employment for people who are currently out of work. While training and skills development was a key focus of EPWP Phase 1, in the form of short accredited skills programmes, it is reported that EPWP Phase 2 will not focus as much on accredited skills programmes due to some of the difficulties associated with provisioning of these skills programmes in Phase 1. It is, however, also mentioned that EPWP Phase 2 will seek to contribute to more sustainable job creation mechanisms. EPWP skills development in the environment and culture sector was reported to have been successful (compared to EPWP skills development programmes in other sectors). If skills development, as practised in Phase 1 of EPWP, enables each of the 375 000 workers to gain two days of training for every 22 days worked, then potentially 375 000 people will benefit from nine days of training each (for 100 days of work), involving **3.4 million person training days**. If this training is carefully developed with attention to quality and output value, this presents **a significant opportunity for developing entry level skills for the environmental sector**, particularly for new potential growth areas and/or for youth development as is currently being identified in green economy and green job strategies (e.g. the projected potential for 140 000 jobs in the recycling industry). For this training to be of maximum benefit, there is a need to further



improve the sustainability value of the skills programmes offered, perhaps through linking them to Environmental Practices Learnership Programmes that are linked to sustainable forms of employment. Environmental Practices Qualifications exist at level 1, 2 and 3 on the NQF, and have been registered in LGSETA, but have been very poorly utilised to date. Capacity needs to be developed amongst training providers to provide improved quality programmes and maximise these investments in skills development.

34. **Environmental education and training skills for strengthening skills development:** To fully service the needs for skills as outlined above, there is a need for associated capacity within the education and training sector – an issue that needs to be taken up by the ETDP SETA, so that environment and green economy education, training and skills development programmes are available for providing the necessary education, training and skills development. ESSP research shows that this area of expertise in the education and training sector is currently under-resourced and inadequate for the range of new demands. **Most teacher education faculties in South Africa tend to focus on schooling, and few are focussing on the development of environmental education, training and skills development for the wider skills provisioning system.** Thus there is also a need for new and

innovative forms of Environmental Education and Training capacity to provide for these skills development needs. DEA, together with WESSA, have been leading a learnership initiative to develop ETDP skills, but this learnership needs to be adequately integrated into the National System of Skills Provisioning, and should be paid for by the ETDP SETA for it to become fully sustainable (it is not sustainable for DEA to pay for this learnership). New practices also need to be learned and adopted in society – for example, community-based natural resource management (CBNRM); energy efficiency practices in workplaces and communities; and new waste avoidance practices (amongst many others). This requires environmental educators with skills to strengthen **social learning for sustainability, adaptation, innovation and resilience**, as outlined in the Global Change Grand Challenge National Research Plan (DST, 2010).

35. **Youth development skills:** A key area of concern in South Africa's human capital development 'pipeline' is the **lost capacity of youth** who graduate at Grade 12 level from school with Mathematics, Science and Geography, but who are lost to higher education and various environment and sustainable development occupational opportunities due to various social and historical factors. A 2007 study undertaken for DST by the CSIR (in four provinces) points out

TABLE 4: DATA EXTRACT FROM CSIR (2007) STUDY ON ESTABLISHING THE FEASIBILITY OF A NATIONAL YOUTH CADET DEVELOPMENT PROGRAMME

Grade 12 pass statistics for the years 2004-2006 for four provinces combined. (National statistics are given in parentheses for comparison.)

Year	Total passed	Maths passes	Science passes	Geography passes	Biology passes
2004	193 555 (330 717)	88 879 (157 293)	68 992 (119 872)	129 803 (215 147)	102 087 (164 607)
2005	207 263 (347 184)	95 982 (169 001)	74 266 (129 358)	140 190 (225 667)	115 642 (183 001)
2006	208 057 (351 503)	94 592 (165 865)	80 934 (138 916)	148 083 (237 588)	123 866 (197 389)
% of matriculants per subject		36 %	46%	56%	69%
In study area number not entering HEIs		± 42 000	± 53 000	± 65 000	± 79 000

that there are between 42 000 and 79 000 out-of-school youth who have completed Grade 12 Mathematics, Science and Geography, but who are not entering the tertiary education sector due to various factors (see Table 4) (CSIR, 2007). The study established that it is possible (with the necessary investment and infrastructure) to establish a 'National Youth Cadet Programme' or youth development programme for these youth, which will provide them with work experience in areas such as land management and rehabilitation; catchment management and monitoring; local government services implementation and other natural resource management occupations, while also increasing their qualifications and chances of gaining access to tertiary education and/or more sustainable forms of employment. **The study established that up to 50 000 such work opportunities can feasibly be created.** Such a programme would require an appropriate funding and mentoring infrastructure, which includes capacity for providing the education and training necessary to ensure that the youth are engaged in a productive learnership and career path environment. This represents another significant skills development demand area.

36. **Skills for the full sustainable development value chain:** A pro-active approach to sustainable development in South Africa requires that the *full sustainable development value chain* be considered in skills planning, at macro- and at micro-institutional level (see Diagram 5). For example, if the skills value chain is missing environmental educators, the public will not be adequately engaged in sustainable development practices, or the quality of environmental training will be neglected. If the system lacks modellers, it will be difficult to predict impact, thus affecting planning and policy efficacy. As shown in Diagram 5, skills for the sustainable development value chain include: policy and planning skills; advocacy and critical implementation skills; communication learning and participation skills to build community and business resilience and participation; monitoring, analysis, impact management and review skills; assessment modelling and prediction skills. These skills involve a range of occupational categories including scenario planners, policy specialists, scientists, R&D specialists, NGO

managers, fundraisers, technical specialists, educators, marketers, communicators, modellers, analysts, impact assessors, and auditors (amongst others). **Within the scope of the ESSP it has not been possible to fully assess the range of skills required to service the sustainable development value chain. Such studies need to be undertaken at micro-levels, where Human Capital Development Strategies provide for finer scale planning** (see for example the Biodiversity Sector Human Capital Development Strategy on www.skillsforbiodiversity.org.za).

