

# **ENVIRONMENTAL IMPACT ASSESSMENT (EIA) DURING PROJECT EXECUTION PHASES: DEVELOPMENT OF A STAGE-GATE PROJECT MANAGEMENT MODEL FOR THE PROCESS INDUSTRY**

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## **ABSTRACT**

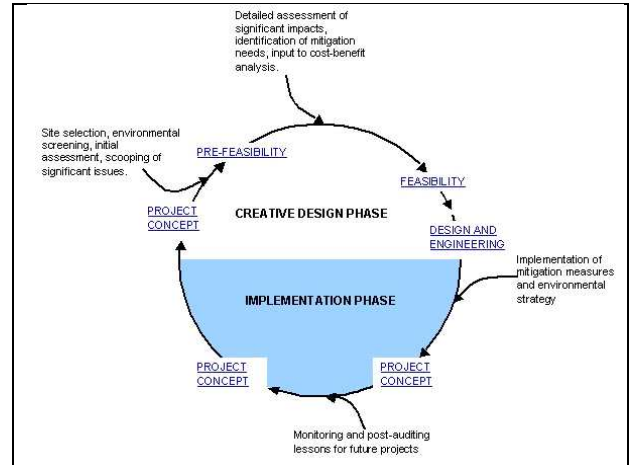
**Companies in the process industry manage numerous projects, which differ in size, capital expenditure and environmental aspects. Although environmental impact assessments (EIAs) are required for all these projects, the EIAs consequently range in comprehensiveness from screening to full EIAs. Due to market demands the projects are typically on extremely tight schedules. Project managers therefore need to ensure the proper alignment of project lifecycles with various other processes, of which the EIA process is one. The South African EIA legislation fails to take project life cycles or gate reviews into considerations. A literature review was conducted in order to compare the South African EIA process with various international approaches, as well as to determine the various project lifecycles that are applicable to the process industry. Based on the literature review findings a questionnaire was compiled and distributed to various stakeholders that participate in EIAs, i.e. EIA consultants and environmental specialists. The survey established the specific model that is usually followed when conducting an EIA in South Africa, and focused on the specific stages of an EIA in relation to the project execution lifecycle phases. The survey ascertained problems that currently exist with the EIA procedure in the process industry, which relate to the poor alignment of the EIA process with the project lifecycle. These problems negatively affect the efficiency of project management practices in South Africa (and elsewhere). Possible solutions to these identified problems are discussed and a stage-gate model is subsequently proposed, whereby the proper alignment of the EIA process followed in South Africa and the project lifecycle is ensured.**

## **INTRODUCTION**

Companies in the process industry manage numerous projects annually, which differ in size, capital expenditure and environmental aspects. Although environmental impact assessment (EIA) authorisation is legally required for most of these projects, the EIA process ranges in comprehensiveness from screening or exemption type projects to full EIAs. Due to market demands projects are typically on extremely tight schedules. During the lifecycle phases of these projects, the projects managers therefore need to ensure proper alignment with various other processes, of which the EIA process is only one. According to Tarr (2003:7) the EIA and the project lifecycle should be interfaced as described in Table 1. The United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) (2003) developed a model to explain how the EIA should be integrated into project lifecycle and project management practices. This model is illustrated in Figure 1.

**Table 1: Interfacing EIA and the project life cycles according to Tarr (2003:7)**

Project life cycle	EIA life cycle
Pre-feasibility	Screening
Site selection	Scoping
Feasibility	Impact assessment
Feasibility Report	EIA report
Board decision	Authority approval
Detailed design	EMP
Construction	Audit
Operation	Monitor & audit
Closure	EIA for closure



**Figure 1: Interfacing EIA and the project life cycles according to ESCAP (2003)**

These two interfaces have certain areas of similarity, but also differ to some extent. The following research questions were subsequently asked:

- Which of the above interfaces are the most appropriate one for the South African process industry, if any?
- What is the most appropriate way to align the detailed steps of the proposed new South African EIA process with project lifecycles?
- What model can be developed to ensure that specific requirements are met for each specific gate in the project lifecycle?

