Bathurst Community Climate Action Network (BCCAN) submission to the NSW department of Planning and Environment

These comments relate to the draft Coastal Management State Environmental Planning Policy (SEPP)

BCCAN welcomes the opportunity to comment on this draft Coastal Management policy. As a community environmental organisation, BCCAN's main concern is Climate Change, and since its inception BCCAN has been advocating for the inclusion of Climate Change in government policy.

Whilst we do believe the current draft policy is comprehensive and constructive in terms of its integrated approach to land use planning and environmental protection of the coastal zone under current climate conditions, we were somewhat disappointed to note that this draft coastal management planning instrument, as it currently stands, does not appear to have included or have planned for Climate Change and climate change scenarios.

We therefore believe there is a need for greater consideration and planning with regards to future predicted changes in sea level and the likelihood of more intense storm activity induced by climate change, and that planning for Climate Change should not be beyond the scope of a Coastal Management Planning Policy.

We do note in Part 3, 21 (3, 4) of the policy, provisions for Emergency Coastal Protection Works which would cater for the impact of coastal hazards including storm activity, but we believe that given the predictions of storms of greater intensity, this issue would also need to be framed in the context of Climate Change.

It is our belief that a comprehensive coastal management planning policy would need to consider a sea level rise induced by climate change. We note that according to the fifth assessment report by the Intergovernmental Panel on Climate Change (IPCC), sea levels world-wide have already risen about 20 cm since 1900 and unless there are significant reduction in the level of greenhouse gas emissions, sea levels are likely to rise by 1m by 2100 (to note, due to current warming of the atmosphere, sea-levels are predicted to rise up to 60cm by 2100 even without the contribution from further emissions).

Planning for sea level rise would, at the very least, involve contour interval mapping of coastal areas likely to be flooded by rising sea levels, and the possible planning for engineering protection works for those areas at risk of flooding. Consideration should also be given to rehabilitating of coastal dunes and coastal dune vegetation systems as a means to mitigate sea level rise.

Another issue that would need attention in the context of rising sea levels and other hydrological changes associated with climate change is that of coastal and ocean pollution. Pollution would be the result of flooding of urban and industrial areas as well as

contaminated sites along low lying coastal areas, due to the fact that water is a medium that can disperse pollutants from their land-based source.

We believe that urban and industrial areas and contaminated sites in low lying coastal areas that are at risk of being flooded by rising sea levels and flash-flooding and storm surges associated with storm activity would need to be rehabilitated or secured by engineering works to prevent contaminants and rubbish from these sites being flushed out to sea and contributing to ocean pollution.

In regards to this issue we wish to direct your attention to the document below regarding *Climate Change and Pollution* developed by one of our BCCAN members and which is also available on our website

http://www.bccan.org.au/article/climate-change-and-ocean-pollution

We believe these issues need consideration and should be included into the Coastal Management SEPP.

Climate Change and Ocean Pollution

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Introduction

When we think of Climate Change we often think of rising sea levels threatening coastal real estate and agricultural land, and shifting weather patterns with predicted increases in extremes of drought and intense storm events. However, there is another less well understood threat: the potential for a significant increase in pollution, in particular coastal and ocean pollution.

The increase in carbon dioxide (CO2) produced by our industrial society has resulted in an increase in the greenhouse effect, trapping heat in the atmosphere and warming the surface of our planet. This heating also warms the planet's water resulting in thermal expansion of our oceans, increased evaporation rates and melting of ice caps. The outcomes, over time, are rising sea levels and intensification of the water cycle.

The problem, however, is that water is a medium that can spread pollutants from their source - as solutes, suspensions, flocculants and through flotation or the significant forces of mass movement.

With climate change, the intensification of the water cycle and rising sea levels would increase water movement, spreading land based contaminants and discarded rubbish, and this would significantly worsen coastal and ocean pollution.

The Mechanisms

There are several mechanisms by which the consequences of climate change can spread pollutants:

- Rising sea levels flooding low lying land such as coastlines and river deltas on all continents;

- Increases in extreme rainfall events, and of storms/cyclones of greater intensity, leading to increased terrestrial flooding;

- The coupling of sea-level rise with more intense storms/cyclones (and associated storm surges) resulting in episodic flooding of coastal areas not immediately under threat from sea level rise.

