

PROCEEDINGS REPORT

The Uptake of Science, Technology and Innovation by Sector Departments as Part of the Innovation for Inclusive Development (IID) Seminar Series



science & innovation

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The Academy of Science of South Africa (ASSAf) was inaugurated in May 1996. It was formed in response to the need for an academy of science consonant with the dawn of democracy in South Africa: activist in its mission of using science and scholarship for the benefit of society, with a mandate encompassing all scholarly disciplines that use an open-minded and evidence-based approach to build knowledge. ASSAf, thus, adopted in its name the term 'science' in the singular as reflecting a common way of enquiring rather than an aggregation of different disciplines. Its Members are elected based on a combination of two principal criteria, academic excellence and significant contributions to society. The Parliament of South Africa passed the Academy of Science of South Africa Act (No 67 of 2001), which came into force on 15 May 2002. This made ASSAf the only academy of science in South Africa officially recognised by government and representing the country in the international community of science academies and elsewhere.

Uptake of Science, Technology and Innovation by Sector Departments as part of the Innovation for Inclusive Development (IID) Seminar Series held on Zoom Webinar. The views expressed are those of the individual participants and not necessarily those of the Academy, nor are they a consensus view of the Academy based on an in-depth evidence-based study.

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ACKNOWLEDGEMENTS

This proceedings report is a product of the Department of Science and Innovation (DSI) in partnership with the Academy of Science of South Africa (ASSAf) on the Innovation for Inclusive Development (IID) seminar series. The objective of the IID learning interventions is to use “knowledge, evidence and learnings” to inform, influence and demonstrate how innovative technology solutions may be used to achieve inclusive development, improve the capacity of the state to deliver and improve access to basic services, and thereby advance local economic development.

The Academy hosted the **Uptake of Science, Technology and Innovation by Sector Departments** seminar on 20 July 2022, virtually, as part of the IID seminar series.

Science, Technology and Innovation (STI) is an important construct in South Africa's policy discourse as illustrated in key national planning frameworks, such as the National Development Plan (NDP) and the 2019 White Paper on Science, Technology and Innovation (STI). The White Paper focuses, amongst other things, on the use of STI to accelerate inclusive socio-economic growth and to ensure that all departments working in areas that affect STI are open to innovation uptake and that there is policy coherence across the national innovation system (NSI).

The Innovation for Inclusive Development (IID) seminar series is one of the instruments designed to inform and influence the uptake of demonstrated innovation and technologies by other sector departments. The DSI has undertaken twelve (12) IID seminars thus far in partnership with ASSAf, however,



the integration of these technologies by various government departments in their policies and programmes is poorly understood. It was on this basis that the DSI and ASSAf commissioned Quantitative Evidence Research to conduct a policy research study to ascertain to what extent are government departments responsive to STI and open to innovation uptake.

The objective of the event was to share the preliminary report and recommendations based on policy document analysis and a survey of twelve (12) sector Departments. The Departments, both national and provincial, were encouraged to adapt STIs in their policies and programmes and also to participate in the next phase of the study.

ASSAf would like to thank and acknowledge the Principal Investigator of the policy research study, Prof Anastassios Pouris (Quantitative Evidence Research) and the speakers, Dr Jennifer Mirembé (NDHS) and Dr Stephen Taylor (DBE) for their Departments' participation in the research study and for being part of the seminar proceedings.

ASSAf gratefully acknowledges all the partners, speakers and participants in attendance and the contributions by Mr Mosiea and Mr Phalafala from DSI and Dr Mabotha and Dr Thwala from ASSAf to this IID project.



Prof Himla Soodyall
ASSAf Executive Officer

WELCOMING REMARKS

Facilitator: Dr Melusi Thwala, Manager: Science Advisory Programme and Strategic Partnerships, Academy of Science of South Africa, ASSAf

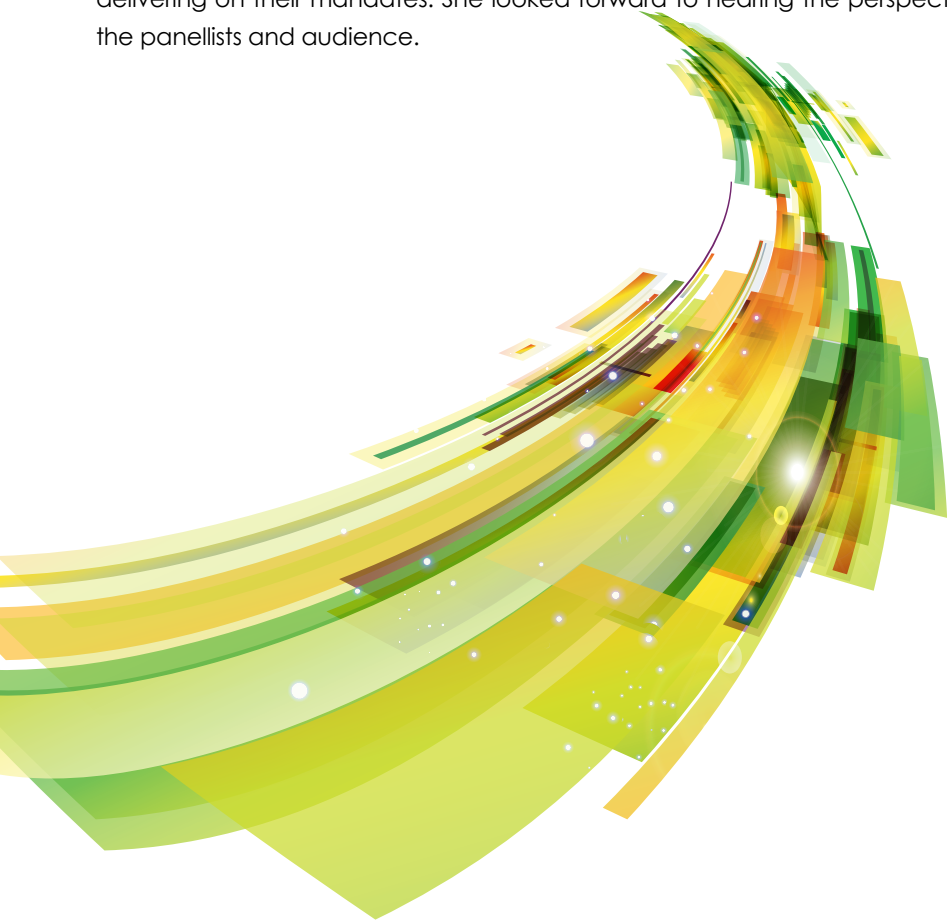
Programme facilitator, Dr Melusi Thwala, welcomed the panellists and participants to the seminar, which was one of a series of Innovation for Inclusive Development (IID) learning interventions initiated by the Department of Science and Innovation (DSI) in collaboration with ASSAf. The White Paper on Science, Technology, and Innovation (STI) was a long-term policy guide that outlined the role of STI in taking advantage of global trends, policy making, and enhancing inclusiveness. Progress was monitored in terms of research and development (R&D) outputs, human capital development in STI fields, commercialisation of STI solutions, and the role of STI in improving the quality of life of citizens.

The IID learning interventions bring stakeholders from various sectors together to discuss innovations that promoted inclusive development. This seminar was earmarked to illustrate how some Government departments were infusing STI within their portfolios, in policy development, and in enhancing service delivery and the quality of life of citizens. There were presentations by the Department of Human Settlements (DHS), and the Department of Basic Education (DBE). Unfortunately, representation from the Department of Water and Sanitation (DWS) could not join. Prof Pouris, the lead investigator, gave an overview of the study commissioned by the DSI.

