*Issues in Social and Environmental Accounting*
Vol. 5, No. 1/2 December 2011
Pp 82-105

# Managing Supplier Requirements with HSE Accounting

## The case of the Mechanical Engineering Company Bisma Jaya, Indonesia

**Stefan Schaltegger**[1*)]
Centre for Sustainability Management (CSM)
Leuphana Universität Lüneburg, Germany
**Christian Herzig**[2]
International Centre for Corporate Social Responsibility (ICCSR)
Nottingham University Business School, UK

**Abstract**

As recent disasters in the offshore petroleum and other industries illustrate, managing HSE is particularly relevant for companies operating in high risk industrial sectors. HSE management systems support companies in minimising adverse health effects, injuries and environmental damages as well as in complying with legislation, standards and stakeholder expectations. Key elements are risk assessment and control through implementation of preventive and protective measures, the preparation of emergency situations and investigation of accidents. HSE management systems have also become a common element of supply chain audits and management. To increase transparency in their supply chains and to reduce risks, large companies aim at aligning compliance of suppliers with their health, safety and environment (HSE) goals and policy. This paper shows with the case of Bisma Jaya, an Indonesian mechanical engineering company, how accounting for HSE can support small and medium sized suppliers to meet the requirements of large international customers. This paper proposes a framework for HSE management accounting and examines the use of management accounting to improve the HSE performance of an Indonesian company as a response to customer audit requirements. The company is a supplier of a large oil company and seeks for effective and efficient ways of HSE improvement. The paper unfolds benefits and limitations of narrow efficiency-oriented responses to rating systems and audits and highlights that efficiency considerations in HSE management are only partially useful and require complementing effectiveness considerations on HSE performance.

**Keywords**: *management accounting, health, savety, environment, performance, supply chain, Indonesia*

[1] Professor Stefan Schaltegger, phD, is a full professor of Sustainability Management and head of the Centre for Sustainability Management (CSM) and the MBA Sustainability Management at Leuphana University of Lüneburg, Germany. His research deals with corporate sustainability management with a special focus on sustainability accounting, performance measurement, management methods, strategic management, stakeholder relationships and the business cases for sustainability.

[2] Dr Christian Herzig is an Assistant Professor at the International Centre for Corporate Social Responsibility, Nottingham University Business School, UK. His research interests lie in corporate sustainability and CSR, management control and sustainability strategy, sustainability accounting and reporting, CSR and environmental management in devel-

## 1. Introduction

To increase transparency in their supply chains and to reduce technical, economic and reputational risks, many large international companies have formulated corporate health, safety and environment (HSE) policies and systems to manage and audit the HSE performance of their suppliers (e.g. Beske, Koplin and Seuring, 2008; BSCI, 2009; NZBCSD, 2003; Piplani, Pujawan and Ray, 2008). HSE management systems play a particularly important role in high risk industrial sectors (E&P Forum and UNEP IE, 1997). Such importance has recently been reinforced with the oil drilling platform and equipment problems of BP resulting in one of the world´s largest oil spills in the Gulf of Mexico (McNulty and Crooks, 2010) and the Montara field blowout in the Timor Sea (Commonwealth of Australia, 2010). Subsequent reviews revealed several failures in the design and execution of HSE measures and emphasized the importance of the proper functioning of HSE management systems (OGP, 2011; Commonwealth of Australia, 2010; Clay, 2010). Indeed, HSE management systems can support companies in at least minimising and at best eliminating adverse health effects, injuries and environmental damages (e.g. Corbett 2004; Health & Safety Executive, 2001; Holt, 2009) and in complying with legislation, standards and stakeholder expectations. Key elements in HSE management systems are risk assessment and risk control through implementation of preventive and protective measures, the preparation of emergency situations and investigation of accidents as well as the integration of facilities into the surrounding environment (Rikhardsson, 2004). To account for and manage HSE performance can be a particular challenge for small and medium sized suppliers who are confronted with HSE policies, management systems and audits of large international customers. This paper proposes a framework for HSE management accounting to support supplying SMEs not just to comply with requirements defined by large international customers but also to effectively and efficiently manage and improve their HSE performance. To better understand real decision situations a single in-depth explorative case study approach has been chosen (e.g. Scapens 1990; Yin 2003). By applying the proposed framework to Bisma Jaya, an Indonesian engineering company supplying the international oil industry, the paper investigates how the choice of management accounting methods can be based on the analysis of decision situations.

This paper is organized as follows. Section 2 proposes a decision-orientated framework for HSE management accounting on the basis of the environmental management accounting framework of Burritt et al. (2002). Section 3 explains for a real case study how the results of an HSE audit and the measures taken by Bisma Jaya can flow into a non-monetary assessment and costing approach which support the company in meeting the supplier requirements in the most cost-efficient way. Additional links to monetary and non-monetary HSE budgeting are outlined. Finally, a discussion of the benefits and limitations of the efficiency notion of strategic responses to regulatory systems such as rating sys-

oping countries and responsible management education.

*)We would like to thank Zulkifli Nasution for his valuable support in conducting the study. Thanks are also due to Mr Nugraha Sumpena, Bisma Jaya, for providing access to the company information. We are furthermore grateful to the helpful comments of Roger Burritt, Tobias Viere, an anonymous reviewer and Hasan Fauzi.

tems and audits is presented; the result being that to focus on efficiency is only partially useful and has to be complemented by effectiveness considerations on HSE performance.

## 2. A decision-oriented framework for HSE management accounting

To audit and improve HSE performance, managers need information which relates to their decision situations. In this context, management accounting embraces a wide set of tools of information management which support different decision situations. In environmental management accounting, which addresses some major elements of HSE, a widely recognized framework has been developed by Burritt et al. (2002) to classify the multitude of existing tools. It supports management to identify which environmental management accounting tools may be useful in particular decision situation. For the purpose of this study, the framework has been adapted to HSE management accounting (see Figure 1).

To support business actors the HSE management accounting framework identifies different tools for various decision situations, according to:

- the type of information: monetary or non-monetary HSE information:
- the time frame – past or future: looking at whether the focus of the decision is oriented towards measuring past HSE performance or making HSE-related decisions for the future:
- the length of time frame – short or long term: whether the HSE decision setting involves strategic information concerning several years or whether it is more operational, thus covering a shorter period such as months, weeks or days:
- the routineness of information provision – regular or ad hoc: whether the required HSE information is gathered regularly for a recurring purpose or only when required, e.g. to support a specific and non-recurring need.

Burritt et al.'s (2002) framework was chosen and adapted for this study for three reasons. Firstly, with its focus on environment performance and impact measurement it addresses major elements of HSE. Secondly, the framework distinguishes two major components of HSE management: it covers accounting tools which support management in identifying, measuring, analysing and control for i) the impact of companies' activities on the natural environment, health and safety (expressed in physical units) and the financial consequences of environmental, safety and health management (in monetary units). Thirdly, HSE issues influence various areas of a company (e.g. Corbett 2004) and thus relate to many different decision situations. When conducting explorative case studies, the framework can be mobilised in discussions between researchers and practitioners and for organisational diagnosis to identify which tools might be useful in certain decision situations.