That is a substantial amount of water interacting with land. The issue here is that changes in the hydrological cycle, due to climate change, can increase the mobilisation of land based contaminants that are the product of human activities, and these, once released into the environment, impact and impair ecosystems (1).

Pollution spread by Flooding

We often don't stop to consider the significant potential for pollution to be spread by water as a result of heavy downpours or cyclonic events, but it is a considerable problem.

In 2010, heavy monsoon rains flooded a fifth of Pakistan's land area affecting about 20 million people. Waters flooded agricultural, urban and industrial areas and destroyed property and infrastructure, yet did we stop to consider how much pollution and debris was washed out to sea during that event? Likewise when we see images of the aftermath of destructive cyclones such as Haiyan, which hit the Philippines in 2013, or cyclone Mathew, which cut a path of destruction through the Caribbean in October this year, we see images of devastation and strewn debris on land but we do not see how much rubbish, plastics and contaminants are flushed out to sea.

Whilst cyclones, heavy downpours and the subsequent associated flooding are natural events, many of our chemicals and potential contaminants are synthetic compounds capable of harming or killing a wide range of organisms if released into water.

The predicted increase in storm activity and precipitation associated with climate change are due to an intensification of the water cycle and to significant volumes of water gradually being released from melting ice caps, snow and frozen soils results in more water becoming available for circulation. This increases the potential for spreading pollution.

Pollution spread by Sea Level rise

Over the centuries, human industrial activity has resulted in soil contamination in many areas around the world, and the contamination that has occurred along coastlines, in particular, is susceptible to becoming mobilised by rising sea levels linked to climate change (2). In fact, along the world's densely populated low-lying coastal landscapes there are significant stores of potentially toxic organic and inorganic pollutants, such as, industrial areas, old contaminated sites, landfills, even the soil under petrol stations, as well as infrastructure such as sewage systems. If, with rising sea levels, these areas get flooded or become part of the sea floor, their hazardous contents (which were previously sealed due being located above water) could be dislodged and spread by water. This would impact coastal landscapes including deltas, mangrove and other coastal vegetation communities, as well as the oceans themselves.

According to the Intergovernmental Panel on Climate Change (IPCC) global sea levels have risen about 20 cm since 1900 with the rate of rise increasing since the mid-1990s (3). The IPCC's current modelling (assuming that global CO2 emissions are not reduced) predicts that sea levels could rise by up to 1m by 2100 (4).

There are many cities around the world lying just a metre or two above sea level, and some, such as Jakarta and Miami, have suburbs which are regularly flooded whenever there are major storms or king tides.

But to get a better idea of what happens when a coastal city is flooded the events of New Orleans in 2005 provide a compelling case study.

When cyclone Katrina hit the city of New Orleans in 2005, the water from the associated storm surge overwhelmed the levee banks designed to protect the low lying city from

flooding, and filled large parts of the city like a bathtub. As in every instance of urban flooding, the waters became polluted. An article published by the (US) National Academy of Engineering regarding the toxic and contaminant concerns raised by Hurricane Katrina (5) reported that chemical plants, petroleum refining facilities and contaminated sites (including hazardous waste landfills) and metal-contaminated soils typical of old urban areas were covered by floodwaters. Petrol stations, pest control and dry cleaning businesses, were also flooded, possibly releasing hazardous chemicals into the flood waters. Additional contamination came from construction timber preserved with creosote, pentachlorophenol and arsenic, from hazardous chemicals commonly stored in homes that were flooded, from fuel and motor oil of thousands of flooded vehicles, not to mention the biological waste from human and animal sources. The floodwaters that submerged much of the city of New Orleans became a hazardous cocktail of chemical and biological contaminants.

In the case of New Orleans, unlike most instances of flooding, the waters were trapped and not washed away (they had to be pumped out – and dealing with the contaminated waste water was an environmental challenge in itself). One might therefore argue that, if another coastal city became flooded, the polluted water, if able to escape to the ocean would be significantly diluted and therefore less harmful (keeping in mind that even in very small concentrations, many pollutants can have devastating short and long term impacts on marine and terrestrial ecosystems).

