CSIR Overview

Presentation to the Portfolio Committee on Health

29 February 2012
Who we are

What we do

Focus on health

Looking ahead: Health
Who we are

What we do

Focus on health

Looking ahead: Health
"The objects of the CSIR are, through directed and particularly multi-disciplinary research and technological innovation, to foster, in the national interest and in fields which in its opinion should receive preference, industrial and scientific development, either by itself or in co-operation with principals from the private or public sectors, and thereby to contribute to the improvement of the quality of life of the people of the Republic, and to perform any other functions that may be assigned to the CSIR by or under this Act.”
# National System of Innovation

**Who we are**

**What we do**

**Focus on health**

**Looking ahead: Health**

<table>
<thead>
<tr>
<th></th>
<th>BASIC RESEARCH</th>
<th>DIRECTED RESEARCH</th>
<th>DEVELOPMENT</th>
<th>IMPLEMENTATION</th>
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<tbody>
<tr>
<td></td>
<td>[Advancement of knowledge]</td>
<td>[New understanding of research domains]</td>
<td>[New technologies, Products or services]</td>
<td>[Impact on economy and society]</td>
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- **Universities and national facilities**
- **CSIR and other science councils**
- **Industry/public sector**

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The CSIR reports to the Minister of Science and Technology

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Council for Scientific and Industrial Research
Selected public research institutions and funding agencies

Who we are

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Focus on health

Looking ahead: Health

Multidisciplinary research - multisector

Mining and mineral processing

Council for Scientific and Industrial Research

Agriculture

Mintek

National Research Foundation

Public research institutions and funding agencies

Human sciences

Medical Research Council

Funding agency

Geosciences

Water Research Commission

Funding agency

Human Sciences Research Council

Council for Geosciences

Funding agency

Selected public research institutions and funding agencies
People and demographics (current)

- 2355 members of staff
- 1486 in SET * base
- 295 with PhDs
- 468 with Master’s
- 53.3% of SET base black
- 34% of SET base female

Financials (2010/11)

- Contract Income: R1175.1 m
- Parliamentary Grant: R535.3 m
- Royalties: R8.6 m
- Total operating income: R1.72 billion
- Net Profit: R35.5 m

*SET: Science, engineering and technology

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### Awards and recognition

<table>
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<tr>
<td>Prof Suprakas Sinha-Ray, only one from Africa in the top 50 chemists in the world</td>
<td>2010 Logistics Achievers Award to State of LogisticsTM team</td>
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<td>2011 JD Roberts Award to Geoff Abbott</td>
<td>Digital Doorway evolved into Digital Drum, cited by <em>Time Magazine</em>, as one of the top 50 inventions in the world for 2011</td>
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<tr>
<td>Best employer status by Corporate Research Foundation Institute in 2010 and 2011</td>
<td>Listed as one of world’s top science and technology think tanks by US-based Think Tanks and Civil Society Program</td>
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Who we are
What we do
Focus on health
Looking ahead: Health
External environment

Who we are

What we do

Focus on health

Looking ahead: Health

12 Government Outcomes

- Safety for South Africans
- Long & healthy life for South Africans
- Decent employment through inclusive economic growth
- Effective public service & inclusive citizenship
- Effective local government system
- Sustainable human settlements
- Competitve & responsible economic infrastructure
- Protecte denvironmental assets & natural resources
- Create a better quality of basic education
- Protecte dpeople, property, & mental assets & World
- A skilled and capable workforce
- Long & healthy life for South Africans
National Development Plan

An inclusive and integrated rural community

Improving infrastructure
Radar technology: The AwareNet concept

- Integrated sensor systems

- Enhances situation awareness: provide real-time area of interest
  - Persistent: All the time with sufficient update rate
  - Ubiquitous: Everywhere at once
  - Recognised: Classes, identities, threat levels, priority
Sensors

- Ultrasonic transducers
- Technology detects cracks on ageing railway lines that can cause derailments
- DST contract for technology upgrading and commercialisation of the ultra-sonic rail break system
- Imminent contract for 2200 transducers for Transnet’s iron ore Orex line to Saldanha
- International interest for use in rail infrastructure for high speed trains, heavy haul routes and metros
Additive manufacturing

- Novel technology where materials are deposited, fused, one layer at a time. Ideal for three dimensional functional parts
- Ideal for titanium-based manufacturing
- AeroSwift: CSIR and AeroSud join forces to build unique aerospace components for Airbus and Boeing
Highlights: Natural environment

