A NATIONAL WASTE RESEARCH, DEVELOPMENT (R&D) AND INNOVATION ROADMAP FOR SOUTH AFRICA: PHASE 1 STATUS QUO ASSESSMENT





Skills for an Innovative Waste Sector: Core waste management skills and implementation modalities for HCD





Department: Science and Technology REPUBLIC OF SOUTH AFRICA

Document to be referenced as:

Department of Science and Technology (2012). A National Waste RDI Roadmap for South Africa: Phase 1 Status Quo Assessment. Skills for an Innovative Waste Sector: Core waste management skills and implementation modalities. Department of Science and Technology: Pretoria.

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DST/CSIR Waste RDI Roadmap, Phase 1, Output 1.3

Cover photographs courtesy of Linda Godfrey (CSIR)

Date: September 2012

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## **DOCUMENT INDEX**

Reports as part of this project include:

REPORT NUMBER	REPORT TITLE	AUTHORS
CSIR/NRE/SUSET/ER/ 2012/0045/A	Phase 1 - HCD: Skills for an Innovative Waste Sector: Workshop Report (11-12 July 2012)	Lombard, R.K., Lombard, J., Godfrey, L. and Roman, H.
CSIR/NRE/PW/ER/ 2012/0052/A	Phase 1 - HCD: Current waste HCD initiatives in South Africa	Lombard, J., Lombard, R.K. Godfrey, L. and Roman, H.
CSIR/NRE/SUSET/ER/ 2012/0053/A	Phase 1 - HCD: Core waste management skills and implementation modalities	Lombard, J., Lombard, R.K., Godfrey, L. and Roman, H.
CSIR/NRE/SUSET/ER/ 2012/0063/A	Phase 1 - Institutional framework: Current and required institutional mechanisms to support waste innovation	Schoeman, C., Mapako, M., Kalan, S., Godfrey, L. and Roman, H.

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## ABBREVIATIONS

CFO	Community Faith-based Organisations
CIWM	Chartered Institution of Wastes Management
CPUT	Cape Peninsular University of Technology
CSIR	Council for Scientific and Industrial Research
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism
DHET	Department of Higher Education and Training
DST	Department of Science and Technology
ELRC	Environmental Learning Research Centre
ESSP	Environmental Sector Skills Plan
GCGC	Global Change Grand Challenge
HCD	Human Capital Development
ISWA	International Solid Waste Association
IWMP	Integrated waste Management Plan
IWMSA	Institute of Waste Management of Southern Africa
NESPF	National Environmental Skills Planning Forum
NQF	National Qualifications Framework
NRF	National Research Foundation
NWMS	National Waste Management Strategy
NWU	North West University
OFO	Organising Framework for Occupations
PG	Post Graduate
PGCA	Post Graduate
PIVOTAL	Professional, Vocational and Technical, as well as Academic Learning
QCTO	Quality Council for Trades and Occupations
R&D	Research and development
RD&E	Research, Development and Evidence
RDI	Research, Development and Innovation
RPL	Recognition of Prior Learning
SAQA	South African Qualifications Authority
SETA	Sector Education and Training Authority
SSP	Sector Skills Plan
SWANA	Solid Waste Association of North America
TUT	Tshwane University of Technology
UCT	University of Cape Town
UJ	University of Johannesburg
UP	University of Pretoria
WAMITAB	Waste Management Industry Training and Advisory Board

## **1 BACKGROUND**

This report proposes core waste management skills and possible modalities for implementing Human Capital Development (HCD) programs in South Africa at a tertiary level that will promote innovation in the field of waste management. These options were identified during the consultative process that included two stakeholder workshops, key stakeholder interviews and a waste HCD audit carried out during July and August 2012. The recommendations contained in this report will feed into the development of a National Waste Research, Development and Innovation (RDI) Roadmap for the Department of Science and Technology (DST) (DST 2011a, 2011b, 2012a, 2012b).

This National Waste RDI Roadmap is being developed in phases:

- Phase 1 (2012) consists of two components, Sub-task 1 determining the HCD and skills required for a Waste RDI Program (this study), and Sub-task 2 determining enterprise/innovation opportunities and constraints associated with such a program.
- Phase 2 (2012/13) is the formulation of the Waste RDI Roadmap.
- Phase 3 is the implementation of the 10-year Waste RDI Roadmap.

As part of Phase 1, Sub-task 1, the first stakeholder workshop on HCD for waste management was held on 11-12 July 2012. Output 1.1 is the report on this workshop (DST, 2012a) during which stakeholders identified challenges and began to formulate goals and options to meet them. They identified the need for a waste management professional skills development program at university level that would:

- (i) enable graduates of tertiary institutions to enter the waste industry (both the public and private sector) well-versed and prepared to contribute effectively, and
- (ii) up-skill persons already working within the waste sector.

Output 1.2 for Phase 1, Sub-task 1, is the HCD audit that reports on what waste HCD learning programs and research initiatives currently exist in South Africa (DST, 2012b). The findings of this audit were shared with participants of the second stakeholder workshop.

This document is the final Output 1.3 of the HCD Sub-task 1 of Phase 1:

- It summarises the outcomes of the second workshop held on 28 August 2012 which defined more specifically the goals and objectives of a waste RDI HCD program going forward.
- It identifies **core and specialisation skills** needed for promoting RDI in waste management to bridge the skills gaps that were identified at the July 2012 workshop.
- It recommends **implementation modalities** for developing human capital to meet the targets for managing wastes and resources in a sustainable, innovative way.

## 2 WORKSHOP PROCEEDINGS

The second stakeholder workshop at Casa Toscana Lodge, Pretoria on 28 August 2012, was attended by participants whose primary interest lay in the R&D aspects of waste management. This workshop was attended by 20 of the approximately 120 stakeholders who had expressed an interest in the

study or who had been identified as being key to this round of discussions on HCD that would promote waste RDI at tertiary level (Appendix 1).

## 2.1 Background session and report back on HCD process so far

Mr Laurie Barwell, of the CSIR, welcomed all the participants and, once they had introduced themselves, he recapped the aim of the HCD Sub-task 1 of the project: to identify current and required HCD programs that will support a national waste innovation program. Appendix 2 provides more details on the presentations and discussions that took place. Only the key points will be reported on here.

## 2.1.1 Objectives of the second workshop

Mr Barwell outlined the objectives of the workshop which were to:

- Define the goal for the Waste RDI Roadmap
- Identify strategic objectives of the Roadmap
- Ensure alignment with the national Department of Environmental Affairs (DEA) waste R&D strategy
- Identify funding opportunities and outline funding requirements to promote HCD in the waste sector
- Identify implementation modalities, e.g. Research Programs, Research Chairs, Studentships, Internships, Centres of Excellence
  - Identify opportunities for the establishment of new research chairs that will support waste innovation
  - Modalities to build on academic systems already in place
  - Map out core and elective waste management modules required to achieve the programs objectives review what had been done in the first workshop (if time allowed)

#### 2.1.2 Overview of the Department of Science and Technology (DST)

The Project Leader, Dr Henry Roman, Director of Environmental Services and Technologies, DST introduced the Department's vision and mission under which this waste RDI program resides. He listed the DST Programs that are currently underway, based on the White Paper on Science and Technology, the National Research & Development Strategy, and the Ten-Year Innovation Plan (DST 2007). Under these, the Global Change Grand Challenge (GCGC) initiative gave rise to the Global Change Research Plan (DST 2011b) which identified four major cross-cutting knowledge challenges and 18 key research themes. The waste-related research themes that fall under the second major GCGC knowledge challenge, entitled 'Reducing the human footprint', are 'Waste minimization methods and technologies' and 'Doing more with less'.

He illustrated the components of the phased program that had been laid out to develop and implement the waste RDI Roadmap (Figure 1).



Figure 1: The Waste Research, Development and Innovation Roadmap

Dr Roman recapped the activities that have taken place in the HCD component of this study thus far within the agreed scope of the study, this scope being that the focus would be on (old) NQF Level 6 (= new NQF level 8)<sup>1</sup> and higher (i.e. post graduate level) since this was seen as the level that would be able to unlock innovation and enterprise development opportunities most effectively. The scope of this project also included waste as defined by the National Environmental Management Waste Act, Act 59 of 2008, as well as mining and power generation wastes, but excluded municipal wastewater.

The goal for the Waste RDI Roadmap as formulated at the first workshop is as follows:

"Acknowledging the goals of the NWMS, the DST believes that '*the South African waste sector* can achieve a 20% reduction<sup>2</sup> (by mass) in industrial waste<sup>3</sup> and a 60% reduction (by mass) in domestic waste, to landfill<sup>4</sup> by 2022' through investment in science and technology and the establishment of a national waste innovation program."

