

CSIR SHAREHOLDER'S COMPACT 2021/22



science & innovation

Department:
Science and Innovation
REPUBLIC OF SOUTH AFRICA



CSIR
Touching lives through innovation

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Acronyms

4IR	Fourth Industrial Revolution	ECD	Enterprise Creation for Development
AI	Artificial Intelligence	EE	Employment Equity
AISI	Aerospace Industry Support Initiative	ERM	Enterprise Risk Management
AMTL	Advanced Material Testing Laboratories	ERMS	Enterprise Risk Management Services
API	Active Pharmaceutical Ingredient	FPP	Fraud Prevention Plan
ARC	Audit and Risk Committee	GDP	Gross Domestic Product
AUDA	African Union Development Agency	GERD	Gross Expenditure on Research and Development
B-BBEE	Broad-Based Black Economic Empowerment	GIT	Graduate-in-Training
BEI	Business Excellence and Integration	GMP	Good Manufacturing Practice
BIDC	Biomanufacturing Industry Development Centre	HC	Human Capital
BIDF	Biorefinery Industry Development Facility	HEIs	Higher Education Institutions
C4IR	Centre for the Fourth Industrial Revolution	HIP	Hot Isostatic Pressing
CAS	Collision Avoidance System	HIV	Human Immunodeficiency Virus
CBD	Cannabidiol	HR	Human Resources
CEO	Chief Executive Officer	ICT	Information and Communication Technology
CFO	Chief Financial Officer	IoT	Internet of Things
CIP	Capital Investment Plan	IKS	Indigenous Knowledge Systems
CoGTA	Cooperative Governance and Traditional Affairs	IP	Intellectual Property
COVID-19	Coronavirus disease 2019	IPOSS	Integrated Port Operations Support System
CMP	Campus Master Plan	IT	Information Technology
CPRC	Capital Projects Review Committee	KPIs	Key Performance Indicators
CSIR	Council for Scientific and Industrial Research	LCBE	Legal, Compliance and Business Enablement
DERI	Defence Evaluation and Research Institute	LF	Learning Factory
DSI	Department of Science and Innovation		
dtic	Department of Trade, Industry and Competition		

Acronyms

MICT	Media, Information and Communication Technologies
MTSF	Medium-term Strategic Framework
MTEF	Medium-term Expenditure Framework
NDP	National Development Plan
NEPAD	New Partnership for Africa's Development
NGEI	NextGen Enterprises and Institutions
NIDF	Nanomaterials Industrial Development Facility
NLC	National Laser Centre
NMDMF	Nano-Micro Device Manufacturing Facility
PC4IR	Presidential Commission on 4IR
PG	Parliamentary Grant
PLM	Product Lifecycle Management
PoC	Point-of-Care
PPE	Property, Plant and Equipment
R&D	Research and Development
RD&I	Research, Development and Innovation
RIR	Recordable Incident Rate
SAHPRA	South Africa Health Products Regulatory Authority
SADC	Southern African Development Community
SALGA	South African Local Government Association
SAMERDI	South African Mining Extraction Research, Development and Innovation
SANDF	South African National Defence Force
SANReN	South African National Research Network
SAPS	South African Police Service
SCEF	Supercritical Carbon Dioxide Encapsulation Facility

SCF	Super Critical Fluid
SET	Science, Engineering and Technology
SETAs	Sector Education and Training Authorities
SEZs	Special Economic Zones
SHEQ	Safety, Health, Environment and Quality
SMMEs	Small, Medium and Micro Enterprises
SOs	Strategic Objectives
SOEs	State-owned Enterprises
STI	Science, Technology and Innovation
TIA	Technology Innovation Agency
TRL	Technology Readiness Level
VR	Virtual Reality
YES	Youth Employment Service
WAITRO	World Association of Industrial and Technological Organisations

The Shareholder's Compact is a performance agreement between the Council for Scientific and Industrial Research (CSIR) and the Minister of Higher Education, Science and Innovation. It consists of the text of the Compact itself (Chapter 2) and a series of supporting annexures that cover the following aspects:

- Strategic planning documents:
 - Strategic Plan (Annexure A); and
 - Annual Performance Plan: 2021/22 (Annexure B).
- Documents setting out the governance structures and risk management strategies of the CSIR:
 - Governance Structure (Annexure C);
 - Risk Management Strategy (Plan) (Annexure D);
 - Fraud Prevention Plan (Annexure E); and
 - Materiality/Significance Framework (Annexure F).
- Documents setting out the CSIR Financial Plan and CSIR's compliance with the applicable financial legislation:
 - Financial Plan (Annexure G)

**science & innovation**Department:
Science and Innovation
REPUBLIC OF SOUTH AFRICA

FOR THE CYCLE COMMENCING 1 APRIL 2021

MADE AND ENTERED INTO BY AND BETWEEN:

THE MINISTER OF HIGHER EDUCATION, SCIENCE AND INNOVATION

Dr Blade Nzimande, in his capacity as Executive Authority, being the responsible Cabinet member
(hereinafter referred to as "the Executive Authority")

and

THE CSIR BOARD

herein represented by Professor Thokozani Majozi, the Chairperson of the Board
(hereinafter referred to as "the Accounting Authority")

(The Parties are hereinafter collectively referred to as "the Parties")

WHEREAS:

The Parties wish to conclude a Shareholder's Compact in order to underscore a constructive working relationship between them, clarify mutual expectations that are to be satisfied, articulate the CSIR's role in support of the effective functioning of the National System of Innovation (NSI) and establish a framework of good corporate governance;

Treasury Regulation 29.2, issued under the Public Finance Management Act, 1999 (PFMA) (Act 1 of 1999), further requires the Accounting Authority of a Schedule 3B public entity to conclude a Shareholder's Compact with its Executive Authority annually; and

The CSIR Board is the organisation's Accounting Authority and the Minister of Higher Education, Science and Innovation its Executive Authority as the Cabinet member responsible for the CSIR; the Parties have negotiated and reached an agreement on the contents of the Shareholder's Compact and wish to record the same in writing.

NOW THEREFORE THE PARTIES HEREBY AGREE AS FOLLOWS:

1. GLOSSARY OF TERMS

In this Shareholder's Compact, the following words and/or phrases shall have the following meanings

- 1.1 **Accounting Authority** means the CSIR Board as established in terms of section 7 of the Scientific Research Council Act, 1988 (Act 46 of 1988);
- 1.2 The **Corporate Plan**, as embodied in Annexures A to G to this Shareholder's Compact, with
 - Annexure A being the CSIR Strategic Plan;
 - Annexure B being the CSIR Annual Plan for the 2021/22 financial year;
 - Annexure C being the CSIR Governance Structure;
 - Annexure D being the CSIR Risk Management Strategy (Plan);
 - Annexure E being the CSIR Fraud Prevention Plan (FPP);
 - Annexure F being the Materiality Framework; and
 - Annexure G being the Financial Plan (including the Budget and Cash flow for 2021/22; the Group's three-year Financial Plan and the three-year borrowing plan).
- 1.3 **Annual Budget** means the CSIR's annual budget as embodied in Annexures A, B and G;
- 1.4 **Balanced Scorecard Framework** means the Executive Authority's framework for evaluating the performance of science, engineering and technology (SET) institutes described in the Department of Science and Innovation's (DSI) publication entitled "Reviewing the science, engineering, technology and innovation (SETI) scorecards", dated May 2003;



- 1.5 **Basic Conditions of Employment Act** means Act 75 of 1997;
- 1.6 **B-BBEE Codes** means the Broad-Based Black Economic Empowerment Codes as published in the Government Gazette from time to time;
- 1.7 **Employment Equity (EE) Act** means Act 55 of 1988;
- 1.8 **Effective Date** means the effective date of this Shareholder's Compact, which shall be 1 April 2021;
- 1.9 **Executive Authority** means the Minister of Higher Education, Science and Innovation;
- 1.10 **Key Performance Indicators (KPIs)** means the performance measures described in the Corporate Plan, against which the performance of the CSIR shall be evaluated;
- 1.11 **Labour Relations Act** means Act 66 of 1995;
- 1.12 **Materiality Framework** means the materiality framework as envisaged by clauses 6.3 and 13.1.5 as amended 1990 and STLAA 2020 below and as recorded in Annexure F;
- 1.13 **Parties** means the Executive Authority and the Accounting Authority, respectively;
- 1.14 **PFMA** means Act 1 of 1999;
- 1.15 **Shareholder's Compact** means this document and all annexures thereto;
- 1.16 **Scientific Research Council Act** means the CSIR's enabling legislation, namely Act 46 of 1988;
- 1.17 **Skills Development Act** means Act 97 of 1998;
- 1.18 **Treasury Regulations** means any prescripts or legislative requirements or practice notes issued by National Treasury for implementation by government departments, trading entities, constitutional institutions and public entities, issued in line with the PFMA.

2. THE SHAREHOLDER'S COMPACT

- 2.1 This Shareholder's Compact represents the agreement between the Executive Authority of the CSIR, being the Minister of Higher Education, Science and Innovation, and the Accounting Authority of the CSIR, being the CSIR Board, herein represented by the Chairperson of the Board. It is a reflection of the expectations of each of the Parties, expressed in terms of outcomes and outputs that need to be achieved during the financial year starting on 1 April 2021.
- 2.2 This Shareholder's Compact shall operate from the Effective Date and will be reviewed by the Parties at the end of the financial year ending on 31 March 2022.

3. LEGAL REQUIREMENT AND PRIMARY RELATIONSHIP BETWEEN THE SIGNATORIES

- 3.1 Chapter 29 of the Treasury Regulations imposes the following legal requirements on the Accounting Authority of a Schedule 3B public entity, such as the CSIR, and its Executive Authority, in terms of the conclusion of a Shareholder's Compact:

"29.2 Shareholder's Compact

29.2.1. The Accounting Authority for a public entity listed in Schedule 2, 3B or 3D must, in consultation with its Executive Authority, annually conclude a Shareholder's Compact.

29.2.2. The Shareholder's Compact must document the mandated key performance measures and indicators to be attained by the public entity as agreed between the Accounting Authority and the Executive Authority."

4. FRAMEWORK FOR SHAREHOLDER'S COMPACT

- 4.1 In terms of section 3 of its enabling legislation, namely the Scientific Research Council Act, the mandate of the CSIR is as follows:

"The objects of the CSIR are, through directed and particularly multidisciplinary 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."

- 4.2 The Shareholder's Compact

The CSIR's Strategic Objectives (SOs) are outlined in the Corporate Plan. The Accounting Authority undertakes to oversee the implementation of the said elements of the Corporate Plan.

5. INTERNAL TRANSFORMATION

In Annexure A, the Corporate Plan of the CSIR deals with matters relating to transformation, among others. In giving effect to the Corporate Plan, the Accounting Authority will ensure that the CSIR is in full compliance with all applicable legislation, such as, but not limited to, the Employment Equity Act, 1998 (Act 55 of 1998) the Skills Development Act, the Labour Relations Act, the Basic Conditions of Employment Act, and the B-BBEE Codes.

6. THE ROLE AND POWERS OF THE ACCOUNTING AUTHORITY

- 6.1 The role and powers of the Accounting Authority are set out in sections 7(1), 11, 12 and 19 of the Scientific Research Council Act read with section 3 of the Science and Technology Laws Amendment Act of 2020.
- 6.2 In terms of section 56 of the PFMA, the Accounting Authority has delegated, in writing, certain of the powers entrusted or delegated to it to officials in the CSIR. To this end, the Accounting Authority has also adopted an approval framework, which governs the authorisation process in the CSIR. It deals with the development of strategic and operational plans, and budgets, appointment of staff, approval of salaries and acquisition and disposal of assets, among others. It also defines authority levels in relation to organisational positions.
- 6.3 The Materiality Framework for reporting losses through criminal conduct and irregular, fruitless and wasteful expenditure, as well as for significant transactions as envisaged by sections 55 (2) and 54 (2) of the PFMA, is in place and is included as Annexure F attached hereto.

7. UNDERTAKINGS BY THE ACCOUNTING AUTHORITY OF THE PUBLIC ENTITY

- 7.1 The Accounting Authority undertakes to act in accordance with the approved Corporate Plan attached hereto.
- 7.2 In the event that it is envisaged that the Accounting Authority will not be able to fully execute the plans as embodied in Annexure A, it will promptly, and in writing, inform the Executive Authority accordingly to seek its advice prior to making decisions or taking action.
- 7.3 The Accounting Authority confirms that it will comply with the provisions of sections 50 and 51 of the PFMA, as more fully dealt with in Annexures D, E and F attached hereto, as well as with the reporting requirements as embodied in the PFMA and the relevant Treasury Regulations.
- 7.4 The Accounting Authority undertakes to ensure that the CSIR complies with its statutory mandate as encapsulated in section 3 of the Scientific Research Council Act as amended by the Science Laws Amendment Act of 2020 (Act 9 of 2020).

8. UNDERTAKINGS BY THE EXECUTIVE AUTHORITY AS THE SHAREHOLDER

- 8.1 The Executive Authority undertakes to allow the Accounting Authority to manage the business of the CSIR as has been approved in the Corporate Plan through ensuring the following:
- 8.1.1 Issuing of instructions and requests for information with sufficient prior notice and response times, with due cognisance that this will not be applicable in instances where the information is required by Parliament and must be provided urgently;
 - 8.1.2 Not reneging on written guarantees and undertakings given;
 - 8.1.3 Providing the organisation with strategic direction and control; and
 - 8.1.4 Complying with the relevant provisions of the PFMA, as well as the Treasury Regulations insofar as the same relates to it in terms of the relationship between the Parties.

9. GOVERNANCE

- 9.1 The Accounting Authority recognises that systems of good corporate governance should be in place and reviewed continuously to ensure that they are sound and consistent with world-class standards at all times, and that they are and remain relevant to the business of the CSIR. Apart from complying with the provisions of the Scientific Research Council Act, the Science and Technology Laws Amendment Act, the PFMA, as well as the Treasury Regulations issued thereunder, and all other applicable legislation, the Accounting Authority shall also ensure compliance with the relevant provisions of the King IV Code on Corporate Governance (2016), and the Protocol on Corporate Governance in the Public Sector (2002) issued by the Department of Public Enterprises.
- 9.2 The Accounting Authority will strive to ensure that the CSIR upholds and sets in place review mechanisms and protocols to ensure that reports and publications, including public comments made by the employees of the CSIR, are based on sound scientific analysis, and do not bring the institution into disrepute.

10. KPIs LINKED TO THE BALANCED SCORECARD FRAMEWORK

The KPIs have been summarised according to the categories of the Balanced Scorecard Framework of the DSI and reflect the strategic objectives (SOs) of the CSIR. The categories and their associated SOs are:

SO1 Conduct research, development and innovation of transformative technologies and accelerate their diffusion.

This SO seeks to ensure that the CSIR undertakes cutting edge research, development and innovation in areas that will bring transformative change in the South African economy and society.

SO2 Improve the competitiveness of high-impact industries to support South Africa's re-industrialisation by collaboratively developing, localising and implementing technology.

This SO seeks to improve the competitiveness of South Africa's high-impact industries through research, technology development and localisation in a collaborative manner, thereby contributing to the re-industrialisation of the country.

SO3 Drive socioeconomic transformation through research, development and innovation that supports the development of a capable state.

This SO emphasises the CSIR's role in supporting the development of a capable state and enabling government to drive the socioeconomic transformation of South Africa through research, development and innovation.

SO4 Build and transform Human Capital and infrastructure.

This SO seeks to build and transform the required HC, and investment in infrastructure to drive industrialisation and the advancement of society.

SO5 Diversify income, maintain financial sustainability and good governance.

This SO seeks to improve the CSIR's financial sustainability by diversifying revenue sources and optimising the business model to achieve competitiveness supported by good, efficient and sound governance.

The CSIR's SOs are explained in greater detail in Annexures A and B.

CSIR's KPIs provide an understanding of performance in terms of inputs, outputs, efficiencies and, to some extent, provide lead indicators of the outcomes and impact that are required for the CSIR to fulfil its mandate. The KPIs are aligned to the strategic objectives and provide a basket of measures that reflect various aspects of organisational performance.

SO1: Conduct research, development and innovation of transformative technologies and accelerate their diffusion.

- **KPI 1 – Publication equivalents:** *Research publications are a measure of the CSIR's research capabilities and outputs. The quantity and quality of peer-reviewed research publications is a measure of the quality and depth of the scientific knowledge base. Publication equivalents consist of peer-reviewed journal articles, peer-reviewed conference papers, peer-reviewed book chapters and books.*
- **KPI 2 – New priority patent applications filed:** *At the CSIR, priority patent filings also serve as a pipeline indicator of patent families. A priority patent is the first patent application filed for protection of a particular invention with the CSIR named as an applicant/assignee/co-applicant/co-assignee.*



- **KPI 3 – New patents granted:** *Patents provide a lead indicator of the potential impact to be achieved when technologies are commercialised. Patents are exclusive rights granted for an inventions granted by an examining patent authority with the CSIR named as an applicant/ assignee/co-applicant/co-assignee.*
- **KPI 4 – New technology demonstrators:** *Measure an intermediate output of research and development activities with the potential to be developed further and that can be transferred to various markets for socioeconomic impacts. A prototype, a rough example of a conceivable technology (Product or system) derived from existing knowledge gained from research and/or practical experience as proof of concept.*
- **KPI 5 – Number of technology licence agreements signed:** *This indicator is a measure of the uptake of CSIR Intellectual Property (IP) in the market. An agreement in terms of which the CSIR grants rights to another party to exploit IP developed by the CSIR, typically in exchange for royalty payments and/or other licence fees.*

SO2: Improve the competitiveness of high-impact industries to support South Africa's re-industrialisation by collaboratively developing, localising and implementing technology.

- **KPI 6 – Number of localised technologies:** *The indicator aims to diffuse technologies commercialized or industrialised from elsewhere in the world that have demonstrated potential to positively affect competitiveness of industry upon competent adoption by users or is a strong candidate to be an input into innovation or improvements of other systems for improvement of industrial activities or capabilities of the State. A localised technology is a technology that has been invented or commercialised outside of South Africa and that has been or will be adapted in South Africa for commercial or scientific benefit or this is a technology that has been locally developed as an import replacement.*
- **KPI 7 – Number of joint technology development agreements being implemented for industry:** *This indicator measures the CSIR's technology development collaborations with industry partners with the intention to commercialise and industrialise*
- **KPI 8 – Number of SMMEs supported:** *The indicator measures CSIR's contribution to socioeconomic development and industrialisation through the support of Small, Medium and Micro Enterprises (SMMEs). Support of SMMEs (as described in Schedule 1 of the National Definition of Small Enterprise in South Africa under the National Small Enterprise Act), through the implementation of RD&I and technology interventions that contribute to SMMEs becoming more productive, efficient and sustainable.*



SO3: Drive socioeconomic transformation through research, development and innovation that supports the development of a capable state.

- **KPI 9 – Number of reports directly contributing to national policy formulation and development:** *The indicator measures CSIR's support to government with evidence-based policy development and decision-making that can benefit from a significant SET input. Evidence-based policy development support provided to various arms of government.*
- **KPI 10 – Number of standards delivered or contributed to in support of the state** *The indicator measures CSIR's support for government policy and regulation through the development of standardised practice guidelines across economic and social sectors. New or updated standards adopted by the state and state-owned entities that the CSIR has developed and delivered or to which it contributed (e.g. interoperability standards, accessibility standards, products or infrastructure standards).*
- **KPI 11 – Number of projects implemented to increase capability of the state:** *This indicator measures the number of projects that the CSIR implements on behalf of the state. The CSIR-facilitated implementation of technologies (CSIR-created or otherwise) that improve the efficiency of Government and SOEs.*

SO4: Build and transform Human Capital and infrastructure.

- **KPI 12 – Total SET staff:** *The indicator is a measure of the CSIR's capacity to deliver on RD&I projects. Number of CSIR staff qualified in the field of science, engineering and technology (SET) field.*
- **KPIs 13 & 14: Percentage of South African SET staff who are black and female, respectively:** *These indicators measure the degree of demographic transformation within the RD&I capacity of the organisation. Percentage of SET staff who black (As per B-BBEE Act definition) and percentage of SET staff who are female, respectively.*
- **KPI 15 – Percentage of SET staff with a doctoral qualification:** *The indicator measures the organisation's capacity to conduct and supervise quality research, and to innovate. Proportion of SET staff who have doctoral level qualifications.*
- **KPI 16 – Total Chief Researchers:** *The indicator is a measure of the quality of SET capacity and their potential influence in the local and international RDI spaces (Capacity to collaborate and share resources). Number of CSIR staff recognized as Chief Researchers through the formal Career Ladder process.*

- **KPIs 17 & 18: Percentage of Chief Researchers who are black and female, respectively.** *These indicators is a measure the level of demographic transformation within the chief researcher level. Proportion of black (As per B-BBEE Act definition) South African and proportion of female South African citizens who are Chief Researchers (as per CSIR's Career Ladder System).*
- **KPI 19 – Total Principal Researchers:** *The indicator is a measure of the quality of SET capacity and their potential influence in the local and international RDI spaces (Capacity to collaborate and share resources). Number of CSIR staff recognized as Principal Researchers through the formal Career Ladder process.*
- **KPIs 20 & 21: Percentage of principal researchers who are black and female, respectively.** *These indicators measure the level of demographic transformation within the principal researcher level. Proportion of black (As per B-BBEE Act definition) South African and proportion of female South African citizens who are Principal Researchers (as per CSIR's Career Ladder System).*
- **KPI 22 – Number of Staff involved in exchange programmes with industry:** *The indicator measures the level at which CSIR shares expertise and resources, in order to strengthen collaborations with industry and other stakeholders to achieve organisational growth. The exchange of staff between the CSIR and other organisations for a period of time to share/gain expertise for the advancement of business growth opportunities and capacity development.*
- **KPI 23 – Property, Plant and Equipment (PPE) investment (Rm):** *This indicator provides a measure of CSIR's investment in research infrastructure in order to develop and maintain world-class facilities and equipment to provide the quality of RD&I that is expected of it. PPE Investment is the amount invested in CSIR and government grant-funded PPE as well as qualifying leases (as per Accounting Standard on Leases) for a financial year.*

SO5: Diversify income, maintain financial sustainability and good governance

- **KPI 24 – Total Operating Income (Rm):** *The indicator reflects the ability of the CSIR to ensure financial sustainability. Growth in total operating income indicates growth in the outcomes and impact achieved by the CSIR. Total Operating income includes revenue declared on R&D contracts (contract R&D income), income derived from licences and royalties, PG received through the Science Vote, and other income.*
- **KPI 25 – Net profit (Rm):** *Net profit is a key indicator of financial sustainability and the ability of the organisation to manage its expenses according to the affordability determined by income levels. Profit for a financial year, which is calculated as total operating income; less total operating expenditure (including the performance bonus accrual); plus net finance income.*



- **KPI 26 – South African public sector income (% Total income):** *South African public sector income reflects the degree of government investment of RDI activities at the CSIR and the ability of CSIR to contract with the public sector. South African public sector income is the total income earned from South African public entities (as listed in the schedules to the Public Finance Management Act “PFMA” and the Municipal Finance Management Act “MFMA”). This includes revenue declared on R&D contracts (contract R&D income), PG received through the Science Vote and any other forms of funding received from South African public entities.*
- **KPI 27 – South African private sector income (% Total income):** *South African private sector income reflects the degree of private sector investment in the CSIR. South African private sector income is the total contract R&D income earned from South African non-public entities (NOT listed as public entities in the schedules to the Public Finance Management Act “PFMA” and the Municipal Finance Management Act “MFMA”). This includes Not for Profit Organisations (NPOs).*
- **KPI 28 – International contract income (% Total Income):** *International contract income reflects the global relevance of the CSIR. Growth in international investment is a key indicator of income diversification, as well as the relevance and impact of the CSIR within the global economy. International contract income is the total income earned from foreign customers (i.e. entities incorporated outside the borders of South Africa). This includes revenue declared on R&D contracts (contract R&D income) and other income received from foreign entities.*
- **KPI 29 – B-BBEE rating:** *The indicator is a measure of CSIR’s compliance to B-BBEE Act in its contribution to support socioeconomic transformation in South Africa. A BBEE rating is a verification certificate issued by a South African National Accreditation System (SANAS) approved verification agency that determines CSIR’s contribution to black (As per B-BBEE Act definition) economic empowerment.*
- **KPI 30 – Recordable Incident Rate (RIR):** *RIR indicates the effectiveness of health and safety management system within the organisation in a year. The Recordable Incident Rate (RIR) is the number of recordable incidences (or cases); multiplied by 200 000; divided by the number of hours worked. A recordable incident is a work-related injury or illness that results in one or more of the following criteria:*
 - *Death;*
 - *Loss of consciousness;*
 - *Restricted work or transfer to another job;*
 - *Days away from work; and/or*
 - *Medical treatment beyond first aid.*

- **KPI 31 – Audit Opinion:** *The indicator is a measure of CSIR’s Accountability and Governance. The Auditor-General (AG) defines a Clean Audit as achieving an unqualified audit opinion on the audits of annual financial statements and pre-determined objectives as well as not having material findings on the audit of compliance with laws and regulations.*

The target values for the set of KPIs are given in Table 1.

11. REPORTING

- 11.1 The Accounting Authority will report on the achievement of its KPIs quarterly, based on PFMA requirements.
- 11.2. A detailed KPI report approved by the Accounting Authority will be submitted to the Executive Authority annually on or before 31 July of each year, in respect of the immediately preceding financial year. The format of such reporting will be based on the CSIR’s KPIs linked to the categories of the Balanced Scorecard Framework.
- 11.3. The Accounting Authority will meet all the external audit requirements, the results of which will be made available to the Executive Authority, the external auditor of the CSIR, being the Auditor-General, who is responsible for independently auditing and reporting on the financial statements of the CSIR.

12. EXTRA-ORDINARY REPORTING

The Accounting Authority will, at its discretion, report to the Executive Authority on matters of strategic importance and/or operational issues that fall outside the agreed framework of this Shareholder’s Compact and the PFMA, as agreed to from time to time during its Board meetings.

13. SUPPORTING DOCUMENTATION

- 13.1 Supporting documentation to this Shareholder’s Compact is to be found in the following supporting documents attached hereto:
 - 13.1.1 CSIR Strategic Plan as embodied in Annexure A attached hereto;
 - 13.1.2 CSIR Annual Plan for the 2021/22 as embodied in Annexure B attached hereto;
 - 13.1.3 Risk Management Strategy (Plan) as embodied in Annexure D attached hereto;
 - 13.1.4 Fraud Prevention Plan (FPP), as embodied in Annexure E attached hereto;
 - 13.1.5 Materiality Framework, as embodied in Annexure F attached hereto; and
 - 13.1.6 Financial Plan as embodied in Annexure G attached hereto.



Table 1: CSIR KPIs: 2021/22

KEY PERFORMANCE INDICATOR	ACTUAL 2018/19	ACTUAL 2019//20	TARGET 2020/21	PROJECTED 2020/21	TARGET 2021/22
SO 1: Conduct research, development and Innovation of transformative technologies and accelerate their diffusion					
KPI 01: Publication Equivalents	536	437,5	278	278	300
KPI 02: New Priority Patent Applications Filed	–	4	3	4	9
KPI 03: New Patents Granted	22	21	10	11	8
KPI 04: New Technology Demonstrators	50	37	38	38	46
KPI 05: Number of technology licence agreements signed	–	5	17	16	19
SO2: Improve the competitiveness of high-impact industries to support South Africa's re-industrialisation by collaboratively developing, localising and implementing technology.					
KPI 06: Number of localised technologies	–	7	10	10	11
KPI 07: Number of joint technology development agreements being implemented for industry	–	23	20	20	22
KPI 08: Number of SMEs supported	–	116	68	68	75
SO3: Drive the socioeconomic transformation through research, development and innovation which supports the development of a capable state					
KPI 09: Number of Reports Contributing to National Policy Development	–	24	17	17	17
KPI 10: Number of standards delivered or contributed in support of the state	–	10	9	9	9
KPI 11: Number of projects implemented to increase the capability of the state	–	67	36	36	40
SO 4: Build and transform human capital and infrastructure					
KPI 12: Total SET staff	1 608	1 367	1 410	1 426	1 497
KPI 13: Percentage of SET staff who are Black	62,08	63	63%	65,00%	66%
KPI 14: Percentage of SET staff who are Female	35,95	35	37%	35,50%	37%
KPI 15: Percentage of SET staff with a PhD	19,47	22	22%	22%	23%
KPI 16: Total Chief Researchers	14	11	12	13	17
KPI 17: Percentage of Chief Researchers who are Black	7,14	18	25%	15,40%	17%
KPI 18: Percentage of Chief Researchers who are Female	14,29	18	17%	23,10%	24%
KPI 19: Total Principal Researchers	190	149	184	178	193
KPI 20: Percentage of Principal Researchers who are Black	27,37	28	37%	29%	35%
KPI 21: Percentage of Principal Researchers who are Female	16,84	16	20%	19,0%	22%
KPI 22: Number of Staff involved in exchange programmes with industry	–	11	11	11	13
KPI 23: PPE Investment (Rm)*	74	86	55	55	100



KEY PERFORMANCE INDICATOR	ACTUAL 2018/19	ACTUAL 2019//20	TARGET 2020/21	PROJECTED 2020/21	TARGET 2021/22
SO 5: Diversify income, maintain financial sustainability and good governance					
KPI 24: Total Operating Income	2 555	2 747	2 701	2 630	2 869
KPI 25: Net Profit (Rm)	7,7	55	-83,4	-50.1	-96.1
KPI 26: SA Public sector income (% Total Income)	-	55	58,50%	55%	56%
KPI 27: SA Private sector income (% Total Income)	-	5	9,60%	9%	9%
KPI 28: International contract income (% Total Income)	-	5	5,90%	5%	6%
KPI 29: B-BBEE Rating*	3	4	3	2	2
KPI 30: Recordable incident rate*	-	1.82	2	<2	1,8
KPI 31: Audit opinion	-	Unqualified audit opinion	Unqualified audit opinion	Unqualified Audit Opinion	Unqualified audit opinion

14. PENALTIES AND REWARDS

- 14.1 The Accounting Authority, in terms of the provisions of section 12 of the Scientific Research Council Act, shall determine the remuneration payable to employees of the CSIR, and, in addition, shall approve the payment of allowances, subsidies and benefits, including performance bonuses.

15. GOVERNING LAW AND DISPUTE RESOLUTION

- 15.1 This Shareholder's Compact shall be governed by and construed in accordance with the laws of the Republic of South Africa.
- 15.2. In the event of any dispute arising from this Shareholder's Compact, the Parties shall make every effort to settle such dispute amicably. Should the dispute, despite such mediation, remain unresolved for a further period of 30 days after being so referred, either Party may declare such dispute a formal intergovernmental dispute by notifying the other Party of such declaration in writing. In which event, the Parties will follow the procedure as outlined in section 42 of the Intergovernmental Relations Framework Act, 2005 (Act 13 of 2005). Should the dispute remain unresolved for a period of 30 days, the said dispute or difference shall be adjudicated upon by a competent third Party agreed upon by the Parties, unless otherwise agreed between the Parties by means of arbitration, mediation or other agreement.
- 15.3. Should the Parties be unable to agree upon a competent third Party as contemplated in clause 15.2, the dispute will be adjudicated by a competent court with jurisdiction to hear the matter.



16. NOTICES

- 16.1 The Parties choose as their domicilium addresses for purposes of this Shareholder's Compact the following physical addresses:
- 16.1.1 The Accounting Authority: c/o the Office of the Chief Executive Officer (CEO)
CSIR, Building 3, CSIR Campus, Meiring Naudé Road, BRUMMERIA, Pretoria, 0184
- 16.1.2 The Executive Authority: Building 53, CSIR Campus, Meiring Naude' Road, BRUMMERIA, Pretoria, 0184
- 16.2 Each Party shall be entitled, from time to time, by written notice to the other, to vary its *domicilium* to any other address within the Republic of South Africa, which is not a post office box or poste restante.
- 16.3 Any notice given by one Party to the other ("the addressee") which:
- 16.3.1 is delivered by hand during the normal business hours of the addressee at the addressee's domicilium for the time being shall be presumed, until the contrary is proved, to have been received by the addressee at the time of delivery;
- 16.3.2 is posted by pre-paid registered post from an address within the Republic of South Africa to the addressee at the addressee's domicilium for the time being shall be presumed, until the contrary is proved, to have been received by the addressee on the fourth day after the date of posting;
- 16.3.3 is transmitted by telefax or e-mail shall be deemed (in the absence of proof to the contrary) to have been received within one hour of transmission where it is transmitted during normal business hours of the receiving instrument, and within two hours of the commencement of the following business day where it is transmitted outside those business hours.

17. WHOLE AGREEMENT

- 17.1. This document, together with the annexures thereto, constitutes the whole of the agreement between the Parties. No instructions, agreements, representations or warranties between the Parties, other than those set out herein, are binding on the Parties.
- 17.2. All undertakings and annexures to this Shareholder's Compact are declared active on the effective date.

18. VARIATIONS

No variation or modification of any provision of this Shareholder's Compact or consent to deviate therefrom or waiver in terms thereof shall be valid, unless such variation or modification or waiver has been reduced to writing and has been signed by both Parties, and such variation, modification, consent or waiver shall be valid only for a specific case and only for the purpose for which and extent to which it was made or given.

19. AMENDMENTS TO THE SHAREHOLDER'S COMPACT

19.1 Should either Party wish to make any amendment or alteration to the Shareholder's Compact, that Party shall prepare a change order and present it to the other Party, which shall specify the following:

19.1.1 The date of the change order;

19.1.2 The description of the proposed amendment or alteration;

19.1.3 Previous unspecified ad hoc work to be undertaken, if applicable;

19.1.4 The reason for making the proposed amendment or alteration;

19.1.5 When the Party requires the change to be implemented;

19.1.6 The resources available; and

19.1.7 The continued balance of the Parties' obligations under this Shareholder's Compact;

19.2 The other Party shall be given an opportunity to consider such change order and make a decision on whether it is prepared to accept such change or not; and

19.3 No change order shall be of any force and effect until it is signed by duly authorised representatives of each of the Parties.

20. UNDERTAKING BY THE CHAIRPERSON OF THE CSIR BOARD

The Chairperson of the CSIR Board, Professor Thokozani Majozi, undertakes to represent the Accounting Authority in the carrying out of the terms of this Shareholder's Compact and in cascading the spirit of the agreement through the ranks of the CSIR.

21. UNDERTAKING BY THE MINISTER OF HIGHER EDUCATION, SCIENCE AND INNOVATION

The Minister of Higher Education, Science and Innovation, Dr Blade Nzimande, approves of this approach and looks forward to the successful implementation of the undertakings embodied in this Shareholder's Compact and its annexures. The Minister accepts that, although the detail of this Shareholder's Compact may change due to variations and changes in the market and in society, the spirit thereof will remain unchanged.



THE CSIR SHAREHOLDER'S COMPACT

Agreed to and signed in PRETORIA on 24 February 2021

Prof. Thokozani Majosi



On behalf of the Accounting Authority

Agreed to and signed in PIETERMARITZBURG on 27 February 2021

Dr Blade Nzimande



The Executive Authority





A

Strategic Plan

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A.1 Strategic Context

The CSIR Strategy is shaped by key global and regional trends, national imperatives and priorities, as well as internal factors.

A.1.1 EXTERNAL CONTEXT

A.1.1.1 GLOBAL MEGATRENDS

COVID-19: The major shock during 2020/21 has been the global pandemic caused by Covid-19. The pandemic disrupted lives and livelihoods and highlighted the importance of global connectedness. It has laid bare socioeconomic challenges across the world. By far, the poor and vulnerable are among the hardest hit by the pandemic and resultant economic restrictions, further aggravating the inequality gap that existed pre-Covid-19. On a positive note, the current crisis stimulated interest in innovative solutions in areas such as remote working methods, distance education, e-commerce and digital communication, collaboration and other solutions.

The Organization for Economic Cooperation and Development and emerging economies are facing the deepest recession since the Great Depression of 1930. This current recession exacerbates the multi-decade slowdown in economic growth and productivity, the primary drivers of higher living standards and poverty reduction. Adding to the inequality problem created by the slow growth trend, the poor and vulnerable are among the hardest hit by the pandemic and economic shutdown. The World Bank states that current estimates show that 60 million people could be pushed into extreme poverty in 2020.

Economies in the regions of the world have put in place interventions aimed at turning around the adverse impacts of Covid-19 on their economies, social infrastructure, health, safety and well-being of their citizens:

The **European Commission's** response to the current Covid-19 crisis is the Annual Sustainable Growth Strategy 2021 which provides a Recovery and Resilience Facility (the Facility), which avails €672.5 billion in loans and grants to support reforms and investments undertaken by Member States. The aim is to mitigate the economic and social impact of the pandemic and to make European economies and societies more sustainable, resilient and better prepared for the challenges and opportunities of the green and digital transitions.

The **United States of America**, the strongest economy in the world, also did not escape adverse health, economic impacts and related job losses due to the Covid-19 pandemic. A study by the Hamilton Project in September 2020 detailed some 10 areas of impact on the US economy and which were described as a "joint economic and health crisis of scale and a speed unprecedented in the history of the US". The US in the early part of 2020 introduced a stimulus package, the CARES Act, in the order of \$2 trillion. A second stimulus package was being negotiated as 2020 ended.

A.1.1 EXTERNAL CONTEXT (continued)

China, the world's second largest economy was the only major world power to avoid a recession in 2020 as Covid-19 forced "lockdowns" and crippled businesses. According to projections from the World Bank, China's Gross Domestic Product (GDP) was expected to grow by 1.6% in 2020, while the global economy as a whole was expected to contract by 5.2%. China built its relatively quick recovery through several measures, including stringent lockdown and population tracking policies intended to contain the virus. The government also set aside hundreds of billions of dollars for major infrastructure projects, and offered cash incentives to stimulate spending among its populace.

The global economic impact of the Covid-19 is yet to be fully quantified, but what is evident is that economies that had prior vulnerabilities, such as South Africa, are in an even more dire economic situation. In order to effectively reset economies post Covid-19 as the World Economic Forum proposes, investment in and deployment of knowledge and technology including technologies of the Fourth Industrial Revolution are going to be key.

Sustainable Development Goals

The Sustainable Development Goals (SDGs) capture the essence of a sustainable and development in support of a better world. This developmental framework for a better world, adopted under the auspices of the United Nations in 2015, consists of 17 goals. Examples of SDGs aligned to the CSIR strategic focus are: good health and well-being (Goal 3), clean water and sanitation (Goal 6), affordable and clean energy (Goal 7), sustainable cities and communities (Goal 11), climate action (Goal 13), life below water (Goal 14) and life on land (15). The critical drivers of growth and development include building of resilient infrastructure, the promotion of inclusive and sustainable industrialisation and fostering innovation (Goal 9) and these are core elements of the CSIR newly adopted strategy. Ultimately, our Research, Development and Innovation (RDI) activities, outputs and outcomes are intended to impact the goals of a world with no poverty (Goal 1); zero hunger (Goal 2); decent work and economic growth (8); and reduced inequality (10).

In respect to technology trends, the 4th Industrial Revolution (4IR) technologies are expected to drive competitiveness significantly. For instance, the digitisation of manufacturing is characterised by technology convergence, affecting the way that data is organised, analysed and shared. It includes integration into the manufacturing of cloud computing, big data analysis, the IoT, apps, mobile computing and so on. Also included are manufacturing trends where technology is impacting the way we sense and interact with the physical world, for example, through advances in robotics, cyber-physical systems (CPS), integrative production technologies, model-based production, embedded software and sensors, 3D printing and additive manufacturing, and the industrial Internet.

A.1.1 EXTERNAL CONTEXT (continued)

A.1.1.2 REGIONAL TRENDS

Africa has many developmental challenges. African Heads of State and decision-makers, through Agenda 2063, have highlighted Science Technology and Innovation (STI) as a key enabler in promoting the ability of African countries to achieve their economic transformation and socioeconomic development goals. The Science, Technology and Innovation Strategy for Africa (STISA-2024) is the first of the 10-year incremental phasing strategies of Agenda 2063 to respond to the demand for STI to impact across critical sectors such as agriculture, energy, environment, health, infrastructure development, mining, security and water, among others.

The African continent did not escape adverse impacts of the pandemic on its health systems, the economy, trade and generally livelihoods. Both the International Monetary Fund (IMF) and the World Bank projected negative growth rates in 2020 for the continent due to the pandemic. The IMF revised GDP growth forecast for the continent dropped to -1.6% and the World Bank has forecasted a similar GDP decline to between -2.1 and -5.1% in 2020.

The *African Union Development Agency New Partnership for Africa's Development (AUDA NEPAD) White Paper: Harnessing Innovation and Emerging Technologies to Address the Impact of Covid-19 in Africa* serves both as a compendium on innovations and emerging technologies being currently utilised to address the pandemic, as well as guidance on the short, medium and long-term strategies essential to mitigating the impacts of the Covid-19 pandemic on African countries. The proposed medium-term responses on supporting Africa's recovery from the pandemic focus on supporting the continent's Small, Medium and Micro Enterprises (SMMEs) and achieving food security.

The Southern African Development Community Industrialisation Strategy (SADC) was adopted in 2015. Its objectives are to engender a major economics and technological transformation of the region to support industrialisation and transition from a commodity-dependent development path to a knowledge-based and self-sustaining economic structure drawing on national and regional strengths as sources of prosperity. The strategy promotes the pursuit of targeted industrial policies to create conditions for higher private and public sector investment in crucial sectors, including the manufacturing sector. The strategy is built on three key pillars, namely industrialisation as a champion of economic transformation, competitiveness and regional integration. The main instrument being used by SADC to implement the strategy is value-chain mapping of three carefully selected sectors, namely agro-processing, minerals beneficiation and pharmaceutical manufacturing. The first five-year phase of implementation of the strategy is coming to an end, and the second phase is just beginning. To date, SADC has completed the value-chain mapping process for agro-processing, whose report has been published. The next focus is on the pharmaceutical value-chain mapping.

Regional integration is vital to South Africa's economic development plans and its economy benefits greatly from regional trade. On 1 January 2021, the African Continental Free Trade Agreement signed in Kigali, Rwanda, on 21 March 2018, came into effect. The agreement's objective is to integrate, diversify and industrialise African economies of about 1.3 billion people with a combined GDP of \$3.4 trillion.

A.1.1 EXTERNAL CONTEXT (continued)

- The South African government continues to place Africa at the centre and top of its international relations priorities. The 2019-2024 Medium Term Strategic Framework (MTSF) has reinforced this position. In alignment with South Africa's commitment to impact Africa's development agenda, the CSIR should pursue opportunities to contribute to the realisation of the Science, Technology and Innovation Strategy for Africa, the SADC Industrialisation Strategy and to support AUDA NEPAD in harnessing emerging technologies and innovations to address the adverse impacts of Covid-19. The CSIR will build on the research, technologies and innovation initiatives of 2020/21 as part of its strategic partnership with AUDA NEPAD, to advance its contribution to achievement of Africa's development objectives.

A.1.1.3 NATIONAL TRENDS

The development of sectoral masterplans, as part of revitalising industrialisation, should embed a strong Research and Development (R&D) component intended to improve the competitiveness and sustainability of the sectors under discussion. Some sectors will emerge in the future driven by innovation. Such an approach is termed innovation-led industrialisation. Investments in sectoral R&D would also serve as positive contributions towards gross expenditure on R&D (GERD) and advance progress towards the national target of 1.1% (expenditure on R&D as a percentage of GDP) by 2024 that has been set in the 2019-2024 MTSF.

The scope to expand and deepen collaborations with Higher Education Institutions (HEIs) and the Sector Education and Training Authorities (SETAs) is an area that the CSIR will continue to pursue, in order to achieve its strategic objectives and to contribute to national goals. In turn, the Department of Science and Innovation (DSI) innovation mandate will enhance the realisation of the CSIR strategic intent i.e. growth, sustainability, impact and relevance and enable the achievement of the National Development Plan (NDP) objectives to which the CSIR Strategy contributes, such as:

- The exploitation of new sources of economic growth;
- The improvement of the competitiveness of existing industries and firms;
- The development of SMMEs;
- Grassroots innovation;
- Service delivery support;
- The improvement of government decision-making; and
- The innovation for environmental sustainability.

The state and nature of funding for R&D remains a concern for the NSI, and particularly for the CSIR. GERD remains well below the targets of 1.5% set by the then Department of Science and Technology (DST). Our response through this strategy is to target increased private sector and international funding. However, public sector funding remains a key component of our income and National Treasury policy and regulatory support should better enable public entities to contract directly with government and State Owned Enterprises (SOEs) thereby contributing to a more capable state.

A.1.1 EXTERNAL CONTEXT (continued)

Covid-19 and the ‘triple challenge’: The Covid-19 pandemic has exacerbated the South African triple challenge of poverty, inequality and unemployment. The country’s economic outlook for 2020 is bleak as the resultant recession contracts the South African economy by 7.8% in real GDP growth. This implies that government finances are under extreme downward pressure, and given that budget cuts have been effected across many departments, this will, in turn, place extreme pressure on the CSIR’s largest income stream, the public sector.

National Economic Recovery Plan: To mitigate the vulnerabilities that the country is facing as a result of the Covid-19 pandemic and the resultant lockdown that started in March 2020, the President of the Republic of South Africa tabled the **South African Economic Reconstruction and Recovery Plan**, post-Covid-19. The Reconstruction and Recovery Plan consists of four priority interventions:

- A massive rollout of infrastructure throughout the country;
- The rapid expansion of energy generation capacity;
- An employment stimulus to create jobs and support livelihoods; and
- A drive for industrial growth (including localisation in manufacturing).

The first two South African Investment Conferences managed to secure pledges of around R664 billion in new investment, of which, to date, just under R170 billion of capital expenditure has been invested in projects for construction and buying equipment that is essential for **mining, manufacturing, telecommunications and agriculture**.

A.1.1.4 NATIONAL PRIORITIES

The design and implementation of the CSIR’s strategic plan is guided by a range of policy documents, chief among which is the NDP, which sets out the long-term developmental framework for the nation. This long-term vision is then supported by the MTSF, 2019-2024, the recently adopted White Paper on Science, Technology and Innovation (2019) and Industrial Policy Action Plan 2018/19 to 2020/21 to name a few relevant policy instruments. As part of the sixth democratic government, priorities are being articulated in other relevant instruments being developed. These include the NDP Five-year Implementation Plan, the dtic’s “Re-imagining Industrialisation Strategy for South Africa” and its Sector Master Plans, and the DSI’s Decadal Plan which is under development.

The National Development Plan: Vision 2030

The NDP offers a long-term perspective on South Africa’s development by clearly articulating a desired destination and identifying the role that different sectors of society need to play in reaching that goal. As a long-term strategic plan, it serves four broad objectives:

- Provides a set of overarching goals that we need to achieve by 2030;
- Builds consensus on the key obstacles to achieving these goals, and what needs to be done to overcome those obstacles;
- Provides a shared long-term strategic framework within which more detailed planning can take place; and
- Creates a basis for making choices about how best to use limited resources.

