



SPE 127119

The Environmental Roadmap: A Management Tool to Address Critical Project Environmental Management Issues

Eugene Kolesnikov, Erik Huber, Thorsten Geyer, Royal Haskoning; Susan Ford, SPE, BP; Victor Putov, Rosneft

Copyright 2010, Society of Petroleum Engineers

This paper was prepared for presentation at the SPE International Conference on Health, Safety and Environment in Oil and Gas Exploration and Production held in Rio de Janeiro, Brazil, 12–14 April 2010.

This paper was selected for presentation by an SPE program committee following review of information contained in an abstract submitted by the author(s). Contents of the paper have not been reviewed by the Society of Petroleum Engineers and are subject to correction by the author(s). The material does not necessarily reflect any position of the Society of Petroleum Engineers, its officers, or members. Electronic reproduction, distribution, or storage of any part of this paper without the written consent of the Society of Petroleum Engineers is prohibited. Permission to reproduce in print is restricted to an abstract of not more than 300 words; illustrations may not be copied. The abstract must contain conspicuous acknowledgment of SPE copyright.

Abstract

Many decisions of critical importance to project success are taken at an early project stage. These decisions are increasingly expensive to reverse as the project matures. Identifying critical environmental management issues and incorporating them into the strategic decision making process at this stage can greatly benefit projects executed in a particularly sensitive natural, social, regulatory and political environment. Early Environmental and Social Impact Assessment (ESIA) may be undertaken to provide input into this process. However, ESIA requires substantial input data that may not be available at this stage. Alternatively, a simple identification of key environmental and social issues may be conducted using available information. Although beneficial, these traditional methodologies cannot address the full range of critical environmental management issues. The Environmental Roadmap methodology and tool has been developed to overcome these limitations.

The Environmental Roadmap combines critical issue identification, decision support analysis, and integrated project planning into a single decision support package for the project management team. The criticality of an environmental management issue is determined by its potential to drive project development decisions. Decision support analysis includes, *inter alia*, evaluation of main project options in terms of environmental and social sensitivities, effects on schedule and cost, and impact on stakeholder relationships. Integrated project planning is conducted to map key environmental management activities and deliverables as a single interrelated process flow that includes management of regulatory approvals, lender interface, public consultation and stakeholder engagement, engineering and project execution interface, environmental risk management, and review and assurance processes.

The Environmental Roadmap methodology and tool has been successfully applied during an early stage of an oil development project offshore Sakhalin Island, Russia.

Introduction

Early in project implementation the project management team has to make important decisions regarding project development options, technology options, project organization, contracting strategy, principal project schedule, regulatory approvals and stakeholder engagement strategies, project financing alternatives and a number of other strategic issues. This strategic decision making process should address and integrate numerous challenges related to the project's natural and social environment as early as possible during project implementation to prevent costly mistakes and omissions. Two HSE methodologies and tools are typically used to inform such strategic decision making process: Environmental and Social Impact Assessment (ESIA) and simple environmental and social issue identification.

These methodologies provide valuable information to the project team but they have some significant limitations. ESIA does not address the full range of environmental management issues. Such issues as project organizational structure, contracting strategy, regulatory approval strategy, and integrated environmental management process planning are normally outside the ESIA scope. In addition ESIA requires substantial input data that may not be available at an early project stage. Issue identification is more flexible and may cover a broad range of issues. However, it provides only initial information that has to be integrated into the project decision making process to achieve its full value. As a result the project team may still face difficulties in evaluating environmental and social and management aspects of the project and the team could risk making costly mistakes or omissions.

The authors recognized these limitations and developed and implemented a new methodology, the Environmental Roadmap, in an early phase of a challenging offshore oil development project. This methodology and tool combines assessment of critical environmental and social management issues and integrated project planning into a single decision support package for the project management team to overcome the limitations of traditional methodologies.

Description and Application of Processes

The Environmental Roadmap is a study that is carried out in four stages. These stages are described further in the section and are graphically presented in Figure 1.

