



Our Ref: 08/306

Committee Secretary
Senate Foreign Affairs, Defence and Trade Committee
Department of the Senate
PO Box 6100
Parliament House
Canberra ACT 2600
Australia

29 August 2008

The Committee Secretary

RE: CSIRO's Submission to the Inquiry into the Main Economic and Security Challenges Facing Papua New Guinea and the Island States of the South West Pacific

We thank you for the opportunity to comment on the main economic and security challenges facing Papua New Guinea (PNG) and the Island States of the South West Pacific. Our attached comments are written with an understanding that CSIRO is actively undertaking research on issues of relevance to Australia and the region.

CSIRO has been involved in research and development activities in this region for more than 20 years and have played an important role in the improvement of scientific knowledge about important issues such as climate change, fish stock management and submarine mining.

Through its research, CSIRO has identified several areas of economic and security concern for the region that could potentially impact on Australia. For instance, the discovery of the mite *Varroa jacobsoni* in PNG poses a significant biosecurity threat to Australia and has a number of implications for Australia's preparedness in terms of border biosecurity, biosecurity planning and implementation. In our submission, CSIRO has chosen to highlight these issues as well as some of the research the Organisation is conducting that will be of benefit to Australia and the region.

Should you require any further information regarding our submission, please do not hesitate to contact me or Mr Peter King (the main submission contact).

Yours sincerely

A handwritten signature in blue ink, appearing to read 'A. Johnson', is written over a light blue circular stamp. The signature is fluid and cursive.

Andrew Johnson
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CSIRO Submission 08/306

Inquiry into the Main Economic and Security Challenges Facing Papua New Guinea and the Islands States of the South West Pacific

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Executive Summary

This submission addresses issues that are specific to scientific research activities conducted by CSIRO in the region. These matters are discussed in the submission in terms of the potential impacts they may have on the countries in the region and upon Australia. Some suggestions are made on how the Australian government might address some of these challenges.

There are a many linked environmental and economic challenges facing PNG and the island states of the south west Pacific. Supporting our regional neighbours to overcome or mitigate these challenges is central to Australia's own wellbeing. These challenges are the result of both newly emerging issues such as climate variability, sea-level rise, water quality and quantity, energy mix, effective natural resource management and food security, and old issues that are becoming more pointed such as having small economies that are highly susceptible to external shocks, remoteness and vulnerability to natural hazards. Specific issues addressed are:

- PNG's environmental assets, which include some of the better preserved marine biodiversity hotspots in the world, are under threat. Economic incentives can be used to better manage these assets by harnessing the international value placed on community environmental stewardship to achieve such aims as biodiversity conservation and carbon offsetting.
- PNG is richly endowed with mineral and petroleum resources and has traditionally turned to Australian based companies to carry out exploration and exploitation of this wealth. CSIRO is engaged in ecosystem assessment in this area and is engaged in emergent deep sea mining initiatives which may operate without the land use conflicts that often accompany terrestrial activities.
- The requirement for economic, social and environmental evaluation of major public investments is weak in the region and could be strengthened. This would improve governance and lead to better investment decisions, and consequential returns.
- Pacific island nations are likely to experience particularly negative climate change consequences with considerable economic impact. Likely impacts include temperature rise, rainfall decline, more extreme weather events, water resource stress (especially for small islands dependent on freshwater lenses), fishery and marine damage, and agricultural pressure. A systematic study of the wider and more integrated implications of climate change and possible proactive adaptation responses for the region is urgently needed as well as support for modelling of possible climate change impacts to inform policy and investment decisions.
- Varroa mite is possible the greatest immediate bio-security threat to Australia. In June 2008 Varroa capable of severely reducing the pollination services by honey bees was found in PNG. In cooperation with RIRDC, CSIRO is investigating whether this new form of Varroa is as threatening to Australia's delivery of pollination to agriculture. This knowledge will be used to inform and revise Australia's existing preparedness and response capacity. Further investment by the Government of Australia to reduce the risk posed by Varroa to both PNG and to Australia is warranted.
- Despite Melanesia representing one of the world's richest areas of biodiversity no established and effective terrestrial protected areas exist. Without integration of natural values into land and seascape-scale assessments of development, ecosystem processes and services will continue to be fragmented and degraded. Payment systems which recognise the value of biodiversity protection, and pass these values onto landholders need to be developed to offset the short-term financial benefits provided by extractive industries such as mining, oil palm and timber.
- Fisheries are a significant contributor to PNG's economy, but overfishing is an issue, particularly as resource depletion has been linked to social and economic disadvantage. Further work is required to protect the fisheries of the region.

