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## **INFLUENCES OF GOVERNMENT REGULATION ON ENVIRONMENTAL OUTCOMES OF ON-SITE CONSTRUCTION OPERATIONS: DEVELOPING THE CONCEPTUAL FRAMEWORK**

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### **ABSTRACT**

It is widely acknowledged that particular on-site practices commonly encountered in the construction industry result in environmental degradation. In response governments have developed regulatory policy to control construction processes in an attempt to ameliorate detrimental impacts. However government commitment to ecologically sustainable development (ESD) has produced a complex legislative system that may be unable to fulfil objectives associated with environmental protection. In particular it is not well understood whether current regulatory policy exerts sufficient control over on-site construction practice, particularly whether information flows are effective to ensure that environmental controls stipulated within the consent documentation are implemented during the construction site phase. Ultimately there is a lack of research linking on-site environmental construction practices and environmental management to the effectiveness of regulatory policy, enforcement and information flow. This paper is based on a review of literature on regulatory framework for ESD and presents the regulatory context for development of a theoretical framework within which examination of the on-site construction domain can be gauged against existing regulatory controls across Australia. In particular it allows the development of knowledge about external non-contractual influences on project information flows and their environmental consequences.

Keywords: construction, environment, framework, management, regulation

### **INTRODUCTION**

Ecologically Sustainable Development (ESD) may be defined as ‘using, conserving and enhancing the community’s resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased’ (Ecologically Sustainable Development Steering Committee [ESDSC], 1992). Principles of ESD have been recognised internationally through Agenda 21, at the United Nations Conference on Environment and Development in 1992. Signatory countries to Agenda 21, including Australia, acknowledged the impact that human activities were having on the environment (ESDSC, 1992).

Agenda 21 has been considered ‘the most significant event influencing environmental policy for the Australian development and construction industry (Maund & London, 2009, p. 334). The industry has remained the most rapidly expanding sector, with an annual economic contribution of approximately \$45 billion (Australian Bureau of Statistics [ABS], 2012). With

such input the consequence has been the gradual exhausting of natural resources and irreversible environmental degradation (Hendrickson and Horvath, 2000; Li, Zhu & Zhang, 2010; Shen & Tam, 2002; Tam, Tam, Zeng & Chan, 2006).

In progressing Agenda 21 the Australian government assessed their commitment to ESD. A plethora of regulatory policies were ratified to achieve the principles of ESD and mitigate environmental degradation (Maund & London, 2009). Within New South Wales (NSW) government commitment to ESD has produced what some consider to be an overly legalistic, complex and perplexing legislative system that may not fulfil the objectives associated with environmental preservation. It is not well understood whether current environmental planning regulation exerts sufficient control over on-site construction practice, particularly whether information flows are effective to ensure that environmental controls stipulated within consent documentation are implemented during the construction phase. The actual ability of the current legislative system to cultivate environmental preservation remains undetermined.

Ideas proposed form part of PhD research. This is currently in the conceptual stage, with one objective being the development of a theoretical framework demonstrating how government regulations related to environmental planning legislation influence environmental outcomes of on-site construction operations. Although primary data collection will be confined to NSW, findings of the study may inform wider national and international practices.

## THE RESEARCH CONTEXT

Shen and Tam (2002) depict the reality of construction activities upon ecosystems: 'construction is not by nature an environmentally friendly activity' (p. 535). Research has identified the range of negative environmental impacts from the construction process in terms of irreversible environmental degradation and contribution to the exhaustion of natural resources (Shen and Tam, 2002; Tam, Tam, Zeng & Chan, 2006).

The plethora of impacts include resource extraction (fossil fuels), resource consumption (water, energy and materials), waste production (solid, liquid and hazardous wastes) and land contamination (chemical emissions and water discharge) (Shen and Tam, 2002). According to Hendrickson and Horvath (2000), significant toxic emissions from construction practices include hydrochloric acid, chlorine, ammonia and methanol. Additionally sulphur dioxide, nitric oxide and volatile organic compounds are generated (Hendrickson and Horvath, 2000).