Figure 1: Environmental Roadmap methodology overview

Data gathering	Analysis	Integration	Reporting
Understand project & its development premises Identify key issues	Screen for critical environmental management issues Analyze critical issues Establish environmental scope & regulatory approvals cope Assess scope impact on project schedule Analyze project environmental management organization Analyze project development options	Develop management recommendations for critical issues For each development option: - Assess impact of critical issues - Evaluate schedule, cost and manageability requirements Optimize, integrate, and map principal environmental management processes using flow-charts Review findings & recommendations with project management team	Produce Project Environmental Roadmap Report
<input type="checkbox"/> Long list of issues	<input type="checkbox"/> List of critical issues Initial analysis of issues & principal environmental management processes	<input type="checkbox"/> Agreed recommendations & decision options <input type="checkbox"/> Project environmental management process flow-charts	<input type="checkbox"/> Background information <input type="checkbox"/> Decision support information <input type="checkbox"/> Process planning flow-charts
Internal document Style and level of detail tailored to the project management audience Study team with sufficient expertise in hands-on management of HSE in oil & gas projects Close involvement of project management team			

Stage One - Data gathering

During this stage the study team carries out two main activities. Firstly it undertakes to understand the project and its development premises, including project objectives, boundaries, potential development alternatives, timeline, and parties involved. This understanding helps scope the second main activity – identification of key issues, including environmental and social issues and sensitivities, key stakeholders, company environmental and social standards, technology involved, regulatory regime, and lessons learned from other projects. Data is gathered using available project documentation, open sources and interviews with key project staff. Since the study is undertaken at an early project stage, availability of documented information may be limited; therefore interviews of key project staff are of particular importance. In general, the work carried out at this stage is similar to the work performed in traditional issue identification studies. The main output of the data gathering stage is a long list of issues related to project environmental and social management.

Stage Two - Analysis

During this stage critical project environmental management issues and a number of principal project environmental management processes are identified and assessed.

Critical project environmental management issues

A long list of issues generated during the data gathering stage is analyzed to identify critical project environmental management issues. These are the issues that have the potential to drive project development decisions or that are otherwise

critical to project success and therefore require particular management attention. In other words, project management perspective defines the criticality of an issue. An issue, regardless of its magnitude, may be evaluated as inconsequential for consideration of development options or as having little or no impact on the project success. In such a case the issue is excluded from further analysis. This screening process results in a short list of critical issues that require attention of the entire project management team.

Critical issues are then analyzed qualitatively. The analysis is supported, where possible, by simple scoring, mapping, diagrams or other assessment and visualization techniques, depending on the subject and the extent of available information. The purpose of assessment is to form an objective picture of an issue that allows subsequent evaluation and decision making by the project management team.

Project environmental and regulatory approvals scope and project schedule

The scope of project environmental work and regulatory approvals is established. This includes evaluation of the likely scope of desktop and field baseline studies, stakeholder engagement effort, the scope of environmental and social impact assessment and work involved in regulatory approvals. The scope is quantified at a high level in terms of time, resources and expenditure involved. This information is used in the development of high level project environmental and regulatory approvals schedules for each development option. This scope and schedule assessment is of critical importance as it provides an independent view on the impact of environmental and regulatory approvals workscope on the overall project schedule.

Project environmental management organization

A multi-factor analysis of environmental management organization size, structure and related expenditure is undertaken. Factors considered for different project phases include duration of the project phases, internal workload, cost and scope of contracted workscope that needs to be managed by the project team, required expertise, and manpower costs. ESIA and regulatory approvals process features are taken into account during this analysis. As a result a number of potential project environmental management organizational models are identified for subsequent management review and decision making.

Project development options

Project development options are analyzed taking into account identified critical project environmental management issues as well as manageability, schedule and cost impacts related to these issues. A ranking matrix is used to document the assessment and enable comparison between the options.

