Singapore's Research, Innovation and Enterprise Ecosystem

Singapore Maritime Institute Forum
31 October 2017

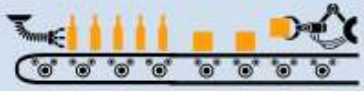
Singapore's RIE Journey – Rapid Progress

- Started only in 1991
  - Establishment of NSTB (renamed A*STAR in 2002)
  - Emphasis on economic narrative, through building up engineering capabilities in research institutes
- Major inflections that built on past efforts:
  - 2000: Launched Biomedical Sciences Initiative
  - 2006: Established RIEC and NRF to coordinate S&T policies across Singapore
  - 2011: Setting aside ~1% of GDP for publicly-funded R&D since

Plan	NTP1995	NSTP2000	S&T2005	S&T2010	RIE2015	RIE2020
Budget	$2B	$4B	$6B	$13.5B	$16.1B	$19B

Research, Innovation and Enterprise 2020

RIE planning oriented along four major technology domains, supported by three cross-cutting supporting horizontals



Advanced Manufacturing and Engineering (AME)

Support growth & competitiveness of manufacturing & engineering sectors

Health and Biomedical Sciences (HBMS)

Advance human health & wellness, and create economic value for Singapore & Singaporeans

Services and Digital Economy (SDE)

Leverage digital innovation to create economic opportunities and meet national priorities

Urban Solutions and Sustainability (USS)

Develop a sustainable & livable city through integrated solutions for Singapore and the World

Academic Research — *Build up a significant base of capabilities and a pipeline of ideas that can drive the next phase of growth*

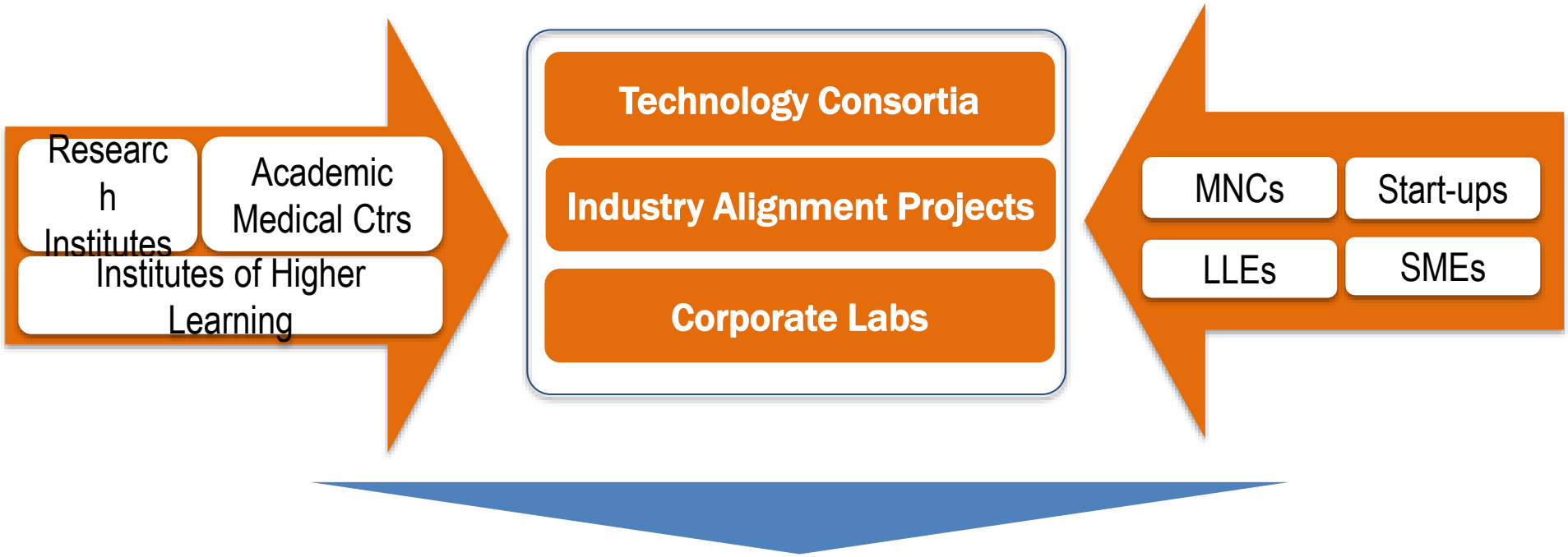
Manpower — *Build a strong research and innovation community*