Studying the case of Bisma Jaya, the framework supports the distinction of different decision situations and relates accounting tools to these decision situations. The framework and its usefulness for managerial practice will be discussed by investigating the experiences manag-

| | | HSE Management Accounting | | | |
|---|---|---|---|---|---|
| | | Monetary HSE Management Accounting | | Physical HSE Management Accounting | |
| | | Short Term Focus | Long Term Focus | Short Term Focus | Long Term Focus |
| Past Oriented | Routinely generated information | 1. HSE cost accounting | 2. Trend analysis of HSE (driven) costs, revenues, etc. | 9. Accounting of material flows, accidents, safety incidents, etc. | 10. Accounting for long-term HSE impacts |
| | Ad hoc information | 3. Ex post assessment of relevant HSE costing decisions | 4. Post-investment assessment of individual projects | 11. Ex post assessment of short term HSE impacts | 12. Physical post- assessment of HSE investment s |
| Future Oriented | Routinely generated information | 5. Monetary HSE operational and capital budgeting | 6. HSE long term financial planning | 13. Physical HSE budgeting | 14. Long term planning of (physical) HSE performance |
| | Ad hoc information | 7. HSE costing | 8. Monetary HSE project investment appraisal | 15. Relevant HSE impacts | 16. Investment appraisal of physical HSE effects |

**Figure 1: Decision-oriented framework classifying HSE management accounting methods (basic framework adopted from Burritt et al., 2002 and in the boxes adapted to HSE tools)**

ers make when applying the HSE accounting tools which relate to the respective decision situation. In so doing, the framework not only serves for conceptual classification but also provides a pragmatic structure for the identification of the appropriate HSE accounting tool for any given corporate decision setting. It is expected to help managers and staff to reflect whether a HSE accounting tool is apt to support a decision or, in turn, whether an accounting tool already in use is the most appropriate one for the intended decision making purpose.

To investigate the real world application of the HSE management accounting framework for Bisma Jaya, the next sections firstly characterize the company, its decision situation and the rating and audit conducted by the main customer and then explains the choice of HSE

management accounting tools based on the identified decision situations.

## 3. Characteristics of Bisma Jaya as a supplier

The purpose of this study is to explore how HSE management accounting could support an Indonesian supplier to meet international HSE requirements.

The CV Bisma Jaya (hereafter *Bisma Jaya*) case is characterized by a decision situation which many small and medium sized enterprises (SMEs) experience which are suppliers of large national and international customers exerting pressure on the environmental and social performance of their clients. The company, established in 1983, is specialised in engineering and mechanical construction. It is located in the oil city of Balikpapan, East Kalimantan (Borneo), Indonesia and employs 132 people of which 50 are full time employees. The core business is offshore construction and marine service. Starting its business with mechanical devices for the timber industry, Bisma Jaya has expanded in recent years to a larger region in East Kalimantan, including oil, gas and coal mining industries. The company has three workshops on the coast or near rivers, all accessible by ship or car and available for construction activities such as building oil platforms. These three workshops are located in Balikpapan, Handil and Senipah.

Like many engineering companies, Bisma Jaya works on a project basis and has carried out a large range of projects for its main customers in the oil and gas industry. These projects require mechanical engineering and construction work such as building pumping installations for a dredging system, revamping a network of fire water lines, protective coating and paintings, de-sanding installations, fabrication of wellhead platforms and accessories.

Financially, Bisma Jaya is doing well, its financial performance, however, being dependent on maintaining good relationships with its principal customer, a large Indonesian subsidiary of an international company engaged in onshore and offshore oil and gas exploration. The customer carefully selects contractors based on technical specifications and analysis of contractor risks, and supervises worksites of the contractor.

The oil and gas company favours a selection of its constructors on the basis of their ability to comply with its policy on quality and HSE. As a consequence of this, Bisma Jaya undergoes regular independent external audits which involve the measurement of HSE performance and compliance. These audits require the formulation of action plans and the institutionalisation of suitable internal control procedures to ensure a safe workplace. In case of an accident at one of the workshops or on site, the company is externally audited on an ad hoc basis. Drawing on the findings from the management system audit, the contractor is rated using the customer's HSE rating system. A poor rating result can have a significant effect on future projects and the economic situation of the company. If the rating score does not meet expectations of the contracting company, Bisma Jaya cannot compete for a job that might be offered by the oil and gas company in the future, and even faces the possibility of losing on-going projects.

Bisma Jaya encountered such a worst case scenario after an accident and subsequent HSE audits by its main customer. The audit revealed failures with the implementation of the HSE management system leading to a rating result that compromised the collaboration between the two business partners and could disqualify the company from participating in future tenders for supplies. The audit and rating results are introduced next.

## 4. Rating and audits as motivation for applying HSE accounting

This section presents the HSE rating and audit system which is used by the main customer to assess the performance of Bisma Jaya, and the initial HSE performance of Bisma Jaya which motivated the management to evaluate EMA as an approach to improve its HSE performance.

### 4.1 The customer´s HSE audit and rating system

The audit and rating system applied for Bisma Jaya consists of primary and secondary HSE factors (source: "Contractor's Safety Program Evaluation", based on the internal document "Contractor Safety Management System - Form and Checklist" 2001; see Figure 2).

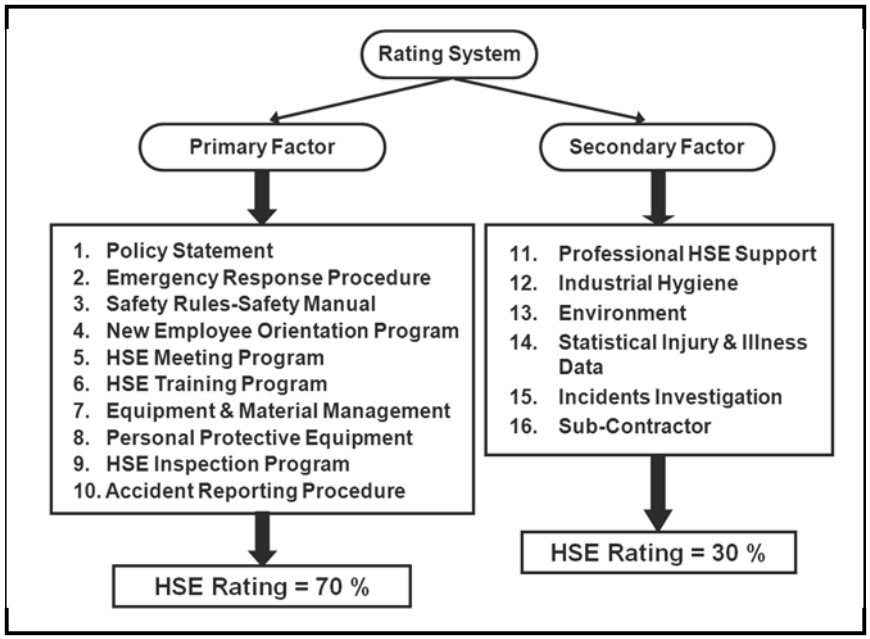


**Figure 2: Rating system of the main customer (Source: "Contractor's Safety Program Evaluation", based on the internal document "Contractor Safety Management System - Form and Checklist" 2001)**

