CSIRO Annual Directions Statement 2014

Outlines the Chief Executive's expectations as input to organisational planning and budgeting for FY2014/15-2017/18

Office of the Chief Executive

May 2014

CSIRO Commercial in Confidence

1. INTRODUCTION

The Annual Directions Statement (ADS) underpins the delivery of, and should be read in conjunction with, our 2011-15 Strategy. It provides the link between long- and short-term planning, updates CSIRO's investment priorities, and outlines the Chief Executive's priorities and expectations for the year ahead.

2. GLOBAL & NATIONAL CONTEXT

CSIRO responds to the most significant challenges and opportunities facing Australia and humanity as outlined in our megatrends document Our Future World, delivering positive impact through innovative solutions on the economy, environment and society. As we continue with this work over the long term, every year we must take stock of the changing context in which we work with our clients and partners.

The global outlook is for continuing slow growth with steady recovery in the advanced economies. Global growth is projected to be at 3.7 per cent, rising to 3.9 per cent in 2015-16. [1]

World Economic Outlook projections[2] suggest that growth in the Asian region will evolve along a more balanced path, with China prioritising economic reform and expecting decelerating growth, while other economies such as Japan and Korea are projected to have slight increases. Growth in the United States is expected to be 2.8 per cent in 2014, up from 1.9 per cent in 2013. Europe is stabilising but unemployment remains high, with growth expected to reach 1 per cent in 2014.

In light of this slow growth, promoting new sources of growth through innovation is steadily increasing as a global policy priority. Innovative activities are a key driver, representing 85 per cent of economic growth.[3] They foster competitiveness, productivity and job creation, and are important mechanisms for encouraging sustainable development.[4]

The economic environment in Australia remains stable, with over two decades of growth. Although there was clearly a decline in growth during the GFC, we continue to enjoy low unemployment and inflation. According to the OECD[5] Australia's growth should remain below global average growth at 2.5 per cent in 2014, increasing to 3 per cent by 2015 as a result of growth in non-mining sectors.

Two key continuing focuses for our nation are our increasing engagement with Asia, and supporting industries to deliver high value-added products and services. In order to provide focussed R&D support with higher levels of collaboration, we will need to ensure that we target excellent science to support the industries of the future.

Global growth in innovation and R&D continues to outstrip GDP growth particularly in Asia. China for example is expected to see a 10.1 per cent growth rate in innovation and R&D, versus expected GDP growth rate of 7.3 per cent in 2014. The United States is expected to see a 3.3 per cent growth rate of R&D versus 2.6 per cent GDP growth. [6]

Australia's productivity is a continuing area of focus, with the Productivity Commission warning that our productivity has fallen well behind that of most other developed economies over the last decade. Multifactor productivity, which includes the impact of new technology adoption, declined an average of 0.6 per cent pa over the past five years. This issue has been partly mitigated by excellent terms of trade during the mining boom but these are now falling away.[7] In the 2014 Federal Budget papers, the Department of Industry emphasised that Australia must transition to knowledge-intensive competitive industries in areas of global growth such as: food and agribusiness; mining equipment, technology and services; medical technologies and pharmaceuticals; oil and gas; and advanced manufacturing.

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[1] IMF World Economic Outlook, January 2014, http://www.imf.org/external/pubs/ft/weo/2014/update/01/pdf/0114.pdf
[2] IMF World Economic Outlook, October 2013, http://www.imf.org/external/pubs/ft/weo/2013/02/pdf/text.pdf
[3] Rosenberg, (2004) "Innovation and Economic Growth", OECD, Available at http://www.oecd.org/dataoecd/55/49/34267902.pdf
[4] OECD (2013)Science, Technology and Industry scoreboard 2013
[5] OECD 2013, Australia – Economic forecast summary (November 2013), http://www.oecd.org/economy/australiaeconomicforecastsummary.htm
[6] Battelle 2014 Global R&D Funding Forecast
[7] Productivity Commission, 2014

Australia's investment in R&D (~2.2 per cent of GDP) remains below the OECD average[8] and, while our national innovation system performs relatively well on scientific outputs, it is relatively weak on 'flows', or collaboration and productivity outcomes when compared to peers. This is a key factor guiding CSIRO's focus on applied research and impact delivery. Australia was fifth last in the OECD for collaboration between research organisations and business, and last for the number of researchers employed in business. In the recent Global Innovation Index report Australia's innovation system was ranked 19th (up from 32 in 2012) out of 142 countries. However we have a particular weakness in innovation efficiency, the number of graduates in science and engineering, expenditure on students, and research and development financed from overseas.[9]

The 2014 Federal Budget included appropriation reductions for CSIRO over the 4 year forward estimates. As a result of this CSIRO will be smaller and more focussed on the national priorities through our Flagships, National Facilities and Services. Key impacts on CSIRO are that;

- Our appropriation will be reduced by AUD27.0m in 2014-15, which then flows with further slight reductions into the out years. This amounts to a reduction of AUD114.8m over the forward estimates. Our appropriation reduction comprises a savings measure of AUD111.4m over the next four years and a AUD3.4m reduction from an increase in the efficiency dividend of 0.25 per cent, to 2.5 per cent for each of the next three years.
- We received additional appropriation of AUD65.7m over the next four years to operate the new Marine National Facility Research Vessel, the RV *Investigator*. This will allow the vessel to operate at sea for 180 days per year over the next four years and beyond.
- CSIRO also received one-off funding of AUD32.2m in 2013-14 to support the management of staff reductions.
- AUD24m over three years to facilitate enhanced scientific collaboration between UTas, CSIRO and the Australian Antarctic Division. The cost of this will be met through reprioritisation of the ARC funding.
- CSIRO's appropriation is only part of our overall budget. Our external co-investment and consulting revenue income is now forecast to be AUD405m in 2013-14, 3.6 per cent less than our 2012-13 revenue of AUD420m. This reflects steady R&D investment in the areas of agriculture, energy, environment, information technology, space and services and a decline in R&D investment in resources and manufacturing.
- Over the next four years we forecast that R&D investment in manufacturing and resources will continue to be impacted by weaker market conditions.

