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Regulating the Pollution of Queensland's Waterways from Natural Resource Extraction: Potential Pathways to Law Reform Inspired by Recent Chinese Developments in Environmental Law

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Abstract

This research paper critically evaluates the status of natural resources law in Australia in relation to its capacity to disincentivize the capacity for mining and natural resource extraction related activities to pollute essential water sources. This paper articulates the historical development of the law protecting waterways from pollution within Australia and Queensland and identifies the deficiencies in this development. This paper then investigates mechanisms for improving the capacity of the law to incentivize environmentally sound practices from groups that carry out natural resource extraction. This topic warrants investigation due to the vital nature of water for sustainable growth and development in Queensland, particularly with Australia and Queensland's dependence on waterways such as the Murray-Darling basin for agricultural and ecological sustainability. This paper investigates the complicated relationship between the necessity of water for facilitating mining infrastructure projects such as coal seam gas extraction, alongside the potential for waterways to become polluted through these processes and negatively impact the livelihood of local populations. This research looks toward jurisdictions who have recently made law reform attempts to address similar issues relating to pollutants from mining practices in waterways such as the recent reforms made by the People's Republic of China. In studying these reforms, this paper critically assesses the capacity for these law reforms to provide solutions to address pollution caused by natural resource extraction in Australian waterways.

Keywords

Water Law, Natural Resource Extraction, Environmental Law, Australian Law, Comparative Law

1. Introduction

1.1. Structure of the Article

This research paper divides its investigation into environmental law reform regarding water pollution in Queensland into three sections.

1) The first section of this paper explains the current legislative instruments that regulate the exploitation of water sources in Australia. This first section then addresses current issues related to the continued contamination of these waterways, and the current failings of these legislative instruments in regulating the pollutant by-products of mineral extraction processes. This section further considers the policy reasoning for the present regulatory mechanisms, and the way in which law reform that utilizes an approach that privileges long term environmental stability over short term economic investment is indispensable for Australia's ongoing ecological wellbeing. Moreover, this section looks at the importance of forms of mineral extraction in Queensland and the challenges that have resulted from these activities. This section further discusses and evaluates the scientific arguments regarding the potential harms of water that has been polluted from mining related activities.

2) The second section of this research paper evaluates recent developments regarding the development of environmental protection legislation in the People's Republic of China and their relation to present issues in Australia. This section further considers the extent to which recently developed reforms in China have led to improvements in reducing contamination, and the processes through which these systems have been implemented.

3) The final section of this paper critically evaluates issues in relation to the applicability of Chinese legal reforms to Australia's legal framework. It considers whether such policy reform would be viable in an Australian socio-political context and consider mechanisms to address the difficulties that are associated with the legal transplantation of foreign policy. As Australian political structures can lead to rapid variation and lack the capacity for long-term nation-level planning through Five-Year implementation blocks (Dai, 2015: pp. 88-89), it will be considered whether there are alternative means of implementing these water source protecting policies in Australia.

1.2. Research Objectives

This research is premised around meeting the objective of reducing waterway pollution in Queensland. There is currently a significant degree of pollution in Queensland's water sources, primarily due to the means in which limited regula-

