

Managing Stakeholders or the Environment? The Challenge of Relating Indicators in Practice

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ABSTRACT

Many organizations present their environmental work in the form of annual reports and use the indicators in them for follow-up. However, internal communication and management is needed for environmental improvements. The indicators found in reports may be suitable for external communication, but are they also suitable internally and operationally?

This article reviews the existing literature on environmental indicators. With the help of an operational approach, from organisation theory, and a life-cycle approach, indicators are analysed. The analysis shows that formulating indicators for internal management is not an easy task; available guidelines are of little help. It is concluded that the environment can be managed internally by relating indicators. Therefore, an additional set of indicators for internal management and a wider responsibility for the life cycle are recommended. The analysis and recommendations are illustrated with examples drawn from the field of property management. Copyright © 2008 John Wiley & Sons, Ltd and ERP Environment.

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Introduction

'STOP IDEALIZING ENVIRONMENTAL EFFECTS – CORPORATE ACCOUNTANCY CONCERNING SUSTAINABILITY NEEDS TO BE improved' is the heading of a recent debate article by the Swedish Society for the Conservation of Nature (Gustafsson, 2007). 'It is vital that environmental goals contribute to business goals and vice versa so that one goal does not counteract the other' is stated in the discussion in the journal *Miljöaktuellt Affärer* (Grankvist, 2007). In fact, many organizations present their environmental work in the form of annual reports to various stakeholders. These external images can be seen regularly and are generally thought of as descriptions of environmental work inside the reporting companies. If this is so, then the indicators presented in these reports should reflect companies' managerial efforts to control their environmental performance. However, doubt has been raised about what the reported indicators represent and questions asked about their usefulness for environmental control in the companies.

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In the environmental management literature, there is a wide variety of practical guidelines for choosing relevant indicators: in the standards (the international standard for Environmental Management System, ISO 14001, and the European Eco-Management and Audit Scheme, EMAS) given in the sustainability literature as well as in the general environmental literature. There is an idea that having an environmental management system (EMS) will improve the performance of a company over time, and that this improvement can be monitored and influenced with the help of specific indicators. However, the standardized environmental management systems and audits do not automatically lead to improved performance (Ammenberg, 2003; Zobel, 2005). In practice, each sector and each company can make their own selection from over hundreds of examples of suggested indicators (ISO 14031, 1999; Schepereel *et al.*, 2001; Morhardt *et al.*, 2002). What kinds of indicator are the most appropriate? Since the practitioner does not get much help from the guidelines, the easiest way is to choose available operational data on energy use, material use and emissions, for example. In the Swedish building industry companies are better at defining an environmental policy than they are at collecting the data needed to evaluate their progress (Baumann *et al.*, 2003; Gluch *et al.*, 2007).

Environmental improvement requires internal communication and management coordination. The environmental indicators found in the annual reports may be suitable for external communication, but the question is whether they are also internally and organizationally meaningful for management that aims at environmental improvement.

Aim and Outline

This paper aims to raise our understanding of what makes environmental performance indicators useful internally to companies in managing the environment and present a critical discussion of the current literature. We analyse primarily the relevance of performance indicators to organizations and to the environment as they are described in the research literature. Our empirical basis for discussing indicators is found in studies of property management, more specifically in housing management (Brunklaus and Thuvander, 2002; Malmqvist, 2004; Brunklaus, 2005; Malmqvist and Glaumann, 2006; Brunklaus, 2007, under review). The emphasis of these studies was laid on the internal work of these companies, i.e. not on their annual reports. Accordingly, we present our understanding of environmentally useful indicators, based on a life cycle approach, and of internally useful indicators drawn from the literature on organizational theory and from experience in the field. Finally, examples of appropriate environmental indicators for the field of property management are suggested.

Overview of Literature on Environmental Indicators

A search to obtain an overview of the literature on indicators was conducted. In 1999, the ISO 14031 standard for environmental performance evaluation (EPE) was published. Today, research papers are still discussing the challenge of choosing and measuring indicators (Xie and Hayase, 2007; Schylander and Martinuzzi, 2007) and the lack of clear concepts (Kolk and Mauser, 2002), while in practice companies may not yet be aware of the existence of indicators or of ISO 14031 (Schylander and Martinuzzi, 2007).

The three basic types of indicator for environmental performance evaluation are discussed here: the managerial, operational and environmental condition indicators. For those interested in internal management, there exist separate terms for managerial indicators, management performance indicators (MPIs in the standardized literature) and environmental management indicators (EMIs in Kolk and Mauser, 2002); however, we continue using a more general term, such as managerial indicators.

Looking at how the different types of environmental indicator have developed and been used for performance evaluation, one finds variations. Operational indicators (OPIs in the standardized literature) seem to be the most advanced and widely used in comparison with managerial and environmental indicators (CRISP, 2007; SIS, 2005). They are reported more often and are clearer as to what they indicate to both internal and external users (Kolk and Mauser, 2002). Managerial indicators are still evolving. Principles for choosing managerial indicators differ depending on the type of literature. We found that sustainability literature tends to define specific and business-related principles (Wolf and Zaring, 2000, GRI, 2000–2006), whereas the standardized literature tends to define reactive and process-related ones (ISO 14031, 1999; EMAS, 2003). Environmental condition indicators (ECIs in the standardized literature) are mainly used by local and regional authorities for monitoring environmental goals, and seldom applied internally by companies (Kolk and Mauser, 2002; Xie and Hayase, 2007).