3. CHIEF EXECUTIVE PRIORITIES

CSIRO plays an important role in supporting our nation's economic, social and environmental prosperity and can contribute to lifting Australia's global competitiveness. Within this context CSIRO will:

- Increase its focus on the national priorities through its nine new Flagships.
- Maintain our science excellence and build quality and scale in the Australian science, research and innovation sector through collaboration and connection to global scale precincts, national centres and collaborative regional sites.
- Enhance our support for the acceleration of industry productivity and competitiveness in all sectors.
- Continue to prioritise impact partnerships with Australian and global industry and supply chains, and remain a national and global leader in commercialisation of R&D.
- Reform our operating arrangements to differentiate CSIRO nationally and globally, increase our science quality and impact, clarify our role as the preeminent manager of National Facilities, and improve our services to industry and the community.

[8] OECD (2012) Science, Technology and Industry Outlook 2012 http://www.oecd.org/sti/oecdsciencetechnologyandindustryoutlook.htm
[9] Cornell University, INSEAD, and WIPO (2013): The Global Innovation Index 2013: The Local Dynamics of Innovation

- Remain a trusted advisor to industry, the government and the community.

CSIRO collaborates and works in over 80 countries and has a subsidiary in Chile. We will continue to lay the foundations for CSIRO to support Australia's global positioning and competitiveness. We will focus our multidisciplinary approach on the national priorities, extend our work in the Asia-Pacific region and increase our global engagement where it delivers national benefit.

CSIRO's key organisational priorities for 2014 are:

1. **Values and culture**
   - Continue to be guided by our Values Compass in all our interactions and decisions.
   - Implement and embed the Pearce Review Stage 1 and 2 recommendations.
   - Focus on fatality prevention and risk-based HSE reviews.

2. **Delivering on our 2011-2015 Strategy**
   - National Flagships: Increased focus on national priorities through the nine Flagships, 65 per cent investment in Flagships, Impact 2020.
   - Science Excellence: Future Science Platforms in and across Flagships, Deliver Major Projects MNF, ASKAP, Pawsey, Black Mountain.
   - Collaboration and Connections: Industry productivity and competitiveness; national and global leadership in R&D commercialisation; increase industry funding across all sectors.
   - Innovation Organisation: Integrated Reform Project, financial sustainability, EBA, Diversity and Inclusion.
   - Trusted Advisor.

3. **Building the foundation for future success**
   - Progressing the Integrated Reform Program to enhance organisational productivity and efficiency
   - Developing our 2015-2025 Strategic Blueprint.
   - Enhancing support for industry productivity and competitiveness
   - Contributing to the development of the Agriculture, Energy and Northern Australia white papers.
   - Further laying the foundations for CSIRO to be a global organisation for the benefit of the nation.

These annual priorities will be reflected in the 2014/15 CSIRO Operational Plan, Key Executive Actions and business unit plans. They are the basis for the 2014-15 Enterprise Performance Framework against which our progress and performance is reported.

PRIORITY 1: VALUES and CULTURE

How we do things is often remembered a lot longer than what we do. Doing things well is our highest priority and something we strive for each and every day. We must continue to mature as an organisation to a level where our values are deeply integrated into everything we do. Ensuring our people's safety and wellbeing in their work continues to be an essential part of CSIRO's success.

In 2014 our priorities are:

- Embedding CSIRO Values Compass to guide decisions and interactions. All annual performance discussions and leadership measurement to include the Values Compass.
- Implement the 34 recommendations from Phase 1 and the 5 recommendations from Phase 2 of Professor Pearce's independent investigation into workplace bullying and other unreasonable behaviour in CSIRO. It is critical that our training program and response is enduring.

- Continue our fatality prevention strategy with risk-based reviews across CSIRO. Continue to target reduction of stress and anxiety related illnesses, and deploy the Wellnomics Risk Management Software across our organisation.
- Execute on our Diversity and Inclusion Plan to better foster an inclusive culture.

Our Values

- Embracing **scientific excellence** and working together ethically and with **integrity** in everything we do.
- Building **trust and respect** each day with our communities, partners and colleagues, knowing that with trust comes **accountability**
- Igniting our **creative spirit**, exploring new horizons and creating an environment where innovation thrives
- Consistently **delivering on our commitments**. 'Do what we say we will do'
- Striving towards a **healthy, safe and sustainable** future

We are successful when

- Our science contributes to an improvement in the prosperity, quality of life and future sustainability of humanity
- Our collaborators, partner and stakeholders realise value and outcomes from our science and describe working with us as a pleasure
- Our people go home safely and share a sense of achievement
- We are a place where people are healthy, flourish and want to work
- We are a trusted research advisor

PRIORITY 2: DELIVERING OUR 2011-15 STRATEGY

Thanks to the hard work and dedication of our people, we are delivering on all aspects of our strategy with positive outcomes across our mission, values culture, five key strategic objectives and our enterprise strategy measures. In 2014/15, we will continue to stay focussed on delivering our strategy while navigating changes in the external environment, and also preparing the blueprint of the 2015-25 strategy.

