Maturing to Tangible IA on Small-scale Construction Projects

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Abstract

While observing aspects that indicate the maturity of the environmental profession, the efficacy of Australian and South African environmental legislative instruments can be compared based on their management of potential environmental harm, which is keenly felt at the initial stages of construction. For a construction site, it is at this culture-setting time that the environmental priorities are set. Are environmental issues on a construction site discussed and led by the project managers or does the environmental team operate as an exclusive and largely excluded entity? The benefits and dangers of these two cultures can be observed by the type of environment-minded solutions found on site while completing the defined scope.

A construction site presents an opportunity for the site team to adapt to the assessment of environmental impacts beyond the broad-scale language used in EIA reports. Impact assessment need not only be presented in an EIA Report. As an example, on-site water management can showcase the effectiveness of IA during the various stages of a development, especially on small-scale construction projects. The EIA tool can be used to avoid a watercourse. However, when a watercourse is inevitably impacted, the effectiveness of the erosion and sedimentation control plan could be verified on a regular basis as the site evolves. IA should thus evolve to a more immediate and tangible product.

Introduction

Sediment pollution costs $16 billon in environmental damage annually and is the most common pollutant affecting watercourses. The most concentrated release of sediment into watercourses is from construction impacts (Mid-America Regional Council, 2018). A hypothetical example of a small-scale road construction project in New South Wales (NSW) and South Africa would be carried through this paper. The process of upgrading a road is a construction process that has a multitude of environmental impacts across its linear spectrum, including a potential impact on watercourses. To demonstrate the construction impacts of a small-scale road project on watercourses (particularly sediment pollution); a comparison could be drawn between the legislative context of NSW and South Africa as examples.

Using the EIA Reporting tool, the road's impact on a watercourse would be assessed in its entirety. However, once construction commences, there could be any number of unforeseen circumstances that could crop up that would force a review of the assessment undertaken. The culture of the project team would thus dictate whether the management of the environmental issues would be led by the project manager with guidance and advice offered by the environmental team or whether the environmental team would work autonomously.

In an effort to decide on a methodology for the management of environmental issues on a road construction project, the impact assessment matrix system would be analysed based on the parameters of duration of impact, extent of impact, intensity of impact and probability of impact. These factors would be considered on an on-going road construction project and a tool would be suggested to manage this impact on a more immediate and tangible basis.

Environmental Legislation Evolution

The EIA process is used as an environmental legislative tool in South Africa and in Australia. The primary legislation in South Africa is the National Environmental Management Act, 1998 (Act No. 107 of 1998) ("NEMA") and in New South Wales (NSW) it is the Environmental Planning and Assessment Act, 1979 (Act No. 203 of 1979) ("EPA Act"). The requirements of both pieces of legislation are similar. Once the localised terminologies are understood, the principle of stakeholder consultation, impact identification, impact assessment and mitigation measures are common. The environmental legislation in South Africa and NSW has evolved at different rates since their respective commencement dates, based on their adaptation within their respective systems. The maturity of a profession is described by Ford & Gibbs (1996) and South Africa and NSW are different stages of the maturity of their environmental legislation, especially owing to the 19 year difference between them.

In South Africa, road projects fall under the jurisdiction of the South African National Roads Agency Limited (SANRAL), a parastatal agency. Considering the hypothetical road construction project in South Africa, the

SANRAL would need to undertake an EIA process. The EIA process would be used in the application to the National Department of Environmental Affairs for environmental authorisation. Therefore, SANRAL by itself is not a determining authority and cannot make decisions regarding their own EIA process. The NEMA requires that an independent consultant be appointed to manage this EIA process. The SANRAL cannot make these decisions by themselves, even for small-scale road projects.

In NSW, the EPA Act allows for a determining authority to be nominated, such as the Roads and Maritime Services (RMS), the operational road authority within the transport network within NSW. This means that there would be an environmental team within the RMS that undertakes the assessment and is compelled in terms of Section 5.5 of the EPA Act to "examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity". This places a responsibility and a duty of care on the entity itself as the determining authority. This further allows for each determining authority to manage its own infrastructure delivery components and not overburden the NSW Environment Protection Authority for small-scale road projects.

In comparing the two pieces of legislation on these terms, one can ascertain that ascribing a duty of care and responsibility to assess environmental impacts to a determining authority directly, seems to have progressed from the model of determining authority being the only environment department (i.e. the NSW Environment Protection Authority or the South African Department of Environmental Affairs). Therefore, the direction that the EPA Act has taken allows for a sharing of the responsibility on environmental matters throughout the governmental structure and not a consolidation of responsibility into one structure. The system works if the environmental matters are assessed by a responsible team and owes much of its success to the shared responsibility culture within the government in NSW. The system would not be successful and environmental matters would not be considered to the "fullest extent possible" if the system were subject to corruption and sub-standard acceptance of assessments.

Environmental Culture on a Construction Site

At the start of a large-scale construction project in NSW and South Africa, it has become customary for the Project Management team and the Contractor's team to meet and decide on the type of culture that will be tolerated and encouraged on site. The focus of these discussions is inevitably about communication, safety standards, the agreed methodology, contractual obligations, the project team as well as the project's environmental risks. The management of these points are all decided and agreed to within the contract between the developer and the Contractor, who would be physically constructing the road. The inclusion of environmental risks and their management are reflected within the contractual obligations of a large-scale project in South Africa such as the upgrade of the N1 Highway as well as a large-scale project in NSW, such as the installation of Smart Motorways within NSW. Therefore, these environmental risks would be continued throughout the construction process of the road.