Organizational Relevance of Indicators

In this section we critically analyse the usefulness of indicators for internal management and draw from the literature in subjects such as organization theory.

Top-Down Indicators and Their Internal Relevance

Although both internal and external drivers are important (Zobel, 2005; Hamschmidt and Dyllick, 2001), managerial indicators are mostly thought of and interpreted as business indicators with an underlying notion of top-down management (Zobel, 2005). In ISO 14031, decision flows are visualized from the top, management, of the organization, to the bottom, operations, of the organization (ISO 14031, Figure 2, 1999). However, Power (1999) points out a gap between official auditing (top-down perspective) and operational praxis (bottom-up perspective); some researchers have found that implementation of an environmental management system does not necessarily lead to better environmental performance (Ammenberg, 2003; Zobel, 2005). Our research, among others, found that indicators need to be adapted to an internal context, e.g. with a bottom-up perspective (Bring Procopé and Axelsson, 2003; Brunklaus, 2005; Enroth, 2006; Thoresen, 1999; Malmqvist and Glaumann, 2006). Bring Procopé and Axelsson (2003) found that organizations driven by internal ambitions also achieved a higher rate of continual improvement than those which focus on customer pressure or owner requirements. Similar results are found in Brunklaus (2005). Brunklaus (2005) found that routines in internal management contribute more to improved environmental performance than to routines in environmental management. Thoresen (1999) found that internal decisions assisted by detailed indicators (for planning, monitoring, scenario evaluation and information purposes) lay the groundwork for reduction of environmental impacts from products and operations. Consequently, indicators need to be based on an internal approach.

Confusing Definitions and a Short-Term Perspective

Companies have difficulties defining managerial indicators. Existing guidelines confuse rather than help. Examples are the confusion within ISO 14001 about whether or not to include business concerns (Zobel, 2005) or the confusion about which of the approaches to choose for selecting indicators (ISO 14031, 1999; SIS, 2005): an operationally based 'cause-effect chain', business oriented and 'risk based' or environmentally oriented and 'LCA based'. These confusions have led to problems of establishing real environmental effects (Zobel, 2005). Another problem is that companies seldom include future perspectives in managerial indicators, even though future orientation has been stated in environmental literature (Kolk and Mauser, 2002; Nutek, 2003; Palme and Tillman, under review). The standard environmental management systems do not demand prognoses and future perspectives (Nutek, 2003). They include only short-term perspective of about 3–5 years, although some long-term activities in organizations may require a longer projection, such as renovation in housing management. In other words, for a better understanding of managerial indicators a long-term perspective is needed.

The Importance of Relating Indicators to Each Other

Some researchers point out the need to combine indicators with each other (Xie and Hayase, 2007; Scherpereel *et al.*, 2001; Olthoorn *et al.*, 2001). Most of them point out the importance of using both managerial and operational indicators (Kolk and Mauser, 2002; Olthoorn *et al.*, 2001; Tyteca *et al.*, 2002; Scherpereel *et al.*, 2001), but few point out the need for using both environmental and operational indicators (Malmqvist and Glaumann, 2006; Xie and Hayase, 2007). However, for environmental management to be effective, it is not enough to simply combine indicators. It is vital to find out *how* indicators relate to and represent various organizational–environmental 'cause-effect' chains. The commonly used normalization of indicators allows only assumptions about underlying cause-effect chains (Tyteca *et al.*, 2002; Xie and Hayase, 2007). Only one explorative example of organizational–environmental related indicators has been found (Malmqvist and Glaumann, 2006). They relate organizations' services to environmental problems in the form of cause-effect chains in order to select environmentally relevant indicators. Other attempts, not as explorative, have been found in the sustainability literature in the works of Funk (2003), Schaefer (2004) and Enroth (2006). Funk points out the importance of relating managerial indicators to business objectives. She concludes that, although identification of leading indicators is difficult, it is still better than having measurement indicators that are not connected with business objectives. She also points out

the need of a long-term strategic view for a comprehensive understanding of what is important for performance over time. Similar thoughts can be found in the works of Schaefer (2004) and Enroth (2006). Consequently, the challenge is to relate indicators to each other in an explorative way.

Organizational Theory Perspective on the Problem of Relating Indicators to Each Other

To overcome the challenge of relating indicators to each other, knowledge of organizational theory and general management literature can be helpful. Examples are the works of Kaplan and Norton (1996) and Hatch (2002). Kaplan and Norton introduced the concept of 'leading and lagging' indicators. Several environmental indicator researchers have also pointed out the importance of distinguishing indicators in this manner (Fiksel *et al.*, 1999; Kolk and Mauser, 2002; Xie and Hayase, 2007). The distinction between leading and lagging indicators is important, because lagging indicators describe the outcome of environmental work, whereas leading indicators describe its performance drivers (Kaplan and Norton, 1996). According to Fiksel *et al.* (1999), neither of them is sufficient on their own (Fiksel *et al.*, 1999; Xie and Hayase, 2007). In other words, leading indicators describe the strategies and the managerial methods used to meet long-term environmental goals.