Stage Three - Integration

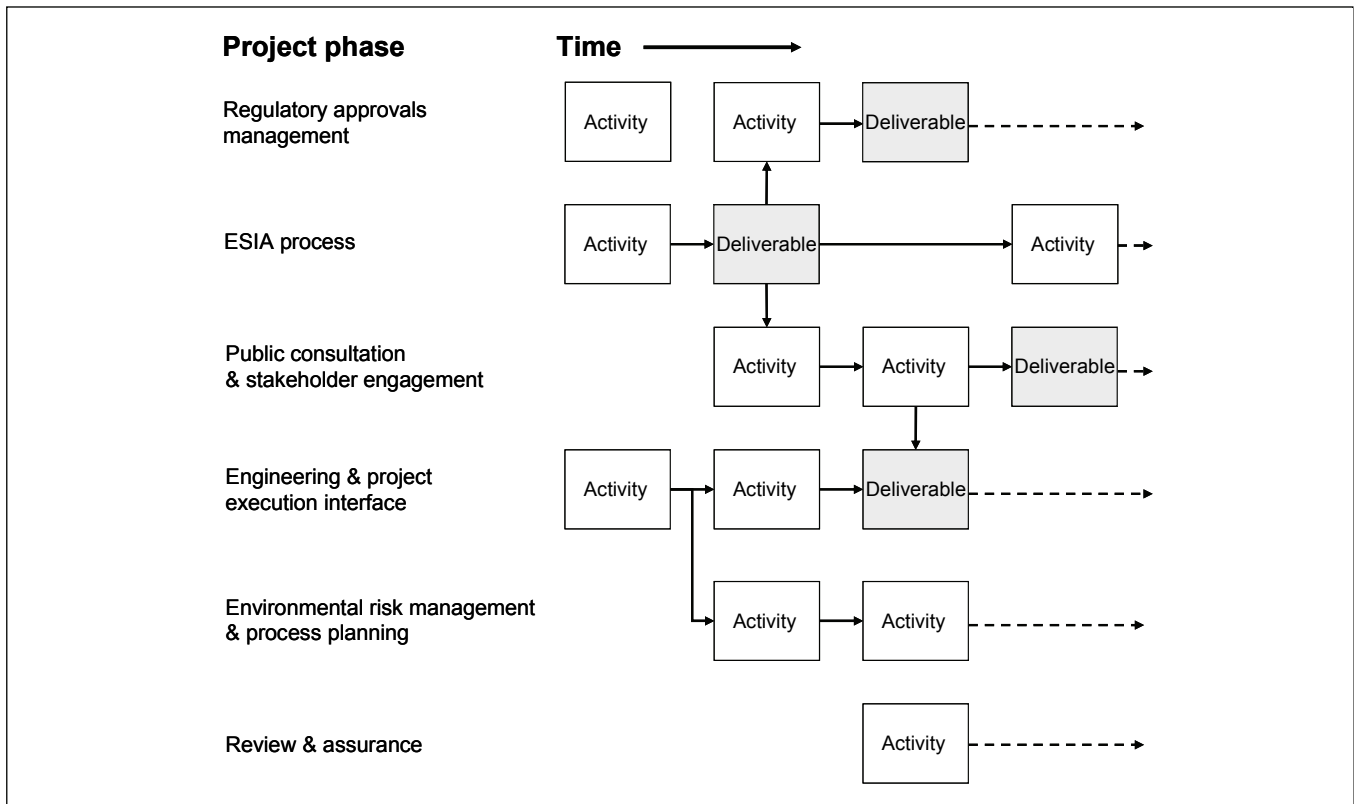
At this stage the initial analytical information is integrated from the perspective of project management. This includes development of description and management recommendations for each critical issue, assessment of how the critical issues affect various development options, as well as evaluation of specific schedule, cost and manageability requirements for each development option or relevant issue. Where necessary, recommendations include several decision options, enabling informed decision making by the project management. Principal project environmental management processes are optimized, integrated and mapped using process flow-charts. A critically important aspect of the integration is review of the findings and recommendation with the project management team.