tion of mining efforts often carries a risk of harming waterways and contamination is highly likely due to the pollutants and chemicals employed in the process natural resource extraction. This is due firstly to the nature of the waste produced from the process, and secondly due to the tendency for water to be used in large quantities, as this can produce significant hazards for watercourses and communities that are dependent on the water source (Winkler, 2012: p. 113). This is further amplified by ongoing environmental risk factors that have increased the strain placed on agricultural systems dependent on clean water, which has further led to the risk of degradation of environments necessary for global stability (World Economic Forum, 2018). Critical evaluation of the impacts of pollution as a result of this relationship is necessary due to the essential nature of clean water for environmentally sustainable development (Winkler, 2012: p. 113). Concerns regarding pollutants in water sources in Australia are highlighted by the significant dependence of irrigated agriculture in South-East Australia on the available clean water flows of the Murray-Darling Basin (United Nations Development Programme, 2006: p. 140). The Murray Darling Basin's potential for contamination due to mining efforts is further exacerbated by its mineral rich nature resulting in the waterway becoming a significant site for gold, copper and coal mining operations (The Senate Environment, Communications, and the Arts References Committee, 2009: p. 2), with surveyors drawn to the estimated 6.4 billion tonnes of high-quality thermal coal within the Surat Basin sector of the Darling Downs (The Senate Environment, Communications, and the Arts References Committee, 2009: p. 4). Due to the agricultural dependence of farmers on the Murray Darling Basin's water supply, there has been significant conflict between usages of the basin, as mineral exploitation efforts along these essential waterways carries strong risks of polluting underground aquifers and the surface water flows necessary for the agricultural sustainability of farmland (The Senate Environment, Communications, and the Arts References Committee, 2009: p. 5).

2. Legal Development in Queensland and Challenges

2.1. Historical Development in Queensland

Legislative attempts to reduce the contamination of waterways in Queensland have been complicated due to the varied forms of public and private ownership of the means of natural resource production in Australia. The relationship between Australian systems of mining operating under various forms of public and private property, contrasted with the governmental duty to preserve the land for recreation, conservation and the protection of the state's population, has caused debate over the means by which the Australian executive should exercise deeper regulation to limit the interests of natural resource rights-holders (Southalan, 2012: pp. 71-72).

Under Section 51 of the Australian Constitution (1901), trade and commerce powers (s 51xxix), jurisdiction over external affairs (s 51 (xxvi)), and in relation to Indigenous Australian issues (s 51(xxvi)), are considerations for mineral de-

velopment and have been applied in this way to broad judicial readings that allow the external affairs power to authorise Commonwealth laws to implement an international obligation that Australia has ratified, including those purely domestic in operation (*Commonwealth v Tasmania* (1983) 158 CLR 1 at 688, 743). Despite these considerations being relevant, federal authority over oil and gas regulation is limited to the corporations power (Australian Constitution, 1901, s 51(xx)), and interstate trade (Australian Constitution, 1901: s 51(i)). As a result, the federal government in Australia has its jurisdiction limited to within these specific constitutional powers and the states have regulatory control of the remaining consideration (Ingelson and Hunter, 2014: p. 225), and most mineral resources are therefore subject to proprietary ownership at a state level (Crommelin, 1986: pp. 295-296; Ingelson & Hunter, 2014: p. 225). The exception to this is with requests for approval of developments with a significant impact on water resources under section 24D of Environmental Protection and Biodiversity Conservation Act 1999 (Cth) which applies to coal seam gas and large coal mining developments (*Environmental Protection and Biodiversity Conservation Act 1999 (*Cth) s 24D). Failure to attain approval for these actions results in a penalty of 5,000 penalty units for an individual and 50,000 penalty units for a body corporate (*Environmental Protection and Biodiversity Conservation Act 1999* (Cth) s 24D). As well as requiring the body to attain approval, if the coal seam gas or large mining development results, will result, or will likely result in a significant impact on a water resource they may be liable for 7 years imprisonment, 420 penalty units, or both (*Environmental Protection and Biodiversity Conservation Act 1999 (*Cth) s 24E).

As another means of regulation, *The Water Act* (2007), is a piece of Commonwealth legislation taking responsibility over major water supplies and aims to consolidate the local plans drafted under state acts that focus upon national interest (McKay & Marsden, 2009: p. 185). While this mechanism has the added benefit of being capable of drafting reform that crosses state boundaries, the lessened local capacity for responsibility and the limited panel of eight independent persons for review (McKay & Marsden, 2009: p. 185), lessens the capacity for regional legislators to adequately oversee issues related to waterways in their individual sectors. However, despite these Commonwealth protections, most shale gas and coalbed methane mining occurs on-shore and the extraction of the gas is regulated by the states (Ingelson & Hunter, 2014: p. 241), and there is still remains potential for further improvement in Queensland legislative efforts.