In summary, the challenges emerging are complex and resultant policy interventions and investments need to be strongly informed by evidence if they are to be effective. There is a strong need for the Government of Australia to support research and development that can contribute to these outcomes.

CSIRO has the capability to address many of these challenges through a systems approach that can contribute evidence to policy and investment decisions across scales from global through to local farmer and community levels.

Introduction

Papua New Guinea (PNG) and the island states of the Southwest Pacific cover an area of more than 5 million square kilometres. The states are made up of thousands of small islands and atolls, many with populations of less than 1000 people. PNG is the largest, most populated, geologically and biologically diverse of the states that make up the region. PNG, is closest to Australia and shares many similar flora and fauna species with this country.

In the past three decades the region has undergone an extensive period of development resulting in the transformation of much of the natural landscape from forest to agriculture, mining and urban development uses. Significant ecological disasters have occurred as the result of mining activities in PNG, while large parts of the Solomon Islands have been logged illegally. These environmental changes have had a significant impact on natural ecosystems, and led to the social transformation of some rural communities and land tenure disputes. The remoteness of this region makes it particularly difficult to service and vulnerable to natural disaster events and the threat of climate change.

The rapid pace of development in the region has led to the emergence of economic problems, some of which present serious challenges to the long-term viability of some of these states, especially those with rapidly rising populations and rising sea level due to climate change. Most of the southwest Pacific island states have subsistence economies, and over exploitation of natural resources, such as fishing, groundwater and forestry is undermining their economic viability to operate as nation states. Remoteness is a constraint to the development and economic viability of many of these nation states, along with economic vulnerability to external shocks such as changing import and export process, and vulnerability to natural hazards. International development assistance will need to be specifically targeted to ensure better management of the region's natural resources in order to provide for a sustainable future.

CSIRO's Capability

CSIRO is Australia's peak scientific research organisation . CSIRO is engaged in a wide range of scientific research programs throughout Australia and the Asia Pacific region. This submission addresses some of the relevant issues contributing to the economic and security challenges facing PNG and the island states of the Southwest Pacific. CSIRO has been involved in research to improve scientific knowledge about this region and its development for more than 30 years. The organisations research activities embrace such things as: the impact of climate change on the ecological systems of low lying island states; changes in coral reefs; loss of forests and biodiversity; fish stocks management; submarine mineral exploration and mining, petroleum exploitation; the environmental impacts of human settlement; and policy and investment decision making tools.

CSIRO also has extensive capability in agriculture and integrated water management which could make a significant contribution to enhancing food security in the region through research and development to enhance agricultural productivity, address market failures inhibiting rural livelihoods, and address social safety nets to reduce social vulnerability. This capability can be harnessed along with environmental and climate change capability to research integrated and systems based solutions for the region.

Economic and Security Challenges

1. Assessment and Management of Environmental Assets Using Economic Incentives

PNG's environmental assets are facing many challenges. At the local level, environmental degradation and biodiversity loss have the largest impact on the poorest members of the community.

There is increasing opportunity to benefit local communities by accessing the international value placed on their environmental stewardship such as through biodiversity conservation or carbon offsetting schemes.

CSIRO and AusAID are collaborating to address this issue.