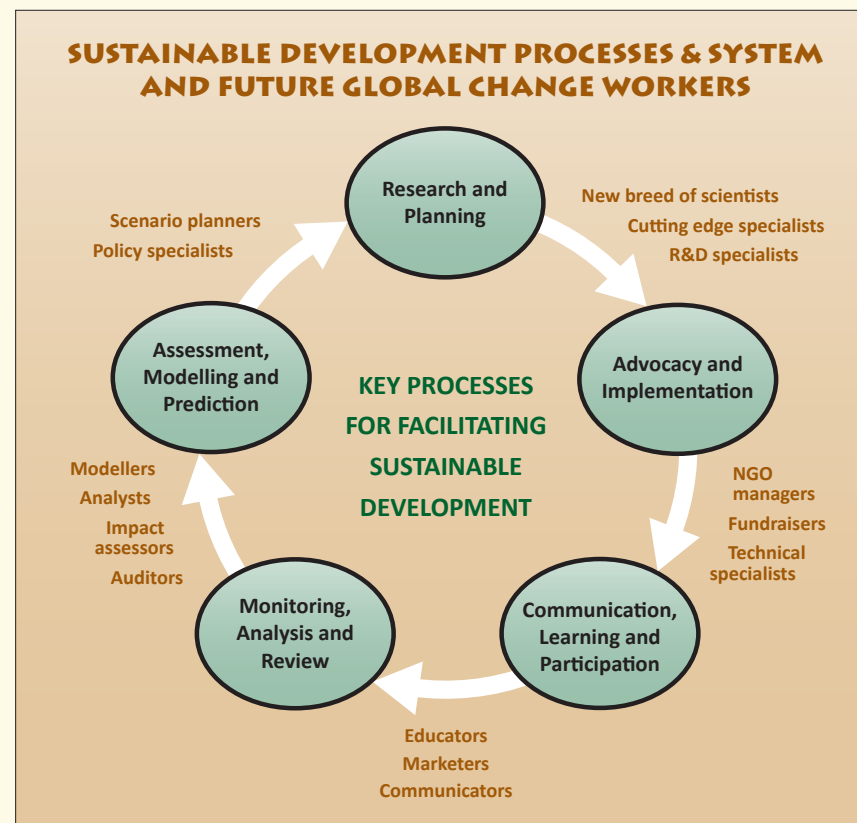


Diagram 5: A model showing the full sustainable development value chain and associated skills needs

SUPPLY OF SKILLS TO THE ENVIRONMENTAL SECTOR

37. **Broad perspective:** A critical factor affecting supply of skills to the environmental sector is the **‘newness’ of environmental policy and knowledge**. Twenty years ago, much of the content necessary for environmental management responses did not exist. Contemporary Environmental Science is a new discipline in most of South Africa’s universities, and sub-disciplines such as environmental law, environmental education, biotechnology, environmental economics, etc. have equally short academic and intellectual histories. Sustainable development thinking is a post-apartheid phenomenon, as is a people-centred approach to environment and development. These issues were therefore not previously included in the schooling system, or in the Higher Education system. In 2004, UNESCO reported that environmental education is one of the fastest growing new curriculum areas internationally, alongside technology education (UNESCO, 2004). This means that new teachers and lecturers are needed with new skills, and investments are needed to update and upgrade curricula in universities, schools and colleges. It also means that most courses in this area are new (i.e. with histories of less than, or between 10 to 15 years). **The impact of this is that few study areas relevant to the environmental sector are accurately captured in the EMIS or HEMIS data sets, particularly because the pattern has been to ‘infuse’ environmental content knowledge into other mainstream disciplines and courses, while new subjects are emerging.** This is also because environmental topics are generally best understood when *integrated* into a range of other areas, and new environmental subjects such as Environmental Science or Sustainability Sciences also require integrated thinking and practice. The ESSP research found that specific environmental qualifications are only now (in 2009 HEMIS data), being captured as new study fields. The supply side analysis

therefore reports very broadly on supply of *environmentally aware* graduates (which captures graduates from courses that have some level of environmental content), rather than specific environmental sciences or environmental management qualifications. Despite this newness, it is encouraging to see that South Africa’s education and training system is responding to environmental qualification needs, albeit unevenly and in a somewhat fragmented manner.

38. **General Education and Training, and teacher development:** The National Curriculum Statement for General and Further Education and Training took account of environment, sustainable development and social change issues. However, the OBE curriculum has been critiqued for being difficult to implement, and **inadequate attention has been given to teachers’ competence and pedagogical content knowledge** to introduce new areas of learning (e.g. knowledge of environmental change/global change; biodiversity; sustainable development, etc.) into teaching. Studies on curriculum implementation show substantial ‘breakdown’ in effective delivery at district and school level (see ESSP Working Document No. 9). There are approximately 350 000 teachers in South Africa, and the system has been unable to provide adequate training for these teachers in these new knowledge areas. Of the 23 HEIs, 16 have some environmental education on offer in their teacher education programmes, but this is generally ad hoc, and of a relatively poor quality. Only four HEIs are producing post-graduates in the field of environmental education, most of which are oriented to schooling. Few HEIs offer ETDP specialism across education (focus on schooling and HE), training (including skills development and workplace learning) and development practices (including community learning). None are currently offering environmental training programmes

for FET College lecturers. This shows that the neglect of teacher education in this area extends to the training of new lecturers.

39. **Further Education and Training Colleges: The FET college system (vocational education and training) is also failing to provide environmental skills.** In addition to general quality and human and other resource constraints in the FET college system, the curricula taught in the colleges have had little relevance to environmental skills needs. This applies to both the recently introduced National Curriculum Vocational (NCV) and the National Certificates the NCV has replaced. While the NCV makes some provision for training in sustainable agriculture and eco-tourism, for example, there are indications that lecturers lack the necessary environmental knowledge and the resources to teach these subject components adequately. In addition, the FET colleges are, similar to the higher education sector, faced with the impact of inadequate skills coming through the basic education level, and drop-out rates are high for a number of reasons, including inadequate academic support, lack of relevance in subject choices, and inadequate financial support. This situation needs addressing, if the requisite environmental technical skills are to be developed in South Africa.



40. **SETAs and the learnership system:** Learnerships are predominantly, but not exclusively, directed to the intermediate skills level. An analysis of the learnerships on offer in the NQF, and the proportion of learnerships on offer in the environmental sector, shows that **only 2.4% of learnerships in South Africa are 'environmental learnerships'**. Furthermore, while 2.4% of these learnerships are registered, this does not necessarily mean that they are being utilised. This shows *severe underutilisation of the learnership system for skills development in the environmental sector*. THETA, AGRISETA, LGSETA, and ETDP SETA are the main SETAs offering environmental training. AGRISETA (based on 2007 figures) had only graduated 176 learners in a GET: Horticulture training programme at level 1; THETA had graduated 4 886 learners, 3 927 of which graduated from a National Certificate in Tourism Guiding (for which it is reported there were inadequate jobs available) with the rest graduating with Nature Conservation level 2 (433 learners) and Tourism Guiding level 2 (442 learners). The bulk of these environmental learnerships are therefore oriented towards Tourism. Of significance is the fact that THETA had 15 qualifications registered but only four have been used. LGSETA had no graduations, despite having six relevant qualifications registered, which include Environmental Practices level 1, 2, and 3 qualifications. The ETDP SETA has been accrediting a learnership at level 5 for environmental educators (with between 50-100 graduates to date), but the ETDP SETA has not funded this learnership (this has been funded by the sector, including DEA) because environment was not identified as being relevant in NSDSII, or the Sector Skills Plan. Learner achievements are low, compared to demand, and very little environmental technical training appears to be on offer through the SETA system in the form of learnerships. **The SETA system remains an underutilised resource for environmental skills development in South Africa.** Lack of engagement with environmental qualifications is said to result from two issues: lack of inclusion of the environmental driver in the National Skills Development Strategy (NSDSII), and lack of provider-driven demand in workplace skills planning (which is said to influence Sector Skills Plans), although it is well known that workplace skills planning is an inadequate mechanism for Sector