OPENING REMARKS

Prof Himla Soodyall. Executive Officer, Academy of Science of South Africa, ASSAf

Prof Soodyall welcomed everyone to the seminar and thanked the panellists for sharing their insights. During the Covid-19 period, it had been inevitable that different sectors of Government and Academic stakeholders would come together to engage, as evidence-based science was fundamental to decision-making. ASSAf had identified Prof Pouris, with his robust approach and analytical eye, to lead the research into the uptake of STIs by sector departments. He would share the outcomes of the questionnaire-based survey, which had investigated how well science was understood and implemented in the course of these departments delivering on their mandates. She looked forward to hearing the perspectives of the panellists and audience.



RATIONALE FOR THE POLICY RESEARCH STUDY

Mr Tshepang Mosiea, Director: Science and Technology for Sustainable Human Settlements, Department of Science and Innovation, DSI

Mr Mosiea introduced the policy context and rationale for the IID Seminar Series. The Vision of the DSI was to increase wellbeing and prosperity through STI, and their Mission was to provide leadership, an enabling environment, and resources for STI in support of inclusive and sustainable development in South Africa. The country was at the point of pursuing an innovation-based system, and this required an enabling policy environment.

The IID Seminars were organised under DSI's Programme 5: Socio-economic Innovation Partnerships, an objective of which is to use knowledge, evidence and learning to inform and influence the policies of other sector departments towards innovation and technology. The IID Unit runs programmes and demonstrates technologies that have potential for widespread adoption by Government. The primary Strategic Objective for the IID Seminars was to enable DSI to engage with stakeholders and government policy- and decision-makers, and to share lessons and policy insights emerging from technology demonstrations and other sources of evidence.

Regarding the policy context, the Seminars were informed by the STI White Paper (2019), which aimed to create a whole-of-government and whole-of-society approach to innovation. The Medium-Term Strategic Framework (MTSF) included outcomes that expressed a need for Government to consider innovations that improved basic services. Furthermore, the DSI's Decadal Plan highlighted innovation priorities for South Africa over the next ten years; it outlined the need for an enabling policy environment as well as policy coherence, and for ensuring that effective innovation governance and mechanisms were in place.

Relevant policy intents in the White Paper on STI included:

- Improving governance of the National System of Innovation (NSI) to ensure that science and innovation (S&I) received attention at the highest levels via Presidential and Ministerial structures
- Coordinating Government's efforts to enable innovation by means of an Innovation Compact across Government

- Building partnerships between DSI and other departments, the private sector, and civil society
- Increasing the innovation footprint across provinces and local governments
- Using innovation to improve government decision-making and service delivery, and
- Strengthening Government's role as an enabler of innovation to support a capable state.

Two key Policy Intents in the White Paper informed the Seminar discussions:

- Intent 3.3: Enhancing policy coherence and a coordinated NSI, and
- Intent 4.13: Strengthening Government's role as an enabler for innovation, and the creation of an enabling policy environment for innovation and a capable State through the use of innovation to improve the delivery of basic services, and to support innovation interventions in the public sector.

The Decadal Plan focuses on innovation priorities for the country in the next ten years, including:

- Innovation as a powerful engine for addressing social and environmental challenges, including current crises relating to flooding and energy insecurity
- Modernising existing economic sectors, such as mining, tourism, manufacturing, and agriculture, through innovation and technologies
- Policy experimentation, and multi-stakeholder partnerships and coordination with other Government departments, industry, academia, and civil society
- Using innovation to support new sources of economic growth, such as the circular economy and renewable energy, and
- Creating an enabling policy environment for innovation in Government.

The Decadal Plan includes a functional framework for creating an enabling environment for innovation in Government. It consisted of six pillars, one of which was Policy, Legislation, and Regulatory Reforms to Support Innovation. The others included Processes and Mechanisms for Coherent Innovation Governance; Skills and Innovation Capacity of Citizens and Organisations; Modern Knowledge and Innovation Infrastructure; Linkages and Networks; and Innovation Funding.

The DSI, in partnership with ASSAf, undertook a study to review and assess the extent to which current sector department policies were supportive of STIs. This was in line with the key policy intents of the STI White Paper to drive a whole-of-government approach to innovation.

The study set out to investigate the following:

- Policy enablers and inhibitors of innovation
- The extent to which sector department policies supported STI
- Public sector policy coherence with innovation
- Constraints to the uptake of innovations in the policy environment of sector departments
- How the policy environments of national and provincial departments and municipalities have opened up to innovation
- How STI has been integrated into the policies and programmes of sector departments, and
- How sector departments have instilled a culture of innovation in relation to policy.

The DSI was keen to share the findings of this study, and to stimulate dialogue and an in-depth policy debate on how to position policies to promote innovation.

In closing, Mr Mosiea referred to other policy initiatives with which the DSI was involved, including:

- e-Participation and Policy Modelling Platforms for SA (ePPMOSA)
- The Council for Scientific and Industrial Research's Viability and Validation of Innovation for Service Delivery (CSIR-VVISDP) Programme, an assessment study of the municipal policy environment
- The National Policy Data Observatory (NPDO) that assessed the use of Science and evidence in decision-making in Government
- STI Policy Dialogues, and
- Policy Briefs, available on the DSI website.

Mr Mosiea concluded by wishing participants a constructive and fruitful engagement.

Dr Thwala thanked Mr Mosiea for sharing the DSI's perspective on the study. He noted the need for STI to play a role in helping to address some of the crises that have affected citizens in recent years, such as Covid-19.

THE UPTAKE OF STIs AND STI SOLUTIONS IN PROGRAMMES AND POLICIES: CASE STUDY

Dr Jennifer Mirembe, Director: Human Settlements Planning, National Department of Human Settlements, NDHS

Dr Mirembe stated that very few of the millions of housing units provided by the DHS to low-income earners were constructed using alternative and innovative building technologies. The DHS had realised that alternative technologies could help them to improve the delivery of sustainable human settlements. Innovation was necessary to respond to challenges such as the recent floods in KwaZulu-Natal (KZN) and the Eastern Cape.

The Department was focusing on scaling up the use of alternative building technologies (ABTs). Doing this required strengthening knowledge and understanding of these innovative systems and technologies. The DHS had started this journey in 2003 with research into the extent to which ABTs were used in low-income housing projects, as well as the socio-economic impact on beneficiaries of these technologies. In 2008, research had focused primarily on officials, investigating why there was limited implementation of these alternatives. Data collected for the 2008 study had been updated and reanalysed in 2010. They had also held a number of conferences and seminars, including the DHS Indaba (2009), the National Round Table on Innovative Building Technologies (2011), the Human Settlements Round Table, and Human Settlements Development Summit (both in 2017).

Despite the above efforts, important questions remained, including:

How can provinces implement alternative technologies in government-assisted housing schemes?

- How can success stories be leveraged and what lessons can be learnt?
- What challenges are preventing the large-scale use of ABTs?
- How can past mistakes be avoided in future?

The DHS was focusing attention on the following areas:

- Policy and legislation: Policies and building regulations should not be an obstacle to the use of ABTs in Government housing development projects.
- Increasing acceptance of alternative technologies by provinces and metropolitan municipalities: The higher costs of ABTs relative to subsidies was an

obstacle; this necessitated special budgetary arrangements in the provinces to enable procurement.

