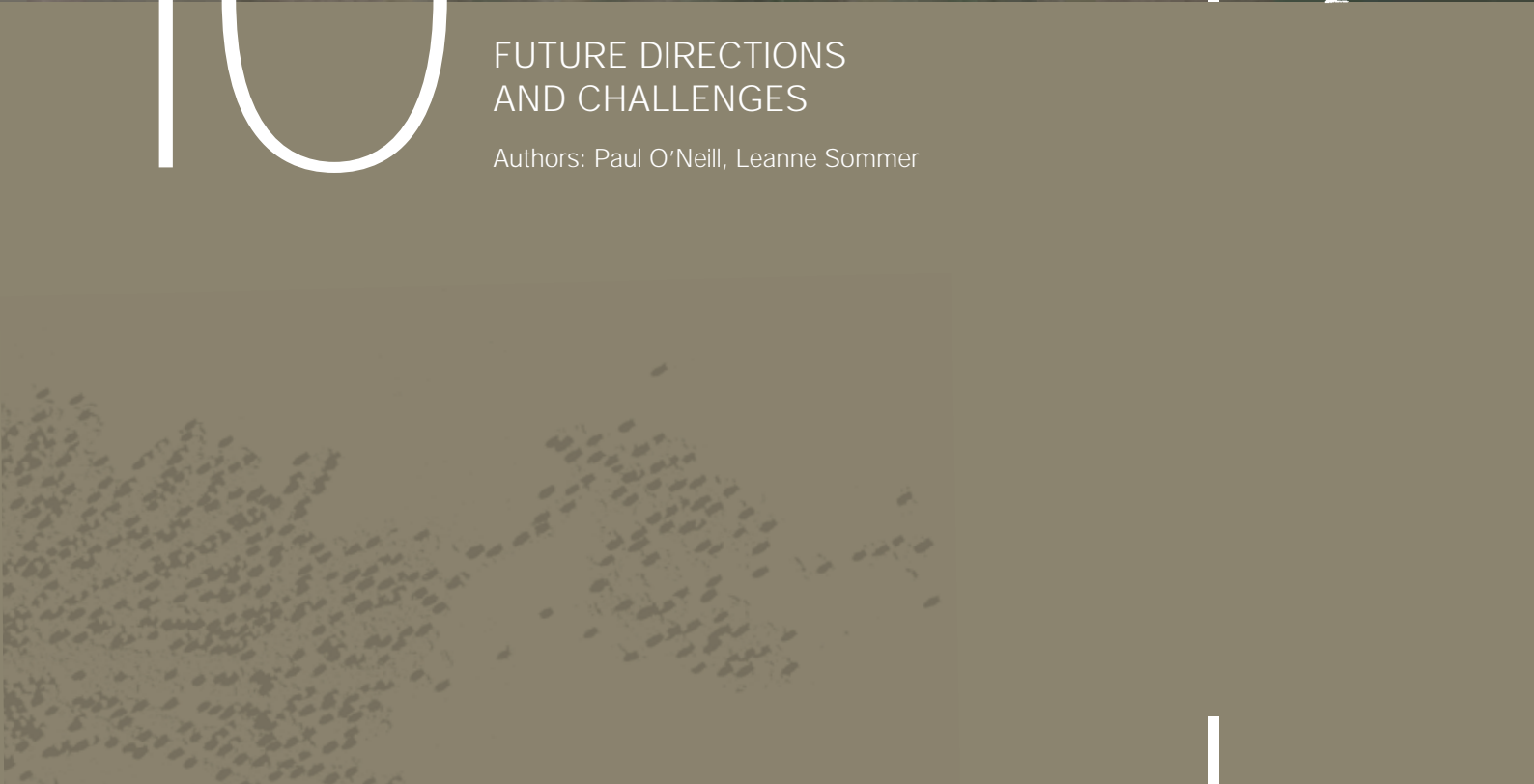




10

FUTURE DIRECTIONS AND CHALLENGES

Authors: Paul O'Neill, Leanne Sommer



CLIMATE CHANGE

The magnitude of the climate change challenge becomes more readily apparent when the full suite of predicted symptoms of anticipated climate change is considered in combination. Accelerated climate change will not result in warmer global temperatures, but will affect a range of global parameters, including weather patterns, ocean temperatures and currents. These phenomena will in turn affect further aspects of the global environment.