Why are leading indicators (performance drivers) used so little? One problem is that leading indicators are more difficult to devise and assess. They have to be devised and developed for particular business units, in contrast to lagging indicators, which are defined more generally (Kaplan and Norton, 1996). Another problem is that leading indicators can be assessed only for the long term (Kolk and Mauser, 2002) and long-term perspectives are rarely used by companies (Nutek, 2003). *How are leading and lagging indicators related?* According to Kaplan and Norton, relationships are a hypothesis of cause–effect chains, which can be better expressed by a sequence of if–then statements. They give an example of a sales unit: 'if we increase employees' training in knowing about products, they will become more aware of the range of products. If they are aware of the range, their sales effectiveness will improve. If their sales effectiveness improves, the average margins for the product they sell will increase' (Kaplan and Norton, 1996).

In organization theory there is an important distinction between *official* and *operational* goals (Hatch, 2002), which corresponds well to the distinction between leading and lagging indicators. Official goals function as a reference frame (leading) in which to develop operational goals. In contrast, operational goals are mainly used to facilitate concrete action strategies and procedures specific for units and individuals, but also for evaluation (lagging) (Hatch, 2002). The relation between official and operational goals can be described as leading and lagging and can be a helpful guide in selecting such indicators. Moreover, there is another important distinction between *managerial* and *technical* indicators in organization theory (Hatch, 2002). The relationships between managerial and technical indicators can be described as leading and lagging and can be a helpful guide in relating such indicators. Hatch (2002) points out that these indicators (managerial and technical) need to be related to both official goals and operational goals. These distinctions and relationships can be helpful guides in selecting sets of indicators. Before doing so, we need to take note of the somewhat confusing terminology.

In the environmental literature, there is a problem in defining and interpreting the terms 'operational' and 'managerial'. In environmental literature, 'operational' indicators are simply interpreted as technical indicators, and 'managerial' is simply interpreted as corporate management. These differences in definition mean that managerial indicators (MPIs) are often interpreted as leading and operational indicators (OPIs) as lagging in the environmental literature (Xie and Hayase, 2007; ISO 14031, 1999; Kolk, 2000; Fiksel *et al.*, 1999).

Additionally, in organization theory each organization is unique (Hatch, 2002). Each organization has to deal with an internal complexity comprising contrasting goals, both the external goals of stakeholders and internal goals (e.g. demand for governing versus flexibility or short profit versus market) and changes over time (Hatch, 2002). However, few researchers in the environmental indicator literature mention the importance of specific and unique indicators (Enroth, 2006; Dahlsrud, 2008; Lawrence *et al.*, 2002). Instead, there is a whole movement to seek generality (Azzone *et al.*, 1996; Young and Welford, 1998; Thoresen, 1999; Tyteca *et al.*, 2002). This generality is intended for comparison on an 'external' context, not for managing internal processes. Environmental problems are unlikely to be solved by general indicators. Consequently, the set of indicators need to be specific and unique.

To sum up, the organization theory perspective can help to select and relate indicators. The concept of 'leading and lagging', and the distinctions between official and operational as well as between managerial and technical, are critical. It is important for each company to describe their relationships as if–then statements. Indicators need

to be specific and unique. A long-term strategic view also is important, as well as the linking of indicators to business objectives. The organizational theory perspective has also shed some light on the simplified and misleading interpretations of the terms 'operational' and 'managerial' in environmental literature.

Environmental Relevance of Indicators

In this section we critically analyse the usefulness of indicators for environmental effective management and draw from an LCA-based approach.

Significant for Whom? The Environment or the Organization?

There is another problem of interpreting terminologies in the environmental literature, such as 'significant' and 'direct'. The 'significant' environmental aspect in the standardized literature refers to environmental impact (ISO 14001, 1996) as well as to organizational control and influence (ISO 14031, 1999). In environmental literature, most researchers interpret 'environmental aspects' as direct ones (Sayre, 1996; Johannson, 1997; Schoffman and Tordini, 2000), while EMAS (2003) refers to direct and indirect organizational control. The terminologies 'significant' and 'direct' used in the standard literature refer to both the environment and the organization, which can create confusion.

General Indicators and the Importance of Uniqueness

In the environmental indicator literature, there is a movement to seek generality to facilitate comparisons (Azzone *et al.*, 1996; Young and Welford, 1998; Thoresen, 1999; Tyteca *et al.*, 2002). In the standardized EMS literature, there is a trend towards unification of diverse things, such as the quality of work and the environment (Jørgensen and Simonsen, 2002; Karapetrovic, 2002). As stated before, environmental problems are not likely to be solved by general indicators. Each environmental indicator has to be specific and unique not only for the organization, but also for a given environmental context, such as local environmental conditions.

