

## **A national security problem – Sea Level rise**

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In 2015 the effects of climate change are starting to be felt by Australian communities. Although there are still some who either do not recognize that climate change processes are affecting our daily lives or believe climate change is a natural process, which is the phase of global warming as part of a cycle of global weather patterns from cooler climates to warmer climates that have not been affected by human activities on the planet.

These people tend to discount the effects of burning fossil fuels intensively over the last 100 years or so. They do not recognize that over time concentrations of certain gases in the atmosphere including carbon dioxide have and are affecting the climate.

Presently many of the effects of this warming pattern are relatively mild but over time unless progress is made to curb carbon emissions these effects will impact the economics of Australia and every individual living within Australia.

However climate change deniers and climate change skeptics suggest that if there is a process of global warming happening today, there is nothing we can do about it. Human activity over the last 150 years in digging up and burning fossil fuels has had little to no impact on global temperatures.

Science tells us just the opposite. Scientific records tell us that temperatures have risen much faster than the trend over the last 100 years than any time in the last 1000 years.

This warming is not just a natural cycle of warming, but an accelerated warming principally caused by the industrial revolution's use of fossil fuels to drive the economic engine of world commerce.

Scientists have produced data that shows the world has warmed on average one degree since the year 1900. Scientists have predicted that if the average world temperatures warm more than two degrees since that time there will be a cycle of events that will increase global temperatures even if the global population stopped using fossil fuels from that point onwards.

There is a wide range of impacts associated with global warming that should be considered in Australia and planned for to help mitigate the effects on the Australian people, the way we live and on our economic status in the world's economy.

The particular climate change impact that we will be focusing on in this paper is climate change induced sea level and coastal flooding caused by extreme weather and tidal events.

Australia is an island and although large will have the effects of sea level rise, severe weather events and tidal inundation around its entire coastline. Much of the population of Australia resides in coastal regions and much of this population is and will increasingly be subject to the effects of wild weather as global temperatures increase.

A smaller proportion of the population live in lower lying areas and the land they occupy will be subject to a variety of effects which include rising sea levels, tidal inundation and higher floods caused by more precipitation caused by more extreme weather events.

Some politicians have suggested that the mitigation processes related to sea level rise should be managed at the State and Local government level. This option has merit in that the bulk of the work in managing these effects should be through State and local government planning instruments. But State and local government do not have the capacity to coordinate strategies to mitigate the effects of the following kind. These are impacts on the social and economic fabric of the nation. This will require a nationwide a response to the effects of climate change induced sea level rise. Only the Federal government will have the overall capacity to co-ordinate an Australian wide approach to these effects on the economy, the environment and the social cohesion of all Australians.

One of the mechanisms that could be used to ensure a coordinated approach would be through enabling federal legislation that would be agreed upon through the COAG process. This legislation would then be dovetailed into all State legislation and then through State government consultation with agencies and local government incorporated into local government planning schemes. This would ensure a best practice approach which would be fairly and uniformly applied across the country.

This process of ensuring a coordinated approach to mitigate the effects of climate change in this one area of sea level rise and associated effects goes to the issue of national security.<sup>1</sup>

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<sup>1</sup> As it stands, there is no national benchmark on a minimum sea-level rise that states must take into account. (quote from Lex Bell Gold Coast Councillor 2013 ABC report on sea level rise.)

## **The National security of our economic systems within Australia.<sup>2</sup>**

Security of markets is about protecting markets within the economy.

### **Coastal Property markets**

The protection of coastal property markets is very important in a growing and prosperous country like Australia. The property market is the bedrock of the economy and a solid source of asset security for the financial sector in Australia.

Potentially affected land by sea level rise up to a level of 1.1 meters above current sea levels hold in the vicinity of \$300 billion worth of asset value according to an ABC report in 2013. This asset value does not take into consideration any additional rises due to tidal inundation in storm events.

If people were to overnight lose confidence in the value of these assets, banks would want to foreclose on loans as many properties are included in an asset list securing the loan. A collapse in property values would affect the financial sector and a scarcity of available funds for business using coastal properties as collateral would mean that extreme pressure would be put on business and on jobs court in this situation.