The research summarised in this paper aimed to address these questions.

## RESEARCH APPROACH

A literature review was conducted in order to compare the current and new South African EIA processes with various international approaches. The various project lifecycles and stage gates that are applicable to the process industry were also determined by means of a literature review.

Based on the literature review findings, a questionnaire was compiled and distributed to some role players in EIAs, i.e. project EIA consultants and environmental specialists. The survey established the specific model that is usually followed when conducting an EIA in South Africa, and focussed on the specific stages of an EIA in relation to the project execution lifecycle phases. Refer to Appendix A for the questionnaire distributed.

The survey results were evaluated to identify problems that currently exist with the EIA approach as part of the project execution phases in the process industry. Furthermore, the results from the survey provide possible solutions to the identified problem areas.

The results of the research were used to evaluate the two proposed interfaces (see Table 1 and Figure 1) and to propose a stage-gate model, whereby the proper alignment of the detailed EIA process, i.e. the draft new legislation for the South African EIA process, and the project lifecycle is ensured. Specific prerequisites in order to complete the EIA activities during the aligned project lifecycle phases in time before an associated project decision-making gate can be passed are also addressed by the model.

## LITERATURE REVIEW

### South African EIA process compared to EIAs in other countries

#### *Existing EIA process followed in South Africa – with definitions for each of the elements*

The application procedure or EIA process that must be followed in order to obtain authorisation to commence with a listed activity, as described in the current EIA legislations (DEAT, 1998:18), can be divided into three phases that follow on each other:

- Phase 1: Screening/Application for Authorisation/Plan of study for scoping.
- Phase 2: Scoping.
- Phase 3: Environmental Impact Assessment.

Review by various role players take place throughout all off the three phases and the EIA process is concluded by a final decision of the lead authority for the proposed project.

The relevant authorities should provide a Record of Decision (ROD) to the applicant of a proposed project, whether or not the proposal is approved. An explanation of how environmental considerations were taken into account and weighed against other considerations must be documented in the ROD. The ROD must reflect any conditions of approval and should be made available on request to any I&APs (DEAT, 1992:8). According to the DEAT (1998:30) the relevant authority will decide to issue a ROD, which gives either an authorisation with or without conditions, or reject the application.

#### *Proposed new EIA process to be followed in South Africa (draft legislation)*

The proposed new EIA process will still have the three phases as described above. Similar review and decision-making will also apply with the new process. However, according to the draft update EIA legislation (2005) some specifics of the proposed EIA process will, amongst others, differ from the existing EIA process as follows:

- The proposed new EIA process will provide an updated list of activities and also a list of areas for which EIA would be required.
- Projects will be screened under different categories and depending on the category, different EIA processes will be followed.
- Small or low impact projects will only undergo a “screening” process where an Initial Assessment Report would have to be submitted for review. A decision on whether the proposed project can be implemented or not will be based on the Initial Assessment Report.
- Large or high impact projects need to go through the normal scoping process as well as the assessment phase of the EIA. No project will be approved after the scoping phase of the EIA anymore.

#### *Other EIA processes*

The following EIA processes were further assessed:

- EIA process required by the World Bank (World Bank, 2004);
- Global best practices on the EIA process proposed by the IAIA (IAIA, 1999);
- EIA processes required in other Southern African Countries, i.e. Namibia and Mozambique (Tarr, 2003:157 & 134); and
- EIA procedures in European countries in general (European Communities, 2001).

It was found from the study that the same principles apply for all of the above-mentioned EIA processes. There are, however, some differences in terms of specific details under each of the screening, scoping and assessment phases that each of them follows. The detail of public participation in the EIA process also differs and reports and legal documents are typically named differently.

