A National Waste Research, Development (R&D) and Innovation Roadmap for South Africa: Phase 1 Status Quo Assessment

Skills for an Innovative Waste Sector: HCD Workshop Report (11-12 July 2012)

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DST/CSIR Waste R&D and Innovation Roadmap, Phase 1, Output 1.1

Cover photographs courtesy of Linda Godfrey (CSIR)

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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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1. BACKGROUND AND CONTEXT TO THE WORKSHOP

This report presents a summary of the process followed and the findings of the National Waste Human Capital Development (HCD) Workshop, held in Pretoria from the 11-12 July 2012. It is the first of two workshops which will complement a simultaneous audit of currently extant skills development programmes. This report forms deliverable Output 1.1 of the work scheduled for the waste HCD strategy as part of the development of a national Waste Research, Development (R&D) and Innovation Roadmap.

1.1 Global Change Grand Challenge

The Department of Science and Technology's (DST) mission is 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 (DST, 2011a). To this effect, the DST is engaged in fostering innovation, job creation and enterprise development within the South African waste sector, through the establishment of a 10-year national Waste R&D and Innovation Roadmap.

The Waste R&D and Innovation Roadmap, the reason for this workshop, emanates in response to the Global Change Grand Challenge (GCGC) initiative, the aim of which is to develop the Green Economy in South Africa in response to the challenges of anthropogenic climate change. See the Figure 1 below, explaining how the Global Change Grand Challenge fits into the DST's strategic focus areas.

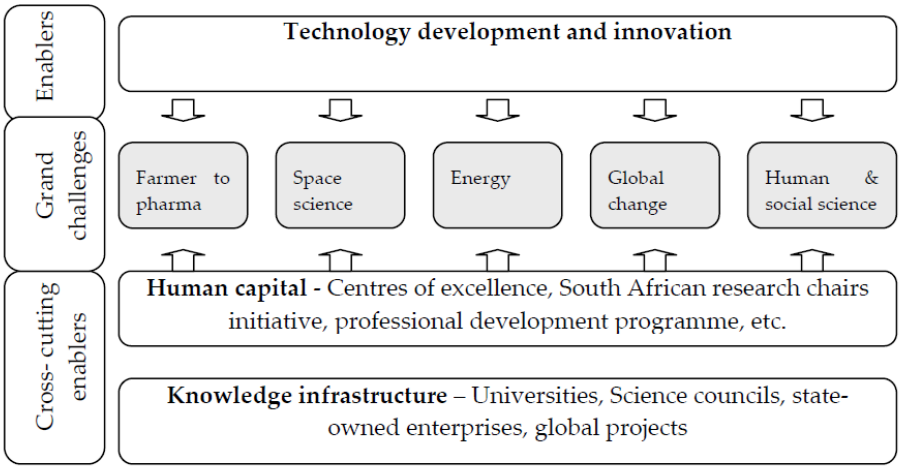

Figure 1. Grand challenges and enablers of the 10-year plan

Government is looking at how best to support innovative solutions-driven projects, by identifying current and required human capital development (HCD) programmes that will support a national Waste R&D and Innovation Roadmap. This project therefore involves looking into ways to ensure that systems are in place for sustainable HCD.

There is much that has already been done as part of the GCGC to map out HCD requirements for the environmental sector (DST, 2011b), which has been drawn upon, as a starting point, to identify gaps in waste HCD. With the GCGC as the umbrella programme, the Waste R&D and Innovation Roadmap

addresses most of the major cross-cutting GCGC knowledge challenges, but particularly research themes B1, B4 and D4[1] (DST, 2011b; DST, 2012).

1.2 National Waste R&D and Innovation Roadmap

The Waste R&D and Innovation Roadmap consists of three phases, the first of the phases (2012) consisting of two prongs, one on HCD and the required skills in relation to a Waste Innovation Programme (Sub-task 1), and the other on enterprise/innovation opportunities and constraints (Sub-task 2). In Phase 2 (2012/13), a Waste R&D and Innovation Roadmap will be formulated, while Phase 3 involves implementation of this 10-year Roadmap.

This report focuses only on the objective of the Phase 1 HCD component, which is to identify current and required HCD programmes that will support a national Waste R&D and Innovation roadmap.

Sub-task 1: Human capital development

In order to assess the current and required HCD programmes that will support a national Waste R&D and Innovation roadmap, the following activities are envisaged –

- HCD scoping workshop
- Waste training audit
- National workshop(s)

2. WORKSHOP PROCEEDINGS

The invitation to this workshop was circulated widely amongst the waste industry (via the Institute of Waste Management's mailing list), environmental practitioners (via the International Association of Impact Assessment's mailing list); relevant government departments and institutions at national, provincial and local level; parastatals; higher education institutions; key environmental and social development NGOs; and relevant participants of previous GCGC workshops. All those who indicated interest in the workshop and who were able to attend were accommodated. The delegate attendance list is provided as Appendix 1.

2.1 Day 1: 11 July 2012

Session 1: Overview of the project

Dr Linda Godfrey, Project Manager from the CSIR, opened the workshop and introduced the Project Leader, Dr Henry Roman, Director of Environmental Services and Technologies, DST. Dr Roman's opening remarks outlined the DST's vision and mission, and the programmes that motivated this study, the most relevant of which is the GCGC, as outlined in the preceding section.

[1] Knowledge Challenge B (Reducing the Human Footprint) – B1 Waste minimization methods and technologies; B4 Doing more with less; Knowledge Challenge D (Innovation for sustainability) – D4 Technological innovation for sustainable social-ecological systems (DST, 2011b)

Dr Godfrey outlined the background and context for the workshop and provided a brief overview of the process followed to date. She informed participants that an initial project scoping meeting[2] had interrogated the level at which the HCD skills programme for waste innovation would have most efficacy, and based on the pyramid model used in a similar, successful process in the biodiversity sector (SANBI, 2010), it was decided to pitch the waste HCD programme on the (old) NQF Level 6 (= new NQF level 8)[3] and higher on the South African Qualifications Authority (SAQA) National Qualifications Framework (at tertiary level qualifications). This did not, and should not, however, preclude discussions about HCD at other skills levels, which are very important in building skills within the sector, but would not be within the direct scope for intervention by this particular project, given the mechanisms available to DST.

The objectives for Day 1 of the workshop were to:

- Obtain an overview of the Vision for an Innovative Waste Sector in South Africa.
- Understand the current activities and approaches taken by stakeholders and role-players in terms of skills development in the context of the various components of the (solid) waste sector in South Africa.

This was to be achieved by means of information sharing between all parties present (formal presentations), as well as participatory small group sessions (facilitated by the workshop facilitator, Mr Laurie Barwell of the CSIR, who had also facilitated the GCGC workshops).