- Knowledge and understanding of beneficiaries: The belief that houses built with ABTs were of inferior quality and could not be extended needed to be addressed.
- Certification: The process of certification needed to be simplified to ensure compliance, and quality assurance standards needed to be realistic so that they could be met.
- High costs: The cost of ABTs was very high compared to conventional technologies, both in terms of initial building costs and ongoing maintenance. These costs often exceeded the available subsidy.
- Finance: It was difficult to access loans and contractors demanded up-front payment.
- Structural defects: Examples of defects included cracks allowing water penetration, and dust from some technologies causing respiratory problems.
- Capacity to deliver: Local manufacturing capacity was limited, resulting in the need for imports. Limited availability of these technologies was an obstacle to large-scale delivery, with most companies remaining at the prototype stage. During the recent floods in KZN, DHS was unable to source innovative units over a weekend that could house a number of people.
- Knowledge and understanding of officials across different spheres of Government: There had been cases of contractors being hired without the necessary Agrément certification, in contravention of the National Building Regulations. There was a need for capacity building, which included institutional support and inspections.

Despite these challenges, ABTs offered the human settlements sector a number of opportunities. These includes job creation, local economic development, and the potential to improve the speed of construction. The DHS had been showcasing examples of innovative work done at the Eric Molobi Innovation Hub.

Dr Mirembé summarised the current situation in DHS with regard to policy, capacity, and quality assurance:

- DHS was in the process of improving procurement processes to encourage the use of ABTs in the provinces and metropolitan municipalities. Only alternative materials certified by Agrément should be used, and performance standards should be used to advertise tenders, rather than the subsidy amount.

- Alternative technologies selected should be sustainable in the South African context, and account for costs across the whole life cycle, including energy efficiency and maintenance.
- The Construction Education and Training Authority (CETA) could help to address capacity challenges.
- Professional bodies were also helping Government to develop capacity in construction project management, and to ensure the quality and durability of structures, as well as the expertise of inspectors. Institutions such as Agrément, the National Home Builders Registration Council (NHBRC), and the Institute for Architects, were supporting local authorities to implement and monitor ABTs.
- Unnecessary bureaucracy in the housing construction chain needed to be reduced.
- DHS was investigating the possibility of being able to claim carbon credits for projects using energy-efficient technologies.
- Consumer education needed to include raising awareness of alternative technologies.
- The high cost of certification needed to be addressed, possibly by other sources of state funding.

The purpose of the projects with which DHS was currently involved was to:

- Ensure that poor households benefited from innovative technologies
- Enable understanding of the role of innovation in the human settlements sector
- Explore how innovation could provide DHS with a systematic, transparent, and accountable approach to the implementation of human settlements projects
- Strengthen academic think-tanks to engage in debates around the post-Covid 'new normal', and
- Demonstrate and communicate the benefits of innovation to poor households.

Some years ago, DHS had developed a draft framework for innovation in the human settlements sector. Current projects relating to innovation included:

- Involvement of NHBRC in various projects, such as exploring with the University of Cape Town (UCT) the use of green building technologies; maintaining the Innovative Building Technologies (IBTs) Dynamic Database, which recorded companies able to implement innovation; and developing rational designs for low carbon emissions, with the support of a team of architects.
- Developing a multi-year housing development plan informed by global visions of ending poverty through shelter. DHS viewed the growth of human

settlements as an asset. They argued that the technology of the house (building technologies, materials, and processes) related to the technology of the neighbourhood (innovative building systems and processes), and this in turn related to Priority Housing Development Areas.

- All the DHS planning systems were becoming digital, including the Multi-Year Housing Development Plans, and Human Settlements Development Grant Plans. This would enable DHS to monitor what the provinces were planning and delivering in real time. This would also apply to metropolitan municipalities, enabling the tracking of service delivery relative to the Urban Settlements Development Grant Plans.
- Research was being conducted into Indigenous Knowledge Systems and alternative technologies in the provision of people's housing in rural areas.
- The DHS, in collaboration with the CSIR, had recently launched the Ten-year Roadmap for the Human Settlements Sector.
- In collaboration with the Department of Environment, Forestry and Fisheries (DEFF), DHS was exploring the use of biomass concrete. A memorandum of understanding (MoU) was being finalised with DEFF that would allow DHS to license factories to manufacture concrete using forest biomass. This could result in biomass concrete becoming the building material of choice for Government projects.
- In collaboration with the Department of Trade, Industry and Competition (dtic), DHS was investigating the use of timber as the construction material of choice in the human settlements sector, especially in response to disasters.

Q&A AND DISCUSSIONS

Dr Melusi Thwala (ASSAf) thanked Dr Mirembé for her insightful presentation and asked her to expand on the thinking behind the commercialisation of biomass concrete.

Dr Jennifer Mirembé (NDHS) replied that Department of Environment, Forestry and Fisheries (DEFF) had been investigating how invasive plants removed from natural areas could become a resource and had researched how to convert invasive plants into biomass concrete. In 2021 they had approached DHS, which had the licence to approach municipalities regarding construction. A legal agreement had been drawn up regarding the roles and responsibilities of the different departments. Once the MoU was signed, DHS would be able to have a different

licence agreement with each of the provinces. When a company had a tender with the province, the material of choice would be biomass concrete. They hoped to establish the same partnership with the metropolitan municipalities. Provinces would not be forced to use biomass concrete; however, it would be flagged as an innovative product produced by Government and offered to other Government sectors as an option to materials sourced from the private sector.

Dr Ntsibane Ntlatlapa (CSIR) asked what the status of digital planning systems was, and how the absence of a data-sharing framework affected that work.

Dr Jennifer Miremba (NDHS) replied that they were currently focusing on optimising planning. Provinces and municipalities were already digital but their systems were not integrated. All systems across the different levels of Government were currently being integrated, as well as the grant planning systems at the different levels.

Dr Melusi Thwala (ASSAf) observed that, due to the absence of a data sharing framework, there was no coordination regarding where the data was housed.

Mr Bonani Madikizela (WRC) noted that the use of biomass concrete was an example of the circular economy. He asked if DHS would be interested in exploring the use of excavated sediment from silted-up dams and estuaries.

Dr Jennifer Miremba (NDHS) responded that the CSIR had invited the DHS to partner with them in a working group to continue researching the potential of biomass concrete. This working group provided an opportunity to research materials other than biomass concrete. Anyone was welcome to approach the group to research alternative materials, especially waste materials.

Dr Melusi Thwala (ASSAf) added that one of UCT's innovation achievements had been using sewer waste in the formulation of bricks

THE UPTAKE OF STIs BY SECTOR DEPARTMENTS: REPORT FINDINGS PRESENTATION

Prof Anastassios Pouris, Principal Investigator: Quantitative Evidence Research

Prof Pouris gave an overview of the investigation into the uptake of Science, Technology, and Innovation (STI) by sector departments. It was the first time that such an investigation had taken place. The study provided a baseline against which future progress could be measured.

The objectives of the study were to:

- Assess how open the policies of Government departments were to the uptake of innovation; National, Provincial and, to a lesser extent, Local Government departments had been monitored
- Ascertain how departments had integrated STI into their policies and institutional programmes
- Inform DSI to formulate policy interventions that accelerated the realisation of the value of STI in public service and society in general, and
- Raise awareness among departmental officials about STI.

A committee comprising representatives from the DSI and ASSAf identified 12 Government departments to investigate. These were:

Government Department	Government Department
National Treasury	Human Settlements (DHS)
Public Works and Infrastructure (DPWI)	Agriculture, Land Reform and Rural Development (DALRRD)
Basic Education (DBE)	Trade, Industry and Competition (the dtic)
Health (DoH)	Cooperative Governance (DCoG)
Communications and Digital Technologies (DCDT)	Mineral Resources and Energy (DMRE)
Water and Sanitation (DWS)	Social Development (DSD)

Prof Pouris noted that the Covid lockdown had caused havoc in Government departments during the study period.

The research approach included a desktop literature review, content analysis of policy documents, two case studies, surveys and interviews, analysis of results, and presentation of a number of recommendations.