Environmental management process flow-charts

Flow-charts show the interdependent sequence of the main environmental management activities and deliverables for all project stages. Activities and deliverables are grouped into several processes along a general project timeline. Principal processes are grouped into the following categories: regulatory approvals management, public consultation and stakeholder engagement, engineering and project execution interface, environmental risk management and process planning, and review and assurance processes. Specific environmental management requirements are also included as applicable, e.g. company ESIA process requirements, lender requirements in case of project financing by International Financing Institutions. The integrated process mapping using flow-charts is illustrated in Figure 2. The flow-charts are accompanied by a brief description of each activity step and deliverable.

Integrated environmental management process planning using flow-charts provides a number of benefits. It clearly shows connections and interdependencies between different activity areas, such as approvals, risk management, public consultation, engineering, and assurance. In this way it facilitates common understanding and ownership of environmental management issues among project team members and shortens the learning time for new team members. It provides a more robust input into project activity, resource and organizational planning and scheduling, and helps the development of a well-substantiated project HSE plan. This method also facilitates the monitoring of activities and provides a better basis for project review and auditing.

Figure 2: Integrated environmental process planning flow-charts



Stage Four - Reporting

Following a review of the findings and recommendation by the project management team the Project Environmental Roadmap report is produced. It consists of three parts: background and issue identification information, decision support package and Roadmap flow-charts. The background section contains relevant project background information as well as information regarding issues identified and screening resulting in a list of critical project environmental management issues. The decision support section contains assessment of critical project environmental management issues, scope and schedule, organization, project development options and respective recommendations and options for management decision making. The Roadmap flow-charts provide an integrated process planning tool for the project management team.

General Considerations

Since the purpose of the Environmental Roadmap is to assist the project management team in making strategic decisions during early project stages, the methodology requires that the document style and level of detail are tailored to the project management audience. It also requires that the Roadmap team, or at least the lead expert, has sufficient expertise in hands-on management of HSE in oil and gas development projects; purely environmental background in this case is insufficient. Close involvement of the project management team is vital for the development of the Environmental Roadmap at a minimum of two points in the process – during initial data gathering and during the integration phase review. The Environmental Roadmap is an internal document and therefore does not require adaptation for external audience.

Presentation of Data and Results – Case Illustration

The Environmental Roadmap methodology and tool was successfully applied during an early stage of an oil development project in Russia. The prospective oil field was located offshore, north-east of the Sakhalin Island. The project was at an early stage with data available from 2D and 3D seismic surveys and two exploration wells. First production was anticipated in 2015 and full production in 2020. A number of development and oil export options were considered at the time.

The project was characterized by technical complexity, harsh climatic conditions, highly vulnerable environmental conditions, sensitive social issues, complex regulatory regime, authorities and NGOs sensitized by previous developments, demanding environmental management requirements related to potential financing by International Financial Institutions, a history of poor environmental performance of local contractors, and an evolving environmental strategy and vision for the JV company. The Roadmap project team included HSE advisors from the joint venture companies and consultants.

During the data gathering stage a long list of environmental management issues was developed. The data gathering work included interviews with key project staff, review of project documentation, review of publicly available information, provision of desktop baseline and other input data, review of lessons learned from other projects, and analysis of the environmental standards and requirements of the joint venture partners. This work resulted in the identification of nearly 100 key environmental and social management issues.

In the order of twenty critical environmental management issues were selected during screening analysis. Some of these issues are listed below.

