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CSIRO Submission 12/439

Inquiry into the Indian Ocean region and Australia's foreign, trade and defence policy

Senate Standing Committees on Foreign Affairs, Defence and Trade

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The Commonwealth Scientific and Industrial Research Organisation (CSIRO) welcomes the opportunity to make a submission to the Inquiry into the Indian Ocean region and Australia's foreign, trade and defence policy. If required, CSIRO would be pleased to provide further information or elaboration to the Senate Standing Committees on Foreign Affairs, Defence and Trade on any issues presented in our submission.

Summary

CSIRO sees the Indian Ocean Region as important for research collaboration and development work to address global challenges that also affect Australia directly. These challenges can be grouped into four main areas.

1. Food, water, energy and resource security
   Given the large and growing population centres around the Indian Ocean Rim and the development challenges in many Indian Ocean Rim countries, the connected challenges of food, water, energy and resource security will continue to increase, and are (or will be) challenges for Australia also. In addition, there are opportunities for Australia to build on its current competitive advantages as well as deliver enabling capability to regional partners.
2. Climate change and adaptation
   There will be commonalities in the issues created by climate change for Australia and other Indian Ocean Rim countries. Climate change in Indian Ocean Rim countries is likely to affect Australia in different ways, meaning that a global approach to climate change mitigation and adaptation will be important.
3. Ecological health of fisheries, coastal zones and ocean biodiversity
   Australia's ocean territory contributes nearly A$40 billion to our economy each year. Sharing scientific knowledge about the Indian Ocean with neighbouring countries is critical for the safe, efficient and sustainable use of Australia's marine wealth as well as for climate-sensitive terrestrial industries.
4. Biosecurity including human and animal health, invasive pests and weeds
   Increasing globalisation through trade, travel and global issues such as climate change mean that a collaborative approach to biosecurity is essential to find solutions and prevent incidents that could cost Australia billions of dollars.

CSIRO has significant research collaboration interests in the Indian Ocean region, including bilateral connections with India, Indonesia, Malaysia and Singapore, multilateral connections with East Africa and roles in several international commissions.

In addition, CSIRO is a member of the Global Research Alliance (GRA), an alliance of nine applied research organisations (including four from the Indian Ocean Rim) drawing on the expertise of over 60 000 knowledge workers in a wide range of disciplines. The GRA's aim is to generate and implement appropriate, affordable and sustainable solutions to global challenges through the delivery of inclusive science and technology. The GRA also has as members CSIR (South Africa), CSIR (India) and SIRIM Berhad (Malaysia).

It is our experience that these collaborations result in stronger relationships with international research organisations, capacity strengthening opportunities for CSIRO staff by accessing international talent and complementary science capabilities, improved networks to address issues of regional and global significance, access to important science infrastructure, and further maximisation of the impact of CSIRO's world class technologies and systems research.

CSIRO has made use of programs such as the Australia-India Strategic Research Fund, AusAID's Public Sector Linkages Program, AusAID's Overseas Aid Program and the Australian Centre for International Agricultural Research to fund some of our collaborative work and to establish connections through which we can build relationships with potential partners. CSIRO sees value in continued support for collaborative science and research-for-development projects with neighbouring Indian Ocean Rim countries.

Background

CSIRO is Australia's national research agency, constituted and operating under the provisions of the *Science and Industry Research Act* (1949). CSIRO is one of the largest and most diverse scientific organisations in the world. It has over 6400 staff located across 57 sites throughout Australia and overseas. CSIRO carries out scientific research in areas including energy, the environment, information technology, health, mining, manufacturing, agriculture and natural resources (see www.csiro.au).

CSIRO seeks to make a difference and generate impact by focusing on the nation's big challenges and opportunities. Those challenges are also often global challenges such as climate change, water resources and food security. CSIRO has a global reach in its activities with many different international partners – in both developed and developing countries – including research collaborations, joint publications, supervising students, commercial agreements, consultancy advice, and representation on international bodies.