There are many challenges facing management of environmental assets in PNG and the Southwest Pacific, and attempts to address them have substantial repercussions locally, regionally and globally. At the local level, environmental degradation and biodiversity loss have the largest impact on the poorest members of the community who may rely on these natural assets for subsistence harvesting (food, firewood), storm protection, etc. Appropriate management of these assets benefits both the local community and the international conservation community, especially as PNG coastal assets include some of the better preserved examples of the world's marine biodiversity hotspot. Inadequate management of shared stocks of threatened species and harvested fish at the local (PNG) level has regional impact including on Australia's domestic economic activity. For instance, consumption of marine species like loggerhead turtles in PNG is resulting in legal mandates for increased conservation activities in Australia, and is a major driver of trade restrictions that are coming into force in the US. These local activities in PNG are likely to have substantial effects on economic activities like coastal development and marine fisheries due to environmental regulatory standards maintained in Australia and elsewhere. Carbon trading using avoided deforestation provides a clear example of local actions impacting at the global level. While PNG is likely to be a major seller of forest carbon credits internationally, there is substantial uncertainty about which operational mechanisms for protecting forest parcels can deliver secure offsets.

These challenges can be addressed to provide local benefit, but to be most effective will need to link the local processes to their regional and global impacts and benefits. There is increasing opportunity to match local environmental stewardship with international benefits in a process that provides increased benefit to the local community through accessing the international value placed on their environmental stewardship. At the same time regional and global communities gain from potentially relatively inexpensive approaches to reach their aims of biodiversity conservation and carbon offsetting.

CSIRO is starting projects in PNG in collaboration with AusAID:

- a) assessing the natural assets, evaluating the risks to those assets from anthropogenic stressors, and developing indicators to give inexpensive information about the state of complicated coastal systems; and
- b) exploring incentive mechanisms that can be used to protect natural assets, such as coral reefs, threatened species, or forest carbon, particularly mechanisms which can link environmental stewardship with poverty alleviation.

2. Mineral and Petroleum Resources

A sustainable marine mining industry has potential for the economic growth of island nations without generating land use conflicts often associated with mining.

PNG is richly endowed in mineral and petroleum resources. As a direct result of a shortage of skilled professionals within the country and its geographic proximity to Australia, the country has traditionally turned to Australian-based companies to carry out exploration for and exploitation of this wealth, sometimes with unfortunate environmental consequences. In most cases, the islands of the Southwest Pacific encompass maritime territories far in excess of their land areas. Coupled with a prospective geological environment, this has meant that many of these countries (for example, PNG, the Solomon Islands, Tonga and Fiji) are at the forefront of a newly emergent deep marine mining industry.

CSIRO has over 20 years history of research in this field within the Southwest Pacific. CSIRO is currently engaged with Lihir Gold Limited (since 1999) and Ramu Nickel to provide both baseline and benchmark ecosystem level impact assessments (e.g. Brewer et al 2007, 2008). Current indications are that Nautilus Minerals will begin to produce copper and gold from its 1500m deep Solwara 1 deposit (a CSIRO discovery) in PNG by late 2010. An environmentally and economically sustainable marine mining industry has the potential to assist the economies of the island nations through export earnings, without generating the land use conflicts that often accompany more traditional terrestrial mining operations.

3. Economic Evaluation of Public Investments

Strengthening the economic evaluation of substantial public investments would improve governance and lead to better investment decisions.

In Australia there are mandatory requirements for benefit cost analysis (BCA) on major public investments (e.g. railways, bridges, dams). There are also requirements for social and environmental impact assessment under State and Federal legislation.

Throughout the Pacific these requirements are not well established and the application of these evaluation procedures is less common. Strengthening the requirements for, understanding of and application of economic evaluation procedures throughout island states of the South West Pacific would help improve governance and the wise expenditure of public funds.

4. Climate Change

The likely net effect of global warming is particularly negative in this region due to sea level and ocean chemistry effects.

CSIRO and the Bureau of Meteorology are collaborating on enhanced climate modelling that will support downscaling climate change projections from the global to regional scales suitable for application to the complex terrain of PNG and the Pacific islands.

A systematic study of the wider and more integrated implications of climate change and possible proactive adaptation responses for the region is urgently needed as well as support for modelling possible climate change impacts to inform policy and investment decisions.

Pacific island nations are already dealing with the impacts of climate change. These will have considerable potential economic impact, and consequently create real security issues in various domains, and will require significant, and costly, adaptation.