Primary factors include for example HSE policy, emergency response procedures and the safety manual whilst secondary HSE factors address issues such as professional HSE support, industrial hygiene and the environment. The supplier's level of achievement on these factors is scored using a four-level scale (with D=0 points and A=max. points). Each of the ten primary HSE factors is rated out of a maximum of 10 whilst the maximum points for the six secondary HSE factors vary according to the factor's relevance, i.e. are rated either 10 (factor 14), 15 (factors 11, 15) or 20 (factors 12, 13, 16) at the maximum. The overall rating score is calculated as the sum of weighted primary and secondary points. The primary HSE factors are given a weight of 70%, i.e. a maximum of 70 rating points can be achieved if all requirements are met by the organisation. The secondary HSE factors can sum up to a total of 30 rating points because they are given a weight of 30% of the overall rating score. In total, the weighted primary and secondary points account for a maximum score of 100 rating points.

### 4.2 The initial HSE performance of Bisma Jaya

Bisma Jaya has a HSE policy and HSE committee that is headed by a HSE coordinator and supported by a manager for HSE personnel, equipment and material. The HSE programme includes daily housekeeping, weekly safety talks, monthly meetings and inspections, an annual medical examination of all employees and check of personnel protective equipment.

The company's HSE management system is designed in line with the HSE rating system of its main client to meet supply chain management and assurance requirements. It coordinates and systematises Bisma Jaya's business activities with the aid of defined and documented steering and control mechanisms to protect people, equipment, material, and environment during project activities.

Table 1 shows a common record of HSE management which brings together information about occupational accidents. The HSE issues covered in Table 1, such as numbers of hours worked, frequency, environmental damage, etc., are commonly used in monitoring HSE performance (see e.g. Holt 2009). The record of Bisma Jaya's initial HSE performance for the month of October characterizes the decision situation: with one case of medical treatment per 132 employees, the medical treatment cases frequency is 0.76 and the accident/near miss frequency 2.27 (3 cases per 132 employees).

The incidents (see Table 1), which were expressed to be too many and too severe in the audit report by the main customer, provoked an additional assessment by the contracting company.

As a consequence, the contracting company sent its auditors to evaluate Bisma Jaya's HSE management system. The aim of the assessment was to ensure employee health and safety and secure environmentally-sound practices at Bisma Jaya's workshops and facilities. Before the audit was conducted, an HSE clarification meeting between the customer and Bisma Jaya was held and an agreement was signed that if the HSE audit indicated that performance was under the minimum requirement, the customer

**Table 1**
**Health, safety and environment performance of Bisma Jaya**

| | |
|---|---|
| Man-hours | 264,401 |
| Fatality | 0 |
| Fatality Frequency | - |
| Lost Time Injuries | 0 |
| Lost Time Injuries Frequency | - |
| Restricted Work Day Cases | 0 |
| Restricted Work Day Cases Frequency | - |
| Medical Treatment Cases | 1 |
| Medical Treatment Cases Frequency | 0.76 |
| Accident/Near miss | 3 |
| Accident/ Near miss Frequency | 2.27 |
| Major Environment Damage | 0 |
| Major Environment Damage Frequency | - |

would withdraw the tender and Bisma Jaya would focus for six months on the improvement of its HSE system. In the case of a further HSE incident or accident during the execution of the existing contract, the six-month period would recommence. With this agreement HSE issues held the highest economic relevance for Bisma Jaya.

In the audit following the accident, Bisma Jaya received less than half of the maximum score (44 points). An improvement of at least six points was needed to meet the minimum requirement. Bisma Jaya wanted to achieve an immediate improvement to reach this goal and, taking a long view, aimed at achieving a significant increase in order to reduce the risk of falling below this benchmark in the future. This would require a more systematic and incremental approach that prioritises cost-efficient and cost-effective measures of HSE improvement.

In their general conclusions, the external auditors noticed that the HSE team had worked well to revise the HSE management system since the previous audit. However, a significant improvement of the HSE performance could still not be achieved. In particular, in the view of the auditors of the main customer the two workshops at Handil and Senipah had not improved sufficiently since the last inspection. Apart from a stronger support and commitment from the management to improve HSE performance, several issues were raised by the auditors to improve the HSE implementation. These issues, and the range of possible measure for improvement and the costing of these options, are presented and discussed in the next section. The section furthermore shows that the decision situations and the required HSE

information were all physical only (right side in the HSE management accounting framework in Figure 1), even though the information was economically crucial for Bisma Jaya. However, as will be shown below, to meet these requirements in the most economical way, monetary HSE accounting information (left side in the framework in Figure 1) proves to be helpful and necessary, too.

## 5. HSE audit and choice of accounting approaches

Section 4 explains the HSE rating issues and the application of management accounting approaches to these HSE issues in detail.

### 5.1 HSE performance and system audit, action plan and costings

The discussion of the HSE audit results, the action plan and the costing of different measures is organised in the following way: firstly, the underlying primary factors for the rating system are briefly introduced followed by consideration of secondary factors. Then as a response to the external audit, main findings from the audit are outlined and the measures from Bisma Jaya's action plan summarised in Table 2. The Table also includes the cost calculations for the HSE measures with which Bisma Jaya responded to the findings of the audit.

#### 5.1.1 Primary HSE rating factors

The primary HSE rating factors will be discussed one by one in the light of the audit results including the HSE policy, emergency response procedures, safety rules and the existence and contents of a safety manual, an information programme for new employees, an HSE meeting programme, an HSE training programme, the management of equipment and materials, personal protective equipment, the HSE inspection programme, and the accident reporting procedure.

*HSE Policy*

This first HSE rating item aims to ensure that the company has a written policy which is aligned with and supports the realisation of government regulations. It has to be signed by senior and line management. HSE structures and job descriptions, as well as the revision process for the HSE policy, are also addressed. The establishment of the HSE policy requires strategic consideration, safety briefings before starting a project, and the introduction of safety meetings and talks. The HSE policy has to be included in the "pocket book" of the company which each employee receives.

The audit revealed that the policy statement was issued in both English and Bahasa Indonesian, but that the HSE policies posted on the walls of the personnel changing rooms were different at both workshops, Senipah and Handil. The same was true for the HSE on site issues in the job description issued to line management and key personnel.