CSIRO's submission to the inquiry into the Indian Ocean region and Australia's foreign, trade and defence policy is made in the context of our role and function in the national and global innovation system and from the perspective of a mission-directed research organisation. Therefore our focus here is on connections with the Indian Ocean Region in the areas of research, science, technology, innovation and entrepreneurship and how Australia can seek to maximise its level of engagement in these areas.

CSIRO is responding to the following terms of reference of the inquiry:

(b) Australian mineral exports, including competition and synergies in the region;
(d) the Indian Ocean Rim Association and any other relevant bodies and their future directions; and
(e) other relevant matters.

We have chosen to structure our response according to the four key areas in which we engage with Indian Ocean Rim countries:

- Food, water, energy and resource security
- Climate change and adaptation
- Ecological health of fisheries, coastal zones and ocean biodiversity
- Biosecurity including human and animal health, invasive pests and weeds.

Food, water, energy and resource security

CSIRO is involved in food, water, energy and resource security research projects with local partners in many Indian Ocean Rim countries. CSIRO sees potential for expanding collaborative efforts to find solutions to these global challenges. Given the large and growing population centres around the Indian Ocean Rim and the development challenges in many Indian Ocean Rim countries, these challenges will continue to increase. Australia faces similar challenges, and with an increasingly urban population could benefit from close attention to the issues posed by urbanisation in many of the Indian Ocean Rim countries.

Food, water, energy and resource security are closely linked and need connected solutions. The current world food situation can be summarised[1] as:

- strong economic growth driving demand for high value products and processed foods
- slow growing supply, low stocks and supply shocks at a time of surging demand
- biofuel production contributing to a changing supply/demand balance
- the poorest countries still being left behind

[1] http://www.csiro.au/Organisation-Structure/Divisions/Ecosystem-Sciences/The-Bioeconomy/Food-opportunities-for-Australia.aspx

- increased demand from an increasing population
- high food prices leading to less balanced diets with adverse health consequences.

There are opportunities for Australia to build on its current competitive advantages and also deliver enabling capability to regional partners by:

- improving agricultural production levels and efficiencies
- improving food safety and the nutritional quality of food cereals, pulses and oils as well as under-utilised indigenous foods like amaranth and cavies
- improving animal health through the production of thermo-stable vaccines extending higher value agricultural production
- improving biosecurity systems to reduce risks to cereal, pulse and oilseed crops
- developing new non-food biomass technologies to partly decouple food and energy needs
- reducing production costs and environmental stress by improving water access and increasing the efficiency of chemical/fertiliser use.

Food security

With a world population projected to rise from 6.8 billion in 2010 to over 9 billion by 2050, the world is facing around a 70 per cent increase in food demand during this period. The increase in food demand is driven by population growth combined with economic development and diet changes driving changes in diet composition and consumption levels.[2]

The global challenge will be to increase food production through raising agricultural productivity efficiently, whilst decreasing our environmental footprint in the face of increased climate variability.

Australia doesn't currently have a problem feeding its own population but has a humanitarian interest in food security and stability for developing countries. Australian agricultural exports support global efforts to achieve food security in relation to immediate humanitarian needs.

Global trade is important in the food security equation, because floods, droughts and other impediments make it impossible to exactly match local food production with the regional demand.

CSIRO is actively partnering with agencies such as Australian Centre for International Agricultural Research (ACIAR) and Australia's Agency for International Development (AusAID) to ensure Australia's world-class agricultural science know-how contributes to improved food security in the developing world by building local capacity through research for development.

CSIRO is playing an important role in assisting farmers in many Asian and African countries to develop technologies and management strategies to diversify and increase their food and fibre yield and to decrease the variability of that yield.

As well as the humanitarian and long-term developmental interests, there are benefits to Australia in collaboration with Indian Ocean Rim countries, which in many cases have common aspects of landscape and farming systems. For example, like sub-Saharan Africa and parts of South and South-East Asia, Australian agriculture is based largely on extensive farming systems on soils of low inherent fertility and under high climate variability, so there are many lessons and tools that can be shared between these continents.