Session 2: Organisational Presentations

Session 2 provided an opportunity for participants to share their own and their organisational visions related to waste innovation, for example current activities, research, future objectives etc. in a brief 10 minute presentation. All workshop participants had been provided with a template for the presentation the week before, to streamline the sharing process. The template is attached as Appendix 2. The following individuals gave presentations:

NAME	ORGANISATION REPRESENTED
Ms Melanie Samson	Women in Informal Employment Globalizing & Organizing (WIEGO)
Ms Gail Smit	Institute of Waste Management Southern Africa (IWMSA)
Dr Suzan Oelofse	Council for Scientific and Industrial |Research (CSIR)
Ms Thea Schoeman	University of Johannesburg, Geography & Environmental Management
Ms Roelien du Plessis	University of South Africa (UNISA)
Prof Rinie Schenk	University of the Western Cape (UWC), Social Work
Ms Mpe-mpe Monyane	Department of Trade & Industry (DTI)
Ms Esme Gombault	EnviroServ
Dr Dhiraj Rama	Association of Cementitious Materials Producers (ACMP)
Mr Morne Kirstein	Delta Facilities Management
Dr Frazer Kadama	North West University (NWU) School of Management Sciences
Prof Jannie Maree	Tshwane University of Technology (TUT)

[2] The initial scoping meeting consisted of Dr Linda Godfrey (CSIR), Mr Laurie Barwell (CSIR & GCGC HCDS), Dr Eureta Rosenberg (GreenMatters & SANBI BHCDS), Ms June Lombard and Ms Rosemary Lombard (ICANDO Waste HCDS) to map out what had already been undertaken within the environmental HCD sector and would be relevant to the development of a waste HCD strategy.

[3] Equivalent to the recently proposed Higher Education Qualifications Framework (HEQF) level 8 or higher, i.e. tertiary level qualifications (RSA, 2011)

NAME	ORGANISATION REPRESENTED
Mr Nakampe Makoti	City of Tshwane Environmental Policy & Resource Management
Ms Thandeka Mandigora	Department of Environmental Affairs (DEA) Waste Research & Planning

Session 3: Group discussions

Mr Barwell led a discussion on the information shared so far and asked participants to prepare for Day 2 by reflecting on those aspects which they had found striking in terms of good ideas and also challenges and gaps in skills. The day concluded with a networking opportunity.

2.2 Day 2: 12 July 2012

The objectives for Day 2 of the workshop were to:

- Develop a consensus Mission Statement for an innovative (solid) waste sector in South Africa
- Define a key number of Strategic Objectives that underpin the Mission
- Define the key suite of capabilities (skills, facilities, technologies, standards, protocols etc.) required to realise the Strategic Objectives

Session 4: Recap of key issues

The introductory small group session focused on identifying key issues of Day 1. In the report-back discussion, the following gaps were highlighted as particularly salient to participants:

- People working with waste in the informal sector, for example waste pickers, were recognised to be a vital part of the value chain and should not be excluded from discussions about the waste economy or skills development programmes. While they could not be the focus of this HCD programme, the benefits of such a programme, if correctly designed, would be felt through the advocacy and facilitatory roles of decision-makers and researchers with tertiary qualifications.
- There is a pressing need for more waste management skills at local government level, for officials tasked with supervisory and managerial duties. In particular, the logic of the green economy, waste management hierarchy and concepts such as “full cost accounting”, “triple bottom line” and “closing the loop” needed to be more widely understood and implemented for new approaches to waste management to be successful, and for political will to improve.
- In the formal sector, lack of understanding of green economics is an obstacle to compliance and innovation at all points in the value chain.
- Markets for recycled goods were underdeveloped, which hampered waste beneficiation and recycling initiatives.
- Networking/communication among professionals and researchers was severely lacking, which hampered the dissemination of innovative ideas.
- Lack of coordination among government departments on waste-related activities led to unnecessary bureaucracy and duplication of effort, and also hampered industry’s ability to implement innovative solutions, for example, waste beneficiation and use of recovered materials as feedstock.
- Graduates from existing university courses lacked sufficient specialised skills and practical knowledge to be immediately functional in the waste industry.

- Accurate waste data on which to evaluate current situations and base projections was lacking across the board, which made integrated waste management planning, enforcement and implementation of adaptive measures difficult.

Dr Godfrey provided a summary of the key themes that emerged from the discussions on Day 1. These are summarised below and presented in Figure 2.

- Creating "waste workplace-ready" graduates
    - Need for 'occupational competency' that bridges from university to organisations – in particular the need for **developing waste management professionals** (practical waste skills, prior learning)

- Bridging research disciplines
    - As a multi-disciplinary subject, developing waste management professionals requires **bridging skills** across specialist domains (social/technical) (environmental/engineering)

- South Africa-appropriate innovation and skills
    - Develop and/or implement technologies and solutions **appropriate to South Africa**, recognising the differing capabilities and resources between e.g. the private and public sectors, and between urban and rural municipalities

- Network/community of practice
    - To **strengthen waste R&D**, and given the limited R&D investment in waste, there is a need to establish a research network for sharing of research outputs

- Who should be capacitated?
    - Legislation defines a number of new waste positions, e.g. designated waste management officers