## 2.1.3 Overview of DEA's Waste Research Strategy

Ms Mapula Tshangela, Director: Sustainable Development of the DEA, gave an overview of the environment sector approach to the science-policy interface, and the establishment of a national environmental R&D strategy, including a waste R&D strategy. She emphasized the need for the activities of DEA and DST to be complementary. Her presentation, which is included in Appendix 2 of this report, outlined the following DEA initiatives that relate directly to waste management:

<sup>&</sup>lt;sup>1</sup> Equivalent to the recently proposed Higher Education Qualifications Framework (HEQF) level 8 or higher, i.e. tertiary level qualifications (RSA, 2011)

<sup>&</sup>lt;sup>2</sup> Where a 'reduction' is seen as being in addition to waste (or urban) mining

<sup>&</sup>lt;sup>3</sup> Where industrial waste includes mining sector waste

<sup>&</sup>lt;sup>4</sup> Where a 'landfill' includes mine dumps and residue stockpiles

- Environment Sector Research, Development and Evidence Framework (RD&E) 10 Year Plan: this is an approach aimed at enhancing the science-policy interface and evidence-based policy making approved by Minmec<sup>5</sup> on 8 June 2012 (DEA, 2012)
- Framework Context: the Environmental Sector Research, Development and Evidence framework is one of the sectors under the National R&D Strategy (Environment Sector Plan and Outcome 10).
- Thematic Strategies Context: one of the thematic strategies under the Environmental Sector RD&E framework is waste, the responsibility of the Branch: Chemicals and Waste (driven by Ms Thandeka Mandigora of DEA).
- Environmental Sector Strategic Plan (DEAT, 2008) and Delivery Agreement for Outcome 10 (DEA, 2010a) agenda items include waste management and sustainable environmental management respectively.
- Guiding sector framework: together with the National Environmental Management Waste Act and National Waste Management Strategy (DEA 2011), a Pollution and Waste Research Strategy is due to be developed by March 2013.

Building on the Global Change Grand Challenge, and based on the policy issues in the Environmental Sector Plan and Outcome 10, DEA was embarking on an evidence-based policy development process that would include participation by both evidence providers and policy-makers. Preference would be given to research that delivered the outputs identified as environment sector needs<sup>6</sup>. Research in line with Outcome 10 priorities would be supported immediately, for example, R&D on recycling, recovery, licensing, basic collection, sustainable consumption and production. Policy priorities and key activities would include research on reporting mechanisms; development of IWMPs; tariff-setting guidelines; capacity building for municipalities, technical directors, CFOs; processing of licenses; and recycling issues.

The evidence-provider and policy-maker role-players would include government departments in all spheres; science and technology institutions; education institutions; industry bodies; financial institutions; as well as NGOs and civil society. These would be organized into forums at different levels and with different areas of focus. There would, for example, be government forums to ensure coordination intra- and interdepartmentally; forums to address theme-specific aspects through a Waste Research Network; and a multi-sectoral forum able to give high-level guidance to broader environmental policy-making processes (See DEA presentation, Appendix 2).

## 2.1.4 Feedback from the First Stakeholder Workshop on HCD for Waste Innovation

Dr Linda Godfrey, Principal Researcher and the Project Manager from the CSIR, presented a brief overview of what had transpired at the first Stakeholder Workshop in July 2012. She explained the broad themes which had emerged during the first workshop.

<sup>&</sup>lt;sup>5</sup> MINMEC: Environment is a standing intergovernmental body consisting of the Minister of Environmental Affairs, members of the provincial Executive Councils (MECs) responsible for environmental management functions, and SALGA. MINMEC meets quarterly.

<sup>&</sup>lt;sup>6</sup> The details of the DEA Waste R&D strategy are to be built on at a DEA workshop to be held on the 27 September 2012.

#### SUMMARY OF KEY THEMES

Challenges, opportunities and constraints had been summarised under the following broad themes:

- The need for waste management professionals
  - Workplace-ready graduates
  - Workplace up-skilling
- South Africa-appropriate innovation and skills
- The need for a network/community of practice: sharing of research and engagement of students
- The need for bridging research disciplines: between e.g. engineering and social science
- The need for accurate waste data.

The question of who was to be capacitated was also highlighted.

#### **OBSTACLES TO ACHIEVING GOAL OF 60% AND 20 % REDUCTION TO LANDFILL**

Six broad themes of obstacles (and solutions) to achieving this goal had emerged:

- Financial
- Legislative
- Institutional
- Infrastructural
- Information, Communication & Awareness
- Human Capital Development (HCD)

#### PRELIMINARY CORE COMPETENCIES

The preliminary list of core competencies identified as necessary for professional waste management had emerged as the following:

- Natural and Physical Sciences:
  - natural sciences (e.g. geography, chemistry, physics and maths there was a need to develop analytical skills)
  - physical science
  - environmental management and legislation
  - public participation
  - basic analysis (e.g. analytical, research, report writing skills)
  - computer literacy (e.g. data capturing, online research)
- Business and social competencies:
  - business management and planning
  - risk management
  - financial management
  - communication
  - project management
  - social sciences (e.g. people management & mentoring skills)
  - understanding of sustainability and the green economy

#### PRELIMINARY ELECTIVE/SPECIALISATION COMPETENCIES

The preliminary list of specialized competencies which might be required of a waste management professional, depending on the sphere in which he/she worked, was identified in the workshop to include:

- Waste
  - waste mass balance
  - landfill management
  - alternate waste management technologies
  - quality management
  - environmental auditing
  - environmental economics and governance
  - policy and data analysis
- Research and Development
  - ethics
  - data generation and gathering skills, capturing and processing
- Business/social
  - introduction to business management
  - entrepreneurial skills
  - people management skills

Finally, Dr Godfrey outlined the conclusions which came out of the first stakeholder workshop. The agreed basic requirements for a waste management professional skills development program at tertiary level were that:

- The program must enable graduates of tertiary institutions to enter the waste industry wellversed and well-prepared to contribute effectively (public or private sector);
- The program must up-skill persons already working within the waste sector, capacitating them to perform their jobs with greater effectiveness and understanding, as well as allowing them to progress further on a learning pathway.

All workshop documents are downloadable for reference and comment from the project website<sup>7</sup>.

#### 2.1.5 Feedback on the 2012 National Waste HCD Audit

June Lombard, of Icando, presented a summary of the findings of the waste HCD audit (DST, 2012b).

#### WASTE HCD AUDIT

The objectives of the HCD audit were to:

- Provide a review of solid waste management-related courses and training programs currently offered at tertiary level in South Africa;
- Identify leading programs and research in solid waste management at South African universities and where institutional capacity for developing waste-related skills was concentrated; and
- Give a brief overview of some international programs for HCD in waste management.

<sup>&</sup>lt;sup>7</sup> <u>http://www.csir.co.za/nre/pollution\_and\_waste/human\_capital.html</u>

#### APPROACH

The methodology, using questionnaires, interviews and an internet search, was described. The report had been made available on the project website<sup>8</sup> and comment had been requested to verify findings and include additional inputs from interested parties.

#### FINDINGS: CURRENT HCD INITIATIVES

#### **Questionnaires and follow-up interviews**

There had been a 23% response to the questionnaires sent out at the time of the workshop. This is in line with expected response levels for self-administered email questionnaires (Rea & Parker, 1992). The majority of respondents were from academic and research institutions, which was to be expected given that the subject matter was primarily concerned with details of training and research conducted. 84% of respondents had completed Part A of the questionnaire, which focused on individuals, as opposed to Part B, which focused on organisations and institutions. However, Part A also contained a section dealing with the respondent's organisation, and results for individuals and organisations had been consolidated where comparable, for example, regarding funding sources. Where necessary, follow-up interviews were conducted for clarity, some formally others informally, via telephone or Skype.

#### Internet search results

The results of the findings on these institutions, along with relevant South African Qualifications Authority (SAQA) Unit Standards, and some international solid waste management HCD initiatives of relevance, are to be found in the workshop report (Appendix 2 of this document) as well as the HCD audit report itself (DST 2012b, Appendix 2).

#### WASTE HCD AUDIT REPORT CONCLUSIONS

The findings of the waste HCD audit which were shared with workshop participants are outlined below:

- At a tertiary level in South Africa, there are currently no diploma or degree qualifications concerned solely with waste management. Typically, waste management is addressed at a very general level of detail as part of courses handling environmental studies; engineering (whether chemical, civil, mechanical or environmental engineering); and more indirectly, via faculties of social science and commerce (environmental economics, management). This differs from the general status quo internationally, where both dedicated waste qualifications and inclusion of waste-focused courses and modules in other qualifications are evident (e.g. UK, Australia, New Zealand, USA).
- Internationally, there are industry training organisations that coordinate, accredit and quality
  assure waste management skills development, where most of the learning is done on-the-job.
  Employees are able to build competency while they are working, which helps to meet the skills
  needs of industry, leading to continual improvements in productivity and performance (e.g. UK,

<sup>&</sup>lt;sup>8</sup> <u>http://www.csir.co.za/nre/pollution\_and\_waste/human\_capital.html</u>

USA, New Zealand). Despite the fact that current South African unit standards for waste management, which fall under broader environmental practice qualifications, exist at a lower NQF levels (L1 - L5) than is the focus of this study, these unit standards would provide an effective basis for a waste learning pathway that would prepare students for postgraduate study.