To foster a long-term sustainable improvement in African food security, the Australian government, through AusAID, has increased its investment into Africa via the Africa Food Security Initiative (AFSI). AFSI is focused on lifting food security and agricultural productivity in Africa through joint research, working with

[2] http://www.csiro.au/en/Organisation-Structure/Divisions/Plant-Industry/Food-security-explained.aspx

and building the capacity of African agricultural, research and other organisations and by enhancing community resilience by working with farmers, food processors, community groups and veterinary officers.

Through the Sustainable Agriculture Flagship, CSIRO is leading one part of this collaborative research program which includes collaboration across both West and East Africa. In East Africa, CSIRO's partnership is with Biosciences Eastern and Central Africa (BecA) focused on animal health and human nutrition projects.

Located at and managed by the International Livestock Research Institute (ILRI) in Nairobi, Kenya, the BecA-ILRI Hub provides a common biosciences research platform, research-related services and capacity building opportunities to the eastern and central African region and beyond. The BecA-ILRI Hub aims to increase access to affordable, world-class research facilities and to create and strengthen human resources in biosciences and related disciplines in Africa. These activities focus on addressing key constraints in African agriculture.

Other examples of CSIRO's collaborative research on food security in the Indian Ocean Region include:

- research to support a group of South African smallholder farmers to enter commercial markets through diversified and improved farming systems (a partnership with the University of Venda for Science and Technology, Limpopo Department of Agriculture, the University of Limpopo and Progress Milling);
- collaboration with Indonesian agencies (including Departemen Pertanian Balai Pengkajian Teknologi Pertanian) to expand the use of forage legumes across a range of farming systems and regions, which may help animal and crop production when grown as a relay or rotation crop with maize;
- identifying potential for large increases in wheat production in Bangladesh. Bangladesh currently consumes more than twice the wheat it grows, so increasing production will help ease the pressure on foreign currency reserves currently being used to import the shortfall;
- improving the accessibility and affordability of improved seeds from breeding programs to benefit large numbers of smallholder tree farms and rural communities in Tamil Nadu and Puducherry, India;
- developing capacity in cropping systems modelling to promote food security and the sustainable use of water resources in South Asia; and
- working with smallholder farmers across Sumatra and Kalimantan in Indonesia to increase the success of large-scale tree planting programs, bringing increased employment and wealth to rural smallholders, and improved community development schemes.

Water security

Rapid population growth and urbanisation increase the demand for water, energy, and food, as well as the generation of waste streams, stormwater runoff, and the flow of nutrients and contaminants into waterways. These pressures are likely to be exacerbated by climate change.

The considerable challenges in water security include[3]:

- providing secure water supplies in a changing climate and in the face of growing populations
- optimising the management and provision of safe, reliable, fit for purpose water supplies from a range of water sources
- reducing the carbon footprint of water supply and use, and recovering energy and nutrients from wastewater

[3] http://www.csiro.au/science/Urban-Water and http://www.csiro.au/Outcomes/Water/Water-information-systems/Irrigation-economics-environment.aspx and http://www.csiro.au/Outcomes/Water/Water-information-systems/Climate-Impacts-on-Water.aspx and http://www.csiro.au/Outcomes/Water/Water-for-the-resources-sector.aspx

- maintaining healthy water environments
- maintenance and management of aging water infrastructure
- establishing appropriate governance, institutional and pricing structures to encourage innovation without compromising social and environmental outcomes
- managing international river basins (within a single country and across borders), incorporating social, economic and hydrological analyses of water resources, food security and poverty reduction
- increasing pressure on water as a critical input to agriculture, industrial processing, mining and metals production.

These challenges apply to Australia as well as to our Indian Ocean neighbours, so a collaborative approach to developing solutions will be of benefit to all.