- Need for accurate and reliable waste data

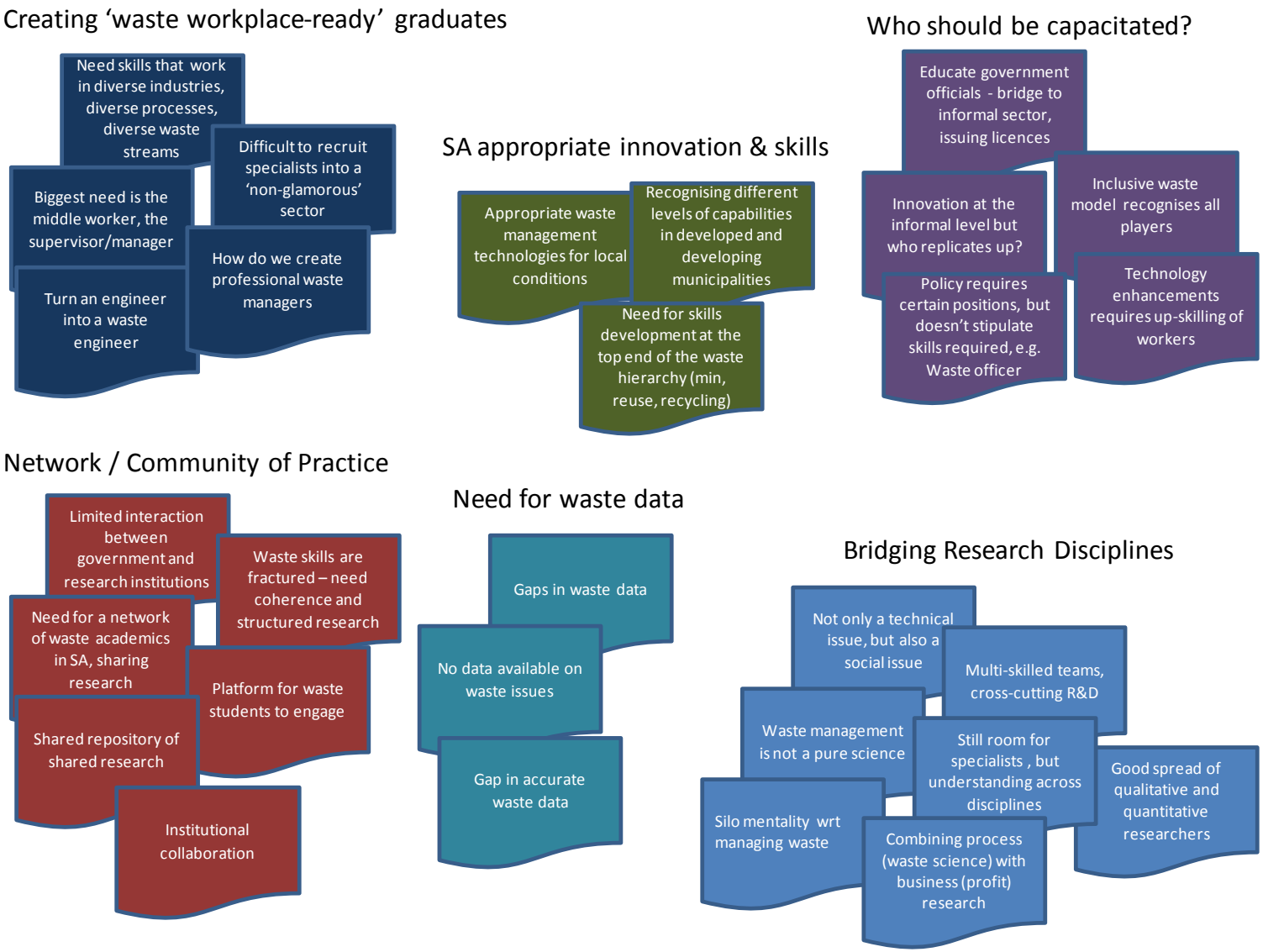

Figure 2: Summary of key themes from Day 1

Session 5: The goal of the programme

Following this discussion, Mr Barwell divided participants into three breakaway groups to formulate and debate a goal for the Waste R&D and Innovation Roadmap. He explained that this exercise was designed to get participants thinking strategically about where waste management is now, what it should look like in the future, and to begin to formulate a roadmap which considered facilities, skills, technologies (policies, procedures, standards etc.) in an enabling legislative environment. The diagram below was used to illustrate the context. The goal was to be SMART (Specific, Measurable, Achievable, Relevant, Time-based (by 2020)).

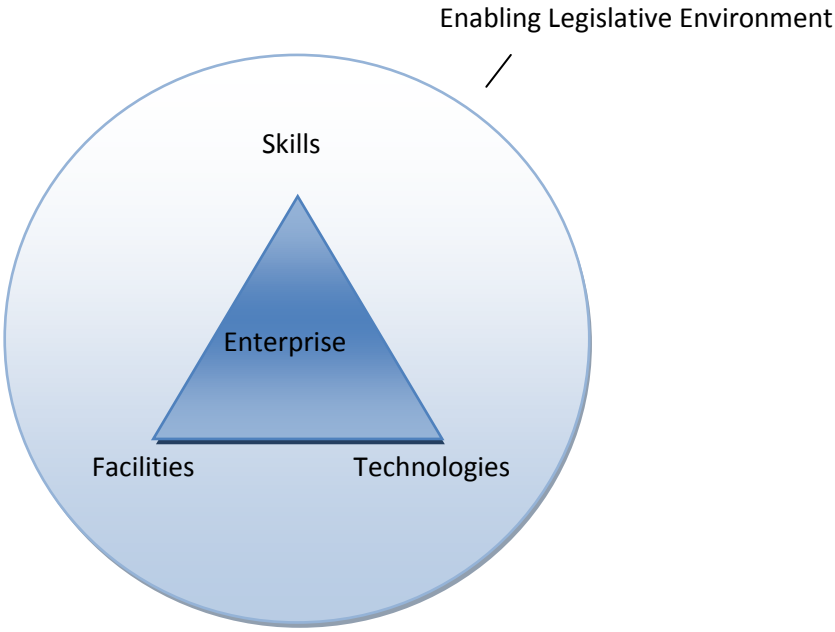

Figure 3. Contextual setting for discussion – the four requisites for successful enterprise

The following goal of a national Waste R&D and Innovation Roadmap was put forward by participants -

> "**The South African waste sector can achieve a 20% reduction (by weight) of industrial waste, and a 60% reduction (by weight) of domestic waste, to landfill by 2022**"

Possible obstacles and associated solutions to achieving this goal were workshopped with delegates. The detailed results of this exercise are presented in Appendix 3. From this participatory process, six broad themes of obstacles/solutions emerged (Appendix 4) -

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

These broad themes will need to be prioritised through the National Waste R&D and Innovation roadmap, for the goal of the programme to be realised. The DST will pursue these issues in partnership with other government departments, agencies and private organisations, in order to reduce the obstacles to waste innovation.

Session 6: Core and elective competencies

Of particular relevance to the HCD activity, and which will provide input to the second workshop to be held in August 2012 on HCD modalities, are the core and elective modules that a waste management qualification should contain. Groups were tasked with providing preliminary thoughts on core and elective modules that a tertiary waste qualification should include to develop workplace-ready waste management professionals.

Group 1:

Assumption:	The needs of Government, Industry, and Consultants were all considered
Core:	Physical science; environmental management; environmental law; public participation; business planning; risk management; financial management; communication
Elective:	Waste mass balance; landfill management; local language; ethics; alternate waste management technologies; entrepreneurial skills; quality management; environmental auditing.

Group 2:

Assumption:	Person who comes for this waste course/diploma will already have a degree (thinking mostly at municipal level).
Core	Environmental management and legislation; business management
Elective	Environmental economics and governance; policy and data analysis; data generation, capturing and processing; people management skills

Group 3:

Assumption:	Middle management with a tertiary degree to go into middle management in the waste sector (municipal or government)
Core:	Basic analysis (analytical, research, report writing skills); computer literacy (data capturing, online research); waste & environmental legislation (what is in legislation); project management; social sciences (people management & mentoring skills); natural sciences (geography, chemistry, physics and maths – develop analytical skills)
Electives	Practical (understanding life cycle of waste, municipal, operations, technical, site-visits); basic training (how to train people under you); introduction to business management

3. CONCLUSIONS AND WAY FORWARD

The HCD skills element which was the subject of this workshop must be seen as part of a larger suite of initiatives that the government is working on towards better waste management, both within the Department of Science and Technology and within other Departments. The DST's role within this broader arena specifically concerns the fostering of innovation and related skills development through mechanisms available to the Department. The possible instruments available include e.g. Centres of Excellence, Research Chairs, Studentships, Professional Development Programmes, and Research Investment, which are all focused on developing skills and strengthening research.