*Emergency Response Procedures*

According to the customer's HSE rating scheme the emergency response procedures (ERP) must be suitable for work areas as well as all projects. This means that all staff must be aware of the emergency numbers for key personnel, the nearest doctors and hospital, as well as emergency services. An official agreement with the clinics or hospitals to accept injured employees is also required.

Specific ERPs are needed for accidents, fire, 'man-over-board' and specific HSE site issues. In addition, Bisma Jaya must show that regular training is conducted for all ERPs with its employees.

The auditors made the remark that a flow chart of the processes was missing and therefore needed to be drawn up and communicated to all parties and that training had to be conducted and registered. In addition, the auditors criticised the observation that some certified first-aid boxes were invalid and that a suitably certified first-aid box had to be provided per five employees working at a remote area.

**Table 2**
**Costing of HSE measures addressing audit results**

| Measure | Explanation | One-off costs (Rupiah) | Annual Costs (Rupiah) | Costs (Euro) |
|---|---|---|---|---|
| 1a. Make copy of all HSE policy and install to strategic areas | | 300,000 | - | 30 |
| 1b. Check that all personnel are familiar with HSE job description as part of their knowledge about HSE policy | 12 teams, 0.5 hrs. each, 10 persons per team, 1trainer | 375,000 | - | 38 |
| 2a. Drill for ERP | monthly, Handil workshop | | 1,050,000 | 105 |
| | monthly, Senipah workshop | | 1,650,000 | 165 |
| 2b. Develop ERP for fire | Procedure development by HSE manager, discussion with two managers | 250,000 | | 25 |
| 2c. Develop ERP for hydrocarbon release | Procedure development by HSE manager, discussion with two managers | 250,000 | | 25 |
| 2d. Develop ERP for "man-over-board" | Procedure development by HSE manager, discussion with two managers | 250,000 | | 25 |
| 2e. Develop ERP for Accident in Site | Procedure development by HSE manager, discussion with two managers | 250,000 | | 25 |
| 2f. Develop ERP for Workshop and install in strategic area | Procedure development by HSE manager, discussion with two managers | 250,000 | | 25 |
| 3a. Develop grinding procedure | Procedure development by HSE manager, discussion with two managers | 250,000 | | 25 |

**Table 2 (Continued)**

| | | | | |
|---|---|---|---|---|
| 3b. Develop welding and cutting procedure | Procedure development by HSE manager, discussion with two managers | 250,000 | | 25 |
| 3c. Develop lifting procedure | Procedure development by HSE manager, discussion with two managers | 250,000 | | 25 |
| 4a. Orientation programme for new employees | 2 per month | | 1,500,000 | 150 |
| 4b. Verification from employees that they have been given a safety briefing/safety talk | Same as above | | 1,500,000 | 150 |
| 4c. HSE refreshment programme for longer term employees | Procedure development by HSE manager, discussion with two managers | 250,000 | | 25 |
| | 1.5 hrs. briefing, 25 employees in total | 137,500 | | 14 |
| 5a. Commit to a regular HSE meeting for all employees responsible for HSE | Monthly meeting, 20 persons, 2 hrs., snacks | | 1,500,000 | 150 |
| 5b. Develop focus agenda that is discussed in meetings & discussion of current issues and review of the previous meeting | Guideline developed by HSE manager, 2 days | 200,000 | | 20 |
| 6a. Develop matrix training for all employees in 2006 | Matrix developed by HSE manager, 3 days | 300,000 | | 30 |
| 6b. Induction training to be implemented for workers from manpower supply | Internal: 15 people, 1 trainer, 9 topics, 0.5 hrs. each | 393,750 | | 39 |
| | External: 10 people, 1 trainer, 7 topics, 0.5 hrs. each | 306,250 | | 31 |
| 6c. Training for first aid | 22 people in-house training, external trainer, 2 days, accommodation (excl. labour costs) | 20,000,000 | | 2,000 |
| | 22 people in-house training, 2 days | 220,000 | | 22 |
| 6d. Training anomaly and incident reporting procedure for all employees | Internal training of supervisors (5 Senipah, 3 Handil workshop) + site manager, 1 hr. | | 52,500 | 5 |
| 7a. Verification list of equipment of Bisma Jaya | 1 week per workshop | 820,000 | | 82 |

**Table 2 (Continued)**

| | | | | |
|---|---|---|---|---|
| 7b. Make inspection record & tagging for equipment | Developing of procedure by HSE manager, 1 day, 2 hrs discussion | 250,000 | | 25 |
| | Record & Tagging 1 day per month per workshop | | 2,400,000 | 240 |
| 7c. Make list and copy equipment certificates | External certification, every 6 months | | 100,000,000 | 10,000 |
| 7d. Coordination of relocation and maintenance of material/equipment and preservation area in the yard | 2 days, crane, helpers, assisting operators | 11,750,000 | | 1,175 |
| 7e. First aid kit boxes | 15 kitboxes needed | 1,500,000 | | 150 |
| | Medicaments refilled every 3 months | | 3,000,000 | 300 |
| 7f. Fire extinguisher | 12 exist, 3 to buy | 3,600,000 | | 360 |
| 8a. Develop record of Personal Protective Equipment stock | 1 day by HSE manager | 100,000 | | 10 |
| 8b. Make matrix Personal Protective Equipment for all employee | Development of matrix 1 day by HSE manager, checking 1 week by HSE manager | 600,000 | | 60 |
| 8c. Monitoring Personal Protective Equipment in yard | 1 day per week by safety manager | | 4,800,000 | 480 |
| 9a. Regular inspection in the yard | 9a, 9b, 9c in total: 1 day per month | | 1,200,000 | 120 |
| 9b. Develop follow up matrix | see above | | | |
| 9c. Bring to HSE committee meeting | see above | | | |
| 10a. Develop follow up matrix for anomaly status | 1 day HSE manager, per month | | 1,200,000 | 120 |
| 10b. Analyse all incidents and accidents | 2 days by team (6 persons, inventory & analysis) | 2,400,000 | | 240 |
| 11a. HSE organization chart and job description. | 2 days per initial project chart by HSE manager,<br>1 day per further 4 projects | 600,000 | | 60 |
| 11b. Schedule of HSE committee meeting | - | | | |
| 12a. Medical check-up/ medical certificate for all employees | per person, per year | 30,000,000 | | 3,000 |
| 12b. Food and beverage procedure | Freezer, boxes, equipment, etc. | 10,000,000 | | 1,000 |
| 13a. Schedule of Environment inspection | 3 days for revision | 300,000 | | 30 |