The Intergovernmental Panel on Climate Change (IPCC) now predicts a 180–590 millimetre Mean Sea Level rise during the 21st century. Sea level rises will have a range of environmental, physical, economic and cultural impacts. Such sea level rises will directly affect those animal and plant communities in the intertidal zone and immediately above it. As already discussed, mangrove communities are likely to be lost from areas of deeper water, but some may migrate inland into low-lying areas.

Another probable result of global warming is an increase in the severity of tropical storms. Cyclone formation is linked closely to ocean temperature. Cyclones normally do not form or survive long over oceans once the temperature drops below about 26°, and the longer waters remain above this threshold the greater the chance of cyclones forming. Results of recent studies show that the strongest cyclones, those with strengths of category 4 or 5, were nearly 50% more frequent around the world in 1990–2004 than in 1975–1989. If the oceans continue to warm as predicted, the frequency and severity of cyclones affecting Shoalwater Bay Training Area (SWBTA or the Area) are set to increase.

The predicted increase in occurrence and severity of cyclones along the Queensland coast will increase the severity of physical damage to communities in exposed situations, such as mountain ranges and low-lying coastal areas. Coastal erosion will increase and may cause the parabolic dune systems of the east coast to again become active. Wet seasons may become shorter but with more severe rainfall events causing more flooding. Western parts of SWBTA are likely to become drier, with more protracted dry seasons. Already the past few years have witnessed the loss of some ironbark woodlands on dry ridge-tops due to prolonged drought conditions.

The IPCC also predicted in 2007 that 20–30% of assessed species are at risk of extinction if global temperatures were to rise more than 1.5–2.5°C. Some species are more quickly affected by climate change effects than others. It is now well known that frog species around the world have been disappearing at alarming rates in recent decades. The culprit is the widespread chytridiomycosis fungus, but the cause was shown to be increased average temperatures induced by global warming.

Many other animal and plant species are also exhibiting effects from climate change, particularly those that have restricted ranges or depend on annual migrations. Many migratory species rely on temperature as their cue to begin migration. With increases in average temperatures, some of these species have begun their migrations early. Others have delayed migration to the point where they have fallen out of synchrony with prey traditionally utilised during the migration. Other species such as turtles rely on ground temperature to incubate their eggs, and ambient temperature determines the sex of the hatchling. If the average temperature changes, the sex ratio of the offspring also changes and a long term gender imbalance threatens survival.

Some plant species will probably benefit from rising temperatures, depending on moisture conditions. Others, particularly those that occur on mountain tops may become extinct. Some mountain tops in SWBTA contain plant communities adapted to cooler, moister conditions. These mountain heath communities may not survive rising temperatures and reduced moisture conditions. Another likely effect of climate change is an increase in invasive species. These species, by definition, can tolerate a wide range of conditions, including drought stress and heat. Many invasive species will also out-compete native species if predicted climate change effects occur across wide areas of the globe. With rising temperatures and drier conditions predicted for many parts of Australia, the risks of fire are also set to increase. This will in turn affect many vegetation types, most notably rainforest, vine forests and other communities that are sensitive to fire.

It is difficult to predict what may happen to the freshwater wetlands, specifically in SWBTA. Those that are supplied with water from the large eastern sand masses may be unchanged, if enough summer rainfall continues to keep the sand aquifers charged. Those reliant on direct runoff from rainfall may cease to exist. The fate of rainforest areas may be similar, with many being vestigial, and located in areas such as protected gullies where moisture loss is minimised. These places are likely to decline with any decrease in average rainfall and increase in temperature. Others with a constant water supply are likely to survive.

There is a growing body of evidence to suggest that human induced climate change is already affecting ecosystems at a global scale (Henson 2008). Loss of many species as a direct result of climate change is inevitable if global temperatures continue to rise and moisture conditions change. Areas likely to be most affected are those where large contrasts in temperature and moisture conditions have produced high biodiversity. Small shifts in climate conditions in such areas can seriously affect the survival of many species concentrated in small localised niches. SWBTA is one such area, with many species at or near their range limits, and a great variety of habitats created by a strong east-west rainfall gradient and pronounced topographical variation.

Safety barricade,
Freshwater Beach



With the international community turning their collective minds to the question of climate change, the importance of refuge areas (refugia) such as SWBTA will only increase. At a World Wildlife Fund and IUCN World Commission on Protected Areas Symposium in Canberra in 2007, delegates highlighted the importance of areas that function as reserves - such as SWBTA - as a critical strategy for buffering nature against climate change.

