特別寄稿

Environmental Policy in Australia
– Pollution Recognition

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1. Environmental Issues in Australia

Most of the environmental issues facing Australia are similar to those faced by other developed countries, e.g. water security, urban air quality, land degradation, deforestation, but some are unique to Australia such as salinity, drought, geographical isolation from the world etc. Major environmental issues in Australia include conservation and invasive species, the effects of land clearing and soil salinity, water health and recycling, urbanization, uranium mining, and also climate change issues.

Urbanization

Even though the Australian continent is vast, liveable zones with infrastructure and utilities are limited to near coastal areas. In fact, although many of the stereotypic representations of Australia and Australian life involve rural areas ('the bush'), the history of the country since European colonisation has been one of urbanisation, with the majority of the population concentrated in the capital cities and major regional centres. The extent urbanization becomes clear when one looks at population statistics – about 80% of the population lives within 50 kilometres of the coast, and 64% of the people lives in the capital cities (Sydney, Melbourne, Brisbane, Adelaide, Hobart, Canberra, Darwin and Perth). Consequently, Australia's population density ranges from less than one person per square kilometre in remote areas to more than 1,000 people per square kilometre in some city suburbs. One reason for this urbanisation is that the most of the major capital and regional cities are located on secure fresh water

supplies, typically near river estuaries that provide safe harbour. In Victoria, the capital Melbourne was established on the banks of the Yarra River near what is now Port Philip Bay. In the twentieth century Melbourne developed around road transportation, not public transport, leading to spreading suburbs. The metropolitan area of Melbourne, for instance, extends along the eastern and western shorelines of Port Phillip Bay, and more than 25 km inland. This expansion has resulted in some of Victoria's most productive farmland being converted into housing plots, the clearing of coastal vegetation, and the pollution of air, water, soil, and wildlife.

Water Health and Recycling

Australia is a big country, with many different climatic zones, from the tropical north to the temperate south. Consequently, there is no single seasonal behaviour, i.e. winters (officially June–August) in the north of Australia tend to be warm-hot and dry, whereas in the southern states the weather is cool-cold and wet. Darwin in the north gets most of its rain in its hot and wet summer, whereas Melbourne in the south-east of the country has winter dominated rainfall patterns. While much of the centre of the country has very low rainfall (average annual rainfall < 200 mm), parts of the tropical north receive substantial seasonal rains. However, overall average annual precipitation across most of Australia is very low compared to Japan, especially in the more populated south-east. For instance, the long-term annual rainfall in Melbourne is ~650 mm, compared to ~1500 mm in Nagoya. Historically, Australians have become used to a pattern of several wet years followed by drier years. In the first ten years of this decade for instance, Melbourne suffered through one of its driest periods on record until drought-breaking rains arrived in 2010. However, in the past two decades some parts of Australia, have seen a step-change to more consistent drier conditions; Perth in Western Australia has been the largest urban area afflicted by such a step-change in climate. Because drought conditions are expected on a regular basis, and expected to become more frequent in the future, water conservation and recycling is becoming an essential consideration for the urban regions where the most of Australian

population reside. In Melbourne, water for drinking is primarily taken from rivers, creeks, and reservoirs in protected upland catchments, with relatively little abstracted from ground water. Increasingly, however, harvested stormwater is seen as the last unexploited water resource in many Australian cities, one that in turn might be used to augment the security of water supplies. For instance, in Melbourne, a city of approximately 4.5 million inhabitants, urban water consumption during the recent drought years of medium-to-high level water restriction, e.g. 2005–2007, was from a minimum of 277 to a maximum of 333 GL / annum, whereas during the recent wet years unrestricted water consumption is higher, e.g. 360 GL in 2011. On the other hand, the amount of stormwater runoff from urban catchments in Melbourne is approximately 540 GL / annum. This highlights the potential of stormwater to meet a substantial proportion of Melbourne's water demand provided it is managed correctly. However, the quality of storm water, and some river waters is threatened by urban and rural pollutants, including pesticides, pharmaceuticals, and daily personal care products. The key principles for urban storm water management include integrating storm water treatment into the urban landscape, e.g. through the use of ponds and wetlands in new urban developments, and the retro-fitting of such amenities into older developments, and reducing potable water demand by using storm water as a resource through capture and reuse for non-potable purposes. This will require protecting water quality while minimising development / utilisation costs. The Australian government has set drinking and recycled water guidelines but these cover only a limited number of potential contaminants, with little coverage of the increasing number of emerging contaminants.

