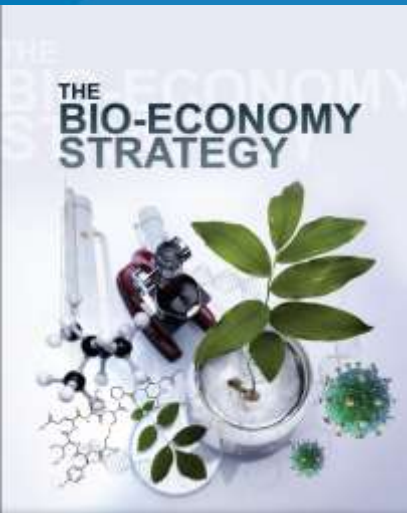


# Bio-economy Strategy



By: Mr Thabang Bambo  
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DST Industry-Meets-Science workshop  
27 November 2014, Durban



science  
& technology

Department:  
Science and Technology  
REPUBLIC OF SOUTH AFRICA

# Bio-economy

Target: 5% GDP attributed to bio-economy by 2050 (~ R175 billion in today's terms).



- R2 billion invested by BRICs / TIA into biotech innovation (2003-10).
- By 2014, the top 7 biotech companies had a combined annual turnover of nearly R1 billion (from a direct investment of R63million).
- jobs, wealth creation, export earnings, improved QoL etc.