- 3. There is a need for additional engineering, technical and biotechnical skills and facilities for waste RDI in SA. This includes laboratory facilities with specialised technicians.
- 4. Skills required for innovation are not only technical there is growing interest in research into the socio-economic aspects of the waste sector, particularly around modalities for sustainable job creation and poverty alleviation.
- 5. A strong need was also identified for waste practitioners to have a holistic understanding of environmental economics, business and social sciences. A multidisciplinary waste management centre would be best positioned to offer postgraduate level waste HCD and to foster the potential for exponential progress in waste RDI.
- 6. There is a need for postgraduate students to be able to undertake their studies on a part-time basis. Structuring of postgraduate learning should accommodate part-time study and could draw on examples of successful models that range from short intensive courses; to combinations of block contact sessions/modules of varying duration and frequency interspersed with assignments and research projects; to a fully-fledged distance learning format.
- 7. The Chartered Institution of Wastes Management (CIWM), as professional statutory body for the waste industry in the United Kingdom, can accredit formal qualifications and academic courses, while the Solid Waste Association of North America (SWANA) in the USA certifies its members by means of a Certification Exam, ensuring continuing professional development. Internationally, the trend is for organisations such as CIWM, SWANA and ISWA (the International Solid Waste Association) to be integrally involved in accreditation of formal tertiary level skills development programs. In South Africa, by contrast, there is currently little formal involvement in skills-development programs by industry and waste sector associations, although the opportunity is believed to exist.
- 8. The Institute of Waste Management of Southern Africa (IWMSA) is exploring the feasibility of becoming a legally recognised quality assurance body for the waste sector, whereby it could advance the professionalisation of the local waste industry, taking its membership and training initiatives to the next level, thus following suit with the CIWM in the UK (CEM 2012).
- 9. To accelerate innovation, mentorship and practical experience are needed to bridge the gap between the often highly theoretical knowledge acquired at a tertiary institution and the acquisition of practical experience in the workplace. There are several successful examples of qualifications structured to accommodate this interface, as discussed in the HCD audit report, Section 3.3.

- 10. There is growing research interest in pioneering waste technologies to minimise or beneficiate waste economically; sustainable management of resources and energy (e.g. biotechnology, waste-to-energy); and the socio-economic aspects of managing waste, particularly waste minimisation with job creation at community level.
- 11. Funding was identified as the most pressing challenge hampering waste R&D in South Africa. A large majority of questionnaire respondents indicated that they had to fund their learning programs and research partly or wholly through their own or their organisation's resources. With currently limited investment in waste research in South Africa, the development of a national waste R&D strategy is imperative to ensure that available resources are distributed to address the key research priorities of government, industry and broader society in a sufficiently focused and systematic way.
- 12. Inadequate leadership and support from more senior echelons within organisations or government departments also featured high on the respondents' list of challenges to waste RDI: this is seen by respondents as symptomatic of the current lack of a national waste R&D strategy to guide research and research investment. Leadership in the public sector is crucial for successful implementation of policy to drive research, new products, processes and markets, i.e. the green economy. This is unlikely to be achieved unless decision-makers themselves have a sound knowledge and appreciation of waste management and the opportunities it provides.
- 13. The modalities considered for HCD for innovation in waste R&D should deliver professional waste managers, via recognised learning pathways, who hold appropriate qualifications and certification in waste management.

## 2.2 Working Groups Sessions:

The activities of the working groups were facilitated by Mr Barwell of the CSIR who had previously facilitated the Global Change Grand Challenge process as well as the first HCD for Waste Innovation stakeholder workshop in July 2012. This workshop was run along similar lines to the first workshop, giving abundant opportunity for information sharing by way of brief informal presentations, and the convening of small participatory group sessions.

Only the highlights and outcomes of the working groups will be reported here. A full workshop report is provided as Appendix 2 to this report.

## i. Breakaway groups

Mr Barwell reminded the small breakaway groups of the 'SMART'<sup>9</sup> mission statement for the waste RDI program: to reduce industrial solid waste to landfill by 20% (by mass) and domestic waste to landfill by 60% by 2022.

<sup>&</sup>lt;sup>9</sup> 'SMART' goals are: Specific, Measurable, Attainable, Realistic and Time-Based.

At the previous workshop, three areas of waste HCD specialization had been identified for inclusion in a waste management professional skills development program. These areas were: social; technological; and business/management/decision-making. The groups were asked to consider whether there were any other areas or categories of role players which needed to be considered.

It was agreed that the list of areas should be revised to include:

- 1. Social
- 2. Technological
- 3. Business
- 4. Managerial/decision-making
- 5. Educational environmental/waste educators
- 6. Legislators/Policymakers/Strategic planners
- 7. Waste service providers/waste companies
  - [Note: not everyone agreed on this last category. Some felt it was redundant as it was already represented in the preceding categories]

In the light of this list it was also agreed that a third requirement for HCD delivery would be added as follows:

- 1. Postgraduate specialisation to produce work-ready graduates
- 2. Up-skilling of existing waste management practitioners to keep them at the cutting edge of their fields
- 3. Training of trainers to produce waste educators at all levels, including supervisors of postgraduate studies and those implementing induction courses.

## ii. Informal Presentations on different HCD modalities in other institutions

Enabling environments and modalities are required to support the effective implementation of a waste management professional skills development program. Mr Barwell invited any participants who had something to offer to make a short informal presentation, not exceeding 10 minutes per person. The inputs of the following people are provided in Appendix 2 of this report:

NAME	ORGANISATION REPRESENTED
2. Dr Claudine Roos	North West University (NWU) Centre for Environmental Management
3. Ms Presha Ramsurup	Rhodes University (RU) Environmental Learning Research Centre (ELRC)
4. Ms Thandeka Mandigora	Department of Environmental Affairs (DEA) Waste Research & Planning
5. Ms Thea Schoeman	University of Johannesburg (UJ) Geography & Environmental Management
6. Prof Jannie Maree	Tshwane University of Technology (TUT)
7. Prof Daniel Ikhu-Omuregbe	Cape Peninsular University of Technology (CPUT)
8. Dr Suzan Oelofse	Council for Scientific and Industrial Research (CSIR)
9. Dr Ravi Vadipalli	CSIR Pollution and Waste Group
10. Dr Rethabile Melamu	University of Cape Town (UCT) Chemical Engineering Department

#### i. Breakaway Groups: HCD Modalities

Group task: Three breakaway groups were asked to design the ideal Waste Management Skills Development Program that would be a mechanism to develop waste RDI capacity while, at the same time, remaining sustainable. The following aspects for HCD were to be included:

- The methodology and implementation instruments for the Waste Management Skills Development Program were to achieve waste reduction and produce waste management professionals.
- Three facets of learning were to be addressed: postgraduate; up-skilling; and train-the-trainer.
- Core skills and specialisation/elective skills should be identified
- An indication should be given of where funding would come from perhaps innovative mechanisms?
- Key elements to be considered: Social, technological, business, management/decision support, education and awareness, and legislation/policy-making.

The proposed modalities developed by each group are described in Appendix 2; however, the synthesis of these, agreed in the plenary discussion after the groups had reported back, is summarised here:

#### **OUTCOMES FROM BREAKAWAY GROUPS**

HCD modalities that were deemed to be important by the workshop participants included the following:

- "Centre of Excellence" and "Industry Chair" models knowledge hub/community of practice, coordination of waste-related research, "one-stop waste management shop". A program coordinator would be needed.
- A centre of excellence and/or an industry chair would coordinate the identified need for occupational workplace learning to be combined in an effective way with knowledge and practical learning at an institution.
- There could be two options: a bridging Honours (e.g. one year Honours qualification followed by a second year workplace internship) and a Postgraduate Advanced Certificate/Diploma.
- The Waste Management Skills Development Program must allow for a multi-disciplinary, portfolio approach, with possible specialisation in one of the identified specialist sectors, i.e. social, technological, business/managerial/decision-making; educational; legislation/policy-making.
- A certificate program for non-degree purposes should be offered in addition to postgraduate qualifications to allow access to a greater number of people. A 65% average mark in an undergraduate degree was generally required for postgraduate enrolment which might exclude some people.
- Recognition of Prior Learning (RPL) should be considered as an option to enable those without formal qualifications but with workplace experience to enter a learning pathway and get official recognition, perhaps through a process of certification.
- There should be strong linkages from the formal training context to workplace learning in terms of placement, funding/bursaries and up-skilling.

- The modalities must link up with the mission to reduce waste. There must be a balance between sufficient workplace learning and academic/research skills so as not to miss the mission to reduce waste.
- Links to legislative processes should be built in, that is, made a legal requirement for certification of waste professionals. Enforcing accreditation or qualification requirements for waste management officers (as defined by the Waste Act) would sustain such an initiative by stimulating ongoing demand for training and assessment of qualified waste professionals.
- The idea of a professional body to drive standardisation and enforceability was recommended and it should be clarified whether the Waste Act could be interpreted to mandate the legal requirement for particular qualifications for a professional waste manager.
- Institute of Waste Management of Southern Africa's (IWMSA) possible role in quality assurance for waste management, including training aspects, could align with the idea of a professional body. IWMSA could explore registration as a professional body with the South African Qualifications Authority (SAQA)<sup>10</sup>.
- A hybrid mix of the advanced certificate and honours models appear feasible these should be explored further (See Section 3 below).
- The waste management learning program would require core modules as well as specialist/elective modules.
- The definitions of waste occupations and structure of the learning program should facilitate access to skills funding and relate to the Quality Council for Trades and Occupations (QCTO) Organisational Framework for Occupations<sup>11</sup> perhaps as a PIVOTAL program<sup>12</sup> (DHET 2011).

## 2.3 Conclusions from this Workshop

Consensus was reached that modalities for waste RDI HCD should include the following options:

- The idea of a multidisciplinary Centre of Excellence and/or Industry Research Chair was favoured.
- The recommended bridging program into the professional waste sector should be a postgraduate advanced certificate/diploma. There was also room for an honours degree in waste management to foster research skills.
- The learning program must be structured to have strong links with the workplace.
- The structure of the learning program should be aligned with the Organisational Framework for Occupations to facilitate access to SETA skills development grants, amongst other more customary sources of funding such as NRF<sup>13</sup> and THRIP<sup>14</sup>.
- Some kind of knowledge hub/community of practice should be created for waste management.
- A driver of the Waste Management Skills Development Program needs to involve a legal requirement for training or accreditation, best driven by a professional/quality assurance body.