The Importance of the Life-Cycle Approach

Three approaches to selecting indicators are given by ISO14031: cause-effect, risk based and the life-cycle approach. In practice, a variety of methods are used, since ISO leaves the method open for each individual organization. Ammenberg (2003) states that the difficulties in assessing environmental aspects originate from ISO's lack of guidance. As a result, methods for assessing the environment differ among organizations; easily accessible indicators suggested by guidelines (ISO 14001, 1996) are used by organizations rather than indicators relevant to the environment (Malmqvist and Glaumann, 2006; Olsthoorn *et al.*, 2001).

We agree with Ammenberg (2003) and Zobel (2005) in suggesting the use of the life-cycle approach, for example employing LCA not only to distinguish between direct and indirect impacts, but also to identify internal and external causes. The distinction between direct and indirect impacts was used by Brunklaus and Baumann (2004); the distinction between external and internal influences has been stated by several authors: see Thoresen (1999), EMAS (2003), Malmqvist and Glaumann (2006) and Zobel (2005). In practice, mostly direct impacts are considered, although indirect environmental aspects could also be significant, e.g. in banks' environmental performance (Nutek, 2003; Korhonen, 2003). The reason for this might be that indirect impacts are still optional within the standardized environmental management systems.

To sum up, for environmental indicators to be organizationally meaningful and environmentally effective, organizational cause-effect chains with a life-cycle perspective are needed. In our studies of housing organizations we have observed such organizational cause-effect chains to the environment (Brunklaus, under review; Malmqvist and Glaumann, 2006) and can therefore suggest examples.

Organizationally Meaningful and Environmentally Effective Indicators

In the following, selected concepts found in the literature are re-conceptualized in terms of organizational theory and a life-cycle approach. The previously outlined problems in the literature on environmental indicators are further explored in relation to our research experiences in the field of property management.

Meaningful Environmental Indicators Based on the Literature

The challenges found in the literature regarding environmental indicators are threefold:

- (1) *Relating indicators to goals.* How can indicators be defined to reflect environmental and business goals well? The distinctions between official (both environmental and business) and operative goals and between leading and lagging indicators are important here.
- (2) *Relating indicators.* How can organizationally meaningful cause–effect chains between different types of indicator be formulated? The distinctions between managerial and technical indicators and between leading and lagging indicators are valuable here.
- (3) *The environmental challenge.* How can environmentally effective cause–effect chains be identified? Better description of the life cycle (e.g. the distinction between direct and indirect) is needed.

To sum up, organizational relevance and environmental relevance are both important for effective indicators. Without them managers may not be able to achieve improvements.

For the *organizational relevance* of environmental indicators, the distinctions between official and operative goals and between leading and lagging indicators are important. Meaningful environmental evaluation is reached by relating performance drivers to their results. The challenge lies in defining unique performance drivers (leading indicators) and relating them to unique results (lagging indicators). One could say that environmental performance evaluation means to work with meaningfully related indicators. Possible combinations of these indicators, shown in Table 1, are those relating official to operational goals and others relating managerial to technical indicators.

As we believe, the operational relationship forms the basis for the official relationship. Hence, the managerial–technical relationships (Relationship 4, Table 1) is the most important one, describing the internal capacity, so to say. Reviewing existing literature, such as the work of Malmqvist (2004) or Xie and Hayase (2007), the problem in practice lies in following external demands. Therefore managerial indicators, MPIs, are simply thought of as official indicators based on managerial assumptions (Relationship 1, Table 1). Performance indicators, OPIs, are simply thought of as operational indicators based on technical assumptions. However, to devise achievable official goals, managerial assumptions need to be based on operational capacity (Relationship 4, Table 1), and technical assumptions need to be based on managerial methods and strategies (Relationship 3, Table 1), otherwise they will lack support.

Applying a *life-cycle approach* to indicators provides an important distinction between direct aspects (foreground system) and indirect aspects (background system) both for the influence of the organization and for the effects on the environment, as recognized by Thoresen (1999) and Heiskanen (2000). The life-cycle perspective not only provides us with an assessment tool (LCA), but also represents a type of thinking that could help make companies aware of the (potentially largest) environmental burdens related to their products: these burdens lie outside their own traditional organizational scope of responsibility. The next section exemplifies cause–effect chains, specific to property management, through our empirical studies.