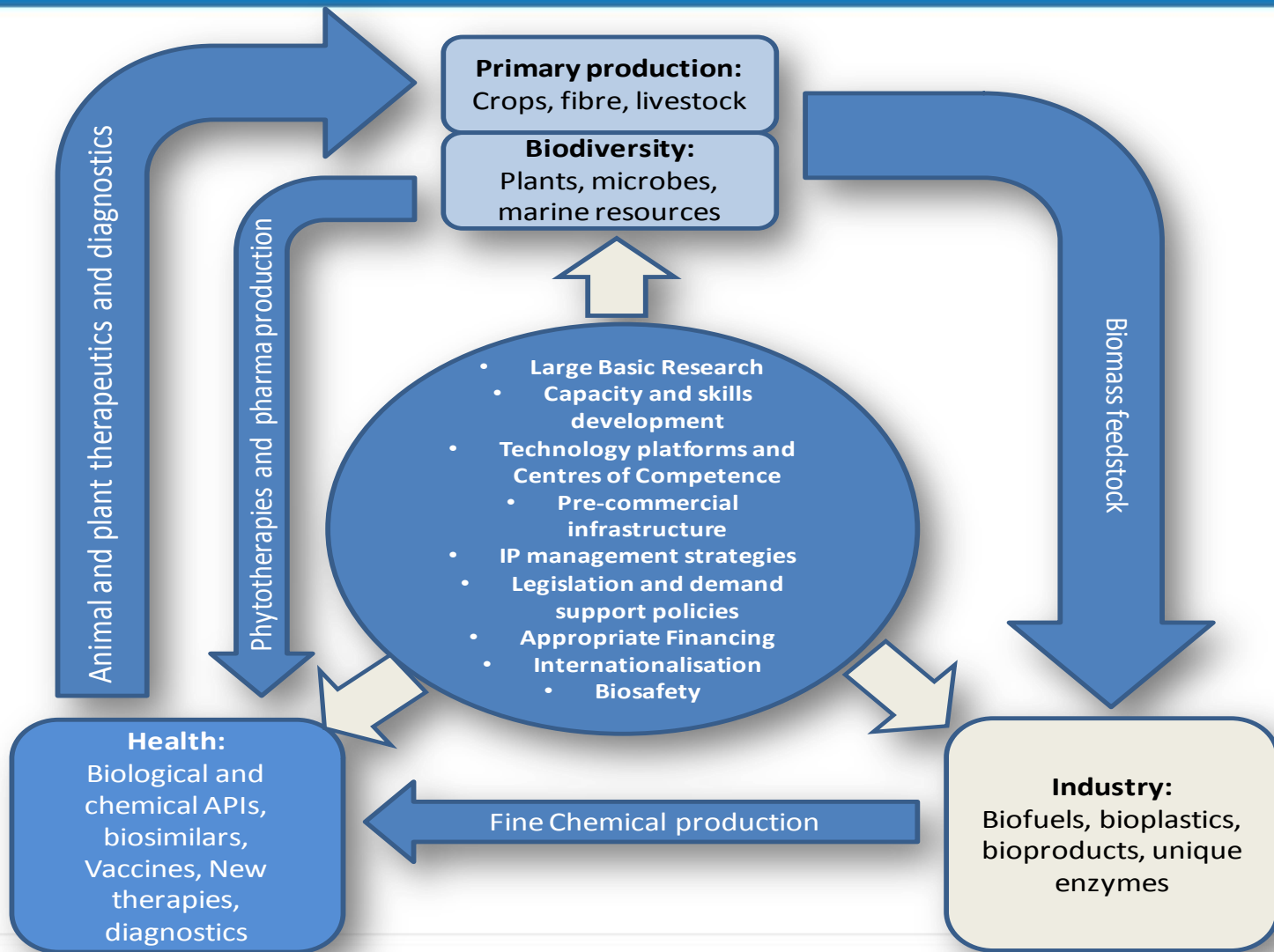


# Current contextualization and Opportunities for industrial bio-economy: Some examples

- Carbon intensive economy
  - South Africa is a water scarce country with water availability projected to decrease to less than 1000 m<sup>3</sup>/person/year by 2025. (nexus of energy, water, and climate change).
  - Biofuels Industrial Strategy- mandatory blending of petrol and diesel with biofuels by 2015.
  - Alignment of the National Waste Management Strategy, e.g. – to reduce, reuse, recycle, recover energy from waste and lastly dispose or landfill the respective waste material
  - Advance Manufacturing Technology Strategy (AMTS) - natural fibre - reinforced composites, applicable to packaging, aerospace, automobile industries
- \*Cross cutting opportunities with the agriculture and health implementation plans  
– agrowaste/biomass beneficiation - agriculture, fine chemicals - health
- \*Need for feasibility studies



# Bio-economy Strategy 2013: Key Pillars






# Factors enabling Bio-economy

- Human Capital Development (HCD)
- Access to next generation technologies
- Enhance the innovation system
- Incentives and funding
- Intellectual property management
- Alignment of regulations
- Ethics framework
- Institutional arrangements
- Governance and co-ordination
- Effective communication and marketing





## Bio-economy Industrial and Environmental Sector Implementation Plan: Strategic Programmes

- **Bioprocess and Biomanufacturing Initiative** - Biobased process and product development to strengthen South Africa's biomanufacturing capability, e.g. Use in light materials etc - Capitalizing from existing instruments such as the BDC and decentralizing into regional pilot plant facilities
  - **The Integrated Biorefineries Initiative (IBI)** - Use of Biomass to produce biofuels, bio-based materials and chemicals - Positioning South Africa as the future investment destination for biofuels and other high value products through integrated biorefineries pilot plants (existing models, Futurol, ARD, etc)
  - **Waste, Waste water and mineral beneficiation** - efficient waste and waste water treatment technologies and mineral beneficiation towards socio-economic, and impact - – propagating water purification technologies
  - **Bio-innovation system support** – that relates to efficient coordination and effective resources needed for implementation
- 





# Bioprocess and Biomanufacturing Initiative

To provide a platform for RDI support across the entire value chain in the following sub-programmes:

- ***Bioprocessing Development Network***– production of proteins, peptides, biological agents (*biocontrol, bioremediation, probiotics*) and speciality enzymes through wild type and proprietary expression system.
- ***Plant Biopharming*** – expression of vaccines, antibodies and other proteins in plants to facilitate product prototype development. Focus will be on veterinary biologics.
- ***Bioprospecting and Agroprocessing*** – transformation of indigenous knowledge and natural plant resources into higher value products ready for use (e.g. nutraceuticals, cosmeceuticals, traditional medicines, canning mopami worms, production of jam etc. )