CSIRO is working on solutions to these challenges for Australia, and is increasingly exploring the adaptation of Australian solutions to our global neighbours, particularly the developing world.

For example, CSIRO is providing training in farming systems research for scientists from Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka. The training will assist the scientists to design improved rice based cropping systems that will increase water use efficiency.

CSIRO is also partnering in India to detect and manage industrial chemical impacts on groundwater resources, and in China to alleviate nutrient discharge to water bodies. These issues are of broad interest to Indian Ocean Rim countries.

One of the challenges in conquering the world's water shortages lies in the development of efficient, low energy processes to recover pure water from industrial, brackish and salt water resources. Membrane technology is the leading candidate for supplying fresh water through desalination and industrial water reuse, and nanotechnology breakthroughs in advanced membranes can provide a low energy solution to these separation challenges. CSIRO is involved in collaborative research with India and Australian universities to develop new membranes for low energy desalination, which could benefit Australia and many other countries.

Energy security

To secure our energy future, it is imperative that we move quickly to address the significant challenges of reducing our greenhouse gas emissions and developing scientific solutions to energy issues that will ensure Australia's long term economic, environmental and social well being.

In many Indian Ocean Rim countries, population growth and urbanisation are increasing pressures on electricity supply, as well as increasing the greenhouse gas emissions from energy sources as more energy is used by upwardly-mobile populations. Conversely, many population groups in these countries have limited or unreliable access to energy, which limits their ability to improve their living conditions.

CSIRO is undertaking research at each end of this spectrum, and believes that global collaboration is important in solving global energy security issues.

For example, CSIRO is developing efficient and low emission coal technologies for energy generation that could be exported to coal-producing Indian Ocean Rim countries such as India, Indonesia and South Africa. This has the potential to reduce global greenhouse emissions and increase energy production efficiency. CSIRO is already in the process of negotiating a collaboration agreement with the Central Mine Planning & Design Institute (CMPDI) Limited in India (a subsidiary of Coal India).

CSIRO is also developing new technologies for oil and gas exploration and production to support a clean and secure energy future. Collaboration with Indian Ocean Rim partners is already underway, such as Petronas in Malaysia.

With the aim of providing reliable, efficient and low-emissions energy to rural and remote areas, CSIRO is collaborating with The Energy Resources Institute of India (TERI) to assist with the low-emissions electrification of rural areas in India through the exploration of minigrids as a way to allow greater penetration of renewable energy in electricity networks while remaining completely portable across all generation methods, now and into the future.

In addition, CSIRO is working in rural India to develop solar cooling facilities that provide refrigeration in areas with no electricity supply to improve food quality and storage life. This A$1 million project is funded by AusAID and aims to assist India to minimise the 30 per cent of agricultural production that currently goes to waste due to lack of refrigeration. As well as solar cooling technology, CSIRO is investigating using waste heat from biomass gasification/gas engine technology that is being developed in rural Indian regions.

Both of these projects also have application in rural and remote areas of Australia, bringing benefits to our own population as well.

Resource Security

To underpin their economic health, the nations of the Indian Ocean Rim must either take advantage of their mineral reserves or access the required resources from trading partners.

Over many years, CSIRO has developed considerable expertise and experience in research related to the entire minerals value chain, from exploration to metal production and manufacturing. Research is increasingly targeting safe, efficient, clean mining, mineral processing and metal production operations which are all global requirements.

Obviously Indian Ocean Rim countries compete with Australia in the export market, and Australian national interest in the minerals domain must be carefully monitored. However, many of the challenges Australia faces in regards to resource discovery and utilisation are shared by Indian Ocean Rim countries. Therefore, the commonalities also provide opportunities for collaboration between CSIRO and Indian Ocean Rim organisations to develop new approaches and technology for the minerals industry of the future.