Experience from the Field of Swedish Property Management

We will now turn to the way Swedish property management practice has handled the previously outlined problems. Our research is based on several case studies; both qualitative and in-depth studies are listed:

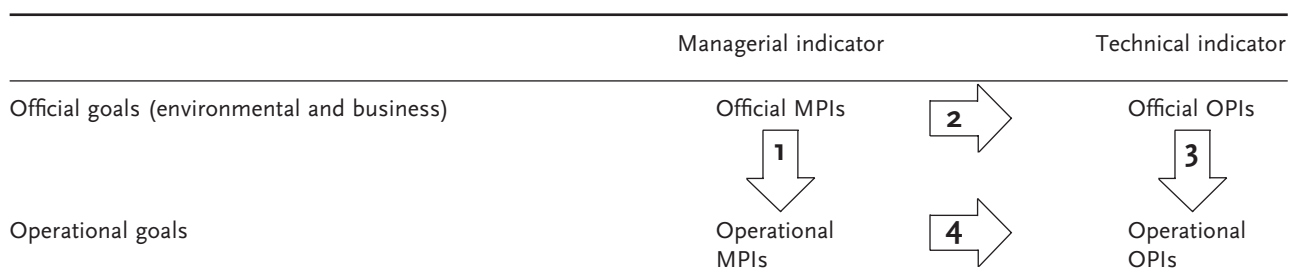


Table 1. MPIs and OPIs are put into the context of official–operational goals and managerial–technical indicators. An arrow symbolizes a leading–lagging relationship

- a qualitative study of environmental management system (EMS) practice in nine Swedish property management organizations considered to have an ambitious environmental management practice (Malmqvist, 2004);
- an in-depth study of two organizations that aimed to propose environmentally relevant indicators for internal EMS practice in housing management (Malmqvist and Glaumann, 2006);
- a qualitative study of environmental data availability at 12 Western Swedish property management organizations, with emphasis on the internal use of environmental data and on the awareness of LCA and time perspectives (Brunklau and Thuvander, 2002) and
- an in-depth comparative study of four properties, held by four organizations, which aimed to trace organizational cause–effect chains to the environmental with the help of LCA, a long-term perspective and internal operational action chains (Brunklau, 2007, under review).

The Top-Down Approach and the Importance of Internal Management

Among the nine environmentally ambitious companies, indicators were seldom used as an internal working tool, although they were adopted for reporting to the top management, board and external stakeholders on the progress of the environmental practice. At the time of the studies, there were hardly any attempts at these companies to adapt and tailor indicators to specific situations and practitioners in the organizations (Malmqvist, 2004; Malmqvist and Glaumann, 2006).

The in-depth study of four technically similar buildings, which aimed to trace organizational cause–effect chains to the environmental, revealed that the general and environmental work is not coordinated (Brunklau, 2005, 2007). While the environmental coordinator at one of the companies was occupied with their environmental management system, the renovation unit of the same company planned a large renovation of their building stock by raising the material standard of apartments rather than adopting energy-efficient solutions, and the operational unit was trying to control energy use through thermostat regulation (Brunklau, 2005). Internal operational management was in this case environmentally more important than environmental management. The effect was a 30% higher energy use than another company, which was focusing on energy-efficient renovation.

The qualitative study on environmental data availability revealed that organizational change, in the form of reorganizations or replacement of staff and turnovers of properties, led to data loss (Brunklau and Thuvander, 2002). The study also revealed that very few companies actively record long-term trends (Brunklau and Thuvander, 2002). Under such circumstances it is difficult to have environmental control over operations, in either the short or the long term.

Relating Indicators

The qualitative study on environmental data availability revealed that related indicators were hard to find. Environmental performance outcomes were not used to follow up managerial indicators. Instead, they were simply explained by internal management processes, such as increase in energy use due to reorganization. Neither managerial indicators nor environmental condition indicators were used (Brunklau and Thuvander, 2002). Similar observations were made for the environmentally ambitious companies (Malmqvist, 2004). However, one company used managerial indicators that concerned the communication with, and distribution of environmental information to, tenants. A few years later, a small number of companies had occasionally started to report CO₂ emissions from energy use (Malmqvist and Glaumann, 2006). This means that related indicators are seldom used in the investigated companies.

Environmental Approaches Used

Companies' environmental work in their organizations is driven by a variety of approaches, e.g. 'regulations', 'Natural Step', 'Agenda 21' or 'eco-cycle thinking', but not by life-cycle thinking (Brunklau and Thuvander, 2002). As a result, life-cycle based environmental data, for example outflow data on waste and waste water, is limited. Only one company reached the conclusion that the material flows into the buildings have to be lowered in order to minimize the outflows. Most property companies do not even consider upstream suppliers (energy supplier, water supplier, material supplier) or downstream processes (waste water treatment, waste treatment) in their environmental work. The more ambitious companies had rudimentary environmental performance evaluation (Malmqvist, 2004). Most organizations (but not all) followed up data on energy use (electricity, heating and hot

water) on a regular basis, since these are easily accessible. It was very obvious that the accessibility of data, to a great extent, steered what indicators were used. As a consequence, it was hardly possible to trace a life-cycle or systems perspective with indicators defined in this way.

To sum up, the problems found in the literature also showed up in the practice of the Swedish property companies. Although a life-cycle perspective is suggested, companies are using a more general approach. They consider mostly their own environmental influence; it is seldom that they see an environmental 'holism' or 'extended responsibility' in their own actions and those of others. Companies' interpretations of organizational cause and environmental effect chains are crucial for environmental improvements. In the next section we exemplify these chains.