Innovation & Enterprise — *Build a strong core of innovative enterprises that drive value creation and economic competitiveness*

Today – Strong Base of R&D Capabilities

- Four knowledge clusters that conduct world-class research
  - Globally-competitive **research-intensive universities**
  - **A*STAR research institutes** that straddle spectrum from fundamental science to applied research
  - **Academic Medical Centres** that support translation of health and biomedical science research into clinical practice and vice versa
  - **CREATE** that build international institional-level partnerships

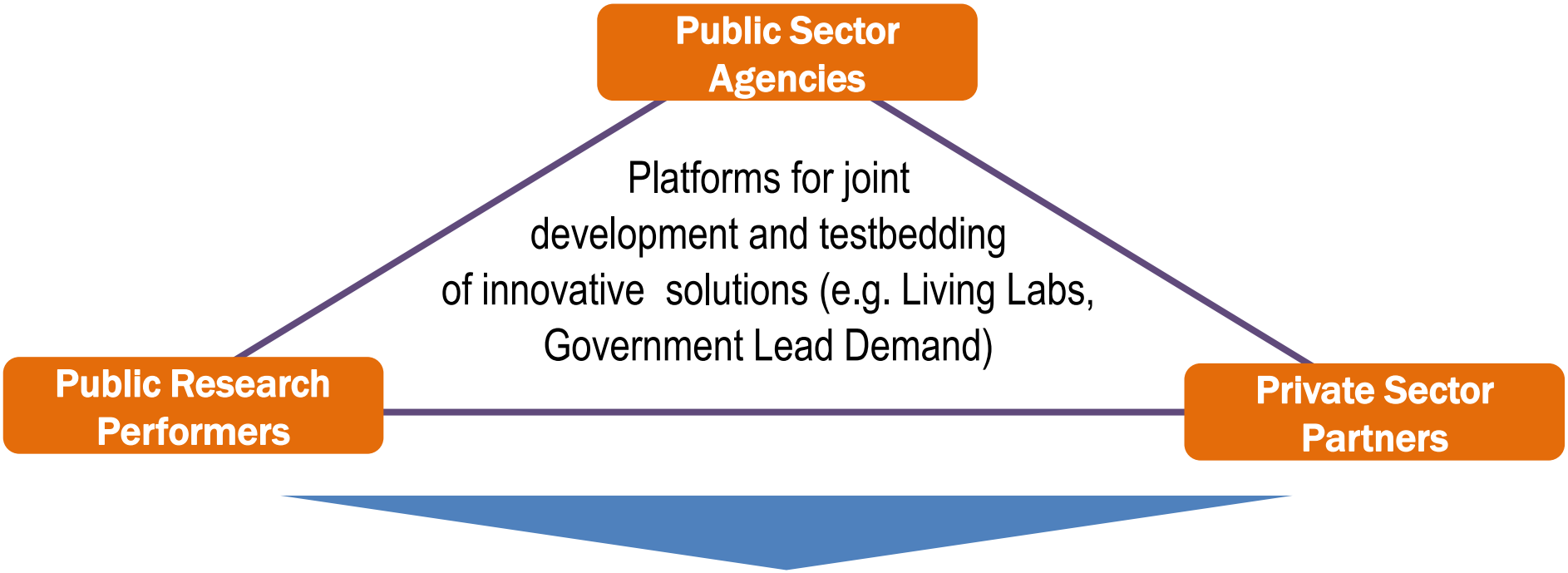
R&D Engagement with Private Sector Players



Outcomes

- Catalyse industry R&D spending and align publicly-funded R&D to meet industry needs
- Build and level-up R&D expertise among publicly-funded research performers
- Catalyse growth of deep-tech start-ups as additional commercialisation pathway
- Strengthen links between start-ups and large companies to speed up innovation to market

R&D Engagement with Public Sector Agencies



Outcomes

- Help grow our Ops-Tech & Innovation Procurement capabilities, and spur integrated Ops-Tech planning, with active 'Build vs Buy' decisions by public sector agencies
- Deployment of technologies to address national challenges
- Potential for export beyond Singapore through private sector partners