Direct impacts of climate change are canvassed in the Intergovernmental Panel on Climate Change's (IPCC's) 2007 chapter on Small Island Nations (Mimura *et al.* 2007), where it is noted that more than 50% of their total population lives within 1.5km of the sea, as well as the chapter on Asia (Cruz *et al.* 2007). Direct impacts include: temperature rise, rainfall decline, more extreme events; water resources stressed, particularly for small islands depending on freshwater lenses which are threatened; coasts, mudflats and estuaries affected, with coral reefs and fisheries at risk, and increased bleaching events, acidification, and anoxia affecting coastal resources in general; and, agriculture under pressure, though with some small potential benefits from CO₂ fertilisation.

These direct impacts lead to indirect impacts such as health effects, significant secondary economic impacts on tourism, actual loss of territory from sea-level rise, loss of cultural heritage, and loss of population support capacity. These in turn lead to regional security issues in various domains, including the potential for mass movement of environmental refugees around the region (including to Australia) which, if unplanned, will lead to great tensions and potential border security and even open conflict concerns; the quarantine security potential for movement of tropical pests, weeds and diseases around the regions (including into northern Australia); and a general undermining of economic security. Whilst climate change does offer some opportunities as well as threats, it must be said that the likely net effect of global warming is particularly negative in this region because of the inexorable impacts on sea levels and ocean chemistry. (It is also worth noting that understanding these issues has high relevance to Australia's own territories, since regions such as the Torres Strait Islands face similar issues; locations such as Saibai Island are at extreme risk of inundation, complete loss of traditional cultural heritage, of territory and of island-based livelihoods.)

There are already documented observed changes that are more-or-less attributable to climate change (Mimura *et al.* 2007; Cruz *et al.* 2007). These include: an increase in hot days and warm nights and decrease in cold days and nights between 1961 and 1998; increased occurrence of extreme rains causing flash floods in Vietnam; landslides and floods in 1990 and 2004 in the Philippines, and floods in Cambodia in 2000; droughts normally associated with El Niño-Southern Oscillation (ENSO) years in Myanmar, Laos, Philippines, Indonesia and Vietnam; droughts in 1997-8 caused massive crop failures and water shortages and forest fires in various parts of Philippines, Laos and Indonesia. On the other hand, the annual numbers of tropical storms show two peaks, one in the mid-1960s and another in early 1990s, and numbers as documented in IPCC (2007) have only been average after 1990.

In the face of these impacts, it is crucial that policy makers have information on the most vulnerable assets and cost effective adaptation options. The IPCC 2007 report (Mimura *et al.* 2007; Cruz *et al.* 2007) identifies a variety of generic approaches, such as coastal protection and population consolidation inland or on larger islands in the face of sea level rise; increased rainwater harvesting and use of alternative water sources such as desalination in the face of water insecurity; and exploring alternative crops and production methods for food security (a substantial list of options is provided in IPCC 2007 a,b). However, these options are not made spatially explicitly nor costed for realism and action is urgently needed to systematise such an understanding.

CSIRO's CCAM model is currently a staple of Australia's regional climate modelling research. CSIRO is delivering the next generation climate and earth system model - the Australian Community Climate and Earth System Simulator (ACCESS) that will deliver a new generation of numerical models to improve weather and climate research in Australia and regionally; it is planned to be used for the next IPCC Report. A key part of ACCESS, which was developed with the Bureau of Meteorology, will be an enhanced regional climate modelling capability, which will be applied to the downscaling of climate change from the global-scale models to the regional scales suitable for application to the complex terrain of PNG or to Pacific island regions. The development in ACCESS of this regional modelling capacity will take a few years, and, in the mean time, the existing C-CAM modelling system will be used for downscaling.

CSIRO Climate model central to Fiji climate study

The first use of a climate model to better understand Fiji's climatic cycles has been performed by CSIRO scientists. It simulated maximum and minimum temperatures and rainfall at selected locations in Fiji over a 10 year period from 1975 to 1984. The research, at a resolution of 8 km, is presently the highest resolution at which a global climate model has been applied for regional climate simulations, generating information required by policy-makers to assess the social and environmental impacts of climate change.

