Limitations of cleaner production programmes as organisational change agents. I. Achieving commitment and on-going improvement

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Abstract

This is the first in a two-part paper that discusses the results of an evaluation of a 2-year 'cleaner production' (CP) demonstration project undertaken in New Zealand (NZ). The project's scale and methods were consistent with international best practice and the methods used were consistent with those advocated in traditional CP or 'pollution prevention' (PP) guides and manuals. On the surface, the project could be considered to have been successful. Like other apparently successful demonstration projects carried out elsewhere, the demonstration businesses identified a range of options that improved their environmental, economic and social performance (including savings of over NZ$4 million per annum, and significant reductions in materials, water and energy use, and improvements in productivity).

However, a more in-depth evaluation of the project raised significant questions about the ability of traditional CP/PP programme components to bring about durable change. The evaluation identified a set of key internal organisational factors that strongly contributed towards the uptake of CP and affected the potential for on-going improvement. They were commitment, leadership, support, communication, staff involvement and programme design. This part of the paper (Part I) provides an overview of the project, as well as the methodology used in the evaluation. It also includes a discussion of the results particularly as they relate to commitment and on-going improvement. Part II discusses the remaining key internal organisational factors. It also presents a framework that could potentially be used to enhance the performance of CP or similar types of programmes, particularly with regard to the key factors identified.
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1. Introduction

New Zealand's (NZ's) Target Zero (TZ) project was what is commonly referred to as a 'cleaner production' (CP) or 'pollution prevention' (PP) 'demonstration' project. It was designed to show that the prevention or reduction of wastes and emissions at source can improve

the environmental, as well as economic performance of participating organisations.

TZ was the first NZ CP/PP project that was comparable with large, multi-sector projects that had been conducted successfully elsewhere (e.g., the Landskrona project in Sweden, the PRISMA project in The Netherlands and the Aire and Calder project in the UK). The TZ project was initiated by NZ's major power generator and wholesaler, the Electricity Corporation of New Zealand (ECNZ) and funded by NZ's Ministry for

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the Environment (MfE). The main aims of the project were:

1. To *demonstrate* that CP/PP can improve the environmental, as well as economic performance of participating organisations, and
2. To use a multi-company approach to establish a critical mass and thereby enhance the potential for the programme to endure beyond the 2-year project period [1].

The project involved a mixed group of 23 demonstration organisations (mostly businesses) from two regions, the power retailers and local authorities from those regions, as well as consultants, researchers and students. The project adopted a programme that was consistent with best practice approaches used elsewhere in the world. Staff from participating organisations were trained in and applied the methods commonly used for CP/PP programmes. Assistance was provided during the 2-year project period by consultants, staff from the electricity companies and local councils, as well as students.

The programme components were consistent with those used in successful CP/PP programmes, e.g. the USEPA's *Facility Pollution Prevention Guide* [2] and The Netherland's *Manual for the Prevention of Waste and Emissions* [3] — now commonly referred to as 'traditional' programmes [4]. The above-mentioned guides were widely used in Europe and the US prior to the start of the TZ project and contributed significantly to the development of the resource materials used for the project. The USEPA's guide has since been updated (see Ref. [4]) and there are now many other sources of advice on sustainability-related programmes for business. However, the results of the TZ evaluation are still relevant because the programme contained a number of components that continue to be recommended and advice that continues to be applied (e.g., see Refs. [4—6]).

The programme components were: development of an environmental policy; organisation and planning; a waste and emissions prevention assessment/audit, and identification, evaluation and implementation of options for improvement. These were all required to form a part of an on-going cycle of improvement (see Fig. 1). These cyclical programme components follow the standard 'plan-do-check-act' approach used for the International Organization for Standardization's (ISO) quality and environmental management systems standards (the ISO 9000 and ISO 14000 series) and the European Union's Eco-Management Audit Scheme (EMAS).

2. Evaluating the TZ project

Traditionally, economic and environmental benefits have been used as the basis for evaluating the effectiveness of CP/PP programmes. Using these criteria,
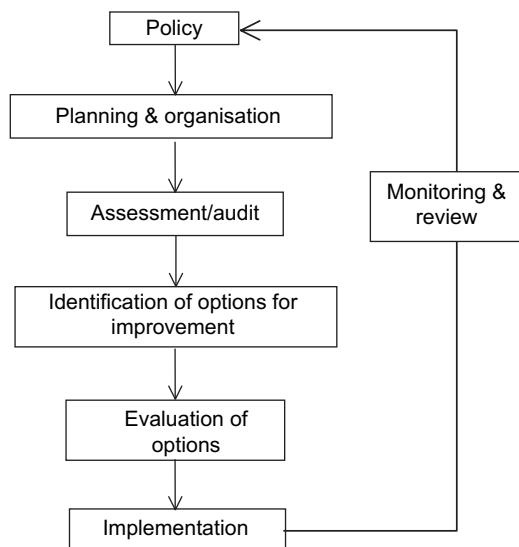
Fig. 1. 'Traditional' CP/PP programme components used for the TZ project.

the TZ project could be considered to have been successful. It resulted in annual savings of NZ$4 million and a wide range of environmental benefits (see Table 1). However, the results of a more in-depth evaluation suggest otherwise.