Skills Planning. Other factors may also be unfamiliarity with the environmental driver and lack of adequate capacity to make use of the skills system. **There is an urgent need to include the environmental driver into NSDSIII, and to support SETAs to understand how the environmental driver is relevant to all of their particular functions.**

An analysis of environmental functions in SETAs shows potential for **cross-SETA collaboration**, and points to a need for an adequate cross-SETA mechanism for dealing with cross-sectoral issues such as environment. The DEA – as lead agent for environment – needs to address this issue in dialogue with the Ministry of Higher Education and Training. DEA's own training programmes could benefit from SETA support, as progress is being made, for example, in training Environmental Management Inspectors (with a level 7 qualification having been developed), but without sustainable sources of funding for the initiative. If skills sector funding could be mobilised and the qualification could be re-oriented into a learnership, this could become a more sustainable initiative (as one example). Many other opportunities exist for developing learnerships that can support and service the sector – particularly for local government training, youth development training, and ongoing training of Environmental Educators (amongst others). **Human Capital Development Strategy Planning should investigate the potential of learnership development for the sector.** It is noteworthy that the Department of Labour have included the need for 7 000 people on their scarce

skills list to increase participation in the SETA system, which provides additional motivation for emphasising the development of Environmental Education and Training skills for using the SETA system. (See more details in ESSP Working Document No. 8.)

41. **Workplace skills planning and provisioning:** ESSP research uncovered a number of problems associated with skills development planning in the workplace. In general, skills development planning is often simplistically viewed as no more than 'training options', with little attention to systemic issues such as mentoring, or mobility in the sector. Large amounts of money are being spent on sending employees on training (in some cases up to R20 000-R30 000 per beneficiary per short course of 2-4 days – which could equally fund participation in a Higher Degree for example). **Workplace training is dominated by a culture of 'short courses'**, which seems to be a strategy used by the sector to update skills, and to make up for a lack of mentoring capacity in the sector. Short courses are also a strategy used to 'keep up' with a rapidly changing field. A large number of short courses exist to service the field, but they are often described as 'provider driven' rather than needs driven, although some short courses are also responding to field-based needs, reflecting a market-based responsiveness, particularly from the university sector (see ESSP Working Document No. 8). SETA accredited short courses seem to show less flexibility, since they have a more complex



system surrounding their design, monitoring and use (more technical procedures). Most of the training funded by the HR workplace skills system is *generic* in nature, focussing more on general workplace skills (e.g. financial management, public administration, communication, etc.) at low levels of attainment (levels 1-4 on the NQF). Line function and specialist skills (e.g. GIS modelling skills; EIA training, etc.) are being catered for, but this happens outside of the mainstream workplace skills planning framework, and tends to be paid for by line function budgets, significantly increasing internal 'spend' on training (also difficult to monitor). There is a dominance of 'short course' training, linked to compliance targets in workplace skills plans. Only recently have workplace skills plans started to include bursaries and internships that focus on addressing scarce skills shortages. Skills development planning has also been affected by *poor quality information systems* which lead to unreliable data and projections, and a mis-informed system. **Workplace skills planning has generally not been linked to productivity, strategic planning or output, leading in turn to poorly constituted Sector Skills Plans that emphasise generic skills over field-specific needs, actual Key Performance Areas and Performance Management.** Skills development reporting is inconsistent, and formats differ from SETA to SETA. In the system as a whole, there has been an overemphasis on economic drivers for skills development (a residue of old 'manpower planning'), and a lack of emphasis on the implications of public good needs (e.g. protection of ecosystem services), and future trends (e.g. impacts of climate change) on skills development needs. Organisations in the environmental sector use a range of different formats for workplace skills planning, few of which provide coherent or useful information on skills planning. **There is an urgent need to align workplace skills planning with critical skills needs associated with institutional mandates and key performance areas. Short courses need to be monitored for quality, efficiency and impact.** Some of the problems with workplace skills plans are also related to **instability in the HR directorates**, as these are characterised by high turnover rates (see Diagram 6). It is also noteworthy that the Department of Labour has included HR Management skills in the list of scarce skills for

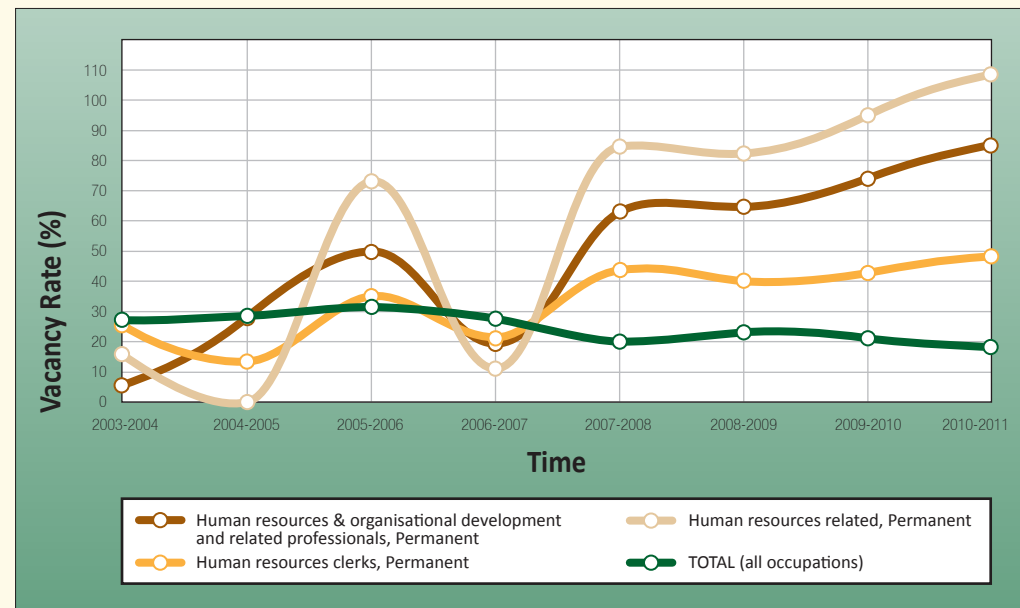


Diagram 6: Fluctuating vacancy rates in HR directorates in the Economic Cluster, showing instability in the HR system

South Africa, as well as Education and Training Skills for increasing participation in the SETA system.

42. **Higher Education:** There is evidence of an **emergent focus on environment** and sustainable development/global change knowledge areas in **existing HEI** teaching programmes. A review of subject matter in Higher Education Programmes shows integration of environment and sustainable development knowledge themes in a range of different disciplines – e.g. law, sociology, sciences, education, psychology, engineering, economics, agriculture, etc. All universities are involved, in some way or other, in producing at least environmentally aware graduates. However, this is **ad hoc, small scale, dependent on lecturer interest, uneven** across the education and training system, and appears to be **inadequate** in relation to newly emergent and rapidly increasing capacity development demands

(e.g. few environmental economists exist, and there is a shortage of environmental lawyers, engineers, scientists, educators, etc.). Diagram 7 shows that while all universities are involved in producing environmentally aware graduates, there is an uneven spread of environmentally aware graduates from South Africa's 23 universities. **An in-depth audit into environment and sustainable development curriculum changes in South Africa's Higher Education system is needed to establish the full scope of, and potential of supplying, skills in a sustainable manner for future demand**, particularly in the light of the emerging Green Economy, and in the light of current skills demands in this sector.