# Bioprocess and Biomanufacturing Initiative model & role player

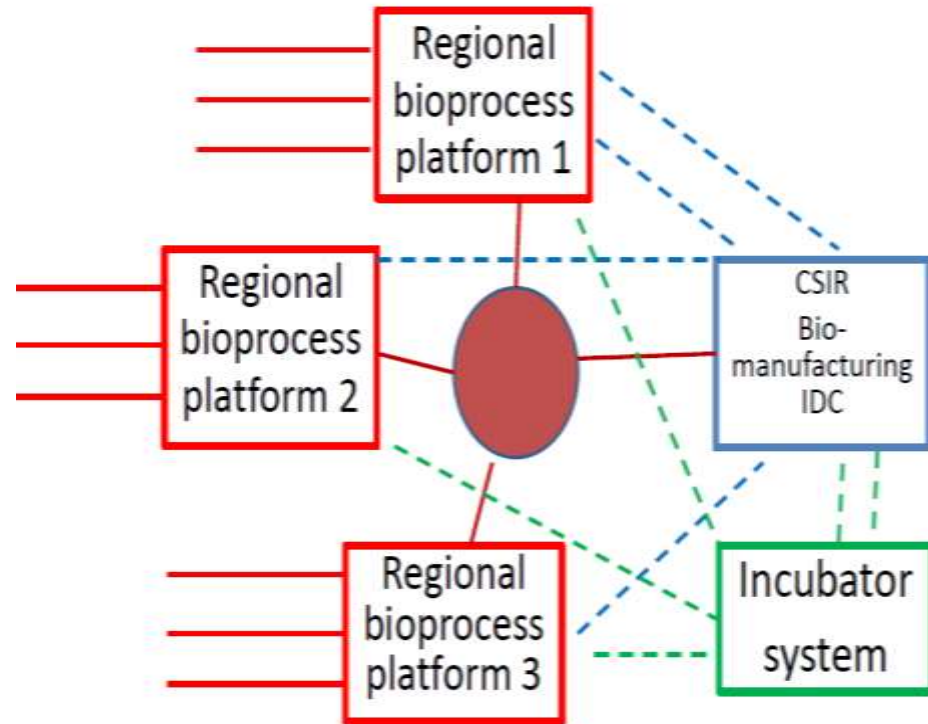
- **Possible regional nodes**

- Western Cape
- Northern Cape
- Eastern Cape and
- KwaZulu Natal

(for process development and commercialization)

- **Fund Managers**

- NRF (HCD-POC)
- TIA (Technology advancement to commercial readiness)
- IDC (Commercialization)







# Integrated Biorefineries Initiative

To provide a platform for RDI support and technology advancement towards the production of biobased products in the following sub-programmes:

- **Platform chemicals (from agro waste)** – production of a wide range of bulk and speciality or platform chemicals that can be produced from biobased resources. The DST Waste RDI Roadmap is an example of a model to be followed
- **Biocomposites and Bioplastics** – innovation in the production of natural fibre based composite materials for application in the aerospace, defence, gas & oil, chemical & mineral process and the transport industries
- **Biocatalysis initiative** – an enabling technology through the application of microorganisms or enzymes towards better and cheaper routes to production of biobased commodities e.g pharmaceuticals, food additives, textiles etc.