The overall conclusion of this workshop is that a waste management professional skills development programme (at university level) is required to (i) enable graduates of tertiary institutions to enter the waste industry well-versed and prepared to contribute effectively (public or private sector), and (ii) to up-skill persons already working within the waste sector.

The National Waste Management Strategy (NWMS) puts forward the goal of "*25% of recyclables diverted from landfill sites for re-use, recycling or recovery*" by 2016 (Goal 1 of 8). Stakeholders from the waste sector, at a workshop held at the CSIR on the 11-12 July 2012, agreed that to actively promote and encourage innovation, this DST Waste Innovation Programme needed to be more ambitious with regards to the programmes goals, and to push the waste sector beyond its comfort zone. Therefore, acknowledging the goals of the NWMS, the DST believes that "***the South African waste sector can achieve a 20% reduction (by weight) in industrial waste and a 60% reduction (by weight) of domestic waste, to landfill by 2022***"[4] through investment in science and technology and the establishment of a national waste innovation programme.

Such a Waste R&D and Innovation Roadmap will support government, universities, science councils, and other key institutions within the national system of innovation (NSI), to strategically deploy resources to maximize waste management R&D, technology development, enterprise creation and innovation.

A follow-up workshop will be conducted in August 2012. This second workshop will define a more specific goal now for the HCD programme, identify objectives of the HCD programme, decide on the most appropriate modalities for implementation, and formulate a suite of core and elective skills and the related learning modules necessary to bridge the gaps that were identified in the July 2012 workshop.

[4] 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.

4. REFERENCES

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SANBI (South African National Botanical Institute) (2010). A Human Capital Development Strategy for the Biodiversity Sector 2010 – 2030. Available from: *http://www.greenmatter.co.za* [last accessed 23 July 2012].

APPENDICES

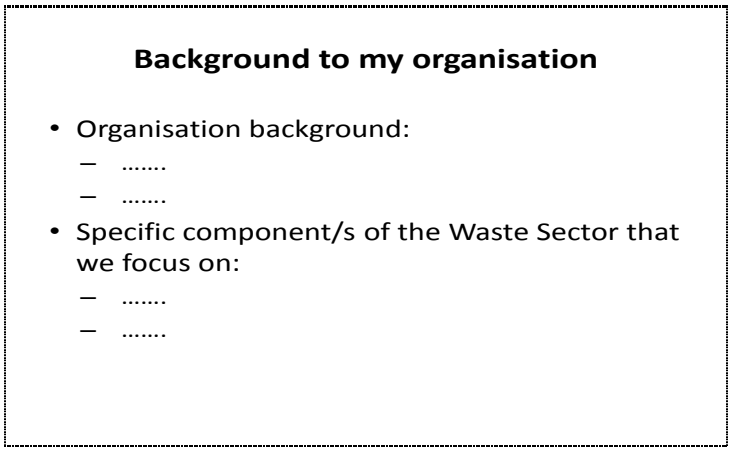
APPENDIX 1: Attendance Register, DST Waste Innovation HCD Workshop - 11-12 July 2012 - Knowledge Commons, CSIR, Pretoria

First Name	Surname	Title	Company/Organisation	Sector
Laurie	Barwell	Dr	Council for Scientific and Industrial Research	Academic, Research, Association
Nadia	Botha	Ms	Enviroserv	Business
Dumisani	Buthelezi	Mr	Department Science & Technology (DST)	National Government
Roelien	du Plessis	Ms	UNISA	Academic, Research, Association
Linda	Godfrey	Dr	Council for Scientific and Industrial Research	Academic, Research, Association
Esme	Gombault	Ms	Enviroserv	Business
Frazer	Kadama	Dr	North West University	Academic, Research, Association
Themba	Khumalo	Ms	DEA	Government
Morne	Kirstein	Mr	Delta Facilities Management	Business
June	Lombard	Ms	Icando	Academic, Research, Association
Rosemary	Lombard	Ms	Icando	Academic, Research, Association
Maxwell	Mapako	Ms	CSIR	Research Organisation
Nakampe	Makoti	Mr	City of Tshwane	Local Government
Thandeka	Mandigora	Ms	Department of Environmental Affairs	National Government
Jannie	Maree	Prof	Tshwane University of Technology	Academic, Research, Association
Mlawule	Mashego	Dr	CSIR MSM	Academic, Research, Association
Tshepo	Mathibela	Mr	DTI	National Government
Frank	Mazibuko	Mr	National Research Foundation	Academic, Research, Association
Sinethemba	Mtshali	Mr	DTI	National Government
Mpe-mpe	Monyane	Ms	DTI Green Industry, Chief Directorate	National Government
Dr Suzan	Oelofse	Dr	CSIR	Academic, Research, Association
Faith	Phooko	Ms	DEA	National Government
Prince	Radzuma	Mr	DEA	National Government
Dhiraj	Rama	Dr	Assn of Cementitious Material Producers	Academic, Research, Association
Henry	Roman	Dr	Department Science & Technology (DST)	National Government
Melanie	Samson	Ms	WIEGO	NGO/NPO
Rinie	Schenck	Prof	University of Western Cape	Academic, Research, Association
Thea	Schoeman	Ms	University of Johannesburg	Academic, Research, Association
Gail	Smit	Ms	Institute of Waste Management of Southern Africa	NGO/NPO
Chucheka	Tivani	Mr	DEA	National Government
Marba	Visagie	Dr	Individual	Business

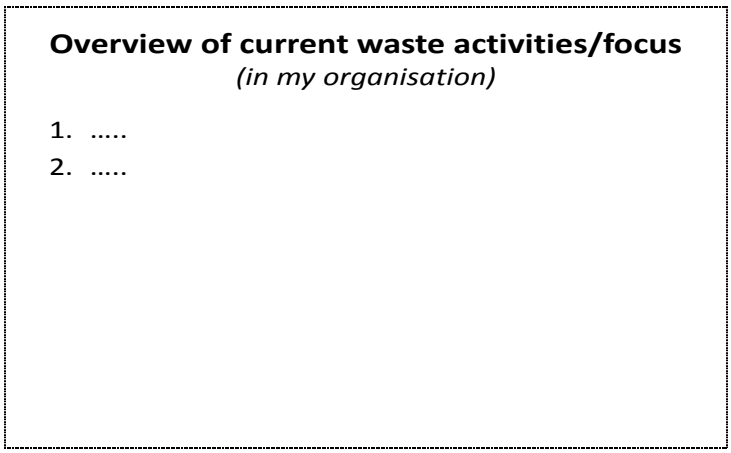
APPENDIX 2: Presentation template

Slide 1

Slide 2



Slide 3



Slide 4

Waste resources available/required
(in my organisation)

- Capabilities (waste skills and infrastructure):
  - Available: ……..
  - Required: ……..
- Capacity (number of staff):
  - Available: ……..
  - Required: ……..