PILLAR 1 – NATIONAL FLAGSHIPS

- Increase our focus on the national priorities and fulfil our objective of delivering 65 per cent of our resources via the Flagship program, through a portfolio of nine Flagships which integrate science and impact delivery.
- Complete our first whole of CSIRO mapping of past and planned future impact, and fully embed the Impact 2020 planning, monitoring and evaluation framework for all Flagships.
- Deliver on a re-positioned health strategy which will see us prioritise our differentiated impact in food and nutrition, services and bio-technology, a national approach to e-health and services, biomedical manufacturing, vaccines and therapeutics to respond to new viruses from animals or biotechnology.
- Evaluate our organisational impact and delivery against Flagship goals and time-to-goal expectations as part of the transition from our current Flagship portfolio to our new portfolio.

PILLAR 2 – SCIENCE EXCELLENCE

- Continue our progress with our partners towards establishing precincts of global standing, in line with individual precinct plans in Canberra, Clayton, Perth, Brisbane and Parkville.
- Ensure that new Flagships build on existing organisational capability planning to develop future science platforms underpinned by cross-Flagship Future Science Platforms, building on the work of our Transformational Capability Platform program.
- Deliver major infrastructure projects (including ASKAP, Pawsey Supercomputing Centre, ACT consolidation, National Geosequestration Laboratory [NGL], SESKA Geothermal and Marine National Facility Future Research Vessel) as per approved project plans and in line with CSIRO Major Project Standards.

PILLAR 3 – COLLABORATIONS AND CONNECTIONS

- Support the acceleration of industry productivity and competitiveness through all Flagships. Continue to prioritise impact partnerships with Australian and global supply chains. Remain a national and global leader in the commercialisation of R&D.
- Maintain and build industry R&D alliances, active licenses, and SME engagement, and increase the proportion of our external funding from industry and international sources.

PILLAR 4 – INNOVATION ORGANISATION

- Deliver a transformational Integrated Reform Program across our organisation to accelerate impact delivery.
- Deliver a four year balanced operating budget responding to external market conditions and appropriation funding levels.
- Achieve a three year Enterprise Bargaining Agreement under the Australian Government Policy Framework.

PILLAR 5 – TRUSTED ADVISOR

- Respond to emerging governmental priorities and directions while maintaining long-term delivery of CSIRO responsibilities in the national interest.
- Develop and progress a robust 2015-25 CSIRO Strategic Plan that
  - builds on our differentiation and sets us up for long-term sustainable delivery of value to the nation, and
  - includes strong engagement with our staff and external parliamentary, government, industry and community stakeholders.
- Engage with government, stakeholders and the community about CSIRO's impact delivery, focusing in particular on industry productivity and competitiveness, and the Northern Australia, Agriculture and Energy White Papers.

PRIORITY 3: BUILDING THE FOUNDATION FOR FUTURE SUCCESS

There are three areas that bridge our current strategy into our future strategy and positioning.

1. Our Strategy 2015-25
2. Integrated Reform Program, and
3. Financial sustainability.

CSIRO is delivering record performance and we are respected as the nation's leading R&D organisation and one of the world's leading applied research organisations. We have gone a long way to differentiate

ourselves and must go further. CSIRO has transformed itself into an impact-focussed, multidisciplinary organisation delivering profound impact through excellent science. We are focussed on the big challenges facing our nation and humanity. We have grown our impact, our science performance and revenue. We have increased our role as connector and trusted advisor to the nation.

The National Research Flagships strategy, along with our current matrix operating model and 'One-CSIRO' support services reform, have delivered a decade of success and substantial benefits for Australia and CSIRO. This transformation was an essential directional shift for CSIRO to maintain relevance and performance over the past decade.

As we remain focussed on delivering on our commitments in our 2011-2015 Strategy we must lay the foundations for the future. We will seek to build on our past successes to drive even more impact for the nation. We must lay the foundations for CSIRO to be a global organisation delivering to this nation.

STRATEGY 2015-25

This year will see us develop a new strategy that will position the organisation for the next decade of sustainable, long-term value for the nation from CSIRO. We will engage systematically with stakeholders and staff through 2014, with some strong hypotheses around what we need to do.

We must continue to differentiate ourselves and our distinct roles. We need to be much clearer about our role as a pre-eminent manager of National Facilities. We need to be much clearer about our role as an innovation catalyst and provider of innovation services to industry, including Australian SMEs, and governments. We need to extend our role to connect Australia into the hotspots of global innovation, including operating more sustainably and permanently offshore. We need to be more flexible in how we focus our science portfolio and source capability from, and work in a more integrated way with our partners and clients. We will focus our long-term national and global property footprint to support vibrancy, reduce our future cost burden and support Australia's long-term national and global positioning.

OPERATING MODEL REFORM: WHAT DOES SUCCESS LOOK LIKE IN 2014?

1. **Line of Business Model:** Our new operating model is designed on three lines of business that reflect our differentiated roles:
    a. Collaborative, applied R&D focused on large-scale impact delivery.
    b. Pre-eminent manager of National Facilities, Collections and scientific infrastructure.
    c. An innovation catalyst delivering effective and efficient commercial and community services.
2. **Impact Science**: We will merge Flagships and Divisions into a smaller number of new Flagships, which will be focused on delivering impact against national challenges, and integrate all activities from capability development, through science delivery and the external interface. These changes will streamline our matrix operating model.
3. **National Facilities and Collections:** We will bring together the National Facilities and Collections CSIRO manages on behalf of the nation and ensure we have a clearer pathway forward for them.
4. **Services**: We will establish a clear line of business focussed on delivering commercial services to the nation and ensuring engagement with the SME sector.
5. **Promoting Collaboration and Integration**: We will support and enhance seamless collaboration across our Lines and Flagships, including cross-Flagship impact initiatives, future science platforms, client account management, communities of practice and operational mobility of staff deploying to projects.
6. **Supporting Science Excellence**: Flagships will jointly foster our exciting transformational science platforms for the future.
7. **Support Function Reform**: We will realign and streamline all support functions into a consistent, one-CSIRO enterprise services model. Continued back office processing reform will occur with further integration of currently separate back office and service centre teams under unified management. We

will invest in properly resourcing the Integrated Reform Program (IRP) and Supporting the Research Operating Model (SROM) projects to enable organisational transformation and efficiencies.