View of SWBTA from
Radar Lookout



Small bay on Cape Clinton

REGIONAL DEVELOPMENT

One of the findings of the 1994 Commission of Inquiry into the future use of SWBTA was:

‘the Area’s defence contribution is of great national significance and great care should be taken to ensure that any future resource uses and activities in the Area do not limit its scope and flexibility.’

This finding arguably has even more relevance today, given the ongoing pressures on natural areas along the Australian coast. Great care must continue to be taken to prevent incompatible uses likely to erode these values. This can apply equally legitimately to impacts on SWBTA of activities in surrounding areas as to those within the Area itself. Given the high level of control over internal use, one of the greatest long-term threats to maintaining the current balance between use and conservation in the Area must come from encroachment by more intense surrounding land use.

Currently land-uses surrounding SWBTA are generally compatible with the current balance of training activities and conservation management. These land-uses consist mostly of low intensity farming and grazing, forestry and conservation (national park, conservation park and marine park). The compatibility of existing surrounding land-uses was favourably assessed during consideration of the Area for acquisition in the early 1960s. Proposals to increase the intensity of use in these lands now or in the future would be of considerable concern to Defence, both from a training and conservation perspective.

By their very nature, Defence activities at times create some noise associated with the use of large equipment, weapons and low-flying aircraft. Urban encroachment on the boundaries of a number of other training areas in Australia has already compromised their original intended purpose and function. Any development encroachment near the boundary of SWBTA also has the potential to create irreversible issues of incompatibility. The most immediate issues are likely to be related to noise and traffic, but there are also a number of serious conservation related consequences.

As already outlined in this report, the conservation value of dugong, turtle and shorebird populations in Shoalwater Bay is very high and increasing. Low levels of human disturbance due to remoteness and inaccessibility is a major factor influencing the current status of these populations. Improving public access and increasing urban or tourist development adjacent to the Area will greatly compromise the future of these wildlife populations. Recreational vessel traffic in Shoalwater Bay would increase as a direct result of increases in adjacent development, with resulting increases in wildlife disturbance, including vessel strike on turtles and dugong.

The strategic value of SWBTA to the nation, its economic value to the regional community, and its high conservation values are compelling reasons to ensure development encroachment does not compromise the current balance between use and conservation. This can only be achieved through strong recognition of these values and issues in regional planning schemes involving all tiers of government.

In September 2008 the Minister for the Environment, the Honourable Peter Garrett announced a decision to reject a recent proposal by Waratah Coal Inc to construct and operate a coal rail line and shipping port within SWBTA. The basis for his decision was the ‘clearly unacceptable impacts the project would have on the internationally recognised Ramsar wetlands and the high wilderness value recognised in the Commonwealth Heritage listing of the property’. The impacts of the rail line and port facility were considered ‘simply too great to effectively mitigate and would destroy the ecological integrity of the Area. They are impacts which cannot be reduced with offsets or managed through approval conditions’.

Grevillea banksii





ENVIRONMENTAL STATUS OF SWBTA

The past 20 years has been an active period of environmental legislative reform at both Queensland and Commonwealth levels, with the enactment of the *Environment Protection and Biodiversity Conservation Act 1999*, the *Nature Conservation Act 1992* (QLD) and the *Environmental Protection Act 1994* (QLD). At the time of writing, moves are afoot nationally to introduce legislative and other incentives to address issues associated with global climate change, and our dependence on carbon emitting fuels and substances which have been shown to accelerate the natural warming cycle of the earth.

It is predicted that, as a range of environmental (climate), economic and demographic factors change over time and pressures on natural resources increase, additional reforms will be progressively introduced to ensure the security and wise use of natural resources and the conservation of natural values.

It is also possible in the future that economic value will be given to 'ecosystem services' in order to ensure that the natural processes continue to support our growing consumption needs. Ecosystem services is a concept that evaluates the services people obtain from their environments including their economic and social worth, and the opportunities that may be derived from considering these services more fully in land management policies and decisions. Ecosystem services include products like clean drinking water and processes such as waste decomposition, which are different from other ecosystem products because there is human demand for them.

These services can be divided into five types: *provisioning services* such as the supply of clean water, food and energy; *regulating services* such as climate regulation, waste decomposition and nutrient cycling; *supporting services* such as water purification, seed dispersal and pest control; *cultural services* such as intellectual inspiration, recreational experiences and scientific discovery; and *preserving services* such as genetic and species diversity for future use, and protection of options (MEA 2005). Because the environment of SWBTA is in a natural condition and it comprehensively provides all five ecosystem services types, its ecosystem service value will be high.