**Table 2 (Continued)**

| | | | | |
|---|---|---|---|---|
| 13b. Waste management area | Segregation of waste, Good Housekeeping, Equipment, truck, fuel, driver | | 2,480,000 | |
| 13c. Relocating waste near the jetty in Handil (in December) | Crane 1 day, 4 employees | 28,160,000 | | 2,816 |
| 13d. Basin for oil tank | | 10,000,000 | | 1,000 |
| 14a. Record monthly labour hours and other HSE factors | 2 days collection & preparation (HSE manager) | | 200,000 | 20 |
| 14b. Analysis of HSE statistics | 2 days by team (6 persons, inventory/analysis) | 2,400,000 | | 240 |
| 14c. Guideline for causal analysis, 1 day by HSE manager | | 100,000 | | 10 |
| 15a. Adopt cause-and-effect tree analysis | - | | | |
| 15b. Analysis of all incidents | 2 days by team (6 persons, inventory & analysis) | 2,400,000 | | 240 |
| 15c. Training of team leaders in cause tree analysis | - | | | |
| 15d. Internal training for incident investigations | included in 6d | | | |
| 16a. Review of procedures | 2 days by HSE manager | 200,000 | | 20 |
| 16b. HSE audit for sub-contractor | | | | |
| 16c. Monitoring of sub-contractor on HSE matters | | | | |

*Safety Rules and Safety Manual*

Safety rules are defined on the basis of the work procedures for welding, cutting, lifting, hydro-testing, painting and blasting, and should be specified according to the scope of work. In the manual, a reference is needed to the operating procedures for the equipment used in the project. The audit revealed that some of the main safety procedures relating to the contract, such as cutting, grinding and lifting procedure, are still missing.

*Information Programme for New Employees*

New employees have to be informed about the HSE procedures, rules, documents, and responsible staff. Key issues for the auditors were: (i) the existence of a New Employee Information Programme, (ii) the clear definition of a procedure, and (iii) whether the programme is implemented and training recorded. The procedure must cover all information about the HSE policy, work

procedures and personal protective equipment (i.e. helmet, shoes, goggles, and clothing), and the "pocket book" containing specific HSE information must be handed out and explained to employees. The auditors emphasised the necessity to provide refreshment possibilities for employees and guidance for employees of sub-contractors.

*HSE Meeting Programme*

Systematic HSE management and, in this case, the HSE rating system, asks for a HSE committee meeting programme which defines the frequency of committee meetings, requires minutes, secures coherency between the meetings over time, and ensures that the results of the meetings are reviewed.

Bisma Jaya has always conducted monthly meetings and safety talks and minutes were kept. However, the monthly safety meeting had not been reviewed and not all HSE issues had been followed-up. The audit results had not been followed-up in the monthly meeting and the auditors mentioned that involvement of management in the meetings could be improved. Additional measures include the writing of minutes for HSE meetings and follow-up review of all HSE matters. Because the salaries of the staff involved were already covered, these activities were not calculated separately. From this perspective these measures were not seen to create additional costs.

*HSE Training Programme*

To organise HSE training for all employees, an annual programme has to be developed. Further relevant aspects which have to be included in the training documentation are (i) the recording of the training which has taken place, (ii) copies of certificates received, (iii) lists of all employees who attended the trainings, (iv) a list of organisations which offer HSE training, and (v) information on internal HSE training. The audit revealed that a training matrix had been issued, however, the matrix needed to cover all employees, permanent as well as contracted employees. Some first-aid certificates were out of date and therefore not valid.

Bisma Jaya took up the recommendations and defined various measures to improve the HSE training programme. The list and copies of employee certificates was not calculated specifically because this was seen as an activity the current administrator could cover without additional cost.

*Equipment and Material Management*

The management of materials and equipment plays a crucial role in HSE. Issues addressed under this category are the existence of a comprehensive list of certified equipment and tools, a copy of all equipment certificates, the inspection and tagging procedure, the inspection form for all pieces of equipment, and a list of all inspection tags. The audit showed that not all equipment lists were completed to cover the whole range of electrical equipment and tools. Moreover, it was pointed out that no records existed about the inspection of tools. Certificates did exist but were not documented in a single list and follow-up inspections had to be improved and documented. No calculation was made for the cost of distributing the minutes and results of equipment inspections to the responsible staff as this was completed in meetings already scheduled as part of ordinary working procedure.

*Personal Protective Equipment*
The existence of a procedure to distribute and check the functionality of personal protective equipment is a substantial element of HSE management. This includes the recording by employees as part of their normal working procedures. Stocks of personal protective equipment are also required for each site. The external auditors confirmed a sufficient supply of personal protective equipment. However, they observed that no stock of equipment existed at the workshops and that enforcement of the procedures for checking stock levels would need to be more stringent.

*HSE Inspection Programme*
The HSE inspection programme defines a procedure and time schedule for inspections, including a list with the status of the inspections which have taken place (time, by whom, and when the next inspection is planned). It also includes a follow-up improvement programme on the basis of the results of the inspections. The inspection results should be discussed at the HSE committee meeting and minutes including the correction plans have to be kept. Furthermore, a record of the corrective actions is required. The audit revealed that the HSE inspection programme has been carried out and guidelines were made available. However, the inspection forms did not mention follow-ups to check the effect of corrective actions and management did not seem to be aware of the status of HSE inspections.

*Accident Reporting Procedure*
The accident reporting procedure requires the existence of (i) a written document explaining the procedure for the reporting of accidents and anomalies, (ii) a list of the current status of incidents and corrective actions taken, (iii) a form to characterise and report accidents and anomalies, and (iv) training for all employees how to behave in such cases. It was rated very positively in the external audit. Improvement was seen with follow-up procedures and their recording and reporting. The total cost of activities to improve the primary HSE rating factors include developing the HSE policy, emergency response procedures, safety rules and safety manual, an information programme for new employees, an HSE meeting programme, a HSE training programme, the management of equipment and materials, personal protective equipment, the HSE inspection programme, and the accident reporting procedure.

### 5.1.2 Secondary HSE rating factors

*Professional HSE Support*

Professional HSE support encompasses for example a HSE committee organisational chart, a job desk for the HSE committee, the curriculum vitae and certificates of the HSE committee members, a list of employees who contribute to the project including certificates, and a record of all HSE committee meetings. The audit findings indicate that a HSE organisational chart was missing and that the training of HSE staff needed to be implemented. Bisma Jaya responded to these audit findings by designing the HSE organisational chart and scheduling HSE committee meetings.

*Industrial Hygiene*
Industrial hygiene requires medical certificates for all employees, a table summarising all employee medical check-ups, agreements with a hospital to accept staff in case of illnesses or injuries, a procedure to ensure safe catering or

food, and a first-aid kit box with standard medical remedies. Furthermore, employees trained in first-aid are needed with one first-aid trained employee per five people.

The audit shows that medical certificates were available for personnel working on site. For office employees, the certificates only existed for staff, not for management. Supply of food and beverages had not been checked during multi-day trips and staying overnight on long boats. The audit findings were taken up by Bisma Jaya by acquiring medical certificates for all employees and by introducing food and beverage procedures.