8. **Performance and Accountability**: We will develop, as part of our innovation culture, a more robust performance management culture and transparent performance framework across the enterprise.
9. **Impact Focus**: We will build the professional capabilities and culture that differentiate us as an impact organisation: multi-, inter- and trans-disciplinary research, client engagement and innovation 'brokering', and impact planning, monitoring and evaluation.
10. **Business Processes, Information Systems and Continuous Improvement**: We will achieve significant simplification and streamlining of business processes and systems to support frontline teams, improve customer and staff satisfaction, enhance productivity and achieve efficiencies in the future operating model.

SUSTAINABLE 4 YEAR BUDGET

CSIRO has developed its four year budget in the context of:

- delivering its internal reform program to enhance the focus on delivery of science and gain efficiency and productivity improvements,
- declining external revenue growth, and
- implementing the decisions of Government.

CSIRO has recalibrated its underlying operating budget to deliver a financially sustainable organisation in each of the four years from 2014-15 to 2017-18. Our Average Staffing Level this year of 5550 will fall in 2014-15 to 5034 and our other operating expenditure will be carefully managed. To support the management of staff reductions, CSIRO was granted AUD24.5m of funding in 2013-14 by the Commonwealth Government and will pursue further one-off savings and revenue raising opportunities in 2014-15.

With a continued focus on delivering impact for the nation from our high quality science capability and platforms, CSIRO aims to sustain its relevance to, and funding support from, government and increase its external revenue over the next four years.

With the lines of business separation of the National Facilities and Collections, and CSIRO's Commercial Services, CSIRO will start to pursue a more differentiated pricing model for services that are provided on a commercial basis and for the use of facilities the organisation owns and operates on behalf of the nation. With an increased level of transparency, CSIRO should be better placed to justify the financial contribution needed from other stakeholders when working with CSIRO or using our facilities, leading to a more sustainable funding model for these assets and businesses.

The operating costs, repairs and maintenance expenditure of CSIRO's extensive property portfolio continue to increase placing pressure on the ability to continue to fund science operations. We will deliver our planned reduction of our property portfolio from 56 sites to 48 with focus on consolidation in the capital cities. We will develop as part of our 2015-2025 strategy a plan supporting further rationalisation of sites to more substantially reduce the operating costs of property.

We will reduce the size of Senior Management (Group, Flagship, Chief) offices by 20 per cent and reduce senior leadership positions as part of the transition to the new operating model. This will include implementation of a more consistent model for support, including office support.

We will reduce travel expenditure through reduction in air miles and adherence to the most advantageous purchasing arrangements to ensure off-site conferences and meetings are undertaken on an 'exception' basis only.

4. SCIENCE DIRECTIONS

CSIRO reviews and adjusts our investment portfolio in response to these factors to ensure that we are living within our means and continually enhancing the value we deliver to the nation. Our science portfolio must be shaped to fit within the financial envelope provided to us by the Government and our external clients. It must respond strategically to national priorities, informed by our external stakeholders, and changes in government policy priorities. We must also have robust evaluation mechanisms for our impact and science performance.

In FY 14/15, our science investment in sectors will be:

- Agribusiness, Food and Health - 28 per cent
- Energy and Resources - 17 per cent
- Productivity, Manufacturing, Information and Services - 23 per cent
- Environment - 21 per cent
- National Facilities & Collections - 11 per cent

In response to the four year Federal Budget and assessment of associated risks to our external revenue, the Executive Team decisions on the key areas for change are outlined below against our critical impact sectors.

AGRICULTURE, FOOD AND HEALTH

CSIRO has a critical role in delivering impact in the Agriculture, Food and Health sectors and in 'Safeguarding Australia'. Agriculture contributes AUD49B p.a. to the Australian economy at the farm gate, and its closely related sectors earn AUD155B p.a., amounting to a 12 per cent share of GDP. Australian farmers export about 60 per cent of their agricultural products, earning over AUD32B p.a. in export revenue. Australian farmers manage and care for over 60 per cent of the land mass of Australia.

The food processing industry in Australia is the largest in our manufacturing sector, accounting for about 23 per cent of its economic activity, 20 per cent of employment and AUD19B p.a. in exports. The agriculture and food sectors are challenged by natural phenomena such as drought, diseases, soil quality and climate fluctuations, and by competition from countries with lower production costs. Australia's strengths are in product quality, reliability and value. All three of these are vitally dependent on continued research, development and innovation in these important sectors.

Future directions are as follows:

- **Enhancement of agricultural/aquacultural productivity** through genetics and agronomic practice. This work involves the use of systems biology: genomics, proteomics and metabolomics, phenomics and bioinformatics. These approaches identify the ideal genetics (plant and animal) for productivity in a given Australian environment. These novel genetics are combined with improvements in agricultural practice to yield optimal performance.
- **Designing sustainable systems.** Research into the total agricultural ecosystem is required in order to ensure that productivity solutions are also sustainable. This involves research into water utilisation, soil quality, nutrient cycling, energy balances, greenhouse gas emissions and adaptation to climate change.

- **Developing and deploying technology to protect Australian biosecurity**. Animal, plant and microbial studies and use of unique facilities such as AAHL to better quantify risks and deliver both pre-emptive and management solutions for pests and pathogens, including vaccines and therapeutics to respond to zoonotic viruses, as part of an effective national response to biosecurity threats.

- **Creating manufacturing and nutritional solutions for safety and quality of food products, and demonstrating their potential to improve health**. Focus on added-value manufacturing processes, enhanced food safety and shelf life, and the use of genomics, biomarkers and metabolomics to establish evidence for healthier nutrition and its contribution to national health priorities.