43. **National diplomas and degrees** are the biggest contributor to the environmental sector in terms of tertiary qualifications involving 'environmentally aware' graduates. The supply of these skills has generally increased in the period 2002-2007. The second largest contributor is the Honours qualifications, but numbers have remained more or less static over the five-year period. The next most important

contributor is the Masters Degree, and numbers have also remained more or less static over the period. Doctorates, fluctuating within a narrow range, are the smallest contributor to the environmental sector. **The widening gap between the numbers of degrees and diplomas and the number of Honours, Masters and Doctorate graduates indicates that recruitment into higher degrees is not matching supply.** Qualitative data and leadership and management skills gap data indicates that there are not enough people entering the sector with higher degrees. Active interventions are needed to address this problem. This is significant in the light of the identified shortages of environmental scientists in the system, in relation to the changing national system of innovation that is demanding environmental science related skills, and in relation to the need to address complex issues such as climate change, water security, low carbon economy developments, new regimes of waste management, critical issues associated with loss of biodiversity and marine resources, sustainable development planning and the emergence of a green economy. Of concern is that **numbers of diploma and**

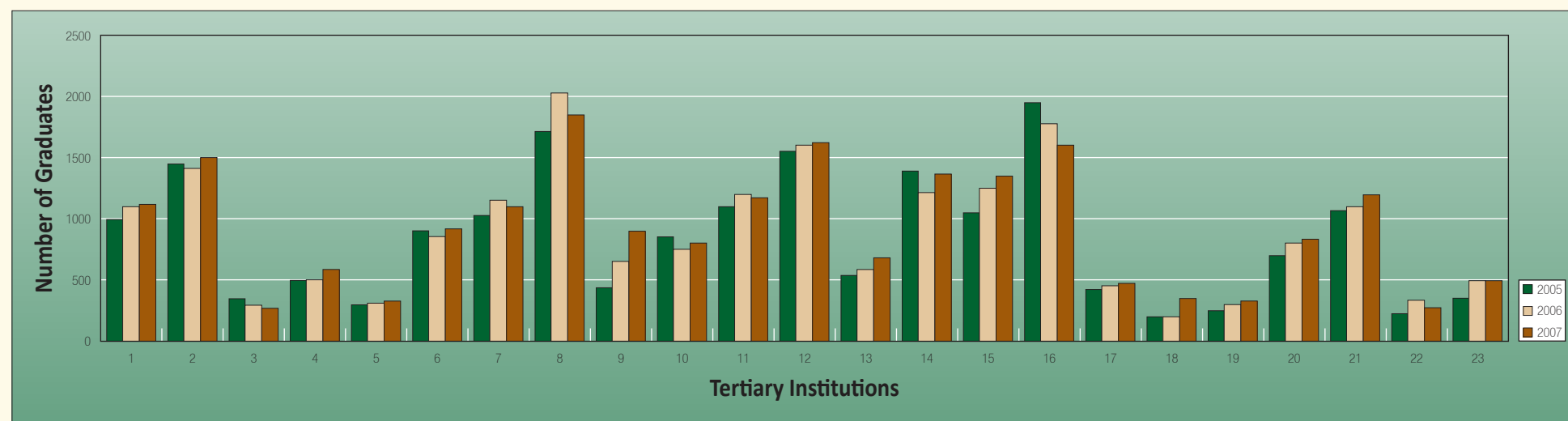


Diagram 7: All universities are involved in producing environmentally aware graduates, but there is an uneven spread from South Africa's 23 universities

certificate qualifications decreased after the changes to Universities of Technology, and these numbers have not increased since the changes in the 2002/4 period. This is significant in the light of the identified need for environmental technicians in the environmental sector, an issue that requires better understanding and assessment. The Ministry of Higher Education and Training and Universities of Technology (and FET Colleges as feeders) should be engaged urgently to address this need in a longer term sustainable manner (e.g. by providing ‘feeder’ technical skills through FET colleges into Universities of Technology and/or through UoT curriculum change programmes).

44. **The university landscape** has changed substantially since 2004. By 2005 there were 23 universities and Universities of Technology in South Africa. Using graduation rates associated with environmentally oriented study fields, it was possible to establish that universities were the main contributors of graduates to the environmental sector. Of all the institutions that had produced 1 000 or more environmentally aware graduates (broad category, with not all graduates ending up in the environmental sector), only two of them were Universities of Technology. The University of KwaZulu-Natal is the top producer of numbers of environmentally aware graduates, followed by the University of Pretoria, Cape Town, UNISA, Stellenbosch, Wits, North West and Johannesburg respectively. Stellenbosch University is producing higher numbers of Life and Physical Science environmentally aware graduates than Social Sciences environmentally aware graduates. It should be noted here that data could only provide broad indicative trends, due to a lack of specificity in data capturing in environmentally specific study areas in university data management systems. Those institutions producing between 500 and 1 000 environmentally aware graduates per year were (in decreasing order of numbers): the University of the Free State, Nelson Mandela Metropolitan University, University of the Western Cape, Limpopo University and Rhodes University. Not all universities are the same size, and thus, relative to its size, Rhodes University produces a high number of environmentally

aware graduates. While this provides broadly indicative data, there is a need for more refined monitoring of environmentally related study fields and how they are integrated into university qualifications, particularly since environmental specialisms are very poorly captured in national datasets. This effectively renders environmental qualifications ‘invisible’ in national data capturing systems. (see ESSP Working Document No. 7).

45. **Graduate profiles:** On a positive note, the total number of graduates that are environmentally aware (i.e. that have some element of environmental content in their courses during their degree studies), increased from approximately 29 000 in 2001 to 90 000 in 2006 (note that these figures are inflated, as they represent all graduates participating in selected study fields – not all of these graduates end up in the environmental sector), with numbers of Black graduates increasing, particularly Black women graduates, which is encouraging, both for mainstreaming of environment into development and for identification of potential graduates for environmental specialist