An example of cooperation in the region is CSIRO's involvement in the Australia-New Zealand Integrated Ocean Drilling Program Consortium (ANZIC). Through ANZIC, Australian researchers are members of the Integrated Ocean Drilling Program (IODP), the world's largest geoscientific collaboration, involving 27 countries. The IODP plans to focus on the Indian Ocean basin in 2014. To this end, CSIRO, Australian universities and Indian institutions will work through ANZIC and Indian agencies to generate high quality Indian Ocean drilling proposals, addressing global scientific issues.

Climate change and adaptation

Greenhouse gas emissions at or above present rates will cause further warming and induce many changes in the global climate system during the 21st century. It is very likely that these changes will be larger than those already seen in the past century.

Heat waves and heavy rain events are likely to become more frequent worldwide, with less snow, more fires, more heavy rainfall events and more intense cyclones. Rainfall is very likely to increase in high

latitudes and likely to decrease in most sub-tropical and temperate land areas. The area affected by droughts is likely to increase and tropical cyclones are likely to become more intense.[4]

There will be commonalities in the issues created by climate change for Australia and other Indian Ocean Rim countries. Climate change in Indian Ocean Rim countries is likely to affect Australia in different ways, meaning that a global approach to climate change mitigation and adaptation will be important.

CSIRO is developing practical technologies to reduce emissions in the manufacturing, agriculture, transport and energy sectors which can be shared with Indian Ocean Rim countries, such as low emissions fuels, energy and transport.

CSIRO has developed links with climate change science agencies internationally, including in India and the broader Asia-Pacific region to help us understand how climate change will affect Australia's international comparative advantages, and how changes elsewhere in the globe (particularly in the Asia-Pacific) will affect Australia.

CSIRO is also working on practical ways to help various Australian industries adapt to climate change, many of which can also be put in place in other Indian Ocean Rim countries. This would help these countries boost their resilience to issues caused by changes in climate which may otherwise have negative effects on domestic and regional security. At the same time, by developing tools to assist our Indian Ocean Rim neighbours manage current issues, we can learn the best ways to address future issues for Australia.
For example, CSIRO is working towards understanding how Australian primary industry businesses, communities and sectors can transform their practices to adapt to climate change.

This knowledge is also being applied in Indian Ocean Rim countries, where the impact of increasing climate variability on food security has been identified as a critical issue. Climate change is affecting agricultural productivity through shifts in rainfall patterns, changing temperature regimes and increased climate variability. Food shortages have occurred due to delays in summer monsoons and heavy rains during the harvest time, contributing to price spikes for food.

As an example of this collaboration, Australia is providing A$2 million for an initiative under the banner of the Indian Ocean Rim Association for Regional Cooperation (IOR-ARC), led by CSIRO. The project supports farmers, industry and policymakers in India and Sri Lanka to make more effective use of seasonal climate forecasts, which will improve food security in Indian Ocean Rim countries.

With AusAID funding, case studies will be conducted at the regional and farm scale in the Andhara Pradesh and Tamil Nadu regions of India and the Ratnapura region of Sri Lanka. The seasonal climate forecasting methods developed in India and Sri Lanka are expected to be transferrable to other Indian Ocean Rim countries, such as those in Africa. A workshop will share lessons learnt with other members of IOR-ARC and explore options for capacity development in this area with IOR-ARC members.

Ecological health of fisheries, coastal zones and ocean biodiversity

Australia has one of the largest ocean territories in the world. It drives our climate and weather, generates employment, provides food and resources, and offers lifestyle and recreational opportunities. Australia's ocean territory contributes nearly A$40 billion to our economy each year through a variety of industries, such as tourism, offshore oil and gas, aquaculture, commercial and recreational fishing, and shipping.

[4] http://www.csiro.au/Outcomes/Climate/Understanding/Climate-Change-Continues.aspx

Sharing scientific knowledge about the Indian Ocean, including its physical, biological, chemical and geological properties, with neighbouring countries is critical for the safe, efficient and sustainable use of Australia's marine wealth as well as for climate-sensitive terrestrial industries. It will help us:

- predict and prepare for global climate change
- support defence, offshore engineering, shipping, ecosystem conservation and management, search and rescue, environmental disaster response and more
- conserve Australia's marine biodiversity, which will lead to triple-bottom-line benefits for our nation.