A.1.1 EXTERNAL CONTEXT (continued)

The CSIR's R&D programmes respond to seven of the focus areas identified in the NDP:

- **Economy and employment.** The CSIR initiates programmes directly aligned with supporting key national economic sectors. New strategic research, development and innovation clusters for the chemicals, mining, agriculture and manufacturing sectors focus specifically on this goal.
- **Building a capable state.** Our interventions in this area focus on service delivery and its associated issues. We have defined strategic research, development and innovation clusters, namely on Smart Mobility, Smart Places, and Next Generation (NextGen) and Institutions to support government in this area.
- **Economic and social infrastructure.** We conduct research, technology development and innovation in areas of Information and Communication Technology (ICT), water, transport, coastal infrastructure, as well as on improved building design and improved building materials.
- **Transition to a low-carbon economy.** The CSIR is working on improving the measurement and management of our natural resources, improving our ability to understand the long-term effects of climate change and, thus, assist government with the formulation of mitigation and adaptation strategies.
- **Transforming human settlements.** The CSIR is supporting metropolitan areas and municipalities in a number of areas, including spatial planning, the management of infrastructure and the transition to greener and smarter economies. Our Smart Places strategic research, development and innovation cluster, in particular, addresses elements of long-term planning and technology integration for smarter, more efficient communities.
- **Improving health.** Under a newly established strategic research, development and innovation cluster, CSIR Next Generation Health, the CSIR's work in support of health ranges from technical support to the National Health Insurance initiative, the development of interconnected and inter-operable Point of Care (PoC) devices and the development of new methods to understand, manage and diagnose disease at the cellular and molecular level.
- **Building safer communities.** CSIR interventions in this area focus on supporting the acquisition and integration of technology by our security forces, national police and the security sector. CSIR Defence and Security cluster will predominantly focus on this goal.

NDP Five-year Implementation Plan

During this sixth democratic government, in implementing the NDP, government is developing two sets of instruments, namely the NDP Five-year Implementation Plan and the MTSF as monitoring frameworks. The NDP Five-year Implementation Plan is under development and, through it, government will collaborate with the private sector, labour and civil society to contribute to the achievement of the set priorities. The CSIR will accordingly align its strategy, programmes and interventions to the NDP Five-year Implementation Plan.

A.1.1 EXTERNAL CONTEXT (continued)

MTSF 2019 to 2024

The MTSF 2019-2024 aims to address the challenges of unemployment, inequality and poverty through three pillars:

- Driving a strong and inclusive economy;
- Building and strengthening the capabilities of South Africans; and
- Achieving a more capable state.

The new MTSF is being designed around seven priorities. The DSI has indicated that the NSI will focus predominantly on priorities I and II (economic transformation, job creation, education, skills and health), with some focus on priority VI (building a capable state). The new CSIR Strategy is fully aligned to these aims and, as these priority areas align closely to the NDP, the CSIR will, in addition, contribute to the MTSF priority areas:

- I. **Economic transformation and job creation:** The CSIR's renewed focus on the future of production is aimed at stimulating economic development of key sectors in the South African economy. The Mining, Manufacturing, Defence and Security, Chemicals and Agriculture clusters will focus on achieving this priority area.
- II. **Education, skills and health:** The CSIR has a number of programmes aimed at skills development in a changing workplace. For example, it is implementing the Data Science for Impact and Decision Enablement programme, which is funded by the DSI. The programme is aimed at building capacity in data science by recruiting students to participate in learn-by-doing problem solving to meet real-world needs. Further, the CSIR is in collaboration with Manufacturing, Engineering and Related Services (Mer) Sector Education and Training Authority (SETA) on the Learning Factory as a platform to develop the skills of the future in particular for industry 4.0.
- III. **Consolidating the social wage through reliable and quality basic services:** The CSIR's support to government in this regard is through achieving its strategic objective, namely "drive socioeconomic transformation through research, development and innovation that supports the development of a capable state".
- IV. **Spatial integration, human settlements and local government:** The Natural Resources, Enabling Infrastructure, Public and Professional Services Division of the CSIR through its Smart Places, NextGen Enterprises and Institutions and Smart Mobility research, development and innovation clusters addresses supports long-term planning and technology integration for smarter, more efficient communities and improved service delivery.
- V. **Social cohesion and safe communities:** Through the Defence and Security strategic research, development and innovation cluster, the CSIR will develop and implement technology interventions aimed at improved digital and physical security.
- VI. **A capable, ethical and developmental state:** As per the NDP focus, the CSIR has defined the Smart Mobility, Smart Places and NextGen Enterprises and Institutions research, development and innovation clusters to support a capable state.

A.1.1 EXTERNAL CONTEXT (continued)

VII.A better Africa and world: The CSIR has established partnerships supporting objectives of the SADC region, the African Union's implementation of Agenda 2063 and collaborates with AUDA/NEPAD in the implementation of various industrialisation, science and technology strategies and initiatives. The CSIR, in collaboration with the DSI, aims to mobilise and facilitate the establishment of the African Chapter of the WAITRO to advance knowledge and innovation inspired development. The CSIR, is a member WAITRO, and collaborates internationally on issues such as climate change, safety and security, and technology governance. In 2021, the CSIR will host the WAITRO Global Innovation Summit.

White Paper for Science, Technology and Innovation (2019)

A key policy document relevant to the CSIR's mandate and strategy, is the new White Paper for Science, Technology and Innovation. It calls for greater collaboration, increased private sector involvement, increased capacity across the innovation value chain and increased resourcing. Through its new strategy, the CSIR aims to support these aspirations through greater collaboration, particularly with private sector; increased research capacity particularly of research translation infrastructure and capacity; and increased resourcing through actively targeting private sector and foreign investment funding.

The White Paper places greater emphasis on the enabling environment in and around the NSI, particularly in the context of increased involvement of private sector and civil society, support of SMMEs, financial incentives, policy guidance, with respect to procurement and private sector investment in Research, Development and Innovation (RD&I). In this respect, the CSIR has a number of programmes that target SMMEs such as Enterprise Creation for Development (ECD), and Industry Innovation Programme and will continue to support government in evidence-led policy development e.g. energy regulation, industrial policy, 4IR policy, ICTs and telecommunication standards.

A further aspect that the CSIR believes is necessary, is the strengthening of the country's regulatory and standards setting environment and, in this regard will collaborate with the South African Bureau of Standards (SABS), and South African Health Products Regulatory Authority, and other agencies such as for agricultural products in order to improve efficiencies and enable responsible adoption of new and emerging technologies.

The White Paper on STI has identified six outcomes and three cross-cutting themes. The cross-cutting themes are partnerships, internationalisation and transformation. The CSIR will contribute to the achievement of the DSI outcomes as follows:

A.1.1 EXTERNAL CONTEXT (continued)

Table A.1: CSIR response to DSI outcomes

DSI Outcomes	CSIR SOs	Relevant programmes/ initiatives
A transformed, inclusive, responsive and coherent NSI	N/A Partnerships?	CSIR advances this outcome in the main through its strategic partnership agreements with for example the Technology Innovation Agency, Development Bank of Southern Africa, Sasol, Siemens, Transnet, Eskom, Black Umbrellas, Black Business Council, 3Sixty/ Tautomer, and BGM Pharma, among others, as well as agreements with government departments, higher education institutions (HEIs) and science councils.
Knowledge utilisation for economic development in revitalising existing industries and stimulating R&D-led industrial development.	Improve the competitiveness of high-impact industries to support South Africa's re-industrialisation, by collaboratively localising, developing and implementing technology.	CSIR contributes to achievement of this outcomes through its future production research, development and innovation clusters, such as on chemicals , which seeks to establish state-of-the-art (bio)-chemistry to drive local pharmaceutical and the broader chemical industries; manufacturing which aims to strengthen the manufacturing value chain to enhance Industry competitiveness; and mining aiming to support the growth and revitalisation of the mining industry. Capability development initiatives such as on pharmaceutical technologies, precision agriculture and biochemical conversions are expected to impact on re-industrialisation of the South African economy.
Human capabilities and skills for the economy and for development.	Build and leverage HC and infrastructure.	CSIR is implementing a range of skills and HC development initiatives including on Young Researchers Empowerment supported by the YREF, GIT, Leadership and Management Development Programme, Accelerated Researcher Development Programme, YES initiative, Bursary Programmes, internships, learnerships, in-service training, and implementation of the Learning Factory Facilities for training of the skills for industry 4.0.
Increased knowledge generation and innovation output.	Conduct research, development and innovation of transformative technologies and accelerate their diffusion.	CSIR's research, development and innovation clusters, associated impact areas, research groups and research centres have the primary purpose of generating knowledge, and to undertake technology development and innovation.



A.1.1 EXTERNAL CONTEXT (continued)

DSI Outcomes	CSIR SOs	Relevant programmes/ initiatives
Knowledge utilisation for inclusive development.	Conduct research, development and innovation of transformative technologies and accelerate their diffusion.	The CSIR implements for example Industry Innovation Programmes funded by the DSI: e.g. Biomanufacturing Industry Development Centre BIDC), Biorefinery Industrial Development Facility, Red and Green Book initiatives. The CSIR is in a collaborative partnership – the Impact Catalyst – with the key mining industry partners Anglo American and Exxaro, the World Vision South Africa and Zutari, with the aim to drive large scale, socio economic development in mining regions of the country.
Innovation in support of a capable and developmental state.	Drive socioeconomic transformation through research, development and innovation that supports the development of a capable state.	<p>Through the NextGen Health research, development and innovation cluster, the CSIR aims to develop technologies to drive improved health outcomes and patient-centric healthcare delivery.</p> <p>The NextGen Enterprises and Institutions research, development and innovation cluster, supports the digitalisation of government, public institutions and the private sector.</p> <p>The Defence and Security research, development and innovation cluster builds resilient defence and security capabilities to strengthen national security technology capacity.</p> <p>The Smart Places research, development and innovation cluster contributes to development of sustainable economic growth and smart infrastructure and service delivery by effecting smarter resource use.</p>

A.1.1 EXTERNAL CONTEXT *(continued)*

Decadal Plan for STI

The CSIR will also effectively respond to achievement of emerging priority areas being identified in the DSI Decadal Plan that is under development. Due to its mandate and multidisciplinarity, it is not surprising that the CSIR is already active in these areas (Figure A.1). However, we will support the DSI by placing more emphasis on these areas together with other actors in the NSI.



Figure A.1: Emerging STI priority areas and the relevant areas that the CSIR is already actively pursuing

A.1.1 EXTERNAL CONTEXT (continued)

dtic “Re-imagining Industrialisation Strategy for South Africa” and Sector Master Plans

The **dtic** has completed four Master Plans covering more than 500 000 direct workers with a strong focus on localisation, development of small and medium enterprises and the informal economy. Two deal with food security and rural development i.e. sugar and poultry, one with the labour-intensive sector, with predominantly women workers and entrepreneurs i.e. retail clothing, textile footwear leather, and one deals with a major earner of foreign exchange for South Africa and platform for advanced manufacturing namely car manufacturing. The Master Plans for Steel Metal Fabrication, and that of furniture are under development during the 2020/21 financial year. Master Plans being developed and implemented by other departments include forestry, digital economy, tourism, agriculture and agro-processing, aerospace and defence, oceans economy, health economy, and renewable energy.

The CSIR will contribute to the **dtic**’s Reimagining Industrialisation Strategy for South Africa and Sector Master Plans to give effect to its mandate, which is “promotion and expansion of existing, as well as the establishment of new industries”. In implementation of our new strategy through both its **industry advancement clusters** and the **industry and society enabling clusters**, we will in turn give effect to sector master plans that align to our priorities.

District Development Model

The District Development Model (DDM) is considered as a new integrated planning model which seeks to be a new integrated, district-based, service delivery approach aimed at fast-tracking service delivery and ensure that municipalities are adequately supported and resourced to carry out their mandate. It is a process driven by Cooperative Governance and Traditional Affairs (CoGTA) (considering the strong cooperative governance theme/focus of the model). Due to the ‘new-ness’ of this model it was first piloted in three districts (also trying to ‘test’ it in different types of areas).

The CSIR has begun or been involved in a number of initiatives related to the DDM to date:

- Provided support to develop the Waterberg Profile (Pilot study) – funded by Anglo American based on a Memorandum of Agreement (MoA) between Anglo American and CoGTA.
- The Impact Catalyst was requested to support the Waterberg District Development Model as part of the presidential pilot.
- An initial geospatial profiling inputs to address a number of aspects that would be reflected in Waterberg (including climate change, settlement typology etc.).

A.1.1 EXTERNAL CONTEXT (continued)

CSIR, through discussions with various partners, is planning further work on the DDM:

- Based on a draft MoA between CSIR and CoGTA the CSIR (attached) intends to support:
 - CoGTA via the draft MoA on the DDM support
 - CoGTA via Development Bank of Southern Africa (DBSA) engagements on DDM Information Management System (IMS)
- The areas of collaboration with CoGTA which also have the areas of work on the DDM, one plan (Focus Area 3), IMS (Focus Area 6) and Economic Stimulus Programme (Focus Area 7) in terms of innovative infrastructure development and service delivery.

The Presidential 4IR Report

The Presidential Commission on the 4IR was set up to give effect to President Ramaphosa's vision to have a South Africa that is technology driven. The Commission recently presented its report, which advances eight recommendations:

- The establishment of an Artificial Intelligence (AI) institute;
- The establishment of a platform for advanced manufacturing;
- Securing and availing data to enable innovation;
- Incentivising future industries, platforms and applications of 4IR technologies;
- Building 4IR infrastructure;
- The review and amendment (or creation) of appropriate policies and legislation;
- The establishment of a 4IR Strategic Implementation Coordination Council; and
- A 4IR Project Management Office (4IR PMO) to develop a Strategic Implementation Plan to realise the recommendations of the PC4IR report.

The CSIR is well positioned and central to the implementation of the recommendations of the Commission. The CSIR's new strategy has as its core the intent, to develop and deploy 4IR and emerging technologies to contribute to industrialisation and achieve its strategic intent and objectives. The CSIR's strategy in respect to 4IR aims to build on previous research and development investments in emerging technologies, and to broaden and deepen its research, development and capabilities through for example new investments in additive manufacturing, the newly launched Emerging Digital Technologies Research Centre, the Mechatronics, Sensor Science and Mobile Autonomous Systems Research Centre and infrastructure such as the Learning Factory to support skills and capacity building required for fourth industrial era.

A.1.1 EXTERNAL CONTEXT (continued)

The CSIR is also hosting the South African World Economic Forum (WEF) Affiliate Centre for the C4IR SA at its Pretoria campus. The Centre is designed to play a central role in the implementation of the 4IR country strategy led by a Presidential Commission and recently published. The Centre activities focus on the policy and regulatory environment necessary for implementation of technologies. The Centre will also provide a means for interacting with relevant public and private sector stakeholders, both locally and internationally. The WEF C4IR Affiliate Centres are intended to be public-private partnerships, facilitated by government, but with strong buy in from relevant private and public sector partners.

National Technology Commercialisation Strategy

- Strengthen government-industry-academia collaboration;
- Build a network of connected technology commercialisation and marketing nodes;
- Promote a culture of knowledge and information sharing;
- Enhance market access for locally developed technologies;
- Create a clear, transparent, flexible and predictable system for IP ownership and access; and
- Develop sustainable skills and infrastructure.

A.1.2 INTERNAL CONTEXT

A.1.2.1 CSIR MANDATE

The CSIR was established on 5 October 1945 by an Act of Parliament. The Act under which the CSIR now operates, the Scientific Research Council Act, 1988 (Act 46 of 1988) stipulates the following mandate:

The objects of the CSIR are, through directed and particularly multidisciplinary 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.

Extract from Scientific Research Council, 1998 (Act 46 of 1988)

Figure A.2: The CSIR Mandate

Specifically, section 4 of the mandate dictates that the CSIR supports better utilisation of the resources of the Republic. This is achieved through the improvement of the productive capacity of its population, improvement of technical processes and methods to improve industrial production, the promotion and expansion of existing, as well as the establishment of new industries, standardisation in industry and commerce, and training of the national work force.

A.1.2.2 VISION, MISSION AND VALUES

OUR VISION

We are accelerators of socioeconomic prosperity in South Africa through leading innovation.

OUR MISSION

Collaboratively innovating and localising technologies, while providing knowledge solutions for the inclusive and sustainable advancement of industry and society.

A.1.2 INTERNAL CONTEXT (continued)

OUR VALUES

We **EXCEL** in R&D and industrial innovation solutions that address South Africa's challenges. Quality and efficient thinking, systems and processes enable the necessary agility to change course should our stakeholders or environment require it. We are unashamedly passionate about the impact we make and pursue excellence in every facet of CSIR life.

We care about **PEOPLE** – our impact through innovation aims to improve lives. We respect each other's diversity and uphold the dignity of every person, regardless of culture or belief system. Our systems and processes enable continuous personal development and we encourage one another to seize opportunities. We treat our stakeholders the way we like to be treated.

We value **INTEGRITY** – in ourselves and in others. We are honest and fair in how we work and how we engage the world around us. We respect the trust that our colleagues and stakeholders place in us and commit to ethical decision-making, delivery and governance.

We are keen to learn from one another and **COLLABORATE** across the organisation and with external partners to ensure that our work has the best chance of innovating a better future for South Africans. We actively share our knowledge and expertise by design, formally and informally, so that we can realise large-scale impact.

STRATEGIC INTENT

Growth – Our intent is to grow the CSIR business and use our capabilities to support inclusive growth of the South African Economy. For organisational growth, this will entail developing and growing new capabilities and competencies especially those that are relevant to the fourth industrial development and to use this to grow the income and impact of the CSIR. We will, in turn, leverage CSIR capabilities such as skilled HC and infrastructure to contribute to growing the South African economy.

Sustainability – We will use CSIR-developed technologies to contribute to the advancement and sustainability of South African enterprises, and at the same time the financial sustainability of the organisation in a resource-constrained environment.

Impact – We will focus on the commercialisation of our technologies and innovations for industrial development, as well as technology and knowledge transfer that enables a capable state.

Relevance – Through our work and its impact we will demonstrate the relevance of innovation in achieving economic development. This will ensure that we deliver on our mandate and remain relevant.

A.1.2 INTERNAL CONTEXT (continued)

A.1.2.3 INTERNAL TRENDS

Progress against Key Performance Indicators

Due to the Covid-19 pandemic, the CSIR reassessed KPI targets for the 2020/21 financial year. The following key challenges experienced by clusters during the lockdown conditions still exist, but the extent has somewhat decreased:

- Reduced laboratory and field work, leading to decreased productivity – with the opening of most economic sectors after June 2020 and return to work of critical CSIR Science, Engineering and Technology (SET) staff, this has become less of an issue;
- Delays in contracting with the private and public sectors due to the national lockdown – contracting remains a challenge, particularly as budgets are re-directed to critical operational issues within our clients' organisations rather than to investments in new RDI programmes; and
- Delayed or deferred recruitment due to uncertainty about contract income

As of December 2020, CSIR was on track to achieve 24 of the 31 KPIs against these amended targets. Targets for publication equivalents, patents and technology demonstrators and localised technologies are all expected to be met, whereas targets for licensed technologies are lagging. A strong pipeline of licensable technologies is however being pursued by the Business Development and Commercialisation functions within each of the divisions. Our work with industry and in support of SMMEs has progressed well despite the challenges, and both KPIs are expected to meet the performance thresholds. Research in support of a capable state started strong in the early part of the financial year due to CSIRs contribution to national Covid-19 efforts. KPIs relating to development of national standards and contribution to national policies are lagging as government departments have shifted focus and resources towards Covid-19 relief activities.

Progress against KPIs relating to Human Capital Development (HCD) and finance are discussed further below. The CSIR has performed exceptionally with regards to good governance in the 2020/21 year, reaching a BB-BEE level of 2 against a target of 3, a Recordable Incident Rate (IRI) of 0,59 against a target of 2 (as of December 2020) and an unqualified audit opinion from the Auditor General.

A.1.2 INTERNAL CONTEXT (continued)

SET base dynamics

The trend for SET staff shows gradual growth in the 2020/21 financial year, from 1 367 at the end of 2019/20 to 1 429 in Q3 of 2020/21 (about 4% growth), a positive development compared to the decline observed over the past four years. The decline was due largely to the change in strategy and associated re-organisation. CSIR has maintained a ratio of around 70:30 for SET to support staff over the previous years, with a drop to 65:35 in 2019/20 and gradual recovery to 68:32 in 2020/21. The CSIR remains committed to maintaining transformation in the SET base. The number of Black and female SET staff followed the same downward trend as the total number of SET staff over the last four years; however the percentages remained steady. With the expected 5% increase in the number of SET staff and based on the employment equity plan in place, it is projected that the numbers will gradually increase with targets set at 66% (from 65% in 2020/21) and 37% (from 35.5%) for black and female SET staff, respectively, increasing to 68% and 40% over the 5 year horizon. The number of staff with PhDs grew to 22% over the last financial year and the number of chief researchers started to increase albeit slightly from the second quarter of 2020/21.

The CSIR lost a significant number of principal Researchers in 2018/19 and 2019/20, but this did not affect the composition of black and female principal researchers. The number increased slightly in 2020/21 to 180 (from 149 in 2019/20). There is a projected positive growth in the coming years, starting with a target of 193 for 2021/22, increasing to 235 over the next five years. Proportions of black and female principal Researchers are currently at 29% and 18.5 %, respectively, the target for 2021/22 will be set at 35% and 22%, respectively, and increasing to 45% and 27% by 2025/26.

Infrastructure

The Capital Investment Plan (CIP) covers infrastructure investment over three areas, which are RDI infrastructure, ICT infrastructure, and Facilities Management infrastructure. Of the total funds allocated (inclusive of CSIR Property, Plant and Equipment (PPE) funding, Grant funding, State funding) for infrastructure, only 34% had been spent by the beginning of the fourth quarter of the 2020/21 financial year, with most of the funds spent in the ICT area.

With regard to the Campus Master Plan (CMP) Projects, such as the Gateway to Science and Innovation Centre, the services of a fundraiser were procured to provide input to the feasibility study and business case. The feasibility study and business case are near completion and will be moving into the next step of marketing and fundraising. The residential accommodation project is nearing the finalisation of a road map inclusive of a market, technical, legal as well as transaction options. Regarding the Shared lab and Pilot and Pre-manufacturing precinct, a Request for Proposal (RFP) for a needs analysis for the Shared labs has been developed and is in the process of being published to get experts on board who will assist with the needs analysis. An internal gap analysis was also completed which identified that no expertise was available internally to do the needs analysis.

A.1.2 INTERNAL CONTEXT (continued)

ICT Strategy and Roadmap

The CSIR appointed Kearney to develop an ICT strategy and transition roadmap aligned with the new CSIR organisational strategy. This was in response to a need for a new ICT strategy that would allow the organisation to develop into a modern, integrated, secure and digitally enabled/transformed organisation.

CSIR has a dual challenge in that it has an existing outdated and non-integrated landscape with multiple pain points coupled with a need to modernise and digitise its operation. As a result, a project approach that would allow two-step transformation process focused on simultaneously resolving legacy issues whilst allowing the organisation to transform to a digital organisation was defined.

The financial analysis of implementation options highlighted that over the past three years, CSIR ICT capital spend was on average ~ R12.5 million annually. This is far below the annual ICT capital investment of approximately R 45 to 50 million needed to align with industry average benchmarks. As a result, CSIR will need to spend more than the average to address the current pain points identified in the as-is assessment that have arisen from under-investment. Based on the CSIR's needs, aspirations and the pace of digital change, the project team recommended that CSIR undertake the execution of the defined ICT strategy and enabling operating model over a three-year implementation timeline.

Given the current state of the economy and the many competing priorities that exist, the CSIR team is currently working on an implementation plan of how best to implement the recommendations.

Marketing and Strategic Communication

Strategic Communication aims to deliver a coherent and cohesive organisational message and position to the multifaceted stakeholders that the organisation serves or engages with. However, due to the Covid-19 pandemic, the organisation could not host physical events, which affected its science engagement initiatives. This meant that a number of events, such as the launch of the new CSIR Strategy and the CSIR Career Day, had to be cancelled or postponed. However, some of these challenges are being addressed by shifting engagements/events to digital platforms. The CSIR is now engaging with its stakeholders mainly through digital platforms, including social media.

The year 2020 was a special one for the CSIR as the organisation celebrated 75 years of existence, launched its refreshed brand, and hosted its first ever online conference and Excellence Awards. Strategic Communication also successfully developed a communication plan to showcase the work that the CSIR is doing to assist the country in the fight against the Covid-19 pandemic.

In October 2020, the CSIR Board approved the CSIR Communication and Marketing Strategy, which aims to position the CSIR as a partner of choice for the private and public sectors, knowledge institutions and international organisations.

A.1.2 INTERNAL CONTEXT (continued)

Strategic Partnerships

A draft Stakeholder Framework has been developed, and a workshop on it was held internally with the CSIR divisions, clusters and support portfolios. The Framework will now be taken through to consideration by CSIR Operations Committee (OPCO), before final consideration and approval by CSIR Executive Committee (EXCO). It is planned that the Framework will be approved before the end of the current financial year. The year 2021 will be used for implementation of the Framework.

In addition to the Stakeholder Engagement Framework, which encompasses local and international cooperation, there is a process under way to develop a Strategic Partnerships Policy, which will complement the Stakeholder Engagement Framework. This policy currently being processed through internal CSIR structures for final approval by the CSIR Board on 19 February 2021. As with Stakeholder Engagement Framework, the year 2021 will be used for implementation of the policy.

In developing the Africa Cooperation Framework, the CSIR has undertaken a major process of establishing a mutually beneficial relationship with the African Union Development Agency NEPAD (AUDA NEPAD). As a result of this process, the CSIR and AUDA NEPAD have partnered with Stellenbosch University to establish a Centre-of-Excellence in Science, Technology and Innovation, hosted by the CSIR at the Stellenbosch Campus. Developments are at an advanced stage, with AUDA NEPAD already occupying Offices in the CSIR Stellenbosch Campus, and a draft Business having been recently completed. The Centre of Excellence on Science Technology and Innovation (CoESTI) will act as conduit for CSIR and Stellenbosch University developed and proven innovations / technologies to be rolled out across the rest of the African continent. This will form a major pillar of CSIR engagement in the African continent while the CSIR Africa Strategy is being developed.

Building a portfolio of partnerships aligned to CSIR RDI focus areas has been a major focus in the 2020/21. Examples of some of the collaborative agreements/engagement that have been pursued/developed include SASOL, Black Business Council, 3Sixty Global Solutions, Tautomer, Black Umbrellas, Siemens, the SA SME Fund, etc. Further engagements are being pursued with other private sector and industry players in this regard. In addition to the industry focus, over the next coming months there will be renewed focus on rekindling relationships with Higher

A.1.2 INTERNAL CONTEXT (continued)

Education Institutions, a key stakeholder grouping for the CSIR.

A.1.2.4 STRATEGIC OBJECTIVES

The organisation's SOs are derived from the prevailing strategic drivers in our operating environment. The SOs provide the framework on which our strategic and operation plan is designed:

SO1 Conduct research, development and innovation of transformative technologies and accelerate their diffusion.

This strategic objective seeks to ensure that the CSIR undertakes cutting-edge research and development in areas that will bring transformative change in the South African economy and society.

SO2 Improve the competitiveness of high-impact industries to support South Africa's re-industrialisation by collaboratively developing, localising and implementing technology.

This strategic objective seeks to improve the competitiveness of South Africa's high-impact industries through research, development, technology localisation and industrialisation in a collaborative manner with partners, thereby contributing to the re-industrialisation of the country.

SO3 Drive socioeconomic transformation through RD&I that supports the development of a capable state.

This strategic objective emphasises the CSIR's role in supporting the development of a capable state and enabling government to drive the socioeconomic transformation of South Africa through research, development and innovation.

SO4 Build and transform human capital and infrastructure.

This strategic objective seeks to build and transform the required human capital, and invest in infrastructure to drive industrialisation and the advancement of society.

SO5 Diversify income, maintain financial sustainability and good governance.

This strategic objective seeks to improve the CSIR's financial sustainability by diversifying revenue sources and optimising the business model to achieve competitiveness supported by good (efficient and sound) governance.

A.2 The CSIR Strategy

The CSIR mandate calls for the CSIR to foster industrial and scientific development through directed multidisciplinary research and technological innovation to improve the quality of life of South Africans.

The interpretation of this mandate seeks to balance the focus of the organisation's efforts between directed research through scientific excellence, effective and meaningful translation of that R&D into solutions that address the triple challenge of poverty, inequality and unemployment.

The past decade or so has seen a significant investment of CSIR resources towards 'strengthening the SET base' of the CSIR. The new CSIR strategy focuses on amplifying the 'I' in 'CSIR' and does so by leveraging its strong SET capability base, building on current industrial development opportunities, while creating the right balance between scientific development and industrial development in its innovation portfolio. A number of external and internal environmental factors influences the strategic direction of the CSIR.

Our RD&I programmes and initiatives aim to address national priorities, national strategies and policies such as the NDP, the MTSF 2019 to 2024, the White Paper on Science, Technology and Innovation, the STI domains identified as part of the recent Foresight initiative and the dtic Sector Master Plans. We are cognisant of changing environmental factors and recent strategic initiatives that may influence our strategic direction. For example, there are strategic prescripts introduced anew in 2020/21, which will inform our programmes and initiatives. These include the DSI strategic plan 2020-2025, the South African Economic Reconstruction and Recovery Plan: post-Covid-19, and the Presidential Commission 4IR Report.

In response to national priorities and to achieve our SOs, including our goal of re-industrialisation, we will leverage our current capabilities as we have demonstrated in response to Covid-19 during 2020. Further, we will develop new capabilities to respond to the national priorities, private sector and international markets.

Industry-oriented RD&I will play a critical role in supporting the short, medium and long-term growth of the economy. In the short-term, we need to develop and deploy technologies and research, development and innovation solutions that improve the efficiency and, thus, competitiveness of existing enterprises. Post-Covid-19 recovery plans also compel us to have interventions that focus on SMMEs, in addition to more established businesses. In the medium to long-term, we need to develop the industries and sectors based on, for example, the use of new technologies such as 4IR technologies and beneficiation of local resources that will grow the economy. Understanding and mitigating the risks to long-term growth due to climate change and the mismanagement of our natural resources will be considerations in support our private sector partners.

The CSIR also sees its role as providing the scientific and technological innovations that will improve the ability of the state to efficiently deliver basic services such as health, education, social security, access to energy and shelter to all South Africans.

Our contributions to the private sector and building of a capable state should ultimately contribute to sustained economic growth that addresses the issues of unemployment, poor access to basic services, poverty and inequality.

A.2.1 STRATEGIC FOCUS OF RESEARCH, DEVELOPMENT AND INNOVATION AT THE CSIR

Four key pillars that include our strategic clusters and research centres; capability development; strategic infrastructure; and HC development as depicted in Figure A.3 below, underpin the CSIR strategy implementation focus. For successful implementation of the four pillars, in turn, adoption of 4IR technology and emerging technologies in our RDI programmes and intensification of commercialisation, technology transfer and diffusion of innovations and solutions will be key. Our business development of customer-centric research and innovation offerings, good governance, advancing business conduct that is in alignment with our values and good ethics, will further enhance our success.

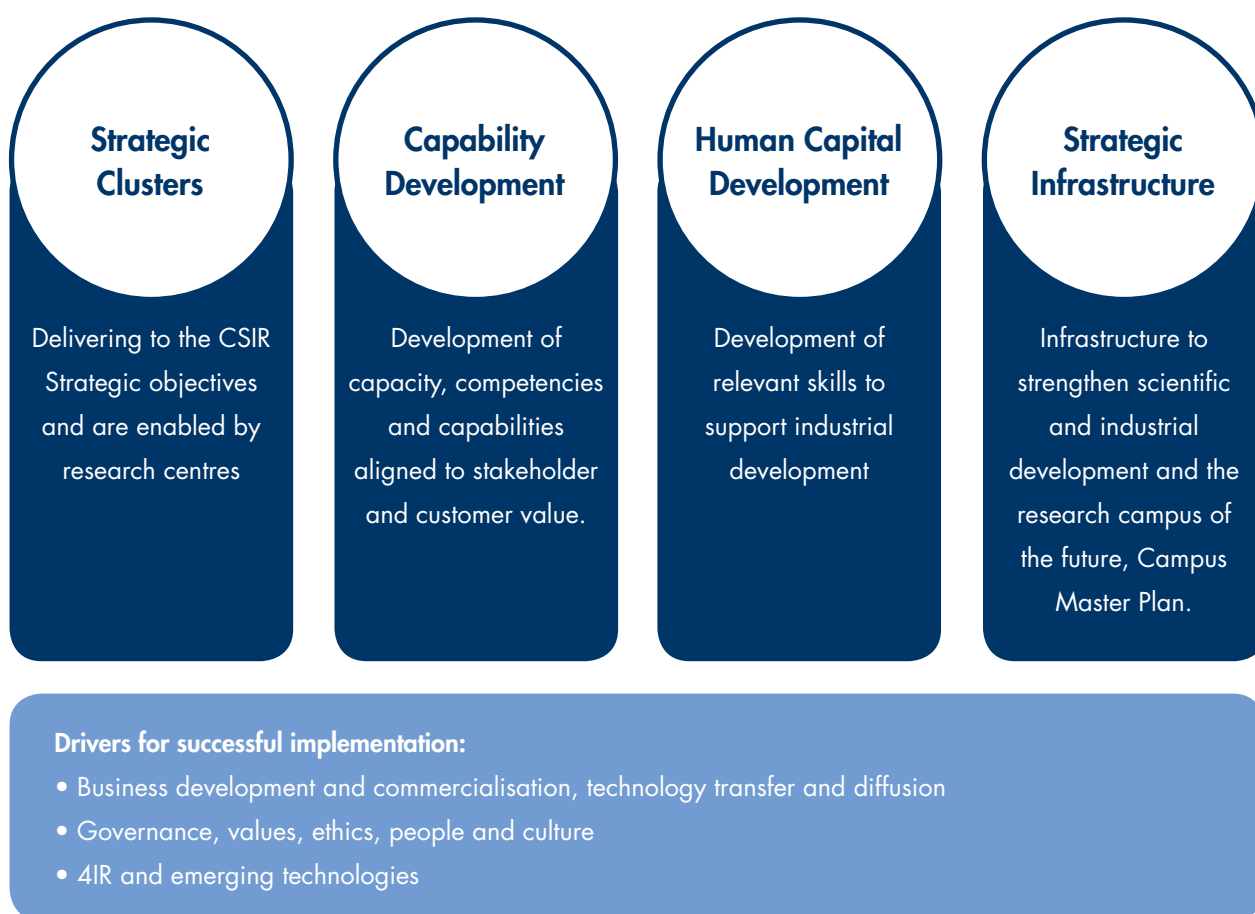


Figure A.3: RD&I Strategy Implementation Pillars

A.2.1 STRATEGIC FOCUS OF RESEARCH, DEVELOPMENT AND INNOVATION AT THE CSIR (continued)

CSIR STRATEGIC RESEARCH

The CSIR clusters represent the core focus areas of the CSIR, which are informed by priority industry sectors and technologies that offer opportunities for research, development and innovation for industry competitiveness and advancement, as well as to enable the achievement of societal objectives. These clusters are:

Advanced Agriculture and Food, which innovates to strengthen primary production, agro-processing and advance rural economies.

Future Production: Chemicals, which seeks to establish state-of-the-art (bio)-chemistry to drive local pharmaceutical and the broader chemical industries.

Next Generation Health, which develops technologies to drive improved health outcomes and patient-centric healthcare delivery.

Future Production: Manufacturing, which strengthens the manufacturing value chain to enhance industry competitiveness

Future Production: Mining, which supports the growth and revitalisation of the mining industry.

Defence and Security, which builds resilient defence and security capabilities to strengthen national security technology capacity.

Smart Places, which effects smarter resource use, sustainable economic growth and smart infrastructure and service developments.

Smart Mobility, which enables South Africa to have an efficient, effective and integrated logistics sector

Next Generation Enterprises and Institutions, which supports the digitalisation of government, public institutions and the private sector.

RESEARCH CENTRES

For the first time in 2020/21, the CSIR supported new research centres:

- Water Research Centre,
- Information and Cybersecurity Research Centre
- Emerging Digital Technologies for the Fourth Industrial Revolution Research Centre

A.2.1 STRATEGIC FOCUS OF RESEARCH, DEVELOPMENT AND INNOVATION AT THE CSIR (continued)

Other CSIR research centres continue to be supported and these are Centre for Synthetic Biology and Precision Medicine, Centre for Nanostructures and Advanced Material and Centre for Robotics and Future Production replacing programs that were previously known as Emerging Research Areas. These programs will continue to be funded in the new financial year at the discretion of the EXCO. Review of the research centres performance by EXCO remains pivotal in ensuring complete alignment during the period of support. Reliance on the Parliamentary Grant as source of funding should be expected at least for the next 5 years, however, the Centres need to invest in the development of capabilities that will allow them to be sustainable and articulation of these in Sustainability Strategies will be developed for each research centre in 2021/22.

CAPABILITY DEVELOPMENT INITIATIVES

The main objective of the capability development initiatives is the development of capacity, competencies and capabilities aligned to stakeholder and customer value. There are five new capability initiatives that are being supported through Parliamentary Grant (PG) strategic initiatives funding. These initiatives are:

- **Bio(chemical) conversions platform** aimed at developing disruptive bio-based technologies and products, namely:
 - Bio-conversions; and
 - Chemical conversions aimed at localising poly butylene succinate and polylactide (PLA) production.
- **Pharmaceutical technology innovation platform** aimed at innovating and localising cutting-edge process technologies to support local pharmaceutical manufacturing through:
 - Small Molecule and Active Pharmaceutical Ingredient (API) Development; and
 - Biopharmaceutical Process Development.
- **Precision agriculture and spatial information systems** which aims to support sector growth with specific focus on maize.
- **Smart Mobility Research Chair:** This initiative is aimed at positioning the Smart Mobility cluster through enhanced collaboration with key academic partners. The initiative is aligned with the principles of the SARCHI research chair funding instruments, which are to “strengthen and improve research and innovation capacity of public universities, research councils, and national research facilities in order to produce high quality postgraduate students and research outputs.”
- **End-to-End Logistics:** This initiative is funded with the aim of establishing a Smart Logistics Management impact area within the Smart Mobility cluster (end-to-end logistics). The envisaged outcome is to implement the directives of the CSIR.

Going forward, there is an opportunity to contribute to the implementation of the new strategy and the value of the strategy can only be created and delivered when the CSIR has the appropriate capabilities. The capability development initiatives will not deliver value immediately, thus the need for the CSIR to be invested in the program for longer than the MTEF. The Capability development initiatives are one of the important pillars for strategy

A.2.1 STRATEGIC FOCUS OF RESEARCH, DEVELOPMENT AND INNOVATION AT THE CSIR (continued)

implementation and continued support in 2021/22 with periodic performance review and guidance of the EXCO will seek to ensure that these initiatives articulate and develop technologies and solutions that are aligned with their value offering. The strategic alignment and linkages of strategic initiatives while investing in all 9 Clusters of the organisation will inform initiatives supported as part of Capability Development.

THE INDUSTRY INNOVATION PROGRAM (IIP)

The CSIR, in collaboration with the DSI, continues to drive the development and implementation initiatives under the Industry Innovation Programme (IIP), which is aimed at enhancing industry competitiveness, encouragement of co-investment in R&D with the private sector, and facilitating job creation and investment in strategic R&D programmes. These platforms are primarily designed to address the gap in the NSI of the shortage of infrastructure and skills to effectively translate concepts into sustainable market opportunities. There are currently five established research facilities offering upscaling, product development, prototyping and vocational training activities, and these are the:

- Biomanufacturing Industry Development Centre;
- Nanomaterials Industrial Development Facility (NIDF);
- Biorefinery Industry Development Facility (BIDF);
- Photonics Prototyping Facility (PPF); and
- Nano-Micro Device Manufacturing Facility (NMDMF).

In 2021/22 the CSIR will explore opportunities to scale up for bigger impact. For instance, the BIDC and NIDF have proven to be good initiatives with tangible outputs and outcomes. Increased resourcing for these initiatives has the potential to lead to up-scaled impact. However, the challenge remains to be the sustainability of these initiatives, and sustainability strategies will be developed in 2021/22.

SCIENCE, ENGINEERING AND TECHNOLOGY CAPABILITY DEVELOPMENT PLAN

The aim of the SET Capability Development Plan is to define the SET capability required based on the existing project pipeline for industry and the state, assess current CSIR SET capabilities and the gap to the required capability and to acquire and develop SET capabilities for closing the identified capability gaps

In order to do this, a CSIR Capability Management Framework is needed. This framework must be institutionalised. The main tasks involved are:

- Develop methods for defining required SET capabilities
- Develop methods for assessing SET capabilities in the context of defined capabilities required
- Develop methods for acquiring and strengthening SET capabilities
- Pilot, test and refine the methods
- Roll out across the organization

A.2.1 STRATEGIC FOCUS OF RESEARCH, DEVELOPMENT AND INNOVATION AT THE CSIR (continued)

The initial pilot was started during October 2020, and its focus is RD&I capabilities for the Mining Industry. The 5 new capability initiatives listed above are potentially additional pilot areas. It is anticipated that the CSIR roll out process will be a multi-year process and will involve all managers in CSIR.

A.2.2 BUILD AND TRANSFORMING HUMAN CAPITAL

The HC priority for the CSIR is to primarily drive the delivery of the fourth strategic objective, which is to “build and transform the HC and infrastructure”. This strategic objective is ultimately to provide a sustainable supply of HC to meet internal capacity demands with relevant and high – quality skills and capabilities in order to achieve the organisation’s strategic objectives. A conducive workplace, cohesive organisational culture, lived and embedded value system are key drivers to improve our organisational effectiveness, increase productivity, enhance performance and achieve operational excellence.

The implementation of the new CSIR strategy, operating model and organisational structures in the past year created the opportunity for the re-alignment of business objectives for increased collaboration with government and the private sector and leverage opportunities arising from the 4IR. Increased focus on industrialisation requires a shift in focus of talent needs aligned to new business objectives and human resource capacity requirements, and the acquisition and development of new skills to complement capacity demands in new areas of research, development and innovation.

The CSIR’s contribution to scientific research, industrial development and innovation is enabled through a highly skilled and capable workforce. Focused interventions for the development and enhancement of the SET capabilities is of critical importance in ensuring the internal sustainability of the organisation. Comprehensive understanding of new business objectives and assessment of internal capacity and capability requirements are critical elements that inform our recruitment strategy, and the recruitment planning and optimisation of channels for the attraction of talent.

The Human Resources Development Strategy for South Africa (HRD-SA) 2010 – 2030 also makes key commitments towards the development of key innovation skills. Of importance is the sixth commitment made in the strategy towards the improvement of the technological and innovation capability and outcomes within the public and private sectors to enhance the country’s competitiveness in the global economy and meet its human development priorities.

The CSIR has adopted four strategic pillars to achieve the fourth CSIR strategic objective (SO4). The four strategic pillars aim to align HC strategy and operational planning with the CSIR’s strategy, vision, mission and values, and create synergy with HC functions and our strategic leadership role to achieve and implement cultural change initiatives. The HC strategic pillars and key initiatives to deliver on the SO4 objectives include the following:

A.2.2 BUILD AND TRANSFORMING HUMAN CAPITAL (continued)

BUILDING A DIVERSE TALENT ECOSYSTEM AND A SUSTAINABLE FUTURE SUPPLY

Our intent is to grow the CSIR business and use our capabilities to support inclusive growth of the South African Economy. For organisational growth, this will entail growing new capabilities and competencies especially those that are relevant to the fourth industrial development and to use this to grow the income and impact of the CSIR. We will, in turn, leverage CSIR capabilities such as skilled HC and infrastructure to contribute to growing the South African economy

The strategic focus in respect to HC is to provide a sustainable supply of HC to meet internal capacity demands with relevant skills and capabilities for the achievement of the organisation's overall business strategy towards increased organisational effectiveness, improved productivity, enhanced performance and achievement of excellence.

STRENGTHENING LEADERSHIP AND DEEPENING PROFESSIONALISM

Strengthening our capabilities through increased investment in HC development programmes is critical to enhance skills and competencies, and elevate capabilities towards a highly skilled workforce capable of achieving organisational goals. Programmes to deepen professionalism, focusing on strengthening the behavioural competencies of our staff aligned to EPIC values and the creation of a cohesive organisational culture among of all staff, are critical strategy drivers to change behaviour and achieve a cohesive committed and engaged workforce.

Continued transformation of our workforce emphasised the need to identify and develop young talent into future leadership role thereby ensuring business continuity and sustainability. New initiatives included in HC development programmes of the CSIR during the past year included the GIT and YES programmes, which focus on the creation of employment opportunities for the youth. These programmes will continue in 2021/22 and there will be increased focus in support of national objectives to reduce levels of unemployment.

IMPROVING INDIVIDUAL AND ORGANISATIONAL PERFORMANCE

The aim of this HC objective is to elevate individual and organisational performance towards the achievement of excellence and a high-performance culture in a systematic and staged approach, and to address key areas of improvement. Key to the achievement of this objective is the implementation of HC initiatives required as imperative for improvement of our capabilities to drive operational efficiency and increase organisational performance.

Driving individual and organisational performance towards the achievement of a high-performance culture is key to the successful achievement of business objectives and long-term sustainability of the CSIR, and maximising our outputs and contribution towards making an impact on RDI in the country.

A.2.2 BUILD AND TRANSFORMING HUMAN CAPITAL (continued)

ADVANCING WOMEN AND PEOPLE WITH DISABILITIES

Advancing of women in the CSIR is a key priority. The percentage of South African Females as at 31 Dec 2020 was 43.8% of the total staff. The percentage of SET staff who are South African Females as at 31 Dec 2020 was 35.3% of total SET staff.

Advancement of women is prioritised through recruitment planning aligned to the Employment Equity Plan of the CSIR. The CSIR has recently established the Employment Equity & Skills Development Committee (the Committee) and Consultative Forums (the Forums). The Committee and Forums shall represent CSIR employees with the view of effectively addressing strategic employment equity and skills development issues. The CSIR seeks to address, through the Committee and Forums, the inequalities in racial, gender and skills development which interfered with the provisions of educational employment opportunities in the past and have created barriers to full and equal participation of the majority of the population in economic life, both outside and within the CSIR.

The CSIR Employment Equity Committee will also focus in advancement of People with Disabilities. The number of People with Disabilities has increased from 8 as at 31 March 2020 to 40 during the past year as a result of the YES-Programme.

A.2.3 STRATEGIC INFRASTRUCTURE INVESTMENT AND DEVELOPMENT

The CSIR is committed to investing in infrastructure to contribute to scientific and industrial development objectives, as well as the development of the research campus of the future as guided by the Campus Master Plan (CMP).