### **Insurance cover scarcity**

Risks associated with buying such properties will mean that insurance providers will not insure coastal properties. At present some of these properties are the most expensive in the total real-estate market and a collapse will deviate the property market.

What are the processes by which such a collapse may occur? Under the current coastal property boom prognosis it is likely that the market will continue to increase without abating until a loss of confidence in the market occurs.

What would be the likely cause of a loss of confidence in the coastal property market without any intervention from the federal or state government? It is likely that the upon a catastrophic storm event that produces very high tides and extensive flooding coastal property owners will start to reassess the viability of staying on the coast.

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<sup>2</sup> Framing climate change as a national security threat has obvious advantages. Not only does it increase the sense of urgency, but it also creates a path for environmental solutions. The military, for instance, could play an important role in building advanced green technology, helping secure the country's grid and giving the US a strategic advantage over other countries in the future. "Once we recognize it as an issue that affects all sectors of society including the security of our political institutions, governments, and communities, then we can tackle it in a much more holistic way," says Femia.

With the insurance industry being saddled with an overwhelming number of claims for damage and destruction of homes and property, the industry would realise that many insurance premiums are massively too low and a reassessment would follow which would increase premiums. (In this scenario there is a possible situation where an insurance company will not insure a particular property.)

In addition the local governments will be shocked into the reality that they are massively exposed to risk of litigation because they had not responsibly informed the property owners of the heightened risk of inundation due to changing climatic conditions.

Then when coastal property owners attempt to reinsure their properties they find that the premiums are astronomically high or even worse that they cannot insure their property at all due to the risk on the property after a reassessment of risks of storm event damage by the insurance companies.

### **The devaluation of coastal properties**

After a very severe storm or a chain of storms producing flooding and the likelihood of a hike in insurance premiums, property owners will be clambering to move away from the coast. Supply for coast properties will rise and as a result coastal property prices will plummet. This drop in asset value will impact the ability for many businesses to operate in a constrained credit environment.

To explain this we must look at the mechanism that allows businesses to borrow. Businesses borrow from financial institutions like banks because they have a capacity to pay back the loan. Often security on a loan is a property and is put up by the borrower as collateral on the loan in case the ability to pay the loan by the borrower evaporates. If the collateral for the loan is a devalued coastal property then the lender may call in the loan on the basis of the reduced value of the asset to lower the exposure to the loan by the lender or financial institution. This will adversely affect the business. Even if the loan is not called in, the business may need to gain more finance in a growing business. If the coastal property asset used as collateral is a devalued coastal property the business may not be able to gain further finance from the lender.

This process of a financial freeze on a section of the business community will affect jobs and growth in Australia's economic engine at large. A flow on effect of this is a down turn in tax receipts income and business taxes which affects government revenues.

### **Local and State governments will be under pressure to raise rates and funds.**

With a drop in coastal property prices Local government will have little choice but to increase rates putting further pressure on rate payers and business owners.

With less money in the economy discretionary spending will be down and marginal businesses will go out of business further reducing Australia's economy.

Local government and State governments will be under extreme pressure to mitigate the impacts of tidal inundation and prolonged flooding. Massive amounts

of money will be needed for projects along the coastal regions of the Australian coast. State and local governments will not be able to supply this money even if their revenues had not dropped due to the economic downturn.

Politically speaking there will be a questioning of the fairness to the whole community on spending such a large amount of money on owners of high value coastal properties and propping them up for a few years to keep these properties above the flood waters, just so these owners will not lose asset value of their property in the near term.

### **Can State governments avoid these inequities without federal help?**

It is unlikely that State governments will be willing to fork out large amounts of money for defensive engineering works to protect coastal properties from flooding on what will become flood prone areas. Federal funding is likely to be tied to a strategic approach to the mitigation of flooding where a solid case is made for a section of the coastline that has merit of being protected. Meritorious cases for this funding may be that the community at large will benefit from certain land being protected from flooding such as CBDs where large investments of public assets have been expended such as roads, public transport systems, sewerage and water supplies etcetera and where the relocation of such infrastructure may cost a considerable amount of money.