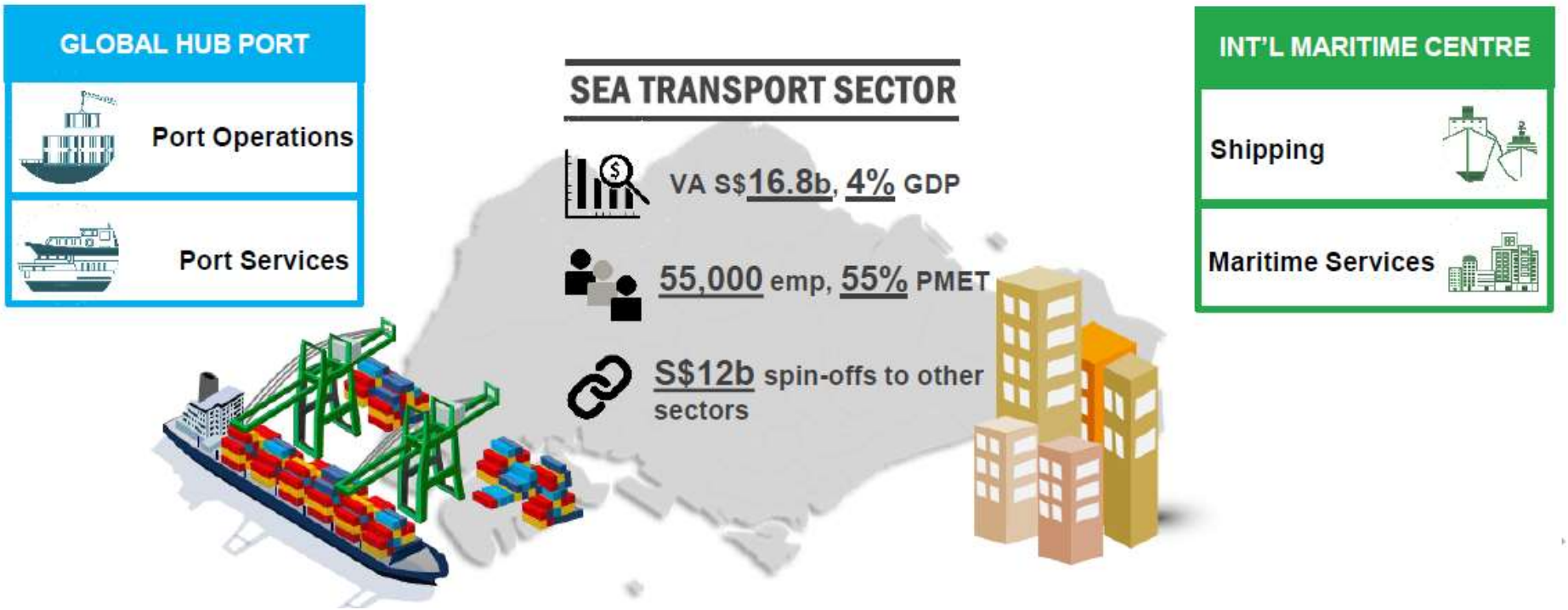
Maritime Ecosystem

- Sea Transport

- Marine & Offshore

- Marine Science

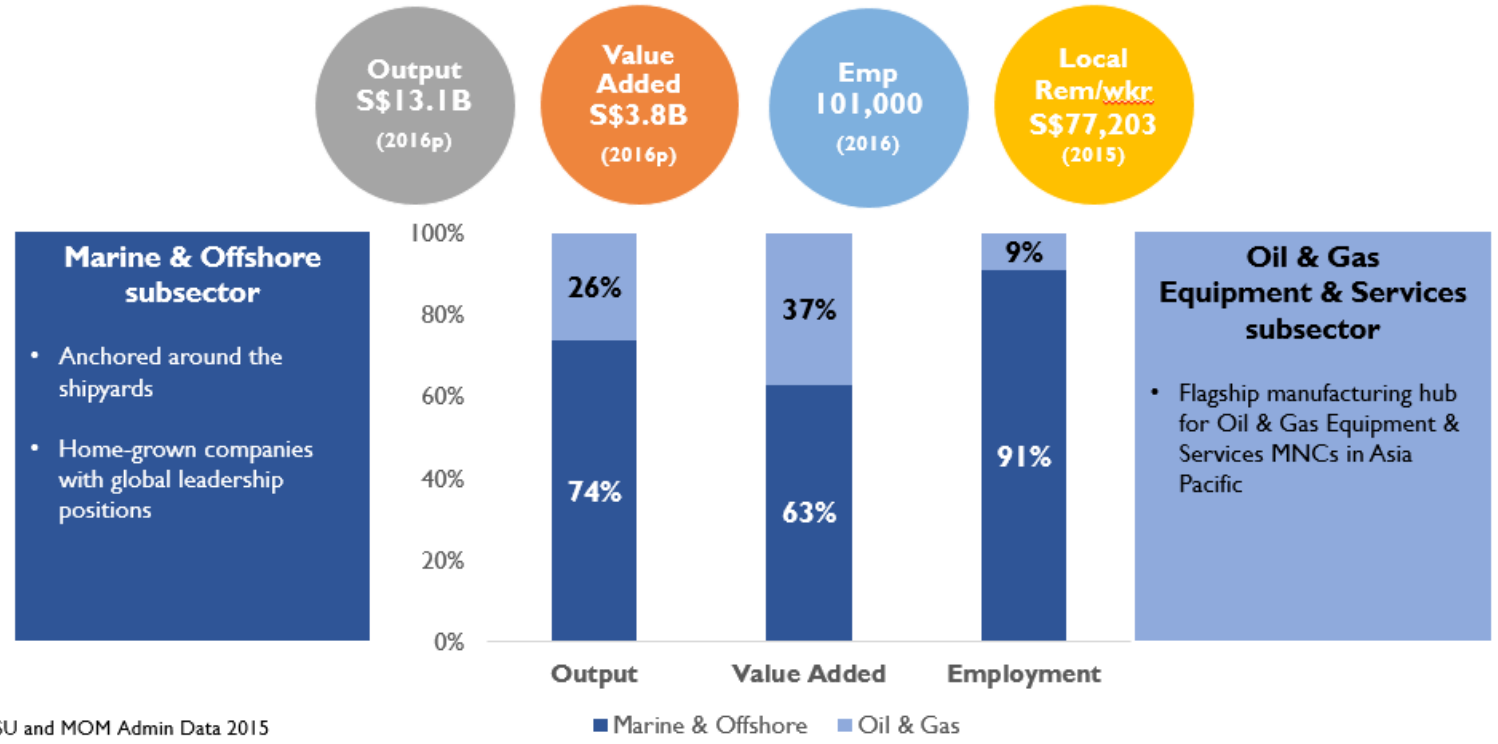
Sea Transport- Contribution to Economy



(Source: MPA)

M&O - Contribution to Economy

Contributes 1 to 2% of Singapore's GDP | More than 100,000 jobs



Sources: EDB RSU and MOM Admin Data 2015

* M&O ITM is underway and will be announced in time to come

TCOMS as National R&D Receptacle

TCOMS – Harness and integrate Singapore's research and industrial expertise for co-development of next generation systems

Technology Centre for Offshore & Marine

Joint Venture

Agency for Science, Technology and Research

NUS National University of Singapore

CAPABILITIES

- **Deepwater Ocean Basin** test facility
- **Fabrication Lab** for model fabrication and sensor deployment
- **Numerical Simulation Lab** for coupled physical-numeral approach to develop and validate models

NATIONAL INTEGRATOR FOR M&OE R&D

Public RI Capabilities

Agency for Science, Technology and Research · NUS National University of Singapore · Nanyang Technological University · SUTD · Singapore Maritime Institute · NSCC

Expertise from Industry

Classification societies