Meaningful Examples of Environmental Indicators for Swedish Property Management

Applying lessons from theory and practice, we develop examples of more organizational and environmental relevant indicators in the field of Swedish property management. Table 2 exemplifies the leading-lagging relationships shown in Table 1, and gives examples of related indicators for a water saving program.

Managerial indicators meeting official goals (official MPIs) are based on a water-saving programme involving management of taps and washing machines. Managerial indicators meeting operational goals (operational MPIs) represent the number of apartments or properties with water programmes. Relationship 1 can thus be described as 'if an overall water programme involving changes of taps is introduced, then a larger number of apartments and properties covered by the water saving programmes is the outcome'. In turn, Relationship 2 can be described as 'if a water saving programme is introduced, then the total water use will be reduced'. Relationship 3 becomes 'if there is a reduction in percentage of total water use in litres (L), then water use will be reduced per apartments and per property'. Relationship 4 can be described as 'if a higher percentage of apartments or properties has water programmes, then the water use per apartments or property will be reduced'.

However, the crucial relationship is the last one, linking managerial indicators (operational MPIs) with technical indicators (operational OPIs) to meet operational goals, because it shows organizations' underlying assumptions on how to solve the problem or reach the goal. In our example, the assumption is based on a physical approach, e.g. the change of water taps or washing machines can lead to reduced water use. For better understanding of the link between the technical system and water use, the users have to be included. Water is not used without the influence of the user opening or closing the tap or using a washing machine. Perhaps the management concerned need to consider an information approach on user behaviour before deciding on the material approach of changing taps. For the environmental consequences of water use, information about water production and wastewater treatment has to be added, such as chemical oxygen demand per litre (COD/L), biological oxygen demand per litre (BOD/L), nitrogen per litre (N/L) or phosphorus per litre (P/L).

In another example, concerning energy use, the significance of the distinction between direct and indirect environmental effects is illustrated. This makes visible how strategies for improvements can be chosen in different ways.

	Managerial indicator		Technical indicator
Official goals (environmental and business)	Water saving program (change of taps and/or change of washing machines)		Total water use (L) % reduction of total water use
Operational goals	% of apartments or properties with water saving programme No of apartments or properties with water saving programme		Water use (L/apartment) (L/property)

Table 2. MPIs and OPIs and their relationships for a water saving program. An arrow symbolizes a leading-lagging relationship

	Direct environmental effect	Indirect environmental effect
Direct organizational influence (in-house services)	Own energy supply	Thermostat regulation Insulation measures
Indirect organizational influence (external services)	Green energy supplier	Green user behaviour

Table 3. The distinction between indirect and direct, both for the cause (influence of the organization) and for the effect (on the environment): an example of energy use for heating in housing management

Environmental impacts can be influenced by in-house services. For example, an organization can choose between end-of-pipe solutions, such as thermostat regulation, or preventive investments, such as insulation. However, environmental impacts can equally be influenced by external services, such as green energy supplier or green user behaviour (Browne and Frame, 1999). Table 3 summarizes some energy choices. Most companies in the property sector work with thermostat regulation, while insulation measures or choosing an energy supplier could offer greater environmental effects (Brunklaus, 2005; Brunklaus *et al.*, 2008).

Conclusions

Historically, accounting has been a ‘language of business’ (Kaplan and Norton, 1996; Power, 1999). Today, indicators are a language of reporting and follow-ups. However, descriptions of indicators intended for external reports are not enough. They need to be identified within the language of internal operational management and control. We recommend that companies identify an additional set of such indicators for internal management. The reason for this is the observation that environmental reports are not objective descriptions of this work. They are, rather, a means for organizations to gain the trust of society (Power, 1999). Environmental work is much more than the representations in such reports, where the work is mostly reduced to follow-ups of technical outcomes. It is the internal management that is important for environmental improvements: (A) how internal management is going to drive performance goals, e.g. if the company consider a physical or an information approach, or (B) how environmental management is adapted to companies’ policy and objectives. Accordingly, different sets of indicators need to be identified to reflect (A) and (B). The internal indicators should reflect performance drivers and follow-ups, both managerial and technical; they should also relate to environmental goals, both official and operational.

Although external and internal sets of indicators overlap to some degree, it is important to acknowledge that managing and reporting internal processes are separate applications for indicators, with different requirements and conditions. The following four examples illustrate how difficult it is to achieve an effective environmental control under the following circumstances.

- (1) Indicators in external reports (as suggested in ISO 14031) are based on a top-down management approach, while a bottom-up approach is needed for setting achievable environmental goals and devising meaningful performance drivers.
- (2) The ISO 14031 guidelines give little instructive help on devising performance drivers, relating them to follow-ups or relating them to official goals (and relating environmental to business strategies). As a result, general business and environmental work may all too often take separate paths in practice.
- (3) Indicators in external reports (as suggested by ISO 14031 guidelines) reflect different approaches, but only one environmental one, the life cycle approach. Swedish property managers choose more general environmental approaches; life-cycle approaches are rare in practice; organizational cause and environmental effect chains are seldom recognized; and significant indicators are those easily collected, but not necessarily relevant environmentally.
- (4) Indicators in external reports (as suggested by ISO 14001 guidelines) reflect more the direct causes and direct effects, while indirect causes and effects are seldom described. However, it may be the indirect causes and effects that have the greatest environmental impact. In a life cycle perspective, reduced local impacts could

lead to increased impacts elsewhere, e.g. change to environmental technology, but increase the use of the technology. By using only EMS, organizations might not see this kind of life-cycle related relationship. They might also pass the responsibility to other organizations.

