anzska
Square Kilometre Array ▸
Australia ▸ New Zealand

askaic
Australasian SKA Industry Consortium

BRIEF: NON-ASTRONOMY BENEFITS OF THE SKA

Socio-Economic Benefits

There is a rich tradition of 'break through' technology emerging from international mega-science programs, including NASA and CERN. Some of these innovations have provided the catalyst for generational change, transformed society, and produced pervasive socio-economic benefits. The SKA as a global initiative will continue this great legacy.

The global financial crisis of 2008–2009 and concerns about climate change are a watershed in world history, a time when the countries of the world have combined to respond collectively and positively to economic and environmental imperatives. Global initiatives such as the SKA have the potential to be part of this international momentum. This long-term global initiative will demonstrate to governments around the world that the SKA-spawned collaborative association between countries is tangible, productive and unifying.

The SKA initiative will allow participating countries to showcase their skills and capabilities in positive contributions to the construction and operation of a unique scientific instrument. Its size, complexity and remote location will require detailed planning and innovative solutions that will highlight future industry pathways. To realise the success of this epoch-changing development, SKA will require an open and collaborative environment between governments, industry and the research community – a compact which in itself will catalyze further innovation to drive sustainable economic and social growth. The timeline of the project requires a robust, co-operative framework that transcends political boundaries.

Artist's impression of the SKA's sparse aperture array antennas. Credit: *Swinburne Astronomy Productions/SKA Program Development Office.*

Technological advancements will provide the opportunity for remote and disadvantaged communities to access communication, information sharing and educational platforms taken for granted in the developed world. Other benefits will be the development of:

- A 'worldview' intellectual property policy that will allow the sharing of technology whilst maintaining and rewarding intellectual property; one which demonstrates a non-adversarial partnership approach;
- A procurement network that is efficient and effective when dealing with global sourcing, supply chains, currency exchanges and diverse tariff protection systems.

Manufacturing support countries will develop and construct supporting infrastructure that will boost their capability and capacity to support other non SKA projects both internally and globally, with the resulting economic and social benefits, through:

- Using advanced techniques to ensure high quality, reduced fault rejection rates and environmental friendly materials;
- Developing a common project management framework focusing on mission assurance, global configuration management, demanding (world standard) metrology and acceptance testing, and system compatibility when manufacturing across international boundaries;
- Provide access to a test bed for the trialling of new products and processes, on a world class scientific instrument.

Quantum leaps in computer development will allow more accurate and real time analysis of our challenging and complex problems in the areas of weather prediction, medical

research, civil engineering and natural resource management, with flow-on benefits to all countries. Development of communication platforms to solve the challenges of the SKA will allow enhancements in land-based communication networks using space based platforms, facilitating pervasive electronic communications. These advancements could include:

- Provision of low cost mobile phone, television, radio and internet services to remote and disadvantaged communities;
- Search and rescue services in times of local catastrophe;
- Enhancement of remote medical diagnostic capabilities;
- An increase in educational opportunities for all communities;
- The application of new technology to reduce the need for multiple communication cells for mobile phone services in large population centres.

NASA has documented several socio-economic advances from its program. In broad terms, US space experts have conservatively estimated that for every dollar spent on space flight, it receives $7 back in corporation and personal income taxes from increased jobs and economic growth. Those jobs are generated through the application of space technologies in thousands of companies, in addition to jobs specific to the aerospace industry. Whilst not quantified, it is highly evident that the NASA space program has had a positive impact on the saving of lives and improving the lifestyles of the general public. The Hubble Space Telescope, through the production of its charge coupled device chips, is used for more efficient digital images for breast biopsies, which are accessed by 500,000 women in the US each year.

Production gains are being achieved through the commercialisation of new computer-based scheduling systems that use artificial intelligence to manage thousands of overlapping activities involved in Shuttle launch preparations; air quality monitors have implications for separating various gases in smokestack exhaust streams; and advanced materials are used in the automotive industry and more broadly in industry for the design of hardware, machine tools etc. NASA-pioneered power systems for spacecraft have been applied to terrestrial applications in the form of renewable energy sources, whilst sensor research facilitates the development of monitors for a large range of environmental conditions.

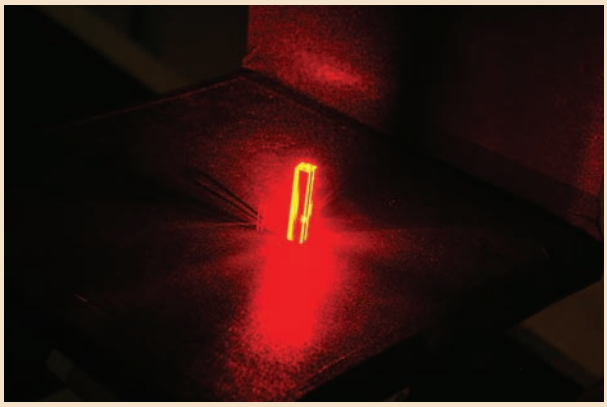
The education sector has benefited through significant advances in knowledge about occupational and public health and safety, as well as fresh insights into new communications platforms. Interactive computer training, originally developed in the space industry, is now deployed universally in computer training, utilising all human senses. Scientists and engineers trained on mega-science facilities enhance human capital globally, and transfer knowledge not available in any other domain.

The case study below highlights CERN's major contribution, particularly to the health and medicine sector. Other numerous examples include radio therapy of deep-seated tumours, which draws on hadron therapy, and biological evaluations for future medical applications that are enhanced by CERN's antiproton decelerator. The SKA offers the next global opportunity for such spin-offs.

CASE STUDY

CERN and Technology Transfer

CERN has developed a technology transfer framework that will ensure ongoing, transformational benefits to global industry and society. Focused on dissemination and implementation, 160 transferable technologies were listed on the 2005 CERN database in a range of areas, including industrial processes, medicine, renewable energy and the environment. Importantly, CERN has developed a program whereby engineers from industry spend several months at the facility, to encourage maximum industry/research interaction.



CERN crystals used in medical imaging. Credit: CERN.

Submitted as an informal briefing paper to COST with input by ASKAIC, March 2010.