While there were some differences between observed and simulated climatic elements, the CCAM model has demonstrated substantial skills in reproducing many observed features of Fiji's climatology. The CCAM model has also successfully reproduced the pattern of maximum and minimum surface air temperatures between the western and central divisions of Fiji, rainfall patterns, variability from season-to-season and year-to-year, with the influence of the El Nino phenomena evident in the rainfall patterns.

These results are the first step in downscaling global climate models to regional scale for tropical islands like Fiji, to infer the regional impacts of climate change. Numerous regional climate model runs have been completed over Australia, some down to 15 km, such as over Queensland and Tasmania. These runs have been used for numerous climate change impact/adaptation studies. Current work includes downscaling multiple global model runs in order to understand the uncertainties in regional climate change.

CSIRO also has capability relevant to the monitoring of PNG's carbon budget, which may have significant economic ramifications (including potential benefits) associated with carbon trading and carbon offsets. Contributions could be made in the areas of:

- Monitoring of land-use change, especially forest conversion/forest degradation/peatland conversion
- Monitoring of greenhouse gas concentrations at a set of specific sites, in order to infer the large scale fluxes.

A current project that is relevant to PNG and Island carbon emissions is on carbon flux implications of the conversion of land to palm oil plantations. Palm oil is a potential significant source of biofuel, but changes in land-air carbon fluxes through massive plantation expansion are likely to be substantial though at present with very large uncertainties. The project aims to reduce these uncertainties in emission change.

CSIRO is also building a strategic alliance with AusAID to deliver systems approaches to environmental problems in the region. However, a systematic study of the wider and more integrated implications of climate change and possible proactive adaptation responses for the region is urgently needed as well as ongoing support for modelling possible climate change impacts to inform policy and investment decisions.

5. Bio-Security

A new invasive Varroa mite discovered in PNG presents an immediate biosecurity threat to Australia and a serious threat to PNG's economy. In cooperation with RIRDC, CSIRO is investigating how threatening this new form of Varroa is to Australia's delivery of pollination to agriculture. This knowledge will be used to inform and revise Australia's existing preparedness and response capacity.

Further investment by the Government of Australia to reduce the risk posed by Varroa to both PNG and to Australia is warranted.

The invasive Varroa mite is probably the greatest immediate bio-security threat to Australia. In June 2008 Varroa, capable of severely reducing the delivery of pollination services by honey bees, was found for the first time in PNG.

CSIRO was central in discovering, identifying and assessing the incursion. Initially the Varroa discovered in PNG was assumed to be *Varroa destructor*, the species which has caused significant problems in the USA and NZ. However, closer investigation revealed that it was in fact *Varroa jacobsoni* but appears to have recently evolved the ability to develop on honey bees. This discovery has a number of implications for Australia's preparedness. To date all our efforts in terms of border biosecurity, biosecurity planning and implementation, risk analysis and communication and impact assessment have been focused on *V. destructor* not *V. jacobsoni* which until now posed no threat at all. The changes in *V. jacobsoni* mean that preparedness focus will now need to broaden to analyse the implications of this new threat.

In PNG its impact will be felt most heavily in the country's coffee production which depends on honey bees for 50% of the crops pollination. Coffee is the major cash crop in the highlands of PNG and over 2 million people depend both directly and indirectly on money earned from coffee. As well as coffee, honey bees pollinate a range of food crops grown in the affected areas including tropical fruits, pumpkins and beans. The presence of Varroa in PNG poses a significant threat to Australia where 70% of the insect pollination of food crops is delivered by feral honey bees and is worth up to \$4 billion. This level of provision of free pollination service is unusual in global terms and is due to the widespread availability of nectar from Australian native plant species which has allowed feral honeybees to proliferate.

The consequence of this is that the size of Australia's managed pollination industry is small and unable to deliver anywhere near the level of pollination required to meet existing industry needs should feral bees no longer be available. An invasion of Australia by Varroa will see feral bees eliminated and primary producers turning to managed pollination services. The prospect of sufficient hives being available to meet the projected demand is low. Countries such as the USA and NZ which have recent experience with invasions by Varroa have found that rather than increase, the managed pollination industry declines in size and becomes increasingly unable to meet demand. This has several consequences, firstly cost of production increases as the fee for pollination increases and secondly production decreases; both result in higher prices for consumers. Another impact is on the availability of seed which becomes less available and more expensive. Industries most at risk are stone fruit, apples, pears, almonds, a range of vegetable crops and broad acre crops such as canola. Grazing industries are also at risk as the availability of seed to maintain pastures becomes limiting.