Currently, disputes are regulated through various legislative instruments. Access to mineral resources disputes are structured via the *Petroleum and Gas Act* (2004) where commercial coal seam gas extraction is required to have petroleum tenure obtained under this act, and environmental protections are addressed under the *Environmental Protection Act* (1994). Although these forms of legislation aspire to drastically curtail unregulated contamination of water sources, private mineral rights holders retain a substantial degree of freedom to pollute

when pursuing their interests. Moreover, Queensland's governance of water tends to prioritize energy projects and short term economic benefit over long term environmental protection (Tan & Robertson, 2018: p. 259). The *Environmental Protection Act* in Chapter 5 provides further protection as it requires the disclosure of chemicals such as those used to stimulate wells in hydraulic fracturing (*Environmental Protection Act* 1994, chapter 5 part 1, chapter 5 division 6 s 206). *The Environmental Protection Act* also covers by-products such as coal seam gas water which falls under the definition of waste under the Act (*Environmental Protection Act* (Qld), 1994, s 13), meaning that the operator must comply with the waste management hierarchy under the waste management policy (*Environmental Protection* (*Waste Management*) *Policy* (Qld), 2000; Swayne, 2012: p. 182).

Another tool provided by the Act is the use of an Environmental Authority which an operator must undertake for a prescribed Environmentally Relevant Activity. This licenses a company to undertake petroleum activities and includes the authority granted for hydraulic fracturing (Ingelson & Hunter, 2014: p. 245). The authority for this is granted under the Environmental Protection Regulation 2008 schedule 2. Rights to water sources in Queensland were recently extended by the *Water Reform and Other Legislation Amendment Act* 2014 (*Qld*) which included a reform that extended statutory rights to water for the mining industry (Tan & Robertson, 2018: p. 266), and clause 10 of the *Environmental Protection* (*Underground Water Management*) *& Other Legislation Amendment Bill 2016 (Qld*) which further extended the rights of mining organizations over water (Tan and Robertsom, 2018: p. 267). The *Mineral and Energy Resources* (*Common Provisions*) *Bill 2014* (*Qld*), provided a redesign of the regime for coal and coal seam gas in Queensland (Adkins & Claugue, 2014: p. 167). Through these mechanisms, the legislative approach in Queensland has taken a practical approach which is founded upon the coalbed methane extractor having layered duties to monitor and report as well as provide compensation where harm has occurred (Swayne, 2012: p. 164). This is a 'learning by doing' approach that is highly dependent on the implementation of continuous monitoring, evaluating, and enhancement of the regulatory frameworks and their impacts on the industry (Swayne, 2012: p. 164). As a result, it must be ensured that these processes are closely monitored to ensure the ongoing success of the program.

2.2. Challenges of Coal Seam Gas Extraction in Queensland

The Historical Development of Natural Resources Law in Queensland has led to a degree of difficulty through the means in which Coal Seam Gas has become necessary for Australia's economy, while simultaneously contributing to the pollution of Australian waterways to a significant degree. Coal seam gas is an important commodity with relevance to mining regulation. It is an inherent by-product of the coal industry, as it is produced in the conversion of peat to coal (Johnston, 2001: p. 258). Recently, it has been extracted for its own inherent value, and gas industry agents with limited interest in the underlying coal re-