These detrimental impacts upon the environment are theoretically a result of deficiencies within regulatory policy and enforcement, in conjunction with inadequate information flows between subsystems in the environmental preservation system. A disconnect has emerged between these three variables that has the potential to result in destructive on-site construction practice.

Policy is a regulation or guideline employed to achieve a set objective. Lee and Yik (2004) state: '...policies are institutional arrangements that influence the decision making of individuals and firms as they attempt to maximise their benefits under the constraints imposed by the policies' (p. 494). Therefore, policy is a mechanism employed by organisations to regulate or control activities: to ensure compliance with a set regime.

Regulatory policy implies ‘...a set of authoritative rules accompanied by a mechanism, usually administered by a public agency, for monitoring and promoting compliance with those rules’ (Johnstone and Starr, 2004, p. 4). Traditionally, regulatory policy has involved a command and control approach, where violations against the rules will normally result in prosecution (Lee and Yik, 2004). However, the evolving nature of regulation has seen the introduction of flexible instruments with subsidies, taxes and similar strategies employed to encourage compliance (Johnstone and Starr, 2004).

Enforcement becomes the instrument by which compliance with regulatory policy is attained: a control mechanism. Enforcement introduces accountability for violations against regulatory policy (United State Environmental Protection Authority [US EPA], 2012; Johnstone and Starr, 2004). The US EPA (2012) states ‘...civil and criminal enforcement is an important part of ensuring governments, companies and individuals meet their environmental obligations’.

Information flow encapsulates regulatory policy and enforcement processes and their relationship with construction operations within the environmental preservation system. Environment preservation comprises various stakeholders and information regarding their requirements and/or intended actions. These are illustrated in figure 1. Ultimately the environmental outcome for a given project will reside at the interface where all of these interests overlap. It can be seen that the environmental outcome is ultimately the product of complex information flows within this space.

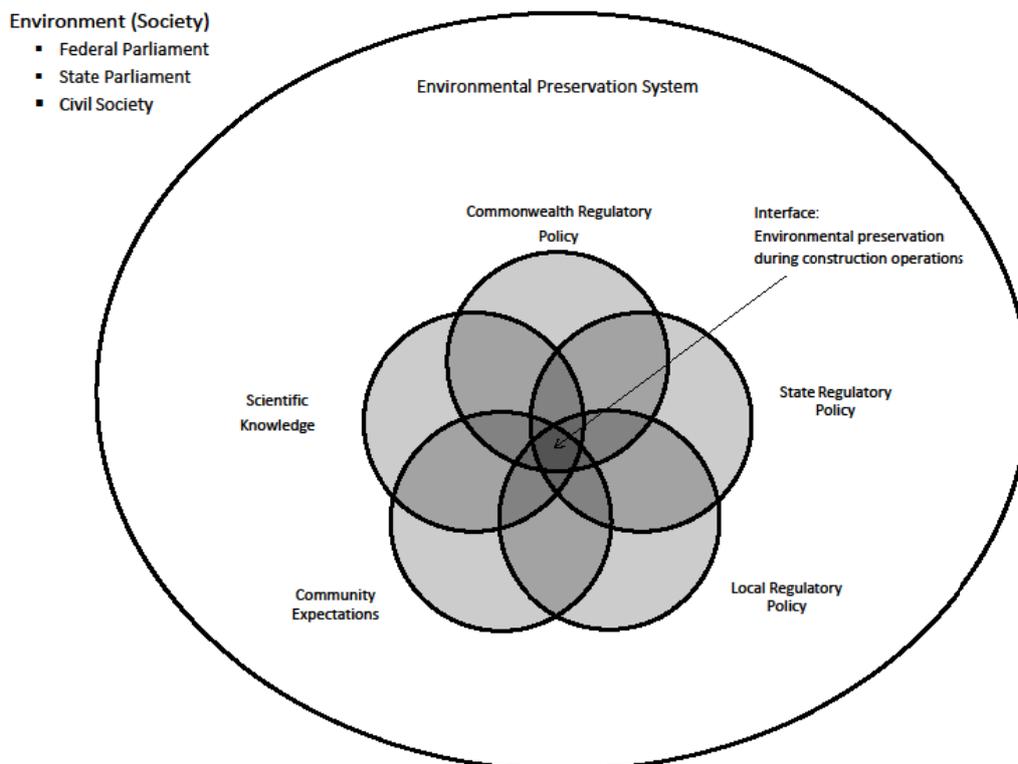


Figure 1 The environmental preservation system

With potential disconnect between regulatory policy, enforcement and information flow the research proposes to investigate these variables within the NSW context, to ascertain whether

they achieve positive on-site construction environmental preservation. Whilst the research focuses on NSW, the theoretical framework may be implemented in other States and Territories.