In cooperation with RIRDC, CSIRO is investigating whether this new form of Varroa is as threatening to Australia's delivery of pollination to agriculture as the well known *Varroa destructor* species. This knowledge will be used to inform and revise Australia's existing preparedness and response capacity. CSIRO is also looking to cooperate with ACIAR to assess the impact of the loss of managed pollination in PNG on its coffee production and to develop approaches to minimise the impact of this new mite. Further investment by the Government of Australia to reduce the risk posed by Varroa to both PNG and to Australia is warranted.

6. Loss of Biodiversity

Despite Melanesia representing one of the worlds richest areas of biodiversity no established and effective terrestrial protected areas exist.

Without integration of natural values into land and seascape-scale assessments of development, ecosystem processes and services will continue to be fragmented and degraded.

Payment systems which recognise the value of biodiversity protection, and pass these values onto landholders need to be developed to offset the short-term financial benefits provided by extractive industries such as mining, oil palm and timber.

Biodiversity underpins the healthy function of ecosystems, and the services that those ecosystems provide to humanity. Such 'ecosystem services' include supporting services (e.g. nutrient cycling, soil formation, primary production), which in turn supply provisioning services (e.g. food, fresh water, wood and fibre), regulating services (e.g. climate regulation, flood regulation) and cultural services (e.g. aesthetic, spiritual and cultural values; MEA, 2003). In PNG and the Pacific Islands, where livelihood systems are largely based on subsistence or primary industry based on exploitation of natural resources, the erosion of biodiversity is likely to have direct impacts on human well-being. Consequently the values attached to biodiversity are likely to be very high from a local perspective, although the linkages between biodiversity and human well-being have never been fully assessed or integrated into development planning. This erosion of biodiversity is also likely to have indirect, long term impacts on human well-being through the loss of future potential values.

The Melanesian region has exceptional global values for biodiversity. It is recognised as one of the world's richest areas of biodiversity, with unique tropical forest, wetland and marine ecosystems. It is estimated that Papua New Guinea alone contains at least 5% of the earth's species (Miller et al., 1994). It has been recently shown that the region potentially provides the highest return on conservation investment worldwide (Hoekstra et al., 2006), and consequently has been the target for conservation initiatives by NGOs and aid agencies for many years.

However, in spite of these values and the focus on biodiversity protection from external interests, there are no established and effective terrestrial protected areas in the region (Graham et al., 2005). Due to the customary ownership of the majority of land, any conservation planning must be driven and accepted by local landholders (Butler et al., *in review*). In most cases the monetary incentives to conserve biodiversity are poor relative to the returns gained from timber extraction or mining, and consequently loss of habitat and species is occurring at a rapid rate (Ellis, 1997). In the marine environment there are more examples of community-driven marine protected areas, primarily because the returns to landholders from increased and sustainable harvests of marine resources are quickly apparent, and directly competing industries do not exist to the same extent as in terrestrial systems (Read, 2002). Equally, there are few examples of integrated planning to assure the maintenance of landscape-scale ecosystem functions, such as water supplies. Only the Sovi Basin in Fiji, where the national water supply company is providing incentives for traditional land owners to maintain native vegetation to protect water filtration functions, represents an example of such planning.

Without improved capacity of planners and government regulation to recognise the values of biodiversity, and to integrate these values into land and seascape-scale assessments of development, ecosystem processes and services will continue to be fragmented and degraded. Similarly, payment systems which recognise the value of biodiversity protection, and pass these values onto landholders must be developed to offset the short-term financial benefits provided by extractive industries such as mining, oil palm and timber. Payments for carbon storage and avoided deforestation may provide such an opportunity if linked with other biodiversity and ecosystem service values (Iftikhar et al., 2007).