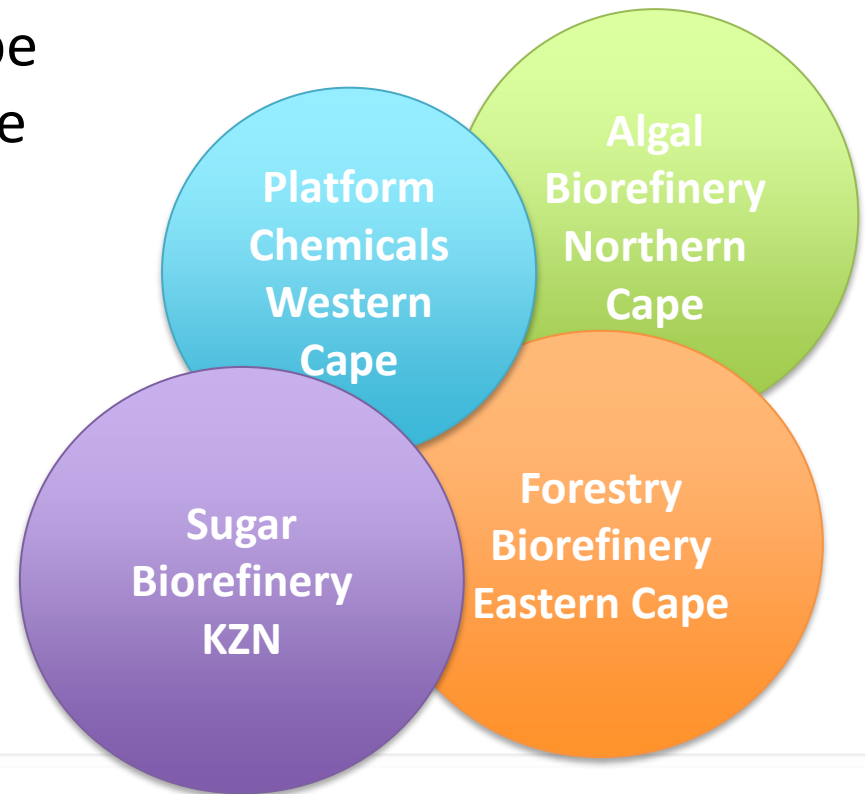
## Integrated Biorefineries Initiative cont...

- **Algae bio-refineries cluster** – The Cluster will provide a platform for RDI support to generate sufficient of algae biomass for commercial production of organic compounds, including a range of high-value products, protein feedstock, algal biodiesel, carotenoids, nutraceuticals and functional food ingredients. Work in collaboration with DST Transport Fuels Unit
- **Forest bio-refineries cluster** – Integration with the current Eucalyptus Genomics Platform (Programme 2) and the Industrial Innovation Partnership Fund (IIPF) (Programme 5) to enhance industry competitiveness in the production of biofuels, chemicals, and alternative power streams such as hydrogen (H<sub>2</sub>)
- **Biomass Supply Programme**- use of residues or wastes from processing of agricultural products, e.g agro-waste from paper and pulp industry, sugar industry and a number of food processing industries (integration with IKS based initiatives and rural development support programmes)



# Pilot Demonstrations: Regional initiatives

- **Regional pilot facilities**
  - Platform chemicals-Western Cape
  - Algal Biorefinery -Northern Cape
  - Forest Biorefinery -Eastern Cape
  - Sugar: KwaZulu Natal
- **Fund Managers**
  - TIA/IDC





# Waste, Waste water and mineral beneficiation

To provide efficient waste and waste water treatment technologies, bioresource utilisation and mineral beneficiation that have economic, environmental and social impact through the following sub-programmes: (overlaps with Waste and Water RDI Roadmap)

- **Bio- hydrometallurgical Process Development** -
    - Technology that involves treatment and extraction of metals from ores e.g. Bioleaching where anaerobic bacteria are used to oxidise ferrous iron to ferric iron (providing the oxidant for the dissolution of sulphide minerals) while also oxidising sulphurous comp of the sulphides to sulphuric acid (maintaining the acidic env. required for the chemistry)
  - **Platform chemicals (Industrial waste)** –
    - production of precursors for making diverse products (e.g. chemicals, materials, polymers and fuels) - overlaps with agrorefineries
  - **Waste water Refineries**
    - to maximize biomass productivity through wastewater treatment (drinking water), and
    - Conversion of waste residues to valuable products (socio-economically)
- Overlaps with some of the work done by WRC (and funded by EST)