Conservation and Invasive Species

Australia is one of the most biologically diverse countries, with a unique fauna and flora. The most famous animals are marsupials such as koalas, kangaroos, bilby, possums, quolls, wombats, and the Tasmanian devil. The flora of Australia comprises numerous native species including Eucalyptus, Acacias and Banksias. Consequently, a very important role for the both the Commonwealth (federal)

and local (state) governments is to protect endangered species and conduct conservation activities. The guiding framework is Australia's Biodiversity Conservation Strategy 2010–2030, which was produced under the aegis of the Natural Resource Management Ministerial Council. The vision of the strategy is that, "Australia's biodiversity is healthy and resilient to threats, and valued both in its own right and for its essential contribution to [Australians'] existence. The strategy covers the conservation three levels of biodiversity: ecosystem diversity (the variety of habitats, ecological communities and ecological processes found in Australia), species diversity (the variety of species, especially native species, in the country) and genetic diversity (the variety of genetic information contained in individual plants, animals and micro-organisms). The strategy covers the ecosystem services and functions provided to the landscape and the peoples therein by healthy ecosystems, as well as the threats to ecosystem resilience (the ability of a system to bounce back after disturbance). The major threats to ecosystem resilience are habitat loss, poor land management, fire and changing climate, changes to the aquatic environment and invasive species.

One governmental response to pests has been to establish the Invasive Animals Cooperative Research Centre, which is funded until 2017 to work with stakeholders, including industry, to counteract the impact of invasive animals through the development and application of new control technologies and by integrating prevention and control approaches across agencies and jurisdictions. There are specific national and state-based policies that mandate the removal of invasive animal species, such as rabbits, cane toads, wild cats, dogs and pigs, and European carp, and invasive plant species, such as blackberry, gorse, rubber vine, serrated tussock, and ragwort. For instance, the Victorian government has a Biosecurity Strategy that provides guidance to landholders, councils and CMAs on biosecurity planning, preparedness, service delivery and the partnerships required to meet Victoria's biosecurity needs. The Victorian government funds Biosecurity Victoria to implement its strategy, which includes protection of indigenous flora and fauna, as well as protection of agriculture from invasive pest animals and weeds.

As the world's only single-nation continent, Australia is surrounded by ocean, and today has many registered marine national conservation parks, of which perhaps the most famous is the Great Barrier Reef Marine National Park that covers much of the biggest coral reef system in the world. The conservation act by both governments and non-governmental groups spreads to protection of endangered species and prevention from whaling, oil spilling, marine pets, etc. Today, however, the controls of invasive species, such as Japanese common starfish, play critical roles in the environmental policies in Australia.

Land Clearing / Soil Salinity

Although localised land clearing had been done by fire-stick farming of aboriginal tribes before European settlement, large-scale clearing of forests and bushland after European colonization has made a dramatic impact on the Australian continent. Land-use changes include clearing of bush to create grazing for cattle and sheep, and broad-acre cropping of cotton and wheat. In total, Queensland has cleared 18% of land compared to 30% in New South Wales and the ACT and 60% in Victoria (National Land and Water Resources Audit 2001). Today, land clearing is one of the major sources of Australia's greenhouse gas emissions. In many agricultural areas, soil salinity and sodicity is also a major environmental issue. Replacing trees and shrubs that have deep root system with shallow rooted annual crops results in a rise in the water table, which brings Aeolian salts up to the ground surface. In some parts of Australia, acid sulphate soils are a major issue. Acidification of the soil can be caused when usually waterlogged soils, such as peat, that contain sulfide minerals are drained or otherwise exposed to air, at which point the sulphides react with oxygen to form sulphuric acid, which mobilises toxic metals, and together these pollutants have a destructive effect on plant and aquatic life.

Uranium Mining

Australia is rich in minerals and raw materials. One of the important resources of mining industries is uranium. Uranium was discovered in 1906, and the mining started in 1980s. Japan, US and Europe are the dominant importers of

Australian uranium from supplies that make up 30% of the world's deposits. One of the uranium mines originally owned by Australian government located amongst the Kakadu National Park that is registered as World Heritage. There is inevitable conflict in this situation.