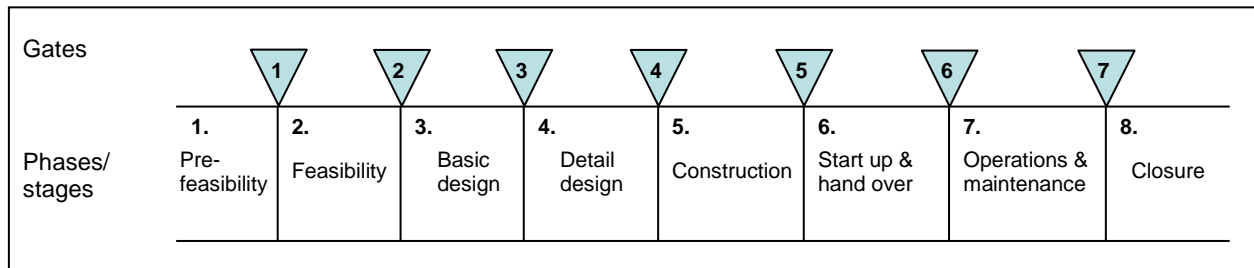
Compared to these evaluated EIA processes, South Africa’s proposed new EIA process follows the same principles and is very well structured and comprehensive.

## Project Lifecycles and Stage Gates

Every development project has certain management phases, known as lifecycle phases. The breakdown and terminology of these phases differ. For example, according to Kerzner (2001:76): “there is no agreement among industries, or even companies within the same industry, about the life-cycle phases of a project. This is understandable because of the complex nature and diversity of projects”. Buttrick (2000:50) defines phases or stages in a project as “specific periods during which work on the project takes place. These are when information is collected and outputs created”. Buttrick (2000:50) further states that for each stage in a project, the project manager should ensure that the full range of work is carried out and that this covers the entire scope of the various functional inputs required. These functions may include, amongst others, marketing, commercialisation, operational issues, technical aspects, environmental consideration, which includes the EIA process, etc. According to Buttrick (2000:50): “these functions should not work on the project in isolation but in a continuous dialogue with each other, thus enabling the best overall solution to be developed”. Furthermore: “gates are the decision points which precede every stage. Unless specific criteria have been met, as evidence by certain approved deliverables, the subsequent stage should not be started” (Buttrick, 2000:50).

### *Proposed project lifecycle phases or stages*

Seventeen different references were found during the literature review, which suggest various project lifecycle phases or stages, e.g. Kerzner (2001:77), Steyn (2003:23, 25), Tarr (2003:7), Buttrick (2000: 59) and Labuschagne & Brent (2005). These suggested lifecycle phases or stages were evaluated to propose a specific model for project management whereby the EIA process could be aligned. The proposed phases or stages for a project with gates are indicated in Figure 2 and an explanation of each phase is presented in Table 2 (Steyn, 2003:23-28).



**Figure 2: Proposed project lifecycle with gates for the process industry**

**Table 2: Short explanation of each phase or stage in the project lifecycle**

Phase or stage in the project	Definition of project lifecycle phase
Pre-feasibility	Clarify the need for the project. The need may arise from a business opportunity such as a new product that could be launched. The need should be well defined.
Feasibility	At this stage the need for the project, the profitability as well as alternatives are investigated.
Basic design*	Concept design that will form the basis for a detailed design
Detail design	A proposed solution to the problem or a proposed plan to exploit the opportunity is developed and refined during this phase. The owner accepts the plan.
Construction	Includes all construction activities.
Start-up and hand-over	Where applicable the constructed facility/plant is commissioned. Test work is conducted to ensure facility/plant can be operated and handed over to operational team. The project team hands over the operational team.
Operations and maintenance	Operational team operates the new facility/plant and ensure proper maintenance.
Closure	Decommissioning of the facility/plant.

\* The basic design phase may in some instances start during the feasibility phase already.