1. Lender (IFI) engagement
2. Impacts (including cumulative impacts) on marine mammals
3. Oil spills, including oil spills in ice and oil spill transboundary impacts
4. Impacts (including cumulative impacts) on indigenous population
5. River crossings and other impacts on fish resources
6. Produced water and drilling mud and cuttings discharge
7. Potentially effected nature reserves
8. Impact of public perceptions, concerns and expectations
9. Integrated assessment of oil export options
10. Considerations for an integrated or separate Russian and international ESIA's
11. Environmental performance of local construction contractors
12. Quality of baseline data
13. Role of early environmental and social studies
14. Impacts of environmental scope and approvals on project schedule
15. Environmental management organization and project management
16. Project environmental standards
17. Differences in design detail requirements for Russian environmental approvals and traditional international project engineering process

We believe that fewer than half of the seventeen issues would have been identified and addressed to some extent in a traditional assessment. The difference came from the Roadmap focus on the project management, rather than purely environmental, aspects of the project.

Each critical issue was analyzed from the point of view of project management. Analysis was supported by the use of various assessment and visualization techniques depending on the subject and the extent of available information. For instance, a number of main oil export options were studied taking into account such factors as cumulative tanker traffic, loading and offloading, scenarios for oil spill in ice, and ranking of oil spill risk factors. An integrated assessment of options included consideration of environmental and social impacts and stakeholder perception issues (see examples of actual visual output in Figure 3).

Conclusions and recommendations related to the analysis of project oil export options are included here to illustrate the project management approach of the Roadmap study.

Conclusions with regards to integrated assessment of oil export options:

- Environmental and social factors alone were not sufficient to definitively favor or disqualify oil export options, however some options appeared less favorable from an environmental and social point of view
- It appeared that stakeholder perception of several key issues (e.g. oil spills, employment, indigenous people, river crossings etc.), and not objective environmental protection issues, would dominate project option comparison

Recommendations:

- It was advisable to accelerate the project option screening process to avoid unnecessary work on the weakest options
- Environmental analysis of project options had to be meticulously developed and documented for stakeholder consultation and approval purposes
- However, for planning purposes the value of in-depth environmental assessment of project options cannot be overestimated
- Stakeholder communication and management were regarded as the corner-stone of project option analysis