The information flows at the interface are the result of various subsystem interactions (refer figure 2). Effectiveness of environmental preservation during construction feeds back into the Environmental Preservation System to encourage amendments to one or more of the five domains in an attempt to improve construction operations over time.

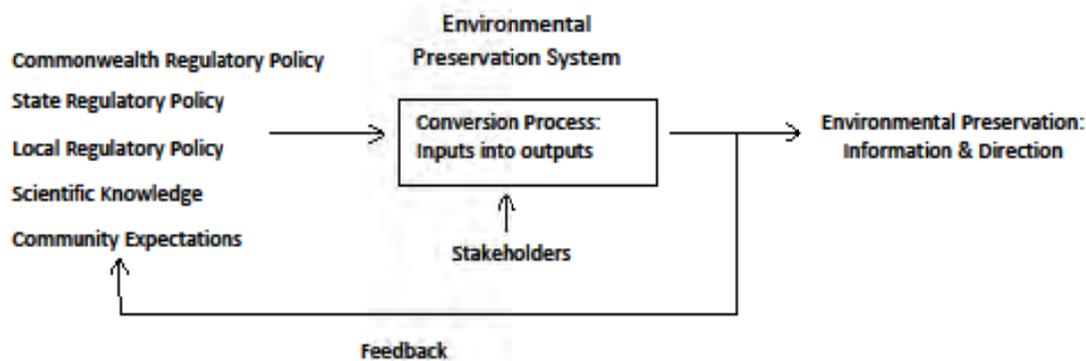


Figure 2: Interactions within the environmental preservation system

## DEVELOPMENT HIERARCHY

The research will outline a theoretical framework within which examination of on-site construction operations can be gauged against existing regulatory controls. It allows development of knowledge about information flow and external non-contractual influences on project operations and environmental consequences.

Existing construction, environmental and planning regulations may be conceptualised into four (4) distinct but inter-related domains (see figure 3). Tier 1 relates to ‘intent’ conventions of the hierarchy, and where they are first formulated. Environmental constructs convey expectations about ESD and environmental preservation. Tier 2 refers to environmental planning regulation, which establishes methods by which expectations can be realised. The final tiers concern ‘actual’ conventions associated with interpretation and implementation of policy, and the tangible project outcome. Human interpretation must be considered an independent tier as it has significant influence over outcomes of a project. The potentially subjective nature of existing regulatory policy assessment may radically alter project outcomes.