Climate Change

There is now general recognition that the world's climate is being affected by increased atmospheric concentrations of greenhouse gases (GHG). Much of the recent increases in sea and atmospheric temperatures are considered to be the result on anthropogenic emissions of GHG, particularly carbon dioxide from fossil fuel combustion. Warming of the Pacific Ocean affects El Nino / La Nina weather patterns alternately causing dry and wet periods across Australia. As the result of climate change, many parts of the world, including Australia, have been experiencing unusual drought, bushfire, and flood conditions. Australia gained the title of the world highest per capita greenhouse emission country in 2005. Even though Australia established the world's first government agency, Australian Greenhouse Office, dedicated to cutting greenhouse emission in 1998, it has been closed in 2007. Should mention the establishment and then dis-establishment of the carbon tax in Australia?

2. Who is in Charge?

There are many players who are involved with environmental policy in Australia. To understand this, one needs to understand the system of governance in Australia. The Commonwealth Government of Australia, also referred to as the Federal Government, is the national democratic administrative authority of the country. The Commonwealth of Australia was formed in 1901 by the agreement among six self-governing British colonies, which then went on to become the six states of Australia (Western Australia, South Australia, Queensland, New South Wales, Victoria and Tasmania). In addition, Australia has several territories, two of which on mainland Australia are self-governing with representatives in the federal parliament: the Australian

Capital Territory (ACT), and the Northern Territory (NT). The constitution of Australia sets out the Commonwealth Government's legislative powers and responsibilities; all remaining responsibilities are retained by the six States. Further, each State has its own constitution, so that Australia has seven sovereign Parliaments, none of which can encroach on the functions of any other. The third level of government is in the form of shire, town or city councils.

Commonwealth (Federal) Government Departments

The main players from the Commonwealth government involved with environmental policy are the Department of the Environment, Department of Agriculture, and Department of Health. Political parties are also stakeholders in environmental politics. Political parties of Australia consist of two major factions: Australian Labour Party and the Coalition (Liberal Party of Australia, National Party of Australia, Liberal National Party of Queensland, and Country Liberal Party (NT)) and minor parties such as Australian Greens and a range of Independent parliamentarians.

Local Governments

Australia has six states and two territories; each state government and the local governmental organizations create domestic environmental policies in addition to those produced by the federal government. Although a lot of environmental issues are borderless, environmental policy is not exceptional and often managed by local governments: Environment ACT, EPA NSW, EPA Victoria, EPA SA, DPI Tasmania, NT Lands Planning and Environment, WA Department of Environmental Protection, QLD Department of Natural Resources. Also other departments and organisations such as primary industries, health departments, water authorities and councils play a role in environmental policy development and implementation.

Industries, Farmers and Land Managers

Industries including water authorities, mining industries, farmers, and land

management authorities are also stakeholders for environmental policies. Mining and farming are the most important industries in Australia. Farming societies consist of National Farmers' Federation, organisations for each produce, state based organisations such as Victorian Farmers Federation, Royal Agricultural Society of Victoria etc. all of which can become involved in some environmental policies. Other important stakeholders for environmental policy are regional land managers such as Catchment Management Authorities (CMA) and cross boundary authorities such as the Murray-Darling Basin Authority.

Scientific societies also play important roles in the development of environmental policies. The Australian Academy of Science is Australia's version of JSPS, with a similar role to promote development of scientific research. Federal organisations that conduct environmental related research include several divisions of CSIRO (Commonwealth Scientific and Industrial Research Organisation). Each state government also has its own research institutes. Academic societies related to environmental issues include universities and conference organisations such as Society for Environmental Toxicology and Chemistry (SETAC) that has local branches: Australasian and Asia Pacific.

ENGOs and Community

Environmental non-governmental organisations (ENGOs) and the community also can play major influence of developing environmental policies. Nationally Australia has ENGOs such as Friends of the Earth Australia, WWF Australia, Greenpeace Australia, Clean Up Australia, Landcare Australia, Sea Sheppard Australia and some of those NEGOs have their local branches. Regional organisations in each state and territories also have own organisations focusing on local community's interests such as protection of rivers and creeks environment.