 $<sup>^{10}</sup>$  RSA National Qualifications Framework Act. 17 February 2009  $\,$  GG No. 31909 GN 167 – Act No. 67 of 2008  $^{11}$  Ibid

<sup>&</sup>lt;sup>12</sup> In its National Skills Development Strategy, NSDS III, DHET promotes the notion of grant-funded PIVOTAL programs, i.e. Professional, Vocational and Technical, as well as Academic Learning Programs which embrace both an institutional as well as a workplace/community dimension, such as professional engineers and artisans

<sup>&</sup>lt;sup>13</sup> <u>http://www.nrf.ac.za/</u>

<sup>&</sup>lt;sup>14</sup> http://thrip.nrf.ac.za/

## **3 RECOMMENDATIONS**

Taking the stakeholder consultation as well as the findings of the waste HCD audit, into consideration, the following recommendations are made:

## 3.1 Institutional Arrangements

Establish a Centre of Excellence for Waste and Resources Management with a project/program Coordinator. The Centre has the following roles:

- It fulfills a coordinating role as an administrative hub for waste management research and development
- It is a knowledge hub and stores waste research information
- It promotes, supports and undertakes waste research
- It facilitates links into public and private sector workplaces for workplace learning

Several institutions should cooperate and collaborate to provide specialist training where necessary, as it is unlikely that all requisite cutting edge expertise would reside in a single institution.

Definitions of waste occupations must be aligned with the Organising Framework for Occupations (OFO) requirements to unlock available Skills Education Training Authorities (SETA) funding.

Ensure that there is a statutory mechanism or an accreditation requirement in place to drive the demand for training of waste management professionals and that will ensure that they will find employment once qualified.

The modalities chosen must contribute towards achieving the goals of waste minimisation and reduced waste to landfill.

Sight should not be lost of the skills development pipeline from lower levels or via recognition of prior learning (RPL) feeding into this level of HCD.

## 3.2 Course Structure

The course should be designed at (new) NQF Level 8 and allow access from various disciplines (see Annexure 3).

Depending on core and specialised module combinations, the course should be able to be tailored to suit those completing it either to follow an academic, specialist pathway, or a post-graduate diploma workplace focused pathway, both options producing workplace-ready graduates.

- Honours option (a research-focused pathway):
  - Coursework to cover waste management core modules
  - Other specialization/elective modules
  - Workplace learning in chosen area of specialisation
  - Mini-research dissertation component

- Postgraduate Diploma option (a workplace-focused pathway):
  - Must be strongly tied to the occupational workplace
  - Must accommodate up-skilling in workplace with the options of part-time block contact sessions and/or semi-distance learning for those unable to study full time
  - Would not preclude the engineering PDE
  - Must include an option that produces waste educators for interventions at all levels
  - The establishment of this option structured as a PIVOTAL program should be explored.

Other modalities common to workplace training systems in general should also be recognized and applied where suitable, for example, mentorships/paid internships or workplace induction programs.

## 4 CONCLUSION

The HCD requirements to promote RDI in waste management should include the following:

- 1. Postgraduate specialisation to produce work-ready graduates
- 2. Up-skilling of existing waste management practitioners to keep them at the cutting edge of their fields
- 3. Training of trainers to produce waste educators at all levels from basic education through further education to higher education, and to provide suitably competent supervisors of postgraduate studies to support RDI. There should be waste educators both in the academic environment and in the workplace. Educators who are able to design and deliver induction/orientation programs have a significant role to play in the waste workplace.

Institutional arrangements around the waste management learning modalities that have been proposed here must be explored in more depth in the next phase of development of the Waste RDI Roadmap. Funding has emerged as the biggest constraint for the sustainability of the HCD component: the key will be to structure HCD programs in a way that unlocks mainstream funding. This study has shown that, in addition to the customary sources of research funding, if the modalities are aligned to statutory structures such as the QCTO's OFO and SETA funding mechanisms, it is possible to access skills development funding on sustainable basis.

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A National Waste Innovation Program for South Africa: Phase 1 Status Quo Assessment

## **APPENDICES**

## **APPENDIX 1: WORKSHOP ATTENDANCE LIST**

## DST-CSIR HCD WORKSHOP 2

## Casa Toscana, Pretoria, 28 August 2012

	Surname	First Name	Organisation
1.	Barwell	Laurie	CSIR
2.	Godfrey	Linda	CSIR
3.	Ikhu-Omoregbe	Daniel	CPUT, Department of Chemical Engineering
4.	Lombard	June	Icando
5.	Lombard	Rosemary	Icando
6.	Mandigora	Thandeka	DEA
7.	Maree	Jannie	TUT
8.	Melamu	Rethabile	UCT Department of Chemical Engineering: Environmental & Process
			Systems Engineering Research Group
9.	Mudau	Virginia	University of Venda
10.	Oelofse	Suzan	CSIR Principal researcher: Pollution and Waste
11.	Pouris	Anthipi	NRF - Director: Capacity & Strategic Platforms Grants
12.	Radzuma	Prince	DEA – Waste Research & Planning
13.	Ramsarup	Presha	Rhodes University PhD scholar ELRU
14.	Roman	Henry	DST - Environmental Services & Technologies
15.	Roos	Claudine	NWU - Centre for Environmental Management
16.	Schoeman	Thea	UJ Geography
17.	Tinarwo	David	University of Venda, Department of Physics
18.	Tshangela	Mapula	DEA – Sustainable Development and
19.	Vadapalli	Ravi	CSIR Pollution and Waste Research Group
20.	Viljoen	Kotie	UJ Economics lecturer

#### **APPENDIX 2: Workshop summary notes - Rosemary Lombard**

#### **1. WELCOME AND INTRODUCTIONS:**

The second stakeholder workshop at Casa Toscana Lodge, Pretoria on 28 August 2012 was attended by participants whose primary interest was in the research and development aspects of waste management. This workshop was attended by 20 of the approximately 120 stakeholders who had expressed an interest in the study or who were identified as being key to this round of discussions on HCD that will promote waste RDI at tertiary level.

# Mr Laurie Barwell welcomed everyone and asked them to introduce themselves (See Appendix 1 for full list of attendees)

#### 1.1 Objectives of the second workshop

Mr Barwell outlined the objectives of the workshop which were to:

- Define the goal for the Waste Research & Development and Innovation Roadmap
- Identify strategic objectives of the Roadmap
- Ensure alignment with the national DEA waste R&D strategy
- Identify funding opportunities and outline funding requirements to promote HCD in the waste sector
- Identify implementation modalities, e.g. research programs, Research Chairs, Studentships, Internships, Centres of Excellence
- Identify opportunities for the establishment of new research chairs that will support waste innovation
- Modalities to build on academic systems already in place
- Map out core and elective waste management modules required to achieve the program's objectives – review what had been done in the first workshop, (if time allowed)

#### **1.2 Background to the study**

See PowerPoint presentation

The Project Leader, Dr Henry Roman, Director of Environmental Services and Technologies, DST introduced the DST's vision and overarching mission for this waste RDI study:

- Vision of the DST: to create a prosperous society that derives enduring and equitable benefits from science and technology.
- Mission of the DST: to develop, coordinate and manage a National System of Innovation (NSI) that will bring about maximum human capital, sustainable economic growth and improved quality of life for all.

He listed the DST Programs that are currently underway based on the White Paper on Science and Technology, the National Research & Development Strategy, and the Ten-Year Innovation Plan. Under these, the Global Change Grand Challenge initiative gave rise to the Global Change Research Plan which identified four major cross cutting knowledge challenges and 18 key research themes. The waste-related research themes, which fall under the second major GCGC knowledge challenge entitled 'Reducing the human footprint', are 'Waste minimization methods and technologies' and 'Doing more with less'.

The National Development Plan (NDC) 2030 incorporates a package of instruments to support the transition to environmental sustainability and a low carbon economy: waste makes up 2% of emissions in SA, hence the target to eliminate waste to landfill. The new policy environment creates opportunities for innovation where the DST can play a role in achievement of targets. The DST has an important role to play in the National Waste RDI program for SA which must address product, process and organizational innovation to achieve its objectives.

Dr Roman recapped the activities that have taken place in the HCD component of this study thus far. In addition to an initial scoping meeting and the first

stakeholder workshop, a waste HCD audit was carried out. The HCD audit ascertained what waste courses and training programs currently exist at tertiary level and gave an indication of which universities are active in the waste management field and where institutional capacity for waste RDI is to be found. The HCD audit report also briefly looked at a few international examples that include dedicated waste research and learning programs.

It had been agreed early on in the project that the focus would be on (old) NQF Level 6 (= new NQF level 8) and up (i.e. postgraduate level) since this was seen as the level that was able to unlock innovation and enterprise development opportunities. The scope of this project included waste as defined by the National Environmental Management Waste Act, Act 59 of 2008, as well as mining and power generation waste where there were good opportunities for innovation. The study would, however, exclude municipal wastewater since DST was running another project with a water and wastewater focus.

The goal for the Waste RDI Roadmap was formulated at the first workshop as follows:

"Acknowledging the goals of the NWMS, the DST believes that "the South African waste sector can achieve a 20% reduction (by mass) in industrial waste and a 60% reduction\* (by mass) in domestic waste, to landfill by 2022" through investment in science and technology and the establishment of a national waste innovation program."

\* Where a 'reduction' is seen as being in addition to waste (or urban) mining; industrial waste includes mining waste; and a 'landfill' includes mine dumps and residue stockpiles.