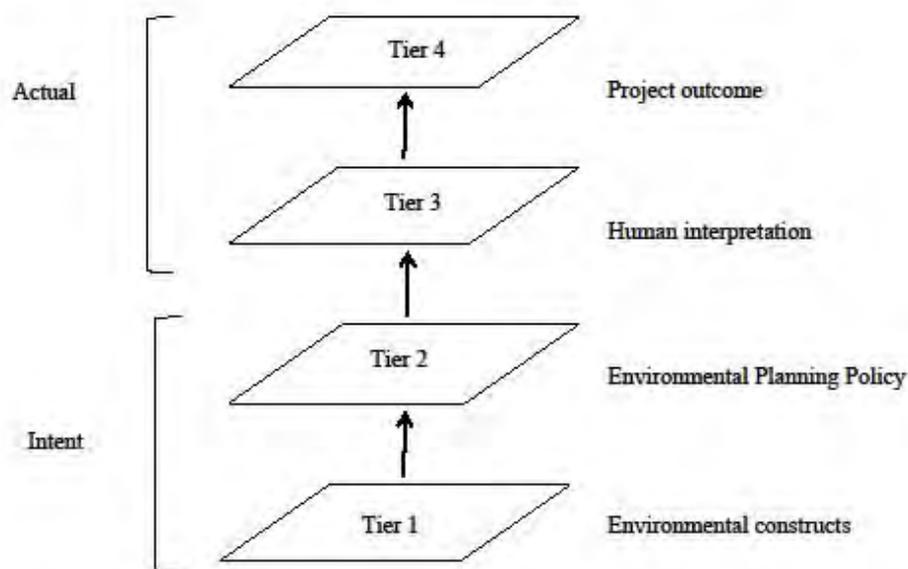


Figure 3 Conceptualisation of legislative-construction hierarchy.

## REGULATORY POLICY

Research has highlighted inefficiencies of regulatory policy. As far back as the early 1970's problems of environmental policy have been debated. Kneese (1976) discussed concerns of policy in context of the United States system and stated: 'It is inconsistent, often outdated, and grossly over dependent on direct regulation...' (p. 253) in addition '...policy also fails to recognize the tight interdependences among all resource problems, including those of environmental resources' (p. 253).

Similarly, Gunningham and Sinclair (1998) stated '...most existing approaches to regulation, are seriously sub-optimal...they are not effective in delivering their purported policy goals, or efficient, in doing so at least cost, nor do they perform well in terms of other criteria such as equity or political acceptability' (p. 1).

Within NSW efficacy of environmental planning policy has continued to be the centre of much debate. Existing regulation illustrates an extremely complex policy climate. The NSW State Government identified that a need to '...eliminate unnecessary and complicated red tape', describing it as '...a confusing web of conflicting plans and instruments' (NSW Government, Department of Planning [DoP], 2005a; 2005b). They further stated it '...remains lengthy, complex and confusing...' (DoP, 2007, p.3) and '...that the community generally feels disconnected with the planning process, deeply cynical about whether it is worthwhile to engage, and extremely frustrated about the current system' (NSW Environmental Defender's Office and Total Environment Centre, 2010, p. 3).

During 2011 the NSW Liberal Coalition was elected to govern the State. They initiated the New South Wales Planning System Review, concerning the Environmental Planning and Assessment Act (EP&A Act), 1979. The review examines existing legislative framework

governing development assessment processes. The Planning Review Panel released an initial Issues Paper in December 2011 based upon community consultation (NSW Government Department of Planning and Infrastructure [DPI], 2011). The paper found the Act was considered antiquated rendering its content irrelevant. Additionally, the Act was seen to employ ‘...overly legalistic language...’ and ‘...overly complicated processes...’ (DPI, 2011, p. 17) with such complex provisions that assessment and interpretation processes were rendered difficult and transparency associated with decision making was questionable. (DPI, 2011, p. 17).

### **New South Wales environmental planning regulatory policy**

Within NSW a hierarchy of environmental management policies and development processes have been introduced that relate to the building and construction industry (see figure 4). The State Government is mandated by Commonwealth statute to undertake State of the Environment (SoE) reporting. State level reporting is purportedly based on scientific assessment of the pressure and condition of environment and heritage: assessment of the State-wide problems in terms of target areas (NSW Government Department of Environment and Heritage [DEH], 2012). The environment is extremely vulnerable to the building and construction industry; however, inclusion of the industry into SoE reporting appears neglected. Solid waste and hazardous waste appear to be the only construction industry impacts assessed via SoE reporting (Maud and London, 2009; DEH, 2012).

The EP&A Act, 1979 is the primary instrument that regulates development activities within NSW and provides a representative example of regulatory issues that filter through to on-site practices. During assessment of a development application under Part 4, consent authorities must consider likely environmental impacts of development generally noted in the Statement of Environmental Effects (SEE). Apart from generalised statements there is no specific guidance on how to undertake this task: review impacts and mitigation measures. The process remains at the discretion of the assessor and potential social, political and economic influences.