## QUESTIONNAIRES AND SURVEY

Based on the findings of the literature review a questionnaire was compiled and distributed to approximately 300 specific role players in EIAs, EIA consultants and environmental specialists as part of the EIA process. The survey addressed three areas:

- To confirm that consultants do follow the legal EIA process for South African projects;
- To confirm the proposed project lifecycles phases or stages; and
- To identify the specific stages of an EIA, conducted in South Africa, in relation to the project execution phases or stages.

The participants completed 40 questionnaires in total. At least 70 questionnaires should be evaluated to make it statistically acceptable. However, if more than 30 questionnaires are evaluated, a 95% confidence interval can be applied, which is the case for this paper (Johnson, 1994: 282). A 95% confidence interval was therefore applied to the results and findings of the conducted survey.

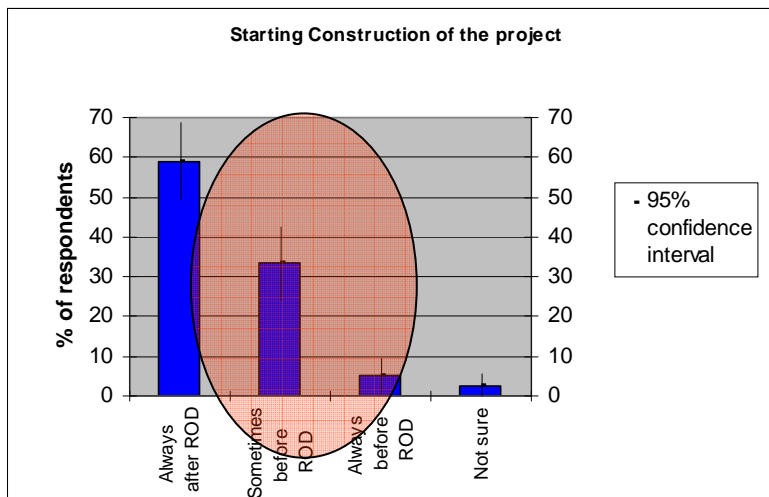
### Results and findings: EIA process in South Africa

#### *Frequency of EIA practice*

From the total number of survey respondents, 52% conduct between one and ten EIAs per annum, 32% between ten and fifty, 8% between fifty and one hundred, and 8% more than one hundred EIAs per year. This means that the minimum number of EIAs that are conducted by the 40 participants total to 601 per annum.

#### *Compliance with legal process:*

The results indicate that the South African legislated process is generally followed, but that some consultants also adopt certain elements from other countries' processes. One critical finding relates to when the projects are actually implemented. The legislation requires that the construction activities may only commence once a positive approval was obtained from the ROD. Figure 3 highlights an area of concern in this regard in that projects often commence before the applicable authority has provided a positive ROD. It was indicated that the reason for this might be that the projects are not always properly aligned with the project phases and that the EIAs consequently start at too late a stage.