Figure 3: Examples of analysis output related to oil export options

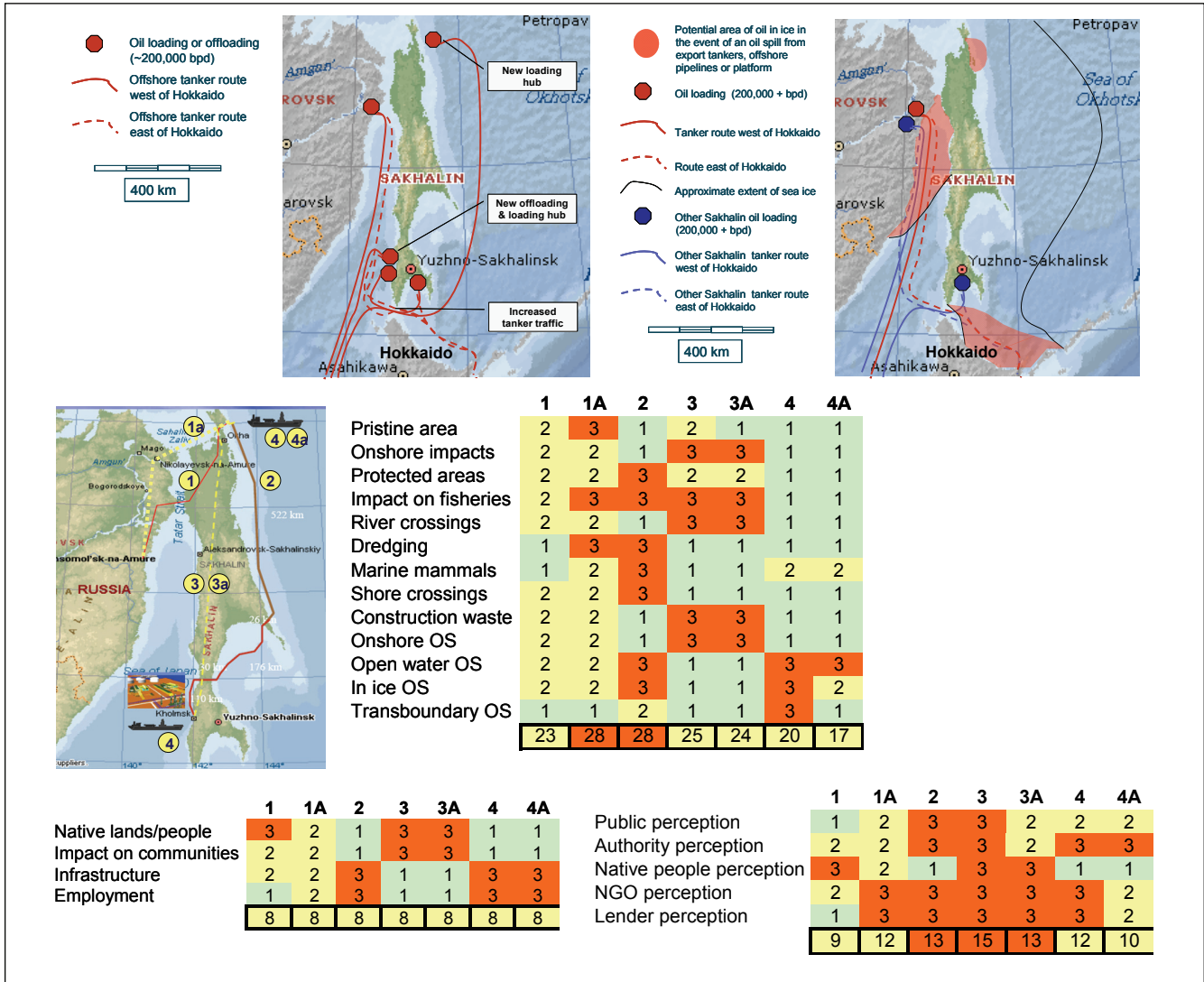


Figure 3 Presents an illustration of qualitative issue severity assessments ranked 1 (low/green), 2 (medium/yellow) or 3 (high/red) of various oil export options (1-4A, see legend on map) on oil spill scenarios, public perception and socio-economics

Another example illustrates the value of scope and schedule analysis in project strategic decision making. The analysis arrived at the following conclusions:

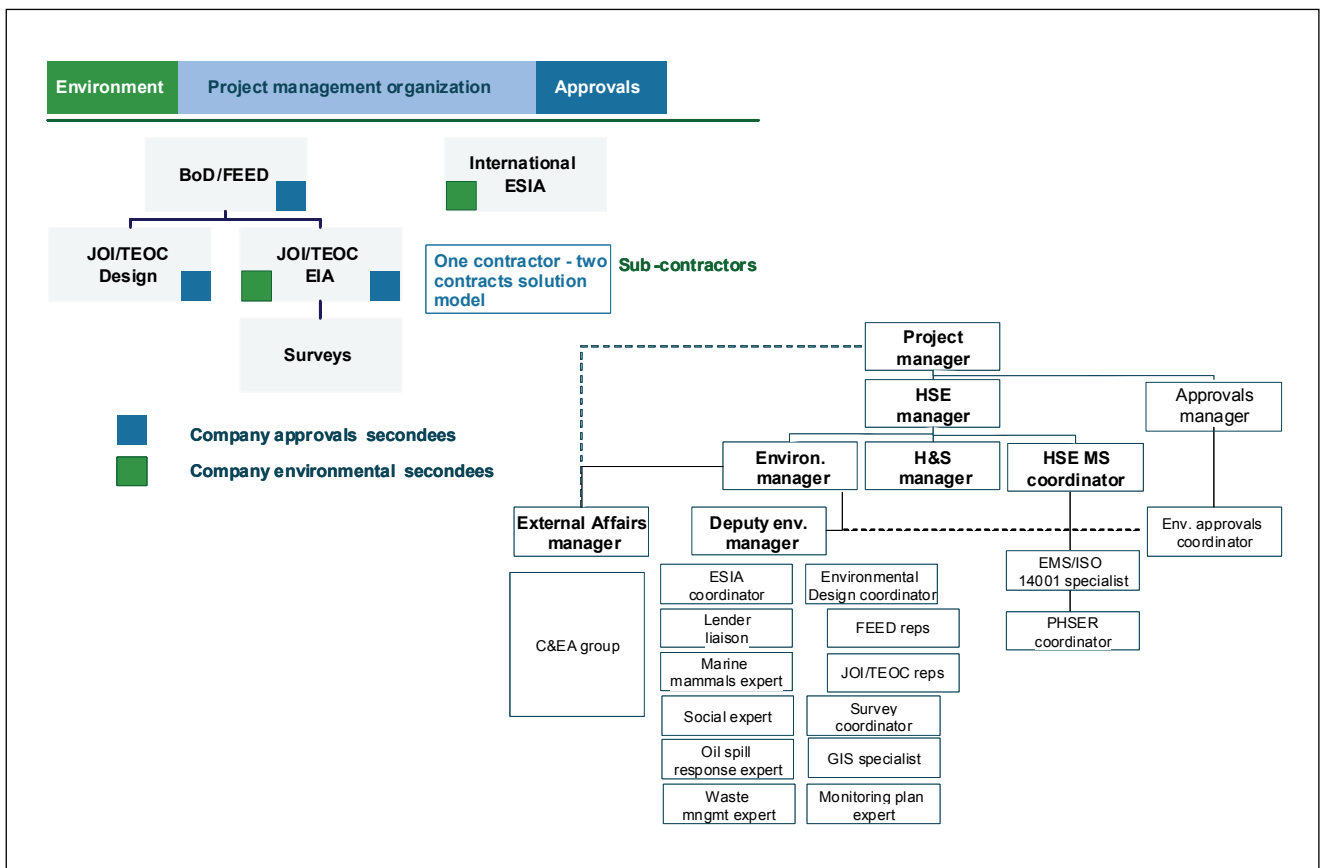
- Project environmental approvals were assumed to increase the project duration by about a year but they were not on a critical path in early project stages
- Reservoir appraisal, selection of an oil export option, and technology decisions were on the critical path in early project stages
- Given the seasonality (summer survey and construction window) and technology development issues (complex FEED and detailed design), environmental approvals could have completely disappeared from the critical path
- Environmental baseline surveys were not on a critical path provided that crucial baseline information was gathered for all considered options during the next project stage
- Metocean and engineering surveys were on a critical path for 2015 production target

An important part of the Roadmap was a multi-factor analysis of the project environmental management organization. The following factors were considered in the analysis:

- Project phase duration
- Internal workload
- Cost and scope of contracted work that needs to be managed by the project team
- Required expertise
- Manpower costs
- Current organizational set-up and related issues
- Need for integration with the project center
- Integration of environmental activities with design activities and project execution planning
- Role and place of Communications & External Affairs function
- Role and place of environmental approvals functions
- Scarcity of qualified environmental resources
- Peak workloads
- Continuity throughout project stages
- Potential misalignment between Russian and international ESIA practices

A number of project management models were analyzed to define optimal organizational structure. Project management model analysis considered the following environmental management aspects: key activity areas (ESIA, engineering interfaces, approvals, surveys etc.), contracting strategy for major environmental and approvals deliverables, degree of required control over management of the key activity areas (e.g. hands-on, hands-off and variations), practicality, efficiency and risks etc. In total eight models were developed and analyzed. The preferred model was further optimized and used for development of the recommended project organizational structure. Specific risk management and organizational planning recommendations were made on the basis of the analysis. The recommended model and organizational setup based on this model are provided in Figure 4 for illustration purposes.