sources seek to extract coal seam gas for commercial exploitation (Johnston, 2001: p. 258). These considerations are important for Queensland as it has a large quantity of Coal Seam Gas resources, estimated at 110, 000 Petajoules (Johnston, 2001: p. 260). This vast quantity of exploitable content has led to a degree of division of interest between those that desire to extract stand-alone coal seam gas and those who mainly extract coal whilst simultaneously extracting coal seam gas for safety purposes (Johnston, 2001: p. 261). These disputes have led to questions regarding the ownership of the coal seam gas sources, and the determination of which party is responsible for the cost of plugging the well and the loss of coal reserves from the drilling of the well (Flanery & Morgan, 2014: pp. 273-274). In response to the demands of the domestic energy market, a further 400 square kilometres of land was opened for coal seam gas development (Lynham, 2017; Robertson, 2018: p. 189). Through this process, coal seam gas removal is necessary for miners to work safely underground, and its extraction is necessary due to its capacity to cause mine explosions, tragedies which have caused the loss of many lives throughout the centuries (Strang & Wood, 1985: p. 120). In Australia, a recent accident occurred in 1994 at the Queensland Moura No 2 underground mine where an ignition of accumulated methane resulted in an explosion that led to the death of eleven miners (Johnston, 2001: p. 259). Indicating that the extraction of coal seam gas is necessary as a safety precaution and its usage as an energy sources can be a positive by-product of its removal.

Furthermore, Coal seam gas extraction raises new issues relating to pollutants from mining efforts due to the widescale necessity of fresh water for this process. This is due to the way in which coalbed methane development requires significant water usage and disposal throughout the extraction process (Flanery & Morgan, 2014: p. 294). The coal seam gas extraction method is advantageous in terms of lessened carbon imprint compared to regular coal extraction (Tan & Robertson, 2018: p. 258), however, the coal seam gas extraction method maintains a high capacity to pollute the aquifers it is dependent upon (Tan & Robertson, 2018: p. 258). In Queensland, these issues are further exacerbated as coal and coal seam gas mining efforts are granted near unlimited rights to the exploitation of groundwater with a limited degree of transparency (Baldwin, 2017: p. 151), although an unlimited right is not an unlimited right to pollute, and there are duties to report the use of fracking and the presence of well-head leaks (*Petroleum and Gas (Production and Safety) Act 2004* (Qld) s 706; *Petroleum and Gas (Safety) Regulation 2018* (Qld) s 11, sch 2.; Swayne, 2012: p. 164). Nonetheless, due to the processes involved there is a 'significant amount of water that contains toxic pollutants which may be discharged directly from power plants,' (*Adani Mining Pty Ltd v Land Services of Coast and Country Inc & Ors* [2015] QLC 048 579), which would have tangibly negative impacts on the sustainability of these water sources, human health, and to the livelihood of fishing communities (*Adani Mining Pty Ltd v Land Services of Coast and Country Inc & Ors* [2015] QLC 048 579). This issue has the potential to impact local landholders who can have their land use practices effected because of air, water, and soil

contamination. There may also be subsequent social impacts over long periods of time (Swayne, 2012: p. 164). Ultimately these concerns raise issues referable to the balance between public health and safety concerns compared with the potential economic benefits of extraction (Ingelson & Hunter, 2014: p. 219). Although with a degree of regulation these damages can be minimized, the National Water Commission has noted that the coal seam gas industry is, 'not adequately managed and regulated, it risks having significant, long-term and adverse impacts on adjacent surface and groundwater systems.' (National Water Commission, 2010: p. 1) Moreover, if inappropriately managed, coal seam gas water can, 'almost irreversibly damage soils, riparian vegetation and fish communities' (Taulis, 2010: p. 421) throughout the project's lifespan.

2.3. Challenges Related to Hydraulic Fracturing in Queensland

The Historical Development of Natural Resources Law in Queensland has also led to a degree of difficulty related to the emerging processes of Hydraulic Fracturing. Recently, hydraulic fracturing has gained legitimacy as a commercially valuable process in Australia and the exporting of liquified natural gas has been one of Australia's fastest growing national export commodities (ABC News, 2013). Despite the economic benefits of hydraulic fracturing to mineral extraction and energy production, the concerns about water contamination from the processes of hydraulic fracturing have resulted in Australia developing legislation and regulations to manage its pollution (Ingelson & Hunter, 2014: p. 217). This is due to the chemical additives to hydraulic fracturing fluids that are used to produce unconventional hydrocarbons that have the potential to pollute, but are also innovative means of developing gas resources and have immense value as trade secrets protected by intellectual property rights (Ingelson & Hunter, 2014: p. 217). This results in the owners of hydraulic fracturing technology having a degree of reluctance to disclose information relating to the chemicals that are added to hydraulic fracturing fluids (Furlow & Hays Jr., 2012: p. 306).