Environmental Legislations

Australian Government's central piece of environmental legislation is the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

This is the legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places. Other legislations related to environmental policies are Aboriginal and Torres Strait Islander Heritage Protection Act 1984, Antarctic Acts, Australian Heritage Council Act 2003, Carbon Credits (Carbon Farming Initiative) Act 2011, Clean Energy Act 2011, Great Barrier Reef Marine Park Acts, Hazardous Waste Act, Historic Shipwrecks Act 1976, Lake Eyre Basin Intergovernmental Agreement Act 2001, Meteorology Act 1955, National Environment Protection Council Act 1994, National Greenhouse and Energy Reporting Act 2007, National Water Commission Act 2004, Natural Heritage Trust of Australia Act 1997, Ozone protection and synthetic greenhouse gas acts, Product Stewardship Act 2011, Renewable Energy Acts, Sea Installations Act 1987, Water Act 2007 etc.

3. Case Studies - Recognition of Pollution

Case studies are useful to provide better understanding of environmental politics in Australia. Hereafter, old but still ongoing issues on soil salinity, media and world watching event on Great Barrier Reef, new aspect of pollution (endocrine disruptors and emerging micropollutants), and climate change in the context of Australia are discussed.

Soil Salinity

Salinity is a measure of the amount of salts in soil or water. Salinity is a significant issue in south-western Australia and in some parts of the Murray-Darling River Basin in New South Wales, Victoria, and South Australia. Soil salinity is caused by various combinations of widespread land clearance, poor land use and management, irrigation and/or changes to landscape hydrology that cause subterranean salts to be transported to the soil surface or into waterways. There are two types of salinity: primary salinity (produced by natural processes such as weathering of rocks and wind and rain depositing salt over thousands of years onto the landscape) and secondary salinity (caused by

man's activities). For instance, by clearing deep-rooted trees and bushes to create farmland for cattle, sheep and wheat production, groundwater that used to be absorbed by those trees and bushes remains under ground. As the water level goes up, dissolved existing salts in the soil appear on the surface of the ground. This is called 'dryland salinity.' Excessive irrigation crop production causes 'irrigation-induced salinity' when excess irrigation water raises the water table, again bringing salts to the surface. Excessive salinity may cause native/agricultural vegetation to become unhealthy or die, and on non-agricultural land lead to a decline in biodiversity through dominance of salt-resistant species, potentially altering ecosystem structures. Reduced groundcover on all tpes of salt-affected land makes the soil more prone to erosion, which can pollute waterways with increased sediment, threatening aquatic ecosystems and the plant and animal species therein. To address the salinity threat the Commonwealth, state and local government, industry, farmers, land managers and community groups got involved to strategy to solve this problem. In November 2000, the Prime Minister, State Premiers and Territory Chiefs endorsed a National Action Plan for Salinity and Water Quality. In June 2008, this program was replaced by the Caring for Our Country program funded by the Department of Agriculture and Department of the Environment.

Great Barrier Reef

In 1981 Great Barrier Reef became the first listed World Heritage in Australia. It is the largest coral reef system in the world, spanning 2,300 km from north to south. It is renowned as a vast, biologically diverse ecosystem containing over 600 types of corals, more than 100 species of jellyfish, 500 species of worms, 1627 types of fish, 133 varieties of sharks and rays, 14 breeding species of sea snakes, 215 species of birds, six of the world's seven species of marine turtle, 30 species of whales and dolphins and one of the world's most important dugong populations. Much of the Great Barrier Reef is incorporated into the Great Barrier Reef Marine Park (GBRMP) off the Queensland cost. The Australian federal government (Department of the Environment) and

Queensland government have been working towards the long-term conservation of the Great Barrier Reef Marine Park since its inception in 1975. This cooperative approach was formalised by the Emerald Agreement in 1979 and updated in July 2009 with the Great Barrier Reef Intergovernmental Agreement. The principle legislation related to Great Barrier Reef is the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) which provides general principles for management of Australian World Heritage areas. Other legislation includes the Great Barrier Reef Marine Park Act 1975 (GBRMP Act) and Queensland's Marine Parks Act 2004 (MP Act) – since 2004 these regulate the GBR Coast Marine Park and Zoning Plan. The Great Barrier Reef Ministerial Forum oversees the implementation of the Intergovernmental Agreement. This Forum was previously known as the Great Barrier Reef Ministerial Council after it was established in 1979 under the Emerald Agreement. The federal and Queensland state governments have made the Great Barrier Reef Marine Park Authority (GBRMPA) responsible for most of the managing of the Great Barrier Reef Marine Park.