- We will focus our investment on the intersection between food, nutrition and health, and on the basis that others are now better placed to tackle the challenge of clinical research in these areas, exit our investments in neurosciences and colo-rectal cancer research except where this relates to nutrition.

ENERGY AND RESOURCES

The Energy and Resources sector is one of Australia's global competitive advantages. Last year, it delivered export revenues of AUD176B (71 per cent of Australia's merchandise exports) and added AUD151B to Australia's GDP [10]. CSIRO's objective in this sector is to help Australia grow the global competitiveness of our resources and unlock significant value for our nation, while minimising the environmental impacts from the extraction and use of these resources.

Our focus on growth and competitiveness has become especially important over the past year as the external environment for the sector has deteriorated sharply. Despite ongoing export volume growth, revenues have dropped by 8 per cent in one year while labour and capital costs are at an all-time high. This is putting significant financial pressure on the industry. At the same time, government support for low emissions technologies is being reduced while key low emissions policies are being revised (e.g. carbon price repeal and RET review).

To adjust to this challenging external environment and in line with both the strategy of the Mineral Resources Flagship and the updated strategy of the newly created Energy Flagship, future directions are as follows:

- **Unconventional gas:** Given the potential for unconventional gas R&D to create significant value for our nation, we will grow this area over time. The growth will focus on enhancing well productivity and reducing costs while enabling the environmental sustainability of the production process. Part of this growth will be funded by re-prioritising conventional oil and gas work and by growing external revenues.
- **Minerals Mining**: We will implement our new mining strategy with the aim of focusing on and, where possible, growing those activities that help to significantly enhance the productivity of this vital sector.
- **Coal Mining:** While we will maintain our overall investment in the coal area, we will slightly rebalance the effort towards resolving logistics issues and reducing the environmental impacts from coal mining.
- **Low emissions technologies:** To adjust to the more difficult operating environment, we will stop our geothermal work and reduce other activities, especially in CO_2 capture and efficient energy management.
- **Downstream minerals processing:** In line with declining industry demand, we will strategically reduce investments in downstream processing and metal production activities. Operational productivity research activities will have to be fully funded by industry to free up CSIRO investment for national strategic priorities. We will also consolidate our analytical facilities and services to reduce overlap and focus on essential services only.
- **Fuels:** We will stop our liquid fuels research as quickly as external obligations allow us to do so.

MANUFACTURING, PRODUCTIVITY & SERVICES

The manufacturing sector in Australia is facing unprecedented challenges to its competitiveness and long-term sustainability. Nonetheless, the sector still employs almost 900,000 people, accounts for 29 per cent of exports, and provides over 20 per cent of inputs into other sectors in the economy and 25 per cent of business expenditure on R&D. Productivity growth will be the main driver of Australia's future economic growth and living standards.

[10] Resources and Energy Statistics 2013 , Bureau of Resource and Energy Economics, Canberra (2013)

The manufacturing industry in Australia is in a state of transition as manufacturing embraces information and communications technologies (ICT) tools and produces manufactured products embedded within services offerings. The services sector represents the bulk of Australia's economy (over 50 per cent of GDP and 64 per cent of the contribution to employment) and touches all industries. The services sector continues to grow as a proportion of the economy and holds the greatest potential for sustainable wealth creation. Increasingly, many of these service industries are, or will be, enabled and transformed through innovative digital services. In the era of 'big data' the relative value of digital information in every system and sector continues to increase. In Australia, the value of the digital economy is now AUD131B p.a. and growing rapidly. As the digital world and world of machines increasingly merge, the Internet of Things (IoT), together with intelligent machines and advanced analytics will revolutionise the way people work across the global industrial system.[11]

CSIRO's Manufacturing, Productivity and Services Sector will play an enabling role for Australian industry and the public service sector to equip us with the tools and skills to be globally competitive. Near term directions include:

- **Support Growth Industries:** We will increase focus on Australian growth industries, including bio-medical technologies including devices, polymers, stem cells and protein manufacture mining equipment technology and services, advanced manufacturing, chemical, infrastructure, defence and security industries, and digital delivery of health through new integrated products, processes, and services to improve industry competitiveness.
- **Platform Technologies:** We will increase focus on development and growth of enabling materials, process, and digital platform technologies that are vital to production innovation and productivity improvements in multiple sectors and where CSIRO holds significant intellectual property. Integration of these platform technologies across all of CSIRO's sectors and lines of business will be vital to improving our own productivity and to improving our services offering to industry and the community.
- **Focus on Impact Science:** We will focus on synergies among our research programs. We will consolidate and reduce our current activities in bioscience and nanoscience, device engineering and systems, and high performance metal industries. We will divest from activities that have duplicated effort in the national innovation system, or that are lacking in CSIRO critical mass or collaborative critical mass needed for impact, or that have a short-term focus or no clear path to market.

ENVIRONMENT

CSIRO contributes leading-edge environmental research that takes a systems perspective to increase the understanding, operation and interaction of entire ecosystems, economies, and societies now and into the future. It provides high integrity, independent advice to governments, industry and society in areas where environmental research and development is relevant.