#### 1.4 Overview of DEA's Waste Research Strategy

See PowerPoint presentation

Ms Mapula Tshangela (DEA) presented the overview of the environmental sector approach to the science–policy interface touching on the following points:

- Complementarity is our reason for being here: DST and DEA have signed an MOU to address environmental issues collaboratively.
- DEA R&D strategy supports both a change agenda (political/Outcome 10) and a sustained agenda (environmental sector plan) – both informing an evidence-based framework to translate policy to research and visa versa
- Outcome 10, Output 3: Sustainable environmental management: less waste that is better managed would be a focus of waste R&D for DEA.
- Building from national R&D Framework framework and thematic strategies were approved in June 2012, 5-year review of the SA State of Environment report is due next year– this also guides research.
- Have identified 9 thematic strategies 5 being implemented in 2012/13 (one of which is waste)
- Pollution and waste research strategy to be developed by March 2013
- Thandeka Mandigora of DEA is looking at the waste element in terms of these agendas.
- Thematic strategies in the Environmental Sector Plan link with the Grand Challenge priorities how to mobilise these on the ground must be determined.
- Waste legislation Act, Strategy, Framework approved, various agreements in place
- Research that is aligned with Outcome 10 priorities will be supported immediately with funding: these include: recycling, recovery, licensing, basic collection, sustainable consumption and production etc.

#### Policy priorities and key activities

These include reporting mechanisms, development of IWMPs, tariff-setting guidelines, capacity building for municipalities, technical directors, CFOs, licensing process research, processing of licenses, recycling issues.

#### Framework for sector science-policy interface

Diagram adapted from DEFRA (UK) 2007 - see diagram in presentation

#### Institutional Structures for Support

Internal coordinating forum Intergovernmental forum Thematic forum – Waste research network Multi-sectoral forum – Science policy aspect

Quote from Environment Sector Research, Development and Evidence Framework <sup>15</sup>:

'The knowledge transfer between researchers and policy-makers in the environmental sector needs to be strengthened. Policy-makers and researchers need to work more closely together by means of established, regular and trusting interaction and dialogue. Through DEA, a central knowledge management system (web-based data system) will be developed to help facilitate interactions among key stakeholders from the science and the policy domains. Various fora will be used to facilitate sector science-policy interface and evidence based policy-making. These fora include an internal coordinating forum, existing intergovernmental forum, theme specific fora and multi-stakeholders forum.

This environment sector R, D&E framework will be implemented in phases. In line with level 3 thematic strategies, a minimum of five areas are identified to initiate immediate implementation i.e. biodiversity, waste management, climate change, air quality and oceans & coast. These areas were selected based on the Memorandum of Understanding between DEA and DST for initial implementation.'

#### 1.5 Overview & Feedback on 1st Stakeholder Workshop

Dr Linda Godfrey, Principal Researcher and Project Manager from CSIR, gave a brief overview of what transpired at 1<sup>st</sup> scoping workshop in July 2012.

#### Achievement of Objectives of first workshop:

First Workshop (July 2012) objectives	Achieved
• Understand the current activities and approaches taken by stakeholders and role players in terms of skills development in the context of various components of the solid waste sector in SA	14 presentations made by delegates of the first workshop
Obtain an overview of the Vision for an Innovative Waste Sector in South Africa	Workshopped with delegates
<ul> <li>Develop a consensus Mission Statement for an innovative solid waste sector in SA</li> </ul>	as the Program Goal
<ul> <li>Definition of the key suite of capabilities (skills, facilities, technologies, standards, protocols, etc.) required to realise the Strategic Objectives</li> </ul>	Workshopped with delegates
<ul> <li>Definition of a key number of strategic objectives that underpin the Mission</li> </ul>	2 <sup>nd</sup> Workshop

Objectives: To understand current activities around R&D

Consolidated vision & mission as a goal: 60% & 20% respective reduction in industrial and domestic solid waste to landfill by 2022.

At the last workshop, participants started to look at capabilities that would be required. More detail would emerge today.

## Challenges, opportunities, constraints – broad themes that came out of Workshop

 Need for WM professionals – workplace-ready graduates, and workplace up skilling of people already in the workplace

<sup>&</sup>lt;sup>15</sup> DEA (2012) Environment Sector Research, Development and Evidence framework, Pretoria.

http://www.environment.gov.za/sites/default/files/docs/environment\_sector\_research\_ framework.pdf

- 2. SA appropriate innovation and skills
- 3. Need for network/community of practice sharing of research and engagement of students
- 4. Need for bridging research disciplines engineering, social sciences
- 5. Need for waste data
- 6. Who to be capacitated?

#### Obstacles to achieving the goal?

Six broad themes had emerged:

- 1. Financial
- 2. Legislation
- 3. Institutional
- 4. Infrastructural
- 5. Information, Communication & Awareness
- 6. Human Capital Development (HCD)

#### **Core competencies and elective competencies for a professional waste manager** Core skills for a learning program:

- Natural & Physical Sciences:
  - natural sciences (geography, chemistry, physics and maths develop analytical skills)
  - o physical science
  - o environmental management and legislation
  - public participation
  - o basic analysis (analytical, research, report writing skills)
  - computer literacy (data capturing, online research)
- Business/social:
  - o business management and planning
  - risk management
  - o financial management
  - o communication
  - project management
  - o social sciences (people management & mentoring skills)

Specialist skills for a learning program:

- Waste
  - waste mass balance
  - o landfill management
  - o alternate waste management technologies
  - o quality management
  - o environmental auditing
  - o environmental economics and governance
  - policy and data analysis
- R&D
  - ethics
  - o data generation, capturing and processing
- Business/social
  - o introduction to business management
  - o entrepreneurial skills
  - o people management skills

#### 1<sup>st</sup> Workshop HCD Conclusions

A waste management professional skills development program (at university level) is required to enable graduates of tertiary institutions to enter the waste industry well-versed and prepared to contribute effectively (public or private sector), and to up-skill persons already working within the waste sector.

All workshop documents can be found online at:

http://www.csir.co.za/nre/pollution\_and\_waste/human\_capital.html

#### 1.6 Feedback on the 2012 Waste HCD Audit

#### JUNE LOMBARD, Icando

Report on findings around HCD currently in place

From this audit we will move on to what is needed and the modalities for waste HCD.

At the workshop today, concentrate on practical way forward to develop the WM professional and up-skilling those who want to learn WM skills. Focus is to be above L6 (but without excluding consideration of the learning pathways of ground level WM activities), because new technologies and innovation etc will come from a tertiary level.

#### WASTE HCD AUDIT

This HCD audit:-

- review of current SWM courses and training programs at tertiary level in SA
- leading programs and research in SWM at SA universities and the institutional capacity for developing waste-related skills; and
- brief overview of some international programs for HCD in waste management

#### Initial scoping

• NQF Level 6 and up (tertiary education)

#### Database

- Approximately 460 names were sent information
- Sectors: waste/environmental/energy academic and research; business; government; public entities; NGOs non-profit organisations; funding organisations

#### APPROACH

First stakeholder workshop (11-12 July 2012)

- Identified need for SWM professional skills development program at university level that would:
  - enable graduates to enter the waste industry well-prepared to contribute effectively, and
  - o up-skill persons already working within the waste sector

#### Questionnaire

- ±106 Questionnaires and some follow-up interviews
- E-mailed to interested and identified role players

- Formal interviews proved inefficient in time available
- Informal discussions

Internet search

- Universities (SA and international)
- SAQA website waste-related Unit Standards at level 6 or higher Other initiatives

• Where these emerged they were captured in the report. Verification and further inputs are now needed

#### FINDINGS: CURRENT HCD INITIATIVES

#### **Questionnaires and follow-up interviews**

23 % response (still more due): in line with self-administered email questionnaires 84 % filled in Part A for individuals

Part A contained a section for respondent's organisation

Part A and Part B results were consolidated where the questions were similar.

#### Internet search

Traditional Universities (11)

- Cape Town, Fort Hare, Free State, KwaZulu-Natal, Limpopo, North-West, Pretoria, Rhodes, Stellenbosch, Western Cape, Witwatersrand
- Comprehensive Universities (6)
- Johannesburg, Nelson Mandela, Unisa, Venda, Walter Sisulu, Zululand Universities of Technology (6)
- Cape Peninsula, Central, Durban, Mangosuthu, Tshwane, Vaal

#### SA Traditional/Comprehensive universities

- Currently no purely waste management qualifications
- There are waste modules as subset of the broader environmental management, environmental science or engineering fields
- Found in the faculties of
  - o science environmental, geographical and earth sciences
  - engineering chemical, biotechnology, environmental and civil engineering

- indirectly social science and commerce environmental economics, management
- Models of multidisciplinary centres of specialisation/ excellence for various fields exist

#### SA Universities of Technology

- No purely waste management qualifications
- Have the most well-developed and seemingly standardised existing SWM learning programs:
  - In the Environmental Health Departments As part of
    - the National Diploma: Environmental Health and
    - B Tech: Environmental Health

#### Accommodating part-time learning

- Several models in SA to make post-graduate learning more accessible:
  - Short intensive courses (e.g. NWU-CEM)
  - Combinations of block contact sessions/modules of varying duration and frequency interspersed with assignments and research projects (e.g. UFS-CEM; UJ; RU)
  - Fully-fledged distance learning format (e.g. Unisa)
  - Telematics could also be considered.