RDI INFRASTRUCTURE INVESTMENT ENABLING THE IMPLEMENTATION OF THE NEW CSIR STRATEGY

Our research, development and innovation infrastructure includes laboratories, testing facilities, scientific platforms, instruments, equipment, prototyping, pilot and pre-manufacturing facilities, demonstration facilities and translational infrastructure. Our infrastructure is housed in our campuses in Cape Town, Durban, Johannesburg, Pretoria, Nelson Mandela Metropolitan Municipality and Stellenbosch.

As part of the implementation of the new CSIR strategy, there is renewed focus on the development and renewal of infrastructure through new investments. Through this intervention, the CSIR aims to develop RDI infrastructure as part of capability development in alignment with national priorities that support the growth and sustainability of various economic sectors in South Africa. The ultimate impact from infrastructure investment includes:

- Creation of jobs in various sectors of the economy;
- Increasing growth and competitiveness in the various sectors;
- Supporting industry to build sustainable businesses;
- Contributing towards the development of a capable state;
- Imparting skills relevant to the industry through training and technology transfer; and
- Increasing industry competitiveness through local technology development.

A.2.3 STRATEGIC INFRASTRUCTURE INVESTMENT AND DEVELOPMENT (continued)

NATIONAL TREASURY — FUNDED CSIR RESEARCH INFRASTRUCTURE

Currently, funding by National Treasury through the DSI, amounting to R155.2 million (excluding VAT) over three years, is being invested in research infrastructure intended to impact the pharmaceutical, manufacturing, smart mobility and infrastructure industries. The infrastructure projects are:

OPEN LABORATORY FOR PHARMACEUTICALS MANUFACTURING

In order to drive technology development and commercialisation of active pharmaceutical ingredients (APIs) manufacturing in South Africa, the establishment of this facility is currently underway. The plan is for this to be an open innovation facility integrating molecular engineering and continuous pharmaceutical manufacturing for Africa. This facility will focus on the production of both small molecule and biologic APIs using modern manufacturing technology that blurs the lines between the physical and the digital worlds, solving complex real-world problems for the local pharmaceutical industry, and making production more automated, modular, cost-effective and responsive.

All drugs consist of two parts, the API and excipients. According to the United States Food and Drug Administration (US FDA), the purpose of APIs is to cause “pharmacological activity or other direct effects in the diagnosis, cure, mitigation, treatment or prevention of disease or to affect the structure and function of the human body”. APIs can be chemically synthesised compounds referred to as small molecule APIs or complex protein-based structures referred to as biologics or biopharmaceuticals. High potency APIs (HPAPI) for our purposes are categorised as small molecule APIs.

The key differentiator and competitive advantage for a successful South African pharmaceutical manufacturing industry will be the integration of state-of-the-art chemistry and bioproduction systems; emerging “green” and disruptive continuous production; and smart technology for process monitoring and intelligent process optimisation, all of which are required to increase efficiencies across the pharmaceuticals production value chain. By working in partnership with industry to apply “forward-looking” business models, measurable impact will be realised through cost competitive and improved end-to-end API production technology scaled-up into commercial API “micro-factories” and other facilities.

LEARNING FACTORY

The sustainability of traditional business models and avenues of employment in South Africa and the African continent is being challenged through the global adoption of digital transformation processes and technologies across various industries. Strategies that focus on the implementation of digital transformation are imperative for local industries to remain relevant, competitive and sustainable across vertical and horizontal value chains that are dynamically evolving.

The CSIR Future Production: Manufacturing cluster has embarked on a journey to enable and support the industrialisation of technologies from other clusters across the CSIR, as well as within local SMMEs and academia. Therefore, the development of an industrial Learning Factory (LF) has been planned as a key element to integrate

A.2.3 STRATEGIC INFRASTRUCTURE INVESTMENT AND DEVELOPMENT (continued)

and deliver on the CSIR strategic objectives within the Future Production: Manufacturing cluster. This LF will focus on the manufacturing technologies, skills and processes required to address industrialisation, economic transformation, skills and education in alignment with the SOs of the CSIR. In addition, the LF will also support industry, government bodies, academia and entrepreneurs that need to adopt a digital transformation intervention or improvement. The focus of this LF supported by National Treasury funding will be on pure and applied manufacturing.

ADVANCED MATERIAL (ROAD) TESTING LABORATORIES

The Advanced Material Testing Laboratories (AMTLs) provide specialist testing services, develop innovative kits and customised equipment, and create new technologies and testing procedures in support of the SET needs of the pavement engineering sectors in South Africa and internationally. The AMTLs are modelled around the two types of road pavement designs, and hence consist of the following:

- A granular (soils, gravel and aggregates) and cementitious materials laboratory;
- An asphalt laboratory;
- A dynamic testing laboratory;
- A bituminous binders laboratory; and
- A mechanical workshop.

This facility supports research, investigations into road failures, and also acts as a reference laboratory for the road pavement industry. The laboratories in the facility are unique in the continent in that their services include 250 – 300 test methods conducted by technicians of various skill sets.

The AMTLs have a RDI programme linked to an annual intake of internships that focusses on value-adding initiatives aligned to industry needs. The themes of these initiatives include:

- Supporting industry specifications through performance-related tests (current tests at this stage of development include extensional bitumen tests to predict fatigue cracking, polymer identification tests for forensic investigations into road failures, bitumen mastic tests for asphalt road performance characterisation, etc.); and
- Supporting the sustainable use of waste material in road construction (current waste material investigations at this stage of development include waste-cooking oil as a rejuvenator, multilayer plastic waste as an alternative soil stabiliser).

MODELLING HALL TO SUPPORT PORTS AND HARBOURS

The purpose of this infrastructure investment project is to refurbish and upgrade the Physical Hydraulics Laboratory, the Modelling Hall, at the CSIR Stellenbosch campus. The laboratory is of national interest, is unique to South Africa and is the largest facility of its type in the southern hemisphere. Its uniqueness also lies in the fact that the laboratory

A.2.3 STRATEGIC INFRASTRUCTURE INVESTMENT AND DEVELOPMENT (continued)

has some of the largest basins in the world, which allows models to be tested at larger scales and therefore reduces uncertainty. Various international work conducted at the laboratory over the last few years resulted in the CSIR being able to bid for physical modelling work at the same or better standard as the top known laboratories in the world.

The laboratory was constructed in the late 1960s and is 11 000 m² in size. Two pump buildings, one adjacent to the laboratory, the other on the opposite corner of the campus, along with underwater storage tanks with a total capacity of three million litres, form part of the integrated infrastructure.

The main function of the laboratory is to test scale layouts of ports, the stability of port breakwaters, ship motion alongside a quay and ship navigation (port entry and departure):

- Port layout (agitation). These tests are essential to determine the degree of wave penetration into a port and the consequence of the wave penetration. Excessive wave penetration can result in an unsafe port (vessels breaking mooring lines) or inefficiencies where cargo movement is affected due to excessive ship movement.
- Breakwater stability. Breakwaters are the primary protection for any port. The failure of a breakwater due to poor design, selection of inappropriate armour or inability to withstand severe storm condition will render a port inoperable.
- Ship motions. Standards have been set for allowable ship motions alongside a quay. Measuring these determines if the port is well designed or not.
- Ship navigation. Wave condition at the entrance to a port could make it unsafe for a vessel to enter or depart a port. Simulating these conditions adds confidence to port designers that the port is able to operate safely under challenging weather conditions.

Additional functionality of the laboratory is linked to:

- Sediment modelling (longshore and cross-shore);
- Small harbour modelling, e.g. development and upgrading of the small fishing harbours along the South African coast (future support for Operation Phakisa);
- Inland dams: walls, structure and plunge pools, e.g. the Katse Dam was modelled before construction and aspects of the Kariba Dam plunge pool were also tested;
- Tidal pools (coastal recreation facilities for local and national government);
- Scour, pressure and flow around physical structures such as bridge pillars, caissons and piles; and
- Offshore wind farm installations.

A.2.3 STRATEGIC INFRASTRUCTURE INVESTMENT AND DEVELOPMENT (continued)

CSIR capabilities to be enhanced are as follows:

- 3D Wave agitation studies;
- 3D Breakwater stability and wave overtopping studies;
- 3D Moored ship response studies which includes passing ship studies;
- 3D Vessel grounding studies;
- Quasi 3D breakwater stability and wave overtopping studies;
- 2D Breakwater stability and wave overtopping studies;
- 2D Wave transmission studies;
- Force and Pressure measurement studies on Caissons, floating walkways and on other forms of slope protection;
- 3D Laser scanning to quantify armour unit damage in prototype, as well as scale model; and
- Numerical modelling to compliment the physical modelling (ship motions, ship navigation and wave agitation).

The Hydraulics Laboratory supports the South African economy through its support and collaboration with Transnet National Ports Authority. Ports are a vital link in the economy, and ensuring that ports are safe and efficient is paramount to port operations. In addition, any new port or changes to existing ports need to be modelled and the design validated before going out to construction. Failure to do this could result in major cost implications if the port fails or cannot operate efficiently once constructed. The closure of a port for a single day due to excessive long-wave motion inside a port that prevents cargo from being moved can cost the economy millions of rand. In addition, there is reputational damage if South African ports are considered unsafe or inefficient. Shipping companies might bypass certain ports in favour of others as a result of this. Long-wave-induced ship motion is one of the aspects that can be studied through 3D agitation studies and remedial measures put in place before a port design is approved. Extrapolating this, if a breakwater fails the cost could run into tens of billions of rand.

Ports are continuously evolving as ships increase in size and cargo volumes increase. Therefore, it is vital that laboratories such as the Hydraulic Laboratory exist to research new techniques and methods that will keep pace with evolving shipping trends. As a consequence of the port and shipping developments, the value of cargo and ships has also increased dramatically. Any damage, delay or loss of cargo and ships also has a major downstream effect.

Over the years, the laboratory has been involved with a number of social projects, such as the Monwabisi, Umhlanga and Port St Johns tidal pools and a number of fishing harbour studies, such as Gaansbaai, Struisbaai and Lamberts Bay

A.2.3 STRATEGIC INFRASTRUCTURE INVESTMENT AND DEVELOPMENT (continued)

MERSETA- FUNDED LEARNING FACTORY

Another complementary Learning Factory infrastructure project that is currently being implemented and in collaboration with the merSETA aims to establish a facility with focus on 4IR innovation, as well as skills development and transfer across any industry adopting a digital transformation strategy.

DSI-FUNDED SUPERCRITICAL CARBON DIOXIDE ENCAPSULATION FACILITY

A specialised Supercritical Carbon Dioxide Encapsulation Facility (SCEF), with the aim of developing uniquely formulated active products using the supercritical carbon dioxide (scCO₂) encapsulation process, scaling these up, and demonstrating reproducibility, and market feasibility for industrialisation, is being established at the CSIR. Encapsulation of sensitive actives, such as probiotics, plant-based extracts is challenging due to degradation either during processing, storage, and/or use, leading to loss in activity, stability and shelf-life. This presents a major bottleneck to a number of companies whereby these sensitive actives may not translate into viable products. The Super Critical Fluid (SCF) encapsulation process offers a unique process to encapsulate these sensitive actives, thereby preserving the functionality of the actives, while providing enhanced stability and shelf life. While a number of commercial SCEFs are available internationally, currently no such system exists in South Africa or on the continent. Investment being made is to setup a pilot scale SCEF in South Africa, which will be the first of its kind facility in Africa and will enable local development of innovative technology-based products for the African market. In particular, the facility will focus on development of innovative formulated products, for scale-up, toll-manufacturing, and to undertake market trials of these products together with industry partners via our Industry Engagement Programme. It is anticipated that through this facility, new products for the nutraceutical, cosmeceutical, personal care product, and pharmaceutical sectors and which are stable, active and fit for use for the local market, will be locally developed.

The CSIR has developed and patented encapsulation technology that significantly enhances the shelf stability of various sensitive actives such as probiotics, vitamins, vaccines and that protect them from gastric degradation during consumption and shelf-life storage.

The unique advantages of the supercritical CO₂-based encapsulation process has attracted significant commercial interest for the encapsulation of other sensitive actives, such as probiotics (for both human and animal health), vaccines, phytochemicals, bacteria, and vitamins, among others. This technology was recently licensed for commercialisation. However, a major barrier for full-scale commercialisation is that, currently, there are no pilot or commercial SCF facilities in the country to produce products at scale. The CSIR houses the only lab-scale unit for R&D purposes, with no capacity for scale-up.

A.2.3 STRATEGIC INFRASTRUCTURE INVESTMENT AND DEVELOPMENT (continued)

As this technology has already been demonstrated in the laboratory, the next step will be to demonstrate scalability and reproducibility at pilot scale, with the aim of industrialising the SCF technology in the country. To bridge the innovation chasm, a pilot supercritical encapsulation facility is required to scale-up the encapsulated products, optimise the processing conditions, and demonstrate reproducibility, while preparing sufficient volumes of encapsulated products to conduct field trials and investigate market uptake, before firms can put down the capex for setting up commercial units.

The CSIR is currently the only institution in Africa with expertise in the SCEF technology. The pilot SCEF facility will be hosted at the CSIR since the institution already has requisite access models for such a facility, as well as the established capabilities, which include skills, expertise, partnerships, and infrastructure that would be required for the proof of concept studies. Establishing the pilot facility at the CSIR will allow industry partners access to the scientists for training and skills transfer, as well as technology transfer to industry. The establishment of the SCEF will allow the de-risking of scCO_2 -based technologies to enable rapid market uptake. In addition to new product development, together with partners, the facility will be opened up to industry for toll manufacturing, which is currently a major bottleneck.

The SCEF facility is aligned with the bio-economy strategy as it is envisaged that the facility will enable better exploitation of SA's indigenous knowledge base by providing knowledge intensive solutions to process bio-based actives into viable and stable high-quality products. Through the facility, new and more effective bio-based products and processes will be developed, thus enabling technology localisation through local manufacturing. This will invariably lead to increased manufacturing and, thus, the creation of more jobs through new product lines.

THE DSI-FUNDED HOT ISOSTATIC PRESSING

Hot Isostatic Pressing (HIP) is a manufacturing process used in high-end aerospace, medical and industrial components to remove inherent defects that are produced during manufacturing. The components are subjected to a combination of high temperature (up to 2000°C) and high gas pressure (up to 2060 bar) under a controlled environment. A HIP is essentially composed of a cylindrical pressure vessel, frame, upper closure, lower closure, furnace (choice of furnace determines the temperature capability), controlled cooling system, quenching system and subsystems that run the HIP. HIPing is a core capability that is required for a number of manufacturing capabilities being developed. This includes investment casting, metal injection moulding, press and sinter of powders, and additive manufacturing (AM). The establishment of a local HIPing capability will reduce the dependence on overseas companies to HIP at huge cost, and will ensure some control over IP leaving the country. Both public and private institutions will have easy access to this facility as there is currently no HIP facility of the type and scale available in South Africa.

A.2.3 STRATEGIC INFRASTRUCTURE INVESTMENT AND DEVELOPMENT (continued)

CMP AND CAPITAL INVESTMENT PLANNING

The Campus Master Plan (CMP) serves as a blueprint that guides infrastructure development and CIPs for the long term, in order to ensure that research infrastructure and the built environment are developed in an integrated manner. The framework provides the CSIR and broader stakeholder community with a planning framework within which the long-term development of infrastructure can be executed.

The framework is rooted in rigorous Capital Investment Planning, projects portfolio management and an asset management approach, in order to prioritise capital investment, in line with the organisational strategy.

The objectives of the CMP are to:

- Facilitate a smooth transition from the current to the research campus of the future;
- Enable a knowledge economy and acknowledge the importance of knowledge clusters;
- Support open innovation where outside knowledge is absorbed and a meeting place for talents and best researchers is provided;
- Align campus renewal priorities with current and future RD&I needs and opportunities, and new research areas arising from the new strategy;
- Pursue an overall development approach that integrates campus planning objectives to continue creating and supporting an innovation ecosystem, while fostering fruitful collaborations between the CSIR and industry; and
- Support a high-tech campus and sustainability.

A.2.4 CSIR BUSINESS MODEL

The renewed CSIR business model will enable the organisation to capture the opportunities identified in the strategy. The CSIR's business and operating models must provide the best possible strategy elements to respond to customers and industry's needs with agility and excellence.

The business model pays specific attention to value propositions, customer segments, income sources, channels (marketing), cost structure, and the effectiveness of partnerships. In line with the CSIR's strategic direction to "Amplify the 'I' in CSIR", the CSIR's business model serves to enable increased relevance to customers in all target sectors. While private sector business is a key driver for growth, the CSIR's work with and for the public sector, and its hosting of large national programmes on behalf of government, will continue and, ideally, also grow.

CUSTOMER VALUE PROPOSITION

Key elements of the CSIR value proposition includes its research, development and innovation capabilities including industry-facing and translational infrastructure; its track record in technology development, commercialisation of technologies, Enterprise Creation for Development (ECD), new business models for the public and private sectors and scaling up of products and processes; and a highly skilled multidisciplinary Human Capital (HC) base.

A.2.4 CSIR BUSINESS MODEL (continued)

The CSIR creates value for customers through its knowledge-based services, which include new knowledge generation; technology development; innovations; decision-support solutions; evidence-based contribution to policy, regulations and standards development; product and technology validation; and enterprise creation and support. Further, the organisation has capabilities to design, develop, manufacture and assemble, and maintain products for contribution to industry and society. The CSIR offers commercial services that include specialised services, standards and compliance assurance. It also hosts national initiatives, such as the National Cleaner Production Centre and the Technology Localisation Implementation Unit, as well as strategic infrastructure, such as the wind tunnels, the Centre for High Performance Computing and the South African National Research Network.

In line with the intent of our new strategy, the CSIR value proposition includes:

- Technology licensing and start-up creation;
- Access to specialised, state of the art infrastructure, skills and technology incubation;
- Innovation support;
- Improvement of industry competitiveness;
- New industry creation;
- Technology localisation and supplier development; and
- Community-based industry creation.

In 2021/22, our efforts will continue to ensure that we deliver a consolidated, strengthened offering that is relevant to the competitiveness of the South African economy.

Our investment priorities will see to a strategic investment shift in our RDI portfolio, with greater focus on the later stages of Technology Readiness Levels (TRLs)

RDI TYPE ACTIVITIES	TYPE A	TYPE B	TYPE C
Equivalent TRL	TRL 1 TRL 2 TRL 3	TRL 4 TRL 5 TRL 6	TRL 7 TRL 8 TRL 9
Pre-Project Synapse Investment profile of the CSIR RDI portfolio	35%	40%	25%
Planned Strategic Investment of the CSIR RDI portfolio	20%	35% – 40%	35% – 40%

Table A.2: Target research portfolio by research type

A.2.4 CSIR BUSINESS MODEL (continued)

The greater investment in Type B and Type C will enhance technology development, commercialisation and technology transfer that will support re-industrialisation and socioeconomic development.

For the medium term, we will also further deepen our value proposition to our customers and partners through collaborative initiatives, such as on shared RDI, and strategic secondments of our expertise to industry, while generally improving the physical proximity of our activities to industry.

INCOME SOURCES AND CUSTOMER SEGMENTS

The CSIR derives its income from contract R&D from the public sector, private sector and international customers, the PG, as well as royalties and licensing income. An analysis of its total annual income for the past three years showed a Compound Annual Growth Rate (CAGR) of 0.93% (including investment income). Clearly, this component of our business model requires greater effort to ensure income stability, sufficient diversity of income sources and profitability.

The largest portion of the CSIR's income is contract R&D from the public sector and is followed by the PG. It is the intention of the CSIR, as part of its new strategy, to diversify its income sources by particularly increasing income from the private sector, international customers, as well as royalties and licensing. In recent years, the CSIR's share of income from the private sector has been increasing. However, the CSIR's private sector income remains lower than benchmarks. It is the CSIR's aspiration to increase its share of private sector R&D income. During 2021/22, the CSIR will continue to increase its focus on industry and the private sector by aligning its offerings to their needs and will also enhance collaborations and co-investment opportunities with this sector of the economy.

International income sources, especially opportunities in the African continent, will be pursued rigorously. Our objectives in the African continent are to align to our government's goal of supporting the region's development initiatives, while also pursuing and creating opportunities that advance our new strategy.

Our new operating model has established the Business Development and Commercialisation (BD&C) function in divisions, in collaboration with RDI experts, ensures that:

- There is improved relevance and competitiveness of the CSIR RDI offerings;
- There is improved collaboration, particularly with the private sector;
- Our income grows and is diversified;
- Commercialisation and technology transfer are driven rigorously;
- Customers are satisfied; and
- There is repeat business.

A.2.4 CSIR BUSINESS MODEL (continued)

MARKETING STRATEGY

The CSIR has provided for a marketing function as part of the BD&C functions in divisions. Various marketing platforms, such as exhibitions, conferences, open days, digital marketing platforms and advertising are utilised and expanded on to ensure greater visibility and uptake of CSIR offerings in the market place.

During 2020/21, the CSIR launched its new brand. The CSIR refreshed brand amplifies the 'I' in "CSIR", which stands for "industrial" to ensure that organisation supports and makes a greater impact on the development and sustainability of industries and the South African economy. The refreshed brand reflects our strategic intent of ensuring the equal importance of industrial and scientific development in our innovation portfolio. The new positioning statement is 'Touching lives through innovation', which asserts that the impact of the CSIR's work must be felt by people through touching their lives and improving them for a better future.

Furthermore in 2020/21, the CSIR adopted a communications and marketing strategy at its strategy session. The strategy responds to the CSIR's strategic objectives, vision and mission; covers communication as an element of the marketing mix; includes corporate communication; marketing communication promotional mix; marketing and communication channels; key messages and considerations of best practices.

The strategy aims to:

- Position the CSIR as a leading RDI organisation that makes an impact through developing, localising and diffusing technologies for industrial development ;
- Accelerate socioeconomic prosperity in South Africa; and
- Promote the showcasing of its scientific research, technology development and innovation.

The aims of the strategy are to:

- Position the CSIR as a partner of choice for private and public sectors;
- Promote the CSIR as an employer of choice;
- Contribute to attracting RDI business and commercialisation opportunities in public and private sectors;
- Contribute to informed, engaged employees pursuing a common goal; and
- Spearhead science engagement.

During 2021/22, the strategy implementation will be scaled up.

CUSTOMER RELATIONSHIPS

As the CSIR pursues the goal of growing its revenue, improving profitability, diversifying income through, among others, enhanced customer attraction, satisfaction and retention, it will continue to enhance its customer relationships. As already stated, the organisation has now implemented the requisite organisational structure, namely, the BD&C function, as the lead interface with customers in divisions.

A.2.4 CSIR BUSINESS MODEL (continued)

COST STRUCTURES

As part of the implementation of the new CSIR strategy and operational model, in the 2018/19 to 2019/20 financial years, the CSIR started with the optimisation of the SET base of the organisation. The process involved a review of pockets of inefficiencies in the then operating units, as well as the streamlining of capabilities that had become inefficient. During 2019/20, the SET base was successfully placed in the new operating model in divisions and clusters, and is now stable.

In 2020/21, the process of optimising the support functions of the CSIR, in order to build a support function that is “fit for purpose” was concluded. The process followed included a benchmark with best practice, alignment of the support functions to the SOs, and addressing the challenges highlighted in the review of the internal operating environment. The support functions are now fully aligned to our new operating model and are stable. Greater efficiencies will be pursued in each of the support functions by implementing improvements in each one, in line with stages of excellence, including basic, aspirational, emerging, consolidating and transformative, as defined through the exercise.

There remains a focus on an organisation-wide business process mapping. Once mapping has been completed, there will be prioritisation of ‘game-changing’ business processes for implementation. The business process implementation will also be complemented by the implementation of a new ICT strategy that will allow the CSIR to develop into a modern, integrated, secure and digitally enabled organisation.

PARTNERSHIPS

The CSIR identifies, develops and manages its strategic partnerships as an integral part of its business model. It sees business value in having healthy strategic partnerships and stakeholder relations that enable and complement the organisation to enhance and realise its vision of accelerating socioeconomic prosperity in South Africa through leading innovation.

The CSIR, through strategic partnerships, aims to:

- Achieve the intentions of its mandate, which encourages collaboration with other parties in the public and private sectors;
- Achieve its mission, which seeks to “collaboratively innovate and localise technologies, while providing knowledge solutions for the inclusive and sustainable advancement of industry and society”, as well as its strategic objectives;
- Leverage and pool capabilities and resources for mutual benefit of parties involved; and
- Build and maintain healthy relationships across sectors and within the National System of Innovation (NSI).

A.2.4 CSIR BUSINESS MODEL (continued)

CSIR is pursuing a renewed approach to strategic partnerships that aligns with the new CSIR strategy. During 2020/21, relationships were initiated and renewed with private sector parties, the public sector, HEIs, not-for-profit organisations, venture capitalists, development finance institutions, state owned organisations (SOEs) and international parties. Several of these relationships were formalised through Memoranda of Understanding/Agreement. Bilateral governance structures between the CSIR and its partners, as well conceptualisation and development of joint projects and programmes were initiated. The value of these strategic partnerships was also demonstrated, in particular, in joint efforts addressing the Covid-19 pandemic. A number of partners including Cape Peninsula University of Technology (CPUT), The South African Health Products Regulatory Authority (SAHPRA), The Solidarity Fund, various SMMEs (3Sixty/ Tautomer, Respitek, Solar Medical, Akacia Medical, Vogel Plastics) and the Development Bank of Southern Africa collaborated on several projects with teams in the CSIR. The CSIR also forged international relationships focusing on the African continent. The relationship with AUDA/NEPAD, for example, materialised a Centre for Science, Technology and Innovation (CoE STI) and which is located at CSIR Stellenbosch campus. In 2021/22, there will be scaling of the implementation of joint initiatives with partners and fast tracking of delivery of planned outputs and outcomes.

The CSIR in 2020/21, despite the Covid-19 constraints, had several strategic interactions with Parliamentarians, including a visit to the CSIR Scientia campus in Pretoria in February 2020, presentations on the budget cuts incurred as a result of Covid-19 readjustments to the Portfolio on Higher Education, Science and Technology and the Standing Committee on Appropriations. The CSIR also offered science advice to Parliament in the area of Internet governance. In alignment with our commitment to advance the development of our country, in 2021/22 CSIR, we will continue to offer value-adding support to Parliament's business of legislation and providing oversight.

It is critical that the CSIR, together with the DSI, engages National Treasury to re-position the CSIR in the context of the PMFA and similar national legislation. The CSIR, through its mandate, was constituted to perform research for the Republic in the interest of public good, yet these current policies hinder the engagement and contracting process between public entities and the CSIR.

It is the intention of the CSIR that, by the end of 2020/21, a Strategic Partnerships Framework and supporting policies be in place. The CSIR will also build and implement a representative portfolio of partnerships aligned to the CSIR RDI focus areas and will cover all partnership segments, especially the private sector portfolio.

During 2021/22, the CSIR will also collaborate with the DSI International Relations portfolio and the Department of International Relations and Cooperation to develop and implement the CSIR International Cooperation Framework, as well as the Africa Cooperation Framework. Through the development and implementation of these frameworks, the CSIR will, thus, be also aligning to the MTSF 2019 to 2024, in particular, in respect of priority seven i.e. a better Africa and the World.

**A.2.5 DIVERSIFY INCOME AND MAINTAIN FINANCIAL SUSTAINABILITY****CSIR FINANCIAL PERFORMANCE AND POSITION**

Table A.3: Financial performance Trend analysis

	Audited		Forecast		Budget		Estimate		Year on year trend				
	2019/2020	2020/2021	2021/2022	2022/2023	2023/2024	2020/2021	2021/2022	2022/2023	2023/2024	2020/2021	2021/2022	2022/2023	2023/2024
	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000	R'000				
Total Operating Revenue	2 763 503	2 630 100	2 869 225	3 261 310	3 424 084					-4.8%	9.1%	13.7%	5.0%
R & D Contract Income	2 023 895	1 924 600	2 140 288	2 516 695	2 675 115					-4.9%	11.2%	17.6%	6.3%
Public - South Africa	1 644 884	1 453 000	1 598 000	1 719 480	1 805 454					-11.7%	10.0%	7.6%	5.0%
Private - South Africa	175 197	236 800	255 000	420 012	462 013					35.2%	7.7%	64.7%	10.0%
International	129 475	137 700	162 000	247 280	272 008					6.4%	17.6%	52.6%	10.0%
Parliamentary Grant - Ringfenced	74 339	97 100	125 288	129 923	135 640					30.6%	29.0%	3.7%	4.4%
Parliamentary Grant	731 202	703 100	725 537	741 615	744 469					-3.8%	3.2%	2.2%	0.4%
Royalty Income	3 616	2 300	2 000	3 000	4 500					-36.4%	-13.0%	50.0%	50.0%
Other Income	4 790	100	1 400	0	0								
Total expenditure	2 757 375	2 716 700	3 000 900	3 336 865	3 480 830					-1.5%	11.2%	11.2%	4.3%
Employee's Remuneration	1 454 565	1 518 400	1 672 000	1 878 240	1 960 883					4.4%	12.3%	12.3%	4.4%
Operating Expenses	1 240 742	1 060 000	1 158 000	1 286 016	1 343 887					-14.6%	11.1%	11.1%	4.5%
Depreciation	62 068	138 300	170 900	172 609	176 061					122.8%	1.0%	1.0%	2.0%
Operating Profit before Investment Income	6 128	(86 600)	(131 675)	(75 555)	(56 747)					-1513.2%	-42.6%	-42.6%	-24.9%
Net Finance Income	48 419	36 500	35 600	36 312	37 038					-26.1%	2.0%	2.0%	2.0%
NET PROFIT/(LOSS)	55 547	(50 100)	(96 075)	(39 243)	(19 708)					-190.2%	59.2%	59.2%	49.8%

A.2.5 DIVERSIFY INCOME AND MAINTAIN FINANCIAL SUSTAINABILITY (continued)

The COVID-19 pandemic has adversely affected the financial performance of the organisation, changing it from a profitable position of R55,5 million during 2019/20 to a forecast loss of R50,1 million in 2020/21. The effects of the pandemic are expected to last throughout the MTEF period, with a gradual improvement in the financial performance.

Although the financial performance is not expected to be positive over the period the CSIR is expecting to maintain a strong financial position having assets in excess of liabilities, the liquidity of the organisation is forecast to be satisfactory with a current ratio of 2 in 2021/22, with a liquidity ratio above 1.0. Aggressive measures to collect outstanding debtors will continue, whilst cost containment measures have to be maintained to limit cash outflows to a minimum.

Additional revenue generation initiatives are being developed to improve the financial situation and to ensure the longer-term financial sustainability of the CSIR. It is expected that these initiatives should bring a significant turnaround in performance once implementation is achieved.

South African spend on R&D is constrained and this should remain a country focus. As per the table below, South Africa only spends 0.83% of GDP on R&D expenditure. This is significantly below the world average and well below the country's own target of 1.5%. The country should not see R&D as an expenditure, but as an investment in its future. This has been supported by the successes that the CSIR achieved in its fight against the Covid-19 pandemic. The pandemic has highlighted, again, the importance of spending on R&D, and South Africa needs to increase its investment in this space.

Table A.3: Gross Domestic Expenditure on R&D as a percentage of GDP in comparison with other countries

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
World	1.60	1.65	1.62	1.64	1.65	1.67	1.68	1.69	1.69	1.72
Low-income	0.24	0.26	0.28	0.29	0.31	0.33	0.32	0.33	0.33	0.29
Lower middle-income	0.49	0.49	0.49	0.49	0.47	0.46	0.43	0.42	0.42	0.42
Upper middle-income	0.98	1.13	1.15	1.19	1.27	1.32	1.37	1.42	1.46	1.48
Higher-income	2.26	2.31	2.27	2.31	2.30	2.33	2.36	2.35	2.33	2.42
SOUTH AFRICA	0.89	0.84	0.74	0.73	0.73	0.72	0.77	0.80	0.82	0.83

Source: United Nations Educational, Scientific and Cultural Organisation Institute for Statistics

A.2.5 DIVERSIFY INCOME AND MAINTAIN FINANCIAL SUSTAINABILITY (continued)

Research, development and innovation needs are changing and there is increased competition in the RD&I sector. CSIR's strategic objective five seeks to improve the CSIR's financial sustainability by diversifying revenue sources and optimising the business model to achieve competitiveness supported by good, efficient and sound governance. The CSIR needs to highlight the importance of R&D investment at every opportunity and showcase the work it does so that more investment can be made into R&D, thereby also assisting it in its diversification strategy. Table A.4 provides a summary of the CSIR's revenue mix, whilst Table A.5 depicts income types as percentage of total operating revenue.

Table A.4: Revenue mix

	Forecast 2020/2021 R'000	Budget 2021/2022 R'000	Budget 2022/2023 R'000	Budget 2023/2024 R'000
Total Operating Revenue	2 630 100	2 869 225	3 261 310	3 424 084
R&D Contract Income	1 924 600	2 140 288	2 516 695	2 675 115
Public – South Africa	1 453 000	1 598 000	1 705 036	1 756 187
Private – South Africa	236 800	255 000	397 920	437 711
International	137 700	162 000	244 609	269 070
Parliamentary Grant – Ringfenced	97 100	125 288	125 288	130 801
Parliamentary Grant	703 100	725 537	741 615	744 469
Royalty Income	2 300	2 000	3 000	4 500
Other Income	100	1 400	–	–

INCOME DIVERSIFICATION

Table A.5: Income type as percentage of total operating revenue

Income as % of total operating revenue	Forecast 2020/2021	Budget 2021/2022	Estimate 2022/2023	Estimate 2023/2024
SA Public Income (including PG) %	86%	85%	79%	78%
SA Public Income (excluding PG) %	55%	56%	53%	53%
SA Private Income %	9%	9%	13%	13%
International Income %	5%	6%	8%	8%
PG (baseline)	27%	25%	23%	22%
PG (ring-fenced)	4%	4%	4%	4%
Royalty Income	0%	0%	0%	0%

A.2.5 DIVERSIFY INCOME AND MAINTAIN FINANCIAL SUSTAINABILITY (continued)

As per the tables above, it is clear that the organisation still has heavy reliance on the public sector income. In the 2021/22 financial year, income diversification will remain a key strategic objective to reduce the financial risk associated with a significant reliance on public sector income. Income diversification is also expected to improve the CSIR's profitability as profit margins are currently between 1% and 2% on public sector income.

The organisation will focus on commercialisation of IP and technologies to drive the diversification of revenue. This is considered a major opportunity to improve financial sustainability in future. The organisation has also been engaging with DSI and National Treasury in an attempt to fulfil the requirements of its Act of establishment, by being the supplier of choice for research and development work to state owned enterprises, government departments and municipalities, in line with its mandate. In this regard the support of National Treasury is crucial to achieving this stated objective.

Furthermore, the CSIR will undertake a space optimisation exercise of its current campus facilities with the view of identifying space that could be let out to to earn additional rental income to supplement its revenue.

Other revenue generation ideas, which are in the early stages of investigation are being considered and will continue to be developed in the short to medium term.

Effective financial management is paramount to the CSIR's ability to deliver on its mandate and strategy, while ensuring compliance with relevant statutory requirements. The provision of accurate and timely financial information to external stakeholders, customers and CSIR management enables the organisation to meet its financial performance targets and improve long-term financial sustainability, while maintaining good governance and financial compliance. The CSIR has a sound track record with regard to receiving unqualified audit reports from the Auditor-General, which it strives to maintain.

A.2.6 GOOD GOVERNANCE

Inherent in the CSIR mission is to pursue the inclusive and sustainable advancement of industry and society. Beyond leading innovation and providing unique solutions to address South Africa's challenges, the impact we seek is to improve lives and this translates to the wider responsibility of the CSIR operating as a responsible corporate citizen. The CSIR must duly comply with all legal imperatives, whether Constitutional, national or common law, with suitable regard for the governance implications for CSIR business. South Africa is also a signatory to a number of international treaties. As such, there are a number of international strategies that inform the work of the CSIR.

Corporate Social Responsibility is entrenched within our EPIC value system, and we consider it our obligation to carefully consider the interests of all of our stakeholders and the environment within which we operate to ensure that we consider the social and environmental consequences of our business activities. In support of the CSIR's corporate citizenship strategy, critical emphasis will continue to be placed on the following initiatives:

- Enhanced implementation of the compliance function as part of our combined assurance model to more effectively manage risks associated with compliance, business ethics and fraud prevention;
- The enhancement of safety, health and environmental practices through integrated collaboration with all internal and external stakeholders to pursue zero harm;
- The active pursuit of strategies to improve the CSIR's carbon footprint against a trajectory of continuous improvement; and
- Contributions to B-BBEE, based on the dtic codes of good practice, with specific focus on the critical role that the youth of South Africa has to play in shaping our economy.

IMPLEMENTATION OF A COMPLIANCE FUNCTION

A centrally structured compliance function that allows compliance outcomes to take a central role in our operations and creates the opportunity to promote and embed a strong compliance culture within the organisation has been established.

Emphasis is placed on defining the regulatory environment and translating it into beneficial and practically actionable policies, procedures and processes.

MAINTENANCE AND ENHANCEMENT OF SAFETY, HEALTH, ENVIRONMENT AND QUALITY PERFORMANCE

In 2018, the CSIR revisited the Safety, Health, Environment and Quality's (SHEQ) in line with its mandate, vision, mission and strategic objectives and after the organisation highlighted a need for urgent intervention to improve the state of safety, health and environment on all CSIR campuses. During 2020/21, CSIR focused on understanding the capability requirements for establishing a best in class, fit-for-purpose SHEQ functionality and model that is well-integrated and enabling, and responsive to the risks faced across every level of the organisation.

A.2.6 GOOD GOVERNANCE (continued)

Through strategic interventions focused on behaviour-based safety, process safety and overall integrated SHEQ management, the journey to demonstrate that the CSIR cares and strives for zero harm to the CSIR community and the areas in which it operates, is well underway, and will be further matured and developed in response to the SHEQ risk environment as it evolves in pursuit of the SOs.

MEASURING AND REPORTING ON THE CSIR CARBON EMISSIONS

In support of the CSIR's corporate citizenship strategy, the CSIR strives to become carbon neutral and ensure that emissions that are created in business operations are neutralised through the purchase of a carbon offset.

In 2018/19, the CSIR launched an initiative to measure its emissions and align its reporting practices with the National Greenhouse Gas Emission Reporting Regulations. This initiative now focuses on continued improvement through the pursuit of data integrity and emission reduction.

The CSIR believes that carbon effectiveness has the potential to offer untold value to the organisation. Alongside being the morally correct thing to do, carbon management makes excellent business sense as a carbon foot printing can add significantly to the CSIR's bottom line over time and, in turn, enhance its ability to support the development of a capable state.

B-BBEE STATUS

In its most recent Broad-Based Black Economic Empowerment (B-BBEE) audit, the CSIR achieved a Level 2 B-BBEE certification. A significant contributor to this performance improvement was the successful implementation of the YES Programme for the CSIR, which acknowledges the need to build economic pathways for the youth of South Africa. The CSIR's YES Programme focuses on previously disadvantaged youth between the ages 18 and 35. It provides them work experience for one year, giving young people a chance to demonstrate their abilities, establish their work ethic and prove their worth. The huge success of the initial phase of the YES Programme is targeting the absorption of at least 5% of the current programme participants and a phase 2 intake of previously disadvantaged youth.

A.2.7 RISK MANAGEMENT

At the core of the CSIR's Enterprise Risk Management (ERM) strategy are initiatives facilitating sound and effective risk management practices in all areas of the organisation in support of good corporate governance. In the CSIR, ERM partners with the organisation to ensure that an effective enterprise risk system and culture is embedded within all day-to-day working practices, in order to minimise negative outcomes of risk events and maximise upside opportunities.

The CSIR's ERM plan aims to protect the organisation through the entrenchment of a combined assurance model that will be a strategic vehicle for embedding best practice frameworks and guidelines, and strike a good balance on sound corporate governance, effective risk management, improved compliance regime, and an independent and objective assurance.

A consolidated organisational risk register is managed on an ongoing basis to inform the Executive Committee and the Audit and Risk Committee (ARC) of the prevailing risks and how they are managed and mitigated to within acceptance levels.

A.2.8 MONITORING AND EVALUATION

Our measurement framework seeks to monitor our short-term progress towards meeting our strategic objectives, as well as assessing whether the long-term essence of these aims is being achieved. The two components of our measurement framework are:

A set of annual performance indicators across the five SOs (See A.6). These form part of our Annual Performance Plan and we will, on a quarterly basis, report on progress towards meeting these targets. In addition to setting targets for the upcoming financial year, we also set five-year targets for these indicators.

A set of longer-term measures that focus more clearly on the outcomes and, potentially, the impacts of our efforts across the five strategic focus areas. The data required to support these measures may be collected on an irregular or ad hoc basis.

Impact planning, monitoring, evaluation and learning lead to a number of tangible deliverables, and these will be recorded in the annual plans. Deliverables include the tracking of R&D outcomes, the planning of interim outcome and longer-term impact assessments, delivery systems modelled and analysed for bottlenecks and leverage points, new solutions and transfer of knowledge (new offerings to be developed), and plans for improving divisions and clusters' capability to increase RD&I outcomes and impact.

A.5.2 KPI TARGETS

Indicator	Target 2020/21	Forecast 2020/21	Target 2021/22	Target 2022/23	Target 2023/24	Target 2024/25	Target 2025/26
SO 1: Conduct research, development and Innovation of transformative technologies and accelerate their diffusion							
KPI 1: Publication equivalents	278	278	300	350	406	422	415
KPI 2: New priority patent applications filed	3	4	9	9	9	10	18
KPI 3: New patents granted	10	11	8	16	18	19	20
KPI 4: New technology demonstrators	38	38	46	46	51	56	61
KPI 5: Number of technology licence agreements signed	17	16	19	21	23	25	27
SO2: Improve the competitiveness of high-impact industries to support South Africa's re-industrialisation by collaboratively developing, localising and implementing technology.							
KPI 6: Number of localised technologies	10	10	11	14	16	17	19
KPI 7: Number of joint technology agreements being implemented for industry	20	20	22	22	24	26	32
KPI 8: Number of SMMEs supported	68	68	75	82	91	100	110
SO3: Drive the socioeconomic transformation through RD&I which supports the development of a capable state							
KPI 9: Number of reports contributing to national policy development	17	17	17	17	17	19	22
KPI 10: Number of standards delivered or contributed in support of the state	9	9	9	10	10	11	11
KPI 11: Number of projects implemented to increase the capability of the state	36	36	40	42	43	44	46
SO 4: Build and transform human capital and infrastructure							
KPI 12: Total SET staff	1410	1426	1497	1572	1651	1733	1820
KPI 13: Percentage of SET staff who are black	63%	65%	66%	66%	67%	67%	68%
KPI 14: Percentage of SET staff who are female	37%	36%	37%	38%	39%	40%	41%
KPI 15: Percentage of SET staff with PhDs	22%	22%	23%	23.5%	24%	24.5%	25%
KPI 16: Total Chief Researchers	12	13	17	18	19	21	23
KPI 17: Percentage of chief researchers who are black	25%	15%	17%	22%	25%	27%	30%

A.5.2 KPI TARGETS (continued)

Indicator	Target 2020/21	Forecast 2020/21	Target 2021/22	Target 2022/23	Target 2023/24	Target 2024/25	Target 2025/26
SO 4: Build and transform human capital and infrastructure (cont.)							
KPI 18: Percentage of chief researchers who are female	17%	23%	24%	25%	27%	30%	33%
KPI 19: Total Principal Researchers	184	178	193	203	213	224	235
KPI 20: Percentage of principal researchers who are black	37%	29%	35%	37%	40%	43%	45%
KPI 21: Percentage of principal researchers who are female	20%	19%	22%	23%	24%	26%	27%
KPI 22: Number of Staff involved in Exchange programmes with industry	11	11	15	17	20	23	26
KPI 23: PPE investment (Rm)*	55	55	100	120	120	120	120
SO 5: Diversify income, maintain financial sustainability and good governance							
KPI 24: Total Operating Income	2630	2630	2869	3261	3424	3580	3817
KPI 25: Net profit (Rm)	-83,4	-50.1	-96.1	-39.2	-19.7	17,9	22,9
KPI 26: SA public sector income (% Total Income)	59%	55%	56%	53%	53%	46%	38%
KPI 27: SA private sector income (% Total Income)	10%	9%	9%	13%	13%	17%	24%
KPI 28: International contract income (% Total Income)	6%	5%	6%	8%	8%	10%	12%
KPI 29: B-BBEE rating*	3	2	2	2	2	2	2
KPI 30: Recordable incident rate*	2	<2	1,8	1,6	1,4	1,2	1
KPI 31: Audit opinion	Unqualified audit opinion	Unqualified Audit Opinion	Unqualified audit opinion	Unqualified audit opinion	Unqualified audit opinion	Unqualified audit opinion	Unqualified audit opinion

Table A.5: 5-Year KPI Targets

A.2.10 KPI DESCRIPTIONS

KPIs provide an understanding of performance in terms of inputs, outputs, efficiencies, and, to some extent, provide lead indicators of the outcomes and impact that are required for the CSIR to fulfil its mandate. The question of whether or not the CSIR is meeting its SOs related to achieving outcomes and impact cannot be resolved by KPI assessment alone and requires a process of programme evaluation as described in the National Evaluation Policy Framework. The SOs provided in the CSIR Strategic Plan make specific statements on planned outcomes that will serve as the basis for future evaluation of performance in this regard.

The CSIR KPIs provide a basket of measures that reflect various aspects of the organisation's performance. The targets that are set reflect, in the context of limited resources, a strategic choice about the areas in which greatest impact can be achieved.

KPI 1: PUBLICATION EQUIVALENTS

INDICATOR TITLE	PUBLICATION EQUIVALENTS
Definition	Publication equivalents consist of peer-reviewed journal articles, peer-reviewed conference papers, peer-reviewed book chapters and books.
Purpose	Research publications are a measure of the CSIR's research capabilities and outputs.
Performance assessment	The CSIR considers a performance above 95% of the target as acceptable. Performance in excess of the target is a positive result.
Data source/Eligible evidence	Publications entered into the CSIR TODB, which provides the information for reporting
Data responsibility	CSIR Information Services.
Method of calculation	The number of publication equivalents assigned to each type of publication as per the approved Publication Equivalent Guidelines. The publications are counted over the calendar year preceding the year in which the financial year ends.
Limitations	Authors submit publications for inclusion in TODB via Workflow. There may be some under-reporting if individual authors do not submit their manuscripts for inclusion. However, there are also measures in place to automatically include publications whose authors are affiliated to the CSIR.
Type of indicator	Output.
Exclusions	Publications not submitted to the TODB will not be allocated publication equivalents. Publications not subjected to scholarly peer review.