Key focus areas are:

[11] (a) ABS Australian System of National Accounts; ABS Labour Force Australia.
(b) Dan Breznitz and John Zysman, eds., The Third Globalization: Can Wealthy Nations Stay Rich in the Twenty-First Century? Oxford University Press, 2013; Chapter by K. E. Kushida et al., Services with Everything: The ICT-Enabled Digital Transformation of Services.
(c) Industrie 4.0 Working Group, 2013,
http://www.acatech.de/fileadmin/user_upload/Baumstruktur_nach_Website/Acatech/root/de/Material_fuer_Sonderseiten/Industrie_4.0/Final_report__Industrie_4.0_accessible.pdf
(d) Marco Annunziata and Peter C. Evans, The Industrial Internet@Work, 2013,
https://www.ge.com/sites/default/files/GE_IndustrialInternetatWork_WhitePaper_20131028.pdf

- **National and Global Partnerships:** In the year ahead, we will further deepen relationships with key Australian Government Departments to underpin national policy in areas such as northern Australia and build new partnerships with industry, the emerging environmental services sector and international funders. We will also continue to support valued partnerships with the BoM, NOAA and key international institutions (e.g. IIASA, NASA, JST, CAS), and accelerate our influence and positioning in international initiatives (e.g. IPBES and *Future Earth*).
- **Industry competitiveness:** Across the sector we will be placing special emphasis on supporting industry competitiveness by:
    1. Delivering technologies and systems that increase the resilience of natural and built assets, including efforts to support the sustainable development of the offshore oil and gas industry.
    2. Providing pre-competitive knowledge to produce more efficient and effective regulatory assessment and approval, with a special focus on northern Australia and the resources sector.
    3. Enabling greater resource use efficiency, productivity and environmental integrity in agriculture, fisheries, mining, infrastructure and manufacturing.
    4. Enhancing industry and community preparedness and responses to extreme events through our world leading atmospheric, oceanographic and adaptation research.

- **Land and Water Flagship.** We will continue to deliver basin scale assessments of water and land resources across Australia and in our region, reposition our efforts to support the sustainable growth of our cities, deliver new technologies and systems that reduce the impacts of contaminants in our environment and provide new thinking to enable the sustainable intensification of land and water assets in Australia's agricultural and pastoral systems. We will reduce investment in urban water with a particular focus on ceasing research currently conducted in WfHC at our Highett Laboratories. We will reduce total investment in social and economic sciences with a focus on rationalisation of effort currently located in CESRE and CES. We will also reduce overall investment in terrestrial biodiversity research by particularly focusing on integrating work currently conducted across the Managing Species and Natural Ecosystems in a Changing Climate theme in CAF and the Building Resilient Australian Biodiversity Assets theme in CES.

- **Oceans and Atmosphere Flagship:** We will continue to invest in our world leading atmospheric and oceanographic science, including further developing ACCESS with the BoM and enhancing our understanding of key systems and phenomena impacting on Australia's weather and climate. This understanding will underpin our ongoing investment in adaptation science. Consistent with this focus, we will integrate work currently delivered across the Climate and Atmosphere theme in CMAR and the Pathways to Adaptation theme in CAF. We will continue to deliver whole of system scale capability to support the management of Australia's ocean territories and coats and, consistent with the national interest, to the world's oceans and coasts. We will also continue to deliver excellent science in support of marine industries, especially with our longstanding partners in fisheries. To support this focus, we will reduce our overall investment in marine biodiversity, especially research currently conducted in WfO on bathymetry and marine habitat mapping.

NATIONAL FACILITIES AND COLLECTIONS

CSIRO activities related to National Facilities and Collections will be grouped together in a single line of business. While the National Facilities are different in purpose, scale and mode of use, they all share the objective of providing scientific infrastructure to both CSIRO and the wider community as efficiently and effectively as possible. In the case of Australian Animal Health Laboratory (AAHL) and the Australian Telescope National Facility (ATNF) this includes the international community. While requiring some specialist staff at each facility, the majority of operations performed are sufficiently similar in terms of contract administration, project management, maintenance, engineering and general operations that they can be coordinated by a centralised Facilities Operations function.

Future directions are as follows:

- **Balanced budget**: Ensure the National Facilities and Collections line of business operates to a balanced budget within the approved deficit. Specifically to work with finance and the Department to develop a forward plan for dealing with depreciation of facility assets.
- **ATNF:** Operate the Australia Telescope as a science national research facility for use by Australian and international researchers. Operate NASA's Canberra Deep Space Facility as part of the NASA Deep Space Network that supports interplanetary spacecraft missions and radio and radar astronomy observations for the exploration of the Solar System and the universe. Complete the transition to round the globe operations. By June 2015, prepare a roadmap for the future shape and scope of ATNF in the period 2016-2022. Deliver ASKAP as the leading radioastronomy survey facility until 2020. Deliver SKA pre-construction commitments to 2016 and position CSIRO for SKA. Reduce the effort at Parkes and Narrabri and close the Mopra facility. Reduce effort in radio-astronomy, astrophysics and Astronomy and Technology theme in line with appropriation reductions.
- **AAHL.** Ensure Australia maintains a world class category 3 and 4 animal health laboratory that is made available to the national and international community. Deliver a case for Federal funding FY16 for a mid-life refurbishment of AAHL to enable the facility to maintain its capability for the next 15 years.
- **Pawsey:** Maintain the Pawsey Supercomputing facility as an operational facility for use by CSIRO and the academic community. With IM&T and academia, prepare a plan that will propose a future funding and capability plan for maintaining an Australian Supercomputing capability to replace the CCI at ANU and Pawsey in 2019/20.
- **Marine National Facility:** Ensure the new Marine Research Vessel is available for at least 180 days p.a. of research voyages. Prepare a strategy for the utilisation of spare capacity to maintain the vessel at sea for 300 days p.a. maximum.
- **National Biological Collections.** Maintain the six national biological collections and ensure that the Atlas of Living Australia (ALA) becomes the primary conduit for digital access to these. In FY15 review the remaining 45+collections held by CSIRO to determine which, if any, should move to the National Facilities and Collections line of business, and determine whether CSIRO should retain the rest as accessible facilities.