Shipyards
Marine equipment companies
Oil field equipment & services companies

PROGRAMS FOR NEXT-GEN SYSTEMS

FUTURE OFFSHORE SYSTEMS

AUTONOMOUS VESSELS

MARINE ROBOTICS

Examples of M&O Research Programs

1. Deepwater Technology (DWT) Programme Awarded in 2014

- **S$7 million**
- 16 projects supported
- 13 companies participated

Simulation & Design | **Equipment Technology** | **Installation & Mooring** | **Operation & Maintenance**

2. Asset Integrity & Risk Management (AIM) Programme Awarded in 2015

- **S$6 million**
- 12 projects supported
- 11 companies participated

Software Development | **Hardware Development & Deployment** | **New Asset Installation** | **System Level Management**

Examples of M&O Research Programs

3. Advanced Materials & Manufacturing (AMM) Programme Awarded in 2016

- **S$5 million**
- 8 projects supported
- 11 companies participated

New Materials Development	Materials Enhancement	Material Testing	Material Processing & Manufacturing

Marine Science as a Further Differentiator

Strategic Opportunities

- **Rich Biodiversity** (Coral Triangle, Pacific Ocean, Indian Ocean)
- **Busy Maritime Hub** (coastal city, exposure to pathogens and foreign organisms)