The project was evaluated using different methods that are commonly referred to as 'evaluation research' (e.g., [7,8]) or 'programme evaluation' (e.g., [9]). Ellis [7] describes evaluation research as a type of applied research that "assesses the effectiveness of programs [that are] intended to alleviate social, health, or interpersonal problems". Posavac and Carey [9] focus more on the process, describing programme evaluation as "a collection of methods, skills and sensitivities" that are used to provide insight into various aspects of the effectiveness of programmes. These include the need for the programme, the likelihood of its use, the likelihood of its meeting identified needs, whether it is provided as planned, and whether it delivers what is desired "at a reasonable cost and without unacceptable side-effects" [9].

Table 1
Environmental and economic benefits resulting from the Target Zero (TZ) project

Environmental indicators	Quantities (yr)		Savings (yr)
	Region 1	Region 2	
Inputs			
Water (m^3)	364,200	94,200	$62,190
Fossil fuels (GJ)	26,430	17,740	$265,300
Electricity (MWh)	430	535	$63,550
Material	$1,155,970	$489,440	$1,645,410
Outputs			
Trade waste (m^3)	387,280	123,990	$116,210
Solid waste (te)	1680	890	$239,300
Product	$710,890	$684,160	$1,395,050
CO_2 emissions (te)	2590	1850	4440 tonnes

te = Tonne equivalents. Source: [21].

There are a number of different models that can be used for evaluation research. The TZ project was evaluated in three parts, using a combination of the following models:

- the 'traditional' model, whereby an informal impression of a programme is gained from someone who is associated with it in some way;
- the 'social science research' model, whereby a group participating in the programme (the experimentation group) is compared with another that is not (the control group);
- the 'objectives-based' model, whereby the extent to which a programme achieves its stated objectives is measured;
- the 'expert opinion' model, whereby the programme is examined and judged (often in a subjective way) by an expert; and
- the 'goal-free' model, whereby the programme itself, as well as its positive and negative effects, are studied without focusing on goals and objectives (see Ref. [9]).

For Part I of the evaluation, personnel from participating businesses were asked, at the end of the project, to provide feedback on benefits and possible improvements. For Part II, the same personnel from participating businesses, as well as those from a systematically selected random group of non-participating businesses, were asked to provide insight into the existence within their businesses of a set of organisational, operational and attitudinal indicators considered to be potentially of relevance to CP/PP uptake. This was repeated at the start, during and at the end of the 2-year project period. Comparison between the two groups was used to identify any changes that could be attributed to the project. For Part III, consultants were asked to submit monthly progress reports for each organisation. They provided insight into a broad range of factors contributing towards or hindering the application of uptake.

The evaluation identified a wide range of structural, human relations, environmental (or contextual), political, and cultural factors that contributed to or hindered uptake. While individual businesses showed unique sets and manifestations of factors, the following were found to limit the uptake in a broad range of organisations: lack of commitment; lack of leadership, particularly by top-level managers[1]; lack of internal support for team members; poor internal communication; failure to extend staff involvement beyond the project team; and

incompatibility of the project with the organisation's culture, needs and existing projects. These limitations served to de-motivate staff, caused the project to be marginalised and its economic and environmental benefits to be ignored. Most importantly, however, these limitations prevented organisational (as opposed to individual) learning and *minimised the likelihood of on-going improvement*.

Failure to achieve on-going improvement cuts to the core of sustainability. This is because businesses are unlikely to undertake the magnitude of changes required of them in one great leap. All of the best-practice guides on CP/PP strongly emphasise the need for on-going improvement (e.g., [2–4]). This is because they assume that organisations will be unlikely to eliminate environmentally unsustainable practices with the first attempt and that they will therefore need to use a series of incremental improvements.

While this incremental approach is criticised by some authors (e.g., [10]), it serves to moderate the ideologically driven calls for environmental improvement in businesses, and is therefore likely to remain a strong feature of future business activities in this regard. It also appears more consistent with iterative models for organisational learning (see Section 4). It is also worth noting that even transformational approaches recognise the need for on-going improvement (e.g., [11]).