A.2.10 KPI DESCRIPTIONS (continued)

KPI 2: NEW PRIORITY PATENT APPLICATIONS FILED

INDICATOR TITLE	NEW PRIORITY PATENT APPLICATIONS FILED
Definition	The first patent application filed for protection of a particular invention with the CSIR named as an applicant/assignee/co-applicant/co-assignee.
Purpose	The "basic purpose [of the right of priority] is to safeguard, for a limited period, the interests of a patent applicant in his endeavour to obtain international protection for his/her invention.
Performance assessment	The CSIR considers a performance above 75% of the target as acceptable. Performance in excess of the target is a positive result.
Data source	KSS records containing evidentiary supporting documentation (from patent attorneys, patent offices and/or reliable patent databases) offices.
Data responsibility	BEI and divisions (BD&C).
Method of calculation	Number of qualifying records on KSS.
Data Limitations	Steps must be taken to avoid double counting of applications that have been previously filed but withdrawn and refiled at a later date (despite obtaining a new priority number and priority date).
Type of indicator	Output.
Exclusions	<ul style="list-style-type: none"> Any patent application that is not the first application filed in respect of a particular invention, including (without limitation) refilings/conversions/nationalisations/continuations/divisional, etc. of a previously filed application. Patent applications for which evidentiary supporting documentation is lacking. Patent applications that do not name the CSIR as an applicant/assignee/ co-applicant/co-assignee.

A.2.10 KPI DESCRIPTIONS (continued)

KPI 3: NEW PATENTS GRANTED

INDICATOR TITLE	NEW PATENTS GRANTED
Definition	Patents are exclusive rights granted for an inventions granted by an examining patent authority with the CSIR named as an applicant/ assignee/co-applicant/co-assignee.
Purpose	Patents provide a lead indicator of the potential impact to be achieved when technologies are commercialised.
Performance assessment	The CSIR considers a performance above 80% of the target as acceptable. Performance in excess of the target is a positive result.
Data source/Eligible evidence	KSS records containing evidentiary supporting documentation (from patent attorneys, patent offices and/or reliable patent databases).
Data responsibility	BEI and divisions (BD&C).
Method of calculation	<p>Number of qualifying records on KSS.</p> <p>For patents from the same patent family granted in multiple territories, each patent granted by an examining authority is counted individually.</p> <p>Where a patent is granted by a regional patent authority (e.g. EPO), only the EPO grant is counted, not the national validations in designated countries.</p> <p>Divisional patents are counted.</p> <p>In cases where notification of a patent is only received after the results for the financial year have been completed, that patent will be included in the subsequent financial year's results. Only co-owned patents or patents in the name of the CSIR are counted.</p>
Limitations	<p>South Africa and certain other countries do not have examining patent offices. Therefore, patents filed in these countries are not counted for this KPI.</p> <p>The time taken for a patent to be granted after filing is unpredictable and can range from one to eight or even more years, depending on the efficiency of the patent authority concerned and the complexity of the examination process.</p>
Type of indicator	Output.
Exclusions	<p>Patents granted by non-examining patent authorities.</p> <p>Patents for which evidentiary supporting documentation is lacking.</p> <p>Patents that do not name the CSIR as an applicant/assignee/co-applicant/co-assignee.</p> <p>Patents that are national validations of a patent granted by a regional patent authority.</p>



A.2.10 KPI DESCRIPTIONS (continued)

KPI 4: NEW TECHNOLOGY DEMONSTRATORS

INDICATOR TITLE	NEW TECHNOLOGY DEMONSTRATORS
Definition	A prototype, a rough example of a conceivable technology (Product or system) derived from existing knowledge gained from research and/or practical experience as proof of concept.
Purpose	Measure an intermediate output of research and development activities with the potential to be developed further and that can be transferred for socioeconomic impacts.
Performance assessment	The CSIR considers a performance above 85% of the target as acceptable. Performance in excess of the target is a positive result.
Data source/ Eligible evidence	Technology demonstrators are submitted by Clusters or Centres for adjudication to the Technology Demonstrator Evaluation Panel. All data is collated in a centralized repository.
Data responsibility	BEI: RDI Office.
Method of calculation	Count of technology demonstrators as approved by the Technology Demonstrator Panel and adjudicated according to the CSIR Technology Demonstrator Evaluation Framework.
Limitations	None.
Type of indicator	Output.
Exclusions	Only outputs that result from experimental development are considered TDs. E.g. development of frameworks are not considered.

A.2.10 KPI DESCRIPTIONS (continued)

KPI 5: NUMBER OF TECHNOLOGY LICENCE AGREEMENTS SIGNED

INDICATOR TITLE	NUMBER OF LICENSED TECHNOLOGIES
Definition	An agreement in terms of which the CSIR grants rights to another party to exploit IP developed by the CSIR, typically in exchange for royalty payments and/or other licence fees. Technologies licensed in this manner must have been disclosed via the invention disclosure process.
Purpose	This indicator is a measure of the uptake of CSIR IP in the market. Technology licences facilitate commercialisation by other parties of the CSIR's scientific and technological outputs.
Performance assessment	The CSIR considers a performance above 75% of the target as acceptable. Performance in excess of the target is a positive result.
Data source/Eligible evidence	Technology licences are proposed and negotiated with other parties by CSIR divisions and are approved and granted in accordance with relevant legislation and the CSIR Commercialisation and Approval Frameworks. Copies of signed agreements and records in KSS. Assignments of IP shall also be included if all other criteria are met, if the assignment is not a conversion of licensed rights to the same IP that have already/previously been licensed to the assignee. Licenses must be approved according to the CSIR Approval Framework
Data responsibility	BEI
Method of calculation	Number of licence agreements signed. Assignments of IP shall also be included if all other criteria are met, if the assignment is not a conversion of licensed rights to the same IP that have already/previously been licensed to the assignee.
Limitations	None.
Type of indicator	Output.
Exclusions	Only full licence agreements negotiated and concluded with another party are counted. This KPI excludes: Instant Access Licences; and Evaluation agreements (or similar).

A.2.10 KPI DESCRIPTIONS (continued)

KPI 6: NUMBER OF LOCALISED TECHNOLOGIES

INDICATOR TITLE	NUMBER OF LOCALISED TECHNOLOGIES
Definition	A localised technology is a technology that has been invented or commercialised outside of South Africa and that has been or will be adapted in South Africa for commercial or scientific benefit or this is a technology that has been locally developed as an import replacement.
Purpose	The indicator aims to diffuse technologies commercialized or industrialised from elsewhere in the world that have demonstrated potential to positively affect competitiveness of industry upon competent adoption by users or is a strong candidate to be an input into innovation or improvements of other systems for improvement of industrial activities or capabilities of the State."
Performance assessment	The CSIR considers a performance above 75% of the target as acceptable. Performance in excess of the target is a positive result.
Data source/Eligible evidence	Evidence for localized technologies is reviewed by the KPI Review Committee and should include: <ul style="list-style-type: none"> (i) Proof, such as licence agreements and intellectual property rights ownership, including in the case of expired or lapsed IP rights, that the technology originated from outside the borders of SA and; (ii) a final implementation report or technology package developed, or other relevant proof that the technology has been piloted or applied/implemented in local South African conditions.
Data responsibility	CSIR clusters and divisions. Central Repository held by BEI: Planning & Knowledge Management
Method of calculation	Number of technologies localised
Limitations	The agreement date may be before the current financial year. The KPI can only be claimed once all eligible evidence is satisfied, which may span a number of years.
Type of indicator	Output.
Exclusions	Excludes a general list of technologies developed by CSIR R&D.

A.2.10 KPI DESCRIPTIONS (continued)

KPI 7: NUMBER OF JOINT TECHNOLOGY DEVELOPMENT AGREEMENTS BEING IMPLEMENTED WITH INDUSTRY

INDICATOR TITLE	NUMBER OF JOINT TECHNOLOGY DEVELOPMENT AGREEMENTS BEING IMPLEMENTED FOR INDUSTRY
Definition	A joint technology development initiative with an industry partner under a written agreement, where each party brings needed capability for the development and implementation of the technology. The initiative may be funded by a third party.
Purpose	This indicator measures the CSIR's technology development collaborations with industry partners with the intention to commercialise and industrialise.
Performance assessment	The CSIR considers a performance above 75% of the target as acceptable. Performance in excess of the target is a positive result.
Data source/Eligible evidence	Technology development and implementation agreements, proposed and negotiated with external clients by divisions supported by the divisional BD&C and relevant portfolio. Supporting evidence of the existence of joint teams, which can include joint R&D outputs (R&D reports, papers, patents, CAD models, technology test reports, etc.). Proof of activities performed in the current financial year
Data responsibility	Divisional BD&C. Central Repository maintained by BEI: Planning and Knowledge Management
Method of calculation	Number of signed agreements for joint technology development and implementation. Number of active technology agreements in a particular year.
Limitations	This definition of the KPI does not differentiate between large joint projects involving many SET base members, and small teams. This definition does not prescribe a minimum ratio of hours contributed by each party (this ratio will change as projects progress through TRLs).
Type of indicator	Output.
Exclusions	Pure contract R&D where there is no joint team with an industry partner. Projects where there is no specific product or process development with industry

A.2.10 KPI DESCRIPTIONS (continued)

KPI 8: NUMBER OF SMMES SUPPORTED

INDICATOR TITLE	NUMBER OF SMMES SUPPORTED
Definition	Support of Small, Medium and Micro Enterprises (SMMEs) as described in the 2019 Revised Schedule 1 of the National Definition of Small Enterprise in South Africa (Government Gazette no. 42304 of 15 March 2019) under the National Small Enterprise Act, 1996 (Act No. 102 of 1996), read with the National Enterprise Amendment Act, 2003 (Act No. 26 of 2003) and the National Small Enterprises Act, 2004 (Act No. 29 of 2004) through the implementation of RD&I and technology interventions that contribute to SMMEs becoming more productive, efficient and sustainable.
Purpose	The indicator measures CSIR's support of SMMEs with the view to stimulate economic activity.
Performance assessment	The CSIR considers a performance above 75% of the target as acceptable. Performance in excess of the target is a positive result.
Data source/Eligible evidence	Signed agreements with SMMEs. Proof of SMME status (from CSD reports), or Proof that SMMEs meet definition as per National Small Enterprise Act. Proof of delivery of support
Data responsibility	CSIR clusters and portfolios. Central repository maintained by BEI Planning & Knowledge Management.
Method of calculation	The number of signed agreements with SMMEs. Assumption: even under third-party funding an agreement with a specific SMME should be in place.
Limitations	This is a proxy for impact measurement. Actual impact will only be available from SMME revenue, job growth, growth in number of SMME business contracts.
Type of indicator	Output.
Exclusions	Routine analytical services. Subcontracting of SMMEs, unless there is an agreement in place to do capacity development of the SMME to enable delivery.

A.2.10 KPI DESCRIPTIONS (continued)

KPI 9: NUMBER OF REPORTS CONTRIBUTING TO NATIONAL POLICY DEVELOPMENT

INDICATOR TITLE	NUMBER OF REPORTS CONTRIBUTING TO NATIONAL POLICY DEVELOPMENT
Definition	Evidence-based policy development support provided to various arms of government
Purpose	The indicator measures CSIR's support to government with evidence-based policy development and decision-making that can benefit from a significant SET input.
Performance assessment	The CSIR considers a performance above 75% of the target as acceptable. Performance in excess of the target is a positive result.
Data source/Eligible evidence	Reports to government department clients; and Departmental or organisational sign-off on the policy and related reports is filed. Policies are only counted if there is external evidence that a contribution to the policy has been accepted/adopted.
Data responsibility	CSIR clusters and portfolios. Central repository maintained by BEI Planning & Knowledge Management
Method of calculation	Count of final reports related to new or updated policies received and accepted by the implementing government department. Count incorporation of inputs into processed legislation.
Limitations	The KPI as defined here does not account for: All national policies that do not have the same level of complexity from a SET point of view; and The effort put in by the CSIR (SET hours), some policy development projects require less input than others.
Type of indicator	Intermediate outcome (uptake and use).
Exclusions	Development of internal policies for government departments, for example general HR policies, quality management policies and general management policies. Contribution to creation or updating of CSIR policies.

A.2.10 KPI DESCRIPTIONS (continued)

KPI 10: NUMBER OF STANDARDS DELIVERED OR CONTRIBUTED TO IN SUPPORT OF THE STATE

INDICATOR TITLE	NUMBER OF STANDARDS DELIVERED OR CONTRIBUTED TO IN SUPPORT OF THE STATE.
Definition	New or updated standards adopted by the state and state-owned entities that the CSIR has developed and delivered or to which it contributed.
Purpose	The indicator measures CSIR's support for government policy and regulation through the development of standardised practice guidelines across economic and social sectors
Performance assessment	The CSIR considers a performance above 75% of the target as acceptable. Performance in excess of the target is a positive result.
Data source/Eligible evidence	Evidence of departmental or SOE sign-off on the standard and or use of "CSIR work" as input to a standard.
Data responsibility	CSIR clusters and portfolios. Central repository maintained by BEI Planning & Knowledge Management
Method of calculation	Count of new or updated standards adopted by government. In the case of updated standards, significant changes from previous versions must be demonstrated. Examples of standards include interoperability standards, accessibility standards, products or infrastructure standards
Limitations	None
Type of indicator	Intermediate outcome (uptake and use).
Exclusions	None.

A.2.10 KPI DESCRIPTIONS (continued)

KPI 11: NUMBER OF PROJECTS BEING IMPLEMENTED TO INCREASE CAPABILITY OF THE STATE.

INDICATOR TITLE	NUMBER OF PROJECTS BEING IMPLEMENTED TO INCREASE CAPABILITY OF THE STATE.
Definition	The CSIR-facilitated implementation of technologies (CSIR-created or otherwise) that improve the efficiency of Government and SOEs.
Purpose	This indicator measures the number of projects that the CSIR implements on behalf of the state
Performance assessment	The CSIR considers a performance above 75% of the target as acceptable. Performance in excess of the target is a positive result.
Data source/Eligible evidence	Active agreements and Implementation Reports – Central repository maintained by BEI Ins. Planning & Knowledge Management
Data responsibility	CSIR clusters and portfolios. Central repository maintained by BEI Planning & Knowledge Management
Method of calculation	Number of active projects with Governments Departments involving increasing the capability of the state (see examples in data source)
Limitations	None
Type of indicator	Intermediate outcome (uptake and use).
Exclusions	Diagnostic projects, engineering investigations, root cause analysis. These are important but may or may not lead to implementation (uptake and use) projects, the focus of this KPI is on implementation of changes in government departments.

A.2.10 KPI DESCRIPTIONS (continued)

KPI 12: TOTAL SET STAFF

INDICATOR TITLE	TOTAL SET STAFF
Definition	Number of CSIR staff qualified in the field of science, engineering and technology (SET) field
Purpose	The indicator is a measure of the CSIR's capacity to deliver on RD&I projects.
Performance assessment	Performance in terms of the number of SET staff is influenced by financial considerations and should be assessed in the context of financial performance. The CSIR considers a performance above 95% of the target as acceptable. Exceeding the target is a successful result and is not the result of an inappropriate target.
Data source	KPI information is extracted from PeopleSoft through an automated process.
Data responsibility	CSIR HC.
Method of calculation	Head count of SET staff at the end of the financial year.
Limitations	HC ensures the correct classification of staff in PeopleSoft.
Type of indicator	Output.
Exclusions	Bursars, visiting students/scientists and vacation work appointments

A.2.10 KPI DESCRIPTIONS (continued)

KPI 13 & 14: PERCENTAGE OF SET STAFF WHO ARE BLACK AND FEMALE, RESPECTIVELY.

INDICATOR TITLE	PERCENTAGE OF SET STAFF WHO ARE BLACK AND FEMALE, RESPECTIVELY.
Definition	Percentage of SET staff who black and percentage of SET staff who are female, respectively. As per B-BBEE Act definition, black South Africans are Africans, Coloureds and Indians, who meet the following criteria; Citizens of the Republic of South Africa by birth or descent; or Became citizens of the Republic of South Africa by naturalization Before 27 April 1994; or On or after 27 April 1994 and who would have been entitled to acquire citizenship by naturalization prior to that date.
Purpose	These indicators measures the degree of demographic transformation within the RD&I capacity of the organisation.
Performance assessment	Performance is influenced by the growth in SET staff numbers and may be negatively affected if the target number of SET staff is not achieved. The CSIR considers a performance within two percentage points of the target as acceptable. Exceeding the target is a successful result and is not the result of an inappropriate target.
Data source	KPI information is extracted from PeopleSoft through an automated process.
Data responsibility	CSIR HC.
Method of calculation	The percentages of black South African and female South African staff of total SET staff at the end of the financial year.
Limitations	None – HC ensures the correct classification of staff on the HC database.
Type of indicator	Output.
Exclusions	None.

A.2.10 KPI DESCRIPTIONS (continued)

KPI 15: PERCENTAGE OF SET STAFF WITH DOCTORAL QUALIFICATIONS

INDICATOR TITLE	PERCENTAGE OF SET STAFF WITH DOCTORAL QUALIFICATIONS
Definition	Proportion of SET staff who have a doctoral level qualifications.
Purpose	The indicator measures the organisation's capacity to conduct and supervise quality research, and to innovate.
Performance assessment	Performance is influenced by the growth in SET staff numbers and may be negatively affected if the target number of SET staff is not achieved. A performance within one percentage point of the proportion of PhDs will be considered as acceptable. Exceeding the target is a successful result and is not the result of an inappropriate target.
Data source	KPI information is extracted from the HR database.
Data responsibility	CSIR HC.
Method of calculation	The percentage of SET staff with doctoral level qualifications at the end of the financial year.
Limitations	None – HC ensures the validity of data and that evidence of the qualification is on file.
Type of indicator	Output.
Exclusions	None.

A.2.10 KPI DESCRIPTIONS (continued)

KPI 16: NUMBER OF CHIEF RESEARCHERS

INDICATOR TITLE	NUMBER OF CHIEF RESEARCHERS
Definition	Number of CSIR staff recognized as Chief Researchers through the formal Career Ladder process.
Purpose	The indicator is a measure of the quality of SET capacity and their potential influence in the local and international RDI spaces (Capacity to collaborate and share resources).
Performance assessment	Promotion or appointment at these senior research levels is based on individual performance as measured through the CSIR Career Ladder process. A performance of above 90% of the target is considered acceptable. Exceeding the target is a successful result and is not the result of an inappropriate target.
Data source	KPI information is extracted from the HC database.
Data responsibility	CSIR HC.
Method of calculation	Count of the number of SET staff who are classified as chief researchers at the end of the financial year.
Limitations	None – HC ensures the validity of data and that the required evidence is on file.
Type of indicator	Output.
Exclusions	IAMs not ratified on career ladders

A.2.10 KPI DESCRIPTIONS (continued)

KPI 17 & 18: PERCENTAGE OF CHIEF RESEARCHERS WHO ARE BLACK AND FEMALE, RESPECTIVELY.

INDICATOR TITLE	PERCENTAGE OF SET STAFF WITH DOCTORAL QUALIFICATIONS
Definition	Percentage of black South African and proportion of female South African citizens who are Chief Researchers (as per CSIR's Career Ladder System). As per B-BBEE Act definition, black South Africans are Africans, Coloureds and Indians, who meet the following criteria; Citizens of the Republic of South Africa by birth or descent; or Became citizens of the Republic of South Africa by naturalization Before 27 April 1994; or On or after 27 April 1994 and who would have been entitled to acquire citizenship by naturalization prior to that date.
Purpose	This indicator is a measure the level of demographic transformation within the chief researcher level.
Performance assessment	Promotion or appointment at these senior research levels is based on individual performance as measured through the CSIR Career Ladder process. A performance of within five percentage points for the proportion of black South African and female South African chief researchers is considered acceptable. Exceeding the target is a successful result and is not the result of an inappropriate target.
Data source	KPI information is extracted from the HR database.
Data responsibility	CSIR HC.
Method of calculation	The percentage of black South African and female South African chief researchers at the end of the financial year.
Limitations	None – HC ensures the validity of data and that the required evidence is on file.
Type of indicator	Output.
Exclusions	None

A.2.10 KPI DESCRIPTIONS (continued)

KPI 19: NUMBER OF PRINCIPAL RESEARCHERS

INDICATOR TITLE	NUMBER OF PRINCIPAL RESEARCHERS
Definition	Number of CSIR staff recognized as Principal Researchers through the formal Career Ladder process.
Purpose	The indicator is a measure of the quality of SET capacity and their potential influence in the local and international RDI spaces (Capacity to collaborate and share resources).
Performance assessment	Promotion or appointment at these senior research levels is based on individual performance as measured through the CSIR Career Ladder process. A performance of above 95% of the target is considered acceptable. Exceeding the target is a successful result and is not the result of an inappropriate target.
Data source	KPI information is extracted from the HC database.
Data responsibility	CSIR HC.
Method of calculation	Count of the number of SET staff who are classified as principal researchers at the end of the financial year.
Limitations	None. HC ensures the validity of data and that the required evidence is on file.
Type of indicator	Output.
Exclusions	RGL's not on career ladders option.

A.2.10 KPI DESCRIPTIONS (continued)

KPI 20 & 21: PERCENTAGE OF PRINCIPAL RESEARCHERS WHO ARE BLACK AND FEMALE, RESPECTIVELY.

INDICATOR TITLE	PERCENTAGE OF PRINCIPAL RESEARCHERS WHO ARE BLACK AND FEMALE, RESPECTIVELY.
Definition	<p>Percentage of principal researchers who are black South Africans and percentage of principal researchers who are female South Africans. As per B-BBEE Act definition, black South Africans are Africans, Coloureds and Indians, who meet the following criteria;</p> <ul style="list-style-type: none"> • Are citizens of the Republic of South Africa by birth or descent; or • Became citizens of the Republic of South Africa by naturalization- <ul style="list-style-type: none"> – Before 27 April 1994; or – On or after 27 April 1994 and who would have been entitled to acquire citizenship by naturalization prior to that date.
Purpose	These indicators measure the level of demographic transformation within the principal researcher level.
Performance assessment	<p>Promotion or appointment at these senior research levels is based on individual performance as measured through the CSIR Career Ladder process.</p> <p>A performance of within three percentage points for the proportion of black South African and female South African principal researchers is considered acceptable. Exceeding the target is a successful result and is not the result of an inappropriate target.</p>
Data source	KPI information is extracted from the HC database.
Data responsibility	CSIR HC.
Method of calculation	The percentage of black South African and female South African principal researchers at the end of the financial year.
Limitations	None – HC ensures the validity of data and that the required evidence is on file.
Type of indicator	Output.
Exclusions	None.



A.2.10 KPI DESCRIPTIONS (continued)

KPI 22: NUMBER OF STAFF INVOLVED IN EXCHANGE PROGRAMMES WITH INDUSTRY

INDICATOR TITLE	NUMBER OF STAFF INVOLVED IN EXCHANGE PROGRAMMES WITH INDUSTRY
Definition	The exchange of staff between the CSIR and other organisations for a period of time to share/gain expertise for the advancement of business growth opportunities and capacity development.
Purpose	The indicator measures the level at which CSIR shares expertise and resources, in order to strengthen collaborations with industry and other stakeholders to achieve organisational growth.
Performance assessment	The CSIR considers a performance above 75% of the target as acceptable. Performance in excess of the target is a positive result.
Data source	KPI information is extracted from the HC database. (transfer/secondment agreement needs to be in place)
Data responsibility	CSIR HC.
Method of calculation	Number of staff involved in exchange programmes for a minimum period of 1 months
Limitations	None – HC will ensure relevant data is captured.
Type of indicator	Output.
Exclusions	None.

A.2.10 KPI DESCRIPTIONS (continued)

KPI 23: INVESTMENT (RM) IN PPE

INDICATOR TITLE	INVESTMENT IN PROPERTY, PLANT AND EQUIPMENT (PPE)
Definition	The amount invested in CSIR and government grant-funded PPE as well as qualifying leases (as per Accounting Standard on Leases) for a financial year.
Purpose	This indicator provides a measure of CSIR's investment in research infrastructure in order to develop and maintain world-class facilities and equipment to provide the quality of RD&I that is expected of it.
Performance assessment	The CSIR considers a performance above 95% of the target as acceptable. The budget target may be exceeded substantially, arising from additional grant funding. This is a successful result and is not the consequence of an inappropriate target.
Data source	The information for the financial KPIs is obtained from the CSIR financial systems.
Data responsibility	CSIR Finances.
Method of calculation	Value of investment in PPE is the amount of CSIR and grant additions for the year. This information is obtained from reports in the fixed assets system, as well as the CSIR trial balance. Reconciliation is done to analyse the movement in the PPE balance and to break this down among additions, disposals and depreciation. This breakdown is also disclosed in the year-end annual financial statements.
Limitations	None
Type of indicator	Input.
Exclusions	Equipment that goes back to 3rd part at end of project and is not logged in the CSIR asset list.



A.2.10 KPI DESCRIPTIONS (continued)

KPI 24: TOTAL OPERATING INCOME

INDICATOR TITLE	TOTAL OPERATING INCOME
Definition	Total Operating income includes revenue declared on R&D contracts (contract R&D income), income derived from licences and royalties, PG received through the Science Vote, and other income.
Purpose	The indicator reflects the ability of the CSIR to ensure financial sustainability. Growth in total operating income indicates growth in the outcomes and impact achieved by the CSIR.
Performance assessment	Performance on financial KPIs needs to be assessed in the context of the prevailing economic climate. The CSIR considers a performance above 95% of the target as acceptable. Exceeding the budget target is a successful result and is not the consequence of an inappropriate target.
Data source	The information for the financial KPIs is obtained from the CSIR financial systems.
Data responsibility	CSIR Finances.
Method of calculation	The CSIR annual trial balance from the financial system is updated for audit adjustments and the final figures are incorporated in the CSIR annual financial statements. The annual financial statements are audited and the KPI results are derived from these audited annual financial statements.
Limitations	None
Type of indicator	Output.
Exclusions	Net finance income is not included in the definition of total operating income.

A.2.10 KPI DESCRIPTIONS (continued)

KPI 25: NET PROFIT (%TOTAL INCOME)

INDICATOR TITLE	NET PROFIT (%TOTAL INCOME)
Definition	Profit for a financial year, which is calculated as total operating income; less total operating expenditure (including the performance bonus accrual); plus net finance income.
Purpose	Net profit is a key indicator of financial sustainability and the ability of the organisation to manage its expenses according to the affordability determined by income levels.
Performance assessment	Performance on financial KPIs needs to be assessed in the context of the prevailing economic climate. The CSIR considers a performance above 95% of the target as acceptable. Reducing the budget target is a successful result and is not the consequence of an inappropriate target.
Data source	The information for the financial KPIs is obtained from the CSIR financial systems.
Data responsibility	CSIR Finances.
Method of calculation	The CSIR annual trial balance from the financial system is updated for audit adjustments and the final figures are incorporated in the CSIR annual financial statements. The annual financial statements are audited and the KPI results are derived from these audited annual financial statements.
Limitations	None.
Type of indicator	Output.
Exclusions	None

A.2.10 KPI DESCRIPTIONS (continued)

KPI 26: SA PUBLIC SECTOR INCOME (% TOTAL INCOME)

INDICATOR TITLE	SA PUBLIC SECTOR INCOME
New Definition	South African public sector income is the total income earned from South African public entities (as listed in the schedules to the Public Finance Management Act "PFMA" and the Municipal Finance Management Act "MFMA"). This includes revenue declared on R&D contracts (contract R&D income), PG received through the Science Vote and any other forms of funding received from South African public entities.
Purpose	South African public sector income reflects the degree of government investment of RDI activities at the CSIR and the ability of CSIR to contract with the public sector.
Performance assessment	The CSIR's annual target is the percentage of South African public sector income included in the annual total operating income budget, which the CSIR aims to achieve or reduce. Future targets are set to ensure increased income diversification and impact in other sectors. The CSIR considers a performance above 95% of the target as acceptable.
Data source	The information for the financial KPIs is obtained from the CSIR financial systems.
Data responsibility	CSIR Finances.
Method of calculation	The CSIR annual trial balance from the financial system is updated for audit adjustments and the final figures are incorporated in the CSIR annual financial statements. The annual financial statements are audited and the KPI results are derived from these audited annual financial statements.
Limitations	None.
Type of indicator	Output.
Exclusions	None.

A.2.10 KPI DESCRIPTIONS (continued)

KPI 27: SA PRIVATE SECTOR INCOME (% TOTAL INCOME)

INDICATOR TITLE	SA PRIVATE SECTOR INCOME (% TOTAL INCOME)
Definition	South African private sector income is the total contract R&D income earned from South African non-public entities (not listed as public entities in the schedules to the Public Finance Management Act "PFMA" nor the Municipal Finance Management Act "MFMA"). This includes Not for Profit Organisations (NPOs).
Purpose	South African private sector income reflects the degree of private sector investment in the CSIR.
Performance assessment	Performance on financial KPIs needs to be assessed in the context of the prevailing economic climate. The CSIR considers a performance above 95% of the target as acceptable. Exceeding the budget target is a successful result and is not the consequence of an inappropriate target.
Data source	The information for the financial KPIs is obtained from the CSIR financial systems.
Data responsibility	CSIR Finances.
Method of calculation	The CSIR annual trial balance from the financial system is updated for audit adjustments and the final figures are incorporated in the CSIR annual financial statements. The annual financial statements are audited and the KPI results are derived from these audited annual financial statements.
Limitations	None.
Type of indicator	Output.
Exclusions	Licences, royalties and interest income is not included in the definition.

A.2.10 KPI DESCRIPTIONS (continued)

KPI 28: INTERNATIONAL CONTRACT INCOME (% TOTAL INCOME)

INDICATOR TITLE	INTERNATIONAL CONTRACT INCOME
New Definition	International contract income is the total income earned from foreign customers (i.e. entities incorporated outside the borders of South Africa). This includes revenue declared on R&D contracts (contract R&D income) and other income received from foreign entities.
Purpose	International contract income reflects the global relevance of the CSIR. Growth in international investment is a key indicator of income diversification, as well as the relevance and impact of the CSIR within the global economy.
Performance assessment	Performance on financial KPIs needs to be assessed in the context of the prevailing economic climate. The CSIR considers a performance above 95% of the target as acceptable. Exceeding the budget target is a successful result and is not the consequence of an inappropriate target.
Data source	The information for the financial KPIs is obtained from the CSIR financial systems.
Data responsibility	CSIR Finances.
Method of calculation	The CSIR annual trial balance from the financial system is updated for audit adjustments and the final figures are incorporated in the CSIR annual financial statements. The annual financial statements are audited and the KPI results are derived from these audited annual financial statements.
Limitations	None.
Type of indicator	Output.
Exclusions	Licences and royalties received from foreign entities are not included in the definition of international contract income.

A.2.10 KPI DESCRIPTIONS (continued)

KPI 29: B-BBEE RATING

INDICATOR TITLE	B-BBEE RATING
Definition	A B-BBEE rating is a verification certificate issued by a SANAS approved verification agency that determines CSIR's contribution to black (As per B-BBEE Act definition) economic empowerment.
Purpose	The indicator is a measure of CSIR's compliance to B-BBEE Act in its contribution to support socioeconomic transformation in South Africa.
Performance assessment	The CSIR would not consider failure to reach a target because of amended Codes of Good Practice targets as a negative result. Improving on the target is a successful result.
Data source	There are multiple sources of information from which the CSIR assessment is compiled and verified by external audit.
Data responsibility	CSIR Management Services.
Method of calculation	<p>B-BBEE rating is based on a certificate that is issued after an external auditing process. The B-BBEE certificate indicates the CSIR's status with regard to a number of measurements as indicated in the B-BBEE Codes of Good Practice. The B-BBEE rating is a composite score that is made up of the following components:</p> <ul style="list-style-type: none"> • Management and Control; • Skills Development; • Preferential Procurement; and • Socioeconomic Development. • Equity Ownership.
Limitations	The external audit ensures that there is no subjectivity in the B-BBEE assessment.
Type of indicator	Output.
Exclusions	As the CSIR is a government business enterprise, equity ownership does not contribute to the B-BBEE rating score.

A.2.10 KPI DESCRIPTIONS (continued)

KPI 30: RECORDABLE INCIDENT RATE (RIR)

INDICATOR TITLE	RECORDABLE INCIDENT RATE (RIR)
Definition	<p>The Recordable Incident Rate (RIR) is the number of recordable incidences (or cases); multiplied by 200 000; divided by the number of hours worked. A recordable incident is a work-related injury or illness that results in one or more of the following criteria:</p> <ul style="list-style-type: none"> • Death; • Loss of consciousness; • Restricted work or transfer to another job; • Days away from work; and/or • Medical treatment beyond first aid.
Purpose	RIR indicates the effectiveness of health and safety management system within the organisation in a year. The CSIR SHEQ policy seeks to establish an effective, accountable and transparent framework for managing, maintaining and implementing SHEQ within the organisation.
Performance assessment	The CSIR aims to achieve its annual target of a an RIR less than 1.8 (equivalent to 40 recordable incidents/ cases) through identifying health and safety risks and implementing proactive health and safety interventions, in order to reduce the number of recordable incidents/cases.
Data source	The information for the health and safety KPIs is obtained from the CSIR SHEQ systems.
Data responsibility	CSIR SHEQ.
Method of calculation	The RIR is an indication of the percentage of employees exposed to work related injury or illness and classified as recordable incident per year. It is calculated by the number of recordable cases x 200 000 divided by number of hours worked.
Limitations	None.
Type of indicator	Output.
Exclusions	None.

A.2.10 KPI DESCRIPTIONS (continued)

KPI 31: AUDIT OPINION

INDICATOR TITLE	CLEAN AUDIT
Definition	The Auditor-General (AG) defines a Clean Audit as achieving an unqualified audit opinion on the audits of annual financial statements and pre-determined objectives as well as not having material findings on the audit of compliance with laws and regulations.
Purpose	The indicator is a measure of CSIR's Accountability and Governance.
Performance assessment	The CSIR would like to maintain a Clean Audit outcome at the end of each annual audit.
Data source	Report of the Auditor-General as published in the annual report.
Data responsibility	Finance function.
Method of calculation	A Clean Audit is based on the overall opinion of the Auditor-General after the performance of the annual statutory audit.
Limitations	Data from the Auditor-General regarding the audit opinion is only available on the third quarter of the financial period. This KPI relates to the audit opinion of the previous financial year
Type of indicator	Output.
Exclusions	None.





B

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B.1 Operational Plan Overview

This section B of the CSIR Shareholder Compact 2021/22 outlines programmes and initiatives that advance the CSIR's strategy's implementation priorities and especially the five SOs during this financial year. The strategic context outlined in the section A – the strategic plan section – has influenced the focus in this section. The operational plan of the CSIR is realised through the operational structures of the CSIR, including divisions, clusters and portfolios (see Figure B.1 on CSIR structure overview below).

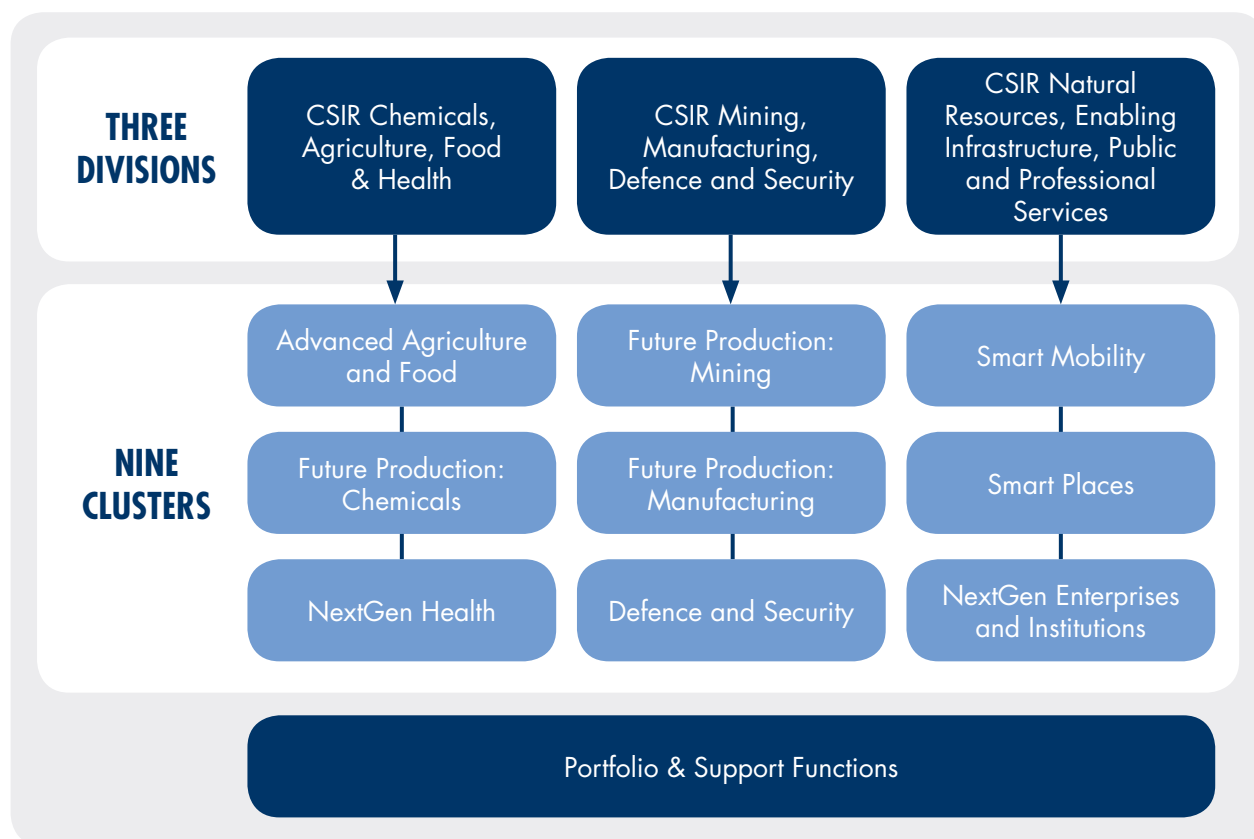


Figure B.1: Overview of CSIR structure

Ultimately, the focus in 2021/22 should advance performance and delivery against the SOs of the CSIR, and contribute to achievement of national priorities (see Figure B.2 on CSIR priority industries below), while also leveraging opportunities emerging in the operating external environment.

B.1 OPERATIONAL PLAN OVERVIEW (continued)

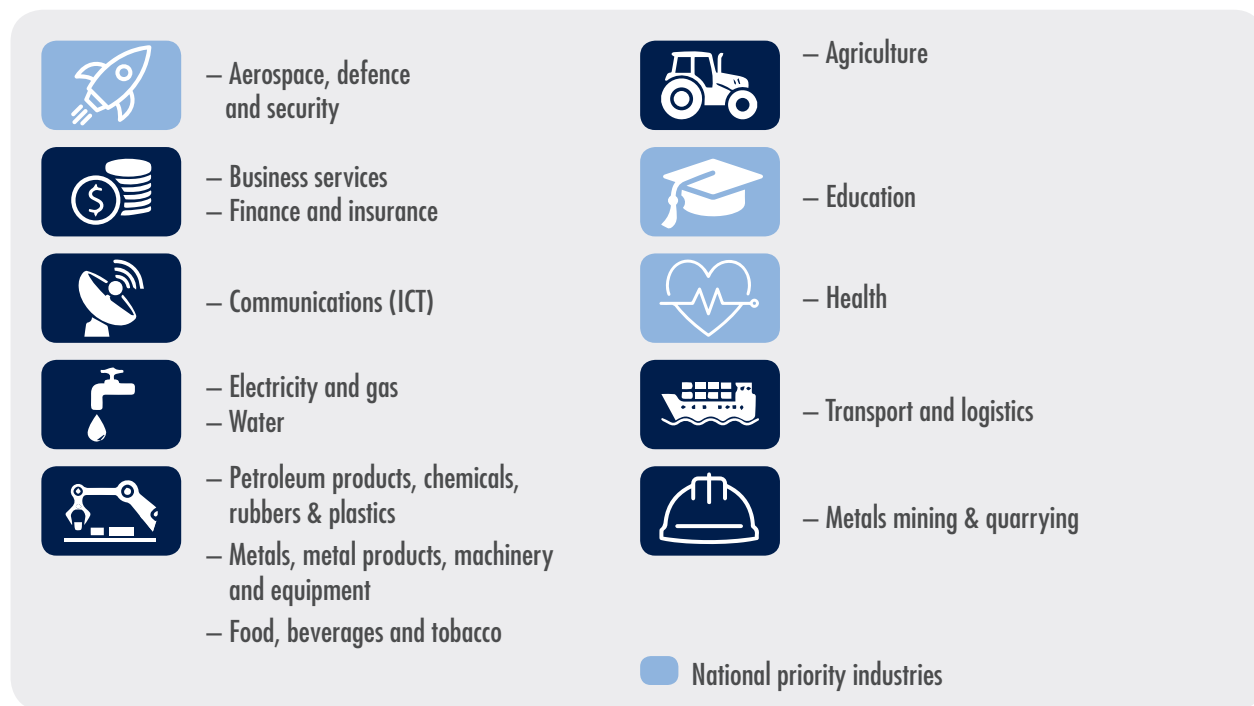


Figure B.2: CSIR priority focus industries and sector including national priority industries (shaded in lighter blue)

The operational plan we outline below, is framed based on the five CSIR SOs and for the purpose of this Shareholder's Compact 2021/22, programmes and initiatives under each of the SOs are not reflective of the fullness of activities by divisions, clusters and portfolios. The CSIR planning process requires that all divisions, clusters and portfolios, to develop detailed strategic and operational plans for this financial year 2021/22 and those detailed plans further enhance delivery against our strategy priorities.

B.2 SO1: Conduct research, development and innovation of transformative technologies and accelerate their diffusion.

This strategic objective seeks to ensure that the CSIR undertakes cutting edge research, development and innovation in areas that will bring transformative change in the South African economy and society. To advance the achievement of this SO in 2021/22, all divisions, clusters and the BEI portfolio through strategic investment of Parliament with drive or support RDI and enabling programmes and initiatives outlined below:

B.2.1 DIVISION AND CLUSTER RDI PROGRAMMES AND INITIATIVES

Table B.1 – Initiatives in support of SO 1

Contributing cluster to SO1	Key focus areas of the Cluster	Key RDI Programmes and Initiatives for 2021/22
CSIR Future Production: Chemicals	<p>The cluster's main focus is on primary, secondary and tertiary conversions of feedstocks. It supports the development of formulated product; and drives the technology for waste reduction and valorisation. The cluster has three strategic capability platforms namely (bio)-chemical conversions, pharmaceutical innovation technology, and advanced materials.</p> <p>The clusters is also enhancing its capabilities through the RDI activities of the CSIR Polymers, Composites and Nanoresearch Centre.</p>	<p>(Bio)-Chemical Conversions Platform</p> <ul style="list-style-type: none"> Focus on the biological and chemical conversion processes to produce specialty chemicals and products for formulation and/or use in areas such as biopolymers, bioplastic, active pharmaceuticals ingredients, cosmeceuticals, nutraceuticals and food additives <p>Centre for Nanostructures and Advanced Materials</p> <ul style="list-style-type: none"> This strategic platform aims to develop new and modified materials, while introducing green production methods and focusing on process efficiencies. Polymer nanocomposites, emerging nanofillers, advanced polymer materials, and primary metal production are the main strategic focus areas for this platform. <p>Pharmaceutical Technology Innovation</p> <ul style="list-style-type: none"> This strategic focus area will enable a dynamic African pharmaceuticals manufacturing industry with access to critical and modern drugs through innovative and world-class processing technology aimed at leapfrogging the current batch of manufacturing with continuous flow processing manufacturing technology.

B.2.1 DIVISION AND CLUSTER RDI PROGRAMMES AND INITIATIVES (continued)

Contributing cluster to SO1	Key focus areas of the Cluster	Key RDI Programmes and Initiatives for 2021/22
CSIR Future Production: Manufacturing	<p>The cluster addresses the challenges and opportunities of the metals, metal products, machinery and equipment sector. Three platforms, namely engineered materials platform; parts fabrication platform and assembly platform, enable the cluster to deliver on its focus areas.</p> <p>The CSIR Mechatronics, Sensor Science and Mobile Autonomous Systems and the CSIR Photonics Research Centres also form part of this cluster.</p> <p>In addition, the cluster houses the National Laser Centre, which develops and applies novel laser applications across a variety of sectors and provide access to laser equipment for R&D and skills development, as well as AISI, which positions South African aerospace and defence-related industry as a global leader, in niche areas, while ensuring effective interdepartmental participation and collaboration.</p>	<p>Development of capabilities in a minimum of seven of the 4IR technology areas</p> <ul style="list-style-type: none"> • 3D printing; Advanced materials and processing; Advanced robotics; AI; Biotechnology; Human enhancement technologies and Industrial IoT. <p>Development of capability in design and servitisation of products, engineered materials, parts fabrication and assemblies.</p> <ul style="list-style-type: none"> • Integrated digital technologies for the creation of the digital twin and digital thread (PLM) • Innovation of the organisation's capabilities and processes to better create mutual value through a shift from selling product to selling Product-Service Systems. • Advanced, programmable, flexible equipment; Industrial IoT; Additive Manufacturing processes and metal 3D printing; and use of Photonics and Robotics. • Implement intelligent/smart/digital factories through the integration of advanced equipment with manufacturing planning and control; factory-wide integration; and agile factories. <p>Drive existing early stage manufactured product technology development programmes to commercialization.</p> <ul style="list-style-type: none"> • Advanced Materials and Engineering: design, develop, manufacture and test metallic materials, mill products and components through powder metallurgy and casting processes. • Over the next three years, the Centre for Robotics and Future Production will enable the concept of a Smart Factory, i.e. a highly digitalised and connected environment where machinery and equipment are able to improve processes through automation and self-optimisation, to incubate and demonstrate 4IR technologies for priority sectors.