#### Summary and Table: See Appendix 2 of audit report

Consolidated summary of findings for SA Universities

- List of 23 Universities
- Faculties; Colleges/Schools; Departments
- Courses with reference to waste and/or pollution
- Brief details and comments
- Participants were asked to verify or augment this information

#### **SAQA: National Qualifications Framework**

• There appear to be no waste management Unit Standards at Level 6 or higher on the SAQA NQF

- All of the qualifications in Environmental Practice at NQF levels 1 to 5 do contain waste-related Unit Standards
- These Unit Standards will be useful for occupationally based learning pathways in waste management and for feeding into tertiary level programs

#### Some international SWM initiatives

- Brief search on UK, Australia, New Zealand and USA.
- There are purely waste-focused qualifications as well broader environmental engineering, science, management and economics at tertiary level
- Possible to become a Professional Waste Manager
- Professional waste bodies play a significant role as sources of information and professional qualifications:
  - Chartered Institution of Wastes Management (CIWM)
  - Solid Waste Association of North America (SWANA) and
  - International Solid Waste Association (ISWA)

#### **Other initiatives**

- Technology Innovation Agency

   Innovation funder: Innovation Skills Development
- The DTI: Skills for the Economy Program
- Green Matters
- Community of Practice for Biodiversity
- WWF Environmental Leadership Program

   Mentorship
- Cambridge Sustainability Program used in SA

#### 2. WORKSHOP SESSION

#### 2.1 Workshop Goals and Objectives

Linda Godfrey recapped the objectives of the workshop:

- 1. Define the goal for the Waste R&D and Innovation Roadmap
- 2. Identify strategic objectives of the Roadmap

- 3. Ensure alignment with the national DEA waste R&D strategy
- 4. Identify funding opportunities and outline funding requirements to promote HCD in the waste sector
- 5. Identify implementation modalities, e.g. research programs, Research Chairs, studentships, internships, Centres of Excellence
  - a. Identify opportunities for the establishment of new research chairs that will support waste innovation
  - b. Modalities to build on academic systems already in place
  - c. Map out core and elective waste management modules required to achieve the programs objectives.

#### 2.2 Buzz session (Facilitator: Laurie Barwell)

**Recap of Waste RDI Roadmap Mission:** to reduce solid waste by 20% (industrial) and 60% of domestic by weight to dumpsite by 2022 (SMART principle-compliant). Six objectives in terms of this; we will be focusing on skills development objective.

We require a WM professional skills development program.

Three categories of stakeholder have already been identified as needing to be capacitated by this program:

- 1. Social
- 2. Technological
- 3. Business/Management/decision-making

Buzz Group question: Who are the other role players: are there any other categories of stakeholders missing?

#### Feedback:

- 1. Buzz team one Should separate business and management categories
- Buzz team two Business sector needs to include strong legislative element international approaches etc
- 3. Buzz team three Wanted to include a service provider category

- 4. Buzz team four Enforcement/judiciary, and education from elementary level
- Buzz team five Educators in WM, including supervisors for students; Legislators/policy

#### Summary of categories requiring waste skills development program

- 1. Social
- 2. Technological
- 3. Business
- 4. Management/decision-making
- 5. Education environmental/waste educators
- 6. Legislators/Policymakers/Strategic planners
- 7. Service providers e.g. Pikitup [ this category was not agreed by all]

Ms Thandeka Mandigora confirmed how important it is to empower educators to pass on WM skills from lowest level. DEA is engaging Department of Basic Ed to check how much content in their syllabi concerns waste.

#### Focus areas for HCD delivery should now be:

- 1. Work-ready graduates must be produced postgraduate specialisation
- Existing practitioners need to be up-skilled and kept at cutting edge of the WM field
- 3. Train the trainer waste educators needed at all levels, and including supervisors of postgrad studies, those implementing induction courses

Are there any other stakeholders that we need to recognise in a professional skills development programs?

Comment: Cape Town City Council had a suite of booklets on sustainable living, including one on waste. Each member of staff received one, plus another for passing on to neighbours to increase public awareness.

Ravi Vadapalli: Regarding the focus being only on NQF level 6 and higher, he thought that those competencies should start at undergraduate level - not only at postgraduate level.

Suzan Oelofse: Induction/orientation into the specific sector should be provided as for DWAF (see her inputs under 2.3 below).

Presha Ramsurup: Asked whether there will be a discussion around what factors will enable or constrain the RDI in the sector, e.g. those on the side like SETAs. LB said that these would be considered later in the day.

#### 2.3 Informal Inputs from Participants on HCD Modalities

The waste RDI Roadmap must create an enabling environment by means of modalities that support and implement waste professional skills development.

Informal presentations: Participants were asked to share examples from their experience or knowledge that could be considered in the development of a program?

Time allowed: maximum of 10 min per person. It was open to anyone from the floor to share.

#### **Rhodes University: Ms Presha Ramsurup**

There were two ideas that were relevant:-

 Exploring Learning Pathways – Rhodes led the development of DEA's ESSP (Environmental Sector Skills Plan). A research program was set up on environmental sector learning pathways, funded by SAQA. Over the years the environmental sector has been developing skills programs and initiatives but they were found to be sitting outside of SAQA-SETA skills development structures and therefore could not gain recognition or access funding. The research program is exploring the interface between how individuals are moving along a learning pathway and the formal structures they engage with. These learning pathways need to be on the NQF and aligned to qualifications that support trajectories in environmental sector. The skills development aspects are also important: workplace skills plans must align with the OFOs – Organising Frameworks for Occupations – to be able to draw SETA funding – it is important to define the job descriptions and occupations according to the OFO codes for this funding to be accessed directly. The research is examining how environmental occupations can be described by OFOs, how to link to official occupation titles and to identify the gaps. Historically line budget money was being used for environmental skilling because occupations were not defined in terms of OFOs to qualify to obtain SETA funding.

There is an HRD network of HRD managers in key environmental organisations. There is no specific waste person represented in this network, however. This network supports HR managers to do their workplace skills planning for environmental occupations in terms of OFO definitions. It meets 4 times per year for 2 - 3 days with participating organisations funding their managers themselves. It is also evident that HRD managers don't understand environmental skills yet either.

- Laurie Barwell: Commented that there were ring-fenced research chairs number 9 on theme D how to facilitate skills transfer.
- 2. The second idea emanating from ESSP research was that there is a Teacher Development Network of key organisations like WESSA and Delta Environmental Centre, supported by DEA. There were 14 participating educational institutions, the ETDP SETA, DEA, DOE, and the professional body for teachers, South African Council for Educators (SACE, a statutory body that aims to enhance the status of the teaching profession and to promote the development of educators and their professional conduct)<sup>16</sup>. This was already running teacher development programs for climate change and biodiversity waste could possibly be another.

<sup>&</sup>lt;sup>16</sup> <u>http://www.sace.org.za/jit\_default\_39.SACE\_Structures.html</u>

#### **DEA: Ms Thandeka Mandigora**

The DEA HCD unit has the biggest budget item. How does the Department fund existing initiatives for up-skilling? PDPs – Professional Development Plans are done for staff to progress to a higher level of management. In most cases people don't go to courses – they are allowed to go on one course per year which is usually funded through a line function budget. The DEA HR Training and Development unit need both introductory as well as more advanced environmental management and waste management courses for staff that move into these functions within the workplace. There are only a few institutions that can respond to the DEA's training needs.

#### NWU – Centre for Environmental Management (CEM): Dr Claudine Roos

CEM at the Faculty of Natural Science at Potchefstroom campus. CEM is not present on the Mafikeng and Vaal campuses of NWU.

The Centre is not focused on research, only on skills development and training It runs Short courses. There are two that are Waste Management courses:

- 1. Legislation
- Integrated Waste Management in South Africa cradle to cradle processes. NQF level 5 – 7 for people with some tertiary education and/or work experience

Courses are pitched at introductory, awareness level (1 day), introductory (2-3 days), and advanced (4 - 5 days).

- Postgraduate Masters and LLM environmental law. CEM is in the process of registering as a training provider for National Certificate in Environmental Management. This will take at least 18 months to go through registration process.
- Internship/Mentorship program for postgraduate students.
   CEM also has a 2 year intern program Interns go on courses, develop skills, get involved in waste consulting projects and so gain hands on, mentored experience e.g. on delisting processes.

#### How many people does CEM train?

Short courses are run almost every week – 1000s of people have been trained Internships: There are 4 interns per year, each on a two-year cycle.

Where are students drawn from? – they are from different sectors – industry, mines, municipalities, government.

CEM does not offer internet-based training.

Lecturers are sourced from experts in the field, not only their own academic staff.

#### UJ: Ms Thea Schoeman

UJ cannot offer degree courses if they are not sustainable. They have to turn away postgraduate students because they don't have capacity. She proposes a generic undergraduate degree (universities do not specialise at undergraduate level in SA as a general rule). Once students complete the generic undergraduate course, BSc, they begin specialising in their honours year, and students go to the institution where the specialisation is offered – e.g marine biology at UCT.

Comment: if there is to be a waste management honours, it must be multidisciplinary. She strongly advises environmental management as the undergraduate degree. Allocate to certain universities certain fields of specialisation. Push for waste research chair at one institution only. Institutions cannot sustain highly specialised degree, such as waste management, if there is not a big enough demand. UJ needs it to be multidisciplinary over different faculties – need science, commerce and social elements for waste management.

#### **TUT: Jannie Maree**

Jannie Maree – TUT – He is in the science department but they also attract students from chemical engineering and chemistry and also support students from UP – for example Japie Schoeman – membrane technology Jonathan Okonkwo – Water, environment and earth Postgraduate studies – Jannie Maree supplied an article/document Focus on treatment and utilisation of sulphur, acid mine water, gypsum, brine treatment, gas wastes, chemical desalination, recycling/scrubbing of gases. There is a consortium of organisations working together. They have THRIP funding.