The Literature Review involved content analysis of a number of policy documents from the 12 departments and provided a benchmark for future studies. The review aimed to identify the importance of research, development, and innovation to the activities of Government departments. A critical issue was policy coherence, or how the policies of one department were in tune with efforts of other departments, and not causing conflict between policies and regulations.

The review identified that research and innovation were necessary for economic growth. Research and development (R&D) was probably the only issue that qualified for Government intervention across the board, due to the existence of public goods, externalities, increasing returns to scale, and informational asymmetries. The review briefly considered the history of development of various countries and highlighted the role of technology and innovation in the development of the East Asian Tigers (Hong Kong, Singapore, South Korea and Taiwan). China, India and Brazil had also adopted such approaches.

Some technologies had been transformative, such as the polio vaccine, new seed varieties that had enabled the Asian Green Revolution, anti-retroviral drugs for HIV/AIDS, and the M-Pesa mobile payment platform. A number of studies had identified that R&D could generate very high rates of return of as much as 100 per cent.

Coherence and policy failures were related to the lack of interdependence and interrelations between different STI policies. Two dimensions of complexity created policy failure, namely the policy mix, where the policies, regulations and objectives of different departments were in conflict with one another; and situations where different levels of Government did not communicate effectively. Coordination mechanisms used internationally to resolve policy failures and promote coherence included centralised agencies, co-ordination councils, super-ministries, leadership at Cabinet level, intermediate agencies, collaboration programmes, lead organisations, and standard-setting bodies.

In South Africa, a Ministerial Committee known as the Higher Education, Science, Technology, and Innovation Institutional Landscape (HESTIIL) had made several recommendations in their report to Cabinet. They identified that the failure of Science and Technology (S&T) policies was due to a lack of overall coordination and made both short- and long-term suggestions to improve the situation. Similarly,

the White Paper on Science and Technology had recommended the establishment of a coordinated system of S&T, with the objective of expanding R&D, developing human capabilities, supporting local innovation systems, increasing investment in the NSI, supporting the pan-African agenda, and promoting inclusivity.

Content analysis is the application of a specified method to examine the existence of a concept of interest in a particular document. The contents of 32 documents from 12 departments were analysed in an attempt to identify whether terms such as R&D, science, technology, innovation, fourth industrial revolution (4IR), smart, and DST or DSI were used in these documents. The main finding was that only a limited number of departments considered STI issues in their policy documents.

The first word analysed was 'Innovation'. It was found that 11 of 12 departments used the concept in their policies to a certain extent. The concept appeared most often (103 times) in the DCDT. Eleven policies (34 per cent) did not mention the word innovation at all. Four documents (12.5 per cent) referred to innovation only once, one (three per cent) referred to it twice, and three (nine per cent) mentioned it three times.

The word 'technologies' was used most often (132 times) by the DCDT, while the dtic had the second-highest use of the terms 'technology' (25 times) and 'innovation' (17 times). Finally, the terms DST or DSI were mentioned most often by DALRRD (four times) and DCDT (three times). Most departments did not mention DSI at all.

Two Case Studies were conducted:

1. China – The take-off of Science and Technology: In the 1960s South Africa had produced many more S&T publications and patents than China, which at the time had produced hardly any. The question was how China had since become a global leader in S&T. It was found that Chairman Mao's successors disagreed with him about the value of scientific knowledge, scientists and engineers. Premiers Zhou Enlai and Deng Xiaoping announced that S&T was one of the four forces of modernisation in the world and had to be supported.

The involvement of the Premiers in the S&T system resolved issues of coherence and alternative approaches. It should be remembered that the Chinese Premier is also the Chairman of the Communist Party. China started spending enormous amounts of money on science and innovation. They were willing to spend more money on S&T, even at the expense of the other driving forces of modernisation, such as agriculture. The report proposed that the importance of S&T be introduced to the African National Congress (ANC).

2. Collaboration between DHS and DSI: The study identified that appropriate actions by the two departments had led to initiatives that addressed issues affecting the poorest and least advantaged citizens. Focusing on these citizens had been critically important, and other departments could learn from DHS and DSI when addressing their issues. DHS and DSI had signed an MoU legalising their agreement to collaborate. This had been further institutionalised when DSI had established a Directorate of Sustainable Human Settlements targeting the poorest and least advantaged citizens. The departments had raised funding from international donors, and discussions amongst stakeholders protected the projects from wrong decisions. It was clear that institutionalisation required much more than simply signing an MoU.

Conducting the survey and interviews was extremely difficult during the Covid-19 lockdown and had required persistence. Despite the support of the Director General, it was difficult to get hold of officials who were not working from their offices or did not respond to messages due to illness. Some were not aware of the project, and a surprising response was that: "We have not received any communique to incorporate STI in departmental policies." The research team found it interesting that Government officials argued that they were not informed about the efforts of other Government departments.

Officials from eight departments were surveyed, and interviews were conducted with officials from four departments. Prof Pouris summarised some of the responses to the survey and interview questions, noting that they could not extrapolate the results to the entire population as the departments had not been randomly selected.

1. Do you think STI is relevant in your Department's policies and workplans?

All departments agreed. This was considered a sign that officials accepted S&T as a driving force.

2. Do you monitor the incorporation of STI into your policies and planning?

7 departments: **Yes** (DBE, DHS, DWS, DPWI, DAFF, the dtic, National Treasury)
 5 departments: **No**
 1 official: **Unsure**
 Only three respondents rated their performance, with values ranging from average to excellent.

3. What are the constraints in incorporating STI in your policies?

4 departments: **Budget / costs**
 3 departments: **Technical skills**
 2 departments: **Lack of capacity / resources**
 Other issues: implementation in lower government sphere; IT silos within departments; lack of interdepartmental collaboration.

4. Has your department integrated or adopted any STI aspects in its workplan?

9 departments: **Yes**, they had a dedicated unit working on STI programmes or activities.

5. Do you monitor the incorporation of STI into your programmes, activities or interventions?

The departments **did not** identify specific programmes or evidence; whether they monitored this in these programmes; nor did they mention any constraints.

6. Has your Department integrated or adopted any aspects of South Africa's STI policies in its policies, planning framework, or workplan?

6 departments: **Yes**, they monitored the incorporation of STI in their policies (DBE, DoH, DHS, DPWI, DWS, National Treasury)

7. Does your Department have a dedicated budget towards STI-related programmes? Indicate the approximate amount for R&D, and for innovation

10 departments: **Yes** (two referred to limited budgets)
 None revealed actual amounts.

8. Does your Department have personnel or a dedicated unit working on STI?

9 departments: **Yes**, they had a dedicated unit

9. Does your Department have human or infrastructural capabilities to incorporate STI in your policies and workplan?

9 departments: **Yes**, they had structures

3 departments: **No** (DCDT, DCoG, DHS)

10. Does your Department monitor local policies and international good practice?

8 departments: **Yes**

4 departments: **No** (DCDT, DCoG, DMRE, the dtic)

11. What policies can improve coherence in the policies and programmes of your Department with the innovation policies and programmes of the DSI?

3 departments: Ministerial clusters

3 departments: R&D

2 departments: Collaboration policies

2 departments: Own policies

Other approaches: Inter-governmental Relations Framework Act 2005, Impact assessments, best practice, research on evidence, Information and Communications Technology (ICT).

The variety of solutions suggested may indicate the complexity of the concept and lack of consensus. The opinion of the research team was that S&T would not grow under current conditions (DSI STI White Paper).

Recommendations

The overall findings appear to show that STI can be accommodated in most departments investigated; however, clarifications should be provided on what is expected from possible amalgamations or incorporations.