Slide 5

Suggested knowledge gap

- What are the current gaps in waste knowledge
  - ……
- Associated research question
  - ……

Slide 6

If I had R1 million to invest in waste capabilities in the next year, I would:

…[Add]…….

- My priorities would be:
  1. …
  2. …
- For the following reason/s:
  - …

APPENDIX 3: Identified obstacles to achieving the goal, with possible solutions to overcome these obstacles

	Description of obstacle
1	Landfilling is cheap and easy
2	Weighing of waste is not being done
3	No enforcement of waste legislation
4	Insufficient support for innovation (ideas to market)
5	Inefficient industry production systems
6	Environmental monitoring and compliance auditing is poor
7	Lack of funding (or inefficient allocation of funding) for landfill, especially in municipalities
8	Little acceptance of cleaner production approaches
9	Perception that costs outweigh benefits of recycling
10	Too much effort
11	No adequate policy that supports recycling and promotes recycling markets
12	Lack of competence to produce IWM Plans that reduce waste to landfill in a financially viable way
13	The definition of waste is an obstacle
14	What benefit is there for industry to achieve these goals (lack of incentives)
15	Industry don't have a waste balance of what happens on site
16	Insecurity in supply change (waste as input) (hinder technology implementation)
17	Regulatory requirements along the chain

	Solution	
A	Full cost accounting for waste management is introduced (with move to including externalities)	1, 7, 9, 11, 15, 20, 23, 25, 26, 32
B	Legislation and Guidelines for landfills are enforced (e.g. weighbridges, monitoring/auditing, operation)	1, 2, 6, 19, 25, 29, 35, 38
C	Sector specific information is in place to support enforcement	3, 15, 19, 30, 38
D	EMIs are in place, appropriately trained and effectively enforcing legislation	3, 6, 35
E	Mechanisms in place to take ideas/research to market	4
F	(Dis)Incentives are in place to improve efficiency, waste minimisation and reuse/recycling	5, 8, 11, 14, 20, 22, 25
G	Benefit of good practice is understood (e.g. IWM, biogas, compost) (capacity)	7, 8, 9, 10, 15, 25, 26, 29, 30, 33, 34, 39
H	Skilled waste managers results in reduced wasteful expenditure (directed funding)	7
I	Training and capacity building to adopt IWM (with a strong practical element) is in place (with emphasis on minimisation, reuse, recycling)	8, 9, 10, 12, 18
J	Legislation that promotes the full waste hierarchy is enforced	10, 11
K	Identify immediate waste streams that can produce business opportunities (markets)	11, 19, 22
L	Recycled content targets (incl Gov procurement)	4, 11
M	Toolkits are available to support decision-makers in approval processes	12, 38
N	We have a resource based definition that supports waste reuse/recycling (beneficiation)	13, 16
O	Benefits of good waste management plans are realised	12, 15
P	Obstacles to waste reuse have been removed (waste as resource)	1, 9, 16, 17, 18, 26, 40
Q	A suite of available technologies are available in South	20

	Description of obstacle
18	Just too hard (lots of legislation from prohibiting passing waste along)
19	Quality of data is inadequate
20	Lack of alternatives to landfilling
21	Lack of proper communication between stakeholders (gov-gov and gov-comm)
22	Business is only profit focused
23	Lack of funding for waste management at municipal level
24	Lack of capacity at municipal level, especially at management level
25	Waste is not separated at source
26	Not enough composting
27	Lack of understanding and caring amongst community
28	Lack of facilities for recyclables
29	No commitment by municipalities to make a change
30	Lack of integration of waste plans into the Green Economy
31	Inefficient transport systems for waste/recyclable collection
32	High transport cost
33	Political will to change waste management practices
34	Change in municipal plans by new gov officials
35	Co-operative governance challenges
36	No benchmarking of waste practices between municipalities
37	No transparency in recycling initiatives by community
38	Lack of by-laws to force waste separation at source
39	Strong labour issues in municipal waste sector
40	Constraining legislation to long-term capital investment

	Solution	
	Africa	
R	Effective communication and sharing of information	21, 36, 37
S	Availability of skilled waste management professionals within the sector	12, 18, 24
T	General public is informed (and supportive) of the benefits of waste minimisation, reuse and recycling	27
U	Necessary infrastructure is in place to support IWM, appropriate for SA conditions	20, 26, 28
V	Efficient and effective transport systems (alternative collection mechanisms)	31, 32
W		
X		

APPENDIX 4: Summary of possible solutions to overcoming obstacles to integrated waste management in South Africa

Financial

- Full cost accounting for waste management is introduced (with move to including externalities)
- (Dis)Incentives are in place to improve efficiency, waste minimisation and reuse/recycling

Legislation

- Legislation and Guidelines for landfills are enforced (e.g. weighbridges, monitoring/auditing, operation)
- EMIs are in place, appropriately trained and effectively enforcing legislation
- Legislation that promotes the full waste hierarchy is enforced
- We have a resource based definition that supports waste reuse/recycling (beneficiation)

Institutional

- Mechanisms in place to take ideas/research to market
- Identify immediate waste streams that can produce business opportunities (markets)
- Recycled content targets (incl Gov procurement)
- Benefits of good waste management plans are realised
- Obstacles to waste reuse have been removed (waste as resource)

Infrastructural

- A suite of available technologies are available in South Africa
- Necessary infrastructure is in place to support IWM, appropriate for SA conditions
- Efficient and effective transport systems (alternative collection mechanisms)

HCD

- EMIs are in place, appropriately trained and effectively enforcing legislation
- Benefit of good practice is understood (e.g. IWM, biogas, compost) (capacity)
- Skilled waste managers results in reduced wasteful expenditure (directed funding)
- Training and capacity building to adopt IWM (with a strong practical element) is in place (with emphasis on minimisation, reuse, recycling)
- Availability of skilled waste management professionals within the sector

Information, Communication & Awareness

- Sector specific information is in place to support enforcement
- Toolkits are available to support decision-makers in approval processes
- Effective communication and sharing of information
- General public is informed (and supportive) of the benefits of waste minimisation, reuse and recycling

APPENDIX 5: Workshop summary notes, Dr Linda Godfrey

DAY 1 OF WORKSHOP (11 July 2012)

A. Buzz session introduction – Question: What do we want in an innovative waste sector?

- Would like to see a waste innovation strategy contributing to DEA as the custodians of waste, since DEA don't typically deal with innovation and technology which is DST's role. See how this will enhance the work DEA is doing with industries, to have waste that is better managed.
- Innovations to implement the waste hierarchy put forward in the NWMS. How innovations are going to contribute to reduced waste going to landfill, plus how it can contribute to jobs.
- Where there are gaps and where we can contribute, and in the sector of innovation to build synergies with others. Potential to create jobs in the green economy and good ideas from ground level. Look at new ideas that should come together, place emphasis on local conditions and constraints so as to take waste to the highest level.
- Cost effective ways of treating waste and creating the right space to do that
- Challenge coming out of the industry, uneducated general worker to the PhD working in the same company. How do we cover the full spectrum but come up with a sustainable solution for industry
- Looking at 2020, would like to see a pipeline of skills development that is working; reliable and good database on waste to inform planning, improved funding for technology development in the waste sector; better entrepreneurial opportunities in the waste sector.
- Hazardous waste and legislation that almost hinders waste management companies; would like to look at improved skills in the public sector; sorting at source. With levels of poverty people are more worried about putting food on plates than sorting waste at source. Look at how government can assist small companies to give them licences to manage waste.