Sensors

- Low-cost robotic observation systems for aquatic ecosystems
- Built new measurement buoys: sensors for radiometry, temperature, wind speed, water current speed, GPS
- Persistent environmental monitoring
- Collaborative, multidisciplinary work with universities
Environmental monitoring

- Freshwater priorities for South Africa

- Information on rivers and wetlands to be maintained in a natural condition while sustaining economic and social development

- Atlas shows 19 priority area maps - one for each SA water management area for preservation

- Uptake country-wide: DWA, DEA, CapeNature, Endangered Wildlife Trust
Strong competence in building technologies

- Improved low-income housing

- CSIR developed a 40m² low-income demonstration house

- CSIR house is more thermally comfortable; durable; faster to build; easily extendible and less dependent on municipal services

- Pilot project rolled out at Kleinmond, Western Cape, incorporating many features
Infrastructure development

- Strong competence in infrastructure:
  - Road
  - Rail
  - Ports
  - Water

- Including:
  - Planning
  - Design
  - Construction
  - Management
  - Maintenance

- Renewed engagement with DoT, Human Settlements, DWA and PICC

Wildlife: water and infrastructure development

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Information and communications technology

- **CSIR support to South African Research Network (SANReN)**
  - National backbone completed
  - Metro rings completed
  - Backbone extensions to outlying campuses commissioned
  - At least 10Gbps to all institutions and HEIs

- **Support to SALT and Meerkat/SKA**
  - SANReN fibre connection to SALT and Meerkat/SKA completed
  - CHPC machine upgraded to 61 teraflop to achieve number 312 on TOP500
  - 1st phase of very large data handling capability installed at CHPC
  - Meerkat technology localization study
Information and communications technology

- Digital Doorway

  Provides access to computers to improve ICT literacy and access to information; learn through experimentation by rural communities.

- Digital Doorway evolved into Digital Drum, cited by *Time Magazine*, as one of the top 50 inventions in the world for 2011.
Challenges in Health: A Global Perspective

Who we are | What we do | Focus on health | Looking ahead: Health

[Map of global health challenges with countries colored and sized based on life expectancy and GDP per person.]
Focus on Health

Two areas of focus

1. The Health Care System

1. Reduction of Burden of Disease
## The Health Care System Interventions

<table>
<thead>
<tr>
<th>Health Care System Component</th>
<th>CSIR Intervention</th>
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<tbody>
<tr>
<td>Health Care Delivery</td>
<td>Logistics, databases, Enterprise architecture</td>
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<tr>
<td>(Planning, coordinating, regulating, organizing, monitoring)</td>
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<tr>
<td>Health Care Providers</td>
<td>Automated Patient Records, Patient files, Medical history</td>
</tr>
<tr>
<td>(Professionals, practitioners, professional Schools)</td>
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<tr>
<td>Institutions</td>
<td>Logistics, Infrastructure, Patient files, therapy management</td>
</tr>
<tr>
<td>(Hospitals, clinics, medical aid associations)</td>
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<tr>
<td>Society</td>
<td>Personal health information, access to health information</td>
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<tr>
<td>(Individuals and communities in need of prevention, diagnosis, treatment, rehabilitation)</td>
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### Burden Disease Interventions

<table>
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<th>Intervention Areas</th>
<th>CSIR Intervention</th>
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<tbody>
<tr>
<td><strong>Diagnosis</strong></td>
<td>Development of point of care diagnostics</td>
</tr>
<tr>
<td>(Early, accurate detection of diseases of relevance to SA)</td>
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<tr>
<td><strong>eHealth</strong></td>
<td>Communication platforms for population awareness, telemedicine, epidemiology</td>
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<tr>
<td>(Application of ICT platforms to support healthcare provision)</td>
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<tr>
<td><strong>Affordable Cures</strong></td>
<td>Novel therapeutics, technologies, devices and delivery systems</td>
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<td>(cost-effective, robust, validated solutions available at PoC)</td>
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<tr>
<td><strong>Nutrition</strong></td>
<td>Nutritional fortification, Food supplements, value-added traditional foods</td>
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<tr>
<td>(Improved foods and supplements for general wellness and the prevention of specific conditions)</td>
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Healthcare industry value chain

Who we are | What we do | Focus on health | Looking ahead: Health

- Producers
  - Drug Manufacturing
  - Device Manufacturing

- Purchasers
  - Wholesalers
  - Group purchasing
  - Distributors

- Providers
  - Hospitals
  - Physicians
  - Integrated delivery networks
  - Pharmacies