The following recommendations were developed based on the findings:

- A common suggestion was that DSI should consider submitting the issue of STI coherence to the economic cluster.
- DSI should consider activating the Intergovernmental Relations Framework Act (IRFA) for the establishment of a national intergovernmental forum. The advantage of this Act is that it mobilises provincial and Local Government officials as well, whereas the economic cluster includes National Government departments only.
- DSI should consider the establishment of a Government Institute for STI (GIST). All over the world there are established research organisations, such as the Office

for Science and Technology in the United States. GIST would undertake ex-ante technology assessments and technology monitoring and inform Government and other stakeholders whether, for example, a novel technology would be cost-effective relative to existing technologies.

- DSI should engage DCoG in order to influence lower levels of Government.
- DSI should propose the establishment of STI Directorates in all Government departments.
- ASSAf should consider establishing a National Programme for Appreciation of S&T in Government. The programme should aim to improve the appreciation of S&T among Government officials. The research identified that all officials agreed that S&T was important for their activities, but when the Human Sciences Research Council (HSRC) collected data on R&D expenditure in South Africa, it showed that this had remained static at 0,7% of Gross Domestic Product (GDP) for the last 20 years even though various Ministers had set a target of 1,5% of GDP for R&D.
- Finally, ASSAf should consider expanding the investigation to cover all Government departments at National and Provincial levels.

Q&A AND DISCUSSIONS

Prof Michael Kahn (CREST) noted that funding this initiative would be a problem as this was a time of extreme constraints. He noted that 65 years previously when the CSIR was established, one of its four original divisions had been dedicated to the built environment. He asked why the CSIR did not appear to be involved and why Government departments were not entering into MoUs with the CSIR, which had the necessary research capacity.

Prof Anastassios Pouris (Quantitative Evidence Research) agreed that the CSIR and other research councils had been established in order to support the Government; however, the partial commercialisation of these organisations had redirected their efforts. Although he assumed that a number of Government departments used the research councils to support their activities, he had not seen an investigation into how these councils and other Government-owned organisations were contributing to the good of the country.

Prof Michael Kahn (CREST) followed up by asking whether the HESTIIL review could have said more about the role of the science councils.

Prof Anastassios Pouris (Quantitative Evidence Research) responded that the aim of the review had been to provide strategic direction without focusing on particular players. The strategy had suggested that the National Advisory Council on Innovation (NACI) should play a more important role in supporting the President's Office with regard to issues of S&T, but even in this case the report did not go into depth. The effort of the Committee had been to provide broad direction and to leave it to other analysts to provide the details.

Dr Ntsibane Ntlatlapa (CSIR) noted that the coordination mechanisms mentioned in the recommendations already existed. He asked how they might make a difference in this particular scenario and whether other coordination mechanisms could be evaluated to see if they might be more effective.

Prof Anastassios Pouris (Quantitative Evidence Research) responded that South Africa had a pluralistic system of innovation. Each Government department received funds from Treasury to achieve specific objectives and was responsible to spend the money on these objectives without considering what happened in other departments or domains. Coordination was difficult a pluralistic system because it infringed on the autonomy of other departments. An official from one department could not tell another department what to do with its R&D budget, for example. The current recommendation was coordination through monitoring. Rather than having a body to coordinate activities with a particular objective, each department should provide information about what it was doing in its domains. By looking, for example, at the amount of money a particular department spent on R&D, an implicit judgment could be made that the departments that did not spend enough would not be at the forefront of knowledge to support their stakeholders but would likely be using less effective and efficient technologies. Trying to introduce a coordinating mechanism would not be easy as a number of departments might choose not to participate in such efforts.

Mr Mphikeleli Mnguni (Department of Sports, Arts and Culture, DSAC) noted that this Department was passionate about innovation as creativity was key to the work of artists. The challenge, however, was translating creativity into innovation. Regarding the recommendation that STI should be presented to the Economic Cluster he stated that not all departments were members and would therefore be excluded. He asked how DSAC could get involved.

Prof Anastassios Pouris (Quantitative Evidence Research) replied that the Economic Cluster was only one of a number of clusters that should be involved with STI. All sectors should be involved. One of their recommendations was that all Government departments needed an S&T Department at Chief Directorate level.

Mr Tshepang Mosiea (DSI) responded by suggesting that a closer working relationship be established between DSI and DSAC. He observed that the fields of sport, arts and culture comprised a potential catalyst for the inclusion of unemployed youth in the drive for innovation.

Ideally each department should have its own Innovation Sector Plan. Mr Mosiea noted that DWS had been working with DSI through the WRC for a number of years to integrate next-generation sanitation technologies into their ISO standards and certification. Another example was the Science, Technology and Innovation for Sustainable Human Settlements Roadmap described by Dr Mirembé, and the opportunity for DSI and DHS to work together to achieve smart, green settlements in the context of climate change. As Prof Pouris had reported, various departments had established R&D units. If the South African Government was committed to putting the country on a Science-based course, it was important that each department became a player in the NSI, with the necessary support and budget allocation, and a relationship with DSI as the department mandated to drive innovation.

The Decadal Plan on STI (2021-2031) is a plan for the country, and not just the DSI, to embrace innovation across all sectors, including Industry, Small Business, Academia, and Government. The Plan has three building blocks:

- Government leadership was committed to innovation at the highest level, including the Office of the President, and the Inter-ministerial Committee on STI, which ensured that all Ministers took account of the Decadal Plan and how it cascaded down to sector department plans and programmes.
- Coordination of the budget, which was necessary because South Africa had never reached its investment target of one per cent of GDP invested in R&D, meaning that the country was underperforming. Mobilising this one per cent of GDP required co-funding from National Treasury, DSI, sector departmental allocations, and provincial departments.
- Innovation Compacts.

Ms Masingita Khandlhela (eThekweni Municipality), who was involved in coordination of the District Development Model (DDM) in eThekweni Municipality, noted that innovation was a cross-cutting outcome that involved many activities. She asked what the report recommended with regard to stakeholders like municipalities that did not belong to clusters. She also wondered how proactive DSI was in identifying innovation elsewhere and mobilising players like municipalities to participate. As one of three DDM pilots, eThekweni had contacted DSI to investigate partnering with them. She asked for Prof Pouris' perspective on supporting innovation through the DDM. She hoped that departments would work together in a consolidated manner in their areas and apply innovative technologies in practice, for example in the aftermath of the KZN floods.

Prof Anastassios Pouris (Quantitative Evidence Research) was encouraged by Ms Khandlhela's description of activities at the municipal level, even though there was not yet a full picture of success. He agreed that S&T should be a focus of all departments at all levels. There might be bureaucratic issues but Local Government officials should be able to participate in the Economic Cluster and any other coordination mechanisms. DSI was willing to talk to anyone wanting to assist with S&T. Prof Pouris applauded the suggestion that S&T should become a focus of Local Government.

Mr Tshepang Mosiea (DSI) responded that a major limitation to DSI engaging with the eThekweni DDM pilot programme was that DSI did not have a provincial footprint or offices. They had a small team of about seven people but were engaging with the Director-General (DG) to ensure that there was a DSI champion in each District who could engage with the DDM team. They were unable to attend most of the meetings but had been following closely what eThekweni was doing. The VVISDP was a DSI initiative in partnership with the European Union (EU), which had provided seed funding to direct innovation support in municipalities. The South African Local Government Association (SALGA), municipalities, universities, and research entities like WRC, CSIR, and the South African National Energy Development Institute (SANEDI) were part of this programme. They were calling for solutions from industry to help municipalities and forging partnerships for innovation and service delivery with municipalities. The programme was in its early stages and DSI viewed the VVISDP as a portfolio that would grow over the next ten years.

Across municipalities and other spheres of Government there was growing awareness, recognition, and appetite to embrace innovation. The challenge

was how DSI resources and instruments could be made available to support this. DSI had started to engage with municipalities as they recognised the need to address unemployment and create opportunities for youth to generate income and entrepreneurship opportunities, including in the circular economy. In terms of context and focus, all efforts should be directed at the District level. The DDM programme could be seen as a platform to enable innovation.