B.2.1 DIVISION AND CLUSTER RDI PROGRAMMES AND INITIATIVES (continued)

Contributing cluster to SO1	Key focus areas of the Cluster	Key RDI Programmes and Initiatives for 2021/22
		<p>National Laser Centre</p> <ul style="list-style-type: none"> • Laser-based manufacturing applications (new processes, new materials); • Laser and photonics-based therapeutic applications for cancer; • New laser sources and laser beam manipulation for application in imaging, communications and medical applications; • Laser-based remote sensing applications; and • Quantum Photonics for the development of an optically pumped magnetometer
CSIR Future Production: Mining	<p>The cluster focuses on leveraging the strong history of mining in South Africa through the modernisation of mines via mechanisation and automation, and ultimately, fully autonomous operations, as the envisaged path to improve safety, bring change to processes, technologies, skill sets, and social and environmental impacts associated with current mining practices.</p> <p>In addition to focusing on post mining landscapes, the cluster delivers on its scope by leveraging two platforms, namely mining development and operations platform and, in partnership, the product development platform.</p>	<p>Pilot programme for VR uptake</p> <ul style="list-style-type: none"> • Enhancement of the mine safety training offering at Kloppersbos through including immersive and experiential training elements including the use of VR. <p>Facilitate local development, testing and implementation of TMM CAS:</p> <ul style="list-style-type: none"> • The implementation of CAS in the mining industry will significantly result in the reduction of TMM-related incidents, hence protecting employees from injury and death, and preventing damage of equipment and infrastructure. <p>Thermal hanging wall inspection device:</p> <ul style="list-style-type: none"> • Uses thermal measurements to identify differences in temperature and hence possible areas of risk due to loose rock. <p>CO₂ sensor system:</p> <ul style="list-style-type: none"> • Monitor indoor CO₂ levels. Can be implemented in cabins of mining vehicles in combination with vision systems to detect driver fatigue



B.2.1 DIVISION AND CLUSTER RDI PROGRAMMES AND INITIATIVES (continued)

Contributing cluster to SO1	Key focus areas of the Cluster	Key RDI Programmes and Initiatives for 2021/22
		Integrated Real Time Information Management System;; <ul style="list-style-type: none"> • Networked communications devices in the stope. Links to surface information management system providing integrated control, monitoring and visualisation functionality
CSIR Advanced Agriculture and Food	The cluster addresses the challenges and opportunities of the agriculture, as well as the food and beverage processing sectors. Three platforms enable the cluster to deliver on its focus, namely precision agriculture platform; the agro-processing platform and advanced processing platform.	Agro-processing <ul style="list-style-type: none"> • Cannabis extraction technologies localisation and development: <ul style="list-style-type: none"> – Developing and commercialising novel and advanced CBD encapsulation techniques to improve the bioavailability of CBD. – Applying a novel biochemical process route to synthesise alternative CBD variants. – Using a combination of cannabinoids to develop new therapeutic medications and products. – Using Synthetic Biology to design microbes/ fungi that can express high quantities of CBD. • Addressing food waste in a circular economy model and post-harvest management technologies in the agro-processing sector: <ul style="list-style-type: none"> – The development of products and processes based on indigenous knowledge supports local value creation and participation in the mainstream value chain. • Alternate protein platform: <ul style="list-style-type: none"> – The development products from alternative protein sources from plants or insects and for feed/food. • Indigenous Knowledge Systems: <ul style="list-style-type: none"> – Driving the development of complementary medicines, cosmetics and food products and assist companies navigate the IKS regulatory framework to ensure compliance and that the benefits accrued from commercialising IKS-based products accrue to the indigenous knowledge holders.



B.2.1 DIVISION AND CLUSTER RDI PROGRAMMES AND INITIATIVES (continued)

Contributing cluster to SO1	Key focus areas of the Cluster	Key RDI Programmes and Initiatives for 2021/22
		<p>Food safety platform</p> <ul style="list-style-type: none"> Address the challenges associated with food safety testing at ports of entry and in remote areas. <p>Precision agriculture platform</p> <ul style="list-style-type: none"> Using existing computing platforms, such as the Amazon Web Service, to develop algorithms that support the platforms for big data analytics that are integral to the group's offering.
CSIR NextGen Health	<p>The cluster focuses on the improvement of access to health care, and incorporates synthetic biology and state-of-the-art diagnostic and treatment technology with advances in AI to provide integrated digital health solutions. The cluster leverages three platforms to deliver on its focus areas: health information systems platform, medical devices and diagnostics platform and precision medicine for pharmaceutical treatments platform.</p> <p>Investment in the CSIR Synthetic Biology and Health Science Research Centre aims to enhance the capabilities of this cluster.</p>	<p>Precision medicine platform integrates synthetic biology, stem cell and genome engineering technology, state-of-the-art disease risk profiling and treatment technologies to provide integrated Digital Precision Medicine solutions for the country.</p> <ul style="list-style-type: none"> Diagnostic areas prioritised will be on the HIV (side effects of Antiretrovirals) and various cancers, such as breast, gall bladder and pancreatic, where signature biomarker panels have been identified. Ultimately, generate large scale omics data linked to clinical information for each patient. <p>Medical devices, diagnostics and vaccines platform</p> <p>Focus on PoC devices, early detection tools, non-invasive and low costs offering that are relevant for the regional context, but have a global impact.</p> <ul style="list-style-type: none"> The current focus is on diseases that are identified as a high burden in South Africa namely; TB and HIV, as well as the recently emergence of Covid-19. The Veterinary Molecular Diagnostics and Vaccines platform also has a focus on development of PoC molecular diagnostic assays, devices and technologies for veterinary health diagnostics and vaccine development particularly for agricultural, livestock, poultry, aqua-culture and wildlife industries



B.2.1 DIVISION AND CLUSTER RDI PROGRAMMES AND INITIATIVES (continued)

Contributing cluster to SO1	Key focus areas of the Cluster	Key RDI Programmes and Initiatives for 2021/22
		<p>Synthetic Nanobiotechnology and Biomachines Platform</p> <ul style="list-style-type: none"> • Developing local capacity for the manufacturing of Biologics and Drug screening platform technologies for drug repurposing. • The group aims to develop a synthetic microbes development platform that would enable applications in health, chemical and agriculture industry.
CSIR Smart Mobility	<p>The cluster addresses the challenges and opportunities of transport and logistics, transport equipment, infrastructure, public services, as well as the oil and gas, and mining sectors. Two key components form part of the strategy of the cluster and there are inbound logistics and outbound logistics operations; and logistics operations.</p>	<ul style="list-style-type: none"> • Smart Mobility Research Chair – this initiative is aimed at positioning the Smart Mobility cluster through enhanced collaboration with key academic partners. • End-to-End Logistics initiative aims to establish a Smart Logistics Management Impact Area. <p>Transport Management, Design and Systems</p> <ul style="list-style-type: none"> • Modeling of passenger travel responsive to changing society and economy. • Improved measurement, reporting and verification of road safety risks. • Improved modeling of crash risk, from a drivers perspective • Developing simplified and relevant tools – Digital solutions for minibus taxi law enforcement <p>Transport Network Asset Management Systems</p> <ul style="list-style-type: none"> • Bridge Management systems (exploring the usefulness of drones for bridge inspection).. • Abnormal loads management systems • Performance-based standards for heavy vehicle operations (Smart Truck initiatives) – localised from Australia.

B.2.1 DIVISION AND CLUSTER RDI PROGRAMMES AND INITIATIVES (continued)

Contributing cluster to SO1	Key focus areas of the Cluster	Key RDI Programmes and Initiatives for 2021/22
		<p>Pavement Design & Construction</p> <ul style="list-style-type: none"> • SET solutions for the cost-effective design, construction, rehabilitation and maintenance of transport infrastructure assets (i.e. roads, airports, railway ballast and underlying structures). <p>Advanced Material Testing Lab</p> <ul style="list-style-type: none"> • Specialist testing services. • Support creation of new technologies and testing procedures in support of the SET needs of the pavement engineering sectors. <p>Coastal Engineering and Ports Infrastructure</p> <ul style="list-style-type: none"> • Physical model studies for breakwater optimisation and long-wave mitigation in South African ports. • Physical and numerical studies for climate change mitigation. • Enhanced decision support systems (environment and operations) e.g. IPOSS and Dmax upgrade. <p>Accelerated Pavement Testing</p> <ul style="list-style-type: none"> • Locally developed equipment exported for performance evaluation of road pavements using the Heavy Vehicle Simulator technology platform. • Development of Traffic Stream Simulator to improve design of roads. • Smart Roads: Validate/calibrate/improve structural design methods and performance models.
CSIR Defence and Security	The cluster focuses on the defence and security sectors and intends to build resilient defence and security capabilities for South Africa to ensure secure borders and enable the safety of all inhabitants, while fostering a secure platform for	<ul style="list-style-type: none"> • Conducting RDI in the field of airborne autonomous systems, developing niche, localising new technologies in alternative propulsion, gas turbine propulsion, novel control systems, and conducting applied operations research in the area of military air operations.



B.2.1 DIVISION AND CLUSTER RDI PROGRAMMES AND INITIATIVES (continued)

Contributing cluster to SO1	Key focus areas of the Cluster	Key RDI Programmes and Initiatives for 2021/22
	<p>business to conduct industrial/ economic activities. Three platforms enable the cluster to deliver on its focus, namely defence platform, cybersecurity platform and civil security platform.</p> <p>Capabilities in this cluster are being enhanced through investment in the CSIR Information Security and the National Integrated Cyberinfrastructure Research Centres.</p>	<ul style="list-style-type: none">• Conducting RDI in new aerodynamic analysis, test and evaluation technologies developing new tools, processes and technologies to deliver validated, cost effective services and to support industry to be more competitive.• Research and development of innovative solutions to address vandalism and crime in large complex industrial installations and government departments, through the exploitation of transformative technologies.• Improve organisational effectiveness by enabling interpretation of complex systems through simulation modelling for decision support and the development of interventions with knowledge centrality.• Research and innovate home-grown identity management, cyber and information security solutions and approaches to securely identify and protect people (cradle to grave) and systems (physical and digital) against vulnerabilities, threats and risks.• Research, development and innovation in Applied Detonics, Ballistics & Explosives and Rapid Operational Solutions.• Develop competitive, innovative, cutting-edge Opto-mechatronic systems through R&D for the surveillance and electronic warfare domains.• Applied operational research, development and innovation in support of Special Operations capabilities as well as national transformative technology programmes.• A world-class research, development and innovation capability for radar and electronic warfare technologies and applications.

**B.2.1 DIVISION AND CLUSTER RDI PROGRAMMES AND INITIATIVES** (continued)

Contributing cluster to SO1	Key focus areas of the Cluster	Key RDI Programmes and Initiatives for 2021/22
CSIR NextGen Enterprises and Institutions	<p>The cluster aims to enable the transition of South Africa's public institutions into a digitalised era that will support effective public and private sector service delivery, improve government transparency and accountability, and cultivate a connected platform that supports service provision, as well as industrial and societal advancement.</p> <p>Key platform the cluster leverages to deliver on its focus areas, namely digital systems platform, data platform and analytics platform.</p> <p>The CSIR Emerging Digital Technologies Research Centre is also a key component of this cluster.</p> <p>In addition, the cluster hosts the National Integrated Cyberinfrastructure System facility providing high-performance computing capability, high-speed network capacity (SANReN), a national data intensive research infrastructure (DIRISA) and an HC Development pillar integrated horizontally into globally connected systems and hierarchically into a local system providing seamless access to the research and teaching community.</p>	<ul style="list-style-type: none">• This cluster will develop capabilities and tools based on key digital technologies, namely AI, Augmented Reality, Distributed Ledger Technologies and Advanced IoT and CPSs to enable the CSIR to develop innovative solutions and products that will fuel enterprise establishment and to support local industries• Design, develop and implement modern software architectures and backend software modules, particularly those harness rich multimedia processing capabilities (voice, video and text) to enable the localisation of key economic and service sectors of the economy and promote development of local content for the networked world.• Host and technically support a world-class network modernisation and automation laboratory that supports research in emerging technologies such as Software Defined Networks, Network Function Virtualisation, next-generation open multi-radio access networks, Mobile Edge Computing, Voice Computing, and cloud-based video streaming services orchestration.

B.2.1 DIVISION AND CLUSTER RDI PROGRAMMES AND INITIATIVES (continued)

Contributing cluster to SO1	Key focus areas of the Cluster	Key RDI Programmes and Initiatives for 2021/22
CSIR Smart Places	<p>The cluster aims to effect smarter resource use, infrastructure and service developments directed at enabling competitive manufacturing environments, and sustainable economic growth.</p> <p>To deliver on its scope, the cluster leverages programmes and capabilities, which include decision support focusing on climate change and adaptation; and spatial planning, smart infrastructure programme, municipal programmes, water systems and energy system design operations and technologies.</p> <p>Further, the CSIR Energy, and Water Resource Management Research Centres are a key areas for capability development in this clusters.</p>	<p>Industrial zone planning; water energy, buildings, etc.:</p> <ul style="list-style-type: none"> Smart Places is uniquely positioned to support regional industrial development in industrial parks and SEZs, through the design and optimisation of integrated energy, water and waste treatment systems. The proposed solution is in the form of a “digital twin” approach to industrial planning incorporating detailed process level modelling of mass and energy flows in industrial parks and SEZs. <p>Sustainability and resilience planning for the Blue/Ocean Economy for coastal settlements, cities and towns</p> <ul style="list-style-type: none"> A modelling and knowledge integration support platform for coastal and ocean development: a one stop expertise and tool platform to enable integrated planning across the South Africa’s ocean and coastal territory <p>Circular economy (industry and economy-wide aspects)</p> <ul style="list-style-type: none"> Cross cutting expertise to create greater efficiency in material use and circular economic development opportunities across multiple sectors in South Africa. <p>Centralised Data Management and Analytic System</p> <ul style="list-style-type: none"> To create an integrated centralised data management and analysis system for ease of data storage, access, advanced analytics and data visualisation for the purposes of tracking and monitoring the outcomes of the NDP and similar government regulations.



B.2.1 DIVISION AND CLUSTER RDI PROGRAMMES AND INITIATIVES (continued)

Contributing cluster to SO1	Key focus areas of the Cluster	Key RDI Programmes and Initiatives for 2021/22
		<p>Creating Inclusive Smart Cities</p> <ul style="list-style-type: none">• The CSIR should play the role of an independent thought leader without any vested interests. It should develop the capability to provide unbiased, evidence-based decision support information. <p>Overcoming natural resource constraints and risks to create development opportunity for industry and the people.</p> <ul style="list-style-type: none">• Resource state analytics to understand current and future resource state towards a more efficient and optimised resource use and maximised socioeconomic benefits in light of climate change.• Assessment and early warning tools for specific sectors (e.g. agriculture, water, health). <p>Water-Food-Energy Nexus</p> <ul style="list-style-type: none">• Nexus-based approaches and tools are being developed to assist in addressing these problems. These tools range from social decision-making platforms “decision theatres” to complex integrated assessment models and quantitative integrated assessments.

B.2.2 PLANNED COMMERCIALISATION AND TECHNOLOGY TRANSFER PROJECTS IN 2021/22

Table B.2 – Commercialisation priorities for 2021/22

Division	Project Name	Description	Outputs
CSIR Chemicals, Agriculture, Food and Health	Bioplastics,	Modification methods for biopolymers using biomass-derived materials and other additives in unique formulations , to enhance the properties of such biopolymers and their blends.	License
	Breath Analyser,	Breathalyser is an innovative technology used for monitoring changes in acetone levels as a biomarker for diabetes.	Equity stake (Partner selected)
	Supercritical CO ₂ and encapsulation technologies	Uniquely formulated active products using the supercritical CO ₂ encapsulation process.	License/toll manufacturing
	Liver bioengineered model	A novel liver toxicity engineered model which aims to predict best treatment outcome for patients in Africa.	Equity Stake (Partner selected)
	Avian Flu diagnostic kits	Production of plant-produced components of avian influenza diagnostic kits.	License (CSIR/ UP IP co-owned)
	Zeolite X	Wonderstone beneficiation- chemical characteristics of pyrophyllite allows it to be a suitable feedstock for zeolite production.	License
	Tick vaccine	Recombinant tick vaccine.	License (CSIR/ UP IP co-owned)
	Nutridrink	The Nutri-Drink is an instant powdered pre-mix that is formulated using locally produced and indigenous crops.	License
	Biocontrol sheet	Biocontrol sheet impregnated with Natural bio-fumigant (Lemongrass, Lemon, Peppermint, Thyme oils).	License (CSIR/ ARC IP co-owned)



B.2.2 PLANNED COMMERCIALISATION AND TECHNOLOGY TRANSFER PROJECTS IN 2021/22

(continued)

Division	Project Name	Description	Outputs
CSIR Mining, Manufacturing, Defence and Security	Contactless Fingerprint Acquisition Device	This is a technology for acquiring fingerprints using a contactless mechanism.	License
	VeristicPrint Technology commercialisation with Wongeta .	A finger photo imaging technology that enables a cellular phone camera or any digital camera to be used to acquire fingerprints in a contactless manner.	License
	CMORE Further Development and commercialisation for SAPS	CMORE is a real-time collaborative platform for shared awareness, asset tracking, planning, mission execution, and monitoring; and data analytics.	License
	Early Warning Detection System (EWS) with (NTSIKA and Pfortner)	A technology for reconnaissance detection in their initial phases, thereby providing an opportunity for a Network Operator to respond and prevent the attack from reaching its final phase.	License
	Aeroswift Commercialisation Plan	A Large area high speed metal 3D printer. Due to the high laser power and unique optical layout configuration, very large metal components can be produced at high production rates.	Business Plan
	TiCoC Commercialisation Plan	TiCoC is a Competence Centre. Its model is to advance public-private partnerships to connect industry to RDI organisations.	Business Plan
	Polyurethane Dispensing Unit (PUDU)	Cash-in-transit heists security technology. PUDU.	License
	GASCAM	Gas detection imaging technology.	Enhanced Gascam with Uvirco
	Hosfin	Hostile fire indication for helicopters using radar.	License



B.2.2 PLANNED COMMERCIALISATION AND TECHNOLOGY TRANSFER PROJECTS IN 2021/22

(continued)

Division	Project Name	Description	Outputs
	Satellite SAR	Satellite Radar sensor for all weather earth observation.	Licence/Equity stake
	Network Emulation and Simulation Laboratory	Web-based network design platform.	TBD
	Optotracker	Optical surveillance technology for tracking targets within the optical domain.	License
	Nano Sat	K-Line camera for forest fire detection and disaster management.	Business Plan
CSIR Natural Resources, Enabling Infrastructure, Public and Professional Service	Television White Spaces	Spectrum Management Database System for providing connectivity by the dynamic utilisation of gaps left between bands allocated for TV broadcasting.	Commercialisation model envisaged for the technology is "pay-per-use"
	Micro-Enterprise Media Engine for Broadcast	Video on demand broadcasting platform with unique technology for effective streaming even under constrained bandwidth environment.	License agreement/ share of proceeds approaches
	Flyash Based Geopolymer	Using waste flyash for the manufacturing of structural materials, such as bricks and pavers.	Licensing and share of proceeds
	Metakaolin Cement Blends	Calcined clay process for the replacement of Portland cement.	License
	Gravel Road Test Kits	Portable kits for the testing of physical properties of unsurfaced roads.	Manufacturing license
	Stereo vision-based trailer off-tracking sensor	Camera-based sensor system for the monitoring and management of off-tracking in heavy vehicles.	License

B.3 SO2: Improve the competitiveness of high-impact industries to support South Africa's re-industrialisation by collaboratively developing, localising and implementing technology.

This strategic objective seeks to improve the competitiveness of South Africa's high-impact industries through research, technology development and localisation in a collaborative manner, thereby contributing to the re-industrialisation of the country. The CSIR will achieve strategic objectives this primarily through its industry advancement clusters, namely Advanced Agriculture and Food; Future Production: Chemicals; Future Production: Manufacturing; Future Production: Mining; NextGen Health and Defence and Security. During 2021/22, the CSIR will implement programmes and initiatives aimed at collaborating in technology development, localisation and implementation:

B.3.1 CLUSTER RDI PROGRAMMES AND INITIATIVES

Table B.3 – Initiative in support of Strategic Objective 2

Cluster	Key Programmes and Initiatives for 2021/22
Advanced Agriculture and Food	<p>Agro-processing platform</p> <ul style="list-style-type: none"> • Developing post-harvest management technologies for the vegetable and fruit industries in South Africa. • Developing automated systems for oil extraction, small processing mills in collaboration with the manufacturing cluster. • Developing technologies and processes to improve the post-harvest management of fruits and vegetables. An example is the extraction of prolamin, a sorghum by-product used for coating fruits to prolong their shelf life. • Developing high protein products in collaboration with industry. • Support to SMMEs to produce high quality products together with the BIDC. • Developing products and processes from cannabis. <p>ECD platform</p> <ul style="list-style-type: none"> • ECD will provide technical and business skills to SMEs, including women and youth in various industries to establish and grow their business. • Furthermore, the team will work with provincial governments to support the establishment of agri-parks, incubators and industrial hubs with the support from the cluster.



B.3.1 CLUSTER RDI PROGRAMMES AND INITIATIVES (continued)

Cluster	Key Programmes and Initiatives for 2021/22
	<p>Precision Agriculture</p> <ul style="list-style-type: none"> • Innovative models with financing agencies such as Old Mutual, Grobank, etc. farmers, government and private companies (for product offtake) will be implemented to support small scale farmers participate in formal markets. In addition, models such as farming as a service, integrating technologies and expertise from companies such as John Deere, ZZ2, provincial government and other start-up companies will be piloted to showcase the value of precision agriculture for improved efficiencies and productivity.
Future Production: Chemicals	<p>Pharmaceutical Innovation Platform</p> <ul style="list-style-type: none"> • RDI to support the establishment of a local pharmaceutical manufacturing industry (demonstrator batch/hybrid project - oncology drug Lapatinib). • RDI to support the establishment of a local pharmaceutical manufacturing industry (demonstrator flow project – anti-inflammatory Celecoxib). • Development of a small-scale cGMP-ready facility for biopharmaceuticals production. • Development of an expanded pipeline of biopharmaceutical products for industry (including Tautomer and 3sixty Bio). • Localisation of mature Insulin production technology from ICGEB Italy. • Further development and maturation of CAP256 HIV antibody technology for clinical readiness. <p>Biomanufacturing Industry Development Centre (BIDC)</p> <ul style="list-style-type: none"> • Estimate two CSIR tech demos, transfer of three technology transfer dossiers and eight products, signing of three licences by the three companies. <p>Biorefinery Industry Development Facility (BIDF)</p> <ul style="list-style-type: none"> • Production and upscaling of cellulose nanocrystals from sawdust waste material. • Technology for pine oil extraction. • Upscaled technology for extraction of C5-C6 sugars from lignocellulosic biomass. <p>Bioconversion Platform</p> <ul style="list-style-type: none"> • Optimisation and scale-up of enzyme-assisted extraction of ferulic acid. • Bioconversion of ferulic acid to vanillin (Puris/Standard Mills projects). <p>Nanomaterials Industrial Development Facility</p> <ul style="list-style-type: none"> • SMMEs supported (three). • Support internal projects with scale up.



B.3.1 CLUSTER RDI PROGRAMMES AND INITIATIVES (continued)

Cluster	Key Programmes and Initiatives for 2021/22
Future Production: Manufacturing	<p>Industry Connect hosts a number of industry support mechanisms with the specific aim of giving industry access to CSIR expertise and infrastructure in specific in advanced manufacturing fields to improve competitiveness.</p> <ul style="list-style-type: none"> • AISI – improving the competitiveness of the local aerospace and defence industry, through technology interventions and technology-based supplier development with an aim to develop technology strategies for industry through technology roadmaps. • Marine Manufacturing and Repairs Supplier Development – providing marine specific certifications to the manufacturing industry, to ensure participation in international supply chains and maximum local value addition. • Fibre Composites RDI Programme – coordinating collaborative industry-led research, development and innovation in the field of composites, utilising the existing Composites Innovation Centres infrastructure. • Medical devices and diagnostics platform – support the establishment of a thriving local medical devices and diagnostic industry and position South Africa as a key exporter of these technologies. <p>The Photonics Centre</p> <ul style="list-style-type: none"> • Additive manufacturing – develop and transfer novel technologies to advance the competitiveness of South African manufacturing industry. • Laser surface engineering – develop and transfer manufacturing processes to reduce operational costs and improve efficiencies for the manufacturing, transport and power-generation industries. • Enterprise creation and development – the Photonic Prototyping Facility provides the necessary infrastructure, skills and expertise for the prototyping and product development of photonics technologies. <p>Mining product development</p> <ul style="list-style-type: none"> • Development of specialty powders, nanomaterials, and specialty alloys, building on the Titanium Acceleration Master Plan and the South African Aluminium Industries Roadmap. <p>Advanced Materials and Engineering platform</p> <ul style="list-style-type: none"> • Raw material beneficiation, especially titanium, aluminium, steel and platinum group metals; import replacement of specialty metals and alloys, advanced polymers, plastics and next-generation composites and fibres; the testing and qualification capability for new material; and nurturing end-to-end value chains working collaboratively with the end users. • The unique in South African metal injection molding facility offers a combination of tooling design and manufacturing capabilities in addition to the mass production of a wide range of small metal parts.



B.3.1 CLUSTER RDI PROGRAMMES AND INITIATIVES (continued)

Cluster	Key Programmes and Initiatives for 2021/22
	<ul style="list-style-type: none"> • The investment casting facility is the only foundry in South Africa with a production-level vacuum casting capability, and has recently established the niche capability to manufacture various metal components (mainly titanium) using investment casting. • An industrial scale high-pressure die casting facility with two die casting machines is used to assist local industry to test dies for automotive components and for semi-industrial scale production. <p>Sensors</p> <ul style="list-style-type: none"> • Development and transfer of sensor based devices to South African industry for manufacture and export (development done with market partner). • Product development and certification support to SA industry to localise technologies and products (TRLs 6-9). • Ongoing support to the South African Navy as its national strategic partner in wet-end sonar devices, with a view to also partnering with a foreign Original Equipment Manufacturer to take new sonar products to market, localising advanced sensor device manufacture in South Africa (TRLs 4-9).
Future Production: Mining	<p>Research partner in the SAMERDI Programme</p> <ul style="list-style-type: none"> • Extend the Life of Mines through the development of local solutions for implementation. • Develop locally manufactured mechanised mining equipment for targeting reefs that are either uneconomical or unsafe to mine. • Develop a method of extracting narrow reef (<50 cm) with zero dilution. • Utilise geophysical tools and practices to create the ability to delineate the orebody up to 30 m ahead of the solid rock face. • Create platforms to proactively manage a mine. <p>Partner with progressive mines on the implementation of modernisation, mechanisation and digitalisation projects</p> <ul style="list-style-type: none"> • Second researchers to learn from progressive mines. • Participate in the implementation of innovative research to modernise, digitalise and/or mechanise mines. • Create digital twins to assist with decision support and process optimisation. <p>Participate in research to enhance the contribution of mining in sustainable development</p> <ul style="list-style-type: none"> • Development of solutions to assist the mines to minimise their environmental footprint [this includes aspects such as green energy (renewable energy), waste management (circular economy), water management, environmental rehabilitation (including mine closure)]. • Studies to assist the mining industry to enhance the contribution of mining to sustainable development and better manage community relationships.

B.3.1 CLUSTER RDI PROGRAMMES AND INITIATIVES (continued)

Cluster	Key Programmes and Initiatives for 2021/22
NextGen Health	<ul style="list-style-type: none"> • Maximisation the value derived from CSIR's patented revolutionary approach to manufacturing (printing) microarrays (biochips) is a priority. Notable progress has been made in developing prototype microarrays that contain printed small molecules. This new microarray application is undergoing optimization within the CSIR labs with the aim of commercialising this, and in future other additional modules of this technology, for applications relevant for the South African and regional market. • Demonstrating the applicability of the omics tools in HIV companion diagnostic tools and finalising the commercialisation model with the identified industry partners. Discussion have already been initiated with Merck KGA.
Defence and Security	<ul style="list-style-type: none"> • The current DERI contract has a mandated minimum percentage subcontracting that needs to be a minimum of a level 2 B-BBEE (51% black ownership). This effort is in line with the transformation of the industry. Though the contracted requirement is a Level 2, in the interest of accelerating industry the Cluster aims to target 75% of DERI subcontracting to level 1 companies. • Development of strategic defence technologies together with SANDF, local and international defence companies (Hensolt, Saab Grintek). • Development of technologies for civil society safety and security needs together with SOEs (PRASA, Eskom), Security agencies (SAPS), Private Security firms and government. • Develop cybersecurity solutions with local and international public and private sector entities.
Smart Places	<ul style="list-style-type: none"> • Inclusive Smart Settlements & Regions supports companies like SANTAM, ABSA and Anglo American with decision support (Green Book, Red Book, Climate Modeling) for risk analysis and investment decisions. • Fly-ash and meta-kaolin geo-polymer cement and concrete materials and high-performance cement blends and concrete are currently the focus areas. Scale up and commercialization of products form part of this initiative. • Strategic and operational planning support to maritime industries, management and authorities, and coastal cities through observational and measurement capability, long term databases, process understanding and modeling capability in coastal and shelf sea environments. • The Energy Supply and Demand group is supporting the emerging local renewable energy industry as underpinned by research work in solar energy, wind energy, energy supply forecasting, thermal energy and energy demand. • Smart Places-hosted Programmes (National Cleaner Production Centre (NCPC) and National Foundry Technology Network provide industry with support to adopt the use of firm level interventions that improve and increase plant systems optimisation, productivity and strengthen South African industry competitiveness.



B.3.1 CLUSTER RDI PROGRAMMES AND INITIATIVES (continued)

Cluster	Key Programmes and Initiatives for 2021/22
	<ul style="list-style-type: none"> • Creating models to include the impact of new vehicles and network management systems and other technology changes. • Value chain modeling of the passenger transport industry. • Harnessing data to develop industry responsive toolkits and technologies in the areas of sustainable freight transport and freight logistics. • Performance engineered asphalt materials. • Beneficiation of waste material e.g. technology developed that use coal ash obtained from gasification processes for the construction of low-volume residential streets, and plastic roads. • Nano-modified, emulsion stabilised road bases – enable local materials to be used (import replacement), thus supporting up to 30% cost savings. • Utilising smart sensors and robotics to improve the competitiveness of the National Ports Authority and regional ports such as the Port of Walvis Bay and the Port of Maputo in support of logistics industry. • Supporting the empowering of SMMEs through production of kits and technologies. • Supporting the evaluation of new products (e.g. Elvaloy, NCRT, etc.) as per newer, more performance related standards to foster competition in material selection in road pavement industries.
NextGen Enterprises and Institution	<ul style="list-style-type: none"> • Supporting the localisation of emerging connectivity technologies such as 5G and applications for the SA market, to enhance broadband penetration, rural access, SMME support and to support the relevant industry verticals such as smart agriculture. • Development of Industry 4.0 IoT digital technology building blocks, cyber-physical industrial lab, Real-time information management system, for applications in various industries, such as mining, utilities, etc. • Development of Advanced Spectrum Management technologies and spectrum toolboxes, and next generation multi-radio access technologies and network solutions. Artificial intelligence and machine learning techniques for the optimisation of future wireless ICT network infrastructure and effective national spectrum resource utilisation. • Development of localised voice computing technologies and expose these to industry to enable integration in third party applications and services. • Development of training programmes and training management software for Industry 4.0 digital technologies, targeted at graduates and artisans.

B.4 SO3: Drive socio - economic transformation through research, development, and innovation that supports the development of a capable state.

This strategic objective emphasises the CSIR's role in supporting the development of a capable state and enabling government to drive the socioeconomic transformation of South Africa through research, development and innovation. The CSIR will achieve this strategic primarily through society enabling clusters and research centres, namely Smart Places, Smart Mobility and NextGen Enterprises and Institutions. CSIR through its programmes and initiatives deliver a range of research, development and innovation outputs and outcomes that support the development of the capable state. These outputs and outcomes include those that contribute to policy and standards formulation and development; improvement of state efficiencies, effectiveness and service delivery.

B.4.1 CLUSTER RDI PROGRAMMES AND INITIATIVES

Table B.4 – Initiatives in support of Strategic Objective 3

Cluster	Key Programmes and Initiatives for 2021/22
Smart Places	<p>Inclusive Smart Settlements and Regions</p> <ul style="list-style-type: none"> Advanced spatial analysis and modelling capability for scenario modelling pertaining to economic, population and climate change futures and how this affects the human settlement landscape of South Africa. Support provided with the development of inclusive smart cities would enable government to drive socioeconomic transformation. The initiative will be guided by existing and future partnerships with external partners, specifically CoGTA (the department responsible for coordinating smart city initiatives in the country), the Department of Human Settlements, Water and Sanitation, SALGA, etc. <p>Functional Building Infrastructure (FBI)</p> <ul style="list-style-type: none"> FBI focuses on science and technology in building infrastructure and in human settlements, and currently supports government in health, basic and higher education, correctional services, defence and human settlements. <p>Sustainable Ecosystems</p> <ul style="list-style-type: none"> Testing a framework for benchmarking of solid waste in South African municipalities to support decision making. Provision of support to decision-making on complex and controversial infrastructure developments by the public sector, through the provision of Strategic Environmental Assessments at regional and national scale, in particular in support of the NDP. <p>Holistic Climate Change</p> <ul style="list-style-type: none"> Generate knowledge and develop technological solutions to national challenges with a particular focus on economy wide understanding of current and future state of resources, with the view to support a capable state, including through assessing the various dimensions of evolving climate risks, and also continue the integrative analysis of different themes, for example, the work on food-energy-water nexus.



B.4.1 CLUSTER RDI PROGRAMMES AND INITIATIVES (continued)

Cluster	Key Programmes and Initiatives for 2021/22
	<p>Energy Centre</p> <ul style="list-style-type: none"> • The Department of Energy continues to be supported with the further expansion and maintenance of the Wind Atlas for South Africa. • Support Eskom and the Department of Public Enterprises via the provision of technical expertise for the Eskom Technical Team and the unbundling of Eskom. • Develop municipal level energy master plans. • The Energy Industry group is leading the fact based decision support for the Just Energy Transition, identifying opportunities for the localisation of new technologies, and the options for the mitigation of impacts in the present coal-regions and for those dependent on coal mining and coal based power production.
Smart Mobility	<ul style="list-style-type: none"> • Addressing backlogs in public transport infrastructure and services through technological leapfrogging of infrastructure and services. • Improved modelling of crash risk, from a driver perspective to improve road safety • Mapping the public transport value chain to identify and quantify opportunities for import substitution and adjustments to trade policy. • Gauteng Public Transport Academy-Developing a training framework across the PT value chain. • Developing minibus taxi route performance indicators • Intelligent Transport Systems enhanced public transport- assessment of BYOT as fare media. • Public Transport Data Portal- creation of a relational public transport database with value add data analytics.. • Developing automated Heavy Vehicle classification capability • Empowering/capacitating local road authorities and the African continent, with designs, methodologies, technologies in pavement design and construction. • Pursue the harmonisation of standards regionally to facilitate trade and contribute to regional integration. • Developing industry standards and manuals for future generation road infrastructure. • Platform for the development, optimisation and validation of new road building materials and concepts leading to national design standards. • Physical and numerical modelling to provide predictive capability to support safe and efficient ports. • As the nominated chair of the SABS material committees, support the development of guidelines, manuals, standards, etc. This also requires a laboratory component (tests and expertise). • Supporting the development of design models to better predict pavement performance e.g. N3 upgrade with South African National Roads Agency



B.4.1 CLUSTER RDI PROGRAMMES AND INITIATIVES (continued)

Cluster	Key Programmes and Initiatives for 2021/22
NextGen Enterprises and Institutions	<ul style="list-style-type: none"> • Contributing to the development of policies and regulations that promote the adoption, beneficiation and diffusion of transformative technologies in order to encourage business undertaking in South Africa (i.e. the ease of doing business). • Development of standards, policies, technique generation, strategies and frameworks through applied data science and mathematical modelling for government to better deliver services and to create avenues for public service innovation. • Analysis of information for planning; resourcing; tracking; monitoring; and evaluating broader and complex programmes or initiatives at an integrated level to enable planning and monitoring for both government and industry. • Development of advanced models, methodologies and techniques for applications in areas such as the deployment of wireless networks, advisory role of spectrum issues, water and energy supply and demand forecasting, law enforcement, National Mobile network coverage, etc. • Supporting government departments in their respective modernisation programmes including the implementation of the technologies for digitalisation of parts of their services. • Contributing to the development of policies and regulations that promote the adoption, beneficiation and diffusion of transformative technologies in order to encourage business undertaking in South Africa (i.e. the ease of doing business). • Contributing voice computing technologies in local languages in support of applications and solutions which enable equitable access to government information and services. • Providing operational support in areas that do not have facilities or computing infrastructure for fail-over during downtime; support projects such as HANIS (Home Affairs National Information System), Department of Health and Water Research Commission. Fail-over service for South African Weather Services, assisting SITA in areas where High Performance Computing skills is required.
Advanced Agriculture and Food	<ul style="list-style-type: none"> • The Cannabis Initiative in support of a capable state will include, supporting policy framework development for Cannabis market, analytical support and development of standards to assist product development in the market. • Livestock identification – a specialised animal biometrics identification cluster and verification system that exploits the muzzle patterns, iris patterns and retinal vascular patterns will be developed. This will support the livestock industry, but more importantly, support the compliance to Animal identification Act. • The eSwatini Water and Agricultural Nexus assessment and decision-making tool has recently been developed for the government of eSwatini and this tool will be expanded to other countries in the SADC region, e.g. Malawi.



B.4.1 CLUSTER RDI PROGRAMMES AND INITIATIVES (continued)

Cluster	Key Programmes and Initiatives for 2021/22
	<ul style="list-style-type: none">• ECD will support a capable state through the following interventions:<ul style="list-style-type: none">– Conducting feasibility studies for the development of Cannabis industry in different provinces;– ECD also focus on applying the Agriparks model in the Cannabis sector to support rural farmers participate in this economic sector; and– Support SEZs or Industrial Development Zones from planning through to implementation and incubation of enterprises in the SEZs.
NextGen Health	<p>Key initiatives include efforts to strengthen the state, more specifically, SAPHRA's regulatory and Pharmacovigilance capabilities to position CSIR tools for application in assessment of side-effects, efficacy and benefit to SA population.</p> <ul style="list-style-type: none">• The cluster will package the tools in a manner that tailored service offering could be offered to SAHPRA.• Secondly, the team will position itself as a thought leadership partner for SAHPRA in the area of precision medicine and pharmacovigilance to drive the adoption of these new technologies.• Thirdly, the team will establish an innovative and cutting-edge functional precision medicine platform that integrate clinicians, hospital, university researcher with the Centre in order to position as a national Centre for synthetic biology and precision medicine.
Future of Production: Manufacturing	<ul style="list-style-type: none">• Continue to host SANAS-accredited laboratories (ISO 17025/IE) used by the government and industry.• Maintain and grow the capability to provide Manufacturing Policy Support for Government using benchmarking data as a support tool.• Leverage existing capability for the development of sensor-based solutions for the improvement of services provided by South Africa's SOEs. Examples include port sonars to affect berth turn-around times for container vessels, rail based sensors to enhance business continuity of Transnet's heavy freight lines, and sensor technologies to aid Eskom with proactive maintenance of energy generation, transmission and distribution.• Define the Commercial Aerospace Industry Framework, and scoping the South African industry and its value to build a decision making tool for the dtic for focused investment, as well as a tool for policy definition.



B.4.1 CLUSTER RDI PROGRAMMES AND INITIATIVES (continued)

Cluster	Key Programmes and Initiatives for 2021/22
Defence and Security	<p>The cluster aims to be the default service provider of integrated security solutions and cybersecurity for all state departments, state agencies and state owned entities.</p> <ul style="list-style-type: none">• Conduct RDI in the fields of aerodynamic test and evaluation, stores integration, air operations and airborne autonomous systems.• Developing of competitive, innovative, national surveillance and situational awareness capability that will address potential deficiencies in border management, environmental asset management, Infrastructure security, etc.• Applied operational research, development and innovation in support of Special Operations maritime, airborne and landwards capabilities.• Research and develop secure identity systems for tangible and non-tangible assets including people and animals.• Establish a Cybersecurity Operations Centre testbed for the purposes of consolidating CSIR cyber security experts, technology, processes, and establishing a Concept Development and Experimentation facility for cyber security at the CSIR.• Support the SANDF in building and sustaining the cyber-warfare capability through the Information Warfare Assistance Programme.• Develop a Holistic and integrated approach/model to national security problems, such as disaster management, Border Management and Infrastructure security, which will ensure that different state departments and security agencies can work collaboratively to combat crime and illegal migration.• Further development of situational awareness platform for Command and Control technology systems for application in complex infrastructure and security awareness to assist stakeholders such as PRASA, Transnet, Eskom, etc.• Support the Landwards Defence and Security Sector to enhance the market competitiveness of the industries and operation effectiveness of user through collaborative technological innovations on forensic of energetic materials, protections, firepower, vehicle mobility and dismounted systems.

B.5 SO4: Build and transform human capital and infrastructure.

B.5.1 HUMAN CAPITAL DEVELOPMENT

HC development remains a priority to ensure that the organisation is adequately equipped with the right skills for it to meet its business objectives and to support government priorities in the development of SET skills. There are a number of pipeline development programmes that aim to improve the attraction and retention of critical skills. These include our bursary and scholarship programmes, as well as technical learning and development programmes such as GIT, internships, work integrated learning (WIL), learnerships and artisanships that are aimed at producing a cohort of highly capable professionals for the organisation. These are complemented by our behavioural learning and development programmes in line with our competency development framework.

There is also a strong focus on leadership and management development programmes to equip all levels of management (from supervisory to Executive) with critical management competencies.

Our long-term strategy is to build a motivated, high-performing and diverse workforce that is multifaceted and encompassing improvements to the pipeline, learning and development, a strong focus on leadership development, succession planning and performance management, innovative approaches towards sourcing, developing and retaining talent, and creating prospects for the long-term growth of our people.

The interventions that will be implemented to build, strengthen and transform our HC in 2021/2022 are as follows:

- Invest in pipeline development programmes informed by a workforce skills plan and improved retention of supported student pipeline and talent pipeline;
- Support the creation of an enabling environment for meaningful career development and progression, in particular for designated groups to grow from D1 (mid-career) to senior levels of the CSIR career ladders i.e. principal and chief researchers;
- Implement talent management and succession planning strategies;
- Develop effective retention strategies that reduce turnover of critical staff, as well as black and female researchers;
- Improve the absorption of the student pipeline;
- Review and improve the CSIR learning and development model to provide relevant induction and training;
- Implement leadership development programmes to equip leaders with the critical leadership and management competencies needed to deliver on the new CSIR Strategy and mandate with a focus on succession planning;
- Entrench business development capabilities;
- Develop and maintain strategic partnerships to leverage resources for HC development; and
- Upgrade systems (PeopleSoft) and automate key HC approval workflows; and
- Drive change management within the business and entrench the CSIR EPIC values, namely excellence, people-centred, integrity and collaboration.

B.5.2 INFRASTRUCTURE

In 2021/22 the CSIR will be implementing a substantive portfolio of research infrastructure projects, in addition to advancing the priority projects of the Campus Master Plan and fundable projects prioritised as part of the CIP 2021/22.

CIP 2021/ 2022 AND THE FIVE-YEAR CIP PROCESSES

The CIP is a planning tool that identifies capital improvements and investments considered for the 2021/22 financial year. It links the organisation's strategic vision, its infrastructure priorities, and its financial resources to enable the CSIR to make decisions in the short-term by understanding the impacts of those decisions on the CSIR's future capital investment requirements. The CIP outlines CSIR's capital requirements for new construction projects, expansion projects, replacement/renewal projects, acquiring equipment and capital renovation projects within research infrastructure, ICT and general facilities infrastructure. Funding for these projects either comes from internal funds (CSIR funds or discretionary PG funding), state/government, grant or other sources. A prioritisation process is followed within each area (Research infrastructure, Facilities infrastructure and ICT infrastructure) depending on the need for infrastructure renewal. Additional prioritisation is undertaken by a task team including finance to ensure alignment with the availability of funds as well as alignment to CSIR's mission, strategic objectives, and research priorities. The finalised list is presented at the Capital Projects Review Committee (CPRC) for comments and approval. Once finalised the list of projects are presented at EXCO for final approval.

The governance structure in place involves several groups continuously reviewing and monitoring each step of the process to ensure that there is proper review and oversight to maintain integrity of the process. Once the projects are approved the progress of implementation of these projects are reported to the different structures including the CPRC and the Executive Oversight Committee (EOC).

A similar process is followed for the development of a strategic five-year CIP, which is a planning tool that identifies capital improvements and investment to be considered over a five-year period. It enables CSIR to make decisions in the short-term by understanding the impacts of these decisions on future capital investment, as well as, allows the CSIR to become resilient in infrastructure planning and development. The list of projects in the five-year CIP feed into the CIP projects for each year and gets prioritised depending on the need of the project for the particular year.



B.5.2 INFRASTRUCTURE (continued)

B.5.2.1 KEY RESEARCH INFRASTRUCTURE PROJECTS 2021/22

Table B.5 – 2021/22 infrastructure priorities

Research infrastructure project	Cluster	Summary of focus 2021/22
Open Laboratory for Pharmaceuticals Manufacturing	Future Production : Chemicals	The focus is to do a needs-analysis for the facility, and a detailed engineering design with building plans submitted to CSIR and building council for approval. The aim is to also refurbish the existing synthetic process development laboratories at the CSIR. The infrastructure required for the project will be installed and commissioned in the year.
Learning Factory	Future Production : Manufacturing	Focus is to ensure that required building renovations for the project to be completed. Procurement will be done for infrastructure and equipment required for integration, manufacturing training equipment and supporting equipment such as computers, software etc. The pilot smart factory platform will be commissioned.
Learning Factory (merSETA funded)	Future Production : Manufacturing	Key will be to ensure finalisation of design specifications of 4IR platforms for the different production environments (mining, healthcare, agriculture etc.), procure equipment for these technology platforms, platform commissioning and operator training. Lastly development of processes and technologies to support implementation of the identified technologies in learning factories at Technical and Vocational Education and Training (TVET) colleges
Advanced Material (Road) Testing Laboratories	Smart Mobility	Focus for the year is to refurbish the workshop, conditioning areas upgrade and the storage areas construction. The equipment and machinery required for the project will also be procured, installed and commissioned.
Modelling Hall to support ports and harbours	Smart Mobility	Key is to refurbish the Wind-wave flume as well as install and commission the Wavemaker 2 modules. Preparation work for the refurbishment of the underground tanks will also be initiated (to be completed in the following year).
Supercritical Carbon Dioxide Encapsulation Facility	Future Production: Chemicals	The focus is to construct the CO ₂ Encapsulation Facility to provide manufacturing as well as contract R&D functionality to clients. The Hazard Analysis Critical Control Point safety system will be implemented across the facility. Procurement of the required equipment will be done to finalise the pilot-scale facility.
Hot Isostatic Pressing (HIP)	Future Production: Manufacturing	The procurement process for the HIP is complete with contracting in process. Key focus for the financial year is the preparation of the civil infrastructure and facilities, procurement and supply of equipment, installation and commissioning of the facility, as well as operator training and facility launch.

B.6 SO5: Diversify income, maintain financial sustainability and good governance.

The CSIR is implementing a new strategy that is geared to deliver on the mandate and specifically, to support industrialisation, however the organisation operates in a resource constrained NSI.

The decline in PG as a percentage of total income below 25% is a concern since the execution of our developmental mandate should always be adequately supported. The PG has declined in both nominal and real terms recently. It is of vital importance that the State continues to fund the R&D space and not see it as an expense, but rather as an investment into the future. Many successful countries have achieved their success through the continued investment in R&D. In this regard, it would be beneficial if the PG allocation was positively reconsidered going forward.