Prioritizing areas for biodiversity conservation

Working in collaboration with Conservation International, CSIRO has been identifying Key Biodiversity Areas (KBAs) in PNG. Using records of species distribution and systematic conservation planning techniques, KBAs are being identified where conservation efforts are likely to achieve greatest multiple-species outcomes. By overlaying these areas with threat data including human population growth, logging and mining, it has been possible to prioritize KBAs.

The incorporation of ecosystem services into KBA identification as an opportunity for conservation is currently being developed. With it the potential for delivering KBA protection through payments to communities who steward the ecosystem services is also being established. Watershed protection for the delivery of water quality, and carbon storage through forest protection are currently viewed as the most feasible areas for development.

7. Depletion of fish stocks

Fisheries are a significant contributor to PNG's economy, but overfishing is an issue, particularly as resource depletion has been linked to social and economic disadvantage.

Further work is required to protect the fisheries of the region

PNG is a significant participant in the Western Central Pacific Fisheries Commission (WCPFC) (the largest tuna fishery in the world), taking both large catches with its domestic flagged fleet and also through joint venture agreements with other distant water fishing nations. A significant proportion of the WCPFC catch of skipjack, yellowfin and bigeye tuna are processed at land based facilities in PNG as well as provisioning etc of distant water fishing fleets; hence pelagic fisheries make a significant contribution to PNG gross domestic product (GDP) as well as subsistence and domestic commercial food supply. Two of these fisheries (yellowfin and bigeye) are now considered to be being overfished and this year's Scientific Committee meeting (currently in session) is likely to recommend a need to reduce effort/catches to maintain long-term yields. Previous studies (not necessarily by CSIRO) have indicated that there is a strong link between local fisheries resource depletion, unemployment and illegal activities (including illegal, unreported and unregulated fishing and other associated activities).

At a regional scale Australia (through AusAID funding to the Secretariat of the Pacific Community and the Pacific Islands Forum Fisheries Agency) and CSIRO (through science contributions to assessments and management frameworks) contribute substantial existing support to these areas, although not necessarily directed at specific fisheries. CSIRO also has a history of collaborative fisheries research with PNG across the spectrum of freshwater, estuarine, coastal and offshore fisheries. CSIRO has assisted with the assessment and management of nearshore small scale fisheries, particularly for shared stocks in Torres Strait and in Milne Bay. This work is usually in close collaboration with managers and scientists from PNG National Fisheries Authority, so there is also a strong capacity building component. Further work is necessary to protect the fisheries of the region.

Conclusion

There are a many linked environmental and economic challenges facing PNG and the island states of the Southwest Pacific. Supporting our regional neighbours to overcome or mitigate these challenges is central to Australia's own wellbeing. These challenges are the result of both newly emerging issues such as climate variability, sea-level rise, water quality and quantity, energy mix, effective natural resource management and food security, and old issues that are becoming more pointed such as such as having small economies that are highly susceptible to external shocks, remoteness and vulnerability to natural hazards. The challenges emerging are complex and resultant policy interventions and investments need to be strongly informed by evidence if they are to be effective. There is a strong need for the Government of Australia to support research and development that can contribute to these outcomes.

CSIRO has the capability to address many of these challenges through a systems approach that can contribute evidence to policy and investment decisions across scales from global through to local farmer and community levels.

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Annex 1 Terms of Reference

Economic and security challenges facing Papua New Guinea and the island states of the southwest Pacific

- (a) The following matter be referred to the Senate Standing Committee on Foreign Affairs, Defence and Trade for inquiry and report to the Senate by 30 May 2009. The major economic and security challenges facing Papua New Guinea and the island states of the southwest Pacific;
 - (i) the implications for Australia;
 - (ii) how the Australian Government can, in practical and concrete ways, assist these countries to meet the challenges.
- (b) The inquiry to include an examination of the following:
 - (i) employment opportunities, labour mobility, education and skilling;
 - (ii) barriers to trade, foreign investment, economic infrastructure, land ownership and private sector development; and
 - (iii) current regional organisations such as the Pacific Islands Forum and the Secretariat of Pacific Community