The potential health impacts of hydraulic fracturing fluids are likely to be limited by minimization of exposure. The chemicals that are added to the fluid may cause negative health effects in their pure forms such as, 'kidney, liver, heart, blood, and brain damage through prolonged or repeated exposure,' (Environmental Protection Agency, 2004, s 4) however these risks are mitigated as the chemicals are significantly diluted prior to injection in the fracturing fluids (Environmental Protection Agency, 2004, s 4-3), and require ingestion by humans through, 'susceptible route(s) of exposure (i.e., inhalation, indigestion, skin contact).' (Environmental Protection Agency, 2004, s 4-17) Moreover, the harms posed to underground drinking water aquifers are mitigated by, 'the concentrations and flowback of injected fluids, and the mitigating effects of dilution and dispersion, fluid entrapment, and potentially biodegradation' (Environmental Protection Agency, 2004, 7-5) which seemingly result in hydraulic fracturing fluid not posing a significant threat to these drinking sources. The amount of chemical formation in hydraulic fracturing fluid is limited, and approximately

99.5% of the total volume of the fluid comprises of water (90%) and proppants (9.5%) (Furlow and Hays Jr, 2004, pp. 303). Moreover, each of the components of the fluid serves a defined engineered purpose, from the reduction of friction to allow proponents to be pumped, biocides to prevent microorganism growth, scale inhibitors to prevent mineral precipitation, and corrosion inhibitors to prevent damage to the metal pipes: many of these chemicals are necessary to ensure the safe operation and integrity of the well (Furlow and Hays Jr, 2004, pp. 303-304).

However, despite these chemicals being essential to ensure the well's operation, and despite them existing as a small fraction of hydraulic fracturing water's overall chemical composition, concerns remain regarding whether the output of these chemicals in hydraulic fracturing water may have long-term endocrine disrupting results that result in adverse health outcomes (Kassotis et al, 2015: p. 4458; Balise et al., 2019: p. 7). Twenty-three commonly used oil and natural gas operation chemicals activate or inhibit, 'the estrogen, androgen, glucocorticoid, progesterone, and/or thyroid receptors, and mixtures of these chemicals can behave synergistically, additively, or antagonistically in vitro.' (Kassotis et al., 2015: p. 4458) A study of the impact of endocrine disrupting chemicals found their presence in surface water from a region of Colorado that was drilling-dense, and in samples collected from spillages in the environment, suggesting that the oil and natural gas operations within the region were increasing the presence of endocrine disrupting chemicals (Kassotis et al., 2015: p. 3349, 4461). Moreover, prenatal exposure to a mixture of these chemicals at 300 μg/kg, 30 μg/kg, an even 3 μg/kg led to, 'decreased sperm counts, increased testes, body, heart, and thymus weights and increased serum testosterone in male mice, suggesting multiple organ system impacts.' (Kassotis et al., 2015: p. 4458) Studies have also documented findings which have suggested, "possible adverse developmental and reproductive health outcomes in humans and animals exposed to potential environmentally relevant levels of oil and gas operation chemicals" (Kassotis et al., 2015: p. 4458). Exposure to these chemicals can result in adverse reproductive outcomes such as "miscarriage, preterm birth, and decreased fertility," (Kassotis et al., 2015: p. 4459) as well as, "respiratory, gastrointestinal, dermatological, neurological, immunological, endocrine, reproductive, and other adverse health outcomes in humans and wildlife" (Kassotis et al., 2015: p. 4459). A literature review of the adverse health effects associated with 353 chemicals used for oil and gas operations found that 75% could impact sensory organs, the respiratory and gastrointestinal systems, 37% were known or suspected endocrine disruptors and 25% were human carcinogens (Colborn et al., 2011: p. 1039; Kassotis et al., 2015: p. 4469). Further study is required to elucidate the potential cross-generational impacts these endocrine disrupting chemicals may have on human biochemistry, and to increase knowledge of the adverse health impacts of these operations (Kassotis et al., 2015: p. 4459). The comprehensive literature evaluating this topic indicates that, until broader research is performed that generates a deeper understanding of the health impacts of these chemicals, a