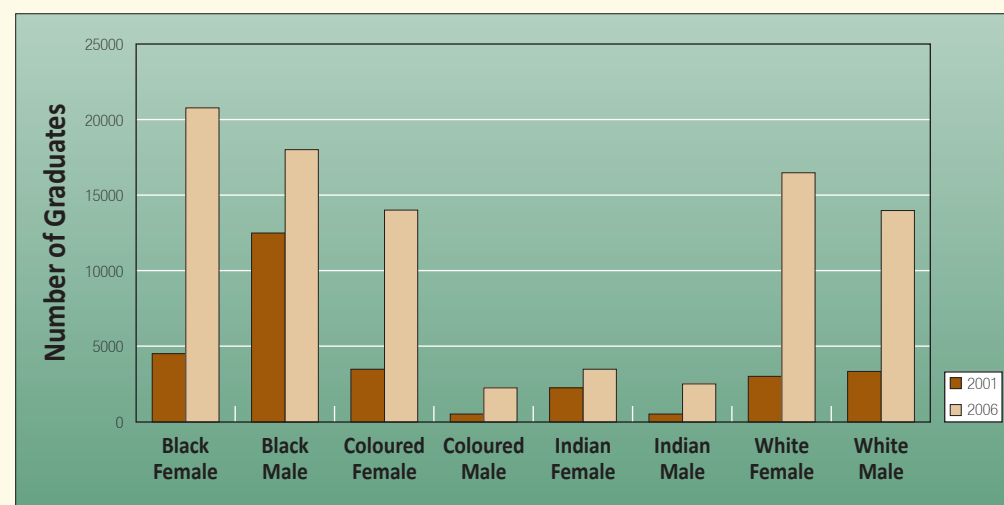


Diagram 8: Race and gender profile of environmentally aware graduates, 2001 and 2006 (Source: HEMIS, own calculations)

degrees. There has been a significant drop in the growth of Black male graduate participation in environment related qualifications over the period 2001-2006 (from 43% in 2001 to 20% in 2006). In terms of overall race profiles, Black graduates formed the largest group of environmentally aware graduates both in 2001 and 2006, with Whites being the next largest environmentally aware graduate population group, followed by Coloureds and Indians. In terms of gender profiles, there were more male than female environmentally aware graduates in 2001 (difference in numbers was 3 717), while in 2006 there were significantly more environmentally aware women graduates (difference in numbers was 18 170). This is encouraging from the perspective that Black women professionals are most needed in the environmental sector, but also worrying from the perspective of an apparent loss of interest in environmental concerns amongst male graduates. **Thus efforts to encourage both women and men to participate in the environmental sector are needed.** At diploma level, Black women graduates dominated in 2006, but the number of Black women graduating in the higher degrees gets progressively less with increasing levels of qualification, with Black women only forming a small proportion of the total percentage at the doctorate level both in 2001 and 2006. In contrast, White women and Coloured women show a general increase in their proportional numbers as the level of qualification increases. This shows that there is a need to **encourage and support Black women to obtain higher degrees in the environmental sector, but also to encourage Black males to continue to participate in the sector**, as Black males decreased in their proportional numbers between 2001 and 2006 for all degrees associated with the environmental study field analysis. In contrast, Coloured females have increased their proportional numbers, with the biggest increase being at doctoral level.

46. **Masters degree qualifications in environmental sciences and management:** A review of a sample of Masters degrees on offer indicates that capacity for delivery in environment and sustainable development knowledge areas is uneven, and that graduation levels are on average low (when compared to demand). Although graduates

in this area have been increasing, this has not always been with the desired quality. Approximately half of South Africa's universities are currently offering coursework and research masters degrees in environment and sustainability sciences in South Africa, most of which are focussed on environmental management, and a few on sustainable development (see Table 5 for some examples). There are also universities that offer degrees by thesis in this area, and the degree by thesis accounts for the much needed specialist knowledge that is also required in the environmental sector (e.g. oceanographic sciences).

TABLE 5: SOME EXISTING COURSEWORK AND RESEARCH MASTERS DEGREES IN ENVIRONMENT AND SUSTAINABILITY SCIENCES THAT ADOPT AN INTER-DISCIPLINARY APPROACH

University	Programme
University of Johannesburg (UJ)	Tutored Masters in Environmental Management
University of the Free State (UFS)	Masters Programme in Environmental Management
University of North West (UNW)	Masters in Sustainable Development
University of Stellenbosch (US)	Masters Programme in Sustainable Development Planning and Management
University of Cape Town (UCT)	MPhil in Environmental Management
University of South Africa (UNISA)	MSc in Environmental Management
Tshwane University of Technology (TUT)	Master of Technology in Environmental Management
Nelson Mandela Metropolitan University (NMMU)	Masters in Development Studies
University of KwaZulu-Natal (UKZN)	Masters in Environment and Development



Most of the Environment and Sustainability Science Masters Degrees reviewed are modular, using a system of core and electives, and many of these programmes are multi- and inter-disciplinary (to varying degrees). International best practice indicates similar trends in Environmental Management/Sustainable Development related Masters Degrees, notably multi- and inter-disciplinarity, modular formats using a core and elective structure, but **international programmes appear to have a stronger work integrated learning orientation** than current South African programmes. There are also specialist environmental science degrees that service the environmental sector, such as the MSc Degree in Atmospheric Sciences at Wits University, which provides skills for air quality monitoring and climate change, while an MTech in Oceanography offered by the Cape Peninsula University of Technology provides skills for Marine and Coastal Zone Management (amongst many others). One of the issues to address in the Environmental Sector is the need to increase graduations in areas of critical shortage such as soil sciences, taxonomy, environmental engineers, environmental economists, etc. (see Appendix B). This is particularly because graduation rates are generally low at Masters and PhD level in relation to demand for scientific skills in a rapidly changing scientific field such as the environmental sciences

(viewed broadly). Of concern is an observed **trend towards stasis at the post-graduate level** (when graduation figures are compared over a five-year period). For example, two key knowledge fields relevant to the DST Global Change Grand Challenge (see Tables 6 and 7) show increases in graduations at first degree and honours levels over a five-year period that are not matched by similar increases in graduation levels at Masters and PhD levels, where stasis in graduation capacity at Masters and PhD levels seems to exist. This is a trend across the system in a range of other related knowledge fields relevant to the environmental sector (see ESSP Working Document No. 13).

TABLES 6 & 7: COMPARATIVE GRADUATION FIGURES IN TWO KEY ENVIRONMENTAL KNOWLEDGE FIELDS FOR 2001 AND 2006, SHOWING GRADUATION CAPACITY, AND INCREASES AND STASIS IN GRADUATIONS AT PARTICULAR LEVELS

Graduations: Study field Biological Sciences			Graduations: Study field Geography		
	2001	2006		2001	2006
First degrees, higher diplomas	549	1 318	First degrees, higher diplomas	425	848
Professional qualifications, Honours	393	446	Professional qualifications, Honours	145	165
Masters	243	243	Masters	106	106
Doctorates, post-doc	83	89	Doctorates, post-doc	8	19

(Additional profiles of study areas are available in ESSP Working Documents No. 7 and 13)