Nonetheless, most of the income is still from the public sector. The heavy reliance on public sector funding is a risk since there are competing priorities on the national fiscus.

Income diversification remains a key strategic objective and will reduce the financial risk associated with a significant reliance on public sector income. Income diversification is also expected to improve the CSIR's profitability as profit margins are currently between 1% and 2% on public sector income. Diversification is expected to be driven by the new commercialisation strategy, which aims to derive more benefit from IP and technology that has been developed. This diversification of revenue streams will assist the organization to become more financially strong in future.

In addition, CSIR would like to become the partner of choice for providing R&D activities to other State owned entities, Government Departments and Municipalities, in line with its Mandate. In this regard the support of National Treasury is crucial to achieving this stated objective.

The CSIR has proven the importance of RD&I in tackling global threats such as pandemics through the National Ventilator Project and others. Our impactful response to COVID-19 has been enabled by past investment in capabilities and infrastructure.

Capability development, human capital development and infrastructure investments are critical to the success of our strategy. The CSIR needs more government investment to implement its strategy in order to respond more effectively to support various prioritised industry sectors with technology solutions.

The CSIR is forecasting a net loss of R96.1 million for the 2021/22 financial year. The CSIR has also adjusted the 3-year plan accordingly with reduced growth targets.

Conservative balance sheet practices, including working capital and cash flow management, are important to enable the CSIR to invest in the scientific equipment and infrastructure required to support strategic objectives.

All financial resources are invested in line with the CSIR's mandate.

B.6.1 GROWTH

The CSIR has budgeted for an increase of 9.1% in total operating revenue on 2020/21 forecast (see Table G.1). Contract income and baseline grant funding increase on a comparative basis by 11.2% and 3% respectively.

Income from the South African public sector and South African private sector is budgeted to increase by 10% and 7.7% respectively, based on secured contracts and current engagements with stakeholders and clients to secure contracts for proposals submitted.

International contract income is budgeted to increase by 17.6% as a result of repositioning the CSIR's value proposition within the International market as aligned to Project Synapse.

Included in contract income from the South African public sector is the Cyber Infrastructure ring-fenced allocation from the DST. These contracts have historically been reflected as such and are included as part of public sector income for comparative purposes.

The CSIR will continue with the directive on wage freezing and budget cuts on goods and services in the 2021/22 financial year and cost containment initiatives / operational efficiencies will continue to be actively driven. This will however, have a negative impact on the operations as it would become more difficult to attract and retain talent in a period of prolonged wage freezes. Whilst the proposals are required in the current economic circumstances, the CSIR will have to make extra efforts to ensure that staff are kept motivated and are not prone to leaving the organization.

As a business enterprise, the CSIR receives less than a quarter of its funding from the government as an unrestricted grant. The balance of the income budget is generated through external R&D contracts, which is becoming increasingly challenging in the current economic environment. The ability to generate external income directly relates to attracting and retaining critical expertise. The ability to offer competitive remuneration is a critical enabling factor for income generation as the CSIR competes with local and international institutions, as well as the private sector for scarce skills and expertise.

B.6.2 EXPENDITURE

Total expenditure is budgeted to increase in 2021/22 by 10.5% on 2020/21 forecast, with employee remuneration costs and depreciation budgeted to increase by 10.1% and 23.6% respectively. Operating expenses are expected to increase by 9.2%.

The increase in employee related costs is determined by taking into consideration the expected savings from restructuring, human capital development costs, as well as the growth projections on contract income. All planned recruitment will be dependent on the securing of contracts, and resource planning of required skills within the CSIR.

The budget for operating expenses is determined by taking into account contract-specific expenses (directly associated with contract income) as well as operational overheads (inherent in running the business).

Based on the current economic climate and need to improve financial performance, strict cost containment measures have been implemented across the CSIR.

The increase in depreciation is based on affordability and the availability of cash flow. The budget for 2021/22 includes fully funded grant assets. All planned investment in property, plant and equipment will be assessed to ensure alignment with strategy and operational requirements and will be prioritised based on affordability and return on investment. The investment for the campus master plan has not been included in the capital expenditure budget as this is dependent on the securing of external funding.

B.6.3 ROYALTY INCOME AND OTHER INCOME

Royalty income is budgeted at R 2 million and is based on current registered license agreements.

Royalty income is budgeted to decrease by 13% from the 2020/21 forecast (R2.3 million). It is anticipated that sales volumes for royalties on non-commodity products will be very slow in the next financial year and hence the expected royalty stream will decrease.

Included in the 2021/22 budget is other income of R1.4 million. This relates mainly to the net effect of foreign exchange gains and losses. The CSIR takes a neutral view on the currency movements going forward and as such has not budgeted for a significant foreign exchange gain or loss.

B.6.4 FINANCIAL SUSTAINABILITY

The 2021/22 budget indicates a net loss of R96.1 million against the 2020/21 forecast loss of R50.1 million. The Nationwide lockdown due to COVID-19 has a negative impact on the operations during the 2020/21 financial year, resulting in contracts not being secured as planned as well as delays on delivering on some large contracts, hence a significant loss forecast.

Table G.1 in appendix G 1. provides the high-level CSIR statement of comprehensive income reflecting the forecast for 2020/21, the budget for 2021/22 and estimates for 2022/23 as well as 2023/24. A summary of parliamentary grant income for the Medium Term Expenditure Framework (MTEF) period is provided in Table G.8 in appendix G1.6.



B.6.5 STATEMENT OF FINANCIAL POSITION

A CSIR statement of the financial position for the MTEF period is provided in Appendix G.1.

One needs to consider the budgeted cash balance of R1.05 billion in conjunction with the current liabilities of R462 million. The current ratio (current assets/current liabilities) is expected to remain at approximately 2.

B.6.6 INVESTMENT IN PROPERTY, PLANT AND EQUIPMENT

The budgeted investment in property, plant and equipment for the 2021/22 financial year is R 122.4 million.

Notwithstanding the fact that an item is included in the property, plant and equipment budget, the investment remains subject to approval as per the Approval Framework of the CSIR and additional considerations such as strategic alignment, return on investment and available cash flow.

B.6.7 CSIR SUBSIDIARIES AND BORROWING PLAN

As depicted in the figure below, the CSIR has two subsidiaries which are dormant and account for an insignificant portion of the total Group's budget.



The five-year borrowing plan is provided in Appendix G.3.



B.7 CSIR quarterly targets: 2021/22

Indicator	Q1	Q2	Q3	Q4
SO 1: Conduct research, development and Innovation, localise transformative technologies and accelerate their diffusion				
KPI 1: Publication equivalents	67	141	228	300
KPI 2: New priority patent applications filed	0	2	2	9
KPI 3: New patents granted	2	3	5	8
KPI 4: New technology demonstrators	0	5	18	46
KPI 5: Number of technology licence agreements signed	0	3	8	19
SO2: Collaboratively improve the competitiveness of high impact industries to support South Africa's re-industrialisation.				
KPI 6: Number of localised technologies	0	1	3	11
KPI 7: Number of joint technology agreements being implemented for industry	2	8	15	22
KPI 8: Number of SMMEs supported	22	36	51	75
SO3: Drive the socioeconomic transformation through RD&I which supports the development of a capable state				
KPI 9: Number of reports contributing to national policy development	7	8	8	17
KPI 10: Number of standards delivered or contributed in support of the state	3	5	5	9
KPI 11: Number of projects implemented to increase the capability of the state	18	24	28	40
SO 4: Build and transform human capital and infrastructure				
KPI 12: Total SET staff	1426	1433	1470	1497
KPI 13: – Percentage of SET staff who are Black	65%	65%	66%	66%
KPI 14: – Percentage of SET staff who are Female	36%	36%	37%	37%
KPI 15: – Percentage of SET staff with a PhD	22%	22%	23%	23%
KPI 16: Total Chief Researchers	13	13	14	17
KPI 17: – Percentage of Chief Researchers who are Black	15%	15%	17%	17%
KPI 18: – Percentage of Chief Researchers who are Female	23%	23%	24%	24%
KPI 19: Total Principal Researchers	178	180	185	193
KPI 20: – Percentage of Principal Researchers who are Black	29%	31%	33%	35%
KPI 21: – Percentage of Principal Researchers who are Female	19%	20%	21%	22%
KPI 22: Number of Staff involved in Exchange Programmes with Industry	1	3	6	13
KPI 23: PPE Investment (Rm)*	31	61	92	100



B.7 CSIR QUARTERLY TARGETS: 2021/22 (continued)

Indicator	Q1	Q2	Q3	Q4
SO 5: Diversify income, maintain financial sustainability and good governance				
KPI 24: Total Operating Income	628	1336	2028	2869
KPI 25: Net Profit (Rm)	-55.7	-	-113.1	-96.1
KPI 26: SA Public sector income (% Total Income)	56%	56%	56%	56%
KPI 27: SA Private sector income (% Total Income)	9%	9%	9%	9%
KPI 28: International contract income (% Total Income)	6%	6%	6%	6%
KPI 29: B-BBEE Rating*	2	2	2	2
KPI 30: Recordable incident rate*	1,8	1,8	1,8	1,8
KPI 31: Audit opinion	n/a	n/a	n/a	Unqualified audit opinion

B.8 A selection of highlights of work done with the rest of Africa, BRICS countries, HEIs and in support of the South African ERRP

B.8.1 WORK PLANNED WITH THE REST OF AFRICA

The CSIR's footprint in the continent is extensive. The organisation does a lot of research, development and innovation work in support of building capable states in the continent.

African Country	Title of the CSIR Project/ type of work	Problem being addressed	Technology solution	Associated CSIR strategic objective	Division / Cluster involved
African Union Development Agency – NEPAD	Establishment of AUDA-NEPAD Centre of Excellence in Science, Technology and Innovation (CoE-STI)	The AUDA-NEPAD CoE-STI) is one of five Centres of Excellence being established by AUDA-NEPAD across the continent of Africa. It is being established in South Africa, in cooperation with the CSIR and Stellenbosch University	A business plan has been developed for the establishment of the Centre of Excellence and rolling out the technologies and innovations into the continent.	1, 3 and 4.	All divisions and Clusters
Tanzania	Recycling of asphalt pavements	Guidelines for the reuse of recycled asphalt materials in pavement layers	Manuals, Guidelines, Specifications, Capacity Building	SO5	Division 3 Smart Mobility Cluster
Tanzania	Quality control/ assurance training	Capacity building to enhance quality in construction	Capacity building	SO5	Division 3 Smart Mobility Cluster



B.8.1 WORK PLANNED WITH THE REST OF AFRICA (continued)

African Country	Title of the CSIR Project/ type of work	Problem being addressed	Technology solution	Associated CSIR strategic objective	Division / Cluster involved
Tanzania	Rut-resistant HMA	Performance-based design of asphalt materials to prevent premature permanent deformation (rutting)	Design methods, Manuals, Specifications, Capacity Building	SO5	Division 3 Smart Mobility Cluster
Tanzania	Characterisation of unbound materials	Performance-related design of granular pavement layers	Design methods, Manuals, Specifications, Capacity Building	SO5	Division 3 Smart Mobility Cluster
Tanzania	Laboratory management	Provision of support to establish ISO17025 accredited laboratory facility	Quality Manual and Systems, Operational Procedures, Capacity Building	SO5	Division 3 Smart Mobility Cluster
Tanzania	Cementitious materials	Performance-related design of cementitious road construction layers	Design Methods, Manuals, Specifications Capacity Building	SO5	Division 3, Smart Mobility Cluster
Malawi	Forensic investigation	An investigation into the causes and mechanisms of premature road failures	Report and Recommendations	SO5	Division 3 Smart Mobility Cluster
Uganda	Technical Assistance to Uganda National Roads Authority (UNRA) with Vehicle Load Control	Enhancing the skills of the UNRA staff dealing with vehicle load control and improving vehicle load control processes	Training and skills transfer	SO 5 KPI 28	Division 3, Smart Mobility Cluster

B.8.1 WORK PLANNED WITH THE REST OF AFRICA (continued)

African Country	Title of the CSIR Project/ type of work	Problem being addressed	Technology solution	Associated CSIR strategic objective	Division / Cluster involved
Namibia	Bridge management system maintenance and technical support	Providing support to the Namibia Roads Authority with the use of the Struman BMS and technical support with bridge management in general	Software: (Struman BMS)	SO 5 KPI 28	Division 3, Smart Mobility Cluster
Nigeria, South Africa	All Atlantic Ocean Sustainable, Profitable and Resilient Aquaculture	To develop new, sustainable, profitable and resilient value chains for integrated multi-trophic aquaculture (IMTA) production within the framework of existing, emerging and potential Atlantic markets.	Integrated multi-trophic aquaculture and associated supporting technologies (CSIR remote sensing and decision support systems)	SO 1	Division 3, Smart Places Cluster
Mauritius	Feasibility Study of Anaerobic Digestion of the Organic Fraction of Solid Wastes	Waste management in the context of climate change mitigation	Anaerobic Digestion of the Organic Fraction of Solid Wastes	Climate change responses	Division 3, Smart Places Cluster
Namibia and Botswana	Facility support model from BIDC, BIDF and NIDF	Lack of affordable support for companies, particularly SMMEs, to development know-how and scale-up, to assist in taking their products to market	Support provision to SMMEs and companies on development and scale-up, as well as skills development support	SO2	Division 1, Chemicals Cluster



B.8.1 WORK PLANNED WITH THE REST OF AFRICA (continued)

African Country	Title of the CSIR Project/ type of work	Problem being addressed	Technology solution	Associated CSIR strategic objective	Division / Cluster involved
Mauritius	Bio-fertilizers	Use of synthetic chemical pesticides and fertilizers	A bio-based alternative to chemical fertilizers, with Chemical Process Technologies (Pty) Ltd	SO2	Division 1, Chemicals Cluster
Zambia Zimbabwe Lesotho Swaziland Botswana Mauritius Seychelles	Supporting various technology developments	Providing technical support to SMMEs in the agro-industry	Product formulation, agroprocessing technologies	SO2	Division 1, Advanced Agriculture, and Food Cluster through SANBio

B.8.2 ALIGNMENT TO ECONOMIC RECONSTRUCTION AND RECOVERY PLAN

The CSIR's work is aligned with the priorities of the National Development Plan 2030, the MTSF (2019 – 2024) and the priorities of the South African Economic Reconstruction and Recovery Plan.

Four (4) Priority/Key Interventions of ERRP	Title of the CSIR Project/Type of Work	Division/Cluster/Portfolio Involved/
1. Massive rollout of infrastructure throughout the country	Order of Magnitude Cost Estimating Tool for Student Housing Infrastructure Planning	Division 3, Smart Places Cluster
	Hosting of National Nano Micro Manufacturing Facility node with management hub	Division 1, Chemicals Cluster
	Development of a Pilot-Scale Supercritical CO ₂ Encapsulation Facility	Division 1, Chemical Cluster
	Open Laboratory to support local Pharmaceuticals Manufacturing	Division 1, Chemical Cluster
	Strategic Infrastructure Management	Division 3, Smart Places Cluster
	Policy and guidance for Green Building	Division 3, Smart Places Cluster
	In collaboration with Diplomics, provision of infrastructure for the proteomics applications	Division 1, NextGen Health Cluster
	Infrastructure for the provision of COVID-19 testing services	Division 1, NextGen Health Cluster
	Provision of infrastructure for the development of products and processes for agroprocessing	Division 1, Advanced Agriculture and Food Cluster

**B.8.2 ALIGNMENT TO ECONOMIC RECONSTRUCTION AND RECOVERY PLAN** (continued)

Four (4) Priority/Key Interventions of ERRP	Title of the CSIR Project/Type of Work	Division/Cluster/Portfolio Involved/
2. Rapidly expand energy generation capacity	<p>Within the Energy Centre, we have several RDI solutions that are directly contributing to generation capacity issues and related solutions. Major work includes:</p> <ul style="list-style-type: none">• Sustainable energy futures – developing energy planning frameworks for application at the national, municipal and enterprise level to identify capacity additions and optimal technology solutions to address the present electricity crisis and capacity shortfall.• Renewable energy integration – support to Eskom and municipalities on the integration of renewable energy technologies to the grid.• Solar PV reliability support – accelerated deployment and performance improvement of solar PV systems.• Renewable energy resource assessment – decision support to facilitate the planning and procurement of renewable energy technologies.• Thermal energy storage and waste heat recovery – improving the energy efficiency and demand response of the energy system and South African industry.• Just energy transition – supporting Eskom, municipalities, provinces and mines in the proactive management of the energy transition from coal to renewable energy so that it is just, and the local economic impacts are managed in coal regions.• Energy storage – testing, development and commercialisation of local energy storage solutions to benefit South African resources	Energy Centre, Smart Places Cluster



B.8.2 ALIGNMENT TO ECONOMIC RECONSTRUCTION AND RECOVERY PLAN (continued)

Four (4) Priority/Key Interventions of ERRP	Title of the CSIR Project/Type of Work	Division/Cluster/Portfolio Involved/
3. Employment stimulus to create jobs and support livelihoods	SMME support from facilities in development and scale-up: BIDE (Durban), BIDE and NIDE (Pretoria)	Division 1, Chemicals Cluster
	Consolidating Port Elizabeth non-woven facility's role in supporting the nascent cannabis industry	Division 1, Chemicals Cluster
	SMME support from facilities in development and scale-up: BIDE, Enterprise Creation & Development	Division 1, Advanced Agriculture and Food Cluster
	Production of Food Safety Standards to ensure food security	Division 1, Advanced Agriculture and Food Cluster
	Use of satellite imaging to support small scale farmers productivity	Division 1, Advanced Agriculture and Food Cluster
4. Drive for industrial growth	Green cement pilot plant	Division 3, Smart Places Cluster
	Support for industrial development infrastructure requirements	Division 3, Smart Places Cluster
	Software-defined Networks Laboratory. Hosting and technically supporting a world-class network modernisation and automation laboratory that supports research in emerging technologies such as Software Defined Networks (SDN), Network Function Virtualisation (NFV), Mobile Edge Computing (MEC), Voice Computing, and cloud-based video streaming services orchestration. The infrastructure will enable collaboration with industry to experiment with digital infrastructure deployment models.	Division 3, NextGen Enterprises and Institutions Cluster
	Develop and/or localise biological and chemical conversion technologies and products using sustainable feedstocks to support commercially competitive green chemical production (through bioconversion, biomanufacturing and bioprospecting with companies such as Chemical Process Technologies (Pty) Ltd and Puris Natural Aroma Chemicals (Pty) Ltd	Division 1, Chemicals Cluster



B.8.2 ALIGNMENT TO ECONOMIC RECONSTRUCTION AND RECOVERY PLAN (continued)

Four (4) Priority/Key Interventions of ERRP	Title of the CSIR Project/Type of Work	Division/Cluster/Portfolio Involved/
4. Drive for industrial growth	Supporting the Chemical Industry to increase production and localisation of advanced materials and their use in products through advanced functional materials, polymer composites, sensor development, supporting the hydrogen economy and carbon capture with companies such as Sappi Southern Africa (Pty) Ltd, Hall Longmore (Pty) Ltd, 3 Sixty Biomedicine (Pty) Ltd and Tauomer (Pty) Ltd.	Division 1, Chemicals Cluster
	Support the development of products and processes based on indigenous knowledge	Division 1, Advanced Agriculture and Food Cluster
	The development of cannabis-based products and processes to stimulate the growth of the cannabis industry	Division 1, Advanced Agriculture and Food Cluster
	Digital precision medicine to support one health concept and advance the health solutions in the country	Division 1, NextGen Health Cluster



B.8.3. WORK PLANNED WITH HIGHER EDUCATION INSTITUTIONS

The CSIR is renewing and initiating new collaborative relationships with Higher Education Institutions, including established, previously disadvantaged universities, universities of technology, newly established universities, and Technical Vocational Education and Training colleges.

Main HEI Categories	HEI Sub-types	Title of the CSIR Project/Type of Work	Division/Cluster/Portfolio Involved
Traditional Universities	Traditional Universities	Sanral/UP/CSIR integrated laboratory facility	Division 3, Smart Places Cluster
		R&D- Beyond freshwater generation: Mineral extraction from seawater desalination brine - Witwatersrand University	Division 3, Smart Place Cluster
		R&D and training-Supporting the transition from conventional plastics to more sustainable alternatives- supporting the informal sector- Witwatersrand University	Division 3, Smart Place Cluster
		Establishment of AUDA-NEPAD Centre of Excellence in Science, Technology and Innovation (CoE-STI) which includes Stellenbosch University	All divisions and Clusters
		Enabling Localised Language Technology Applications: A Computational Wide Coverage Resource Grammar for IsiZulu - Resource and language technology development for the South African languages	Division 3, NextGen Enterprises and Institutions Cluster
		Corpus and system development for automatic captioning of official speeches - Resource and language technology development for the South African languages	Division 3, NextGen Enterprises and Institutions Cluster
		NRF/CSIR Smart Mobility Research Chair	Division 3, Smart Mobility Cluster
		NRF Earth System Science Research Programme:	Division 1, Advanced Agriculture and Food Cluster



B.8.3. WORK PLANNED WITH HIGHER EDUCATION INSTITUTIONS (continued)

Main HEI Categories	HEI Sub-types	Title of the CSIR Project/Type of Work	Division/Cluster/Portfolio Involved
Traditional Universities	Traditional Universities	Pollution Management and Environmental Health Pilot: supporting air quality management planning in Johannesburg, South Africa – cost-effectiveness/air quality management planning.	Division 3, Smart Places Cluster
		Students co-supervised by Chemical cluster staff registered at universities around the country as follows: University of Pretoria (5 students); University of Witwatersrand (1 student), University of Free State (3 students), University of Johannesburg (3 students)	Division 1, Chemicals Cluster
		Students co-supervised by Chemical cluster staff registered at universities around the country as follows: University of Pretoria; the University of Witwatersrand, University of Free State, University of Johannesburg, Stellenbosch University, University of Cape Town	Division 1, Advanced Agriculture and Food and NextGen Health Clusters
	Previously Disadvantaged Universities	Developing Metrics and Indicators for Understanding Climate Change Adaptation Progress and Trends	Division 3, Smart Places Cluster
		Co-development of a linked-up monitoring and reporting framework for the SDGs and the Paris Agreement: a case study of the water sector	
		Students co-supervised by Chemical cluster staff registered at universities around the country as follows: University of Limpopo (1 student)	Division 1, Chemicals Cluster



B.8.3. WORK PLANNED WITH HIGHER EDUCATION INSTITUTIONS (continued)

Main HEI Categories	HEI Sub-types	Title of the CSIR Project/Type of Work	Division/Cluster/Portfolio Involved
Traditional Universities	Previously Disadvantaged Universities	Students co-supervised by Chemical cluster staff registered at universities around the country as follows: the University of Limpopo, University of Mpumalanga	Division 1, Advanced Agriculture and Food Cluster
	Newly Established Universities	Informal co-operation between the CeNAM Characterization Facility and the SMU Electron Microscope Unit	Division 1, Chemicals Cluster
Universities of Technology	Universities of Technology	Healthy Buildings Collaboration Initiative with TUT	Division 3, Smart Places Cluster
		Students co-supervised by Adv AgriFood Cluster staff registered at Tshwane University of Technology	Division 1, Advanced Agriculture and Food Cluster
		Students co-supervised by Chemical Cluster staff registered at Tshwane University of Technology (4 students)	Division 1, Chemicals Cluster
Technical and Vocational Education and Training (TVET) Colleges	TVET Colleges	Information and Communication Technologies for Apprentices (merSETA) – R&D on an innovative learning pathway integration platform that aims to transform apprentice skills development in South Africa	Division 3, NextGen Enterprises and Institutions Cluster Division 2, Defence and Security Cluster

B.8.4 WORK PLANNED WITH BRAZIL, RUSSIA, INDIA, CHINA AND SOUTH AFRICA (BRICS) COUNTRIES AND CUBA.

The CSIR is establishing partnerships with BRICS countries. The work with the BRICS countries is an emerging area that will intensify in the coming years. Through the Department of Science and Innovation (International Corporation and Resources Programme) and the Department of International Relations and Corporation, the CSIR will forge active participation in the BRICS space as an international relations focus on business development and commercialisation, in line with the CSIR strategy. The CSIR will actively pursue concrete projects of cooperation with Cuba through the DSI.

Country	Title of the CSIR Project/Type of Work	Division/Cluster/Portfolio Involved/
1. Brazil	R&D-All Atlantic Ocean Sustainable, Profitable and Resilient Aquaculture	Division 3, Smart Places Cluster
2. India	Developing a relationship with Reliance in India	Division 1, Chemicals Cluster
3. China	Establishing collaboration with Beijing Forestry University in China, and some areas identified for joint proposals including current joint editorship of a journal.	Division 1, Chemicals Cluster
4. South Africa*	BRICS Institute for Future Networks South Africa chapter (BIFN-S)	Division 3, Next Generation Enterprise and Institutions Cluster

*Essentially implicit in the work done in support of the CSIR Mandate.



C

Governance Structure

The Executive Authority of the CSIR is the Minister of Higher Education, Science and Innovation. The Accounting Authority of the CSIR is the CSIR Board, duly appointed by the Minister. The Practice Note issued by National Treasury dealing with the Submission of Corporate Plans requires the inclusion of the following in the Corporate Plan:

- The composition of the Board of Directors and its subcommittees; and
- The members of the Executive Management team.

C.1 CSIR Board

The members of the CSIR Board are:

- | | |
|--|--------------------------|
| • Prof. Thokozani Majozi (Chairperson) | • Ms Phindile Baleni |
| • Dr Thulani Dlamini (CEO) | • Ms Tiny Mokhabuki |
| • Dr Vuyo Mthethwa | • Mr Joel Netshitenzhe |
| • Dr Christine Render | • Mr Cassim Shariff |
| • Dr Amber-Robyn Childs | • Dr Ramatsemela Masango |
| • Mr Stafford Masie | |

The Board has three sub-committees, namely: Research, Development and Industrialisation, Audit and Risk, and HR and Social and Ethics (HRSEC). The members of these committees are as follows:

RESEARCH, DEVELOPMENT AND INDUSTRIALISATION COMMITTEE

- | | |
|-------------------------------------|------------------------|
| • Dr Christine Render (Chairperson) | • Mr Stafford Masie |
| • Dr Amber-Robyn Childs | • Mr Joel Netshitenzhe |
| • Dr Ramatsemela Masango | • Mr Cassim Shariff |

AUDIT AND RISK MANAGEMENT COMMITTEE

- Ms Tiny Mokhabuki (Chairperson)
- Ms Phindile Baleni
- Mr Stafford Masie
- Dr Christine Render
- Dr Vuyo Mthethwa

HR AND REMUNERATION COMMITTEE

- Dr Vuyo Mthethwa (Chairperson)
- Ms Phindile Baleni
- Dr Ramatsemela Masango
- Mr Cassim Shariff

Additional details on each Board member are provided in Table C.1.

Table C.1 – Board Member details

Age	Sex	Race	Qualifications	Years	Position(s) on other Boards
Prof. Thokozani Majozi (Chairperson)					
48	Male	Black	University of Manchester Institute of Science and Technology PhD (Process Integration) University of Natal MSc (Engineering) BSc (Chemical Engineering)	6	Director A1 Consulting Engineers CC A2 Consulting Engineers CC Zyblue Pty Ltd
Dr. Thulani Dlamini (CEO)					
51	Male	Black	University of the Witwatersrand BSc Chemistry BSc (Hons) Chemistry PhD Chemistry, Catalysis University of South Africa Master of Business Leadership	4	Council Member: National Advisory Council on Innovation Director Vumelana Trade 120 CC Kusile Invest 125 CC Mavela Consulting Services CC



Age	Sex	Race	Qualifications	Years	Position(s) on other Boards
Dr Amber – Robyn Childs					
40	Female	White	<i>Rhodes University</i> PhD (Ichthyology) MSc (Cum Laude) (Ichthyology) BSc (Hons) Ichthyology BSc Ichthyology, Zoology, Mathematical Studies	2	None
Dr Ramatsemela Masango					
44	Female	Black	<i>Pennsylvania State University</i> PhD (Nuclear Engineering) MSc (Nuclear Engineering) <i>Lyceum College</i> Diploma in Project Management <i>Cape Peninsula University of Technology</i> B.Tech Degree (Chemical Engineering)	6	Executive Director Mzansi Energy Solutions and Innovations Mzesi Energy Mzesi Academy Mzesi Holdings Non-Executive Director ArioGenix Face to Face Foundation Redhorn Holdings Mzesi Water & Construction Yonga Energy Tingo Technologies Amanzi Technologies Miyenzi Investments Vito Ario Metapower Keavaya and Home
Dr. Christine Render					
62	Female	White	<i>Leeds University (England)</i> PhD (Chemical Engineering) BSc Hons. (Chemical Engineering)	2	None
Dr. Vuyo Mthethwa					
52	Female	Black	<i>University of KwaZulu-Natal</i> PhD Higher Education governance	2	Senior Director Durban University of Technology Hucad CC Bizdom CC



Age	Sex	Race	Qualifications	Years	Position(s) on other Boards
Ms. Phindile Baleni					
52	Female	Black	University of the Witwatersrand B.Proc LLB	6	Employee (Director General) Gauteng Provincial Government Council Member (Non-remunerative) Wits University Council Board Member (Non-remunerative) IIASA NMO (RSA) Trustee (Non-remunerative) Rev LW Mbethe Trust Trust First Rand Black Directors BEE Scheme
Mr. Cassim Shariff					
50	Male		Leicester Business School, DeMontfort University Master's in Business Administration	2	Director Aquaworx Remediator & Infrastructure Solutions Lirazest Southern Cross Diamonds SDB Gas Indigo Diamond Trading Greenstone Energy Zinah Investments Acapulco Trade and Invest 149 Silver Crown Trading 25 Shareholder Opulent Energy
Mr Joel Netshitenzhe					
63	Male	Black	University of London M.Sc (Financial Economics) Post-graduate Diploma (Economic Principles) Institute of Social Sciences, Moscow Diploma (Political Science)	6	Executive Director Mapungubwe Institute for Strategic Reflection Director Nedbank Group Nedbank Life Healthcare Group Camel Rock Trading 434 Member African National Congress NEC



Age	Sex	Race	Qualifications	Years	Position(s) on other Boards
Mr. Stafford Masie					
46	Male			2	Non-Executive Director and Shares Thumbzup South Africa Thumbzup Australia/AsiaPac Thumbzup International (London) Thumbzup USA Sauron AI ZA Shareholder/Funder Green Moon Transact Executive Director and Shareholder GATTACA SnapTutor Razologix Shareholder LRXYM Non-Executive Director
Ms. Tiny Mokhabuki					
37	Female	Black	SAICA CA (SA) CIMA Adv Dip in MA Acma, CGMA <i>University of KwaZulu-Natal</i> PGDA (with CTA) <i>University of the Witwatersrand</i> Bachelor of Commerce <i>Global Institute of Business Sciences</i> Aspen Management Programme	2	Director Business Entrepreneur Community (Dormant, Deregistration process) Equata World in a Bag Mokhabuki Building and Construction Sphimokha Digiten Employee MICT SETA

C.2 Executive Management

Several changes have been made to the CSIR Executive portfolios, in order to improve efficiency in the organisation. These changes have been implemented in order to address:

- Misalignment between strategy and operations, leading to mixed messages and confusion in the organisation;
- The need to better align our strategic partnerships with our investment strategy, innovation strategy and operations; and
- Streamlining our decision-making and ensuring that there is single-point accountability.

To address these concerns and augment the impact of our key deliverables for organisational efficiency, the CSIR Executive portfolios have been consolidated and are now structured as follows:

- **Finance** – Chief Financial Officer (CFO): Mr Ashraf Dindar
- **Business Excellence and Integration** – Group Executive: Ms Khungeka Njobe
- **Chemicals, Agriculture, Food and Health** – Divisional Group Executive: Dr Rachel Chikwamba
- **Mining, Manufacturing, Defence and Security** – Divisional Group Executive: Dr Motodi Maserumule
- **Natural Resources, Enabling Infrastructure, Public and Professional Services** – Vacant, Dr Thulani Dlamini (acting)
- **HC and Strategic Communications** – Group Executive: Mr Andile Mabindisa
- **Legal, Compliance and Business Enablement (LCBE)** – Group Executive: Adv. Esmé Kennedy

Table C.2 – Executive Committee Member details

Age	Sex	Race	Qualifications	Years	Position(s) on other Boards
Adv Esmé Kennedy – Group Executive: LCBE					
42	Female	White	<i>University of Pretoria</i> B.Proc <i>Potchefstroom University</i> LLB LLM (Import and Export Law) <i>High Court of South Africa</i> Admitted as an Advocate <i>General Council Bar of South Africa</i> Admitted as member of the <i>Johannesburg Bar</i> <i>University of the North West:</i> <i>Potchefstroom Business School</i> MBA	2	Trustee CSIR Pension Fund Professional Membership Institute of Directors S.A.



Age	Sex	Race	Qualifications	Years	Position(s) on other Boards
Mr Andile Mabindisa – Group Executive: Human Capital and Strategic Communications					
51	Male	Black	<i>University of Natal</i> B Soc Sc <i>University of Natal</i> B Sco Sc (Hons) <i>University of Natal</i> Postgraduate Diploma in IR	1	None
Dr Motodi Maserumule – Divisional Group Executive: Mining, Manufacturing, Defence and Security					
52	Male	Black	<i>Rensselaer Polytechnic Institute (USA)</i> PhD Mathematics <i>Clark Atlanta University</i> MSc Mathematics. Applied Math <i>Morris Brown College</i> BSc Mathematics <i>IMD, Lausanne, Switzerland</i> Mastering Technology Enterprise <i>SA National Defence College</i> Executive National Security Programme	3	Professional Membership Institute of Directors S.A. Society of Industrial and Applied Mathematics
Mr. Ashraf Dindar – CFO					
50	Male	Indian	<i>University of the Witwatersrand</i> BCom BAcc SAICA CA (SA) <i>Global Institute of Business Sciences</i> Global Institute of Leadership Development Management Development Programme Global Executive Development Programme	6 m	None



Age	Sex	Race	Qualifications	Years	Position(s) on other Boards
Ms Khungeka Njobe, Group Executive: Business Excellence and Integration					
50	Female	Black	<p>University of Pretoria M.Sc Zoology</p> <p>University of California, Los Angeles (USA) B.Sc (Hons), Biology</p> <p>Santa Monica College (USA) Associate Arts Degree</p> <p>International Institute for Management Development (IMD), (Switzerland) Mastering Technology Enterprises (MTE)</p> <p>University of Cambridge Institute for Sustainability Leadership, Business Sustainability Management</p> <p>International Institute for Management Development (IMD), (Switzerland), Disruptive innovation Programme</p>	3	<p>Non - Executive Director and Shareholder through shareholding company: Sasol Khanyisa Public and Public Fundco RF</p> <p>Trustee Hans Merensky Foundation</p> <p>Shareholder: Kay Ann Investments (Dormant)</p> <p>Professional Membership: Institute of Directors of SA</p>
Dr Rachel Chikwamba – Divisional Group Executive: Chemicals, Agriculture, Food and Health					
49	Female	Black	<p>University of Queensland M.Sc (Agricultural studies)</p> <p>Iowa State University PhD (Genetics)</p> <p>Gordon Institute of Business Science MBA</p>	14	<p>Member Academy of Science of South Africa Global Governing Board, ICRISAT South African Medical Research Council Board</p> <p>Advisory Board Institute for Science and Technology Education, UNISA Wits Health Consortium (Pty) Limited</p> <p>Chair of Advisory Board Applied Centre for Climate & Earth System Science</p>

D

Risk Management Plan

D.1 Introduction

D.1.1 BACKGROUND

Every entity exists to provide value for its stakeholders. All entities face uncertainty and the challenge for management is to determine how much uncertainty to accept as it strives to grow stakeholder value. This is achieved through an effective risk management system. The CSIR recognises that risk management is a corporate, as well as an individual responsibility, everyone has a role to play

Adequate and effective risk management is fundamental to a sound corporate governance. Part of the framework of internal control and has become a focus area in all corporate governance frameworks. The CSIR uses risk management as a tool to drive the achievement of the SOs and goals. Risk management cannot be divorced from strategy-setting process, as it is the other side of the same coin. Successful organisations identify risks (what could go wrong) as part of the genesis of strategy-setting.

A thorough understanding of risk accepted by the CSIR in the pursuance of its SOs, together with those strategies employed to mitigate risks, is, thus, essential for a proper appreciation of the CSIR's affairs by the Executive Management Committee (Exco) and the Board of Directors of the CSIR.

To this end, CSIR management is responsible for ensuring that all risks, both internal and external are managed effectively. The approach to risk management utilised by the CSIR provides a mechanism to formalise responsibility and establish accountability for all risk management activities, i.e. a consolidated risk report culminating in a Risk Management Plan (RMP). The formalisation of risk management activities is achieved through the ARC, which recommends approval of the RMP to the CSIR Board of Directors.

Good risk management is not about eliminating or avoiding risks, but rather taking acceptable risks and managing them well. The RMP assists the CSIR to improve and sustain performance by enhancing its system of risk management to protect against adverse outcomes and optimise opportunities.

The CSIR has revised and reorganised its Enterprise Risk Management Services (ERMS) function to be fit for purpose. The repurposing of the ERMS function is fundamental and was also informed by the strategic need to align to the organisational needs and requirements as defined by the new CSIR strategy and operating model. The restructure was also informed by benchmarking with peer organisation, as well as risk management best practice.

D.1.2 GLOSSARY OF TERMS AND ABBREVIATIONS

Throughout this section, unless otherwise stated, the words/abbreviations in the first column below have the meanings assigned to them in the second column (and cognate expressions shall bear corresponding meanings):

Table D.1 – Glossary and abbreviations

Abbreviation/ Term	Meaning Ascribed
ARC	Audit and Risk Committee – a CSIR Board of Directors committee constituted to and tasked with reviewing the control, governance and risk management practices within the CSIR and to determine appropriate policies, controls and procedures to manage them, proportionate to the risk or opportunity involved
Board	The CSIR Board of Directors
Combined/integrated assurance plan	A planned approach for assessing the extent and adequacy of assurance coverage on key organisational risks and reporting on those risks to senior management, the ARC.
Control	A measure employed to modify risk, the existing risk processes, policy, devices, practices or other actions that act to minimise risks or to enhance positive opportunities
COSO	Committee of sponsoring organisations of the Treadway Commission (an international risk management standard).
DSI	Department of Science and Innovation
ERM	Enterprise Risk Management
ERMS	Enterprise Risk Management Services
Event	An occurrence or a change of a particular set of circumstances
Exco	Executive Management Committee
Inherent risk	The exposure arising from risk factors in the absence of deliberate management intervention(s) to exercise control over such factors
Internal control	A system designed to promote efficiency to ensure the implementation of a policy, to safeguard assets or to avoid fraud and error (these set of rules/measures are put in place to prevent or mitigate an undesired event or condition)
Institutional Review Report	The report generated periodically in terms of section 3 of the 1997 White Paper on Science and Technology requiring periodic institutional reviews to be carried out on SET institutions by an independent panel
ISO 31000	A family of standards relating to risk management codified by the International Organisation for Standardisation that provides generic guidelines for the design, implementation and maintenance of risk management processes throughout an organisation



Abbreviation/ Term	Meaning Ascribed
King IV	The King IV Report on Corporate Governance for South Africa, 2016
PFMA	Public Finance Management Act, 1999 (Act 1 of 1999) as amended by Act 29 of 1999)
Residual risk	The remaining risk exposure after management has put measures in to control the inherent risk
Risk	An unwanted outcome, actual or potential, to the CSIR's performance objective caused by the presence of risk factors (may also present as an upside potential available for exploitation)
Risk acceptance	An informed decision by the organisation to take a particular risk
Risk appetite	The amount of residual risk an organisation is willing to accept
Risk assessment	An overall process by the organisation for risk identification, risk analysis and risk evaluation
Risk culture	The values, beliefs, knowledge and understanding about risk that are shared by a group of people with a common intended purpose, in particular the leadership and employees of the organisation
Risk factor	Any threat or event that creates or has the potential to create risk
Risk management	A systematic and formalised process of identifying, assessing, managing and monitoring risks
Risk owner	The person accountable for managing a particular risk
RMP	Risk Management Plan
Risk register	The record of information about identified risks
Risk reporting	A form of communication intended to inform particular internal or external stakeholders by providing information about the current state of risk and how it is being managed
Risk tolerance	The amount of risk an organisation is capable of bearing
Risk treatment	A process by which existing controls are improved and new controls are developed or implemented
Stakeholders	Everyone who has direct and indirect interest in affairs of the organisation, persons and an entities who can affect, be affected by, or perceive themselves to be affected by a decision or an activity
Threats	Risks emanating from the organisation's nature of business

D.1.3 LEGISLATIVE CONTEXT

The CSIR RMP has been developed in terms of the prescripts of applicable legislation, including but not limited to:

- The PFMA;
- Treasury Regulations issued in terms of the PFMA;
- The Scientific Research Council Act, 1988 (Act 46 of 1988);
- Occupational Health and Safety Act, 1993 (Act 85 of 1993) as amended by the Occupational Health and Safety Amendment Act, 1993 (Act 181 of 1993); and
- Labour Relations Act.

The CSIR RMP also incorporates the requirements of the King IV Report on Corporate Governance for South Africa (King IV), insofar as it concerns risk management, as well as the principles of ISO 31000 and COSO as best practice guidelines and framework.

D.2 CSIR Risk Management Plan

D.2.1 RISK MANAGEMENT PHILOSOPHY

The CSIR maintains a broad view of risk as any event, positive or negative, that could affect its ability to achieve its mandate, mission, vision and SOs.

The CSIR acknowledges that risk, in one form or another, is present in virtually all its endeavours, and that successful risk-taking will often be necessary to achieve SOs. Therefore, we do not seek to eliminate all risk, but seek to be risk-aware as opposed to risk-averse, and effectively manage the uncertainty inherent in our environment.

To this end, the CSIR seeks to identify, understand, assess, and respond to the risks and opportunities faced, taking into account their impact on the CSIR's resources, reputational standing, financial position, and performance. Furthermore, the CSIR seeks to pursue prudent risks or opportunities that we believe will generate sufficient and sustainable performance and value, avoid intolerable risks, manage residual risk within defined and desired levels, and be prepared to respond to risks or appropriate opportunities when necessary.

CSIR Exco and the Board, acting through the ARC, will assess the CSIR risk philosophy on an annual basis, and report and implemented any recommended and approved changes.

To ensure that there is no uncertainty among employees and stakeholders about the policies and procedures that shape the CSIR's approach to risk management, the CSIR has developed and implemented a Risk Management Policy and associated Risk Appetite statements. A Risk Tolerance Framework aligned with the RMP will be developed.



D.2.2 PURPOSE OF THE RMP

The CSIR RMP is developed to support the successful implementation and achievement of the CSIR strategy and outline what risk management activities are necessary during the financial year. In addition, it aims to entrench a risk management culture throughout the CSIR, creating a corporate culture aligned with the CSIR's core organisational EPIC values. The development of the Risk Management Plan for 2021/22 takes into account the CSIR strategic plan and the annual performance plan.

Risk management, as set out in King IV, addresses a much wider spectrum of risk than in the past, in addition, the corporate governance drivers behind risk management today require new ways of reporting and monitoring the CSIR's risk exposures. Therefore, it is important to note that the RMP is, by necessity, an evolving risk management instrument. The contents of the plan reflect the current risk management requirements of the CSIR. The document is reviewed and updated annually by the ARC of the CSIR Board.

When ERM is applied to all aspects of the organisation, it assists the CSIR in making informed choices which:

- Provide assurance that current significant risks are managed effectively;
- Improve business performance by assisting with enhancing decision-making and planning;
- Promote a more innovative, less risk averse culture in which the taking of calculated risks in pursuit of opportunities to benefit the organisation is encouraged; and
- Provide a sound basis for integrated risk management and internal control as components of good corporate governance.

D.2.3 SCOPE OF APPLICATION

The RMP applies to all business activities of the CSIR.

D.3 Components of the CSIR RMP

The CSIR manages risk through a well-defined risk-governance model. Each component of this governance model is defined through a number of supplementary guidelines, templates and implementation tools that provide clarity and enhancement for stakeholder use and ensure a single approach to enterprise wide risk management. The governance model comprises the elements outlined below.

D.3.1 RISK GOVERNANCE MODEL AND FRAMEWORK

The CSIR adopted the five lines of defence model when approaching risk management as outlined in Figure D.1 below. This model is a revised version of the traditional three lines of defence model as recommended by best practice.

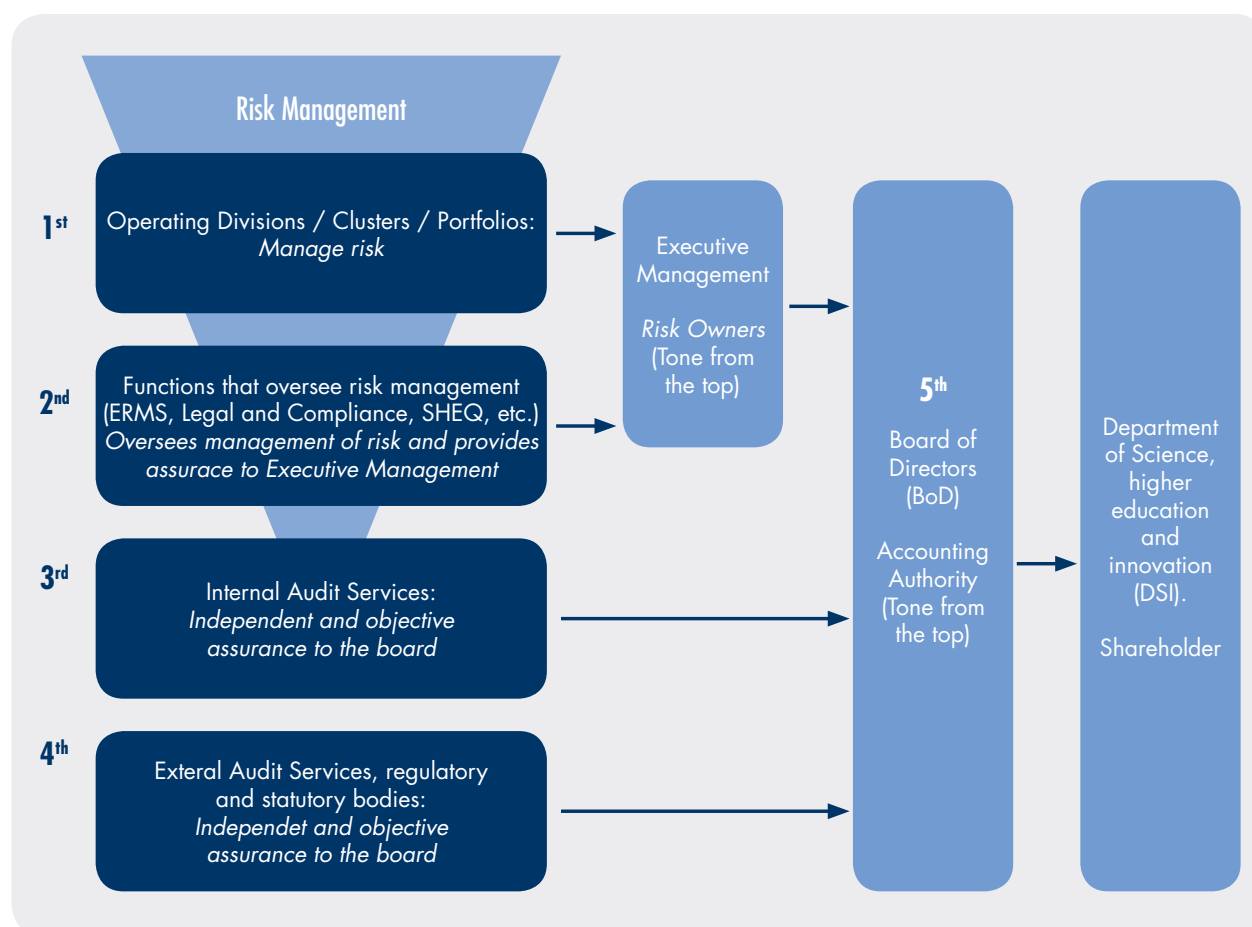


Figure D.1 CSIR five lines of defence model

D.3.1 RISK GOVERNANCE MODEL AND FRAMEWORK (continued)

As this model illustrates, the ownership and management of risk lies with those who undertake the operations within the organisation (**first line defence**). Operational staff are also responsible for implementing and maintaining an effective internal controls, executing risk and control procedures on a day-to-day basis and implementing corrective actions to address process and control deficiencies. They identify, assess and mitigate risks, guiding the development and implementation of internal policies and procedures, and ensuring that activities are consistent with goals and objectives.