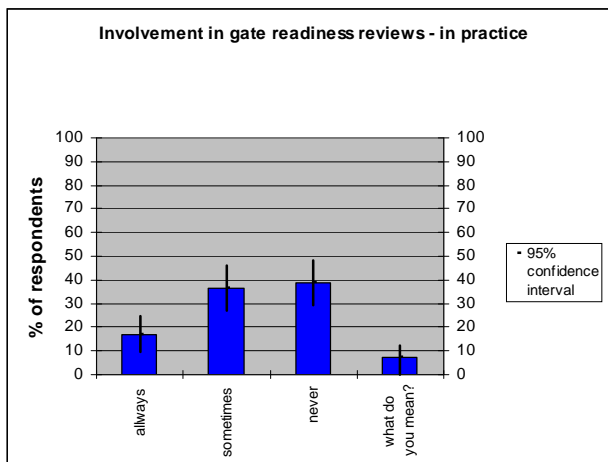


**Figure 3: Commencement of projects in relation to the provision of a positive ROD**

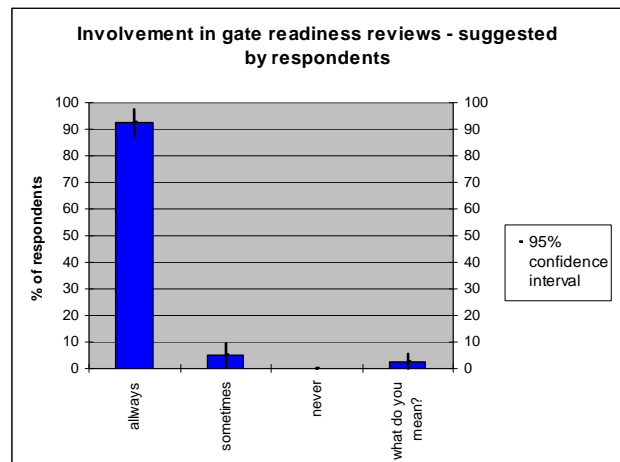
## Results and findings: Project lifecycles

The second part of the survey tested whether participants are well versed with the project lifecycle phases and whether the proposed project lifecycle phases or stages (see above) are a true reflection of project management practices in the South African process industry.

From the survey it was found that most of the respondents (approximately 90%) are aware of the fact that projects have different lifecycles or stages and that project managers apply gate reviews in order to ensure that all the tasks are completed before a next stage can kick off. Approximately 65% of the respondents are familiar with project management practices. Almost all the respondents (95%) who have knowledge of project lifecycles and stage gates agreed to the proposed project lifecycles phases or stages. It was also established whether respondents are involved in the gate readiness review meetings to ensure EIA requirements have been met and to assist the project manager to confirm whether all activities have been completed. Figures 4 and 5 indicate how often the respondents are actually involved in this process in relation to what they think should occur.



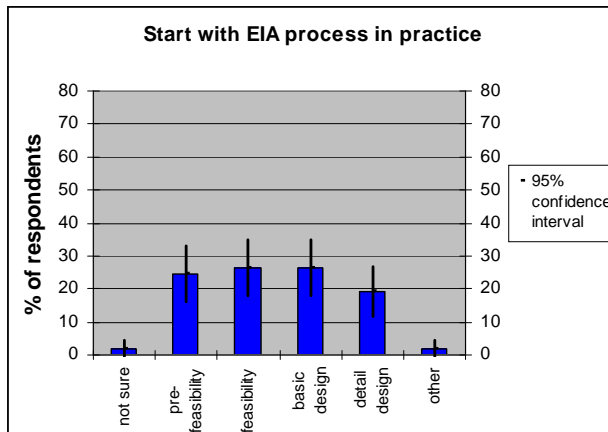
**Figure 4: Involvement of respondents in gate readiness review meetings – in practice**



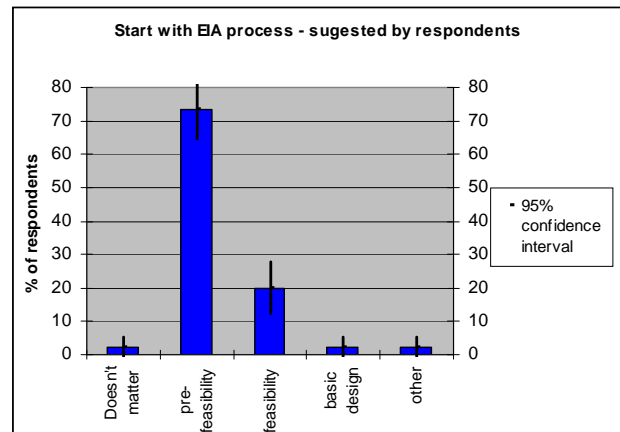
**Figure 5: Involvement in gate readiness review meetings as suggested by respondents**

## Results and findings: EIA as part of project lifecycles

A number of questions relating to EIAs as part of the project lifecycles were asked. Figure 6 indicates that in practice EIAs may commence in any of the project lifecycle phases, from pre-feasibility to detailed design. This is clearly a point of concern from the respondents' perspective as Figure 7 indicates that the general feeling amongst respondents is that the EIA should kick off during the pre-feasibility phase.