Many people and groups provide input into Great Barrier Reef environmental policy. Not only governments, but industries such as mining, tourism and farming, have strong influence on the reef environment, with the scientific community, ENGOs, local communities and media also having strong influence on environmental policies on protection and conservation of the Great Barrier Reef. There is a obviously great potential for environmental policy conflict between government and the other communities. A good example of this began in 2004, when the Queensland government created a TV ad and ran a campaign about the Great Barrier Reef.

"Over the past 30 years, the Great Barrier Reef has lost almost half its coral cover. The Australian Institute of Marine Science attributes the lost to storms (48 per cent), the coral devouring of crown-of-thorns starfish (42 per cent) and coral bleaching (10 per cent). No scientific study has blamed ports or shipping for coral loss or a decline in the environmental health of the Great Barrier Reef. The reef facts are clear. (Authorised by Michael Roche, Queensland Resources

Council, Brisbane) ”

This TV advert was broadcasted in conjunction with the Gladstone Port dredging approval in order to utilise the bay for mining shipping. The information about the Great Barrier Reef that the Queensland government used in the ad was from an article published by Australian Institute of Marine Science. The data in the 2012 study come from coral reefs predominantly on the mid-shelf of the Great Barrier Reef located 30 to 100 km from the coast, and does not include inshore reefs, seagrass meadows, dugongs, turtles and inshore dolphins. The Queensland Government was focussed on economic development but effect of dredging on the whole ecosystem is still unknown and there is not enough monitoring conducted. Conflict between development and conservation is obvious in this case. There are potential old and new environmental hazards along the coastline such as upstream farming, and coal and liquid natural gas (LNG) industry developments. Those hazards have been deposited in the port and the dredging and disposal of dredge soil near the Great Barrier Reef could cause harm to the ecosystem. The sources of conflict are information conflicts over scientific data arising from scientific uncertainty, different interpretation of the same information, and lack of information or misinformation. As the result of conflicts, Australia is facing the consequence of endangerment of listing of world heritage of the Great Barrier Reef.

Endocrine Disruptors and Emerging Micropollutants

When the world started to be concerned about the potential effects of endocrine disrupting chemicals (EDCs), Australia was slow to respond. After investigations by CSIRO, universities and regional water authorities to understand EDCs in aquatic environment, the Federal government concluded that endocrine disruption was one part of a spectrum of effects and not considered to be an adverse endpoint per se. There is no national legislation covering water quality, but there are guidelines for fresh and marine water quality in Australia. The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (the “ANZECC guidelines”) became effective in 1992 and were revised in 2000. The

guidelines say, “Ultimately, it is the responsibility of local stakeholders and State and Territory or regional governments to agree on the level of protection to be applied to water bodies. … The current knowledge on endocrine disrupting chemicals is insufficient to make recommendations on water quality guidelines at present.” However, EDC research across the country has shown some aspects of endocrine disrupting influences in the aquatic environment. Australia has extensive dairy and beef agriculture industries and usage of natural hormones and veterinary medicines could become sources of hormonally active contaminants. Dairy manure and dairy farm effluents and run off from confined animal feeding operation could contain high level of estrogens. Wastewater treatment plant effluents are also essential source of endocrine disrupting chemicals. However there is no regulation of water quality on endocrine disrupting chemicals in Australia yet, although guideline levels for some of these chemicals may be provided in the next revision of the ANZECC guidelines (due 2016).

Climate Change

In 2005 Australia was the world most significant emitter of greenhouse gas emission per capita. The major contributions to Australia’s GHG emissions are from coal-fired power stations, some energy intensive industries (e.g. aluminium production), from transport fuels and from agriculture. In 1998 the Australian government showed some initiative by establishing the world’s first government agency, the Australian Greenhouse Office, in order to cut greenhouse emission, but this office was closed in 2007. A price on carbon (or carbon tax) is one of the strategies many economists have proposed to reduce greenhouse gas emission and slow down global warming. Australia’s Gillard Government introduced a carbon pricing policy in 2012 with the aim of reducing greenhouse gas emissions by 5% below 2000 levels by 2020 and 80% below 2000 levels by 2050; the price of a permit for one ton of carbon was initially set \$23/CO_2-ton (Japan, 289 yen in 2012) charging electricity generators and industries. However in 2014 the newly elected Abott Government abolished the carbon tax policy, replacing it with an Emission Reimbursement policy and Direct Action Scheme

(Carbon Farming Initiative Amendment Bill 2014), claiming the carbon tax could cause increase of cost of living in Australia.