- Fiscal Intermediates
  - Insurers
  - Health maintenance organisations
  - Benefit managers

- Payers
  - Government
  - Employers
  - Individuals
  - Employer coalition

- Process development
- Drug delivery technologies
- Prototypes
- IT/Electronic records
- Technology evaluation
- Logistics
- Infrastructure design
- Enterprise architecture
- Information Security
- Databases
- Enterprise architecture
- Information Security
- Databases

3/2/12

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our future through science
Infrastructure for TB infection control

- Infrastructure design to minimise risk of cross infection between patients and infection of healthcare staff
  - Global Fund project in partnership with DoH
  - 8 clinics upgraded to manage MDR TB patients. 400 new long term care beds
  - Additional 2 facilities upgraded post Global Fund project.
Global Fund Drug Resistant -TB Infrastructure Project

- 8 sites (of 22 MDR facilities in SA)
- 400 new long term care beds

Public Health Facilities in South Africa
- Hospitals
- Tuberculosis centres
- Primary health centres

Overlay on population distribution
• Optimising acquisition and management of South Africa’s public healthcare infrastructure
  • national norms, standards, guidelines and performance benchmarks for all levels of health care facilities
• Implementation of a Project Management Information System (PMIS)
• Development of health care infrastructure cost modelling capability for the DoH

• Partnership between DoH, DBSA and the CSIR
Umbiflow: Foetal Assessment System for Clinics

- Enables sick-small foetus diagnosis at the primary health care level: Save >3,000 babies p.a. Enables ten-fold reduction in referrals to secondary level.

- Low cost, easy to use, PC / Tablet computer, previously only possible by specialists at the secondary level.

- System entering regulatory process for CE Mark during 2012.

- “Mother & Child Suite” proposed: to include Foetal Heart Rate & Maternal BP

- Spin off application into a low cost, clinic based diagnostic system to screen population for cardio-vascular disease
**Emerging health technologies: diagnostics**

- Point of care diagnostic technologies
- Mobile diagnostic technologies

E.g. Tablet-based technology to measure full blood count

Advantages include:

- Lower capital investment and operational costs
- Lower-skilled personnel at point of care
- Faster turn-around time on diagnostics (near real time)
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Enabling primary healthcare as the main mechanism of healthcare service delivery

Primary healthcare to be re-engineered as the main mode of healthcare delivery (Minister Motsoaledi Budget Vote Speech 2011).
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**Functions of CH practitioners:**
- health promotion
- disease prevention/diagnosis
- curative function

TB and pilots extremely successfully in identifying people infected with TB and reducing mother to child HIV transmission.

NPC National Development Plan: require 700 000 to 1.2 million CHPs

### Multimedia training platform
- BB4All mobile platform
  - >200 sites already available
- ARTIST video platform (advanced development)

### Primary diagnosis
- automated BP, temperature, heart rate etc (pipeline)

### Access to expert advice
- BB4All platform
- Multimedia access (video, radio)

### Data collection (epidemiology)

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Current issues:
- Multiple patient visits before diagnosis and treatment
- Geographic separation of clinic and pathology lab leading to delayed diagnosis and treatment
- Limited availability of expert skills at clinic

mHealth – utilise ICT technology to connect expert opinion with the point of care, leading to near real time diagnosis and treatment.

Mobile or electronic diagnosis and healthcare
- Cellnostics mobile blood count diagnosis
- Video diagnosis (ARTIST technology, pipeline)

Optimised sample logistics
- Logistics and supply chain solution (nhs)
- NHS logistics and supply chain (pipeline)

Automated diagnosis
- Automated BP, temperature, heart rate etc (pipeline)

Point of care diagnosis
- UMBIFLOW - foetal health monitor (clinical evaluation)
- mScan cardiovascular monitor (pipeline)
- Range of POC diagnostics for TB, malaria, HIV (pipeline)

FutureClinic
Lack of compliance with treatment regimes leads to people remaining ill and increases incidence of drug resistant pathogens. By remaining ill spread of disease in the population is increased.
A culture of using evidence to inform planning, resource allocation and clinical practice must be created (NPC, National Development Plan)

Healthcare facilities should be located in areas where they deliver the greatest impact for healthcare service delivery – population demographics, accessibility, disease burden

**National Health Services Atlas**
- BE geospatial analysis and GIS platform (mature)

**Regional Atlas focused on priority areas**
- BE geospatial analysis platform and GIS platform (pipeline)
Thank you