To overcome the difficulties discussed here and to foster communication between external and internal management, honesty about complexity may allow more trust to both internal and external stakeholders; a better understanding of the organizational–environmental problem *could* eventually lead to real solutions.

References

- Ammenberg J. 2003. *Do Standardised Environmental Management Systems Lead to Reduced Environmental Impacts?* Environmental Technology and Management, Dissertation 851. Linköping University: Linköping, Sweden.
- Azzone G, Noci G, Welford R, Young C. 1996. Defining environmental performance indicators: an integrated framework. *Business Strategy and the Environment* 5(2): 69–80.
- Baumann H, Brunklaus B, Gluch P, Kadefors A, Stenberg AC, Thuvander L. 2003. *Environmental Business Barometer for the Swedish Building Sector*, Environmental Systems Analysis (ESA) Report 2003:2. Chalmers University of Technology: Gothenburg, Sweden.
- Bring Procopé C, Axelsson U. 2003. *Is the Environmental Performance Improved Through an Environmental Management System?* Report B1529. IVL Swedish Environmental Research Institute: Stockholm.
- Browne S, Frame I. 1999. Green buildings need green occupants. *Eco-Management and Auditing* 6: 80–85.
- Brunklaus B. 2005. *Organizational Background to Environmental Impacts: Field Study on Housing Managed in Gothenburg*, Environmental Systems Analysis (ESA) Report 2005:1. Chalmers University of Technology: Gothenburg, Sweden.
- Brunklaus B. 2007. Understanding organizational influence on environmental performance: studies of housing management in Sweden. 3rd Conference on Life Cycle Management, Zürich, 2007.
- Brunklaus B, Baumann H. 2004. Environmental improvement potential for housing management: LCA's possibilities for organisational studies. SETAC Conference, Prague, 2004.
- Brunklaus B, Thormark C, Baumann H. 2008. Beyond pure energy accounting: introducing environmental and actor perspectives in comparisons of passive and conventional buildings. *Environmental Systems Analysis*. Chalmers University of Technology: Gothenburg, Sweden.
- Brunklaus B, Thuvander L. 2002. Do Swedish property management companies have the necessary conditions for environmental management? An interview study on environmental data availability. Greening of Industry Network Conference, Gothenburg, Sweden, 2002.
- CRISP. 2007. *A European Thematic Network on Construction and City Related Sustainability Indicators*. <http://crisp.cstb.fr/default.thm> [3 September 2007].
- Dahlsrud A. 2008. How corporate social responsibility is defined: an analysis of 37 definitions. *Corporate Social Responsibility and Environmental Management* 15(1): 1–14.
- Eco-Management and Audit Scheme (EMAS). 2003. *Kommisionens Rekommendation för EG Förordning nr. 761/2001 Eco-Management and Audit Scheme*, Europeiska Unionens Officiella Tidning 2003/532/EG. http://ec.europa.eu/environment/emas/pdf/guidance/guidanceo8_sv.pdf [23 July 2003].
- Enroth M. 2006. *Developing Tools for Sustainability Management in the Graphic Arts Industry*, Dissertation TRITA-CSC-A 2006:19. Computer Science and Communication, The Royal Institute of Technology: Stockholm.
- Fiksel J, McDaniel J, Mendenhall C. 1999. Measuring progress towards sustainability: principles, process, and best practices. Best Practice Proceedings at the Eighth Greening of Industry Network Conference. The Greening of Industry Network: Chapel Hill.
- Funk K. 2003. Sustainability and performance. *MIT Sloan Management Review* 44(2): 65–70.
- Global Reporting Initiative (GRI). 2000–2006. *Sustainability Reporting Guidelines*, Version 3.0. <http://www.globalreporting.org/ReportingFramework/G3Guidelines/> [21 May 2007].
- Gluch P, Brunklaus B, Johansson K, Lundberg Ö, Stenberg AC, Thuvander L. 2007. *Environmental Business Barometer for the Swedish Building and Property Sector 2006*. Centrum for Management in the Building Sector CMB, Chalmers University of Technology: Gothenburg, Sweden.
- Grankvist P. 2007. Konsten att belöna miljöarbete [The art of rewarding environmental work]. *Miljöaktuellt Affärer* No. 6.
- Gustafsson J. 2007. *Sluta Skönmåla Miljöpåverkan: Företagens Hållbarhet-Sredovisningar Behöver Förbättras [Stop Idealizing Environmental Effects: Corporate Accounting Concerning Sustainability Needs to be Improved]*. Swedish Society for the Conservation of Nature, Miljöaktuellt Nr. 5.
- Hamschmidt J, Dyllick T. 2001. ISO 14001. Profitable? Yes! But eco-effective? *Greener Management International* 36: 43–54.
- Hatch MJ. 2002. *Organisationsteori*. Studentlitteratur: Lund, Sweden.
- Heiskanen E. 2000. Managers' interpretations of LCA: enlightenment and responsibility or confusion and denial? *Business Strategy and the Environment* 9: 239–254.
- International Organisation for Standardization ISO14001. 1996. *Environmental Management Systems: Specification with Guidance for Use*. Swedish Standards Institute (SIS): Stockholm.
- International Organisation for Standardization ISO 14031. 1999. *Environmental Management—Environmental Performance Evaluation: Guidelines*. Swedish Standards Institute (SIS): Stockholm.