# Expected Outcomes & Impact

OUTCOMES	IMPACT
<b>1</b> Increased <b>use of renewable resources</b> as <b>raw materials</b> for industrial applications	<ul style="list-style-type: none"><li>• Enhanced competitiveness of industries</li></ul>
<b>2</b> Increased <b>application of biotechnology</b> in the <b>manufacture of products</b> across various industries	<ul style="list-style-type: none"><li>• Eco-efficient use of the renewable raw materials</li></ul>
<b>3</b> <b>Beneficiation of Indigenous knowledge</b> systems and biological resources	<ul style="list-style-type: none"><li>• Sustainable industries less reliant on limited fossil fuels</li></ul>
<b>4</b> Increased <b>production of biomass-derived energy</b> based on biotechnology for everyday consumption	<ul style="list-style-type: none"><li>• Economically &amp; environmentally sustainable manufacture of products</li></ul>
<b>5</b> Increased <b>rural development</b> that contributes to the supply of raw renewable materials	<ul style="list-style-type: none"><li>• SA's dependency on fossil fuels reduced</li><li>• SA's import of fuels reduced</li><li>• Meaningful job creation</li></ul>
<b>6</b> Increased <b>cooperation, collaboration</b> and <b>support</b> between researchers, industry, government & civil society	<ul style="list-style-type: none"><li>• Improved standards of living for all SAs</li><li>• Reduced waste generation</li></ul>
<b>7</b> Enhanced management and <b>beneficiation of waste</b>	<ul style="list-style-type: none"><li>• Reduced production of greenhouse gases</li><li>• Increased contribution to the national GDP</li><li>• Enhanced global competitiveness of South African firms &amp; industries</li></ul>





# Elements contributing to sustainability

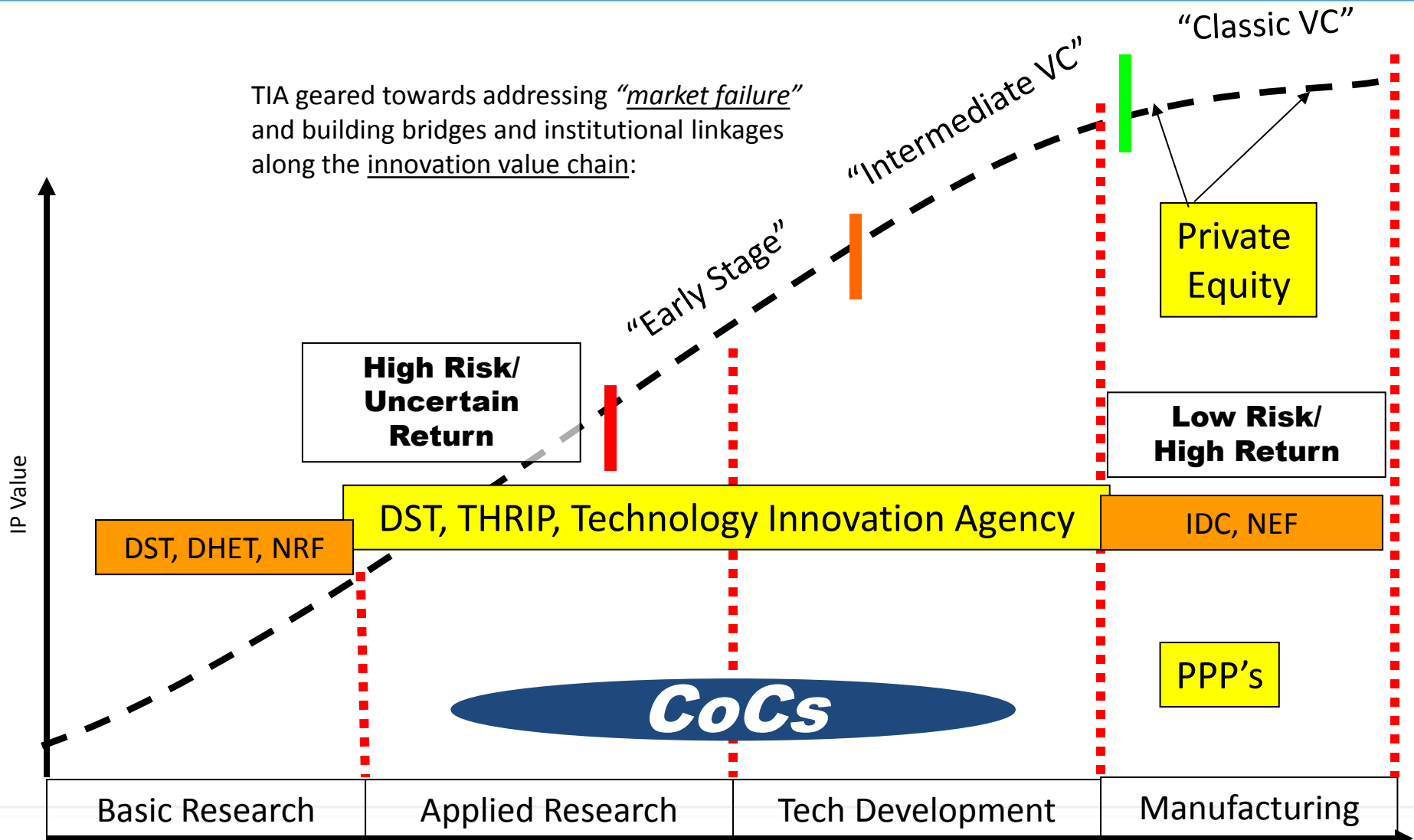
- Value chain approach – need to support the product development pipeline and ensure value add from RD &I efforts
- Contributes towards the development of a knowledge economy – PhDs but also technologists, technicians, engineers and bio-entrepreneurs
- As a developing nation – greater opportunities to close the innovation gap by focussing on the needs of communities
- Some specific examples:
- Long term solutions to create a pipeline of prototypes, products and services that continue to support a competitiveness and socio economic outcomes
- Balancing effect of other Bioinnovations with food security
  - Biomass beneficiation - potential to utilise for e.g agrowaste to develop niche market, reduce landfill and contribute to green economy