National Impact

- **Sustainable Development** (coastal development, environment conservation, food security, mining)
- **Manage climate change** (rising sea level, ocean acidification, changing weather patterns)

First-Mover Advantage

- **Region is undeveloped** (no country in SEA with comparable expertise, infrastructure and resources)
- **Linkages with top R&D institutions** (through TMSI, SCELSE, EOS, CENSAM)

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Marine Science Proposed Research Programs

Theme 1: MEB

Marine Ecosystems and Biodiversity

Theme 2: EIM

Environment Impact and Monitoring

Theme 3: CEE

Coastal Ecological Engineering

Theme 4: MTP

Marine Technology and Platforms

Key considerations

1) Capitalize on rich biodiversity
2) Build on existing capabilities
3) Support national needs

1. MEB – understand and protect marine ecosystem using latest advances in research
2. EIM – identify and mitigate potential environmental stresses and hazards
3. CEE – develop solutions for enhancing coastal development & sustainable marine environment
4. MTP – integrate marine science with applications in engineering design, antifouling, etc.

Looking Forward: Exciting New Opportunities

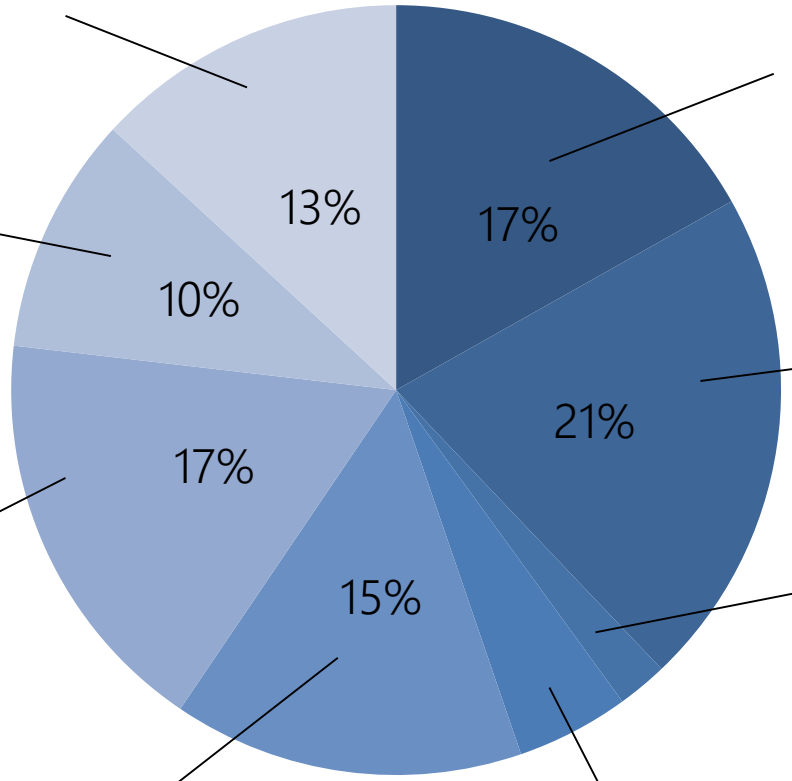
- NRF is exploring with MPA and PSA on exciting new opportunities in support of the Maritime Singapore 2030 vision

Continued Commitment to Maritime Sector

- Maritime remains a cornerstone of our economy
- Continue to invest heavily in research and engineering, together with industry
- Partnerships important to continue our journey

Thank you

RIE2020 Budget and Funding Schemes



White Space ($2.5 Billion)

Advanced Manufacturing and Engineering ($3.2 Billion)
E.g. Individual Research Grant, Programmatic Grant

Manpower ($1.9 Billion)
E.g. MOE Research Scholarship, EDB Industrial Postgraduate Programme

Health and Biomedical Sciences ($4.0 Billion)
E.g. Open Fund, Clinician Scientist Award

Innovation and Enterprise ($3.3 Billion)
E.g. Gap Funding, Early Stage Venture Fund, Research Incentive Scheme for Companies

Services and Digital Economy ($0.4 Billion, 2%)
E.g. Smart Systems SRP

Academic Research ($2.8 Billion)
E.g. Academic Research Fund, NRF Fellowship

Urban Solutions and Sustainability ($0.9 Billion, 5%)
E.g. Living Lab Initiatives