Australia participates in several key international ocean science research programs, such as

- the World Meteorological Organisation's World Climate Research Program CLIVAR
- the Intergovernmental Oceanographic Commission's Indian Ocean Global Observing System which administers the Indian Ocean Observing System (INDOOS)
- the Sustained Indian Ocean Biogeochemical and Ecological Research (SIBER).

These programs assist in the coordination of the evolving Indian Ocean Observing System (INDOOS) which is a multi-national ocean-basin scale observing program, to which Australia is a significant contributor, through its deployment of Argo floats and its long-running repeat temperature observations from ships of opportunity and drifters. Australia's recently established Integrated Marine Observing System (IMOS) further strengthens INDOOS through provision of an observing program on the Western Australian continental shelf and via instrumenting the major passages linking the Indian and Pacific Oceans via the Indonesian Archipelago. In addition Australia contributes to the Indian Ocean Tsunami warning system by maintaining several moored sites.

Australia provides science expertise to the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) and was instrumental in the design and evaluation of the management procedure to rebuild the stock, which was adopted and used to set the global quota for southern bluefin tuna by the CCSBT at their October 2011 meeting.

Australia has a long history of involvement in research and capacity building through the Indian Ocean Tuna Commission (IOTC). This work is lead by CSIRO with funding from AusAID and the Australian Centre for International Agricultural Research (ACIAR). CSIRO has participated in joint research projects and formal committees for the IOTC to assist with stock assessments and capacity development. Australia is currently assisting Indonesia to develop national strategies for sustainable participation in the international fisheries management forums. Similar initiatives would provide considerable benefits to the participation of small Indian Ocean coastal and island states in the IOTC.

In addition CSIRO has also begun work looking at fishing impacts on benthic communities and habitats on seamounts and prominent seabed features throughout the Indian Ocean. This work is being done in collaboration with the Australian Fisheries Management Authority and the fishing industry.

CSIRO is part of an international collaboration to identify Ecologically and Biologically Significant Areas (EBSAs) on the high seas, especially outside national jurisdiction, including in the Indian Ocean. This work continues earlier international engagement in developing comprehensive maps and criteria for EBSAs and is informing the Convention on Biological Diversity (CBD).

CSIRO is also working on tools to support sustainable fisheries (ecosystem-based fisheries management) that are being adopted world-wide and could have significant benefits for Indian Ocean Rim countries. CSIRO has similar expertise in coastal modelling capability and 'whole of system' ecosystem models.

Biosecurity including human and animal health, invasive pests and weeds

Increasing globalisation through trade, travel and global issues such as climate change mean that a collaborative approach to biosecurity is essential to find solutions and prevent incidents that could cost Australia billions of dollars.

For example, newly emerging diseases and devastating livestock plagues pose a constant threat to human health and well-being as well as potential threats to Australia's livestock industries. Through research into their detection and methods for limiting spread, CSIRO is helping to protect public health, animal health, community resilience and trade.

CSIRO is involved in several animal health development programs overseas, particularly in Southeast Asia and sub-Saharan Africa. This support not only reduces the disease risks to the countries themselves but also supports Australian biosecurity through better threat assessment and preparedness.

CSIRO operates 13 projects through the Australian Animal Health Laboratory's regional program, with support from partners such as AusAID. These projects include:

- providing training for staff handling avian influenza diagnosis in the Southeast Asian region;
- building veterinary laboratory capacity in Indonesia;
- supporting the implementation of Indonesia's national strategic plan for avian influenza control and human pandemic preparedness at the national level and specifically at the provincial level in South Sulawesi and Papua New Guinea;
- helping to design and implement a web-based data transfer system to enhance the management and national reporting of animal and zoonotic disease in Indonesia;
- understanding diseases transmission and control mechanisms including the development of thermo-stable vaccines for diseases like ovine rinderpest, contagious bovine pleuropneumonia and African Swine Fever in Africa; and
- working with Murdoch University to develop a national surveillance system in Indonesia for classical swine fever, avian influenza and foot and mouth disease.[5]