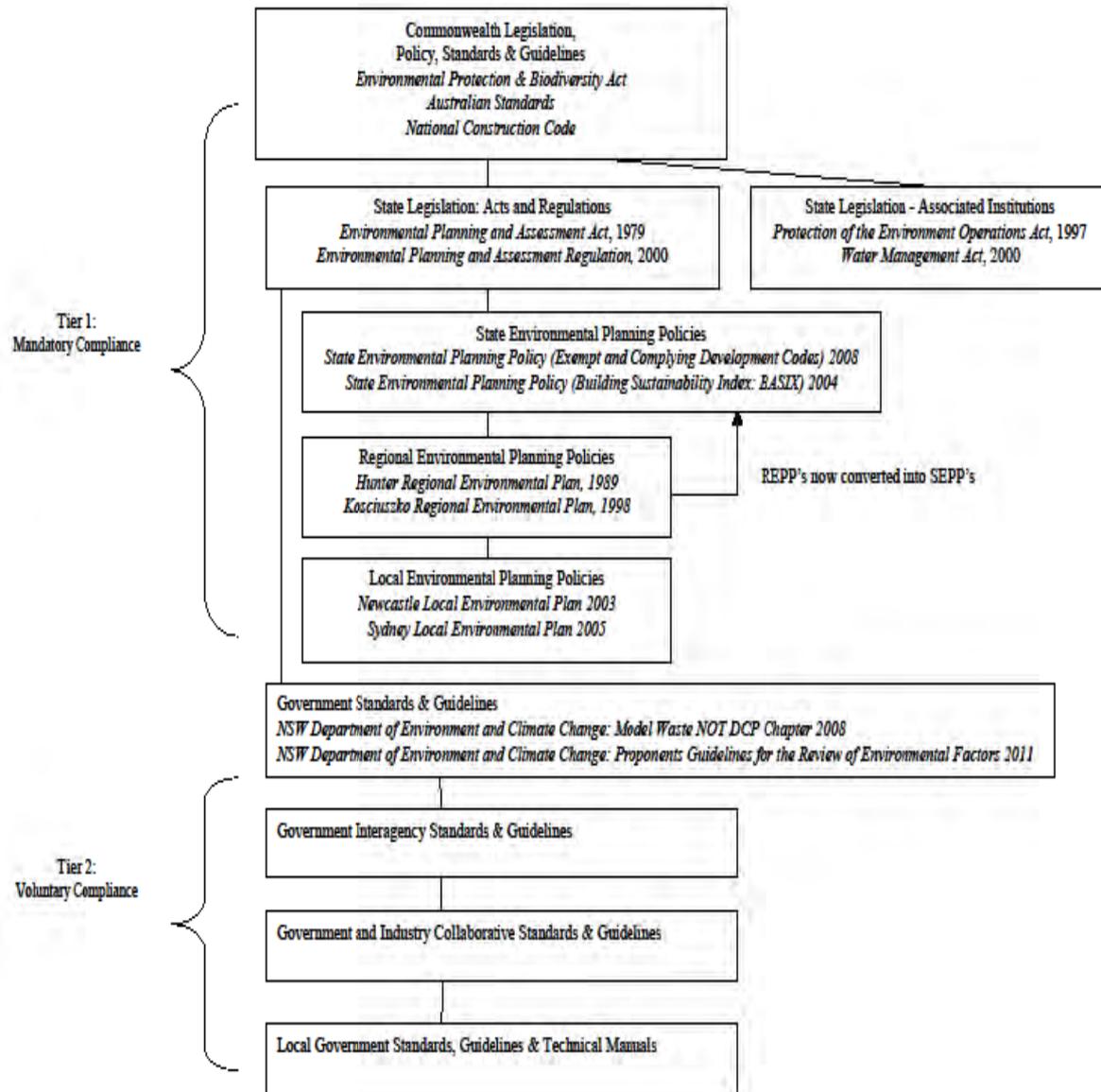


Figure 4 Illustration of New South Wales policy governing the development.

Assessment may require interagency concurrence and assessment against additional legislation. In general, these regulations neglect all on-site construction impacts. For example, the Water Management Act, 2000 retains a focus upon floodplain management, water sharing and drainage management. The Protection of the Environment Operations (Clean Air) Regulations, 2002 concerns the management of pollution from major industry. While the Contaminated Land Management Act, 1987 generally relates to the regulation of sites with existing chemical contamination.