The following sections discuss, in light of the TZ results, the way in which commitment and on-going improvement are dealt with in examples of CP/PP guides, and use organisation theory (particularly as it relates to change and learning) to draw conclusions about why commonly-presented advice on gaining commitment and on-going improvement may be responsible for failure in these areas. Three basic assumptions have led me to focus, for the purposes of this paper, on these two areas alone. The first is that the TZ evaluation suggests that on-going improvement is the most important measure of success in a sustainability programme. The second is that it is inextricably linked to commitment, and the third is that failure in these two areas will render successes in the others (i.e. leadership, support, communication and involvement) meaningless.

3. Sources of limited achievement in commitment on-going improvement

3.1. Commitment

Within the literature on CP/PP, as well as environmental management (EM), discussion of commitment generally revolves around top-level management. Early literature on the implementation of CP/PP (e.g., [2,3]) identifies top-level commitment as being essential for success, and this emphasis continues in more recent

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[1] The term *top-level managers* is used to describe CEOs and/or senior managers. While it is recognised that these two groups play different roles, they tend not to be distinguished within the CP/PP literature. The two groups are referred to only when the results of the evaluation warrant it and when specifically relevant for learning.

updates (e.g., [4,12]). It is also echoed in early and more recent literature on environmental management (e.g., [13–17]). This emphasis may be due, in part, to the rational authority that is vested in top-level managers and the expectation that they can play a significant role in driving change within organisations. However, despite stressing the *importance* of top-level commitment, prevalent CP/PP guides pay little attention to the process of actually *gaining* or *enhancing* it.

Advice in this regard commonly includes a 'pre-assessment' to identify low cost opportunities with quick pay-back periods. However, it is not always clear who will conduct this and how it will be justified in the *absence* of top-level commitment (e.g., [2,3]). More recent guides include many references to the need for top-level commitment and provide insight into what management should do to *demonstrate* it (see below), but still do not provide much insight into what can be done to ensure that commitment itself is developed or enhanced (e.g., [4]). There is also a common assumption that a cost-benefit analysis will guarantee management support.

In retrospect, it is apparent that the advice provided for the TZ project was similarly deficient. While the importance of commitment was stressed, little advice was given on how to achieve it (see Ref. [18]). There was a heavy reliance on the assumption that a marketing type of exercise will 'sell' the concept to senior management and, if not, that a 'project champion' will be able to render this relevant. Feedback from respondents in the TZ evaluation suggests that the first assumption cannot be relied upon. Participants appear to have responded negatively to generic information, particularly case studies from other sectors, and it seems reasonable to assume that such material may be equally insufficient to gain commitment from senior managers. The second assumption also has a tenuous base. TZ team members did not necessarily have experience or backgrounds that would enable them to facilitate changes of this magnitude. They tended to have been chosen to participate in the project teams because of their technical skills and/or enthusiasm for the project. The suggestion that benefits (economic, as well as environmental) and a "step-by-step" approach to realise them are sufficient to commit top-level managers to the project that is highly mechanistic[2], and the results of the TZ evaluation found it to be inaccurate.

More than two thirds of those allocated responsibility by their organisations for the TZ project were primarily involved in production or operations and, of those, all had technical backgrounds (even those with managerial roles). Since these people were, in most cases, effectively playing the role of change agent, a lack of marketing expertise may have contributed to their inability to enhance CEO commitment. In addition to the lack of expertise, there is also a 'Catch-22' situation involved here. If a change agent's senior manager is not committed to the work, how will s/he get the support necessary to carry out the work that s/he will *use* to gain commitment from that senior manager? The implication is that the change agent will need to carry out the work *without* the support of their senior manager. The question then becomes: when and how is s/he likely to do this, and what are the implications? The situation would be particularly untenable if CP/PP responsibility were to be allocated at a relatively low level in the organisation. Another related question is: how important is the role of top-level managers really, if subordinates can be expected to be able to carry out this type of work without their support?

Newton and Harte [10] believe that this over-optimism is prevalent in much of the literature on environmental management in business. They believe that it is misleading to suggest that programme components such as policy, audits and management systems can easily be developed and implemented. They believe that such prescriptions for change in organisations rely heavily on the assumption that "organizations will *voluntarily* become greener" [10]. The results of the TZ evaluation, particularly the analysis of the progress reports, seem to support this criticism. They show just how difficult it really is for organisations to develop and implement change programmes.