Delegates are asked to note the following from the upcoming presentations

- What you like
- Challenges

B. Delegate presentations

1. WIEGO (Melanie Samson)

- Role of waste pickers in an innovative waste sector? How are they and how should they be integrated into an inclusive waste model (lead by someone with a higher education, since pickers are typically uneducated)
- Educate government officials to engage with waste pickers, but also to educate waste pickers to engage with government officials
- Waste management is not only a technical issue, it is also a social issue (social relations)
- Not to say engineers should become social scientists, but engineers should be introduced to these social skills. There is still room for specialists, and a need for social scientists in the waste sector.

2. IWMSA (Gail Smit)

- Basic Waste Course & Hazardous Waste Course for training of municipal waste managers (non-accredited)
- Gap in available waste data
- Appropriate waste management technologies for local conditions
- Need for a research chair on waste management as well as a training academy for waste management in South Africa (run training)

- Waste management is not a pure science and therefore not taught at university level

3. CSIR (Suzan Oelofse)

- Multi-skilled team, cross-cutting R&D from behaviour, economics, treatment & beneficiation technology, engineering
- Engineering skills, innovation skills, state-of-the-art testing facilities
- Gap in accurate waste data
- Appropriate technologies for local conditions (comes out often – locally appropriate solutions – new or adapting)
- Recognising differing levels of capabilities in developed and developing municipalities in SA
- Investment in waste PhD and MSc's

4. University of Johannesburg (Thea Schoeman)

- Growth in green industry jobs – most of their honours students will find jobs, where companies contact UJ asking for graduated students for employment
- Geography & Eng Management – cater for both the science and human side of it
- Recycling behaviour, ignorance of household wrt recyclables
- For persons that are employed, a full-time research masters is difficult to complete, so look at a tutored-masters with a small dissertation
- Can take up to 4-years to get a course accredited, but important that we go this way
- Idea of a research chair in waste management is a good one, to coordinate research in this area
- No data available on waste issues in South Africa – make use of universities to answer your research questions, where students are looking for a research topic, or available to collect waste data
- Limited interaction between government and research institutions on waste issues
- Low level of education of incoming 1st year students (value of a matric exemption)

5. UNISA (Roelien du Plessis)

- Hons, MSc and PhDs in environmental management and environmental sciences – lots of students who either work full time or who cannot afford contact-degrees – waste is included in this, but need to consolidate
- Community engagement projects – awareness with schools, school teachers and communities, e.g. shared community drop-off facilities – link these community engagement projects with research
- Waste skills within UNISA are fractured – required coherence and support across departments, structured research projects
- Stakeholder question: a broad environmental degree works for general landuse waste issues, but found that it was not sufficient for industry or hazardous waste issues – may need to specialise in particular waste streams.

6. University Western Cape (Rinie Schenk)

- Research on waste collectors, pickers and buy-back centres – 'invisible human capital' – we don't understand the middle-man and they hold huge amounts of knowledge
- Waste pickers are incredibly innovative ito of their trolleys, collection, sorting
- How do we accommodate informal pickers in a waste management solution?
- 3 researchers, but a good spread of qualitative and quantitative researchers
- From the research the Univ staff have a lot of ideas of how to integrate the pickers, but the Univ is not the implementer – so who implements?
- "*waste pickers will not become part of the formal sector – they will stay in the informal economy*" – why?

- Stakeholder question: How do we include academics in the conceptual stage of e.g. IWMP development or IDP development in municipalities, not only in the review stage, often only as residents and not academics.

** There is a strong emphasis on informal collectors in producing an innovative waste sector – but could they (as often illiterate collectors) expand the model to a national/regional model or will it require someone with a more formal understanding/knowledge to ramp up, or should we even? Municipalities are the key role players to formalise pickers – so again, perhaps about producing informed municipal waste officials with technical and social skills.*
** Is there a network of waste academics in South Africa, and if not, would it be useful? Not only for lecturers but also for students – to allow them to engage on research issues. And then, how should this academic/research network engage with policy makers? How do we move from research into implementation?*
** Is there a social media platform for sharing of waste research findings in South Africa?*

7. DT (Mpe-mpe Monyane)

- Under national policy (IPAP) recognise waste and recycling as a sector to support economic growth and job creation
- DTI capabilities focus on cleaner production and sustainable manufacturing, but require expertise on entrepreneurship development opportunities
- Gaps – climate change & waste; creating recycling markets

** When it comes to recycling, sustainable markets are essential to support ongoing innovation in this area. None of the academics who have already presented are doing any research on sustainable markets*

** Not only about recycling but also about minimising waste, and the need for innovation in this area – NCPC plays a crucial role here – we need to focus on the full waste hierarchy.*

8. Enviroserv (Esme Gombault)

- Waste industry is not a glamorous industry, so find it difficult to recruit specialists e.g. engineers into the sector
- Losing a lot of our current waste management skills to outside of SA, including Africa
- Broad range of skills needed from unskilled collectors to PhDs in chemistry or engineering
- There is no common, single space where South African research is made available – currently knowledge is scattered
- Need skills that work in diverse industries, diverse processes, diverse waste streams – mining, petrochemical, metallurgical, pharmaceutical, etc. – important that we cover a wide spectrum through this project
- Going to need up-skilling of workers – with technology enhancements, will need less unskilled workers and more skilled workers, e.g. chemists, engineers
- Have found the biggest need is the middle worker, the supervisor/manager, who manages unskilled workers but reports to a skilled engineer – they have not had a problem finding skilled engineers who fairly quickly understand the business (perhaps with a tag-on to become a waste engineer)
- Need for a shared repository of shared research
- Research needs on the implications of the new regulations on processes
- Esme Gombault has qualified as a professional waste manager (international course), but no one in SA offers this.

** Perhaps for a company like Enviroserv, Innovation Skills Development rather than HCD (TIA comment) is more useful, where the industry has to 'retrain' university graduates through internal mentoring and internal institutional knowledge*

Summary of issues by Thea Schoeman – Fragmentation (within research, between research and government); that bit extra to turn an engineer into a waste engineer (industry also acknowledges this need);

Emse Gombault comment – there is a step before innovation to just get the basics right first. So get people trained in waste management before we get to train in innovation.