In accordance with the Protection of the Environment Operations Act, 1997, the Environmental Protection Authority has powers to licence, audit and regulate environmental issues. Most development under Part 4 does not require such permits or auditing processes. Therefore, the SEE is not reviewed by the EPA and environmental issues on-site during the construction phase are not investigated by this agency unless brought to their attention.

The Act enables implementation of State Environmental Planning Policies (SEPPs) that dictate further objectives and controls related to development assessment and ESD principles. Currently, there are over 45 SEPPs in practice (NSW Government, 2012) that set structure for development compliance. Regional Environmental Planning Policies, now deemed SEPPs, also regulate State and some Local government agencies and increase the number of policy documents that govern development assessment. There is no SEPP that specifically regulates processes associated with on-site construction practice to require environmental preservation during construction operations (NSW Government, 2012).

### **New South Wales local environmental planning regulatory policy**

On a local level, Commonwealth and State legislation are supplemented by Local Environmental Plans (LEPs), Development Control Plans (DCPs), local government policies, guidelines and technical manuals. In accordance with the EP&A Act, each local government organisation (LGO) is required to maintain a LEP that dictates land use planning requirements with supporting technical guidelines known as DCPs. DCPs provide in-depth guide to development. There remains no specific local regulatory requirement to consider all environmental impacts from construction operations (NSW Government, 2012). Historically, there has been no restriction placed upon LGOs in terms of DCP development; hence, a plethora of DCP's evolved to constrain the industry.

The State Government attempted to address the issue through an amendment to the EP&A Act mandating that 'only one DCP per planning authority can apply to the same land' (DoP, 2005c, p.1). However, the ability to implement this change proved difficult to the development assessment process and before long an additional amendment was introduced.

The one DCP rule remained but there were different ways this could now be complied with (DoP, 2006). As stated by Maund and London (2009) 'regrettably, the focus on a single DCP for most LGAs has become an amalgamation of all previous DCP's. Therefore the new DCP may become an extremely lengthy document with a myriad of Elements avoiding the streamline approach'.

DCP content remains at the discretion of the 152 LGOs, each requiring different content. Anecdotal evidence shows that some LGOs have given consideration to areas such as sedimentation and erosion control, water and waste management. However, they are not comprehensive. For example, one water management plan requirement relates to post construction operations. A Waste Management Plan is submitted with a development application; however, it predicts waste type, amount and disposal with no detail on minimisation or monitoring measures.

### **National frameworks**

Nationally, there remains a similar trend. For example, within Tasmania, the Environmental Management and Pollution Control Act, 1994 regulates environmental practices yet there appears a dearth of control regarding on-site operations. While, in Western Australia, Planning Schemes implemented through the Planning and Development Act, 2005 show similar findings.

## International frameworks

Internationally continued detrimental environmental impacts of construction operations have been acknowledged. Anecdotal evidence suggests exemplar ESD regulatory frameworks to address all on-site construction operations remain in development phase as countries continue to modify regulation in an attempt to mitigate further environmental harm. This are would be explored within the research.

## CONCLUSION

ESD and regulatory policy should provide the framework for effective environmental protection during on-site construction practices. The complex legislative system that currently exists in NSW brings into question the ability, at an operational level, of on-site practices to achieve environmental preservation during construction operations.

It is not well understood whether current policy can exert sufficient control over on-site construction practice. Moreover it is unclear whether sufficiently effective information flow is occurring to ensure that environmental controls stipulated within consent documentation are implemented during the construction site phase. There appears to be limited guidance regarding preparation of construction planning documentation, which results in a lack of uniformity in final documentation submitted to authorities. Ultimately, the impact of external non-contractual influences during preparation of construction planning documentation is poorly understood, but paradoxically can have a disproportionately high impact upon outcomes. There is therefore a pressing need to investigate mechanisms, both human and regulatory, that influence of government intervention in environmental outcomes of construction projects. The theoretical framework presented in this paper provides an appropriate point of departure for such research where the existing regulatory framework can be investigated to determine whether the existing system can deliver ESD.

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