*Environment*

The environmental audit assesses whether the company has implemented an environment management system which refers to or is certified in line with ISO 14001. The waste management is of interest, in particular whether a waste management system exists and a separation of waste and scrap occurs. General housekeeping and environment inspections conducted by the owners are in the scope of the audit. The audit results showed that the underlying procedures of the systems were not well implemented on site. The inspection found many oil spills in both the Senipah and the Handil yard. In addition, scrap metal pieces were scattered about the yards. Moreover, insufficient waste management seemed to be the reason why the waste and scrap accumulated in the Handil yard.

As a response to the audit findings the company planned to (i) schedule environmental inspections, (ii) develop a waste dumping area, (iii) relocate waste near the jetty of the Handil yard, and (iv) improve the socialisation of the results of environmental inspections and show the results of the analysis on the notice board of the main changing rooms and offices in the yard.

*Statistical Injury and Illness Data*

A procedure for collecting, storing and communicating statistical data is required by the rating system. This includes the display of statistical information about man-hours, fatality, anomalies, incidents and accidents, frequency and severity of these incidents, analyses of statistical factors, recommendations for improvement, action plans, and the communication and implementation of recommendations.

The auditors recognised an improvement in the analysis of man-hours per accident/incident. However, the statistical system started by Bisma Jaya did not allow for long-term comparisons.

*Investigation of Incident*

This category includes the necessity for a procedure to track and investigate incidents, to create an incident reporting form, ensure data collection about incidents, and analyse the chronology of incidents. In addition, the HSE committee should develop at its meetings, three analyses and a recommendation programme to prevent incidents and accidents.

The existing procedure did not allow for the identification of a basic cause of all accidents. As a response, Bisma Jaya took four actions: developing a 'cause-and-effect tree' analysis, analysing all former incidents, training team leaders in 'cause-and-effect tree' analysis, and implementing internal training in accident analyses.

*Sub-Contractors*
Managing sub-contractors requires a procedure for training and qualification, including HSE inspections and audits, HSE ratings, and the proper use of HSE documents by the sub-contractors. The rating system reviews how the HSE programme is implemented by sub-contractors. The external auditors analysed Bisma Jaya's management of HSE issues in its relationship with sub-contractors and asked for an improved implementation and a review of the procedures.

### 5.1.3 Other audit factors

Three other factors are part of the overall audit but not explicitly included in the rating score: safety campaign, housekeeping, and electrical issues. Corresponding measures, such as display of HSE posters and installation of electrical panels, have been implemented by Bisma Jaya in order to meet the HSE requirements of the contracting company in the three areas (not listed individually in Table 2), at a cost of IDR3,700,000.

The next section discusses the choice and application of different HSE accounting tools based on the decision situations the management of Bisma Jaya faced.

## 5.2 Decision situations and accounting for efficiency

The decision situation at Bisma Jaya is characterised by a mix of past-orientated physical HSE information and future-oriented monetary HSE information. Table 3 provides an overview of the auditing results and the cost implications relating to the improvement measures necessary if re-contracting is to be secured.

The Table provides an ex-post assessment of the past short-term non-monetary impacts (i.e. HSE deficiencies, see Figure 1; Box 11) and combines the information collected with a future-orientated ad hoc monetary assessment (see Figure 1; Box 7) of the necessary measures to improve the rating. A close inspection of Table 3 shows the costs of each measure, the costs to improve for one rating point, the rating for each rating item, the next rating step and the current score. The calculation and optimization of improved HSE rating points per IDR represents the idea of accounting for eco-efficiency (for an overview see e.g. Schaltegger 1998).

Table 3 shows in (physical) rating points and score figures how the results of an HSE audit and the measures taken by Bisma Jaya can flow into a non-monetary assessment. The accounting methods which support the company in i) meeting the rating requirements and ii) meeting them in the most cost-efficient way are shown in the HSE management accounting framework in Figure 1. The ex post assessment of short term HSE impacts (Figure 1; Box 11) supports the measurement and management of information shown in columns "rating" and "score" in Table 3. The costing approach (Figure 1; Box 7) supports calculations of the costs (Table 3; column "costs") and the most cost-efficient measures (Table 3; column "costs/rating point"). In addition, links to monetary and non-monetary HSE budgeting (Figure 1; Boxes 5 and 13) exist for the planning of future measures to improve HSE performance.

**Table 3. Overview of HSE measures, their contribution to rating improvement (physical measures) and their costs**

| Factor/Rating Item | Costs | Costs/ Rating Point | Rating A | B | C | D | Score (28/11 /05) | Next Step |
|---|---|---|---|---|---|---|---|---|
| 1. Policy Statement | 675,000 | 157,500 | 0 | 3 | 7 | 10 | 7 | 10 |
| 2. Emergency Response Procedure | 3,950,000 | 691,250 | 0 | 3 | 7 | 10 | 3 | 7 |
| 3. Safety Rules - Safety Manuals | 750,000 | 131,250 | 0 | 3 | 7 | 10 | 3 | 7 |
| 4. New Employee Orientation Programme | 3,387,500 | 790,417 | 0 | 3 | 7 | 10 | 7 | 10 |
| 5. HSE Meeting Program | 1,700,000 | 297,500 | 0 | 3 | 7 | 10 | 3 | 7 |
| 6. HSE Training Program | 21,272,500 | 3,722,688 | 0 | 3 | 7 | 10 | 3 | 7 |
| 7. Equipment and Material Management | 129,320,000 | 22,631,000 | 0 | 3 | 7 | 10 | 3 | 7 |
| 8. Personal Protective Equipment | 22,300,000 | 7,433,333 | 0 | 3 | 7 | 10 | 7 | 10 |
| 9. HSE Inspection Programme | 1,200,000 | 210,000 | 0 | 3 | 7 | 10 | 3 | 7 |
| 10. Accident Reporting Procedure | 3,600,000 | 840,000 | 0 | 3 | 7 | 10 | 7 | 10 |
| **Weighted Score HSE Primary Factors** = (SUM relevant score/SUM relevant maximum)*0.7 | | | | | | | **32** | |
| 11. Professional HSE Support | 600,000 | 30,000 | 0 | 5 | 11 | 15 | 5 | 11 |
| 12. Industrial Hygiene | 40,000,000 | 1,500,000 | 0 | 6 | 14 | 20 | 6 | 14 |
| 13. Environment | 40,940,000 | 1,535,250 | 0 | 6 | 14 | 20 | 6 | 14 |
| 14. Statistical Injury & Illness Data | 2,700,000 | 270,000 | 0 | 3 | 7 | 10 | 7 | 10 |
| 15. Incident Investigation | 2,400,000 | 180,000 | 0 | 5 | 11 | 15 | 11 | 15 |
| 16. Sub-contractor* | | | 0 | 6 | 14 | 20 | 6 | 20 |
| Other HSE measures** | 3,700,000 | | | | | | | |
| **Weighted Score HSE Secondary Factors** = (SUM relevant score/SUM relevant maximum)*0.3 | | | | | | | **12** | |
| **Overall HSE Score**= (Primary Score + Secondary Score) | | | | | | | **44** | |

* Cost for improvement measures regarding sub-contractor (rating item 16) are not considered here.
** Other HSE measures do not have impacts on the rating score.