significant degree of caution must be exerted regarding the regulation of these pollutants entering ground water sources from coal seam gas and oil mining endeavours.

The issues involving these pollutants have been addressed to a very limited degree in Australia through the *Industrial Chemicals* (*Notification and Assessment*) *Act* 1989, as the industrial chemicals that are used in hydraulic fracturing must be listed on the Australian Inventory of Chemical Substances (*Industrial Chemicals* (*Notification and Assessment*) *Act* 1989 (Cth), art 11). The effectiveness of this however is limited as not all of the chemicals listed have been assessed for human health and environmental impact (Ingelson & Hunter 2014: p. 229). The disclosure of hydraulic fracturing fluids and their impact has been of substantial public concern to environmental groups and public stakeholders (Boling, 2012: p. 257), As a result of this, various jurisdictions have taken to regulate hydraulic fracturing and its relationship with water such as the proposed *Spill Response and Prevention Surety Act* (2019) in the United States. Despite industry assurances that the potential risk to drinking water is minimal, these forms of regulations where demanded by the public are essential in ensuring public trust and acceptance of the hydraulic fracturing process and serve to rehabilitate the mining industry's image (Boling, 2012: p. 261). These regulations are also important for the interests of the agricultural and geoscience sectors, who have concerns regarding the potential for hydraulic fracturing fluid to be responsible for "initiating new erosion features in susceptible areas," (Moran & Vink, 2010: p. 4) and to have an impact upon the structural integrity of other aquifers, aquitards, and groundwater flow processes that, "can never be completely eliminated" (Geoscience Australia & Habermehl, 2010: p. 4). Despite the limited success of these measures, due to the continued excessive levels of mineral pollutants in Australian waterway systems (The Senate Environment, Communications, and the Arts References Committee, 2009: pp. 4-5) this paper will also look to recent reforms in the People's Republic of China for ways in which this system of assigning local responsibility can be improved.

3. Assessment of the Recent Reforms in China and Their Potential Application in an Australian Context

3.1. Assessment of the Recent Reforms in China

Recent targets set by the United Nations Sustainable Development Goals have established indicators for member states to frame agendas for tackling development such as the impacts of mining and resource extraction (McKay & Zheng, 2018: p. 166). In China, drastic environmental protection was necessary to combat levels of extreme water pollution, in which 90% of the parts of rivers which flow through cities were extremely contaminated, 50% of lakes were eutrophicated, and in rural communities 360 million people were unable to drink water up to a drinkable standard (Li, 2007: p. 38). In response to these developments, China underwent major systemic legal reform to its management of water re-

sources, and these reforms had been largely successful (McKay & Zheng, 2018: p. 168). The dire nature of the pollutant water crisis that existed prior to the legal reforms, and the way in which these reforms drastically improved the conditions of water sources in China, render the study of these reforms highly valuable to ascertain where further improvement can be made to Australian environmental protection law. The study of these reforms will assist Australian law to improve its protection of water sources, and ensure the prevention of environmental harm to water sources from natural resource extraction activities.

Article 33 of *the Law of the People's Republic of China on the Prevention and Control of Water Pollution* prohibits the discharging of oil, acid, or highly toxic waste liquid into water bodies, and article 29 of the legislation expands on this and includes obligations on local people's governments to organize protection of restoration rivers, lakes and wetlands. By-product acid requires disposal by institutions qualified to handle, dispose, produce, and transport hazardous waste in accordance with Chinese national laws and regulation (*Taixing pollution liability dispute,* 2015). Further protection is granted by Article 63, in which the State Council and people's governments may flexibly stipulate the protection of drinking water sources in accordance with the needs of environmental protection from prescribed water pollutants for which the person in charge and other persons are directly liable.