There are various complex issues that affect this situation (i.e. an apparent inability to increase graduate capacity at Masters and PhD level, and to maximise first degree and Honours throughput

potential) most notably **supervision capacity**, and **adequate funding for scholars so that they can remain in the system** (many are forced to leave earlier than necessary due to socio-economic circumstances). ESSP research also revealed that obtaining Masters Degrees did not seem to be a high priority for South African graduates who were able to obtain high paying work without these qualifications, in relatively senior positions, at a relatively young age. No workplace bursaries for Masters degree studies were found to exist, which means that it is difficult for those already in positions to improve their qualifications (see ESSP Working Documents No. 7 and 13). Another factor is that those with scientific qualifications are often drawn into management in the public sector, as no parallel career pathing exists for scientists (of equal value) to a management career path. Some of the research institutions (e.g. CSIR) were working on innovative practices to develop dual career paths – one for scientific services and one for management services – within their institutions, which provides a model that can be extended to the environmental sector. **If the environmental sector is to retain and develop its scientific skills, then development of career pathing options, with in-service post-graduate study opportunities, will need to be considered as a key strategy for retention.**

47. **ICT skills in the environment sector:** One of the important factors shaping skills needs in South Africa's environment sector appears to be the need to understand, identify and manage risks. If risks are better understood, development can be more easily pursued as precautionary approaches become unnecessary. A knowledge-based economy and the kind of research necessary for understanding Global Change, requires robust information systems and infrastructure which are easily accessible. Information and computer technologies (ICT) are needed to fast track and strengthen the learning and development of individuals and organisations. Skills are needed to facilitate and fast track needs-driven, ICT-facilitated learning capabilities. There is a need to focus on the use of ICTs in facilitating learning within HEIs, between HEIs, and between HEIs and societal organisations and structures. In addition, ICT capabilities need to be developed in HEIs



for modelling and management of risk. In 2007, skills shortages in ICT in South Africa stood at over 300 000, but the Information Systems, Electronics and Telecommunication Technologies SETA training capacity was a mere 7 000 per year.

48. **Funding skills development in the environmental sector:** The ESSP research showed that most institutions in the Environmental Sector are spending 1% of payroll (compliance target) and above on skills development. Only the 1% appears to be formally captured as skills development expenditure. Line function budget costs, and specialist skills development programmes and project budgets, are not calculated into skills development 'spend', indicating that much more is being spent on skills development than is obvious from Annual Training Reports. This amounts to a significant investment in skills development. However, the ESSP research indicates that while substantial amounts are being spent on skills development, this is not necessary well targeted expenditure, and may therefore be inefficient. The ESSP analysis also shows that the environmental sector has made extremely poor use of funding available in the National Skills Development System (e.g. SETA funding) (see ESSP Working Document No. 8). This is partly because environment has not been prioritised in the National Skills Development Strategy, thus restricting the release of funding through the SETAs for environmental training, and because stakeholders in the environmental sector have found it difficult to work with the SETA system. The ESSP research therefore shows that the environmental sector is not well situated or integrated in the National System of Skills Development.

RECOMMENDATIONS AND OBJECTIVES FOR ENVIRONMENTAL SECTOR SKILLS PLANNING IN SOUTH AFRICA

49. **Recommendation Areas:** From the above, it is clear that it is necessary to **address the immediate demand and supply issues** for effective service delivery and implementation of existing and new environmental legislation.
50. It is also necessary to **address capacity needs for growing the sector** in relation to the emerging Green Economy (economic and science and technology development drivers) as well as for addressing increased demands created by ongoing environmental degradation and new risks such as climate change (ecological drivers), transformation demands and the demands of instituting pro-active approaches to environmental management and sustainable development.
51. It is also necessary to **build capacity for building capacity and enabling innovation**. This involves ensuring that adequate environmental education and training capacity exists for developing the skills needed to respond to the current gaps, and future needs; and that environmental entrepreneurship and skills for public education, participation and empowerment are available to the environmental sector.
52. Recommendations, framed in the form of *Objectives for Environmental Sector Skills Planning in South Africa*, are therefore directed at all three of the above needs, and are framed to ensure **a systems approach to skills development** in the environmental sector. Such an approach will be necessary to ensure a proactive, longer term, more sustainable skills development system for the environmental sector.



OBJECTIVES AND SUGGESTED INTERVENTIONS FOR ENVIRONMENTAL SECTOR SKILLS PLANNING

53. Objective 1: Address environmental sector skills at macro-system level

- 1) Include the **environmental driver** into the National Skills Development Strategy, the Occupational Learning System, and the Vocational Education and Training System in South Africa – including the Human Resources Development Strategy (2010-2013).
- 2) Motivate to the Ministry of Higher Education and Training and the QCTO for the establishment of an **inter-SETA structure or appropriate mechanisms (including funding mechanisms)** to ensure inclusion of the environmental driver into SETA functions and operations, and to avoid duplication and maximise coherence of approach to environmental training.
- 3) Engage with the implementers of the National System of Statistics and with the South African Qualifications Authority to **ensure adequate information management systems** exist for monitoring and capturing environmental employment in the South African employment system, and in Education Information Management Systems.

54. Objective 2: Address scarce and critical skills in the environmental sector

- 4) Establish an **initiative to provide for, and strengthen Environmental Leadership Skills**, which includes giving attention to retention of environmental leadership skills in the sector, with

emphasis on provincial and local government capacity, but not neglecting national level leadership in the public sector, NPOs and business.

- 5) Prioritise the **reduction of vacancies** in the public environmental sector, especially in provinces where vacancies in critical environmental occupations are on the rise, particularly in specialist professional occupations and management positions.
- 6) Work with the Ministry of Higher Education and Training and the Department of Science and Technology and other partners to improve systemic attraction to, and graduation rates in **environment related sciences and other scarce skill areas** (as outlined in Appendix B). The emphasis should be on enabling and extending the participation of Black women in the environmental sciences, but should not neglect attracting Black men to the sector.
- 7) **Review the current allocations of skills development funding** to adequate allocation of funding for adequate bursary funding to facilitate skills development in scarce skills areas, and for lifelong learning linked to career path development in scarce skills areas.
- 8) Establish an initiative with the Ministry of Higher Education and Training to further examine and address the need for **environmental technical skills** required in the environmental sector. Undertake a scoping of Universities of Technology to establish which ones can immediately begin to address the need for environmental technical skills in South Africa, and link

graduates to work placements, post-qualification internships and potential employment opportunities.

- 9) Support the development of skills programmes for the sector that **address critical skills gaps** identified across the sector, especially:

- Sustainable development planning skills
- Climate change risk and opportunity assessment
- Environmental law and policy
- Integrative skills programmes
- Mentoring and coaching
- ICT skills programmes, including use and interpretation of GIS and modelling technologies
- Monitoring, modelling and evaluation of environmental change
- Green procurement and green economy planning skills
- Environmental ethics and social justice practices in the environmental sector.

55. **Objective 3: Put measures in place to ensure a longer term, more sustainable supply of quality skills to the environmental sector**

- 10) Engage the Ministry of Higher Education and Training to **integrate environmental technical skills development in the Further Education and Training College Curricula and Programmes, with learning pathways into the Universities of Technology** – Environmental Practices level 1, 2, and 3 qualifications (amongst others) can be **revised for use in FET Colleges**. This should include giving attention to the training of lecturers for these new FET college programmes, and curriculum innovations in Universities of Technology.
- 11) Support and motivate for support for **Environmental Education and Training Capacity Development** within the Education, Training and Skills Development SETA and within university

education faculties to ensure adequate education and training capacity for providing training in the sector, and for teacher education.