Nevertheless, the point to consider is that the city of New Orleans in 2005 had a population of under half a million people, according to the Commonwealth Scientific and Industrial Research Organisation (CSIRO) over 150 million people world-wide are estimated to live within a metre of the high tide level, and all up 250 million within the 5 metre high tide mark (6). A one metre rise in sea level could flood large tracts of Bangladesh, parts of the Nile Delta in Egypt, parts of Northern Europe, and fully or partially flood several large coastal cities and megacities around the world. These are all densely populated and potentially a significant source of pollution.

We have to ask ourselves, how much pollution can the marine ecosystem handle, keeping in mind that our oceans are already heavily polluted by plastics, chemical and petroleum spills, becoming more acidic due increased absorption of CO2 from the atmosphere, not to mention warmer and exhausted from overfishing?

One can argue that the flooding of New Orleans was sudden in contrast to the predicted one metre sea level increase that will happen slowly over the course of a century. But the fact remains that urban dwellings, industrial infrastructure and contaminated sites lie just above the current sea level. Are we considering relocating such sites or rehabilitating contaminated land? Engineering protection could in some cases be an option, but this may not always be feasible, affordable or even sufficient to prevent rising sea levels flooding coastal areas.

Putting things in context

We have to bear in mind that over geological time significant changes in weather events have occurred as well as dynamic changes in sea levels. What is different now in this era we call the Anthropocene, is that our society has concentrated its activities along what are modern shorelines - a result of the stable climate that has prevailed for the past few millennia.

Essentially we have built the edifice of modern civilisation to function within a very narrow climatic range (our modern agriculture depends on this!). The chemical nasties and plastics that modern society has produced as products or by-products of our activities can stay relatively contained in the coastal environment only if our shorelines remain stable. However, without concerted, well planned response, these pollutants are at risk of future mobilisation, due to a combinations of sea level rise and intensification of storm events.

What we need to do - and why

Up to now we have thought of the spread of pollutants as an accidental, unintended consequence of storms or cyclones, but we need to change our thinking. We must realise that rising sea levels and the stronger storm activity associated with climate change will spread pollutants. This is another dimension of the climate change picture that needs to be taken seriously at a policy level.

We need to have specific policies and management plans in place that address the danger of spreading pollution resulting from a combination of rising sea levels and the impact of destructive cyclones and flooding, particularly in coastal areas. Chemical and petroleum based products stored in port facilities, industrial areas, rail depots and farming areas, as well as rubbish and organic waste, in low lying and coastal areas all around the world, need to be stored safely and/or relocated to prevent them being spread by flooding or storm events. Natural ecological buffers such as sand dunes and coastal vegetation communities need to be restored along our coastlines. Wealthy countries would need to not only implement their own coastal management strategies, but help poorer countries with theirs, as the ecological impact from ocean pollution resulting from rising sea levels and increased water circulation in any nation will affect everyone.

Ocean pollution threatens marine ecosystems including delicate coral reefs and mangroves, which are nurseries for many marine species. Additionally, we all depend on the humble Phyto-Plankton (the plant component of Plankton) and marine algae for our very life as they produce 50% to 70% of the oxygen we breathe. If we compromise the health of marine ecosystems, we shoot ourselves in the foot!

Doesn’t tackling not only climate change, but also the long term risks posed by the chemicals used and stored in low lying, coastal urban environments, based on well thought through management strategies seem like a sensible course of action?

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Notes

There are several scholarly articles that investigate the potential impacts of sea level rise resulting in contamination of agricultural land due to salt-water inundation (particularly as a result of storm surges), or in the intrusion of contaminants (such as salt-water or sewage) into ground-water aquifers. However, the mobilisation of land-based pollutants due to climate-change-induced hydrological changes, and their ecological impact on coastal and marine ecosystems needs greater scientific focus. The articles by Schiedek, et al. and Yu, et al., (below) do consider the link between climate change and dispersion of pollutants into the marine environment.

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