Strengthening protection for native animals and plants is also likely, including tighter controls on wild fisheries; requirements to protect or compensate habitat loss; capping, trading and offsetting of losses of natural areas; and protection of individual species.

Defence training areas around Australia are already widely acknowledged as 'islands' of natural bushland, grassland or forest in an Australian environment of expanding rural and urban development and landscape modification. The value of the Area as a large, intact, natural area where ecological processes continue with minimal human impacts is likely to increase over time, along with increased legislative and policy measures to protect biodiversity, ensure the maintenance of ecological processes and 'services', and reduce potential human impacts on climate.



Shoalwater Bay
mangroves at high tide

CHANGING DEFENCE TECHNOLOGY AND TRAINING

SWBTA was acquired by the Australian Army in the 1960s for the purposes of training for jungle fighting conditions on foot with limited technology or mechanical support. Over forty years, training requirements have gradually changed, with a more mechanised Army, greater technology in weapons systems, more accurate, longer distance weapons, faster aircraft, more sophisticated amphibious ships, and plans for faster jets with smarter fire power. The requirement for training venues that replicate urban environments rather than jungle environments has also emerged. The safety templates of contemporary weapons systems are much larger, and in a few cases, SWBTA is no longer large enough to support the safe firing of some of these weapons, and thus they cannot be used in the Area.

ADF operations and training activities are also becoming networked and integrated using telecommunications and sophisticated computer tracking. There

is an increasing use of 'constructive' training environments, where real training is conducted with an injection of hypothetical scenarios and forces. Virtual and simulated training is also increasing, and is particularly important when the financial cost of real training is high, and Defence forces are reluctant to use real weapons on practise events. New platforms such as the Australian Super Hornet, proposed to replace F-111s in the coming years, are likely to require less training time in SWBTA and other training areas, as much of the pilot and navigator training can be done in a simulator.

The impacts of these trends in Defence capability are potentially various for SWBTA. On one hand, there is better information about where activities are occurring and what the impacts are, because of better tracking. On the other, there may be future requirements for an additional fixed range, or new camp infrastructure to support training activities. Similarly, Defence environmental management is adopting technology, such as handheld field computers with inbuilt Geographical Positioning Systems, movement sensing still cameras, detailed satellite imagery, and access to helicopters for aerial monitoring.

MAINTAINING THE BALANCE

The significant values of SWBTA have been well recognised within Australia and internationally. International values include the contribution of the marine portion of the training area to the Great Barrier Reef Marine Park and World Heritage Area. The freshwater and intertidal wetlands within SWBTA also contribute to an internationally protected Ramsar wetland and are also recognised as important wetlands in Australia.

SWBTA is of national importance to the maintenance and demonstration of geomorphological, ecological and biological processes of the coastal and coastal hinterland environment. This has been recognised through its inclusion on the Register of the National Estate (replaced by the National Heritage List), and by inclusion on the Commonwealth Heritage List.

SWBTA represents one of the few remaining large tracts of coastal and subcoastal land, with relatively low level and localised disturbance, providing habitat to a number of locally and internationally endangered and threatened species. Many of the environmental and heritage values of SWBTA reflect the original wilderness landscapes of the Queensland coast and are hence irreplaceable.

Dune ridges,
Dismal Sector



Defence training values are also of great importance to the nation, and of considerable economic value to the region. When viewed together these values constitute an important environmental and economic feature of the central Queensland region. With the impending threats of climate change it is now more important than ever to protect the *status quo* within SWBTA and in surrounding areas.

Natural environments around the world are currently undergoing unprecedented alteration as a consequence of development pressure and climate change. In parallel, there is increasing recognition by the world community that retention of remaining natural areas is important for human survival. SWBTA retains its natural values despite major anthropological impacts at a landscape scale throughout central Queensland. As pressures on surrounding landscapes continue and the development potential inside and adjoining the Area receives renewed attention, managing the ecological integrity while continuing to provide military training capability will be an ongoing challenge for Defence at SWBTA. The key to Defence's stewardship of SWBTA will be to maintain the balance between military training capability and conservation of the natural environment.