ERMS and other functions that oversee risk management (**second line defence**) coordinates the management of risk in support of the risk owners (Exco), who, in turn, report to the Board. The latter retains ultimate accountability for the governance of risk. The Internal Audit function (**third line of defence**) provides independent assurance directly to the Board on the effectiveness of internal controls, risk management frameworks, systems and implementation.

The new five lines of defence model recognises the external audit function as the fourth line of defence providing an independent and objective assurance to the Board and the shareholder (DSI) on the CSIR financial statements (Statutory audit). The Auditor General of South Africa is the statutory body that performs this function.

Robust oversight by the Board and Exco (**fifth line defence**), establishes the cornerstone of effective risk management and sets the tone from the top. To give effect to its fiduciary responsibility, the Board is supported by the ARC. The ARC is an oversight body delegated with the responsibility of implementing an effective risk strategy, supported by an appropriate risk management framework that includes adequate control mechanisms to ensure effective risk management. The ARC also reviews the overall effectiveness of risk management structures and response strategies.

D.3.2 RISK MANAGEMENT FRAMEWORK OVERVIEW

The main elements of the CSIR's risk management framework, as per the ISO 31000 standard, are reflected in the Risk Management Process depicted in Figure D.2 below:

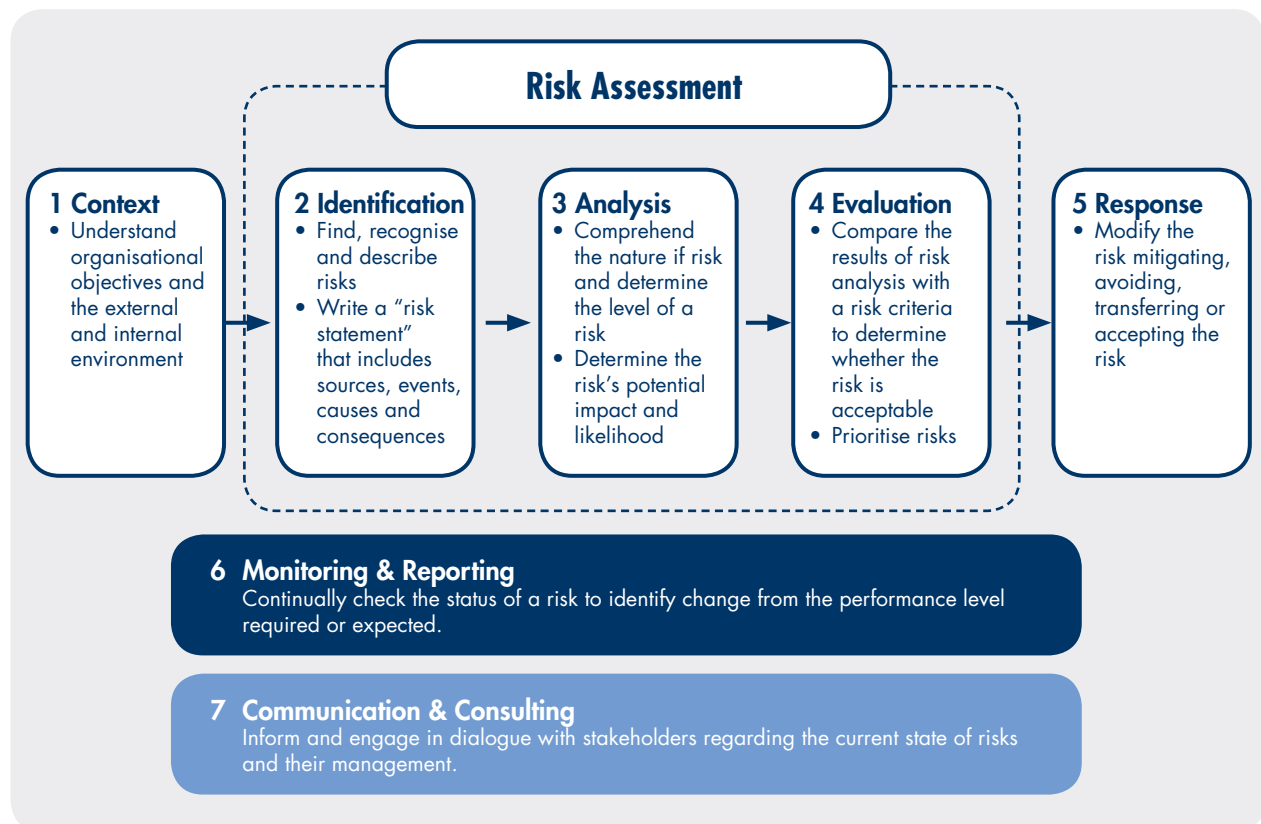


Figure D.2: Risk Management Process

A general description of each step of the process is given in the following sections.

D.3.3 ESTABLISHING THE RISK CONTEXT

Establishing the risk context entails analysis of the CSIR's external and internal operating environments, which is taken into account when managing risk as per the diagram below:

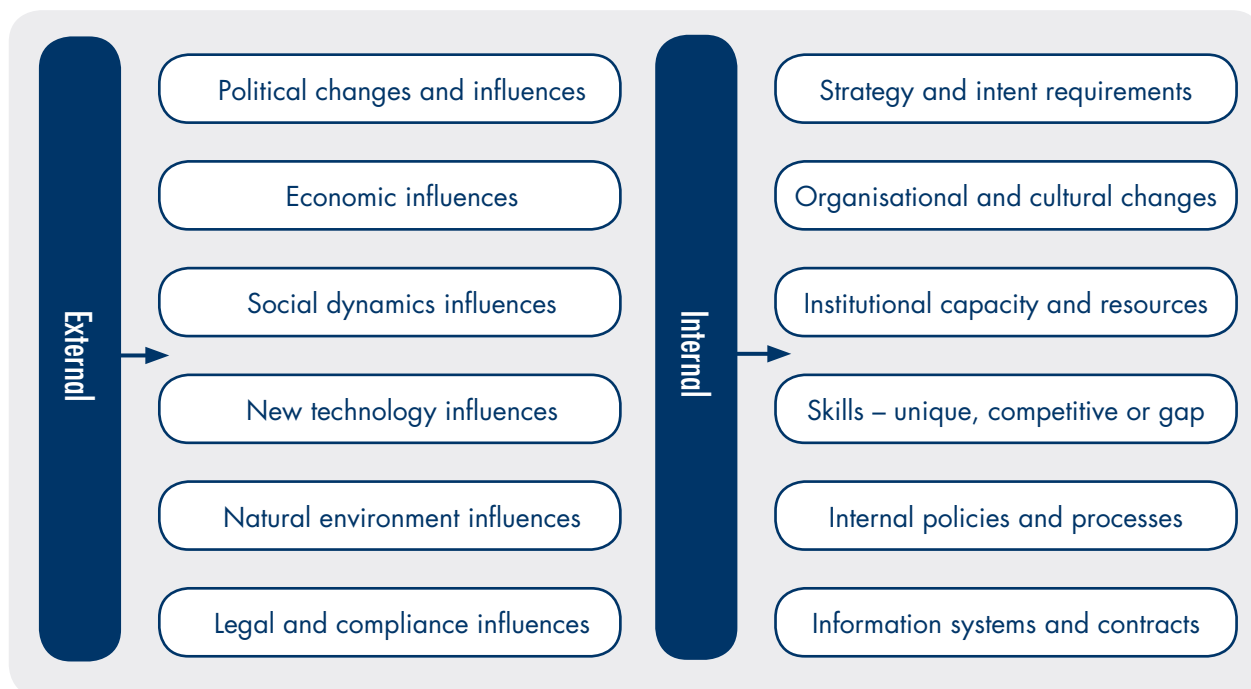


Figure D.3: Risk context

In order to achieve the CSIR's SOs, a thorough analysis of the overall risk environment is conducted periodically to establish a common understanding of the risk universe that needs to be addressed. As this environment remains in flux, the relevant risk universe is continuously reviewed, updated and agreed upon.

As the ownership and management of risk lies primarily with those who undertake operations within the organisation, CSIR operational and portfolio management is largely responsible for identifying risk. ERMS consolidates the risk universe for further analysis and eventual agreement, based on relevance and potential impact.

D.3.4 THE RISK ASSESSMENT PROCESS

In summary, the overall systematic approach taken by the CSIR for risk management is aligned to ISO 31000 and undertakes the following steps:

- Profiling the key aspects of the CSIR and the context in which the organisation operates in. This highlights dependencies and critical parts of the business and starts to pinpoint vulnerabilities. Identifying and understanding organisational objectives – the ultimate objectives of the CSIR – guides the risk appetite within each operational area, while adhering to the prescribed (by ARC) overall CSIR risk appetite. The profile of the individual operating environment objectives should take into consideration:
 - Revenue and expenditure targets;
 - Customer objectives and targets;
 - Socioeconomic targets; and
 - Other business objectives.
- Identifying and understanding operational activities.
- Identifying and categorising/prioritising risks – risk identification involves the identification of risk sources and events, their causes and potential consequences. This element consists of a detailed classification, analysis of the likely impact and likelihood of occurrence of a risk. A consequence/impact table is used in this process with clearly defined parameters that define the consequence/impact for each category of risk to determine the inherent risk, i.e., risk without controls. An assessment of the effectiveness of the controls is done to determine the residual risks and prioritisation of the risks, including additional controls required to mitigate the risk further and escalation to the relevant levels.
- Determining a risk response strategy/identifying current controls/risk mitigation – putting controls in place to manage the risk. The three approaches to risk mitigation are tolerate, treat, transfer or terminate the activities that give rise to the risk.
- Determining an action plan, responsible person and the target date.
- Developing risk registers, in order to enable comparison and consolidation of the different risk registers in the CSIR, a common risk register structure has been adopted.
- Monitoring and reviewing the risk and the response to it.
- Reporting.

RISK IDENTIFICATION AND CATEGORISATION

Risk identification involves the identification of risk sources and events, their causes and potential consequences. Management meetings, strategy sessions, engagements with heads of operating divisions, clusters, research centres and portfolios are all part of the risk identification process.

D.3.4 THE RISK ASSESSMENT PROCESS (continued)

The process of identifying top risks also entails:

- Review of historical top risks and current relevance and threat assessment;
- Review of the CSIR's external operating environment through external macro-economic risk monitoring specialists;
- Consideration of the organisational strategy and risk implications;
- Review of the CSIR operating model;
- Analysis of internal audit reports and reporting through a combined assurance model, highlighting weaknesses in the control environment; and
- Analysis of organisational incident lessons learnt and current local and international incident trends.

RISK ANALYSIS AND EVALUATION TO DETERMINE PRIORITISATION

The outcomes of the risk identification and classification processes are compiled into risk registers within each area of the organisation. An escalation process is utilised, as outlined in Figure 14 below, wherein each level of the organisation identifies, evaluates and then prioritises the risks it faces, and reports the major risks to the next level in the organisation.

Thus, risks are identified for each operational cluster or portfolio in the CSIR, with major risks reported to the next level, ultimately culminating in the formulation of the CSIR's top risks. This escalation process involves executive-level, in-depth analysis of risks that might not be identified at the level below, but which often represent the most critical risks for the organisation as a whole. All operational areas are required to compile a risk register and maintain it continuously through risk assessment workshops coordinated by ERMS.

Risk registers are reviewed and updated on a quarterly basis through meetings with the risk and control owners, risk owners and action plan owners coordinated by ERMS. After any strategic, policy, mandate or structural change, a risk assessment workshop is conducted to review and update the applicable risk register.

Risks in the CSIR have been classified into the following three broad categories:

- **Systemic risks** – originate from macro-economic and national challenges affecting the NSI and national government business enterprise space in which the CSIR operates;
- **Strategic risks** – directly impact the ability of the CSIR to deliver on its SOs and statutory mandate; and
- **Operational risks** – include financial, legal and compliance risks and are those risks affecting the systems, people and processes through which the CSIR operates.

Assessing and prioritising the total identified risk universe consists of a detailed classification and analysis of the potential impact and likelihood of occurrence of a risk. A consequence/impact table is used in this process with clearly defined parameters that express the consequence/impact for each category of risk in order to determine the inherent risk, i.e., risk without controls. An assessment of the effectiveness of the controls is done to determine the residual risks and prioritisation of the risks, including additional controls required to mitigate the risk further and escalation to the relevant levels.

D.3.4 THE RISK ASSESSMENT PROCESS (continued)

In order to enable comparison and consolidation of the different risk registers in the CSIR, a common risk register structure has been adopted. Annexure A to this document identifies the top organisational risks that have been identified through the bottom-up risk evaluation process. The process is based on the following:

- Risks are identified from the bottom up and require analysis by each level of the specific risks pertaining to that level, culminating in a top down evaluation to determine organisational relevance and the top organisational risks; and
- Risk management is integrated into existing management processes, such as planning, budgeting and performance management and evaluation.

The risk register, as well as the management of risk events is built and managed through an escalation from project level, to operating division/cluster/portfolio level as illustrated by the following diagram:



Figure D.4: Risk escalation

D.3.4 THE RISK ASSESSMENT PROCESS (continued)

RISK MITIGATION

Risk mitigation entails implementing controls to manage the risk. This involves the options below:

- **Tolerate/accept** – accepting the risk by keeping activities unchanged. This option is applied when exposure is tolerable, control is impossible or the cost of control exceeds potential benefit. The question of whether or not a particular risk can be tolerated is a key management decision.
- **Treat/reduce** – adjusting (adding or revising) relevant activities.
- **Transfer** – sharing the risk by involving relevant stakeholders. This works well for financial risks, risks to assets and includes securing conventional insurance or sourcing a third-party to manage or undertake the risk.
- **Terminate/avoid** – avoiding or cancelling the activities that give rise to the risk after considering the cost/benefit analysis.

Mitigation strategies are translated into internal control activities with defined implementation timelines. For those areas and items for which the risk owner recommends the option “treat/reduce”, i.e. mitigate the risk, actions are taken to reduce the probability of the risk occurring or the impact of the risk. Mitigation measures are also linked to the best use of resources. A SMART principle approach should be adopted when defining/developing risk mitigation action plans i.e. the action plans should be Specific, Measurable, Achievable, Realistic and Timely. This will enable effective reporting and monitoring on progress against action plans.

Mitigation strategies consider the results/reports of the combined assurance efforts and ensure that appropriate action is taken to address identified areas for improvement.

D.3.5 MONITORING AND REPORTING

After the establishment of detailed risk register and associated mitigation strategies, each risk is monitored by ERMS to verify the implementation of the proposed mitigation strategies. ERMS also facilitates the review of the risks, taking into consideration:

- Changes in the assessment of the risk;
- Changes to risks as forced by the macro environment;
- Suggested changes to the risk mitigation strategy;
- Progress made against the detailed action plans; and
- Any material factors from the internal and external environments.

Internal audits and ad hoc risk assessments, either in accordance with the combined assurance plan or due to a perceived risk, will be conducted to monitor and evaluate the extent of compliance with policies, procedures and proposed controls. The role of the Internal Audit function is to actively monitor the internal and external environments and, if identified risks are not responded to appropriately, be the catalyst for ensuring that the risk universe is updated continually.

D.3.5 MONITORING AND REPORTING (continued)

Furthermore, the CSIR will utilise the Operations Committee (Opco) forum to establish a focused efforts/agenda on risk management, compliance and audit to steer and take responsibility of the CSIR RMP and to ensure the effective implementation thereof in support of combined assurance, and ensuring that key risks are being managed appropriately. It will also implement a combined fit-for-purpose assurance operating model that will help the CSIR to effectively address GRC agenda.

The objectives of the combined assurance model on risk management, compliance and audit will mainly be to:

- Identify and specify the sources of assurance over the CSIR's risks;
- Provide the ARC, Accounting Officer and Executive Management with a framework of the various assurance parties;
- Link risk management activities with assurance activities;
- Assist the Accounting Officer with reviewing the effectiveness of the risk management system; and
- Provide a basis for identifying any areas of potential assurance gaps.

In compliance with King IV, the CSIR Board will receive assurance regarding the effectiveness of the RMP through the following principles:

- On a monthly basis and once established, the Risk Management, Compliance and Audit Steering Committee will provide Exco with progress updates against the combined assurance plan and progress against the implementation of the RMP.
- On a quarterly basis, management will provide assurance to Exco that the RMP is integrated into the daily activities of the CSIR. The CSIR CEO, as part of his quarterly report to the Board, will provide it with assurance via the ARC on the effectiveness of the risk management system.
- On a quarterly basis, the risk manager will provide assurance to the Board that the planned risk management activities are being implemented according to this RMP. This assurance shall be communicated to the Board via the ARC.
- On an annual basis, the Internal Audit function will provide a written assessment of the effectiveness of the system of internal controls and risk management to the Board via the ARC.

In order for the Board to discharge its duty of ensuring that effective and continual monitoring of risk management takes place, risk monitoring is an integral part of the CSIR RMP, to give assurance that measures remain effective.

D.4 Conclusion

The CSIR proposes a proactive approach towards risk management and will continue to take the necessary measures to improve its ERM practices. The top risks identified for the CSIR for the 2020/21 financial year are depicted in Annexure A hereto.

ANNEXURE A: CSIR TOP RISKS AND HEAT MAP



Figure D.5: Top risk against Strategic Objectives

ANNEXURE A: CSIR TOP RISKS REGISTER


The top risks identified have a specific focus on the significant factors (internal and external) that have a direct impact on the CSIR's business. These factors have a potential negative impact on the CSIR's ability to achieve its SOs and goals.

Legends:  Risk Rating High  Risk Rating Medium  Risk Rating Low


Systemic risks: These are risks that originate from macro-economic and national challenges affecting the NSI and national government business enterprise space in which the CSIR operates.

Risk No. 1: Regulatory constraints – PFMA on public sector procurement							CSIR SO1, SO2, SO3 , SO4 & SO5 impacted	
Detailed risk description	Risk context	Risk impact	Risk rating	Risk status rationale	Key remedial actions	Action Plan owner		
Collaborative initiatives treated by National Treasury as standard Public Sector Procurement.	External	<ul style="list-style-type: none">Compromised financial sustainability.Inhibited delivery on mandate.Increased risk of irregular expenditure.Protracted National Treasury-dependent procurement and tendering processes.	Medium 	<ul style="list-style-type: none">Covid-19 lockdown had a negative impact as collaborations with government as policymakers were interrupted and could not continue against original timelines.Exemptions available on a case-by-case basis, but no blanket exemption available.Exemptions secured have long lead times.	<ul style="list-style-type: none">Continuously engage shareholder on continued negotiations with policy owners.Performance of scenario analyses to demonstrate and understand the impact of legislative changes.Documenting the processes followed for consortiums presented to National Treasury.Engagements with government policymakers to continue.	CFO (Supported by Exco).		
Risk No. 2: Regulatory Constraints – PFMA and Covid-19 procurement constraints							CSIR SO1, SO2, SO3, SO4 & SO5 impacted	
Detailed risk description	Risk context	Risk impact	Risk rating	Risk status rationale	Key remedial actions	Action Plan owner		
In response to the National State of Disaster, National Treasury issued Instruction Note No. 05 of 2020/21 on Emergency Procurement. Clause 6.1.3 of the Instruction Note declares that briefing sessions and site visits are not to be made compulsory or mandatory, unless otherwise approved by the Accounting Officer or Authority. The CSIR has managed to operate without compulsory briefing sessions; however on some matters, it is becoming increasingly difficult to conclude the procurement effectively without the briefing sessions.	External	<ul style="list-style-type: none">Compromised financial sustainability.Inhibited delivery on mandate.Protracted National Treasury-dependent procurement and tendering processes.	Low 	<ul style="list-style-type: none">Board approval to allow the CFO to approve all compulsory briefing sessions.All protocols, including hygiene, social distancing, as well as the number of people allowed in a group will be adhered to, in line with the Covid-19 Regulations.The relaxation of the government risk-based Covid-19 strategy to level 1 could have a positive impact on procurement (local and international).	<ul style="list-style-type: none">Strict management of briefing sessions.Kept to a minimum and will only be held when absolutely necessary to ensure that all public procurement prescripts are observed in line with section 217 of the Constitution, including competitiveness, fairness, equitable and efficiency.	CFO (Supported by procurement specialists/practitioners and buyers).		


Annexure A: CSIR Top Risks Register continued.

Risk No. 3: Regulatory Constraints – Disaster Management Act, 2002 (Act 57 of 2002)					
CSIR SO1, SO2, SO3, SO4 and SO5 impacted					
Detailed risk description	Risk context	Risk impact	Risk rating	Risk status rationale	Key remedial actions
Lockdown of national economy and gradual risk-based re-opening, prospects of further future lockdowns.	External	<p>The virus had a negative impact on the delivery and achievement of the following :</p> <ul style="list-style-type: none"> • Collaboration initiatives with business and government, including international clients; • PG/funding; • The bottom-line; • The cash flow status of the organisation; • Ability to achieve target contract income; • Programmes and projects as they were deferred and/or put on hold; • Potential contractual and legal issues on projects and initiatives i.e. fines, penalties, etc.; • Covid-19 related cost for time, resources, infrastructure, etc.; • Import and export of products and services from and to affected countries; • Financial impact (Forex) on international prices; • Voluntary/involuntary employee absenteeism and reduction in workforce, which will impact production and service levels; and • Striking a balance between maintaining productivity and efficiency and providing a safe working environment for their employees. 	<p>Medium</p> 	<ul style="list-style-type: none"> • Closure and progressive risk-based re-opening of CSIR sites and allowing remote and rotational working. • Relaxation to lockdown Level 1 could result in return of more resources to CSIR sites. • The CSIR will adopt a cautious and a hybrid (remote and on-site working) approach on return-to-work protocols. • Remote working will be encouraged for people who can still perform productively on remote arrangement. 	<ul style="list-style-type: none"> • Implementation of the national government protocols, as well as CSIR-specific protocols to curb the spread of the virus. • Implementation of the CSIR BCM plan. • Implementation of Return to Work Guideline and supporting behavioural protocols. • Deployment and continuous enhancement of a risk management strategy to manage risks that are inherent to the business as a result of Covid-19. • Conducting of a detailed business impact analysis, as well as mitigation plans for the business.
					<p>Action Plan owner</p> <p>Group Executive: Legal, Compliance and Business enablement (Supported by specialist from the SHEQ department and the CSIR Incident Response Team/IRT).</p>


Annexure A: CSIR Top Risks Register continued.

Risk No. 4: Economic downturn – Credit rating downgrade, Covid-19 business interruption and PG cuts CSIR SO1, SO2, SO3, SO4 and SO5 impacted						
Detailed risk description	Risk context	Risk impact	Risk rating	Risk status rationale	Key remedial actions	Action Plan owner
PG and funding cut redirected to relief funds, inability to achieve target contract income, programmes and projects deferred and/or put on hold due to economic and mobility restrictions and financial pressures resulting in negative impact on the bottom line and cash flow.	External	<ul style="list-style-type: none"> Negative impact on financial sustainability. Negative impact on the CSIR's ability to deliver on its mandate. Deferred/ delayed realisation of SOs. 10% cut in PG. 	High 	<ul style="list-style-type: none"> The risk remains high due to the global markets collapse and shutdown/ lockdown of key economic activities around the world due to Covid-19. The staggered and gradual opening of the economy based on different alert levels will make the pace of the economic recovery slow. Relaxing to Covid-19 level 1 could have a positive impact. CSIR support on government Covid-19 special projects (opportunity cost and work at risk for Covid-19-specific initiatives). 	<ul style="list-style-type: none"> Staggered opening of business activities based on the government risk adjusted strategy. Closure and progressive risk-based re-opening of the CSIR sites and allowing remote and rotational working. Drive commercialisation of technology – CSIR has seen accelerated product development and commercialisation, leading to the strengthening of capabilities and contracts, new service offerings, such as testing and medical equipment manufacturing being established. PG investment based on CSIR investment process guided by organisational priorities. Allocation and utilisations of reserve cash. 	<p>Group Executive: DIV GE, Cluster Exec Managers, BD&C Exec Managers</p> <p>PG allocation office.</p> <p>Cluster executives.</p>

Annexure A: CSIR Top Risks Register continued.


Risk No. 5 : Economic downturn – Business failures and slow sector/industry recovery CSIR SO1, SO2, SO3, SO4 & SO5 impacted						
Detailed risk description	Risk context	Risk impact	Risk rating	Risk status rationale	Key remedial actions	Action Plan owner
<p>Covid-19 diminished economic activity, required trillions of dollars in response packages and is likely to cause structural shifts in the global economy going forward, as countries plan for recovery and revival.</p> <p>Business failures, severe tourism/conferencing, and specific sector contraction.</p> <p>A build-up of debt is likely to burden government budgets and corporate balances for many years, global economic relations could be reshaped, emerging economies are at risk of submerging into a deeper crisis, while businesses could face increasingly adverse consumption, production and competition patterns.</p>	External	Possible falling revenue, reduced financial liquidity and the going concerns of key business partners, negatively impacting the CSIR's sustainability.	<p>Low</p> 	<ul style="list-style-type: none"> The risk remains high due to the global markets collapse and shutdown/lockdown of key economic activities around the world due to Covid-19 The staggered and gradual opening of the economy based on different alert levels will make the pace of the economic recovery slow. Relaxing to Covid-19 level 1 could have a positive impact. 	<ul style="list-style-type: none"> CSIR support on government Covid-19 special projects. Staggered opening of the business activities based on the government risk adjusted strategy. Closure and progressive risk-based re-opening of the CSIR sites and allowing remote and rotational working. Drive commercialisation of technology – the CSIR has seen accelerated product development and commercialisation, leading to strengthening of capabilities and contracts, new service offerings, such as testing and medical equipment, manufacturing being established. Allocation and utilisations of reserve cash. Develop a debtor's collection framework and drive debt collection. 	<p>Cluster executives.</p> <p>CFO (Debtors' collection).</p>


Annexure A: CSIR Top Risks Register continued.

Risk No. 6: Economic downturn – Supply Chain Disruptions CSIR SO1, SO2, SO3, SO4 & SO5 impacted						
Detailed risk description	Risk context	Risk impact	Risk rating	Risk status rationale	Key remedial actions	Action Plan owner
<p>Disaster Management Act and Regulations:</p> <ul style="list-style-type: none"> Supply chain disruption due to global mobility constraints. Negative financial impacts (Forex) on international pricing. 	External	<ul style="list-style-type: none"> Lack of delivery on collaboration initiatives with business and government, including international clients. Negative impact on the bottom line. Inability to achieve target contract income. Programmes and projects deferred and/or put on hold. Potential contractual and legal issues on projects and initiatives, i.e. fines, penalties, etc. Import and export of products and services from and to affected countries. Negative financial impact (Forex) on the international prices. 	<p>Medium</p> 	<ul style="list-style-type: none"> Global supply chains are currently critical to rapidly producing and distributing essential goods worldwide, including personal protection equipment and a possible vaccine against Covid-19 Relaxation to Covid-19 level 1 could result in the opening of borders and easing of supply chain regulations. Nationalistic tendencies have intensified as countries look to safeguarding their citizens and economies. For example, many countries have restricted exports of food and medical supplies during 2020. Long term, governments fearing another outbreak and supply shortages could seek to minimise reliance on imports through hard barriers to trade. 	<ul style="list-style-type: none"> Drive commercialisation of technology – the CSIR has seen accelerated product development and commercialisation, leading to the strengthening of capabilities and contracts, such as testing and medical equipment manufacturing being established. 	<p>CFO GM: Strategic Procurement Divisional and Cluster: Strategic Procurement Department</p>


Annexure A: CSIR Top Risks Register continued.

Strategic risks: These are risks that directly impact on the ability of the CSIR to deliver on its mandate.

Risk No. 7: Relevance of RDI resources and outcomes					
CSIR SO1, SO2, SO3 & SO5 impacted					
Detailed risk description	Risk context	Risk impact	Risk rating	Risk status rationale	Key remedial actions
Low rate of tech commercialisation and transfer as a result of low risk appetite in the market	Internal and external	<ul style="list-style-type: none"> Negative impact on financial sustainability. Deferred realisation of the SOs and goals. Low investment appetite by funders into RD&I programmes. 	Medium 	<ul style="list-style-type: none"> The CSIR has seen accelerated product development and commercialisation, leading to strengthening of capabilities and contracts, new service offerings, such as testing and medical equipment manufacturing being established. Ability to respond at pace with market demand. Business development as an integral function of the operating model. 	<ul style="list-style-type: none"> Drive commercialisation of technology – the CSIR has seen accelerated product development and commercialisation, leading to the strengthening of capabilities and contracts, new service offerings, such as testing and medical equipment manufacturing being established. Strategy development assessed continued relevance of research activity – continued monitoring and evaluation against available markets.
					Action Plan owner Cluster executives Managers. BD&C managers.


Risk No. 8: HC in support of RDI, as well as in response to changing market needs/requirements					
CSIR SO1, SO2, SO3 and SO4 impacted					
Detailed risk description	Risk context	Risk impact	Risk rating	Risk status rationale	Key remedial actions
Inadequate and low supply of the SET-base skills by the labour market (skills demand exceeds the supply), freezing of recruitment for vacant positions due to cost containment measures and positions becoming redundant as a result of changes in the business, stakeholder needs, industry and technology.	Internal and external	<ul style="list-style-type: none"> Resource complement and skills sets not available to exploit market opportunities fully. Inability to diversify income sources. Financial losses and aggravating constraint to continued financial feasibility. 	High 	<ul style="list-style-type: none"> Restructuring processes complete and in final stage of resolving non-placed employee allocation. Focus on employee value proposition (EVP). Remote working arrangements and opportunity to test its integration into the employee wellness proposition. 	<ul style="list-style-type: none"> Develop and implement a robust and comprehensive HC strategy and related policies that will boost the recognition of the CSIR as an employer of choice by considering: <ul style="list-style-type: none"> Flexible Working Practices Talent Mapping (High Potential candidates identification); Succession planning; Career pathing; Leadership programmes; Bursary programmes; EVP; and Change management (Strategy being implemented with the assistance of PWC).
					Action Plan owner Group Executive: HC. Div. GEs ECM

Annexure A: CSIR Top Risks Register continued.


Risk No. 9: ICT infrastructure and integrated business systems CSIR SO1, SO2, SO3, SO4 & SO5 impacted						
Detailed risk description	Risk context	Risk impact	Risk rating	Risk status rationale	Key remedial actions	Action Plan owner
Lack of adequate ICT infrastructure and integrated business systems results in reduced productivity, higher manpower requirements and lack of agility in responding to business intelligence requirements.	Internal	<ul style="list-style-type: none"> Low productivity and increased overhead costs. Lack of systems integration, resulting in multiple sources of data impacting negatively on data accuracy/quality and reporting. Duplicate investment in ICT infrastructure and systems. Poor quality of R&D outputs. Increased risk of projects failures. Increased SHEQ risks. 	High 	<ul style="list-style-type: none"> ICT strategy development process underway (Kearney appointed as consultants). Required mitigation controls will mature with the implementation of the ICT strategy. Covid-19 lockdown forced deployment and continuous enhancement of virtual platforms in support of business continuity and stakeholders/customer engagements, alleviating risks imposed by Covid-19 on normal business activity 	<ul style="list-style-type: none"> Develop and implement ICT strategy (develop and plan holistic and strategic integrated systems improvement and implementation to achieve agility, data integrity and seamless reporting). Portfolio, programme and project management capability development – proof of concept. Customer Relationship Management (CRM) – testing phase CSIR Systems reconfiguration to align with revised operating model – 80% complete. Various operational infrastructure improvements in various stages of implementation. 	CFO Group executive: Business Excellence and Integration. Programme manager: Capital projects.

Annexure A: CSIR Top Risks Register continued.


Operational risks: These include financial, legal and compliance risks and are those risks that affect the systems, people and processes through which the CSIR operates.


Risk No. 10: ICT security risk associated with remote working CSIR SO5 impacted						
Detailed risk description	Risk context	Risk impact	Risk rating	Risk status rationale	Key remedial actions	Action Plan owner
<ul style="list-style-type: none"> The increase in working-from-home arrangements has expanded the use of potentially vulnerable services, such as virtual private networks (VPNs), which lack adequate safeguards, amplifying the threat to individuals and organisations. The risk of disruption to critical information infrastructure is also enhanced by the vulnerability of services under strain from high demand. A blurring of the line separating corporate and personal systems heightens the risk of exposing sensitive information that is not appropriately secured and monitored on personal devices. 	Internal	Increased threats of cyberattacks.	High 	<ul style="list-style-type: none"> Technology has been central to the way people, companies and governments have managed the Covid-19 crisis. Greater dependence on technology has increased cybersecurity risks. Critical patches released by Microsoft and other platforms implemented/applied in August. Covid-19 lockdown resulted in increased security vulnerability. 	<ul style="list-style-type: none"> Future security patches to be applied on time and automatically forced on deployment and log-in by users. Monthly release of updates, via the WSUS platform to all CSIR personal computers and laptops. Management to assess and address impact on data bundles of staff. 	Chief Information Officer/CIO Chief Information Security Officer/CISO

Annexure A: CSIR Top Risks Register continued.

Risk No. 11.1: Poor health and safety culture – Covid-19. CSIR SO4 impacted						
Detailed risk description	Risk context	Risk impact	Risk rating	Risk status rationale	Key remedial actions	Action Plan owner
Increased likelihood of SHE threats due to Covid-19. Potential infection and fatalities due to the spread of Covid-19.	External	<ul style="list-style-type: none"> Health hazards/injuries/loss of human life inhibit CSIR objective of "ZERO HARM". Reputational damage. Legal liability associated with fines and penalties, civil claims and potential criminal liability. Increased cost of implementing the risk-adjusted SHE response strategy and related protocols. 	Medium 	<ul style="list-style-type: none"> Current protocols and the management of infection and exposure are proving robust in managing the risk to staff and business continuity. Business continuity maintained, despite regulatory and risk constraints. The continued spread and escalation of the Coronavirus both in South Africa and internationally requires continued monitoring to assess risk impact and required mitigation protocols. Interim SHEQ team, with clear roles and responsibilities, was mobilised with specific focus on embedded SHEQ support to the divisions and portfolios as of 1 May 2020. Health Services has developed a Covid-19 surveillance testing programme, which allows for all staff at risk of onsite transmission to be tested. Detailed risk mitigation guidelines and protocols strictly implemented based on regulatory requirements and the actual risk profile identified for each working area mobilised for business resumption and regularly reviewed in line with national alert level changes and feedback from compliance officers and SHEQ team. Tenants are being audited for compliance. 	<ul style="list-style-type: none"> Conduct risk assessment as a preliminary requirement for team mobilising to come to site. Appoint compliance officers for all environments. Implement all the approved-Covid-19 protocols. Review existing risk assessments and remedial action plans in cases where more people/staff are being mobilised. 	Group manager: SHEQ.

Annexure A: CSIR Top Risks Register continued.

Risk No. 11.2: Poor health and safety culture – Contractors and Tenants CSIR SO4 affected					
Detailed risk description	Risk context	Risk impact	Risk rating	Risk status rationale	Key remedial actions
Misalignment with CSIR values and increased probability of injuries and fatality. Potential pollution generated from or by contractor and tenant activities.	Internal	<ul style="list-style-type: none"> Health hazards/injuries/loss of human life inhibit on CSIR objective of "ZERO HARM". Reputational damage. Legal liability associated with fines and penalties, civil claims and potential criminal liability. Increased cost of implementing the risk adjusted SHE response strategy and related protocols. 	High 	<ul style="list-style-type: none"> Non-compliance by contractors and tenants to OHS Act requirements and CSIR SHEQ requirements. Reduced CSIR liability to pollution caused by tenants Reduced significant health and safety risks to the CSIR and other tenants. Reputational damage to the CSIR due to non-compliant activities by contractors and tenants. 	<ul style="list-style-type: none"> SHEQ team auditing and reviewing all contractor health and safety files prior to working on site. On site compliance SHE audits to improve adherence to CSIR requirements. Reconvene SHE tenant forum. Review and enhance a contractor and tenant SHE management plan. Review current protocols to for access of contractors to CSIR sites. Review current contractor and tenant induction process.
					Action Plan owner: Group manager: SHEQ.

Risk No. 11.3: Poor health and safety culture – CSIR Employees CSIR SO4 impacted					
Detailed risk description	Risk context	Risk impact	Risk rating	Risk status rationale	Key remedial actions
Misalignment with CSIR values and increased probability of injuries and fatality.	Internal	<ul style="list-style-type: none"> Health hazards/injuries/loss of human life inhibit on CSIR objective of "ZERO HARM". Reputational damage. Legal liability associated with fines and penalties, civil claims and potential criminal liability. Increased cost of implementing the risk adjusted SHE response strategy and related protocols. 	High 	<ul style="list-style-type: none"> Potential loss of life, disabling injuries and lost time accidents. Reduced significant health and safety risks to the CSIR and other tenants. Reputational damage to the CSIR and prosecution of key individuals. Damage to PPE. 	<ul style="list-style-type: none"> Introduce KPIs for S16.2s and other SHE role players in the performance management contracts to assist in instilling a culture of accountability and consequence management. Regular random SHE audits and management by walk about. Capacitate SHEQ department with key functions Manager SHE and SHE Implementation. Develop behaviour/culture change approach for the CSIR. Develop SHEQ risk-based thinking training and management approach, and roll out.
					Action Plan owner: Group manager: SHEQ.

Annexure A: CSIR Top Risks Register continued.

Risk No. 12: Business Continuity Management and Covid-19. CSIR SO1, SO2, SO3, SO4 SO5 impacted						
Detailed risk description	Risk context	Risk impact	Risk rating	Risk status rationale	Key remedial actions	Action Plan owner
<p>Constraints to business continuity following disruptive incidents or events.</p> <p>Covid-19 pandemic disrupting business continuity and requiring mitigating response.</p>	Internal and external	<ul style="list-style-type: none"> Additional operational costs and loss of business opportunity and income. Reputational damage. Negative impact on insurance profile and premiums. Contractual and related liabilities due to non-performance. Increased, SHE and security risks. Potential liability associated with tenants and hosted 	Medium 	<ul style="list-style-type: none"> Defined BCM strategy, risk scenarios and response protocols. Significant enhancement and refinement of BCM plan and response protocols due to Covid-19 pandemic and continued practical testing of efficacy. Enhancement of remote working platforms and infrastructure. 	<ul style="list-style-type: none"> Testing of the current BCM plan. 	<p>Snr Manager: LCBE operations.</p>
Risk No. 13 CSIR re-organisation process ICT department CSIR SO1 affected						
Detailed risk description	Risk context	Risk impact	Risk rating	Risk status rationale	Key remedial actions	Action Plan owner
<p>Disruptions to the CSIR operations, as a result of the potential restructuring in ICT department to align to the new ICT strategy/road-map.</p>	Internal	<ul style="list-style-type: none"> Leaking of company sensitive and confidential data/information. Delays in the implementation of the fit-for-purpose support model. Reputational damage to the CSIR due to media coverage. Low staff morale that could result in an inefficient support to the activities and operations of the SET base. 	Low 	<ul style="list-style-type: none"> The risk has gone down significantly, as a result of the placement process nearing completion in the support structure. Few placements still need to be completed. However, the risk can increase in the near future due to the potential restructure of the ICT department to align to the new strategy/road-map. 	<ul style="list-style-type: none"> Commission for Conciliation, Mediation and Arbitration mediation process for Section 189. Employer (CSIR) proposed operating model for the reorganisation. Appointment of task teams from the employer, labour unions and Unionised staff members. Improved physical security operations to prevent potential interruptions and ensure staff safety. Established a dedicated reorganisation Intranet site and email address to ensure effective communication. 	<p>Group Executive: HC.</p> <p>Group Executive: LCBE.</p> <p>CFO.</p> <p>Chief Information Officer (CIO)</p>

ANNEXURE A: CSIR TOP RISKS REGISTER

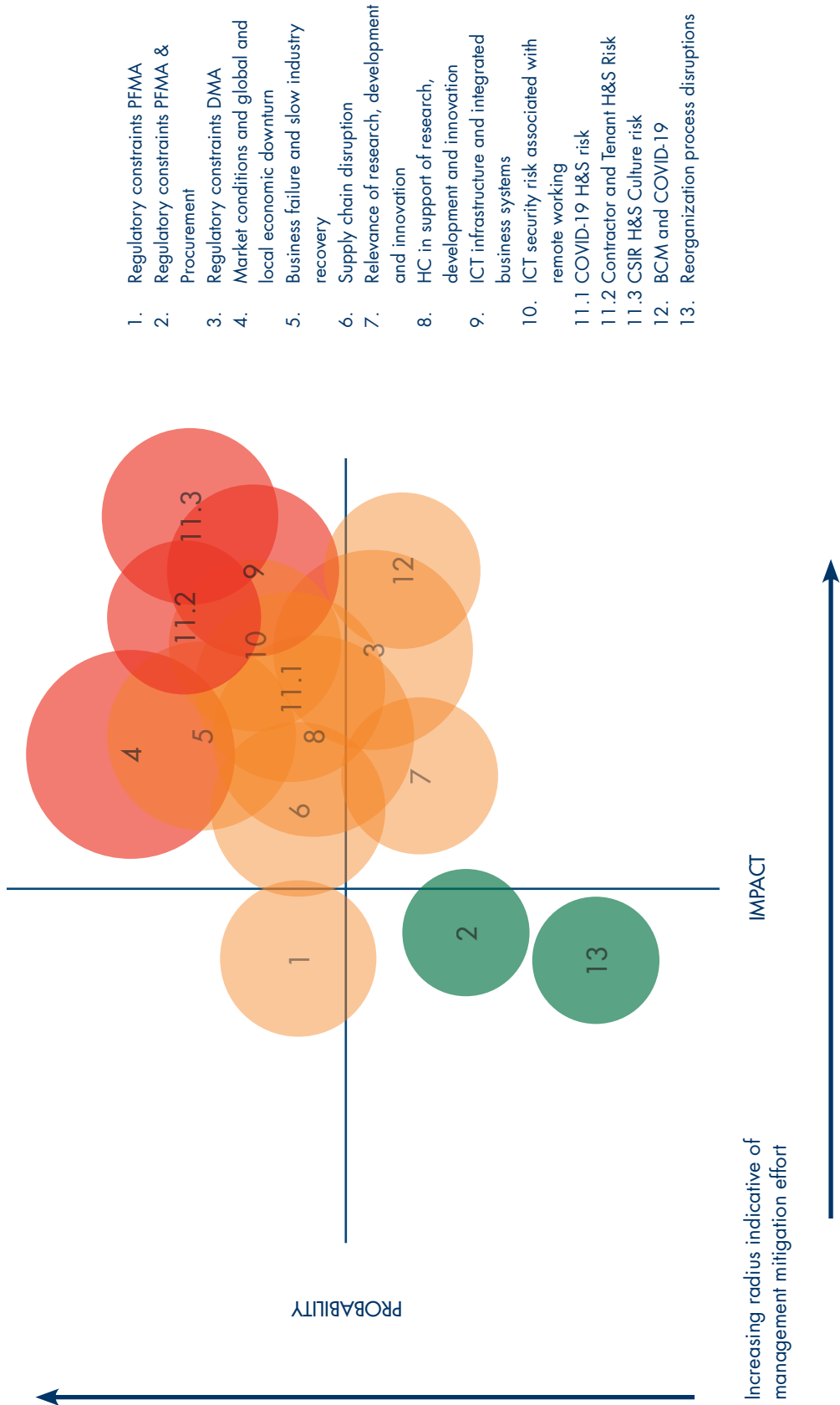


Figure D.6: CSIR risk heat map

E

Fraud Prevention Plan

E.1 Introduction

E.1.1 BACKGROUND

The CSIR FPP has been developed in compliance with section 3.2.1 of the Treasury Regulations of the PMFA. The CSIR subscribes to the principles of good corporate governance, which require business to be conducted in an honest, ethical and transparent manner. Consequently, the CSIR is committed to eradicating fraudulent behaviour at all levels within the organisation.

This FPP is premised on the CSIR's core ethical values driving the business of the CSIR, the development of its systems, policies and procedures, interactions with upstream and downstream stakeholders in its value chain and overall value proposition, including public and private sector customers, members of the public at large, suppliers and service providers, employees and its shareholder.

In alignment with the CSIR's core organisational EPIC values, this FPP is the cornerstone in promoting ethical conduct and determining how incidents or suspected incidents of fraud and corruption will be prevented, detected and investigated.

The CSIR has a **zero tolerance** appetite for fraud and corruption. The organisation has, to this end, established a whistleblowing facility to support the efforts of this FPP. This facility is operated on a 24/7 basis through an independent service provider.

The re-organisation of the CSIR support structure resulted in the establishment of a fit-for-purpose compliance function, under the Legal and Compliance portfolio. The adverse economic impact of the Covid-19 pandemic meant re-directing of funds away from curtailed planned and budgeted for functions and deferment of the certain of the Compliance functions of the portfolio. Business Ethics and Governance is one such functions. Because it remains important to establish the investigative and forensic capabilities and boost Legal and Compliance portfolio's skills base in this area, recruitment for this function will again be motivated for in the new financial year. Meanwhile, the Legal and Compliance function is training existing resources to acquire legal skills in this area; which skills will support any future incumbent in the role. A comprehensive process of establishing a combined assurance model with other key role-players in the business to drive an adequate and effective GRC capability was begun and will reach full maturity and functionality in the financial year 2021/22.