# Innovation Value Chain – National System of Innovation (NSI)

TIA geared towards addressing *“market failure”* and building bridges and institutional linkages along the innovation value chain:



# Strategic Partners

**Sugar industry** - The South African Sugar Association (SASA)

- SA Sugarcane Research Institute (SASRI)

- Sugar Milling Research Institute (SMRI).

**Pulp&paper industry** - The Paper Manufacturers' Association of South Africa (PAMSA)  
(represents more than 90% of the industry )

- Forestry SA, SAFCOL, Merensky, etc.

**Petrochemical industry**

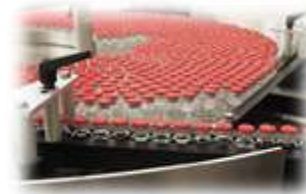
**HEIs and science councils** – Universities, ARC, MRC, CSIR, MINTEK, etc.

**Funding agencies** – TIA, IDC, the dti, Treasury, Foreign Development Institutions (FDIs),  
Corporate Development Partners, VCs, etc.



# What next

- Develop framework for a Bio-innovation VC fund with various industry partners
- Develop a Bioportal
- Complete Value chain analysis and audit
- Develop critical infrastructure roadmap and capacity development plan.
- Establish Community-Based Business Enterprises by 2017
- Ongoing coordination of roleplayers in the NSI
- Continue to invest in strategic bio-innovation projects





The Bio-economy Strategy is accessible online

<http://www.dst.gov.za/index.php/media-room/communiques/801-media-release-launch-of-south-africas-bio-economy-strategy>

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**Ndo livhuwa**

**Enkosi**

**Thank you**

**Baie dankie**

**Siyabonga**

**Re a leboga**

**Ha Khensa**

**Enkosi Ditebo**