That said, the reality is that with the relentless increase of sea level rise over the next say 500 years at some stage the risk of inundation will be too great and this infrastructure will have to eventually be abandoned.

In the long term it will be in the interests of a Federal government driven funding model to be involved in the policy settings of State governments related to planned retreat from the coastal regions.

In the big picture it will not be only the coastal regions of New South Wales and Queensland that will be affected but every state and territory in Australia that is exposed to coastal sea level rise inundation and climate change induced storm events.

Low lying areas such as south-eastern Victoria where a huge area is about 1 meter above sea level. Places like South Australia's lakes region where large amounts of people are settling over recent years on flat land around the Murray River lakes systems.<sup>3</sup>

### **The Security of other economic essential services in Australia**

#### **(1) Agricultural Land lost to sea level rise and other climate change effects**

When considering the wider affects of climate change it becomes evident that the inland regions will become hotter and dryer. This would make a large amount of Australia's agricultural land more marginal for food production. This coupled with

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<sup>3</sup> **Rhiannon J N, Douglas K B**, Planned retreat as a management response to coastal risk, Case Study of the Fleurieu Peninsula South Australia, <http://link.springer.com/article/10.1007/s10113-012-0315-4>

the potential for sea level rise to inundate large areas of land in Victoria and South Australia and even up river regions under agricultural production such as around Windsor in the upper reaches of the Hawkesbury river near the Nepean and Colo Rivers raises a concern for the retention of Agricultural land across Australia.

In 2012 the highest value agricultural production in order from highest to lowest was cattle, wheat, dairy, vegetables, fruit and nuts, before lamb meat and wool. Smaller cropping businesses netted about half the value of the total grain, beef cattle and sheep businesses. Cropping businesses such as fruit and nut trees, grape growing, sugar cane, and other crop businesses.

This shows that the high value small cropping businesses are an important part of the economy and tend to provide more high value food per kilogram than high volume production as in the case of cattle, sheep and wheat.<sup>4</sup>

George W Goyder, the south Australian government surveyor general drew a line on the map after 2 consecutive drought years before 1865 to delineate the agricultural land in south Australia from good cropping land for wheat and marginal land.

It was found that farmers who crossed this line in subsequent years found that rainfall was severely reduced and they suffered drought in dry years.

The problem is that Goyder's line is moving south with climate change effects.<sup>5</sup> All the lines between marginal farming land and productive land are generally moving coast wards as a result of climate change.

This process will continue over the next few centuries slowly affecting the level of productive agricultural land in Australia.

So with Agricultural land reducing from the inland coupled with flood affected agricultural land along the coastal regions a significant amount of agricultural land will be lost into the future. To predict this erosion of agricultural land over the years will depend on a number of factors and steps should be taken to quantify this soon. But it is clear that there will be a significant amount of land lost to agricultural production into the future.

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<sup>4</sup> **Australian Government, Australian stories**, Australian Farming agriculture - grazing and cropping, <http://www.australia.gov.au/about-australia/australian-story/austn-farming-and-agriculture>

<sup>5</sup> Goyder's line is moving south due to climate change effects. <http://www.abc.net.au/news/2015-12-02/goyders-line-climate-change-wheat-wine-grapes/6919276>

This reduction in agricultural will affect Australia's agricultural output and economic future and should be considered as a issue of national security that is related to climate change and climate change induced sea level rise.

### **Intrusion of salt water into wetlands and ground water supplies**

One of the main difficulties with sea level rise in low-lying coastland areas is that the salty seawater starts to affect fresh water ground water. This is a most striking problem in Pacific Island nations like Tuvalu and on Kiribati. Island nations often rely on fresh water supplies from ground water for crops and as a main source of water. Without a non saline supply of water the nation will not be able to feed itself and must look for other alternatives in an appropriately quick time after salt water starts to infiltrate into the ground water.

The coastal regions of Australia are also subject to this problem. The Woy Woy peninsula on the Central Coast is a sand flat, but has a good supply of fresh water in its sand aquifer, which supplies close to the surface ground water. Over the years residents have tapped this resource for the watering of gardens.