The case study also highlights benefits and limitations of the efficient notion of "highly economically rational" responses to regulatory systems such as rating systems and audits. From a purely economic point of view Bisma Jaya can optimise its efforts to improve its rating by addressing the cheapest improvements per rating point (see in Table 3: professional HSE support for IDR 30,000 per rating point, then the writing of a safety rules manual for IDR 131,259 per rating point, then the development of a policy statement for IDR 157,000 per rating point, etc.). Depending on the risk Bisma Jaya wishes to accept the measures can be implemented until the minimum necessary rating has been achieved. Given that it is not possible to ensure that not more accidents or working days lost happen than planned, a tight targeting of the most cost-efficient HSE performance has a very high risk of failing. A purely efficiency oriented HSE approach would move Bisma Jaya into a position where even small accidents and incidents would likely result in insufficient rating results and thus curtail future bidding activity, which furthermore, would endanger the customer relationship and consequently the whole business. Therefore, even from a financial point of view, it appears sensible that the management continues to improve the overall HSE measures incrementally.

### 5.3 Further use of HSE management accounting

The costing of HSE measures is helpful for assessing the economic consequences of the measures taken. However, the HSE costing can also be used for further future-oriented decision making (see lower two rows in the framework in Figure 1) as they build a basis for subsequent budget settings. Periodic target-setting and budget control of HSE measures can help Bisma Jaya to ensure an on-going comparison between actual results and budgeted estimates and to implement corrective plans for the future, if considered necessary. Such a future-orientated cost management approach has been under development to improve both the HSE performance and cost performance. Moreover, short-term costing and budgeting can serve accountability processes and thus give credence to Bisma Jaya's efforts for continuous improvement of its HSE performance in the future.

### 5.4 Concluding Discussion

As with a large number of small suppliers in many industries, Bisma Jaya is influenced by a large customer who is closely observed by media and non-governmental organizations. The effect of legal requirements and the enforcement of laws may be limited in many regions in the world, specifically in more remote areas (e.g. Burritt et al., 2009), like the ones where many of the engineering and mechanical activities of Bisma Jaya take place This is why large international companies concerned about their reputation and negative effects which their suppliers may cause, increasingly implement privately organized regulation systems. Regulation with approaches such as rating systems and audits by customers and self-control by management become more important and play a crucial role in the design and implementation of HSE measures. In Bisma Jaya's case, such a privately organized regulation exists in the form of

process standards (Gunningham and Sinclair 1999) through the HSE rating system of the main client.

Consequently, business and financial risks emerging from insufficient HSE rating results revealed to be a main driver in Bisma Jaya's attempt to improve HSE performance. Bisma Jaya can only survive as a supplier if it demonstrates an improved HSE performance in non-monetary terms. The application of the proposed HSE management accounting framework to the Bisma Jaya case has supported management in choosing the adequate accounting methods to improve HSE performance and to ensure the choice of effective and cost-efficient implementation measures. More specifically, extended forms of management accounting tools with a physical and environmental emphasis provided support for improved decision-making by management. The improved audit results were achieved through tracking of HSE performance and identification of eco-efficient and eco-effective HSE improvement measures which were then implemented.

In the process of continuous improvement, Bisma Jaya is further challenged to apply HSE accounting methods routinely and to conduct internal audits on a regular basis to meet the requirements of the professional audits of the large main customer. Physical HSE management accounting has significant economic relevance for Bisma Jaya, even if the physical data collected are not directly related to internal monetary data of the company or if the improvement in terms of HSE rating points does not pay off with a cost reduction in operations. Failure to meet the required HSE performance can endanger the relationship with the core customer and lead to a total loss of the main business and terminate the existence of the company as a whole.

This case study also shows one particular limitation of the efficiency concept if applied too narrowly. Calculating the efficiency of different measures would not necessarily lead to the HSE performance result which is required by the main customer. A narrow calculative comparison of direct costs and cost reductions of measures to reduce HSE impacts would not justify further HSE improvement activities from a profitability and efficiency perspective. However, if efficiency is interpreted in a broader sense, acknowledging the potential loss of the main customer as an unlimited high economic risk, many improvements of HSE performance become compelling in efficiency terms and otherwise. As a consequence, calculating operational HSE-efficiency is only a partially useful concept when rating systems and audits have a strong influence on customer loyalty in general. In such cases the efficiency calculations have to be complemented by effectiveness considerations on HSE performance. In a narrow view, efficiency considerations can focus on the objective of how to reach an improved performance measured in rating scores and include a safety margin (e.g. 60 points) with the lowest cost possible. Such a narrow interpretation of applying the efficiency approach would, however, suggest doing just enough to avoid trouble and could involve the risk of not meeting the minimum standards when unforeseen events occur, thus creating further problems.

It would not be recommendable to reduce the activities of the company and the possibilities and benefits of en-

hanced accounting procedures to just meet minimal standards. The tracking, assessment and costing approach discussed allows the company to achieve the highest HSE benefit over time by entering a systematic process of improving its HSE performance in the least costly way possible. With increasing routine and experience many measures discussed may be achieved with lower costs than estimated. Further, some measures build on other measures and the self-regulation costs for their implementation may also decrease with a higher general standard. Even if Bisma Jaya aimed at achieving the highest score possible, it would make sense to start with implementation of the least costly actions and gradually to improve through more sophisticated actions over time. Furthermore, the company can also develop an annual budget for rating improvements and achieve the highest HSE improvement for this budget by following the recommendations suggested. An accounting supported approach to managing HSE, as discussed in this paper, represents a pragmatic but systematic way of addressing failures of the current HSE management system and measures to improve the performance.

Given that the HSE performance has to be improved, documented, audited and verified on a continuous basis, the HSE management accounting framework and its overview of tools can support an internal management development process and the most effective (in terms of HSE scores) and most cost-efficient achievement of the required HSE standards.

## References

Beske, P., Koplin, J. & Seuring, S. (2008) "The use of environmental and social standards by German first-tier suppliers of the Volkswagen AG", Corporate Social Responsibility and Environmental Management, Vol. 15, pp. 63 - 75.

Bowen, F.E., Cousins, P.D., Lamming, R.C. & Faruk, A.C. (2001) "The role of supply management capabilities in green supply", Production and Operations Management, Vol. 10, No. 2, pp. 174 - 189.

BSCI (2009) "Business social compliance initiative" http://www.bsci-eu.com (accessed 08.11.2011).