BIBLIOGRAPHY

- Cosgrove, B 1996, *Shoalwater Bay: Settlers in a Queensland Wilderness*, Central Queensland University Press, Rockhampton, 108p.
- Henson, R 2008, *The Rough Guide to Climate Change*, Penguin Books, London.
- MEA—see Millennium Ecosystem Assessment
- Millennium Ecosystem Assessment 2005, *Ecosystems and Human Well-Being: Synthesis*, Island Press, Washington, 155pp.

4RAR – 4th Royal Australian Regiment	CSIRO – Commonwealth Science and Industrial Research Organisation
6RAR – 6th Royal Australian Regiment	CT – counter-terrorist
ABARE – Australian Bureau of Agricultural and Resource Economics	DEH – Department of Environment and Heritage (Queensland)
ABMAP – Ambient Biological Monitoring and Assessment Program	DEWHA – Department of Environment, Water, Heritage and the Arts (Commonwealth)
ADF – Australian Defence Force	DIP – Department of Infrastructure and Planning
AFC – Australian Flying Corps	DoE – Department of Environment (Queensland)
AHC – Australian Heritage Commission	DPI&F – Department of Primary Industries and Fisheries (Queensland)
AMSA – Australian Maritime Safety Authority	DSTO – Australian Defence Science and Technology Organisation
ANZAC – Australian and New Zealand Army Corps	EAC – Environmental Advisory Committee
ANZECC – Australian and New Zealand Environment and Conservation Council	ECC – Environmental Clearance Certificate
ANZECC 2000 Guidelines – Australian and New Zealand Environment and Conservation Council Guidelines for Fresh and Marine Water Quality 2000	EMG – Environmental Management Group
AQIS – Australian Quarantine and Inspection Service	ENSO – El Niño–Southern Oscillation
ARMCANZ – Agriculture and Resource Management Council of Australia and New Zealand	EOD – Explosive Ordnance Disposal
ASLAVs – Australian Light Armoured Vehicles	EPA – Environmental Protection Agency (Queensland)
AUSCDT – Australian Clearance Diving Teams	EPBC Act – Environment Protection and Biodiversity Conservation Act 1999
AusRivAS – Australian River Assessment System	FD BTY – field batteries
CAPT – Captain	GBRMP – Great Barrier Reef Marine Park
CAMBA – China–Australia Migratory Bird Agreement	GBRMP Act – Great Barrier Reef Marine Park Act 1975
CD – Clearance Diver	GBRMPA – Great Barrier Reef Marine Park Authority
CMDR – Commander	GBRWHA – Great Barrier Reef World Heritage Area
COL - Colonel	GIS – geographic information system
	GPCAPT – Group Captain

GPS – global positioning system

HE – high explosives

IEDD – improvised explosive device disposal

IEDs – improvised explosive devices

IMS – Integrated Management System

IPCC – Intergovernmental Panel on Climate Change

JAMBA – Japan–Australia Migratory Bird Agreement

LAVs – Light Armoured Vehicles

LCAC – Landing Craft Air Cushioned

LHR – Light Horse Regiment (Queensland Mounted Infantry)

LTCOL – Lieutenant Colonel

MAJ – Major

MCDO – Minewarfare Clearance Diving Officer

MCM – Mine Counter-Measures

MDM BTY – Medium Battery

MSQ – Maritime Safety Queensland

MTO – Maritime Tactical Operations

MW – Mine Warfare

NOTAMs – Notices to Airmen

NOTMARs – Notices to Mariners

NR&W – Department of Natural Resources and Water (Queensland)

NRM&E – Department of Natural Resources, Mines and Energy (Queensland)

NRM&W – Department of Natural Resources, Mines and Water (Queensland)

QWOG 2006 – Queensland Water Quality Guidelines 2006

RAAF – Royal Australian Air Force

RAN – Royal Australian Navy

RANR – Royal Australian Navy (Reserve)

RBA – rapid biological assessment

RE – Regional Ecosystems

ROKAMBA – Republic of Korea–Australia Migratory Bird Agreement

SASR – Special Air Service Regiment

SEAP – Stream and Estuary Assessment Program

SGT – Sergeant

SoE Report – State of the Environment Report

SOI – Southern Oscillation Index

SQN – Squadron

SQLDR – Squadron Leader

SWBTA – Shoalwater Bay Training Area or the Area

UAVs – unmanned aerial vehicles

UBDR – Underwater Battle Damage Repair

UNEP – United Nations Environment Program

WG – Wing

WO1 – Warrant Officer Class 1

WO2 – Warrant Officer Class 2