Suzan Oelofse – perhaps not an entire training/university degree in waste management, but an add-on degree/diploma that we can add on to existing degrees, e.g. engineer +, or environment science +, i.e. a bridging degree/diploma to become a waste management professional. Where did Esme Gombault get her international accreditation (applied with prior learning, and wrote a thesis)?

Thendeka Mandigora commented that DEA is in the process of finalising their waste research strategy – will call a research conference and contribute to the research strategy and will establish a waste research network – implemented for internal and external use (one-stop shop of all P&W research) – will communicate details

9. ACMP (Dr Dhiraj Rama)

- Legislation stipulates certain officers – environmental control officer, air quality officer, waste officer, but does not give capacity requirements for these positions
- Needs to be a focus on cleaner production – not producing the waste in the first place
- Investment in securing supply chains away from landfills – directing waste into alternative technologies, alternative fuels
- Education on understanding around the top end of the waste hierarchy – cleaner production and reuse – especially when it comes to issuing waste licences by government to support waste as a renewable resource (alternative fuels).
- Lack of skills/capacity of government officials responsible for e.g. issuing licences, reviewing EIAs for innovative use of waste materials
- Silo mentality wrt managing waste

10. Delta facilities management (Morne Kirstein)

- Sometimes the innovation required is for a small waste stream and for a small generator (e.g. disposal of un-punctured aerosol cans) – difficult to find companies that can assist (and only viable if someone can amalgamate waste from a number of generators)

11. North West Univ – Mafikeng (Dr Frazer Kadama)

- Are combining process (waste/science) with business (profit)
- Lack of data on waste management to support waste planning, combined with under-funding of waste services in municipalities – research needs on all aspects of quantifying waste (per capita, classification, types, etc)

12. Tshwane University of Technology (Dr Jannie Maree)

- Existing research chairs – Rand Water, NRF Acid Mine water, NRF – sanitation
- THRIP funding to these research programmes has supported capacity development (requirement of funding is that the project supports students) - Condition of NRF funding that for every R150k of funding you need a 4th year student or higher
- Benefit of institutional collaboration – CSIR and TUT joint research initiatives, as each organisation brings benefits to the relationship – industrial partner, students, laboratories, etc.
- Presented on AMD, desalination, sludge treatment, brine treatment technologies – so a question from the 2nd project team must be 'what is stopping successful implementation of these technologies in SA?'

- Bridging technology development in universities to successful implementation in industries

** Based on university presentations today, Env Science/Geography Departments have typically presented on softer, social waste issues (pickers, buy-back centres) (typically domestic waste), while engineering departments are focusing on technology solutions (treatment, beneficiation) (typically industrial waste). Is there a way that we can combine these two or bridge them to develop skills across sectors (given fragmentation)?*

13. City of Tshwane (Nakampe Makoti)
(missed presentation)

14. DEA (Thandeka Mandigora)

- NWMS gazetted in February which calls for a wide range of instruments – including development of industry waste management plans (WMPs) – see innovation playing a role here, where industries identify opportunities for changing the way waste is managed. DEA does not prescribe technology options.
- Identify waste streams where beneficiation can happen, opportunities for reuse – stimulate local innovation and local industries
- Complex and emerging waste streams – manage through the existing legislation which allows for 'priority waste streams' – come out of the industry waste management plans
- DEA plans to engage with universities to see whether current courses meet the requirements put forward by legislation and the waste sector.
- Working together with the green scorpions (and EMI training to include waste issues) to support enforcement of waste legislation – that will help to drive innovation.

** So DEA will place a strong emphasis on the industry WMP to identify opportunities for innovation – or at least leave identifying innovation up to the industry.*

C. Group Discussions (1-3)

Recap comments by Dr Henry Roman (DST)

- HCD in an innovative solid waste sector
- Solutions appropriate to a developing country context
- How do we use innovation to increase jobs in a green economy
- Technical (products & process) & non-technical innovation (management, governance)
- Novelty (new and improved), in the sector, market, SA, global

Discussion points

- What did you hear today ito beneficiation solid waste and crystallise out key points (technical & non-technical) (from production to disposal)
- Be specific – what data do we need (from generation to disposal)

Homework

- Think about the mission statement for a national programme on waste innovation
- 5 basic skills (modules) (core skills) and 5 integrative skills (modules) that a waste manager would need (across the whole value chain)

Summary of the day by Dr Linda Godfrey

Objective: Innovation to improve the way waste is managed, move up the hierarchy and create opportunities for jobs

Key points:

- There is waste R&D happening in SA at numerous institutions – academic and non-academic
- Diverse sector – role players from unskilled to skilled, inclusive models
- Diverse waste types, from diverse generators (domestic, industry types)
- Fragmented approach to waste R&D and benefit to central sharing R&D and network of students/researchers to stimulate research and sharing
- Waste solutions are not only technical but also social – need for retaining specialists but with sensitivity/understanding of other disciplines
- Fragmentation of skills developed
    - engineering / technology solutions, often focused on industrial waste streams
    - Env science / geography, often 'softer' social issues, often focussed on domestic waste
- Unique SA conditions, local solutions suitable for small/large companies, diverse municipalities and industries
- Benefits of multi-skilled teams to address waste issues
- Innovation does happen at the unskilled level, but these models are local and usually aren't up-scaled by those directly involved
- Need to bridge university degrees (add-on) with skills useful for that person within the industry or waste company

Who needs to be capacitated?

- Government officials
    - Municipal – engage with pickers, improved landfill operation
    - Provincial/National – informed around alternatives, issuing of licences
- Employees of companies – waste organisations, industries, consulting companies (waste specialists)
- Researchers / scientists

1. Need for bridging skills across specialist domains (social/technical) (env/engin)
2. Need for 'occupational competency' (bridging from Univ to Organ) – registered waste professional (practical waste skills, prior learning)
3. Need for network of researchers (community) – with shared R&D outputs
4. Modalities to implement waste HCD skills

DAY 2 of WORKSHOP (12 July 2012)

D. Buzz session – Recap on the key points from Day 1

- Scope of work is too wide (technical to waste pickers); current focus on bottom of the waste hierarchy but focus should be at different levels of the pyramid, little attention to policy issues; independent think-tank for the sector; lot of work already done but not communicated; lack of coordination especially amongst government departments; why innovation? There is a lot that is working well, why re-invent the wheel? Let innovation come when the time is right.
- Addressing the issue of waste pickers; training and gaps from lower to higher pickers to management; need for data and more research into waste management; waste beneficiation can improve on
- Need for a central place where research findings can be shared and research questions; general lack of data on waste both quantitative and qualitative; waste beneficiation opportunities need to be identified – e.g. table of all waste streams, what can be extracted that are useful, column on price, so can decide where to focus research; research network a good idea; opportunity for innovation of how to incorporate them into IWM going forward
- Institutions of higher learning are willing to provide assistance with research; address the issues that qualifications don't address the skills needed by the industry; social aspect of waste management that talks about waste pickers and how legislation can be used to derive minimum requirements for waste pickers instead of prohibiting their presence on landfills; creating

competition between virgin and recycled products to create markets; knowledge system that will act as a central point for sharing on industrial waste symbiosis