#### **CPUT: Daniel Ikhu-Omuregbe**

Research: Chemical Engineering Department, working on solid waste conversion to energy – research on energy from landfills Refuse Derived Fuel – compaction of solid waste to fuel material Looking at technical analysis of producing hydrogen from waste

- Desalination
- Waste water treatment

The system is not set up at postgraduate level to have a program for waste – they are working on a curriculum for technicians and technologists.

Solid waste area – there is a vacuum, a need in this area.

#### **CSIR: Suzan Oelofse**

The up-skilling program in the Water Quality Management section of Department of Water Affairs and Forestry in 2002 was very effective as an induction program for new employees.

Typically people were appointed without practical knowledge of water quality management and could come in with science, engineering or BA Geography qualifications (analogous to the situation in the waste sector). She underwent an intensive 3 week induction and advanced water quality training program at the Roodeplaat training centre. The venue was out of office and the course was presented by internal DWAF staff. Weeks were not consecutive.

Week 1 of training: Basic chemistry, basic geography, basic ecology, how to do site inspections

Visited all sites that Water Affairs would regulate and learned how to do an inspection, what to look for. Exam at end of first week – 60% minimum was required to pass into the  $2^{nd}$  week

Week 2 of training: offered by UP in collaboration with Mr At Pretorius – Engineering Department. Learned about effluent streams, different industries and their impacts, available technology and management options (in detail), identification of problems on site, limitations of the technologies.

Exam at end of 2<sup>nd</sup> week: If you didn't pass you had to redo the exam and pass before you were allowed to move onto the next module.

Week 3 of training: At UP, covered governance issues – legislation, regulations, policies, interpretation, translation of these into license conditions, evaluation of licence applications.

An exam was written to complete the course.

If an official was appointed at head office, they also had to spend 3 months shadowing an official in a regional office – like induction – giving them practical experience in dealing with clients on the ground

The course was very useful and comprehensive.

#### CSIR: Ravi Vadapalli

Pollution & Waste Group

Focus on chemical treatment of acid mine drainage and brine treatment, physical and biological treatments. Collaboration with other academics. Co-supervising Masters and PhD students System at CSIR allows their staff to undertake teaching at universities.

#### UCT: Rethabile Melamu

Chemical Engineering department

Mainly postgraduate – research in biological treatment of organic waste Postgraduates being supervised

Different implementation: Active research: do projects at demonstration level. Students are trained to run projects and operate plant and equipment – e.g biodigesters. Global Change funding has been secured for this.

#### 2.4 Breakaway Groups: HCD Modalities

Breakaway groups task: Design the ideal waste management skills development program that includes methodology and implementation instruments, including funding, to develop capacity and be sustainable

It should include the following aspects for HCD:

- The ability to create an environment to enable the success of waste management skills development program, in context with the mission of waste reduction, and in terms of producing people with the necessary skills.
- Three facets of learning were to be addressed: Post graduate; up-skilling; and train the trainer
- Core Skills and Specialisation/Elective Skills
- An indication of where funding will come from. Innovative mechanisms?
- Key elements: Social, technological, business, management/decision support, education and awareness, and policy/legal.

#### Group 1: Roadmap

Graduates from diverse backgrounds take an Advanced Certificate in Waste Management with a strong practical training component in the workplace. The aim of this course would be to enable workplace readiness in a WM environment. Certified students can go into the workplace in an operational management position or proceed to further postgraduate research at masters or PhD level. A Centre of Excellence could fulfil the role of a knowledge hub and research coordinator.

The institution offering this course would have to make a formal link with maybe five workplaces where occupational learning can take place – this would make a stronger proposal for Jobs Fund.

To attract students, there would be an interest/requirement for municipalities and industries to employ the services of competent person in WM and they come and interview students for employment. Jobs fund: There is an issue with Post Graduates where their learning has been purely theoretical – need for workplace readiness

Design with aim for readiness for the workplace – collaboration between workplaces and a tertiary institution

Driver is needed to drive the demand for waste professionals in the workplace – needs to be a legally mandated person – certificate of competence required to do a job e.g. buyback centre manager etc.

Multiplier must happen somewhere in terms of HCD/training trainers – need a pool of trainers and mentors.

Demand must be industry-driven. There is a need for a professional body i.e. IWMSA to maintain standards and professional up-skilling.



Claudine: CEM working with IWMSA to establish a certification body to standardise certification protocol. There is a pattern in the report for this – UK has done it through the CIWM.

#### Group 2: Roadmap

Distinction is made between Postgraduate and Certificate students – postgraduate requirements exclude many prospective learners.

Centre of Excellence and Research Chair – can be an industry waste chair put out to tender.

Centralised National Program Coordinator is needed to advise potential students which department to go to.

NWU modules Towards advanced certificates Multidisciplinary and multi-institutional – can draw in experts.



#### Group 3: Roadmap

- Honours professional waste management degree
- Multi degrees as entry, with core waste management module and then electives in social, engineering, business, education, policy.
- Full-time honours degree (core + elective) or part-time courses (block weeks) (core + elective)
- Internship is imperative for workplace ready graduates two options (i) making use of existing government placement and funding programs (DST and DEA), after finalisation of honours, or (ii) as part of honours the second year is placement to industry/waste companies. Both will require relationships with the waste sector.
- Funding full time honours (NRF, government and industry bursaries), upskilling courses (job fund, DTI, SAQA, skills levy)

LB: example of UFS Disaster Management Masters – 100 students per year graduated, job-ready, 80% are South African; 80% are part-time students with employer funds

Question over whether a Program (e.g. Global change large research program) vs Chair vs Centre of Excellence Hub-spoke centre – e.g. funding from Industry Program – self-defined

Part - time Full-time redits Social EnglTech. BA/BSS BEn /BSc 3. Bus/Manag Blom 4. Education 5. Policy/Irgal BEd Polse / BAdmin Shar corseha Han e.g. MEETI (Mining Source) Elective (ore D Intenship (i) post (use acisting DST/DEA mach) Rogramme (ii) part (univ) texam 'exists

#### **REFLECTION ON SUGGESTED HCD MODALITIES**

Points raised by the groups that were supported, included:

- Bridging Honours or Postgraduate Advanced Certificate: 1 year honours and second year workplace internship; cross-disciplinary portfolio approach
- Centre of Excellence model, together with an Industry Chair knowledge hub/community of practice, coordination of waste related research, one-stop WM shop program coordinator would be needed
- Need strong linkages with the workplace in terms of placement, funding/bursaries and up-skilling
- How does the exercise link up with the mission to reduce waste? We need a balance between sufficient workplace multiplier and the research skills not to miss the mission to reduce waste
- Certificate program should be offered as well as post-graduate degrees to allow access to more people than only those with 65% average, and recognition of prior learning to be considered as well.
- Build in links to legislative processes as the driver e.g. enforcing accreditation or qualification requirements for waste management officers will sustain the initiative creates the demand.
- Important to establish a professional body that waste professionals are accredited with – legal requirement
- IWMSA's possible role in quality assurance for waste management, including training aspects, should be supported. IWMSA could explore registration as a professional body with SAQA<sup>17</sup>, or industry skills development institute with DHET.
- Mix of advanced certificate and honours model appears feasible
- Centre of excellence and industry chair would accommodate the identified need for occupational workplace learning as well as knowledge and practical learning at an institution.
- The program needs core modules and specialisation/elective modules

- Idea of a professional body is very helpful in driving standardisation and enforceability clarify whether the Waste Act can be interpreted to mandate this legal requirement
- Different types of universities within the system so may have different programs to support a professional waste management program (honours or certificate)

#### 3. CONCLUSIONS

#### 3.1 Conclusions from HCD audit (June Lombard)

- 1. There are no diplomas or degrees purely in waste management at a tertiary level in South Africa
- 2. WM modules in SA universities are typically part of environmental studies, biotechnology or engineering, whether chemical, civil, mechanical or environmental engineering
- 3. Growing research interest in new waste technologies that economically beneficiate waste; sustainable management of resources and energy; and the socio-economic aspects of managing waste, particularly at community level
- 4. Need for additional engineering, technical and biotechnical skills around waste innovation chemical, mechanical engineering, and laboratory facilities with technicians
- 5. Skills required for innovation are not only technical need for environmental economics, business skills and "closing the loop" in managing materials and resources
- 6. Need to structure postgraduate learning to accommodate part time study
- 7. Need for mentorship and practical experience to bridge the gap between the highly theoretical learning and the occupational experience in the workplace
- 8. Need for leadership in the public sector is imperative to implement policy that drives research, new products, processes and markets i.e the green economy capacity development of decision-makers
- 9. Need to professionalise waste management establish recognised learning pathways and qualifications/certification
- 10. But the biggest need identified by participants of this process is funding.