The FPP is a dynamic plan and will continuously evolve as the CSIR strives to further promote ethics and prevent fraud.



E.1.2 GLOSSARY OF TERMS AND ABBREVIATIONS

Throughout this FPP, unless otherwise stated, the words/abbreviations in the first column below have the meanings assigned to them in the second column (and cognate expressions shall bear corresponding meanings):

Abbreviation/ Term	Meaning Ascribed
Accounting Officer	A person as defined in terms of section 36 of the PFMA.
Approval Framework	The CSIR policy document specifying the decision matrix and levels of maximum approval authority for different role-players within the CSIR, as approved by the Board of the CSIR and as amended from time to time.
ARC	A committee constituted in terms of the requirements as prescribed by the Treasury Regulations of the PFMA and sound corporate governance practices. The ARC is established to assist the Board in discharging its duties, relating to the safeguarding of assets, the operation of adequate systems, control processes and the preparation of accurate financial reporting and statements in compliance with all applicable legal requirements and accounting standards.
Code	The CSIR Ethics Statement and Code of Conduct.
Conditions of Service	The CSIR Conditions of Service as approved by the Board of the CSIR in terms of section 12 of the Scientific Research Council Act and as amended from time to time.
Combined Assurance Plan	A planned approach, based on continuous risk analysis, designed to highlight the relevant high-risk areas and the assurance to be provided by management, compliance, external audit, internal audit and other consultants or service providers, in order for the CSIR Board to be appraised of the risk management efforts undertaken to manage the risks to an acceptable level and for assessing the extent and the adequacy of assurance on key organisational risks and reporting on those risks to senior management and the ARC, and in the context of fraud prevention, to the HRSEC.
Contracted Stakeholders	Those persons or parties with whom the CSIR has formal contractual relations, such as its shareholders, employees, suppliers/service providers, collaborators and customers.
Corruption	An act whereby anybody accepts any gratification from anybody else or offers or gives any gratification (benefit) to anybody else in order to influence the receiver to conduct herself or himself or itself in a way that amounts to the unlawful or irregular exercise of any duties.
CSIR	Council for Scientific and Industrial Research.



E.1.2 GLOSSARY OF TERMS AND ABBREVIATIONS (continued)

Abbreviation/ Term	Meaning Ascribed
Disciplinary Code and Procedure	A document that provides guidance when dealing with misconduct and poor work performance. It promotes regulated fairness, certainty and consistency in the application of discipline, establishes standards, principles and procedures when addressing misconduct, and encourages all employees to adhere to the appropriate standards of conduct by providing for progressive and corrective action, as approved by the Board of the CSIR and as amended from time to time.
ERMS	Enterprise Risk Management Services.
Ethics Hotline Procedure	Provides employees with an independent mechanism to bring any unethical business practices to the attention of management via telephone, e-mail, web-based tip-off facility, facsimile or post.
Event	An occurrence or a change of a particular set of circumstances.
Fixed Asset Policy	A document that governs the controls associated with the recognition, de-recognition, financing and transfer of assets as approved by the Board of the CSIR and as amended from time to time.
Fraud	The unlawful and intentional making of a misrepresentation, which causes actual prejudice or is potentially prejudicial to another.
Fraud Risk	The CSIR's vulnerability to fraud, based on the adequacy of the mechanisms designed and implemented to prevent, deter and detect fraud.
FPP	Fraud Prevention Plan.
Fraud prevention strategy	The CSIR's strategy to facilitate fraud prevention/fraud risk management and is a process that is adopted by the CSIR in putting mechanisms in place to manage CSIR's vulnerability to fraud. Such mechanisms are designed to prevent, deter and detect fraud.



E.1.2 GLOSSARY OF TERMS AND ABBREVIATIONS (continued)

Abbreviation/ Term	Meaning Ascribed
HRSEC	<p>The HR and Social and Ethics Committee constituted in terms of Regulation 43 of the Companies Act, 2008 (Act 71 of 2008) that has to monitor the company's activities with regard to matters relating to:</p> <ul style="list-style-type: none">• Social and economic development, including the company's standing in terms of the goals and purposes of:<ul style="list-style-type: none">– The 10 principles set out in the United Nations Global Company Principles,– The Organisation of Economic Co-operation and Development recommendations regarding corruption,– The Employment Equity Act; and– The Broad-Based Black Economic Empowerment Act (Act 53 of 2003);• Good corporate citizenship, including the company's:<ul style="list-style-type: none">– Promotion of equality, prevention of unfair discrimination and measures to address corruption,– Contribution to the development of the communities in which its activities are predominantly conducted or within which its products or services are predominantly marketed, and– Record of sponsorship, donations and charitable giving;• The environment, health and public safety, including the impact of the company's activities and of its products or services;• Consumer relationships, including the company's policies and records relating to advertising, public relations and compliance with consumer protection laws; and• Labour and employment matters.
ICT Policy	<p>Provides the framework within which the CSIR's computing facilities and assets that are provided to employees and CSIR representatives, for the purpose of conducting CSIR business, are administered and managed, as approved by the Board of the CSIR and as amended from time to time.</p>
Information Security Policy	<p>Expresses the CSIR's position and intent to implement, maintain and improve its information security measures as approved by the Board of the CSIR and as amended from time to time.</p>
Non-contracted Stakeholders	<p>Those persons or parties that do not have a formal contractual relationship with the CSIR, but are, nevertheless, affected by what the CSIR does or says, such as communities, the natural environment, and future generations.</p>

E.1.2 GLOSSARY OF TERMS AND ABBREVIATIONS (continued)

Abbreviation/ Term	Meaning Ascribed
PFMA	The Public Finance Management Act.
SO	Strategic Objective.
Stakeholders	Broadly defined as those who are affected by an organisation's decisions and actions inclusive of contracted and non-contracted stakeholders – see definitions for "contracted stakeholders" and "Non-contracted stakeholders."
Treasury Regulations	The regulations issued by National Treasury in support of the PFMA.

E.1.3 PURPOSE OF THE FPP

The purpose of the CSIR FPP is to establish an approach in dealing with fraud risk, and it recognises the basic fraud prevention initiatives within the CSIR, as well as identifies the custodians responsible for the creation of awareness, enforcement and investigation of incidents or suspected incidents of fraud and corruption.

The primary objectives of the CSIR FPP are to:

- Provide guidelines in preventing, detecting and reporting fraudulent activities within the CSIR;
- Create and encourage a culture within the CSIR where all stakeholders continuously behave ethically in their dealings with, or on behalf of the CSIR;
- Improve the application of applicable systems and compliance with applicable policies, procedures and regulations;
- Encourage all employees and stakeholders to strive towards the prevention and detection of fraud impacting or with the potential to impact on the CSIR;
- Encourage all employees and stakeholders to report suspicions of fraudulent activity without fear of reprisals or recriminations; and
- Provide a governance framework within which the initiatives that support the creation of awareness, enforcement and investigation of incidents, or suspected incidents of fraud and corruption, are implemented and overseen.

E.1.4 LEGISLATIVE CONTEXT

The FPP was developed with the aim of giving effect to the requirements and stipulations of the following legislations, among others, as amended from time to time:

- The Constitution of the Republic of South Africa, 1996;
- The PFMA
- Treasury Regulations issued in terms of the PFMA in April 2001;
- The Scientific Research Council Act;
- The Protected Disclosures Act, 2000 (Act 26 of 2000);
- The Prevention of Organised Crime Act, 1998 (Act 121 of 1998);
- The Prevention and Combatting of Corrupt Activities Act, 2004 (Act 12 of 2004); and
- All mandatory policies adopted by the Board of the CSIR contextualising legislative and related compliance requirements.

E.1.5 SCOPE OF APPLICATION

The FPP applies to all corruption, fraud, theft, financial misconduct and maladministration or suspected irregularities of such nature involving the following persons or entities:

- All members of the CSIR Board;
- All employees of the CSIR;
- Consultants, suppliers, contractors and other providers of goods or services to the CSIR; and
- All parties representing the CSIR and its business activities in an official capacity.

E.1.6 POLICY STANCE

The policy of the CSIR is one of **zero tolerance** to fraud and corruption. All alleged cases of fraud and corruption will be investigated and followed up by the application of all remedies available to the full extent of the law, and the implementation of appropriate prevention and detection measures. These measures include existing financial and related controls and verification mechanisms as prescribed in the systems, policies and procedures of the CSIR.

The CSIR seeks and intends to facilitate a culture of disclosure of information relating to suspected fraud and related misconduct by employees in a responsible manner. Employees and stakeholders are encouraged to report suspicions of fraudulent activity without fear of reprisals or recriminations.

The efficient application of instructions and guidance contained in the regulations, policies and procedures of the CSIR is one of the most important duties of every employee in the execution of his/her daily tasks.

The CSIR's policy stance is currently encapsulated in various CSIR policies and procedures, including, but not

E.1.6 POLICY STANCE *(continued)*

limited to, the Code, the CSIR Conditions of Service, CSIR Disciplinary Code and Procedure, CSIR ICT Policy, the Information Security Policy and the CSIR Ethics Hotline Procedure.

To ensure that there is no uncertainty among employees and stakeholders about the policies and procedures that shape the CSIR's approach to fraud, the CSIR has established a dedicated Compliance function within the Legal and Compliance portfolio.

The Compliance function serves a management function primarily focused on devising, implementing and overseeing organisational processes to meet its statutory and regulatory obligations. The Compliance function's objective is to integrate legal analysis, design and implement appropriate controls and form part of the Combined Assurance Plan of the organisation. Compliance services focus on educating the Board, senior management and other employees, as well as preventing and rooting out misconduct, whether legal, ethical, criminal or otherwise. Upon its implementation, the Compliance function will serve as the dedicated custodian of fraud prevention, fraud risk management and the process that is adopted by the CSIR in putting mechanisms in place to manage the CSIR's vulnerability to fraud. Such mechanisms are designed to prevent, deter and detect fraud.

E.2 Components of the FPP

E.2.1 GUIDING PRINCIPLES

The FPP of the CSIR is based upon the CSIR's EPIC values of pursuit of "Excellence", being "People" centred, personification of "Integrity" and welcoming "Collaboration". The FPP places emphasis on Integrity. This principle is founded on honesty in business and other dealings, creating a culture of openness and disclosure, promoting the eradication of criminal, unethical and other irregular conduct and adopt a zero-tolerance approach towards fraud and corrupt activities.

This plan applies to all allegations, attempts and incidents of fraud that have an impact on or with the potential to impact the CSIR.

All CSIR employees, management and other stakeholders must comply with the spirit and content of the plan.

A person who holds a position of authority as stipulated in section 34 of the Prevention and Combatting of Corrupt Activities Act, should report any suspected corrupt activity and/or an offence of theft/fraud to the police.

E.2.2 COMPONENTS

The CSIR's FPP encompasses controls that have three SOs:

- Prevent instances of fraud and corruption from occurring;
- Detect instances of fraud and corruption when they do occur; and
- Respond appropriately and take corrective action when fraud and corruption happens.

E.2.2 COMPONENTS (continued)

The FPP provides the CSIR with tools to manage fraud and corruption risk and has four phases:

- Assessment of organisational needs, based upon the nature of fraud and corruption risks and existing control environment;
- Design of programmes and controls in a manner that is consistent with legal and regulatory requirements, as well as best practices;
- Implementation of programmes and controls through the assignment of roles, building of internal competencies, training and deployment of resources; and
- Evaluation of programme and control design, implementation and operational effectiveness.

Fraud prevention is a business imperative, and a shared responsibility between management and employees. The FPP forms part of the Shareholder's Compact that is approved by the CSIR Board annually.

The components of the FPP are as follows:

- The CSIR's core organisational EPIC values;
- The Code;
- CSIR systems, policies, procedures, rules and regulations;
- The CSIR Disciplinary Code and Procedure;
- Internal controls to prevent and detect fraud;
- Physical and information security management;
- Internal Audit function;
- Ongoing risk assessments;
- Reporting and monitoring of fraud allegations;
- Creation of fraud and corruption awareness among employees and relevant stakeholders through communication and education;
- Continued implementation of a combined assurance forum to steer and take responsibility for the FPP and ensuring the effective implementation thereof, in support of combined assurance that key fraud risks are being managed appropriately in the CSIR; and
- Ongoing maintenance and review of the FPP.

The key deliverables of the FPP are to raise awareness about potential fraud and corruption, and put fraud prevention and response strategies in place.

In addition to the generic risks and mitigation strategies identified below, the CSIR has also developed and maintains a CSIR Fraud Risk Register as a sub-set of the overall organisational Risk Register. The Fraud Risk Register is a key outcome of the risk identification and assessment process and includes all key risks that require a mitigating response.

E.3 Approach to Fraud Prevention

E.3.1 PREVENTING FRAUD

Fraud prevention strategies are the first line of defence and provide the most cost-effective method of controlling fraud within the CSIR. To be effective, fraud prevention requires a number of contributory elements, including an ethical organisational culture, a strong awareness of fraud among stakeholders and an effective internal control framework.

I. THE CODE (THE CSIR ETHICS STATEMENT AND CODE OF CONDUCT)

The Code establishes clear guidelines for contracted and non-contracted stakeholders of the CSIR regarding the standard of conduct required in their internal and external dealings for and on behalf of the CSIR.

The generic risks identified by the CSIR in application of the Code, are as follows:

- Lack of buy-in or compliance with the requirements of the Code by management and employees or official CSIR representatives;
- Lack of awareness and/or inadequate communication and training strategy relating to the Code;
- Employees with low integrity and/or standards of professional conduct seeking to enhance personal benefit; and
- Strict compliance with and acceptance of gifts and strong disclosure elements.

Strict compliance with the Code by employees and CSIR representatives, both in its spirit and content, addresses the aforementioned risks. However, recognising that striving to achieve such a status and culture of compliance in totality is idealistic, the CSIR will pursue the following tactics to improve the professional ethics and conduct of its employees and representatives:

- A copy of the Code will be circulated to all employees and CSIR representatives and will be included in induction packs for new employees/representatives;
- All employees will be required to sign a declaration annually, serving as an indication of their understanding of, commitment to and compliance with the Code; and
- Relevant aspects of the Code will be included in awareness presentations, training sessions and communication programmes to create awareness thereof among employees and relevant stakeholders. Further objectives of this training will include the following:
 - Assisting stakeholders to understand the meaning of fraudulent and corrupt behaviour;
 - Presenting case studies to assist employees in developing behaviour to articulate and encourage attitudes and values that support ethical behaviour in all conduct; and
 - Communicating the implications of unethical behaviour and its impact for individuals, the workplace, professional relationships, the CSIR as a whole, external stakeholders and the public.

E.3.1 PREVENTING FRAUD (continued)

The CSIR Manager: Compliance will be responsible for reviewing and reviving the relevance and implementation of the Code, its communication and supportive education. Currently, pending the appointment of this professional, this function rests with the Acting Manager: Compliance assisted by Senior Legal Counsel within the Legal and Compliance portfolio.

II. SYSTEMS, POLICIES, PROCEDURES, RULES AND REGULATIONS

The CSIR has a number of systems, policies, procedures, rules and regulations designed to ensure compliance with prevailing legislation and limit the risk of fraud. Fundamentally, all stakeholders should be fully conversant and compliant with these. In addition, several operational measures have been designed to control business activities.

The generic risks identified by the CSIR, in terms of systems, policies, procedures, rules and regulations, are as follows:

- Lack of knowledge and understanding of prevailing policies and procedures among employees;
- Lack of structured awareness and training programmes for employees in applicable policies, procedures, rules and regulations;
- Non-adherence with policies and procedures, as a result of weaknesses in systems and tools;
- Lack of proper delegation; and
- Non-compliance due to an absence of a culture of compliance and shared value system.

The aforementioned risks suggest that controls should be reviewed continuously to secure tolerable levels of compliance.

The CSIR recognises that its employees are often best placed to identify shortcomings or weaknesses in systems and procedures. Therefore, it is committed to harnessing this knowledge through the development of a structured programme aimed at encouraging employee commitment and effort in reporting such weaknesses.

In addition, the CSIR will undertake the following actions to mitigate the risks identified:

- The Code was approved by the Board, paving a way for structured continuous training of stakeholders on its principles and practical implications for stakeholders. It is envisaged that this training will be compulsory (to employees). It will take the form of in-person training (within existing Covid-19 protocols), online tuition, CSIR Intranet snippets, etc.
- Creative re-launch of the whistle blower hotline through awareness days, employee competitions, posters, etc., all with emphasis on its purpose, processes, proper use, implications for its abuse and acceptance by stakeholders.
- Review of other CSIR policies that may be in conflict with the Code to bring them to harmony with the Code's core principles and prescribed procedures.
- Distribution of pocket-size quick reference booklet on the Code to employees.

E.3.1 PREVENTING FRAUD (continued)

- Internal audits and ad hoc risk assessments, either in accordance with a combined assurance plan or due to a perceived risk, will be undertaken to monitor and evaluate the extent of compliance with policies and procedures.
- In instances where breaches occur, swift and appropriate disciplinary action will be undertaken to set an example to other potential wrongdoers.
- A specific effort will be made to ensure that measures are put in place for the censure of suppliers and/or other providers of goods and/or services who are found guilty of unethical conduct or other irregularities. Any employee found to be colluding with suppliers will be subjected to immediate disciplinary action with a possible sanction of dismissal and/or personal liability for losses suffered.

III. DISCIPLINARY CODE AND PROCEDURE

The CSIR Disciplinary Code and Procedure prescribes appropriate steps to be taken to resolve disciplinary matters. The identified risks of fraud with regard to discipline and the application thereof are as follows:

- In some instances, the disciplinary process is too lengthy;
- Inadequate training of investigating officers presenting the case and parties chairing or adjudicating the charges;
- Inadequate maintenance and security of source documents to be used at disciplinary, criminal and civil proceedings; and
- Inconsistent application of disciplinary actions and outcomes.

The CSIR recognises that the consistent and efficient application of disciplinary measures is an integral component of making the FPP a success. The CSIR will continue to pursue the following steps to ensure the consistent, efficient and speedy application of disciplinary measures:

- The review and re-alignment of the Disciplinary Code and Procedure by HC department by specifically establishing offences premised on the breach of principles and rules laid down in the Code; and working with Legal and Compliance portfolio, create a continuous training and awareness programme.
- Making all managers are aware of the content of the Disciplinary Code and Procedure, their responsibility for maintaining discipline, the standards of discipline expected, the procedure for the application of disciplinary measures and the disciplinary process through communication and awareness exercises.
- Ongoing training of managers and investigating officers with regard to the content of the Disciplinary Code and Procedures, the application of disciplinary measures and process, and sustaining this training in conjunction with the Compliance function and HR department.
- The development of a system to facilitate the consistent application of disciplinary measures, e.g. a monitoring system that includes proper record keeping of all disciplinary actions taken.
- The development of a system where managers are held accountable for the management and addressing of misconduct and fraud within their areas of oversight.

E.3.1 PREVENTING FRAUD (continued)

IV. INTERNAL CONTROLS

This section of the FPP relates to basic internal controls to prevent and detect fraud. The systems, policies, procedures, rules and regulations of the CSIR prescribe various controls, which, if effectively implemented, will limit fraud within the CSIR. These controls may be categorised as follows, it being recognised that the categories contain overlapping elements:

- Prevention controls: These are divided into two sub-categories, namely;
 - Authorisation, and
 - Physical;
- Detection controls: These are divided into four categories, namely:
 - Arithmetic and accounting,
 - Physical,
 - Supervision, and
 - Management Information; and
- Segregation of Duties.

Prevention Controls

- **Authorisation:**

All transactions require authorisation or approval by a responsible person with the appropriate authority limits. The authority limits are specified in the CSIR Approval Framework, the latter having been recently reviewed and approved by the Board.

- **Physical:**

These controls are mainly concerned with the custody of assets and involve procedures and security measures designed to ensure that access to assets is limited to personnel who have been duly authorised, in writing. The CSIR Fixed and Movable Assets Policy governs the controls associated with the recognition, de-recognition, financing and transfer of assets.

Detection Controls

- **Arithmetic and accounting:**

These are basic controls within the recording function that check that transactions to be recorded and processed have been authorised and that they are completely and correctly recorded and accurately processed. Such controls include checking the arithmetical accuracy of the records, the maintenance and checking of totals, reconciliation and accounting for documents.

- **Physical:**

These controls relate to the security of records. Therefore, they underpin arithmetic and accounting controls. Their similarity to preventive controls lies in the fact that they are also designed to limit access to unauthorised persons.

E.3.1 PREVENTING FRAUD (continued)

- **Supervision:**

This control relates to managers' supervision of day-to-day transactions and the recording thereof.

- **Management Information:**

This relates to the review of management accounts and budgetary control. These controls are normally exercised by management outside the day-to-day routine of the system.

Segregation of duties

The lack of segregation of duties, or the overriding of existing internal controls, is a generic risk that exposes the CSIR to the inherent risk of fraud and manipulation of data. One of the primary means of control is the separation of those responsibilities or duties, which, if combined, enables one individual to record and process a complete transaction, thereby providing him/her with the opportunity to manipulate the transaction irregularly and commit fraud.

Segregation of duties reduces the risk of intentional manipulation or error and increases the element of verification.

Functions that should be separated include those of recording, checking, authorisation, approval, custody, execution and, in the case of computer-based accounting systems, system controller functions and daily operations.

In the context of fraud, segregation of duties lies in separating either the authorisation or custodial function from the verification function.

To ensure that these internal controls are applied effectively and consistently, deficiencies and non-compliance identified by internal audit will be addressed as follows:

- The CSIR will continue to regularly re-emphasise to all managers that consistent compliance by employees with internal control is in itself one of the fundamental controls in place to prevent fraud. Managers will be encouraged to recognise that internal control shortcomings identified during the course of audits are, in many instances, purely symptoms and that they should strive to identify and address the causes of these internal control weaknesses.
- The CSIR will ensure that the performance appraisal of senior managers will take into account the number of audit queries raised and the level of seriousness of the consequent risk to the CSIR, as a result of the internal control deficiency identified. This is intended to raise the level of accountability for internal control by the Accounting Officer and managers. Where managers do not comply with basic internal controls, e.g. non-adherence to the limits of the CSIR Approval Framework, firm disciplinary action will be considered.

V. PHYSICAL AND INFORMATION SECURITY

- **Physical security:**

Recognising that effective physical security is one of the "front line" defences against fraud, the CSIR will take regular steps to improve it and access control at its sites of operation, in order to limit the risk of theft of assets. The CSIR will also conduct a regular review of the physical security arrangements at its offices and facilities, and improve on weaknesses identified.

E.3.1 PREVENTING FRAUD (continued)

- **Information security:**

The CSIR will ensure that employees are sensitised to the risks of fraud associated with poor management of information security on a regular basis, in order to enhance their understanding thereof and the risks to the CSIR associated with poor control over confidential information.

Regular reviews of information and computer security will also be considered. Weaknesses identified during these reviews will be addressed with the respective managers. The CSIR Information Security Policy expresses the CSIR's position and intent to implement, maintain and improve its information security measures.

E.3.2 DETECTING, REPORTING AND INVESTIGATING FRAUD

Detection controls are designed to discover any fraud or corruption as soon as possible after it has occurred. In spite of best practice prevention activities, fraud and corruption may occur. The next line of defence is a robust suite of detection strategies to discover any incident of fraud and corruption as soon as possible to minimise any detrimental impacts. The CSIR's detection controls include:

- Maintaining an effective system of internal controls;
- Review and approval of financial transactions;
- Review and approval of management reports;
- Internal and external audits;
- Monitoring and evaluation;
- Data analysis; and
- The CSIR Ethics Hotline Procedure to report allegations of fraud, corruption and unethical conduct.

I. RESPONSE

The CSIR's response strategies that ensure appropriate mechanisms are in place to:

- Take corrective actions;
- Minimise the impact of fraud and corruption risks;
- Improve prevention and detection strategies; and
- Report any occurrences to the relevant stakeholders.

All identified occurrences of fraud and corruption will be investigated in accordance with the principles enshrined in the Protected Disclosure Act, 2000 (Act 26 of 2000), the CSIR Ethics Hotline Procedure and this FPP. The principles include confidentiality, protection from victimisation and the application of justice.

Key CSIR response strategies include:

- Investigation of all allegations of fraud and corruption;
- Central registry of all fraud and corruption allegations maintained, reported and monitored;

E.3.2 DETECTING, REPORTING AND INVESTIGATING FRAUD (continued)

- Disciplinary procedure;
- Review of internal controls post incident;
- Implementation of corrective and preventative actions and recommendations;
- Recovery of losses; and
- Fidelity and employee dishonesty insurance.

II. FRAUD POLICY AND FRAUD RESPONSE PLAN

The CSIR's policy stance is currently encapsulated in various CSIR policies and procedures, including but not limited to, the CSIR Code of Conduct/Ethics, the CSIR Conditions of Service, CSIR Disciplinary Code and Procedure, CSIR ICT Policy, the IS Policy and the CSIR Ethics Hotline Procedure. To ensure that there is no uncertainty among employees and stakeholders about the policies and procedures that shape the CSIR's approach to fraud, the CSIR has developed for implementation a dedicated Fraud Prevention Policy aligned with the FPP and the associated strategy. This policy is intended for Board approval in February 2021.

III. WHISTLE BLOWING AND PROTECTION OF WHISTLE BLOWERS AND THE FALSELY ACCUSED

Based on the Protected Disclosures Act, the CSIR commits itself to guarantee protection to whistle blowers and stakeholders against victimisation and is intended to encourage and enable stakeholders to raise serious concerns without fear of victimisation. To ensure that the protection measures are effective, the hotline is administered by an outside third party organisation that undertakes strict confidentiality. It is also important for the organisation to get the right CSIR professionals trained in and who understand professional privilege and confidentiality in the conduct of investigations and consistently taking disciplinary action against those who breach this confidentiality and privilege. Through education and screening reported cases to establish prima facie facts and evidence pointing to possible misconduct or breach of the Code and, where necessary, taking disciplinary action against the false accusers, the CSIR aims to limit incidents of abuse.

E.3.3 FURTHER IMPLEMENTATION AND MAINTENANCE

I. CREATING AWARENESS

This component of the plan comprises two approaches, namely education and communication. The strategic weaknesses identified in this area are as follows:

- Lack of a formalised strategy to create awareness among employees of the manifestations of fraud and the risks of fraud facing the CSIR; and
- Lack of knowledge of approaches to prevent and detect fraud in specific processes and transactions.

Key CSIR response strategies include:

- **Education:** The CSIR will ensure that regular presentations and formal training are carried out for employees to enhance their understanding of the manifestations of fraud, prevention and detection techniques and the components of the FPP.
- **Communication:** Communication is crucial in creating awareness of the FPP among employees and other stakeholders. This is intended to facilitate a culture where all stakeholders strive to make the FPP a success and sustain a positive, ethical culture within the CSIR. This will increase the prospect of fraud being reported and improve the CSIR's prevention and detection ability.

The CSIR will consider various means of communicating its fraud prevention initiatives, including the following:

- Conducting workshops and creating awareness about the FPP;
- Developing a poster campaign aimed at all stakeholders to advertise the CSIR stance to fraud and its expectations with regard to the ethics and integrity of all stakeholders;
- Circulating appropriate sections of the Code to other stakeholders, e.g. consultants and contractors;
- Publicising "lessons learned", following investigations into allegations of fraud among employees;
- Circulating successes related to the FPP and fraud modus operandi;
- Placing notices or other communiqués related to the FPP on notice boards and other areas to which employees and the public have access;
- Giving copies of the Code to suppliers of goods and services and seeking commitments from them, in writing, as a precondition to contracting with the CSIR;
- Developing promotional items communicating the FPP or components thereof; and
- Using the Intranet to communicate issues relating to the prevention and detection of fraud, including matters reported and action taken.

E.3.3 FURTHER IMPLEMENTATION AND MAINTENANCE (continued)

Combined assurance forum

The CSIR has established an operationally based combined assurance collaboration forum to steer and take responsibility for the FPP and ensure the effective implementation thereof, in support of combined assurance and ensuring that key fraud risks are being managed appropriately in the CSIR.

The objectives of the combined assurance forum are mainly to:

- Identify and specify the sources of assurance over the CSIR's risks;
- Provide the ARC, HRSEC, Accounting Officer and Executive Management with a framework of the various assurance parties;
- Establish a combined assurance strategy and plan;
- Link risk management activities with assurance activities;
- Assist the Accounting Officer with reviewing the effectiveness of the risk management system; and
- Provide a basis for identifying any areas of potential assurance gaps.

The forum is responsible for the ongoing maintenance and review of the FPP, including:

- Evaluating reports of fraud and highlighting areas of risk within the CSIR;
- Considering fraud threats to the CSIR and addressing them;
- Monitoring action taken to implement recommendations relating to incidents of fraud;
- Steering and taking responsibility for the FPP;
- Reviewing and making appropriate amendments to the FPP;
- Continuous monitoring of the effectiveness of controls already in place and making improvements where necessary; and
- Ensuring that ongoing implementation strategies are developed and carried out.

II. CONTROL ENVIRONMENT

The CSIR's ARC and HRSEC significantly influence the fraud control environment, particularly by overseeing the tone at the top. This is done in the discharge of its duties in terms of the PFMA and Treasury Regulations.

The ARC and HRSEC systematically oversee, and periodically review the internal controls established by the management of CSIR. Oversight extends to:

- Enterprise risk and fraud risk management;
- The potential for management to override controls or exercise other inappropriate influence over the financial reporting process;
- Mechanisms for employees to report concerns;
- Receipt and review of periodic reports describing the nature, status and eventual resolution of alleged or suspected fraud;



E.3.3 FURTHER IMPLEMENTATION AND MAINTENANCE (continued)

- An internal audit plan that addresses fraud risk, and a mechanism to ensure that internal audit can express any concerns about management's commitment to appropriate internal controls, or to report suspicions or allegations of fraud;
- The involvement of other experts, such as legal and HR, as needed to investigate any alleged or suspected wrongdoing;
- The review of accounting principles, policies and reasonableness of significant estimates used by the CSIR;
- The review of significant non-routine transactions (if any) entered into by management and employees; and
- Functional reporting by internal and external auditors to the ARC.

III. INDEPENDENT ASSURANCE

The internal and external auditors will provide an independent assurance on the adequacy and effectiveness of CSIR's internal controls to prevent, detect and manage fraud and corruption. The independent risk assurers will also advise on the effectiveness of the CSIR's FPP.

E.4 Conclusion

The CSIR proposes a proactive and progressive approach towards managing fraud risk in the organisation. It seeks to make ethics and integrity an intuitive response to ethical dilemmas confronting all CSIR stakeholders. The approach seeks to entrench ethical principles as an important consideration in business transacting and laying a foundation for sustainable collaboration with all stakeholders. This exercise is much in line with the stated EPIC values that aim to make the organisation and its people a blueprint of business morality. Consequently, the CSIR has adopted a zero tolerance approach towards fraud, theft and corruption and will continue to take the necessary measures to ensure that the risks are managed effectively.



F

Materiality/Significance Framework

EXECUTIVE SUMMARY

In terms of Treasury Regulations for government departments, trading entities, constitutional institutions and public entities, issued in terms of the PFMA, the CSIR must have a materiality framework of acceptable levels of materiality and significance within the organisation.

The CSIR's reputation, built over more than half a century, depends on the nature of every business transaction, conducted by every employee, on a daily basis. It is built on an implicit set of values, which inspire our employees to maintain the highest ethical standards in all their dealings with our clients and stakeholders, as well as their relationships within the CSIR.

The CSIR is committed to a policy of fair dealing and integrity in conducting its business. This commitment is based on a fundamental belief in honest, fair and legal conduct in all business activities. We expect all our employees to share this commitment to high morals, ethics and legal standards.

Ethics involve the ability to distinguish right from wrong and a commitment to do what is right. Values are core beliefs that create individual attitudes. Although individual values may differ, this does not imply a choice about behaving ethically in the business environment of the CSIR. Our Code of Conduct, as well as the Constitution of the Republic of South Africa and the national laws and regulations, prescribe the legal conduct that embodies values based on ethical principles, while respecting cultural diversity.

F.1 Treasury Regulation 28.1.5

"For purposes of "material" [sections 50(1), 55(2) and 66(1) of the Act] and "significant" [section 54(2) of the Act], the Accounting Authority must develop and agree on a framework of acceptable levels of materiality and significance with the relevant Executive Authority, in consultation with the external auditors."

(HOWEVER, THE CSIR HAS BEEN EXEMPTED FROM SECTION 54 (2) AND THIS SCHEDULE DOES NOT INCLUDE THIS SUBSECTION.)



Table F.1 – Materiality/Significance framework

		MATERIAL
Section 50 (1)	<p>(1) The Accounting Authority for a public entity must –</p> <p>(a) Exercise the duty of utmost care to ensure reasonable protection of the assets and records of the public entity;</p> <p>(b) Act with fidelity, honesty, integrity and in the best interest of the public entity in managing the financial affairs of the public entity;</p> <p>(c) On request, disclose to the Executive Authority responsible for that public entity or the legislature to which the public entity is accountable, all material facts, including those reasonably discoverable which, in any way, influence the decision or actions of the Executive Authority or that legislature; and</p> <p>(d) Seek within the sphere of influence of that Accounting Authority, to prevent any prejudice to the financial interests of the state.</p>	<p>Significant audit findings that could negatively impact the CSIR's operations and the attainment of strategic goals.</p> <p>The CSIR sets high standards on fidelity, honesty and integrity. The best interest of the public entity is always relevant in fulfilling its mandate and in the execution of the Shareholder's Compact. Any acts of dishonesty, infidelity and others that are not in the best interests (from a research, financial and reputation perspective) of the CSIR are viewed in a serious manner.</p> <p>The CSIR is committed to disclosing any relevant information to its stakeholders. Materiality can only be determined if the nature of the information is known.</p>

Table F.1 – Materiality/Significance framework

		MATERIAL
Section 55 (2)	<p>(2) The annual report and financial statements referred to by subsection 55 (1)(d) of the PFMA must -</p> <p>(a) Fairly present the state of affairs of the public entity, its business, financial results and performance against pre-determined objectives and its financial position as at the end of the financial year concerned;</p> <p>(b) Include particulars of –</p> <p>(i) any material losses through criminal conduct and any irregular expenditure and fruitless and wasteful expenditure that occurred during the financial year;</p> <p>(ii) any criminal or disciplinary steps taken as a consequence of such losses or irregular expenditure or fruitless and wasteful expenditure;</p> <p>(iii) any losses recovered or written off;</p> <p>(c) include the financial statements of any subsidiaries</p>	<p>Significance/materiality is calculated as 1% of revenue, which amounts to R28 692 000. R1 000 000. All cases are unique and will, thus, be treated as such. These will be subject to internal audit reviews.</p> <p>R1 000 000. All cases are unique and will, thus, be treated as such. Issues that inform steps to be taken are:</p> <ul style="list-style-type: none"> • The level of responsibility and position of the person involved; • The affected core business/support/operational; and • The impact on other areas of operation of the CSIR. <p>These will be subject to internal audit reviews.</p> <p>R1 000 000 (excluding losses incurred through normal operating activities)</p> <p>Will disclose as prescribed.</p> <p>Will disclose as prescribed.</p> <p>All subsidiaries are consolidated.</p>



Table F.1 – Materiality/Significance framework

		MATERIAL
Section 66 (1)	(1) An institution to which this Act applies may not borrow money or issue a guarantee, indemnity or security or enter into any other transaction that binds or may bind that institution or the Revenue Fund to any future financial commitment, unless such borrowing, guarantee, indemnity, security or other transaction – (a) Is authorised by this Act; (b) In the case of public entities, is also authorised by other legislation not in conflict with this Act; and (c) In the case of loans by a province or a provincial government business enterprise under the ownership control of a provincial executive, is within the limits as set in terms of the Borrowing Powers of Provincial	The CSIR complies with this requirement.

G

Financial Plan

G.1 CSIR Budget and Parliamentary Grant Cash flow 2021/22

G.1.1 CSIR STATEMENTS OF COMPREHENSIVE INCOME OVER THE MTEF PERIOD

Table G.1: Statement of Comprehensive Income – MTEF Period

	Forecast 2020/2021 R'000	Budget 2021/2022 R'000	Budget 2022/2023 R'000	Budget 2023/2024 R'000
Total Operating Revenue	2 630 100	2 869 225	3 261 310	3 424 084
R&D Contract Income	1 924 600	2 140 288	2 516 695	2 675 115
Public – South Africa	1 453 000	1 598 000	1 719 480	1 805 454
Private – South Africa	236 800	255 000	420 012	462 013
International	137 700	162 000	247 280	272 008
Parliamentary Grant – Ringfenced	97 100	125 288	129 923	135 640
Parliamentary Grant	703 100	725 537	741 615	744 469
Royalty Income	2 300	2 000	3 000	4 500
Other Income	100	1 400	–	–
Total Expenditure	2 716 700	3 000 900	3 336 865	3 480 830
Employees' Remuneration	1 518 400	1 672 000	1 878 240	1 960 883
Operating Expenses	1 060 000	1 158 000	1 286 016	1 343 887
Depreciation	138 300	170 900	172 609	176 061
Operating Profit before Investment Income	(86 600)	(131 675)	(75 555)	(56 747)
Net Finance Income	36 500	35 600	36 312	37 038
NET PROFIT/(LOSS)	(50 100)	(96 075)	(39 243)	(19 708)

G.1.2 CSIR STATEMENTS OF FINANCIAL POSITION OVER THE MTEF PERIOD

Table G.2: Statement of Financial Position over the MTEF Period

	Forecast March 2021 R'000	Budget March 2022 R'000	Estimate March 2023 R'000	Estimate March 2024 R'000
ASSETS				
Non-Current assets	751 843	703 343	650 734	770 558
Property, plant, equipment and lease assets	744 889	696 389	643 780	763 604
Interest in Joint Ventures and Associates	2 304	2 304	2 304	2 304
Interest in Subsidiaries	4 650	4 650	4 650	4 650
Current Assets	804 113	768 132	802 024	683 894
Trade and other receivables	315 612	344 307	391 357	410 890
Inventory and contracts in progress	(578 622)	(631 230)	(717 488)	(753 298)
Cash and cash equivalents	1 067 123	1 055 055	1 128 155	1 026 303
TOTAL ASSETS	1 555 956	1 471 475	1 452 758	1 454 452
EQUITY AND LIABILITIES				
Reserves	1 082 644	986 569	947 326	927 617
Retained earnings	1 082 644	986 569	947 326	927 617
Non-current liabilities	23 807	22 737	21 788	20 946
Post retirement medical benefits and lease liabilities	23 807	22 737	21 788	20 946
Current Liabilities	449 505	462 169	483 644	505 889
Advances received	131 505	114 769	97 839	102 723
Trade and other payables	318 000	347 400	385 805	403 166
TOTAL EQUITY AND LIABILITIES	1 555 956	1 471 475	1 452 758	1 454 452

One needs to consider the budgeted cash balance of R1.05 billion in conjunction with the current liabilities of R462 million. The current ratio (current assets/current liabilities) is expected to remain at approximately 2.



G.1.3 CSIR CASH FLOW STATEMENT

Table G.3: CSIR Cash-Flow Statement

	March 2021 R'000	March 2022 R'000	March 2023 R'000	March 2024 R'000
Cashflow from operating activities				
Cash receipts from external customers	1 824 419	2 150 865	2 541 974	2 664 965
Parliamentary Grant income	703 100	725 537	741 615	744 469
Cash paid to suppliers and employees	(2 627 422)	(2 800 600)	(3 125 851)	(3 427 482)
Cash generated from operating activities	(99 903)	75 802	157 738	(18 048)
Net finance income	36 500	35 600	36 312	37 038
Net cash from operating activities	(63 403)	111 402	194 050	18 990
Cashflow from investing activities				
Increase in interest in joint ventures and associates	–	–	–	–
Decrease in long term receivables	292	–	–	–
Acquisition of property, plant and equipment	(122 400)	(122 400)	(120 000)	(120 000)
Net cash utilised in investing activities	(122 108)	(122 400)	(120 000)	(120 000)
Cashflow from financing activities				
Decrease in non-current liabilities	(1 203)	(1 070)	(950)	(841)
Net cash generated from financing activities	(1 203)	(1 070)	(950)	(841)
Net increase in cash and cash equivalents	(186 714)	(12 068)	73 100	(101 852)
Cash and cash equivalents at beginning of the year	1 253 837	1 067 123	1 055 055	1 128 155
Cash and cash equivalents at end of the year	1 067 123	1 055 055	1 128 155	1 026 303



G.1.4 TWELVE MONTH CASH FLOW PROJECTION FOR PARLIAMENTARY GRANT: 2020/21 (INCLUDING VAT)

Table G.4: Cash-Flow for Parliamentary Grant

R'000	Total	April	July	October	January
	1 315 653	328 913	328 913	328 913	328 912
Baseline	834 368				
National Laser Centre	39 506				
Laser Loan Programme	11 598				
African Laser Centre	6 336				
WEF Affiliate Centre	28 373				
Implementation: ICT R&D Roadmap	58 268				
Infrastructure Programme	62 000				
Cyber Infrastructure (NICIS)	275 204				

G.1.5 PPE BUDGET SUMMARY

Table G.5: PPE Budget Summary

Category	2021/22 R'000
Buildings	5 850
Equipment	32 609
ICT Equipment	37 544
Furniture and fittings	45 735
Vehicles	661
TOTAL	122 400

The budgeted investment in property, plant and equipment for the 2021/22 financial year is R122.4 million, which includes fully funded grant assets.

Notwithstanding the fact that an item is included in the property, plant and equipment budget, the investment remains subject to approval as per the Approval Framework of the CSIR and additional considerations such as strategic alignment, return on investment and available cash flow.

G.1.6 ALIGNMENT OF PARLIAMENTARY GRANT BUDGET AND STRATEGIC OBJECTIVES

The CSIR's Parliamentary Grant (PG) baseline allocation is guided by the CSIR's 2019 PG Investment Policy. The policy is aimed at ensuring that PG is invested efficiently and effectively across the organisation and in line with the new strategy. The process involves a newly established PG Investment Committee, which recommends annual PG Investment Plans to the CSIR Executive Committee for approval based on the CSIR Strategy direction.

The new CSIR PG Investment Policy has informed the development of a new fund, the Commercialisation Fund, to ensure that PG is invested to facilitate the deployment and diffusion of CSIR technologies and innovations to the market. The PG is also invested in infrastructure and capability development initiatives and this has entailed initial capitalisation of newly established research centres which are part of the new operating model.

As at the final compilation of this CSIR Shareholder's Compact 2021/22, the annual PG baseline allocation letter from the Shareholder's department has not been received, hence only the proportions of anticipated investments of the estimated PG baseline allocations have been provided (Table G.6a). Additionally, only historical percentages for PG Investment by Strategic Objectives (Table G.6b) have been used.

Table G.6a: Link between Parliamentary Grant and CSIR Strategic Objectives

PG Investment/ Allocation Categories	PG Investment Sub- categories	Estimated proportion of PG baseline Investment/Allocation	Alignment with Strategic Objectives
PG baseline investment to Divisions/Clusters	Division 1: Chemicals, Agriculture, Food and Health	44%	SO1, SO2, SO3, SO4, SO5
	Division 2: Mining, Manufacturing, Defence and Security		
	Division 3: Natural Resources, Enabling Infrastructure, Public and Professional Services		
PG baseline allocation to Portfolios/Support functions	Business Excellence and Integration	24%	SO1, SO2, SO3, SO4
	Legal Compliance and Business Enablement		SO5
	Finance		SO5
	Human Capital and Strategic Communications		SO4



PG Investment/Allocation Categories	PG Investment Sub-categories	Enhanced proportion of PG baseline Investment/ Allocation	Alignment with Strategic Objectives
PG baseline investment to Divisions/Clusters	Division 1: Chemicals, Agriculture, Food and Health	44%	SO1, SO2, SO3, SO4, SO5
	Division 2: Mining, Manufacturing, Defence and Security		
	Division 3: Natural Resources, Enabling Infrastructure, Public and Professional Services		
PG baseline allocation to Portfolios/Support functions	Business Excellence and Integration	24%	SO1, SO2, SO3, SO4
	Legal Compliance and Business Enablement		SO5
	Finance		SO5
	Human Capital and Strategic Communications		SO4
Capability Development	Research Centres	16%	SO1, SO2, SO3, SO4, SO5
	New Capability Development Strategic Initiatives		
	Research Infrastructure		
	Human Capital and Skills Development		
Commercialisation and Technology Transfer	Seed Fund	6%	SO1, SO2, SO5
	Apex Fund		
Strategic/Discretionary Fund	CSIR Leadership Initiatives	1%	ALL SOs
DSI Ring-fenced allocations	ICT Roadmap Funding	9%	SO1, SO2, SO3
	National Treasury Infrastructure Funding		SO4
	National Laser Centre		SO1, SO2, SO3
	National Integrated Cyber Infrastructure System		
TOTAL	-	100%	-



Table G.6b: Summary of PG Investment by Strategic Objectives

DSI Programmes	CSIR Strategic Objectives	Proportion of Allocations (2021/22)
Programme 1: Administration: Financial Sustainability and Good Governance	SO5	9%
Programme 2: Research, Development and Innovation	SO1,SO2 & SO3	85%
Programme 3: Human capital and infrastructure development	SO4	6%
TOTAL		100%

Table G.7: Medium Term Expenditure Framework allocation to the CSIR (excl VAT)

R'000	2020/21 R'000	2021/22 R'000	2022/23 R'000	2023/24 R'000
Baseline Parliamentary Grant	673 787	725 537	741 615	744 469
Parliamentary Grant	673 787	725 537	741 615	744 469
Ring fenced allocation	156 547	418 509	435 520	439 483
Laser Loan Programme	8 612	10 085	10 458	10 498
National Laser Centre	29 334	34 353	35 624	35 760
African Laser Centre	4 704	5 510	5 713	5 735
WEF Affiliate Centre	–	24 672	15 025	5 179
Implementation: ICT R&D Strategy	64 332	50 668	63 103	73 245
Infrastructure Programme	49 565	53 913	57 391	59 917
National Integrated Cyber Infrastructure System (NICIS)	–	239 308	248 206	249 149
TOTAL	830 334	1 144 046	1 177 135	1 183 952



G.2 5 Year Borrowing Plan

Table G.8: CSIR 5 Year Borrowing Plan

Financial year ending	Performance bonds	Bid bond	Payment guarantee	Advance payment guarantee	Total annual limit
R'000					
31 Mar 21	35 000	5 000	20 000	50 000	110 000
31 Mar 22	70 000	5 000	25 000	70 000	170 000
31 Mar 23	115 000	5 000	30 000	100 000	250 000
31 Mar 24	120 000	5 000	35 000	110 000	270 000
31 Mar 25	130 000	5 000	40 000	115 000	290 000
31 Mar 26	130 000	5 000	50 000	115 000	300 000



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