CSIRO SERVICES

CSIRO's Commercial Services line of business delivers cost effective innovation services to industry and the community which directly apply CSIRO's intellectual property, capability and infrastructure to deliver client solutions and outcomes, and to extend CSIRO's impact delivery. CSIRO Commercial Services maintains a portfolio of businesses and assets which will grow revenue, reach and impact.

Future directions are as follows:

- **Line of Business**. Bring together into a single line of business advisory and technical consulting, industry collaboration & SME services programs, education programs, publishing, and futures foresight services. Develop a more streamlined, lower cost and customer focused business model for the delivery of services, within CSIRO's broader policy and procedural environment.
- **Innovation Catalyst**: Promote CSIRO as an 'innovation catalyst', and market a suite of 'lighter touch' innovation and collaboration services to industry clients who may not work with us at present.
- **Entry Point for SMEs**: Serve as an easy entry point to introduce industry partners to working with CSIRO.

5. FUNCTIONS

CSIRO's functional areas support the governance, management and operations of the organisation. Their role is to provide high quality, effective and efficient corporate and in-business services to enable the delivery of our strategy and impact from our science.

Key future directions across include:

SCIENCE, STRATEGY & PEOPLE

- Support the transformation of our operating arrangements to the line-of-business model across all relevant business processes and support functions.
- Develop and progress a robust 2015-25 CSIRO Strategic Plan to position the organisation for longer term sustainability, in particular leading a process to:
  - Review our decadal impact, market, science/capability and property directions with Science Leaders.
  - Identify areas of global priority and review the way we manage and service international operations.
  - Engage with our Board, staff and stakeholders to identify, explore and develop new ideas to enhance the value we deliver to the nation.
- Lead the integration and substantial reshaping of high-performing, centrally-managed teams in Communications and Business Development & Commercial, in particular:
  - Reviewing and responsibly reducing the overall cost base in line with a streamlining of commercial governance and processes.
  - Working closely together with our Flagships and Programs to ensure that the centrally-managed model supports external and commercial engagement activity.
- Delivery of an integrated 5-year plan (in consultation with Comcare) to equip all of our people to foster inclusion, trust, respect in a diverse and zero harm culture.
- Continue our delivery of our 5-year HSE plan.
- Lift the maturity of Flagship Impact management – planning, monitoring, evaluation and communication based on CSIRO Impact Project methodology, particularly to inform portfolio investment decision making.
- Proceed with the next phase of reform in the newly integrated Commercial (IP&L and Commercial Legal) to identify opportunities for service efficiencies and savings.
- Working with Finance and Services, review CSIRO's risk approach to its policies and procedures and challenge existing principles to reduce process complexity and improve efficiency.
- Lead the development and execution of an enhanced international engagement strategy with an increased focus on Asia-Pacific and continued effort into more traditional markets.
- Establish an integrated Research Office to provide strategic and operational support to developing our science excellence, collaborations and reputation, and as the key point of contact for funding bodies and academies.
- Engage with business, governments and academia to progress innovative initiatives with a national reach (e.g. BCA engagement).

FINANCE AND SERVICES

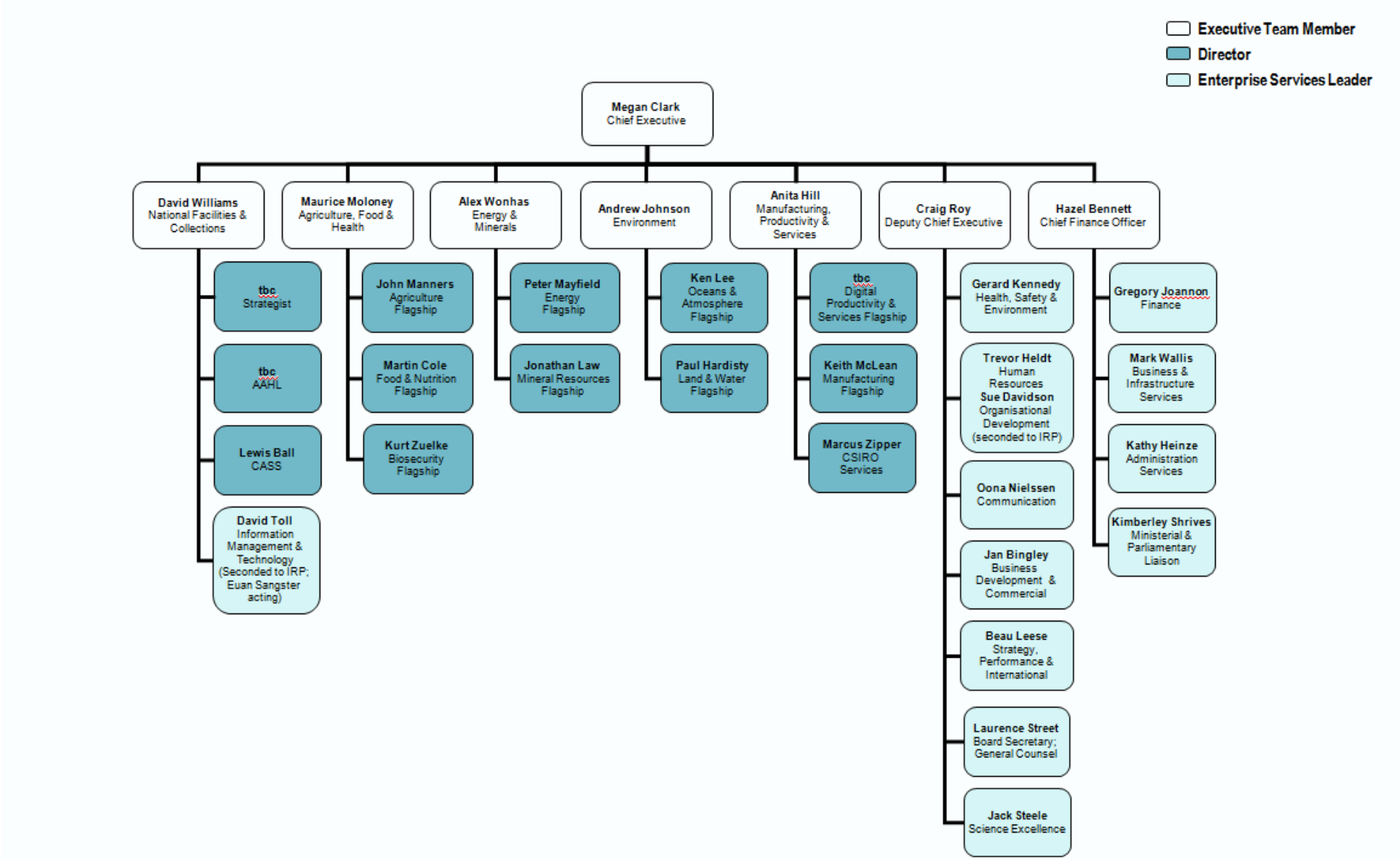
- Develop a long-term cash strategy and refresh our annual four year capital management plan consistent with updating our ten year property strategy.
- Progress with the Supporting the Research Operating Model (SROM) project which will reform the frameworks, processes and systems supporting the delivery of CSIRO's research projects ready for implementation on 1 July 2015.
- Develop a revised approach to procurement across CSIRO identifying opportunities for savings based on 'smarter' procurement including use of CSIRO-wide and whole of government panels, and delivering more efficient and satisfying user experience with increased back office support.
- Deliver major property projects particularly the ACT Consolidation and Clayton Redevelopment in line with approved project plans and with CSIRO's Major Project Standard and organisational best practice.