- 12) Support the development of **tools for monitoring and improvement of workplace skills development planning and short course development** and participation to address critical skills gaps in relation to Key Performance Areas, with attention to improving efficiency, quality, impact and relevance of short course programmes and workplace skills expenditure.

- 13) Develop capacity in the environmental sector to **make better use of the learnership system** to address critical and scarce skills (e.g. training of environmental compliance officers; new waste management training; environmental impact management training). Learnerships do not have to be restricted to levels 1-4, but can also be developed for levels 5, 6, and 7.

56. **Objective 4: Put measures in place to ensure a proactive, transformative and innovative skills development system for the environmental sector**

- 14) Develop capacity for **integrating and costing skills planning into the strategic plans** being developed for the green economy and green job development planning.
- 15) Support the development of a **Training of Trainers Programme** to expand Provider Capacity for Green Jobs and Green Economy Training and Capacity Development.
- 16) Develop a **national training initiative and national materials** (potentially based on Environmental Practices level 1, 2, and 3 qualifications) to develop entry level skills. Modules (skills programmes) based on these qualifications can be used in EPWP training, and extended into learnerships for Youth Development Environment and Sustainability Citizen Sciences (e.g. for participation in monitoring and recycling activities at community level), and other green job development contexts at elementary

occupation level (e.g. development of recycling jobs in local government contexts). Train providers to use these materials to ensure quality of provision. This training can be used to strengthen skills at elementary occupation level in local government, and conservation organisations, since environmental training at elementary occupation level is almost completely absent in the system at present.

57. Objective 5: Support human capital development strategy planning at sub-focus and institutional levels

17) Support Human Capital Development Strategy Planning at sub-focus level, to address the range of skills demands in the environmental sector at meso- and micro-levels. Support such strategies to adopt a systems approach to Human Capital Development, and to take account of quality related issues in the system.

18) Develop guidelines and support co-ordinated approaches to Human Capital Development Strategies in the Environmental

Sector through a **Human Capital Development Planning Forum**, and through an ongoing emphasis on quality provisioning in the Environmental Sector through activities of the **Environmental Learning Forum**.

58. Objective 6: Establish a system for monitoring and evaluation of skills planning and development in the environmental sector

19) Facilitate the establishment of a coherent **national system for monitoring and evaluating skills planning and development** in the environmental sector, particularly to establish an ‘intelligence system’ that informs skills development programmes and processes and that provides a national system of information for guiding environmental sector skills planning. This should be established in partnership with the Ministry of Higher Education and Training, the National Skills Authority and SETA system, SAQA and other institutions responsible for skills development planning in South Africa.



APPENDIX A:

STAKEHOLDERS PARTICIPATING IN ESSP PROCESS

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Chemical & Allied Industries Association (Dr. MD Booth)

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Department of Environment and Nature Conservation (Julius Koen)

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Department of Trade and Industry (Marba Visagie, Jacqueline Raphala, Zakhele Mdlalose)

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DST (Mmampei Mabusela)

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Endangered Wildlife Trust (EWT) (David J Newton, Graeme Wilson)
Environment Law Association (Richard Summers)
EnviroServ Waste Management (Michelle Charlie, Brian Kungwane, Katie Duarte)
Equispectives (San Mare Aucamp)
ESETA (Lungile Tshabalala)
Eskom (Lungile Mbense)
Eskom KZN (Troy Govender)
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MTPA (Boniwe Shoba)

Municipalities:

Alfred Nzo (F Khowa)
Amatole (Honjiwe Mayaphi)
Bojanala (Hlamalang Come)
Bophirima (Granny Dlamini)
Buffalo City (K Qwede, S Fungus)
Cacadu (X Sirayi)
Cape Winelands (M Albertus)
Capricon (Thabo Hlongwane)
Central Karoo (B Brown)
Chris Hani (S Dumalisile)
Dr KK Municipality (ZP Mabaso)
Dr RSM Municipality (DG Dlamini)
Ehlanzeni (CS Mabuza)
Ekurhuleni Metropolitan Municipality (Dudu Moela, Rubin Nzima)
eThekweni (MM Madikane)
FDDM (BH Phahlamohlaka)
Frances Baard (M Mathaba)
Ilembe (Bongumusa Buthelezi)
John Taolo Gaetsewe (SS Cekiso)
Mogale City (Samu Mdlalose, Aaron Tsoku, Koogan Naidoo)
Mopani (Dumisani D Sitlhangu, Azwianewi Makatu)
Motheo (TM Moepi, Lebogang Boitumelo, Angelo Lekhu)
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NMMDM (N Mkhosi)
ODM (SB Dlulisa)
OR Tambo (S Buso)
Randfontein (Hansie Duvenage)

Rustenburg (Lillian Sefike)
Sedibeng (ML Mdhlane)
Sekhukhune (HT Chavani)
Sisonke (B Luthuli)
Thabo Mofokeng (LJ Mofokeng)
Tshwane (Amulet Thobane, Elizabeth Moatshe)
UGU (DN Mbanjwa)
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Uthungulu (N Mngoma)
Vhembe (TD Malotsha)
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Zululand (NN Khuluse)

Newton Landscape Architects (Yonanda Martin)

NMMU (Claire Harves)

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North West University (Johan Nel, Jamare Jamare, Theunis Meyer)

Petro SA (Jessica Courtovaille)

Plastics Federation of SA (Douw Steyn)

Pseta (Zamokwakhe Khuzwayo, Moses Kutu, Abbey Sekokope)

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SALGA Eastern Cape (Khosi Msimka)

SALGA North West (Thabiso Tong)

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Western Cape Department of Environmental Affairs and Development Planning (Yakeen Atwaru)

Wholesale & Retail SETA (Inger Marrian)

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Wits University (Norman Owen-Smith)

Working for Water (Florence Gamanie)

Working On Fire Programme (Fred Favard)

WSP Engineers and Environment (Daniella Michel)

APPENDIX B:

SUMMARY OF IDENTIFIED SCARCE SKILLS IN THE ENVIRONMENTAL SECTOR

NOTE: A more detailed analysis is provided in the document titled *Integrating the Environmental Driver into Sector Skills Plans in South Africa: An Enabling Document for all SETAs* (DEA, 2010). See also ESSP Working Document No. 5.