In a new initiative CSIRO will address the changing threat of vector-borne disease in the face of global change. The implications of the changing vector-borne disease 'landscape' are far reaching. Beyond the direct public health and economic consequences of vector-borne pathogens, increased disease activity directly impacts tourism appeal and places additional demands on Australia's already limited blood supply. Modification of landscape and the urban encroachment into natural ecosystems increases the potential for exposure to pathogens transmitted by mosquitoes (and to a lesser extent, ticks, mites and other blood-feeding arthropods). Further, invasive mosquitoes are likely to expand the geographical regions at risk of arboviruses and threaten our outdoor lifestyle. These issues are relevant across the Indian Ocean rim countries and in the Pacific and can be addressed through a proactive, integrated and ecologically based approach which will generate benefits for public health, industry, and regulators.

CSIRO is also investing in pre-border control of invasive species. It is estimated that alien invertebrate and vertebrate pests and weeds cost Australia at least A$7 billion a year and, globally, the costs of invasive alien species are around US$350 billion.[6] Working with our Indian Ocean neighbours to help prevent invasive species entering Australia can have significant positive benefits for Australia.

[5] http://www.csiro.au/en/Organisation-Structure/National-Facilities/Australian-Animal-Health-Laboratory/Research-and-Capabilities/AAHL-Regional-Program.aspx

[6] http://www.csiro.au/Outcomes/Safeguarding-Australia/Biosecurity-Invasive-Species.aspx

For example, CSIRO is undertaking risk assessments of potential exotic pests by studying similar geographic regions' pest and disease issues, as well as sharing data with neighbouring countries to help assess how of climate change could affect the impact of invasive species. A key aspect here is to investigate the natural movement patterns of both animal and plant pests and the diseases they transmit between populations in northern Australia and those in neighbouring countries in the Indian Ocean Rim. This is being considered in the context of future strategies in Australia to increase the scope of our agricultural activities in the north, and also with regards to the expected increase of our population in the north. We aim to assess the additional biosecurity and human health risks that might arise as a consequence of these expected changes in northern Australia. Since natural movement occurs in both directions, any effects in Australia could also lead to additional risks for our northern neighbours. This research is a key area for CSIRO's Invasive Species and Plant Biosecurity Theme.

CSIRO also undertakes research in countries affected by invasive species that may be a threat to Australia in order to identify possible biocontrol agents. Collaboration with Indian Ocean Rim neighbours is crucial for this work.

CSIRO also works on human health and disease risks, and is collaborating with our neighbouring countries to prevent the spread of infectious diseases as well as to find ways to control other global health issues. For example:

- CSIRO is working with partners in India to improve treatment for diarrhoea caused by diseases such as cholera; and
- CSIRO has significant collaborations with Malaysia and Singapore to research bat-borne diseases that can infect humans, such as the Melaka virus.

In addition, CSIRO hosts the Australian National Insect Collection (ANIC), the world's largest collection of Australian invertebrates, consisting of more than 12 million specimens. As part of ANIC, the Virtual Taxonomic Laboratory (VTL) was launched in September 2009 as part of a Memorandum Of Understanding between CSIRO and the Chinese Academy of Sciences. The VTL will be used to promote collaborative taxonomic and systematic research amongst geographically remote institutions by supporting real-time remote microscope diagnostics, teaching and training.

ANIC is also an integral part of the Remote Microscope Diagnostic Network (RMDN), which has flourished throughout Australia, New Zealand and South-East Asia. The RMDN connects insect specimens and experts in real time via a web-based feed and is being developed in conjunction with other national diagnostic initiatives to protect Australia both internally and externally from biosecurity threats, and capture new information on the diagnosis and management of these threats.