The questions were how to drive and champion innovation at the highest level in the provinces and districts, and how to make innovation funding available at these levels. Options could include setting up an innovation fund for the DDM, or a Premier Committee on Innovation, similar to the Decadal Plan's Inter-Ministerial Committee. While the mechanisms were not yet in place, there was a clear direction and future milestones regarding strengthening the DDM. Assessment of the District One Plans showed that there were relationships between sector departments other than DSI and districts, for example in establishing digital hubs. It was necessary to determine how DSI could support innovation programmes in municipalities that they had not initiated.

Dr Mamohlodig Tihagale (Water Research Commission, WRC) responded to Ms Khandlhela's question about how to expose municipalities to and involve them in the STI conversation. She referred to the collaboration between DSI and WRC mentioned by Mr Mosiea. WRC managed two platforms that served to accelerate uptake and development of technology and innovation focusing on water. WRC also had partnerships with SALGA, DHS, DWS and DCoG. They worked through the provinces to assist municipalities with research knowledge and technological solutions to respond to disasters situations. DSI worked with other governmental entities in various ways to ensure that all stakeholders knew about and were able to access available technologies. WRC was one of those partnerships. WRC and SALGA had initiated an annual technology and innovation forum held in September each year. They invited water boards and municipalities and showcased technologies developed through the Water Technologies Demonstration Programme (WADER), a partnership between DSI and WRC. They also identified their needs and tried to coordinate a national agenda in response.

Dr Melusi Thwala (ASSAf) noted that it was encouraging to see that the IID Seminars were creating opportunities for stakeholders to connect with one another and take discussions forward.

Dr Mamohloding Tihagale (WRC) asked whether the Institute for STI proposed by Prof Pouris would be a virtual or physical institute.

Prof Anastassios Pouris (Quantitative Evidence Research) responded that it did not matter if the Institute was virtual or physical. A small group of researchers could manage the Institute and researchers all over the country could contribute by assessing technologies. The concern was that currently such a source of information did not exist in South Africa. There was nobody permanently available to evaluate the various technologies and present their findings to Parliament. If it was decided that such a body was required, a permanent source of funding would need to be secured to institutionalise the activity.

Dr Almero Oosthuizen (Western Cape Department of Health) asked what the role of the Centre for Public Sector Innovation (CPSI) was in relation to these issues.

Prof Anastassios Pouris (Quantitative Evidence Research) did not recognise the name of the Centre but commented that if this meant that there would be different centres undertaking various investigations, this would be useful. South Africa's universities were doing an excellent job producing researchers, but mechanisms were needed to transform research findings into the early stages of innovation, which were conducted by other bodies. The Technology Innovation Agency existed but had a very small budget.

Dr Almero Oosthuizen (Western Cape Department of Health) explained that CPSI¹ was a national organ of Government tasked with fostering, supporting and coordinating innovation in the public sector. If such an organ already existed and was not included in this discussion, this might be an oversight but it was another manifestation of how difficult it was to coordinate existing initiatives.

Mr Bonani Madikizela (WRC) asked if DSI should be mandated as a one-stop-shop for all data collection in the country, including the Environmental Bank.

Prof Anastassios Pouris (Quantitative Evidence Research) responded that each department/authority should be responsible for the data/information that they require in order to function appropriately. Data/information should be publicly available to the extent possible.

Dr Almero Oosthuizen (Western Cape Department of Health) mentioned that metrics remain an important driver of behaviour. He asked if there were any more detailed findings on how departments measure STI activities and outcomes. Also, if there were any suggestions/insights about how metrics may be used to contribute to STI uptake in departments.

Prof Anastassios Pouris (Quantitative Evidence Research) said that probably in the current level of development the most important metrics will be a) the existence of a directorate/chief directorate responsible for ST&I and b) the availability of a budget for supporting relevant research, development and innovation.

Ms Kelebohile Lekoape (BASF) asked if a peer review system (as in any science system) would not work between the various departments.

Prof Anastassios Pouris (Quantitative Evidence Research) said that peer review requires certain characteristics which are not available in the public service. For example, scientists are assessed on their outputs in the open literature. Government officials do not have something similar. Over the years databases have been developed to present research outputs (e.g. Web of Science, WoS). Such databases are not available for government departments, although they would have been useful.

FEEDBACK FROM SECTOR DEPARTMENTS: RESEARCH STUDY PARTICIPANTS

Dr Stephen Taylor, Director: Research, Monitoring & Evaluation, Department of Basic Education, DBE

Dr Taylor explained that he was not responsible for STI in Education, but for research, monitoring and evaluation more broadly across the Basic Education Sector.

The DBE had a dedicated Directorate as well as a National Strategy for Mathematics, Science and Technology (MST), which cascaded down to the provinces where most implementation took place. At a curriculum level, new Technology subjects were being introduced, such as the Three-Streams Curriculum Model that included Information Technology (IT), Coding and Robotics. There was a lot of discussion about adapting the curriculum to provide new skills for a changing world or 4IR, but it would take some time to work out how this could be integrated. They were

¹ <https://cpsi.co.za/>

increasingly establishing focus schools that specialised in S&T curricula, and there was an MST Conditional Grant amounting to R391 million in the past financial year.

The DBE Sector was beholden to a large number of mandates. In order to integrate the NSI into the work of the DBE, it was necessary to find a 'landing point' within existing mandates, such as the National Development Plan (NDP), five-year plans, the MTSF, international commitments such as the Sustainable Development Goals (SDGs), continental commitments, priorities from the annual State of the Nation Addresses (SONAs), a broader five-year plan for the Sector, departmental five-year strategic plans, and National and Provincial Annual Performance Plans. It was a challenge for those responsible for planning to align and comply with all these different mandates. Dr Taylor noted that the focus areas for DBE highlighted in previous SONAs included Early Childhood Development, Early Learning, 4IR, and ICT. There had been an initiative called Operation Phakisa, and commitments to roll out Coding and Robotics, and skills for a changing world. In the past two years, however, the focus has been recovering from the Covid-19 lockdown.

ICT had a number of purposes in the DBE sector. It helped to improve school administration, such as the monitoring of school data and management information systems; could be used to support the professional development of teachers; and to improve learning by children, both in terms of technical subject offerings, and enhancing learning in other subjects. A review of the local and international literature on using ICTs to improve learning had revealed that many of the results were not optimistic and some experts were quite sceptical. They warned authorities not to rush into technological interventions as these 'solutions' were often complex and could have negative unintended consequences. Unless they were effectively integrated into broader efforts to support teaching, they were unlikely to be effective. While they could be part of improving the quality of teaching and learning, they were not a stand-alone solution.

The DBE offered 12 niche Technology subjects in the Matric exams. Figures from 2017 and 2019 showed that there were significant racial inequalities in registration for these subjects, with only nine per cent of Black African and Coloured students taking at least one of these subjects, compared to 50 per cent of White and Indian students.

DBE had learnt a number of lessons from the Covid-19 period. From an administrative perspective, the Department had required quick, real-time information from

schools regarding the prevalence of infections, and readiness to implement health and safety protocols. There had been no such system in place, with most administrative systems having significant time lags between school principals submitting data and this being fully captured, cleaned and ready for analysis.