**Figure 6: Kick-off the EIA process in practice**



**Figure 7: Kick-off the EIA process as suggested by respondents**

In the experience of almost 80% of respondents the EIA process plays an extremely important part of the project schedule, to the extent that the applicant's project schedule is driven by the EIA. These results show that it is crucial to ensure alignment between the EIA process and the project lifecycles, and to ensure that EIA activities do receive due consideration during the stage gate reviews. Table 3 summarises the results from the survey relating to the abovementioned research questions.

In terms of the consideration of alternatives, less than 25% respondents indicated that they are always or most of the times consulted in the consideration of alternatives at the early stages of a project's lifecycle. More than 20% indicated that they are never involved in this process whereas more than 50% indicated that they are only sometimes involved. Almost all the respondents (more than 90%) indicated that this should, in fact, occur.

More than 90% of the respondents indicated that they "always" or "most of the times" do public participation as part of the EIA process. However, when exactly to start involving interested and effected parties and how to align the public participation process with the project life cycle phases seems to be of concern as respondents indicated that they start with the public participation process anytime from pre-feasibility to the detail design phase.

**Table 3: Summary of the survey results relating to the research questions**

EIA activity	% of respondents					
	Pre-feasibility	Feasibility	Basic design	Detail design	Construction	Not sure
Conduct Screening in practice	38	23	21	13	0	2
Start with public participation in practice	19	29	31	19	0	0
Conduct Scoping in practice	11	30	43	11	2	2
Identify aspects and impact for the first time in practice	21	30	30	14	2	0
When identification of aspects and impact should happen for the first time	49	27	10	10	2	2
Enough information available to conduct specialist studies	2	21	34	34	-	9
Obtain ROD	0	16	18	40	13	4
Enough information available to compile detail EMP	0	7	22	66	-	5

## PROPOSED MODEL

Based on the findings of the literature review and the survey, a model is proposed to align the new South African EIA process with the project lifecycles and to provide EIA stage-gate criteria. The model is summarised in Table 4 (see also Figure 1 and Table 2).

**Table 4: Proposed model to align the EIA process with project lifecycles**

Project lifecycle phase	Stage Gate	EIA activities and deliverables
Pre-feasibility		Pre-application Screening Stage 1 to include: <ul style="list-style-type: none"> <li>• Obtain relevant information regarding the proposed project.               <ul style="list-style-type: none"> <li>- Description of activity</li> <li>- Need and desirability</li> <li>- Site assessment</li> <li>- Consider alternatives from an environmental perspective</li> <li>- Preliminary identification of aspects and potential impacts on the environment</li> </ul> </li> </ul>