To address issues relating to water pollution China has introduced three major legal developments, the "Captain of the River" concept, the introduction of "green courts", and the introduction of stricter local oversight of pollution regulation (McKay & Zheng, 2018: p. 168). These tools, if capable of being legally transplanted, would be helpful to reduce mineral pollution in Australian waterways due to the means through which they have been highly significant at mitigating pollution led damage caused in waterways in China. The "Captain of the River" concept is the most extensive of the reforms and developed as a system of ensuring local governmental responsibility to oversight of pollution in major waterways. Government officials are assigned as "captains" and deposit funds into an account at the beginning of the year (Dai, 2015: p. 87). Captains whose river quality has been independently assessed to have improved are granted double as a reward, those who maintain the status quo in terms of pollution have money returned, and those whose waterway quality has worsened have their deposit confiscated (Dai, 2015: p. 87). Moreover, those who fail to reach any targets violate the *yipiao foujue* Veto System (Dai, 2015: p. 88), which can have a negative impact on the personal career advancement prospects of the official in question (Heberer, 2019: p. 172). The water quality due to lessened pollution in these sectors has improved considerably with 74.7% reaching the established standards in the 2008 implementation compared to the 50% that reached the standards in the year prior to adoption (Dai, 2015: p. 88). The "Captain of the River" instrument functions as an adaptive tool to deal with the issue of water pollution through its direct contractual compellance of local officials to secure and take charge of reducing pollutants from mineral waste in the water systems

of their sector (Dai, 2015: p. 93). This "Captain of the River" concept, alongside green courts, and sustainable local and national protection projects has been proven to reduce the impacts of mining-based pollution as it discourages and mitigates the impact of mining projects in the sector and reduces and minimizes water pollution. The Notion of personal liability is supported by Article 20 of the 2018 Revisions to the Law of the People's Republic of China on the Prevention and Control of Water Pollution which imposes legal sanctions. Where the aquatic environmental quality improvement goal has not been achieved the environmental protection department will, alongside relevant departments, conduct disciplinary interviews with the principal responsible persons of the local people's government and suspend the approval of environmental impact assessment documents of newly added construction projects that would discharge new major pollutants in water sources, with the results of this process being made public (People's Republic of China, National People's Congress Standing Committee, 2018, art 20). Due to the damage caused to the aquatic environment and the destruction of regional ecological environmental functions, the actual cost of the harm far exceeds the labor intervention cost (*Taixing pollution liability dispute*, 2015). This is because the dumping of chemical by-products can cause serious damage to not only the river's quality but to animals, river banks and the ecological environment downstream, where the accumulation of pollution eventually will cause irreversible damage if not appropriately treated. (*Environmental pollution damage compensation dispute*, 2015; *Taixing pollution liability dispute*, 2015).

In a case dealt with by the Supreme People's Court, the polluting activity of a chemical company to essential river supplies was rectified (*Taixing pollution liability dispute*, 2015). The penalties were increased due to the classification system, in which the company polluted a Class III standard water supply. The Class III standard of surface water quality is of special importance as it refers to water that is suitable for drinking and fishing, and in 2005 was limited to a ratio of 36% of water meeting that standard for direct use (Li, 2007: p. 40). When evaluating the polluting activity of the company, the Supreme People's Court determined that the company must pay an environmental restoration cost calculated by multiplying the cost of the treatment and the quantity that was dumped. The repair cost to be paid by the polluter exceeded the labour and chemical cost of repair. This method of calculating the restoration cost considers not only direct environmental restoration cost, but also considers the unascertainable long term impacts of environmental damage (*Taixing pollution liability dispute*, 2015). A similar case involved the release of pollutants from chemical plants which caused damage to wildlife after the wastewater leaked into drinking water (*Dispute over Damages of Water Pollution,* 2000). These acts were penalized severely and the perpetrators were fined for failing to dispose and discharge of sewage from pits without taking appropriate action to prevent leakage (*Dispute over Damages of Water Pollution,* 2000).