Newton and Harte [10] also question the existence of external drivers (upon which rest the success of the marketing exercises mentioned previously), suggesting that they have more to do with "evangelical rhetoric" than reality. For example, there is no evidence to suggest that the changes made by TZ organisations improved their competitive advantage. The results of the evaluation neither confirmed nor refuted a link between environmental performance and competitive edge, although some respondents recommended that the project be improved by *providing* opportunities for increasing market share.

In summary, two features appear to stand out in the coverage of top-level commitment, and both are paradoxical in nature. On the one hand, top-level commitment is considered to be extremely important and essential for the success of a programme, yet on the other hand little advice is given on how to gain it. In the cases where such advice is given, it is characterised by the need for a change agent who will undertake

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[2] The term *mechanistic* refers to the rational or normative approach to organisations whereby decision-making is based primarily on costs and benefits. Goals are set to maximise benefits and minimise costs, and organisational structure (allocation of roles and responsibilities for achieving the goals) is the primary focus. This approach has long been recognised in mainstream organisational literature as being flawed because it is too simplistic, ignoring the influences that human relationships, organisational politics and culture, as well as external factors, have on an organisation's performance.

a marketing exercise that will sell the programme to top-level managers. Success is therefore heavily dependent on the existence of external drivers, as well as the commitment and marketing abilities of the change agent.

In addition, if the change agent is internal and subordinate (as is suggested in the results of the evaluation and the above-mentioned literature), it is questionable where s/he would get the authority and support necessary to do the work to gain top-level commitment. His/her efforts may also be seen as an incursion into the managers role (see Ref. [19]), and may therefore result in defensive routines. Such defensive routines are characterised by an unwillingness to change deep-seated assumptions that govern behaviour, without which old patterns of behaviour will tend to be reinforced and the opportunity for learning new behaviours will be minimised (e.g., see Ref. [20] and Section 4).

The potential for defensive routines may be heightened in the case of approaches to top-level managers about the sustainability-related performance of their organisations. The change agent will not only be questioning the organisation's performance, but also challenging the manager's authority and the contributions that s/he has made to any impacts that the organisation may have had.

3.2. On-going improvement

The TZ project appears to have been successful in bringing about improvements in specific environmental performance indicators (e.g. raw materials, water and energy use – see Ref. [21]). These changes are consistent with, and occurred as a result of, the application of common CP/PP methods and tools, particularly a waste and emissions prevention assessment/audit that included an input/output analysis, and identification and evaluation of CP/PP options. However, the evaluation suggests that on-going improvement was unlikely to occur in most organisations, and the programme can therefore be considered to have been deficient in this regard.

As mentioned earlier, the importance of on-going improvement is stressed in literature on the application of CP/PP, as well as other sustainability-related approaches. Earlier and more recent guides draw attention to the need for iterative cycles of assessment, performance improvement and review (e.g., [2–4]). Some suggest that the frequency and timing of assessments should be linked to the project budget, the organisation's budgeting cycle and any special needs that may arise (e.g. changes in raw materials, products, costs, regulations and technology, or the occurrence of accidents), and that they need to be integrated into the philosophy and strategy of the organisation, including

marketing, production and administration (e.g., [3]). Others identify the specific types of activities that will help to encourage iteration, including allocation of responsibility and establishment of programmes to promote employee involvement, including awareness-raising, training, provision of information, encouragement, recognition and reward (e.g., [2,4]).

In earlier guides, advice on how to incorporate CP/PP into an organisation's strategic planning process is sketchy, although some do identify critical factors that would contribute towards the process, including two-way communication between management and employees (e.g., [2]). More recent literature identifies the need for visionary goals to drive improvement (e.g., [4]).

The resource materials used for the TZ project take a similar approach to earlier guides in terms of on-going improvement (see Ref. [18]). They focus on describing the process as cyclical, involving monitoring progress towards goals and reviewing the programme in accordance with the results. Monitoring and review are covered last in a sequence of phases (as exemplified in Fig. 1). While the advice appears to be useful, a number of observations are possible in light of the results of the TZ evaluation (particularly the progress reports). Very little detail is provided on exactly what needs to be done to ensure that on-going improvement will occur. Like earlier guides there is heavy reliance on the inclusion of a monitoring/review phase and participants' willingness to repeat the cycle. Little advice is provided on *how* to ensure that this willingness exists.