<sup>&</sup>lt;sup>17</sup> RSA National Qualifications Framework Act. 17 February 2009 GG No. 31909 GN 167 – Act No. 67 of 2008

#### 3.2 Conclusions from this Workshop

- 1. Bridging immediate program e.g. postgraduate advanced certificate
- 2. Centre of excellence and research chair models recommended
- 3. Links with the workplace must be structured
- 4. Structure can allow funding to be made available e.g. OFOs etc
- 5. Some kind of hub/community of practice
- 6. Driver needs to involve legal requirement industry will have to follow suit

#### 3.3 Have we achieved our Workshop Objectives?

#### 2<sup>ND</sup> HCD WORKSHOP – AUGUST 2012

Second Workshop (August 2012) objectives		Achieved	
1.	Define the goal for the Waste R&D and Innovation Roadmap	Need for a professional WM qualification to address <u>three</u> aspects – to produce full time workplace-ready graduates; to up-skill waste professionals already in the workplace; to produce waste educators to ensure learning at all levels , including supervision of postgraduate students and induction programs	
2.	Identify strategic objectives of the Roadmap	Workshopped with delegates as the Program Goal	
3.	Ensure alignment with the national DEA waste R&D strategy	DEA presentation was given as background to the workshop and incorporated into reports	
4.	Identify funding opportunities and outline funding requirements to promote HCD in the waste sector	Workshopped with delegates – part of exercise to identify modalities was what would be needed to access funding from different sources. HCD audit provided some sources of funding	

Se	cond Workshop (August 2012) objectives	Achieved
5.	Identify implementation modalities, e.g. research programs, Research Chairs, studentships, internships, Centres of Excellence	HCD audit provided examples of different modalities. Workshopped with delegates –exercise to identify modalities
6.	Identify opportunities for the establishment of new research chairs that will support waste innovation	Participants gave examples of successful HCD programs in their experience
7.	Modalities to build on academic systems already in place	HCD audit provided examples of different modalities Workshopped with delegates – exercise to identify modalities
8.	(Map out core and elective waste management modules required to achieve the programs objectives)	Begun in first workshop and then again as part of modalities proposed by second workshop breakaway groups

#### 4. Closure

Dr Godfrey concluded by saying that once the Phase 1 tasks have been completed, all of these inputs will be fed into Phase 2 during which the Waste RDI Roadmap will be developed.

Dr Roman thanked everyone for attending and said he was encouraged by achieving the workshop objectives, the close working relationship with DEA and the convergence of thinking around a Centre of Excellence which DST will be able to take forward to stimulate the knowledge economy and the waste sector.

#### DST Presentation – Dr Henry Roman



DST Vision and Mission
• Vision
<ul> <li>To create a prosperous society that derives enduring and equitable benefits from science and technology.</li> </ul>
Mission
<ul> <li>To develop, coordinate and manage a National System of Innovation (NSI) that will bring about</li> </ul>
maximum human capital sustainable economic





















#### DEA Presentation – Ms Mapula Tshangela















	IRONMENT SECTOR EVIDENCE NEED	S (RESE	ARCH PRI	OR	RITIES)
ENVIRONMENT SECTOR PLAN	VURONMENT OUTCOME 10 ENVIRONMENT OUTLOG				
		(Sneen Light)	(Yelow Light)		[Pert Light]
Waste and Chemicals Management	Output 3: Sustainable environmental management: Less waste that is better managed • % of households with basic waste collection • % of permitted landfill sites • Number of waste licenses processed • %waste diverted/reclaimed from landfills for reuse, recycling and recovery			•	Many was sites do n have t required licenses Recycling Sustainable consumption and production

# Policy priorities and key activities 3.3.1 % of households with basic waste collection Activity: Establish reporting mechanism for refuse removal by municipalities Report on refuse removal in municipalities Municipalities: Reports on refuse removal Activity: Stablish reporting mechanism for refuse removal Activity: Assist municipalities with the development of IWM P's Municipalities: Reports on refuse removal Activity: Develop tariff setting guidelines for municipalities Activity: Develop Action plan for licensing unicensed landfill sites 3.3.3. Number of waste licenses processed Activity: Process 95% of licence applications 3.3.4. %waste diverted/reclaimed from landfills for reuse, recycling and recovery Activity: Establish baseline for the 3 R's, Targets for the 3 R's set, Development Industry Waste Management Plans, Measurable increase in targets of waste diverted/reclaimed from landfills for reuse, recycling and recovery







## APPENDIX 3: NOTES FROM FOLLOW-UP DISCUSSION ON SKILLS DEVELOPMENT MODALITIES

A focus group discussion on the modalities and funding mechanisms for skills development was following the workshop, on 30 August 2012 at Delta Environmental Centre, Johannesburg<sup>18.</sup> The modalities that had been proposed at the second Stakeholder Workshop were explored further to formulate an integrated approach to HCD that could be put forward for the waste RDI roadmap. The notes from the discussion are included here.

The Environmental Skills Sector Plan (ESSP) SETA Enabling Document (DEA et al 2010) had been formulated by DEA and the National Environmental Skills Planning Forum (NESPF) to facilitate discussion with Sector Education and Training Authorities (SETAs) during the SETA Sector Skills Planning (SSP) process, and to support the inclusion of the environmental driver across all SETAs. Although it is not prescriptive, DHET (which approves all Sector Skills Plans), now requires DEA to sign off on all SSPs that environmental aspects have been adequately addressed, using this enabling document as a guide. It was noted that we are not looking at developing a waste sector skills strategy, but we do need to point out how this DST program talks to the broader waste sector.

The outcomes and recommendations of the discussion were as follows:

- The learning program should take the form of an Honours degree (for more academic, research-oriented waste professionals) and/or a Postgraduate Diploma (for more workplace-oriented waste professionals). Entry level requirements should allow access to learners from diverse backgrounds. A coursework Honours should have core modules in waste management and specialization/elective modules according to chosen sub-field.
- PDE<sup>19</sup> requirement for engineers would still apply perhaps there could be an equivalent in the waste management Postgraduate Diploma.
- It was important to recognise that the HCD aspects form only part of a suite of mechanisms available for RDI in waste management.
- There is a need to accommodate up-skilling of waste management officers already in the field by putting in place the requirement for their continuing professional development.
- The IWMSA could have a role to play as an accreditation and quality assurance body, in a similar role to that played by the Engineering Council of South Africa (ECSA) or Consulting Engineers South Africa (CESA). A dedicated session had been scheduled by IWMSA at WasteCon 2012<sup>20</sup> to engage with this issue. Research on certification of waste management practitioners has been done in conjunction with the Centre for Environmental Management at North West University, and during this session, the report-back would be given and linked with legislative options (CEM 2012).
- A 'place-marker' should be created for the involvement of IWMSA in the outcomes of this HCD Sub-task to contextualize the accreditation aspect in the waste RDI roadmap. The way that the CIWM<sup>21</sup> has been structured in UK provides an example of an accreditation model that has been successful and South Africa would do well to consider its modalities. WAMITAB<sup>22</sup>, the UK's Waste Management Industry Training and

<sup>&</sup>lt;sup>18</sup> Present: Dr H Roman (CSIR), Dr L Godfrey (CSIR), Ms P Ramsurup (Rhodes University), Ms J Lombard (Icando), Ms R K Lombard (Icando)

<sup>19</sup> 

http://www.eng.sun.ac.za/portal/page/portal/Engineering/Engineering\_Home/Programs/PostGradPrograms/Postgraduate %20Diploma%20in%20Engineering%20(PDE)

The PDE (minimum 120 credits) is aimed at students with a BSc or Technikon background, or students who have a Bachelor's degree in a discipline other than the one they want to pursue on a postgraduate level. It can also be followed by Engineering graduates. This one year program is offered in the fields of Chemical Engineering, Civil Engineering, Electrical Engineering, Electronic Engineering, Industrial Engineering, Mineral Engineering. The aims of the PDE are to prepare students for further postgraduate studies in Engineering or to enable them to convert to a Master's program.

www.wastecon.co.za/

<sup>&</sup>lt;sup>21</sup> www.ciwm.co.uk/

<sup>22</sup> www.wamitab.org.uk/

Advisory Board is the vocational training body that addresses the need for professional development and research aspects.

- It would be wise to keep separate the issue of accreditation/ professionalizing the waste industry from the skills development modalities so that delays in terms of one aspect do not affect the other.
- There is a need to define waste-related occupations in terms of the standard definitions of the Organising Framework for Occupations (OFO)<sup>23</sup> to make SETA funding and monitoring of skills development possible. This would involve a process of mapping waste-related jobs against the OFO definitions and would identify the gaps if important waste occupations are not represented in the OFOs. These could then be aligned accordingly.
- The establishment of a waste management PIVOTAL program should be explored. In its National Skills Development Strategy, NSDS III, DHET plans to promote the notion of grant-funded PIVOTAL programs, namely Professional, Vocational and Technical, as well as Academic Learning Programs which embrace both an institutional as well as a workplace/community dimension, such as professional engineers and artisans (DHET 2011).

Two further meetings will be necessary to clarify legal aspects and funding aspects:

#### Meeting on legalities: DST to meet with DEA.

(DEA: Mapula Tshangela & Thomas Mathiba (HCD))

The key questions that would need addressing would be as follows:

- Will DST have the mandate to drive skills development for waste management to make it enforceable? DEA would need to generate a supporting regulation.
- In terms of the suggestion to drive the process of formalizing waste management accreditation, are there currently officer positions in other fields (e.g. in Air Quality management) where certain qualifications are stipulated legally for practitioners?
- A discussion with DEA regarding procedural requirements for registering an accreditation body would be required.
- Henry Roman undertook to write these questions into the agenda for the regular bilateral DEA/DST meeting – chaired by the Directors General, which would create awareness with prominent actors and hopefully help drive change.

#### Meeting on funding aspects: DST to meet with NRF

(NRF: Anthipi Pouris)

The key questions that would need to be addressed by the NRF were as follows:

- What are the funding drivers?
- What will be fundable?

<sup>&</sup>lt;sup>23</sup> The Organising Framework for Occupations (OFO) is a skills-based, coded classification system that captures all jobs in the form of occupations.