



Assessing the impact and value of CSIRO

What was this project about?

ACIL Tasman undertook an independent evaluation of the impact and value of CSIRO's activities. The report is designed to provide an overview of the processes through which CSIRO has had impact and continues to create value for the Australian community. The report also aims to provide some credible indicators of the scale of its impact and value.

Why?

CSIRO's purpose is to deliver great science and innovative solutions for industry, society and the environment. CSIRO delivers value through the:

1. flow of delivered research outcomes and research based advisory services
2. building and maintenance of potentially valuable research capabilities (skills, research infrastructure, networks, databases and other collections)
3. systems and internal cultures that allow these capabilities to be managed to add value to Australia's innovation efforts.

As a substantially publicly funded organisation, CSIRO needs to demonstrate value for money for the Australian taxpayer, as well as assess the extent to which it is achieving its goals.

What did we find?

We **sought evidence** that recent CSIRO activities have delivered substantial value, large enough to justify recent investment costs.

We **found** that CSIRO has beneficially **changed the structure** of Australia's innovation capabilities as well as adding to the scale and scope of R&D efforts. CSIRO's involvement has allowed for greater concentration of multidisciplinary skills on important challenges for Australia. CSIRO has demonstrated a strong focus on **delivery** of better outcomes and options for society, including delivery through its commercialisation strategies and policy influence. In many cases, CSIRO has extracted high value from years of capability development – while adding capability for future innovation. CSIRO, through its **mission-oriented business model**, and its external collaborations, has also been active in tapping and adding value to research undertaken by others.

Focusing on activity and resultant outcomes over the last few years, where the level of investment in CSIRO has been around \$5 billion (about half of this direct Government funding), we inferred that the value of the outcomes and impacts has almost certainly been of the order of several tens of billions of dollars, with substantial upside potential¹. We concluded with high confidence that **CSIRO is delivering high value for money**.

This value consists of a mix of **benefits already flowing** – through commercialisation arrangements, improved Australian industry competitiveness and more soundly-based policy development and Government investment – and a substantially **richer set of forward opportunities** for Australia to deal better with major risks and opportunities.

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Where costs and values have been quantified, we have generally reported them as risk-weighted present value figures, based on a real discount rate of 7 per cent. Benefits were generally expressed net of forward implementation costs, but not of CSIRO costs. These benefits could then be compared to the CSIRO costs for purposes of inferring whether benefits exceed costs.

How?

Neither time nor budget constraints allowed for comprehensive probing of the full range of CSIRO activities, nor for the derivation of precise estimates of aggregate impact (even assuming this could be done for all impacts). Instead, we applied a process that allowed strong conclusions to be drawn regarding whether and to what extent benefits across CSIRO have exceeded costs. Key steps in the process included:

1. Mapping out the range of CSIRO activities and ways in which these may have impact and deliver value.
2. Drawing from these a ‘sample’ of activities – 11 diverse case studies and vignettes that directly account for only a small proportion of CSIRO expenditure but that illustrate many of the major value delivery mechanisms. This was not a sample of the highest value activities but rather of activities which can illustrate wider CSIRO value delivery, across economic, social and environmental dimensions of value.
3. Subjecting each of these case studies and vignettes to careful probing, relative to a counterfactual that would credibly have applied without CSIRO. The probing included identification and assessment of key impacts and **quantification of only a subset of these**. Where quantification was done, we generally erred on the side of under- rather than over-estimating value – our **estimates were ‘conservative’**. Not valued in this process were some potentially very high value benefits – including for low cost carbon mitigation.
4. Recognising that this quantification involves conservative estimates of the value of a subset of the benefits from the case study activities, we took the sum of these estimates – about \$6 billion – as a **substantial underestimate of the value of the case studies** as a block. The fact that this figure still exceeded the investment costs incurred across all of CSIRO (not just the case studies) over the matching time period suggested a particularly robust conclusion that aggregate CSIRO benefits are in excess of these costs.
5. We then returned to the mapping of activities across CSIRO (Step 1 above) and identified a range of activities analogous to one or more of the case studies, and supporting broadly analogous value propositions. This pointed to a large number of other activities likely to add greatly to the value reflected by the subset of values from the case studies alone, were they to be probed in the same way.
6. We stood back from some of the non-quantified benefits – especially in relation to carbon mitigation options that were a significant feature of several of the case studies – to consider whether the impacts not valued in the case studies were likely to be high in value relative to those valued. We concluded that they were. This included cost savings under carbon pricing regime and potential influence over global policy.
7. Based on all of the above, we concluded that the whole of CSIRO value across the recent period can be expected to be at least several times the extremely conservative indicator of \$6 billion derived from the subset of impacts of the case studies alone.

Collapsing to a single figure the complex values supported by CSIRO cannot do justice to the range of values supported. What the analysis did was support a strong conclusion of benefits well in excess of costs.

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What case studies were examined?

- **Climate Adaptation Flagship:** High value from reduced costs of dealing with climate pressures, and increased insurance against limited international mitigation response. Conservative value of \$2 billion+.
- **Prawn breeding & novel feed supplement:** Value of increases delivered in prawn yield of \$430 million plus options to extend to other species. Royalty streams and export potential from the feeds; possible contribution to wild fish stock conservation values.
- **Cement substitutes and novel products:** Plausible royalty streams of tens to hundreds of millions of dollars on competitive niche products underwriting the risks in pursuing a major opportunity for low cost reduction in carbon dioxide emissions from cement production, in Australia and globally.
- **Murray-Darling Basin Sustainable Yields Project:** Conservative estimate of \$2.8 billion linked to more efficient deployment of the investment funds already committed to buyback and water infrastructure efficiencies.
- **Resistant starch grains:** Improved health outcomes for Australia from products already entering markets, plus expansion of Australian agriculture into grains that can command price premiums. Very conservative value estimate of \$100 million, plausibly several times as much.
- **Titanium within Light Metals:** With commercial partnerships in place, opportunities for TiRO and product fabrication suggests significant strengthening above an earlier ACIL Tasman assessment of value of \$275 million+
- **The UltraBattery:** Commercialisation in place for automotive and stationary applications will support returns to CSIRO, with plausible revenue streams valued at tens of millions of dollars. More speculative, but potentially very high value, via accelerated moves to lower emission vehicles and more effective use of renewables.
- **Mapping undersea mineral deposits:** Immediate cultural and policy value and longer term potentially high value in supporting commercial off-shore exploration.
- **Biochar:** CSIRO adding to a field now receiving substantial attention. Plausible role for biochar as a substantial contributor to lower cost abatement, given its complementarity with several aspects of farm production and with steel production, with potential value of many billions of dollars under a carbon target policy.
- **Radio astronomy and the SKA:** High value for Australia if wanting to participate in big science projects in a cost effective way. This is a project where Australia appears competitive as a site for locating the international facility, with potentially large value in overseas contributions to remote area infrastructure plus on-going employment etc. Net tangible value likely in excess of \$150 million in addition to the value of the science.
- **Cross-CSIRO climate work:** Currently the subject of an active proposal for a major coordinated program of activities that could deliver very high value, but this value has not been explicitly quantified. Examined as an example of options for future evolution of CSIRO portfolio, in this case covering adaptation, mitigation and forecasting.