- Johansson L. 1997. The challenge of implementing ISO 14001 for small and medium sized enterprises: surviving in the new global jungle. *Environmental Quality Management* 7(2): 9–19.
- Jørgensen TH, Simonsen G. 2002. Prospects of a unified management system. *Corporate Social Responsibility and Environmental Management* 9: 91–98.
- Kaplan R, Norton D. 1996. *The Balanced Score-Card: Translating Strategy into Action*. Harvard Business School Press: Boston, MA.
- Karapetrovic S. 2002. On the concept of a universal audit of quality and environmental management systems. *Corporate Social Responsibility and Environmental Management* 9: 147–156.
- Kolk A. 2000. *Economics of Environmental Management*. Financial Times–Prentice-Hall: Harlow, UK.
- Kolk A, Mauser A. 2002. The evolution of environmental management: from stage models to performance evaluation. *Business Strategy and the Environment* 11: 14–31.
- Korhonen J. 2003. Sustainable banking – the greening of finance: a book review. *Corporate Social Responsibility and Environmental Management* 10(2): 112–114.
- Lawrence E, Andrews D, Ralph B, France C. 2002. Applying organizational environmental tools and techniques. *Corporate Social Responsibility and Environmental Management* 9(2): 116–125.
- Malmqvist T. 2004. *Property Management with Environmental Problems in Focus: About Environmental Regulation in Property Management Organizations*. Royal Institute of Technology: Stockholm.
- Malmqvist T, Glaumann M. 2006. Selecting problem-related environmental indicators for housing management. *Building Research and Information* 34(4): 321–333.
- Morhardt JE, Baird S, Freeman K. 2002. Scoring corporate environmental and sustainability reports using GRI 2000, ISO 14031 and other criteria. *Corporate Social Responsibility and Environmental Management* 9(4): 215–233.
- Nutek (Swedish Agency for Economic and Regional Growth). 2003. *More Effective Environmental Management Systems: a Study on Fails, Needs and Possibilities for Improvements*, Report 5304. Nutek: Stockholm.
- Olsthoorn X, Tyteca D, Wehrmeyer W, Wagner M. 2001. Environmental indicators for business: a review of the literature and standardised methods. *Journal of Cleaner Production* 9(5): 453–463.
- Power M. 1999. *The Audit Society: Rituals of Verification*. Oxford University Press: New York.
- Sayre D. 1996. *Inside ISO 14000: the Corporative Advantage of Environmental Management*. St. Lucie Press: Delray Beach, FL.
- Schaefer A. 2004. Corporate sustainability – integrating environmental and social concerns? *Corporate Social Responsibility and Environmental Management* 11(4): 179–186.
- Scherpereel C, Van Koppen K, Heering F. 2001. Selecting environmental performance indicators: the case of Numico. *Greener Management International* 33: 97–114.
- Schoffman A, Tordini A. 2000. *ISO 14001: a Practical Approach*. Oxford University Press: New York.
- Schylander E, Martinuzzi A. 2007. ISO 14001: Experiences, effects and future challenges: a national study in Austria. *Business Strategy and the Environment* 16: 133–147.
- Swedish Standards Institute (SIS). 2005. *Environmental Goals and Indicators: Driving Forces for Continuous Improvement with ISO 14031*. SIS: Stockholm.
- Thoresen J. 1999. Environmental performance evaluation: a tool for industrial improvement. *Journal of Cleaner Production* 7: 365–370.
- Tyteca D, Carlens J, Berkhout F, Hertin J, Wehrmeyer W, Wagner M. 2002. Corporate environmental evaluation: evidence from the MEPI project. *Business Strategy and the Environment* 11(1): 1–13.
- Wolf R, Zaring O. 2000. Indicators for sustainable development. SPE International Conference on Health, Safety, and the Environment in Oil and Gas Exploration and Production, Stavanger, Norway, 2000.
- Xie S, Hayase K. 2007. Corporate environmental performance evaluation: a measurement model and a new concept. *Business Strategy and the Environment* 16: 148–168.
- Young W, Welford R. 1998. An environmental performance measurement framework for business. *Greener Management International* 21: 30–49.
- Zobel T. 2005. *Environmental Management Systems: Policy Implementation and Environmental Effects* (PhD thesis). Department of Business Administration and Social Sciences, Luleå University of Technology: Luleå, Sweden.