The result of this assessment of the recent legal reforms in the People's Re-

public of China reveals that the Captain of the River concept and increased accountability imposed upon corporate polluters has substantially improved water conditions in China and has led to a vast improvement in water conditions. The effective nature of these Chinese reforms indicates that they would lead to a vast improvement in water quality in Queensland and Australia provided that they were appropriately implemented in an Australian context.

3.2. Potential Application of the Chinese Reforms in Australia and Recommendations for Legal Change in Australia

This section of the research paper will further stress the need for regulatory principles in Australia to ideally retain certainty, transparency, practicality and flexibility (Goldstein, Malavazos, & Hayter, 2017: p. 374). The recent Chinese reforms through the Captain of the River concept and the strengthened liability for polluters are substantively helpful for reform to attain the goal of these regulatory principles and increase corporate accountability in Australia. Moreover, it will stress the need for legislative regulations of the environment to provide the community with information regarding the potential environmental impacts of operations long before corporations apply for on-ground activity approval and further engage with people and enterprises that will be effected by the regulated activities (Goldstein, Malavazos, & Hayter, 2017: p. 374). Neoliberalism as a dominant form of governing ideology in Australia obfuscates and neglects social, cultural and economic obligations and state regulation of the private sector in its pursuit of the supremacy of individual autonomy and capital gain (Brown, 2015: pp. 155-156; Brown, 2016: p. 3). Because of this neglect of social, cultural and economic rights, in Australia an individual's commitment to the environment, or to the well-being of the broader community, becomes secondary to an individual's capacity to manoeuvre through the marketplace and pursue the interests of accumulating capital with as little communal commitment that can be seen to be justifiable. As a result, the interests of the environment are commonly framed as inconsistent with and harmful to the importance of natural resource extraction to Australia's export economy. As such, only if frameable as an "investment" does environmental protection become acceptable as a consideration to the financial sector. This concern can be met by highlighting the business interests of investing in protection mechanisms such as the Captain of the River concept and the further specialization of environmental investigative bodies and green energy initiatives by promoting the ways in which these policies improve water conditions and allow for long term stability.

Consequently, the innovative processes that have been introduced in recent years through environmental policy in the People's Republic of China would lead to a vast improvement in Australian law that regulates the usage and enjoyment of water. This paper recommends the following improvements to better secure water quality in Queensland: Firstly, establishing and enacting forms of governing policy that assign a greater degree of personal responsibility to political representatives regarding water protection in Australia similar to the Chinese

Captain of the River concept, which would add personal incentives for governing bodies to maintain safe water standards within their jurisdiction. Secondly, this paper recommends expansions to Queensland's Planning and Environmental Courts, which would include increased powers in relation to the public notification of gross mismanagement of water sources by companies in disputes where such breaches have occurred. Thirdly, it is necessary that there is a substantive increase in funding for Queensland's Crime and Corruption Commission for the purpose of forming a 'Water Protection Investigation Body' specifically designed to investigate and prosecute illicit efforts by individuals and corporations to bypass pre-existing water protection policy by influencing public officials, alongside an increase in public notice of issues effecting waterways. This increase in public awareness can be furthered by providing increased funding to disseminate public information regarding obligations to water. Additionally, increases in funding to biomedical research bodies to further investigate the health impacts of water pollution would further increase governmental awareness of how to tackle the issue of pollutants. This funding to be used to create a new research body investigating water pollution's potential harms related to human disease, and to investigate the long-term negative health impacts of toxic compounds found in polluted groundwater that are endocrine disruptors. Lastly, the Queensland government must make a stronger commitment to investment in green energy entrepreneurial initiatives that provide more environmentally sustainable mechanisms for regulating and preserving water quality.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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