Project lifecycle phase	Stage Gate	EIA activities and deliverables	
		<ul style="list-style-type: none"> <li>Screen the project in terms of whether an EIA is required or not. <ul style="list-style-type: none"> <li>Listed activity</li> <li>Listed area</li> <li>Impact on the environment</li> </ul> </li> </ul>	
	<b>1</b>	<b>Screening decision: Required to conduct an EIA or not (in other words, whether an application for authorisation need to be submitted or not)</b> (Applicable to projects that require an EIA) Pre-application Screening Stage 2 to include: <ul style="list-style-type: none"> <li>Identify aspects and potential impacts on the environment. <ul style="list-style-type: none"> <li>Determine at this stage which aspects may be applicable</li> <li>Preliminary significance rating to determine whether aspects and potential impacts need to be assessed by specialists</li> <li>Identify responsible persons to assess potential impacts</li> <li>Start specialist BASELINE studies</li> </ul> </li> <li>Identify list of stakeholders/interested and affected parties (I&amp;APs) to involve during the public participation process</li> <li>Screen the project in terms of project category to determine which process need to be followed:</li> </ul>	
Feasibility		<b>Small/low impact projects</b>  <b>Extended Screening process (initial assessment)</b> <ul style="list-style-type: none"> <li>Application for Authorisation</li> <li>Determine feasible alternative</li> </ul>	<b>Large/high impact projects</b>  <b>Full EIA process</b> <ul style="list-style-type: none"> <li>Application for Authorisation</li> <li>Plan of study for EIA</li> <li>Determine feasible alternative (can start with the scoping process and public participation process at this stage)</li> </ul>
	<b>2</b>	<ul style="list-style-type: none"> <li><b>Register with potentially applicable aspects and impacts with responsibilities</b></li> <li><b>Screening decision</b></li> <li><b>Proof of application for authorisation submitted</b></li> <li><b>Plan of study for EIA report and approval from the lead authority (for big/high impact projects)</b></li> <li><b>Environmentally feasible alternatives report</b></li> <li><b>List of I&amp;APs to involve during public participation</b></li> </ul>	
Basic design		<b>Extended Screening process (initial assessment)</b> <ul style="list-style-type: none"> <li>Initial assessment</li> <li>Conduct public participation</li> <li>Prepare preliminary environmental management plan (EMP)</li> </ul>	<b>Full EIA process</b> <ul style="list-style-type: none"> <li>Scoping process</li> <li>Conduct public participation</li> <li>Conduct impact assessment (specialist studies)</li> <li>Prepare preliminary environmental management plan (EMP)</li> </ul>
	<b>3</b>	<b>Extended Screening process (initial assessment)</b> <ul style="list-style-type: none"> <li>Initial assessment report</li> <li>Preliminary EMP</li> <li>ROD</li> </ul>	<b>Full EIA process</b> <ul style="list-style-type: none"> <li>Scoping Report</li> <li>Decision on Scoping Report from relevant authority</li> <li>Specialist studies</li> <li>Environmental impact report (EIR)</li> <li>Prepare (EMP)</li> <li>ROD</li> </ul>
Detail design		<b>Extended Screening process (initial assessment) and full EIA process</b> <ul style="list-style-type: none"> <li>Continue public participation</li> <li>Prepare updated (detailed) EMP to be included into the contractor's contract</li> </ul>	



Project lifecycle phase	Stage Gate	EIA activities and deliverables
		and be used to develop EMS.
	<b>4</b>	<b>Detail EMP</b>
Construction		Conduct audits against the EMP.
	<b>5</b>	<b>Audit reports</b>
Start-up and hand-over		Conduct audits against the EMP.
	<b>6</b>	<b>Audit reports</b>
Operations and maintenance		Conduct audits against the EMP.
	<b>7</b>	<b>Audit reports</b>
Closure		Conduct audits against the EMP.

## CONCLUSION

Neither the existing EIA regulations (under the Environment Conservation Act) nor the proposed new (draft) regulations under the National Environmental Management Act take project life cycles or project gate reviews into consideration.

The literature study and the survey indicated that problems exist in the execution of an EIA relevant to the project execution lifecycle phases. The two interfaces discussed in the introduction of this paper provide relatively good guidance in terms of aligning the EIA process with the project lifecycle phases. However, an improved model is proposed to ensure the effective alignment of the EIA process with project management practices, based on the experiences of EIA practitioners in the process industry. The specific deliverables required to pass each gate in the project lifecycle are also provided.

The Department of Environmental Affairs and Forestry should therefore consider to include a model to consider project life cycles and project gate reviews as part of the new EIA legislation to be implemented soon.

Interviews will further be held with a selected panel from the targeted stakeholders in order to verify the results of the survey, and case studies in the process industry will be introduced at a later stage, through which the proposed model will be evaluated and potentially refined.