- Plight of the waste pickers and legislation does not take into consideration social issues and this is being neglected and sidelined; rather move sorting facilities outside of landfills, so that there is no reason for pickers to go onto landfills; behaviour of collection and dumping is favoured by municipalities because the cost is low; a need for beneficiation and studies should be undertaken to determine what products can be created from waste; good research capacity in-house and what we need is direction on areas to focus on to improve our research
- Pickers don't pick waste because it's enjoyable, they do it because of survival – we must look at the whole waste value chain and look at what is in our waste; people must be educated on our legislation now, otherwise it won't be implemented; mine the waste where you are creating it and immediately send it into a value chain

Presentation on the 6 broad themes of issues that emerged on Day 1 (presented by Dr Linda Godfrey)

Stakeholder comments on the 6-clusters of 'themes' from day 1

- Creating waste workplace-ready graduates; SA appropriate innovation and skills; Who should be capacitated; Network/Community of Practice; Need for waste data; Bridging Research Disciplines
- Changing mind-sets (non-technical) e.g. recognising that waste is a resource – what is the trigger, how do we capacitate for that? Especially large volumes in the mining and power generation sector – these softer issues
- Are waste responsibilities housed in the right department? DEA? The relationship between government departments that is stifling innovation – community of practice that also includes government-sector engagement (perhaps different kinds of CoPs)
- Selling of electricity from waste into the grid hasn't yet been sorted out in South Africa
- Enabling regulatory framework that facilitates a lot of these points
- The informal sector is not adequately covered in these 6 themes – do not want to lose it
- Communities need to be educated – business communities, households, domestic workers

** This HCD programme is going to have to run in parallel with a more general awareness programme run by DEA and by NGOs to reach the informal sector, households, businesses, communities – a need for both formal education programmes and informal/awareness programmes*

- How do we bring indigenous waste knowledge into the mainstream (from communities to larger scale initiatives), e.g. waste dung for energy, cooking, etc ?
- How do we ensure that cooperatives at a local level benefit from this ?
- Municipalities must be included in the community of practice

** We are going to need multiple CoPs – research CoP; Government CoP (national and municipal); Government to Industry CoP – but also allow for each CoP to plug into the other when needed.*

- How do we convert pickers who only collect to manufacture – to add value to the waste they collect?
- Do we understand the whole value chain of each sector and how it works, e.g. plastics – do we know exactly what can be done – and exhaust the whole sector?
- The role of waste management officers – they can influence change at local level – but they are not skilled enough – gap in terms of skills development

Comments from Dr Roman on the summary of issues raised -

- The lack of data and data capturing – tied to that is a central point for research findings – DST is working on RIMS (research information management system) which is meant to address this issue, as cuts across disciplines
- But e.g. NRF difficult to gauge how money investment in research is happening because of the way data is captured and the key words used
- Concentration on beneficiation – that's where the focus needs to be
- We need innovation – but it's not only technological, but appropriate technology and innovation – what works for us
- Networking forum or think-tank is vital, given the multi-disciplinary nature of the sector to address a complex problem
- Department of Higher Education – qualifications that are being produced that do not address the skills gap – aim of this – what do we need to do to prepare graduates for the workplace

Stakeholder comment: The innovation is going to come from the business man, not the waste manager – if the idea can't make money, it won't happen. What are the triggers for innovation and perhaps we're looking at the wrong person.

** The need to bridge science with business*

** We need to keep in mind the mandate and mechanisms available to DST in supporting waste innovation skills development, but recognising that this will fit into a national strategy with multiple mechanisms and instruments driven by other departments and organisations.*

E. Sub-group Task 2a:

Goal of this DST programme

Who is going to experience what by when?

(SMART) Specific, measurable, achievable, relevant, time based

Group 1: Solid waste sector (industry and municipal) will experience a 15% reduction (by weight) in waste to landfill by 2020 (considering that the bulk of waste is not municipal waste)

Group 2: Through innovative skills the solid waste management sector will attain a 50% reduction of deposition of waste to landfill by 2020

Group 3: South Africa functioning within all encompassing enabling environment to improve solid waste management by 2020

From the above individual group goals, the following combined goal of the National Waste Innovation Programme was forged by workshop delegates:

Recognising the goals of the National Waste Management Strategy, the Department of Science and Technology believes that through investment in science and technology and the establishment of a national waste innovation programme, South Africa can achieve ....

Consensus Goal: Solid waste sector will experience a 20% reduction (by weight) in industrial waste and a 60% reduction in domestic waste to landfill by 2020

Notes

- Including mining waste and power generation waste
- In addition to waste mining
- Mining waste is included in industrial waste
- Landfill includes mine dumps & residue stockpiles

F. Sub-group Task 2b:

If this is our goal, why can't we achieve this now? Give 3 obstacles for the industrial waste, and 3 for the municipal waste as to why we can't claim this to be the case in 2012?

For each obstacle, what would we need to put in place to overcome it?

G. Sub-group Task 2c:
What are the core modules and elective modules?

** This should focus on creating a 'professional waste manager' – as the field is very diverse, not taking away from specialist career development, e.g. engineers, social scientists, chemists, etc.*

** Look at what ISWA requires ito courses/skills to qualify as a professional waste manager*

Group 1 – everything above mass balance is core, everything below is core (Government, Industry, Consultants) (spreadsheet)

Group 2 – assuming that someone who comes for this waste course/diploma, will already have a degree (thinking mostly at municipal level).
Core – environmental management and legislation; business management
Elective – environmental economics and governance, policy and data analysis, data generation, capturing and processing; people management skills

Group 3 – middle management with a tertiary degree to go into middle management in the waste sector (municipal or government)
Core (6) – basic analysis (analytical, research, report writing skills); computer literacy (data capturing, online research); waste & environmental legislation (what is in legislation); project management; social sciences (people management & mentoring skills); natural sciences (geography, chemistry, physics and maths – develop analytical skills)
Electives – practical (understanding life cycle of waste, municipal, operations, technical, site-visits); basic training (how to train people under you); introduction to business management

Comment from June Lombard that it comes out strongly in other engagement the need for an environmental economics understanding and not only a business course

** Modalities – research chairs, centres of excellence are already endorsed by Univ VCs and NRF through the modalities of the Global Change Grand Challenge HCD strategy which this project forms a subset of.*

Way forward:

1. Finalise workshop report, with inclusion of LG notes as annexure
2. Status quo assessment of what universities are currently offering completed by end July 2012 (available for August workshop)
3. Interviews/questionnaires in next 3 weeks completed (available for August workshop)
4. For the next workshop we focus with academia on what the requirements are for HCD going forward – a focused 1-day workshop. Notify people of this ASAP (as soon as date confirmed)