This ground water is renewed by rainwater seeping into the sand and lodging between the sand grains about 3 to 5 meters below ground level. This ground water would extend down to the bedrock of the region. At present seawater is kept out because the salty water is limited to the beach areas and there seems to be impermeability between the beach and the inland on the peninsula. However if seawater were to flood large areas of the sandy peninsula, logically one might predict that this water too would seep down into the ground water below thus reducing the areas where fresh water can to mined on the peninsula.<sup>6</sup>

### **The process of sea level rise will turn freshwater wetlands into salt lakes.**

During this process salt intolerant plants will die including many species of trees. This is evident around Lake Munmorah near Wyong on the Central Coast of NSW where a salt lake's bottom has dropped away after a mine collapse under the lake. The mature trees that were on the side of the lake found themselves in the briny waters of the lake while still standing and alive. However subsequently due to the salt in the water and around their roots have died.

Fresh water dependent eco-systems will enviably change with the introduction of climate change induced sea level rise and species will be lost to areas.

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<sup>6</sup> **Armstrong T J, Determination Of Aquifer Properties And Heterogeneity In A Large Coastal Sand Mass: Bribie Island, Southeast Queensland, Bribie Island study of freshwater ground water in a sea water surrounded island, <https://core.ac.uk/download/files/310/10884977.pdf>, (accessed Jan. 2016)**

## Conclusion

State governments must manage at risk economic and environmental processes through local government planning instruments and State government legislation. It is expected that these planning agencies will be monitoring these changes, however only the Federal government will be able to monitor the overall decline in agricultural land affected by sea level rise, the overall amount of wetlands lost due to sea level rise and the overall loss of freshwater resources across Australia due to sea level rise. Through this monitoring process the Federal Government should through a partnership with the State governments be able to design programs to mitigate the losses associated with climate change effects.

For example, to mitigate losses of agricultural lands other planning activities could be undertaken in a timely manner by the States, including the expansion of irrigation areas.

It may mean that once productive land now covered by housing could once again be productive through an appropriate agricultural buy back land scheme associated with a coastal retreat policy.<sup>7</sup>

The Federal government would be able to broker an Australia wide uniform scheme of planned retreat from high-risk coastal lands through legislation agreed to by the State and territory governments around Australia, that would ensure a planned and predictable retreat from inundated land.

This retreat would give governments the opportunity to rezone land to a less intense use while ensuring a predictable property market in coastal areas.

With a process of planned retreat in place, it may allow local governments to be encouraged by the State and Federal governments to reallocate coastal high productive agricultural land onto the urban fringes, providing agriculturally productive farmland owned by Australian producers for the periods before total tidal inundation.

With the concept of planned retreat there are many challenges, however there are a lot of opportunities.<sup>8</sup> From an economic point of view this process must

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<sup>7</sup> **Anne Lietch**, Sea level rise, coastal development and planned retreat: analytical framework, governance principles and an Australian case study  
[https://www.researchgate.net/profile/Anne\\_Leitch/publication/236005298\\_Sea\\_level\\_rise\\_coastal\\_development\\_and\\_planned\\_retreat\\_analytical\\_framework\\_governance\\_principles\\_and\\_an\\_Australian\\_case\\_study/links/0c96051870c0b6bfe8000000.pdf](https://www.researchgate.net/profile/Anne_Leitch/publication/236005298_Sea_level_rise_coastal_development_and_planned_retreat_analytical_framework_governance_principles_and_an_Australian_case_study/links/0c96051870c0b6bfe8000000.pdf)

<sup>8</sup> Holland David, Habitat Association Blog site, Planning for Sea Level Rise Risk in some Coastal Regions of Australia - A Market Approach,  
<https://habitatownplanningforum.files.wordpress.com/2015/04/planning-for-climate-change-the-risk-model-for-sea-level-rise-discussion-paper-3rd-edition-rev1-20151.pdf>,

be undertaken to ensure economic growth in these coastal region, and without our politicians taking up this challenge we can expect a long period of negative economic growth across Australia.

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