Burritt, R.L. & Schaltegger, S. (2001) "Eco-Efficiency in Corporate Budgeting", Environmental Management and Health, Vol. 1, No. 2, pp. 158 - 174.

Burritt, R.L., Hahn, T. & Schaltegger, S. (2002) "Towards a comprehensive framework for environmental management accounting: links between business actors and environmental management accounting tools", Australian Accounting Review, Vol. 12, pp. 39 - 50.

Burritt, R.L., Herzig, C. & Tadeo, B.D. (2009) "Environmental Management Accounting for Cleaner Production: The Case of a Philippine Rice Mill", Journal of Cleaner Production, Vol. 17, No. 4, pp. 431 - 439.

Carter, C.R. & Dresner, M. (2001) "Purchasing´s Role in Environmental Management: Cross-Functional Development of Grounded Theory", The Journal of Supply Chain Management, Vol. 37, No. 3, pp. 12 - 27.

Chima, C. (2007) "Supply Chain Management Issues in the Oil and Gas Industry", Journal of Business & Economics Research, Vol. 5, No. 6, pp. 27 - 36.

Clay, J. (2010) "An Explosion of Litigation: BP and Deepwater Horizon", Energy Litigation, Vol. 9, pp 1 - 6.

Commonwealth of Australia (2010) Report of the Montara Commission of Inquiry. Canberra: Commonwealth of Australia.

Cooper, M.C., Lambert, D.M. & Pagh, J.D. (1997) "Supply Chain Management: More Than a New Name for Logistics", International Journal of Logistics Management, Vol. 8, No. 1, pp. 1 - 14.

Cooper, M.C., Lambert, D.M. & Pagh, J.D. (1998) "Supply Chain Management: Implementation Issues and Research Opportunities", International Journal of Logistics Management, Vol. 9, No. 2, pp. 1 - 19.

Corbet, D. (2004) "Excellence in Canada. Healthy Organizations. Achieve Results by Acting Responsibly", Journal of Business Ethics, Vol. 55, pp. 125 - 133.

Desai, U. (1998) Ecological policy and politics in developing countries. Economic growth, democracy, and environment. New York: State University of New York Press.

Ehrenfeld, J.R. (2005) "Eco-efficiency. Philosophy, Theory, and Tools", Journal of Industrial Ecology, Vol. 9, No. 4, pp. 6 - 8.

Exploration and Production Forum of the Oil Industry (E&P Forum) & United Nations Environmental Programme Industry and Environment (UNEP IE) (1997) Environmental management in oil and gas exploration and production. An overview of issues and management approaches. London/ Paris: E&P Forum/ UNEP IE.

Gunningham, N. & Sinclair, D. (1999) "Regulatory pluralism: designing policy mixes for environmental protection", Law & Policy,Vol. 21, pp. 49 - 76.

Hall, J. (2000) "Environmental supply chain dynamics", Journal of Cleaner Production, Vol. 8, pp. 455 - 471.

Handfield, R.B. & Nichols, E.L. (1999) Introduction to Supply Chain Management. Upper Saddle River, N.J.: Prentice-Hall.

Health & Safety Executive (HSE) (2001) A Guide to Measuring Health & Safety Performance. Caerphilly: HSE.

Hillary, R. (1997) "Environmental Management Standards. What do SMEs Think?", in Sheldon, C. (ed.): ISO 14001 and Beyond. Environmental Management Systems in the Real World, pp. 333-358. Sheffield: Greenleaf Publishing.

Hobbs, J. (2000) "Promoting Cleaner Production in Small and Medium-Sized Enterprises", in Hillary, R. (ed.): Small and Medium-Sized Enterprises and the Environment. Business Impera-

tives, pp. 148-157. Sheffield: Greenleaf Publishing.

Holt, A. J. (2009) Principles of Health and Safety at Work. Wigston: IOSH Services.

International Association of Oil & Gas Producers (OGP) (2011) "ISO Post Montara and Macondo", Standards Bulletin, Vol. 12, p. 1.

Matos, S. & Hall, J. (2007) "Integrating Sustainable Development in the Extended Value Chain: The Case of Life Cycle Assessment in the Oil & Gas and Agricultural Biotechnology Industries", Journal of Operations Management, Vol. 25, pp. 1083 - 1102.

McNulty, S. & Crooks, E. (2010) "BP oil spill: A spreading stain", Financial Times, 6 May 2010.

Min, H. & Galle, W. P. (2001) "Green purchasing practices of US firms", International Journal of Operations & Production Management, Vol. 21, No. 9, pp. 1222 - 1238.

NZBCSD (New Zealand Business Council for Sustainable Development) (2003) Business guide to a sustainable supply chain: a practical guide. Auckland: NZBCSD.

Piplani, R., Pujawan, N. & Ray, S. (2008) "Sustainable supply chain management", International Journal Production Economics, Vol. 111, pp. 193 - 194.

Rikhardsson, P. (2004) "Accounting for the costs of occupational accidents", Corporate Social Responsibility and Environmental Management, Vol. 11, pp. 63 - 70.

Rikhardsson, P. (2006) "Accounting for Health and safety costs: review and comparison of selected methods", in Schaltegger, S., Bennett, M. & Burritt, R. (eds.) Sustainability accounting and reporting, pp. 129-152. Dordrecht: Springer.

Roberts, S. (2004) "Supply Chains as a Lever for Sustainability Progress, Prospects and Pitfalls", in Reddy, S. & Seuring, S. (eds.) Corporate Social Responsibility: Sustainable Supply Chains, pp. 1 -18. Punjagutta: ICFAI Books.

Scapens R.W. (1990) "Researching Management Accounting Practice: The Role of Case Study Methods", British Accounting Review, Vol. 22, No. 3, pp. 259 - 281.

Schaltegger, S. (1998) "Accounting for eco-efficiency", in Nath, B., Hens, L., Compton, P. & Devuyst, D. (eds.) Environmental management in practice, Volume I: Instruments for environmental management, pp. 272-287. London: Routledge.

Schaltegger, S. & Burritt, R. (2000) Contemporary environmental accounting: issues, concepts and practice. Sheffield: Greenleaf.

Scott, A. (2000) "Small-scale Enterprises and the Environment in Developing Countries", in Hillary, R. (ed.) Small and Medium-Sized Enterprises and the Environment. Business Imperatives, pp. 276-288. Sheffield: Greenleaf Publishing.

Seuring, S. & Müller, M. (2008) "From a literature review to a conceptual framework for sustainable supply chain management", Journal of Cleaner Production, Vol. 16, No. 15, pp. 1699 - 1710.

Walker, H., Di Sisto, L. & McBain, D. (2008) "Drivers and barriers to environmental supply chain management practices: Lessons from the public and private sector", Journal of Purchasing & Supply Management, Vol. 14, pp. 69 - 85.

Yin, R. (2003) Study Research: Design and Methods. Sage: Thousand Oaks.