Figure 4: Recommended organizational model and organizational setup

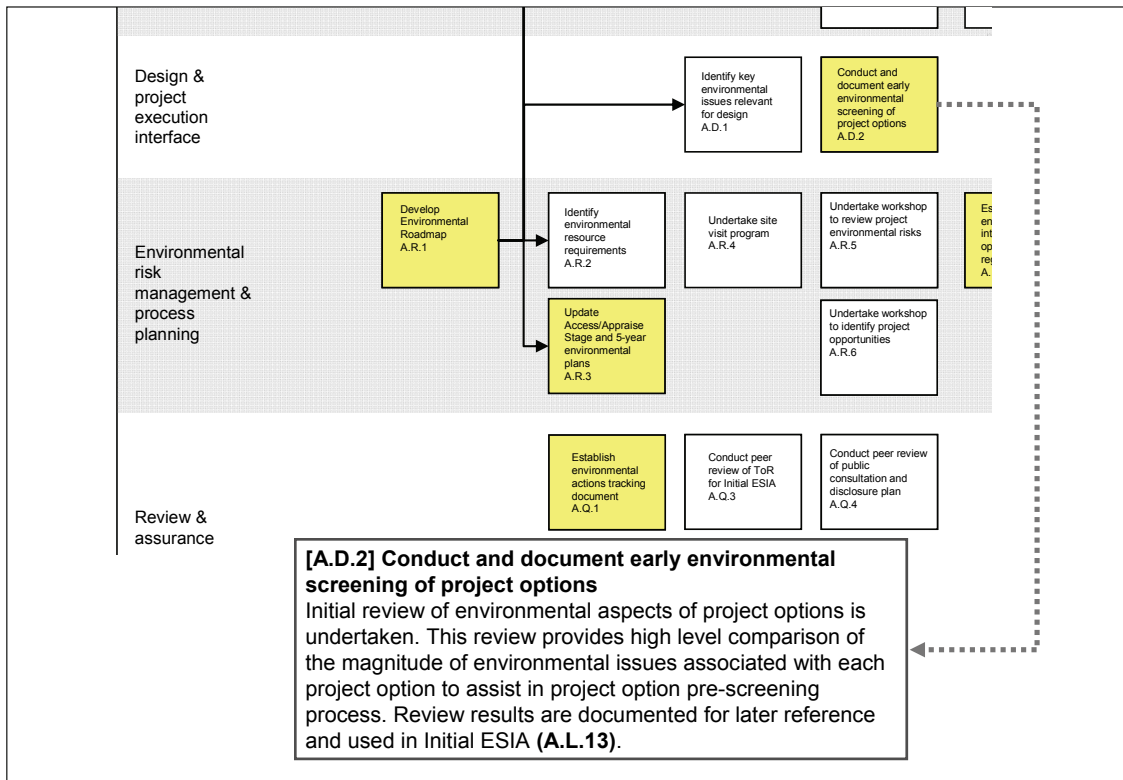


Abbreviations used: **JOI**: Justification of Investment; **TEOC**: Technical and Economical Substantiation for Construction - these are the two major regulatory approval milestones within Russian Legislation

Integrated environmental management process planning was performed using the information generated during the assessment. Process flow-charts were developed for all project phases, with decreasing level of detail for later stages. An excerpt from an actual flow-chart for an early project phase and an accompanying description is provided in Figure 5.

All findings and recommendations were thoroughly reviewed by all key members of the project management team in a workshop setting. This activity was critical for the integration of analysis and facilitation of a common understanding among the project team members.

Figure 5: Example of process flow-chart and accompanying description



Conclusions

The Environmental Roadmap is a new methodology specifically developed to inform strategic decision making at an early project stage. It is based on an integral analysis of environmental, social and management aspects of a project. The approach used in the Environmental Roadmap methodology helps to overcome the limitations of traditional methodologies and can substantially benefit project environmental management and overall project planning. Projects implemented in a sensitive natural, social and regulatory environment will particularly benefit from the application of this methodology. The methodology has been successfully applied in a major oil and gas development project and can be recommended for wider application in oil and gas projects.