Covid-19 had been hugely disruptive for the Basic Education sector. The initial school closures followed by rotational timetabling had had a huge negative effect. Trying to implement new technologies for remote learning did not work for the great majority of children. The DBE tried using radio, television, and online platforms but this had a very small impact at scale, largely due to the lack of adequate internet access. For a sense of the problem, only eight per cent of households with children had access to the internet, including via smart phones. This resulted in a huge loss of learning. In certain subjects, children at Grade Four level did worse than those in Grade Three before Covid-19. Learning losses due to the disruptions of the previous two years had been equivalent to a full year of teaching. Some basic ICT was still not in place, with less than 80 per cent of schools being connected to the internet. This indicates where the DBE is in relation to the effective use of new technologies in Education.

STI was clearly a cross-cutting feature of Government's work, having a role in all departments and programmes, but it was hard to define and measure. In the STI review, the use of proxies such as words like 'technology' or 'innovation' in Government documents was an interesting way of getting an idea of how aware departments were. But ultimately there could be innovations taking place that were not framed as STI. The important thing in all departments and development projects was that STI should be in service of development needs. In the DBE context, new technologies should be used to the extent that they promote better educational outcomes. The innovations needed went beyond ICTs and included evidence-based interventions and reforms that did in fact improve the quality of learning.

There were many policies and programmes that, when evaluated, did not have the intended outcomes. An important aspect of innovation was improving monitoring and evaluation in order to understand what was actually having an impact so that when new programmes were rolled out, they had been properly tested and evaluated and were likely to have a positive impact. Dr Taylor felt that insufficient money was spent on research and development, broadly defined.

Q&A AND DISCUSSIONS

Dr Melusi Thwala (ASSAf) commented that because infrastructure development was not fully under the control of the DBE, it was a great challenge for the Department to provide such services to schools, resulting in the inequalities that became more obvious during the Covid-19 period.

Dr Thobela Nkukwana (University of Pretoria, UP) asked what the level of Government investment was in the training of Educators specialising in MST.

Dr Stephen Taylor (Department of Basic Education, DBE) was unable to give an actual amount but noted that initial Teacher Education was the responsibility of the Department of Higher Education and Training (DHET). DBE had some bursary programmes that aimed to encourage people to become Teachers of key priority subjects such as Mathematics and Science.

Dr Melusi Thwala (ASSAf) asked if there had been progress in upskilling some of the more severely impacted schools since the lockdowns.

Dr Stephen Taylor (DBE) replied that the vast majority of schools had been extremely negatively affected, with the most affluent ten per cent slightly less affected. In addition to impacts on learning, lockdowns had affected basic nutrition, especially during the initial lockdown when children had not received their daily school meals due to school closures. In terms of rolling out infrastructure and internet connectivity, there were partnerships with telecoms companies and initiatives to roll out more connectivity across the system. There had been attempts to zero-rate educational websites, digitise textbooks, and make online learning opportunities available. Lockdowns had created an impetus to speed up existing remote learning initiatives but in reality, many schools were not ready for remote learning and the priority was to get children back to school and institute recovery programmes, which did not necessarily use new educational technologies.

Dr Ntsibane Ntlatlapa (CSIR) noted that after Operation Phakisa there had been a number of ongoing meetings with National Treasury, DCDT, and DSI, partly to address issues relating to educational ICTs and connectivity. He asked if this coordinating mechanism had continued after Operation Phakisa and how the Education Sector could benefit from what had been learnt from this collaboration.

Dr Stephen Taylor (DBE) replied that Operation Phakisa had taken place in 2015 and 2016. The Education workstream had focused on ICT initiatives, connectivity, and using devices in schools. The President had followed up with statements regarding providing devices across the system but there were budgetary constraints and it would be more realistic to provide devices for Teacher Professional Development, which was another Operation Phakisa workstream. Dr Taylor's Directorate had done a research project evaluating the impact of virtual coaching for teachers, giving them an electronic tablet, and providing virtual coaching, electronic lesson plans, and additional tutorial resources. Unfortunately this had not had any noticeable impacts on learning. The teachers used the tablets but it did not impact on learning compared with in-person, physical coaching. Relevant sections within DBE had continued working on digitising textbooks that were part of the official catalogue. Another focus of Operation Phakisa had been e-administration and colleagues in the Education Management and Information Systems (EMIS) section were working towards a modernised, online administration system for South African schools. Many schools continued to submit their figures on CDs, which were then captured at provincial warehouses and collated into a national database. These were some examples of work continuing since the end of Operation Phakisa.

Mr Mphikeleli Mnguni (DSAC) commented that the DSAC had established its research hub: The South African Cultural Observatory (SACO) managed by the Nelson Mandela Metropolitan University in partnership with three other universities.

Ms Masingita Khandlhela (eThekweni Municipality) commented that innovation was expensive and that eThekweni Metro was one of the most innovative municipalities. Their models of finding solutions to improving service delivery comes back to the implementation of innovation. She encouraged anyone with innovative projects to partner with the Metro to test DDM.

She further highlighted that the greater focus at the highest level is sometimes the problem. She referred the participants to check their DDM Draft One Plan and see how important it is to get some implementation commitments from partners. But most importantly is how DSI can partner with the Metro to respond to development priorities. She shared her contact information for anyone requiring information on their DDM One Plan (Masingita.Khandlhela@durban.gov.za.)

WAY FORWARD CONCLUDING REMARKS

Mr Ephraim Phalafala, Deputy Director: S&T for Sustainable Human Settlements, Department of Science and Innovation, DSI

Mr Phalafala thanked Dr Thwala for chairing the session and Dr Mabotha for coordinating the series of seminars. He appreciated Prof Soodyall's overarching statement regarding the importance of the study, noting that science, evidence and knowledge had been key to tackling Covid-19, and that STI should not be championed by DSI alone but other departments should come to the fore. Mr Mosiea had strengthened this message by stating that there should be a whole-of-government and whole-of-society approach to innovation. Mr Phalafala appreciated that different voices were sharing the same message.

The approach of DSI was to run STI demonstration projects on the ground, to learn from these projects, and to share what had been learnt with the relevant sector departments. DSI had commissioned this study because they wanted to know whether the evidence, learning and knowledge shared with the sector departments through seminars and technology demonstrations was truly making an impact.

Mr Phalafala thanked Dr Mirembé, noting the challenges presented by DHS, and the ABT projects she described. They would still need to look at acceptability of these alternative technologies in terms of costs, structural defects, financing, and capacity to deliver especially at a local level, to ensure delivery of what had been demonstrated by the innovation holders.

Prof Pouris was thanked for delivering the main presentation. Due to Covid-19 the study could not involve all departments as originally intended. The findings and recommendations had been presented to the Executive Committee of DSI, who had agreed that the study should be extended to other departments.

Mr Phalafala thanked Dr Taylor for his presentation and noted that DSI and DBE worked well together. He had personally participated in Operation Phakisa and had a good working relationship with the ICT Forum, which worked to make technologies available to the Education Sector that could enable positive outcomes.

Regarding the way forward, DSI was finalising how best to craft the findings and recommendations. This might entail expanding the study to more departments to ensure that the findings were even more rigorous and that the recommendations catered to everyone. He noted the point that the CPSI had not been considered and stated that when the study was extended, it would need to include all stakeholders in the innovation ecosystem, especially in governance.

Mr Phalafala thanked all the participants for their questions and comments. He had appreciated the insights from the WRC regarding collaboration with the DDM and DCoG, particularly considering the fact that DSI lacked provincial and local footprints. DDM might become a vehicle to ensure that STI was more visible at a local level. The inputs of participants would be considered and the draft report would be circulated for purposes of confirmation of the contents.

Dr Thwala thanked the attendees, panellists, and the support team for a successful session.