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### Appendix A – Questionnaire distributed (questions only)

a1	How many EIAs does your company do per year? (application for authorizations logged)
a2	How many of these are conducted on projects in South Africa only?
a3	Indicate which of the following are (or may be), amongst others, relevant activities to the EIAs that you are involved in.  (It can be more than one)
a4	For projects that require EIA approval, how often do you (or the applicant) submit an Application for Authorisation form to the relevant Environmental Department (Authority)?
a5	How many of the EIAs that you conduct are exemption type projects?
a6	How often do you have to do the full EIA process – up to the stage where specialist studies need to be conducted and an Environmental Impact Report (EIR) be submitted?
a7	Do you ever combine the scoping and assessment phases of the EIA?
a8	Do you do public participation as part of your EIA process?
a9	During which stage do the applicant usually implemented (start with construction activities) your EIA related projects?

b1	Are you aware of the fact that projects have different life cycles (stages) and that project managers apply gate reviews in order to ensure that all tasks are completed before a next stage can kick off?								
b2	<p>If your answer was “yes” in b1 – would you agree that the following are representative project life cycles (stages)?</p> <table border="0"> <tr> <td>1. Pre-feasibility</td> <td>5. Construction</td> </tr> <tr> <td>2. Feasibility</td> <td>6. Start-up and hand-over</td> </tr> <tr> <td>3. Basic design</td> <td>7. Operations and maintenance</td> </tr> <tr> <td>4. Detail design</td> <td>8. Closure</td> </tr> </table> <p>(Please provide any comments relating to “b2” in the open space below – if you have any?)  <u>Comments relating to “b2”:</u></p>	1. Pre-feasibility	5. Construction	2. Feasibility	6. Start-up and hand-over	3. Basic design	7. Operations and maintenance	4. Detail design	8. Closure
1. Pre-feasibility	5. Construction								
2. Feasibility	6. Start-up and hand-over								
3. Basic design	7. Operations and maintenance								
4. Detail design	8. Closure								
b3	How often are you involved/invited to project “gate readiness review meetings”?								
b4	Would you say a project manager should ensure that EIA activities are considered during stage gate reviews?								

c1	<p><u>Consultants</u>  When do you usually start with the EIA process in terms of the project stages (when do the applicants usually appoint you to kick off EIA activities)?</p> <p>Or</p> <p><u>Applicants</u>  When do you usually appoint an independent environmental consultant?</p>
c2	<p><u>Consultants</u>  When do you think or when would you like to become involved (start with the EIA)?</p> <p>Or</p> <p><u>Applicants</u>  When do you think an independent environmental consultant should be appointed?</p>
c3	When do you usually consult/meet with the lead authorities for the first time?
c4	Do you usually have enough time to conduct the EIA process?
c5	How often is the applicants’ project schedule driven by the EIA process?
c6	When do you do your EIA screening?
c7	When do you usually start with the public participation process?
c8	<p><u>Consultants</u>  How often are you <b>consulted</b> on the project alternatives from an environmental perspective? (meaning that you actually take part in the consideration of alternatives at the early stages of the projects life and you are not only informed about it later on)</p> <p>Or</p> <p><u>Applicants</u>  How often do you consult the independent environmental consultant regarding project alternatives at the pre-feasibility/feasibility phase of a project?</p>
c9	Do you think it is important from an EIA perspective that environmental consultants assist in the consideration of alternatives for a specific project?
c10	When do you conduct the scoping phase of the EIA?
c11	When do you usually identify environmental aspects and potential impacts (issues of concern) for the first time in a project life?
c12	When would you like to start identifying environmental aspects and potential impacts?
c13	When is enough information available from the project team to conduct the specialist environmental assessment(s)?

c14	When do you usually compile an Environmental Management Plan (EMP)?
c15	When do you usually get the ROD from the relevant Environmental Department (Authority)?
c16	When is enough information available from the project team to compile a detailed enough EMP to be used by contractors during construction and to be implemented in an environmental management system?
c17	<p><u>Consultants</u>  How often do you stay involved in the project after the ROD has been issued?</p> <p><u>Applicants</u>  How often do you appoint the independent environmental consultant to stay involved after the ROD has been issued?</p>