High skills	Leadership and management skills Risk assessment and management skills Integrated environment and sustainable development planning skills
High skills (specialist professionals)	Environmental law and compliance (environmental inspection) Specialist scientific skills (particularly Black women scientists) Specialist technical skills Climate change risk and opportunity assessment skills Environmental Modelling and ICT skills Sustainable development planning skills Green Economy skills (resource economists, ecological economics, skills for green jobs development and training)
Intermediate level	Technical environmental monitoring skills (e.g. waste, water, coastal, environmental sciences)
Low skills	Environmental practices (e.g. recycling, waste practices, greening, basic horticulture, rehabilitation technical skills, etc. – a range of formalised operational level skills for the environmental sector)

Priority generic skills development programmes that need to be developed to service the sector as a whole include:

- Environmental Compliance and Environmental Management Inspection Skills
- Sustainable development and Green Economy leadership skills
- Adaptive environmental management and sustainable development planning and implementation
- Climate change risk and opportunity assessment and monitoring
- Environmental monitoring and modelling skills
- Environmental economics/resource economics and Green Economy planning
- Environment scientific skills
- Environmental technical skills (with specialist applications).

The Department of Labour Scarce Skills List identifies the following:

- It identifies **Management Specialists**, but it does not identify managers for the environmental sector
- It does not list resource or environmental economists
- It identifies a need for Engineers and Engineering Technologists, but it does not identify **environmental/air quality or water quality engineers or engineers with cleaner production skills on the list**
- It identifies the need for Natural and Physical Science Professionals including 100 Geologists, 150 Geophysicists, 500 Bioengineers and Biotechnologists, 200 Astronomers; 200 Astrophysicists; 200 Atmospheric Physicists, but it does not list all environmental scientific skills that are in demand (e.g. climate change scientists, soil scientists)

- It identifies a need for 250 Earth Science Technicians and 1 000 Biological Science Technicians, but it does not reflect all environmental technician scarcities (e.g. oceanographic technicians; environmental science technicians; cleaner production technicians, etc.)

Based on the above, at least the following scarce skills need to be placed on the Department of Labour's Scarce Skills List for 2010/11/12:

- Climate Change Risk Assessors/Long-Range Modellers
- Environmental Science Technicians
- Environmental Scientists (including NRM Scientists)
- Toxicologists
- Geochemists

- Hydrologists
- Taxonomists
- Oceanographic Engineers and Technicians
- Cleaner Production Engineers and Technicians
- Resource Economists/Environmental Economists
- Sustainable Development Planners.

The Department of Labour also includes HRD Skills and Training Skills on the National Scarce Skills List – both of which have been found to be needed in the environmental sector:

- Environmental Education and Training Skills
- Human Resource Management Skills for the Environmental Sector.



SUMMARY OF SCARCE SKILLS IDENTIFIED AT SUB-FOCUS LEVEL

(Exact quantities are not known and need to be established at sub-sector level, through ongoing monitoring and analysis).

NOTE: A more comprehensive overview is contained in ESSP Working Document No. 5 and the document titled *Integrating the Environmental Driver into Sector Skills Plans in South Africa: An Enabling Document for all SETAs*.

	WASTE MANAGEMENT	AIR QUALITY MANAGEMENT	GENERAL ENVIRONMENTAL MANAGEMENT (INCLUDING SD AND CLIMATE CHANGE)	ENVIRONMENTAL IMPACT MANAGEMENT AND POLLUTION CONTROL	MARINE AND COASTAL MANAGEMENT	BIODIVERSITY
High Skills (Management)	Senior Managers Middle Managers in public sector	Senior Managers Middle Managers in public sector	Senior Managers Middle Managers in public sector	Senior Managers Middle Managers in public sector	Senior Managers Middle Managers in public sector	Senior Managers Middle Managers in public sector
High Skills (Specialist Professionals)	Waste Researchers and Scientists Toxicologists Soil Geochemists Remediation Specialists Landfill Designers and Managers	Air pollution control officers Air Quality Specialists Engineers Atmospheric Dispersion Monitoring Atmospheric Scientists	Environmental managers (at local government level) Long range modellers Climate change risk assessors Nanotechnologists Space Scientists Climatologists Environmental Engineers Astronomers Environmental Scientists (including NRM Scientists)	Environmental Impact Management Officers (56% shortage at provincial level) Environmental Management Inspectors Environmental Risk Assessors Hydrologists Entomologists Cleaner Production Skills	Environmental Management Inspectors and Compliance Officers Researchers Climate Change Specialists Oceanographic Engineers Aquaculture Skills Coastal Zone Sustainable Development Planning	Bioregional Planners Taxonomists Soil Scientists Scientific Curators Physical Curators Climate Change specialists Bio-systematics Stewardship and Extension (Relative Scarcity) Environmental Compliance Officers (EMI) Bioprospecting Biosafety
Intermediate Skills	Environmental Science Technicians (with specialist competence for waste management)	Air Quality Compliance Monitoring Technicians Licensing Officers	Environmental Science Technicians	Environmental Science Technicians Cleaner Production Technicians	Fisheries Control Officers Oceanographic Technicians Community based Monitoring Skills (for coastal zone) Monitoring skills (for monitoring fish stocks)	Extension and social ecology skills Databasers Herbaria technical staff
Elementary Occupation Skills	Waste recyclers (relative scarcity, related to formalisation of recycling industry and new waste management Act)				Community Based Natural Resource Management Skills	Community Based Natural Resource Management Skills

ACRONYMS

ABET	Adult Basic Education and Training	HEMIS	Higher Education Information Management System
AGRISETA	Agricultural SETA	HR	Human Resources
CBNRM	Community-Based Natural Resource Management	HSRC	Human Sciences Research Council
CIPRO	Companies and Intellectual Property Registration Office	ICT	Information and Communication Technology
CSIR	Council for Scientific and Industrial Research	IPAP	Industrial Policy Action Plan
DEA	Department of Environmental Affairs	JSE	Johannesburg Stock Exchange
DPLG	Department of Provincial and Local Government	LGSETA	Local Government SETA
DST	Department of Science and Technology	MTSF	Medium Term Strategic Framework
DTI	Department of Trade and Industry	NAMAs	Nationally Appropriate Mitigation Actions
DWA	Department of Water Affairs	NCV	National Curriculum Vocational
DWEA	Department of Water and Environmental Affairs	NPO	Not for Profit Organisation
EGS	Environmental Goods and Services	NSDS	National Skills Development Strategy
EIA	Environmental Impact Assessment	OBE	Outcomes Based Education
EIM	Environmental Impact Management	QCTO	Quality Council for Trades and Occupations
EMIS	Education Information Management System	R&D	Research and Development
EPWP	Expanded Public Works Programme	SANParks	South African National Parks
ESSP	Environmental Sector Skills Plan	SANBI	South African National Biodiversity Institute
ETDP	Education, Training and Development Practices	SAQA	South African Qualifications Authority
FET	Further Education and Training	SD	Sustainable Development
GDP	Gross Domestic Product	SETA	Sectoral Education and Training Authority
GIS	Geographic Information Systems	SMME	Small, Medium and Micro Enterprises
HCD	Human Capital Development	THETA	Tourism, Hospitality & Sports Education & Training Authority
HCDPF	Human Capital Development Planning Forum	UNESCO	United Nations Educational, Scientific and Cultural Organisation
HCDS	Human Capital Development Strategy	UoT	Universities of Technology
HE	Higher Education		
HEI	Higher Education Institution		

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