- Realign the support and services provided by the group to the rest of CSIRO under the new organising arrangements, including integration of new staff transferring from the previous divisional structure and streamlining and refocusing the group's support to the delivery of CSIRO's research projects.

INFORMATION MANAGEMENT AND TECHNOLOGY

- Maintain IM&T as a world-class research and office computing infrastructure provider. Ensure provision of science computing through supercomputer support, cloud computing (E-computing), specialist systems and the underlying network infrastructure.
- As we now deliver 474 electronic access requests for every physical request, we will close our remaining physical libraries, repurpose them to offices, and transition to 100 per cent digital.

Appendix A- Our Organisation from 1 July, 2014



Line of Business	Business Unit
National Facilities and Collections	Business Units: • Australian Animal Health Laboratory • Marine National Facility • Australian Telescope National Facility • Australian National Biological Collections • Pawsey Supercomputing Centre • Atlas of Living Australia • Canberra Deep Space Communications Centre
Impact Science	Flagships: • Manufacturing • Digital Productivity & Services • Energy • Mineral Resources • Oceans & Atmosphere • Agriculture • Food & Nutrition • Land & Water • Biosecurity
CSIRO Services	Business Units: • CSIRO Publishing • CSIRO Education • CSIRO Discovery Centre • SME Engagement • CSIRO Futures Advisory Services • Infrastructure Technologies
Enterprise Support Services	Business Units: • Health, Safety & Environment • HR Business Services • HR Strategy & Organisational Development • Science Excellence • Strategy, Performance, International & Flagships • Communication • Board, Governance & Legal • Business Development & Commercial • Finance • Business & Infrastructure Services • Administration Services • Ministerial and Parliamentary Liaison • Information Management & Technology

Appendix B - Flagship Program structure from July 2014

FLAGSHIP AT 1 JULY 2014	PROGRAM
Manufacturing	• High Performance Metal Industries
	• Advanced Fibres and Chemical Industries
	• Devices and Engineered Products
	• Bio Medical Manufacturing
	• *Advanced Materials Future Science Platform (TCP)*
	• *Intelligent Processing Future Science Platform (TCP)*
Digital Productivity and Services	• eHealth
	• Autonomous Systems
	• Wireless and Networks
	• Government and Commercial Services
	• Data Analytics
	• *Transformational Biology Future Science Platform (TCP)*
	• *Sensors and Sensor Networks Future Science Platform (TCP)*
	• *Computational and Simulation Science Future Science Platform (TCP)*
Energy	• Grids and Energy Efficiency Systems
	• Coal Mining
	• Oil Gas and Fuels
	• Low emissions technology
	• Unconventional Gas
Mineral Resources	• Discovering Australia's Mineral Resources
	• Intelligent mining and resource management
	• Processing Australian ores
	• Resources, community and environment
Oceans and Atmosphere	• Climate Variability, Risk, and Adaptation
	• Earth System Assessment
	• Coastal Development and Management
	• Marine Resources and Industries
	• Engineering and Technology
Agriculture	• Breakthrough genetic breeding technologies
	• Breeding higher value food crops
	• Crop improvement for novel fibre, food and industrial products
	• Productive and adaptive livestock systems
	• Integrated Agricultural Systems
	• Integrated Sustainable Aquaculture Production
	• Sustaining Agricultural Soil and Landscapes
	• Agriculture and Food Security in a changing world
Food and Nutrition	• Innovative Food Products
	• Foods, diets and lifestyles for a healthy future
	• Future bio-based products

Land and Water	• Ecosystems and Biodiversity Knowledge and Systems
	• Environmental Contaminant Mitigation and Technologies
	• Water Resources Management
	• Liveable Sustainable and Resilient Cities
	• Adaptive Social and Economic Systems
	• Landscape Intensification
	• *Earth Observation and Informatics Future Science Platform (TCP)*
Biosecurity	• Reducing Likelihood – Biosecurity Risk and Preparedness
	• Managing Consequence – Managing Invasive Species Impacts
	• One Health Approach to emerging Infectious Disease