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INQUIRY INTO COAL SEAM GAS

Name: Dr Floris van Ogtrop

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NSW Parliamentary inquiry into coal seam gas exploration

Submission

A/Prof Willem Vervoort & Dr. Floris van Ogtrop, Hydrology Research Laboratory, Faculty of Agriculture, Food and Natural Resources, The University of Sydney.

Preamble

In our dry continent, groundwater is our most precious resource. It is reliable, can help us through drought periods, is accessible and provides water to humans and ecosystems alike.

Much of the discussion about coal seam gas extraction has concentrated on its interaction with agriculture. Both of these industries interact with groundwater in different ways. Both have potential negative impacts on groundwater.

In principle we are not against coal seam gas (CSG) exploration and extraction. It is an energy source and we need to look for different energy sources, and it is a valuable export product. It is a mining operation, meaning there is never any long term sustainability involved with this industry. Mining exploits and extracts our natural resources.

In contrast, agriculture, in its best form, is based on the long term management of natural resources.

How short term high level gain from CSG extraction is balanced with long term low level gain from Agriculture is the question for government. It would be a simple question if one replaces the other at a location and has no impact on the surrounding activities. In other words if Agriculture and CSG extraction can exist happily side by side, then CSG extraction should be granted. It is the interaction with groundwater of both industries that makes this coexistence problematic.

Due to the nature of groundwater there are major issues with uncertainty related to the short and long term effects of CSG extraction, and this needs to be taken into account when granting extraction licences. This uncertainty is based on two major characteristics of coal seam gas extraction:

1. The extraction process resulting in dewatering of underground layers
2. The disposal of the waste products

Our submission

That the government of NSW takes a very cautious approach to granting further CSG exploration and extraction licences until:

1. High value (in dollar terms) and long term (50 years minimum) bonds or guarantees are obtained from CSG companies contingent on the absence of monitored long term effects of CSG extraction;
2. Solutions for the safe and sustainable disposal of CSG waste products can be found; and
3. More understanding can be gained about the connectivity of different underground aquifers in NSW and the medium and long term effects of depressurising coal seam aquifers.

1. The extraction process

Some of the difficulties with understanding risks related to the CSG extraction process are due to the specific characteristics of groundwater.

Groundwater is extremely slow moving, can be very deep underground, and is often under pressure. There is increasing understanding that impacts on groundwater take a long time to become evident. Deeper groundwater often moves slower (up to millions of years old in the GAB).

The extraction process of CSG involves reducing the water pressure in the gas holding rock layers. This is basically done by pumping water out of the pore spaces from the gas and coal holding rock layers. As a result the gas is released and this can be captured and processed.

The problem with this process is that the pore space almost every underground rock layer is connected to other layers. Sometimes this connection is only slight, but in many cases the connections are significant. We know this because groundwater hydrologists have studied the extraction of water for more than 50 years from underground layers. Initially it was thought connections were very limited, for example the Great Artesian Basin was seen as totally separate from the overlying aquifers in the Namoi. However, work in the 1990's and the 2000's has shown that extraction of water from the overlying production (irrigation aquifers) has caused a slow mixing with Great Artesian Basin water. The potential for such connections was already alluded to in the original Namoi aquifer investigation by Calf (1978). Similar connections occur between all aquifers across NSW. As a result, dewatering of one part of the overall underlying geological system cannot be seen separate from the effects on the other parts.

A second problem is that dewatering of rock layers causes irreversible changes to the rock system as the system is under immense pressures, both from the above layers as from other geological phenomena. As a result, reduction of the pressure in the aquifer results often in a non-reversible collapse of the pore system resulting in a rearrangement of pressures. Subsidence of rock and surface layers is a regular observed feature of gas extraction. This was most dramatic in the North of the Netherlands after natural gas extraction. A web search of "subsidence Netherlands gas extraction" delivers many references dealing with this topic. While it is recognised Australia has a different geology, some rearrangement cannot be excluded for the effects. This is particularly concerning for urban areas where such rearrangement may damage building foundations and public infrastructure.

Overall, the characteristics of groundwater combined with the extraction process of CSG means that there is a substantial risk of irreversibly damaging the underlying aquifer system or causing mixing of saline and fresh groundwater. However, it might take tens of years to hundreds of years for this to become visible or noticeable. This means that long-term monitoring and guarantees need to be in place to protect the public groundwater resources. These measures are essential to prevent future costs to the NSW government for clean-up or remediation (such as the current costs related to the clean-up of Barangaroo).

2. Waste product disposal

CSG has the potential to significantly increase the movements of salts from groundwater to the surface (Biggs 2011). The state and federal governments have spent millions of dollars over the last 20 years to reduce salt loads in rivers and minimise the impact of salt in the landscape. The disposal of saline discharge from CSG extraction is therefore a major problem related to the process.

Existing reports such as the CSGWMS (2004) conducted by Queensland NRE&M indicate that water extracted in CSG is of varying quality and conclude that it is likely that all water will need to be treated to an equivalent quality as to that of the receiving environment. Satisfying this criterion would most likely require some form of desalination which will increase the costs of CSG and will reduce the net energy gained from CSG.

Appropriately treated water could be utilised for agriculture and stock and domestic water. However, as a recent survey by Galaxy research suggests, members of the public are concerned about the waste products of CSG. Most interviewed suggested that they would not want CSG waste water in their back yard. A government wishing to initialise CGS would have to be very convincing in their arguments as to why the water is safe for use. Furthermore, disposal of brine (concentrated salts) from the desalinisation process is a further problematic and unresolved issue. There is a need for innovative ways in which brine can be used or disposed of which does not require transportation or dumping risking contamination.

Re-injection into neighbouring aquifers needs very careful consideration and strict regulation. Increasing the pressure in an aquifer has the same risks as reducing the pressure. Again the quality of injected water must be equivalent to the water in the environment. However, the impact of re-

injection to the local water table may lead to rising water tables and the mobilisation of salts in the landscape ultimately leading to dryland salinity and the increase of salt loads in our river systems.

The lack of solutions to the management of waste products from CSG extraction is a major unresolved issue that needs urgent addressing to prevent future calamities.

In conclusion, the costs of disposal and the potential risk to infrastructure and the environment need to be calculated into the extraction costs of CSG to reflect the true production costs. Only then can CSG be compared with other forms of energy production that are currently on offer.

References

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