Within smaller-scale road construction projects, the budget is typically not readily available to set an environmentally aware culture for the construction process and management of environmental risks that have the potential to be significant, as the scope may be completed in a short (less than 6 months) period of time. In an unnamed example in South Africa, the "environmental basic assessment process" required for such a small-scale project was completed and the corresponding Environmental Management Programme (EMPr) was included in the contract documentation with the Contractor. However, the obligations were not fully understood by the project management team. This resulted in many of the conditions of environmental authorisation and specifications in the EMPr not being met. During the construction of the project, the environmental risks were not understood and managed and there was no environmental representative through the construction process. This led to environmental risks being ignored at a time when environmental risks need to be managed. A decision was taken to stockpile some material with no controls next to a wetland area. The project team were unaware of the risk at the time as the designs did not have the environmental constraints overlaid. Therefore, the environmental risk profile was deemed to be low by the project management team and there was no further advice provided by anybody with an environmental background.

A storm event in March 2016 (100mm rainfall within a 48 hour period) resulted in a large quantity of stockpiled topsoil being washed into an adjacent watercourse. There were no environmental control measures to address the erosion risk of the topsoil stockpiles, as shown in Figure 1. Following the storm event, the project management team installed a sediment fence at the base of the stockpiles to ensure the incident would not be repeated. However, this solution was not effective as the sediment fence was not installed correctly and just washed away at the next rainfall event.

Figure 1: Unprotected Topsoil Stockpiles (before rain on left and during the rain on right)

Despite the incidents that recurred, these types of environmental risks were not considered effectively due to the lack of environmental expertise within the project management team. Therefore, even with smaller-scale road construction projects, the environmental risks associated with them have the potential to have a significantly high risk profile, especially at the start of the construction process. This risk could easily have occurred in NSW as it did in South Africa. The only way to avoid such an impact would be to identify a more suitable area for the location of the stockpile and setup appropriate environmental controls at the outset. Moreover, the potential to avoid this impact would be higher if there is an environmental representative that would advise the Engineer / PM accordingly.

In NSW, the RMS supports the compilation of an Erosion and Sediment Control Plan (ESCP), as a best practice solution to address the management of stormwater risk. This ESCP is then reviewed when the site changes or every two weeks. This requirement is built into the contract with the Contractor and is thus managed by the project management team. The environmental team still provides input into the review of the ESCP, which adds credibility to the management of environmental risks on site. The review function of the environmental team still considers a similar impact assessment methodology to what is undertaken during the EIA phase of the project.

Impact Assessment during Construction

A construction site by its nature is a dynamic setting. Environmental control measures may not be installed all the time while the project is being constructed. However, when there is a high risk of erosion (predicted high intensity or prolonged period of rainfall), the environmental control measures should be installed to reduce the risk of erosion of material from the construction site. If the typical impact assessment methodology used during an EIA process were to be used on a construction project (on a regular basis), the principle of the methodology should be sustained. However, decisions on a construction site need to be made with a quicker turnaround time than the preparation of an EIA Report. Therefore, the type of impact assessment methodology may be influenced by the criteria that would be affected by the construction process.

In South Africa, a typical impact assessment methodology used in an EIA Report to determine the significance rating is shown in the equation below. Each criteria used is assigned a pre-defined value from 1-5, which rates the criteria from low, low-medium, medium, medium-high and high. A significance rating is calculated based on the numerical values entered into the equation below.

$$\textit{Significance} = (\textit{Duration} + \textit{Extent} + \textit{Intensity}) \times \textit{Probability}$$

Considering the road construction example mentioned earlier in this paper, the significance rating could be calculated using the following motivation for the criteria:

- Duration: defined for the duration of construction. This criterion would not change.
- Extent: within the affected properties and neighbouring properties. This criterion may be confined to within the site or just outside of the site (in most instances).
- Intensity: this criterion is dependent on whether there are any environmental control measures installed on site to reduce the risk of sediment pollution. Pollution is to be avoided as per the EPA Act as well as the NEMA.
- Probability: this criterion is dependent on whether there is the potential for erosion from the site, e.g. high rainfall is predicted,
- Significance: This is calculated using the above equation and could range from low significance to high significance.

With the duration and extent criteria remaining constant, the significance rating would be determined by the intensity rating and the probability rating. In defining the probability for the risk of erosion to occur, there is a reliance of weather patterns and predictions, a considerably uncertain science in these times of climate change affecting weather patterns so drastically. The intensity rating is thus the only criterion where the Contractor would have some level of control over, resulting in a tangible impact assessment during construction, i.e. the installation of sufficient environmental control measures to ensure that the risk of erosion is reduced. These measures could include stabilisation measures to control erosion and sediment control measures to control the risk of sediment leaving the site as pollution. These measures could thus be easily captured within an ESCP, as used by the RMS in NSW.

Conclusion

The comparison of the legislative philosophy within NSW and South Africa indicates how a maturing legislation allows for the sharing of responsibility within various institutions and where a centralised power within the environment department (i.e. the National Department of Environmental Affairs in South Africa) may be inspired to evolve toward.

Once a construction project commences, the environmental representative would add value to the construction process (in South Africa or in NSW) not just at the start but on a continuous basis as the site evolves. In South Africa, this role is sometimes expected of the auditor, which does not fulfil the expected intention of what would be required for the project management team. This was highlighted on how stormwater was managed on the hypothetical road construction project.

The paper concludes by offering further support of the best practice method of using an Erosion and Sediment Control Plan on a regular basis on a construction project as a means of undertaking an impact assessment methodology that is used within an EIA Report, but is tangible and prompt.

References

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