ANNEXURE A: LIST OF ACRONYMS

4IR	Fourth Industrial Revolution
ABT	Alternative Building Technology
ANC	African National Congress
ASSAf	Academy of Science of South Africa
CETA	Construction Education and Training Authority
CPSI	Centre for Public Sector Innovation
CSIR	Council for Scientific and Industrial Research
DALRRD	Department of Agriculture, Land Reform and Rural Development
DCDT	Department of Communications and Digital Technologies
DBE	Department of Basic Education
DCoG	Department of Cooperative Governance
DDM	District Development Model
DEFF	Department of Environment, Forestry and Fisheries
DG	Director-General
DHET	Department of Higher Education and Training
DMRE	Department of Mineral Resources and Energy
DPME	Department of Planning, Monitoring and Evaluation
DPWI	Department of Public Works and Infrastructure
DHS	Department of Human Settlements
DoH	Department of Health
DSAC	Department of Sports, Arts and Culture
DSD	Department of Social Development
DSI	Department of Science and Innovation
dtic	Department of Trade, Industry and Competition
DWS	Department of Water and Sanitation
EMIS	Education Management and Information Systems
ePPMOSA	e-Participation and Policy Modelling Platforms for South Africa
EU	European Union
GDP	Gross Domestic Product
GIST	Government Institute for STI
HESTIIL	Higher Education, Science, Technology, and Innovation Institutional Landscape
HSRC	Human Sciences Research Council
IBT	Innovative Building Technology
ICT	Information and Communications Technology
IRFA	Intergovernmental Relations Framework Act
IID	Innovation for Inclusive Development
IT	Information Technology
KZN	KwaZulu-Natal

MoU	Memorandum of Understanding
MSF	Mathematics, Science and Technology
MTSF	Medium Term Strategic Framework
NACI	National Advisory Council on Innovation
NDP	National Development Plan
NHBRC	National Home Builders Registration Council
NSI	National System of Innovation
R&D	Research and Development
S&T	Science and Technology
SANEDI	South African National Energy Development Institute
SONA	State of the Nation Address
STI	Science, Technology and Innovation
UCT	University of Cape Town
VVISDP	Viability and Validation of Innovation for Service Delivery Programme
WADER	Water Technologies Demonstration Programme
WRC	Water Research Commission

ANNEXURE B: LIST OF PARTICIPANTS

First Name	Last Name	Organisation
Nadia	Algera	Academy of Science of South Africa (ASSAf)
Alice (Dr)	Ashwell	Write Connection – Scribe
Marlon	Cerf	South African Medical Research Council (SAMRC)
Mmampei	Chaba	Department of Science and Innovation (DSI)
Alison	Chapman	Ekurhuleni Water Care Company (ERWAT)
Leon	Chetty	eThekweni Municipality
Ivan	Claims	Drakenstein Municipality
Oltman	Fourie	Department of Women, Youth & Persons with Disabilities (DWYPD)
Lindiwe	Gama	Department of Science and Innovation (DSI)
Fred	Gault	UNU-MERIT
Wieland (Prof)	Gevers	University of Cape Town (UCT)
Richard	Gordon	South African Medical Research Council (SAMRC)
Siyabonga	Gumede	Technology Innovation Agency (TIA)
Alexis	Habiyaremye	University of Johannesburg (UJ)
Roula	Inglesi-Lotz	University of Pretoria (UP)
Michael	Kahn	Centre for Research on Evaluation, Science and Technology (CREST)
Emmanuel	Kasese	Mintek
Sekgoilane	Kgopotso	National Treasury
Masingita	Khandlhela	eThekweni Municipality
Gugu	Kubheka	University of Pretoria (UP)
Siphukuthula	Kumalo	Department of Science and Innovation (DSI)
Siphiwo	Landzela	Mossel Bay Municipality
Kelebohile	Lekoape	BASF
Tshepiso	Lekoma	Department of Trade, Industry and Competition (DTIC)
Norma	Lerobane	Department of Water & Sanitation (DWS)
Phatu	Letsoalo	Office of the Premier: Limpopo Provincial Government
Precious	Lukhele	Department of Science and Innovation (DSI)
Bonani	Madikizela	Water Research Commission (WRC)
Dimakatso	Madondo	Technology Innovation Agency (TIA)
Litha	Magingxa	Agricultural Research Council (ARC)
Ditshego	Magoro	National Treasury
Rasigan	Maharajh	Tshwane University of Technology (TUT)
Johnny	Mahlangu	University of the Witwatersrand (Wits)
Victor	Makgalemele	Tirisan Tech Solutions
Matsimbi	Makondo	University of Pretoria (UP)

Ndivhuwo Edward	Malindi	Office of the Premier: Limpopo Provincial Government
Mmasedile	Mariri	Technology Innovation Agency (TIA)
Godfrey Tseisi	Masithela	Eastern Cape Department of Sport, Recreation, Arts & Culture
Matshidiso	Matabane	South African Council for Natural Scientific Professions (SACNASP)
Phillemon	Matabola	Mintek
Penny	Mathumba	Mintek
Gauta	Matlou	University of Johannesburg (UJ)
Kabo	Matshetshe	Mintek
Sibu	Mawonga	Department of Water and Sanitation (DWS)
Bekubuhle	Mbentse	Department of Water and Sanitation (DWS)
Hayley	McKuur	National Department of Human Settlements (NDHS)
Sandiswa	Menze	Office of The Premier: Eastern Cape Provincial Government
Jennifer (Dr)	Mirembe	National Department of Human Settlements (NDHS)
Mbuso	Mkumbuzi	Nurses At A Go
Bongani	Mlasi	Mintek
Mphikeleli	Mnguni	Department of Sport, Arts and Culture (DSAC)
Portia	Mnikathi	Department of Science and Innovation (DSI)
Joyce	Mokobi	Office of the Premier: Limpopo Provincial Government
Benny	Molefe	National Research Foundation (NRF)
Thabiso	Molemohi	South African Bureau of Standards (SABS)
Thato	Morokong	Department of Science and Innovation (DSI)
Tshepang (Mr)	Mosiea	Department of Science and Innovation (DSI)
Palesa	Mothapo	Stellenbosch University (SU)
Palesa	Motsoeneng	Department of Science and Innovation (DSI)
Ashton	Mpofu	GreenCape
Phumu	Mudumela	National Treasury
Sithembiso	Myeni	University of KwaZulu-Natal (UKZN)
Mark	Napier	Council for Scientific and Industrial Research (CSIR)
Phumzile	Ncube	University of Johannesburg (UJ)
Lufuno	Nemadodzi	Mintek
Thobela	Nkukwana	University of Pretoria (UP)
Onkemetse	Nkwana	Technology Innovation Agency (TIA)
Ntsibane	Ntlatlapa	Council for Scientific and Industrial Research (CSIR)
Andrew	Okem	University of KwaZulu-Natal (UKZN)
Almero	Oosthuizen	Western Cape Department of Health
Angus	Paterson	National Research Foundation (NRF)
Modikoe	Patjane	Department of Science and Innovation (DSI)

Ephraim (Mr)	Phalafala	Department of Science and Innovation (DSI)
Letlotlo	Phohole	University of the Witwatersrand (Wits)
Anastassios (Prof)	Pouris	Quantitative Evidence Research/UP
Sibongile	Radebe	Technology Innovation Agency (TIA)
Nosizo	Sebake	Council for Scientific and Industrial Research (CSIR)
Busisiwe	Sibiya	eThekweni Municipality
Thembinkosi	Siganda	City of Cape Town
Isaai	Sihlangu	National Advisory Council on Innovation (NACI)
Keneiloe	Sikhwivhilu	Mintek
Cynthia	Sithole	Technology Innovation Agency (TIA)
Anele	Slater	University of Johannesburg (UJ)
Himla (Prof)	Soodyall	Academy of Science of South Africa (ASSAf)
Vanessa	Steenkamp	University of Pretoria (UP)
Swastika	Surujlal-Naicker	City of Cape Town
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