Traditional guides also tend to be top-down and mechanistic in their approach, apparently relying on the ability of an executive level decision, the expression of commitment through policy, and the existence of an agreed set of goals to motivate everyone to play their role in achieving on-going improvement. They tend to provide only perfunctory advice on barriers or obstacles that may prevent or hinder on-going improvement. While obstacles/barriers that may be encountered during the course of the programme are identified, the responses to them are simplistic. They appear to rely not only on the *willingness* of participants to overcome them, but also on their *ability* to do so. There appears to be strong reliance on the assumption that participants will work it out for the sake of achieving a set of pre-determined goals, and that they will know how to do so (e.g., [2,3]). This is in strong contrast to developments in organisation theory that recognise that individuals do not necessarily pull together to achieve a particular set of goals: human relations, external influences, internal politics and organisation culture all affect their behaviour and decision-making (e.g., see Refs. [22–24]).

While some of the limitations identified above still apply to the more recent USEPA guide, the latter does recognise that there can be considerable difficulties in getting on-going improvement to occur and that these

difficulties can be related to organisational values, inappropriate goals and inadequate attention to change management and iterative learning processes (see Ref. [4]). These assertions are based on lessons learned from previous experiences with traditional CP/PP approaches and resonate with conclusions from the TZ evaluation, which are discussed below and further in Part II of this paper. The majority of TZ organisations encountered obstacles during the project period that were complex, difficult to overcome, prevented or delayed progress, and served to frustrate and de-motivate staff. Nowhere did the existence of an environmental policy and set of goals appear to alleviate to any significant extent the difficulties encountered in overcoming obstacles.

Another obvious characteristic of the earlier CP/PP guides is that they emphasise right at the beginning the need for on-going improvement, but they provide advice on how to achieve it at the end (e.g., [2,3]). Since the phases in both are sequential and adherence to this sequence is implied (if not obligatory), it is possible that consideration of the need for on-going improvement would occur only at the end of the other phases (i.e. *after* planning, organisation, assessment, and evaluation and implementation of options for improvement). A considerable amount of effort may therefore have gone into the programme before the mechanisms for ensuring on-going improvement are put in place.

The significance that CP/PP programmes place on on-going improvement, and the apparent failure of the TZ project in this regard, suggest that mechanisms for ensuring that on-going improvement occurs need to be given more prominence at the start of the programme and be incorporated into its design.

In addition, the results of the evaluation of the TZ project certainly emphasise that people, not policies and goals, are what bring about change in organisations. If staff are inadequately equipped (particularly in terms of motivation, knowledge, skills and experience) and do not have the resources (particularly in terms of authority and support), they are unlikely to be prepared for the difficulties they will encounter during the course of what is likely to be a significant change programme. This is confirmed to some extent by the relative ease with which technical problems were able to be overcome in the TZ programme (most participants had technical back-grounds), in contrast to the difficulties encountered in overcoming non-technical problems. While consultants with an appreciation of the latter were sometimes able to assist in this regard, the extent depended on their own abilities (which again tended to be technical), as well as the receptivity of the team, and the political and the cultural characteristics of the organisation.

Moxen and Strachan [25] are critical of the way in which the processes advocated in the earlier guides tend to result in "technical adjustments to production pro-cesses and reductions in wastes and emissions". While they agree that these strategies have improved environ-mental performance, they also suggest that they have led businesses to misunderstand the scale and complexity of the social changes that are necessary, and to ignore the role that non-technical forces play in the process [25].

This criticism is consistent with early developments in organisation theory that represent a progression away from mechanistic, efficiency-driven approaches, towards humanist approaches that recognise the roles that people play in bringing about change. Higgins [12] provides an example of attempts to recognise some of the social elements of CP/PP implementation. While the pro-gramme components he suggests are similar to those advocated in the earlier CP/PP guides, his approach appears less prescriptive, and gives prominence to moti-vating elements such as rewards and recognition, the inclusion of operations personnel in planning, and the use of a project champion. In addition, Futornick [26] advocates the use of 'total quality environmental management' (TQEM) principles to assist organisations to progress from compliance-driven to sustainable phases in environmental management and identifies the need for flexibility. Drawing from the criteria used for a US national quality award, she advocates the application of seven key areas of "organizational excellence": leader-ship; effective use of human resources, information and analysis; strategic planning; quality-related assurance and results; and customer satisfaction (see Ref. [26]).

While Futornick's recommendations suggest greater recognition of the human side of organisational change, she does have a cost–benefit focus that suggests they may still be primarily mechanistic. As with previously mentioned guides, the importance of senior manage-ment commitment is stressed, but then taken as a given. In addition, there appears to be heavy reliance on the assumption that everyone involved will simply "pull together for a common [environmental] purpose" [26]. It is inferred that the challenge of environmental sustain-ability, together with the heroism of industry will be enough for the transition to occur [26]. This, together with the simplistic coverage of the seven key areas of organisational excellence, serves to emphasise, rather than provide a counter to a mechanistic approach.

Inkson and Kolb [24] suggest that what total quality management (from which the concept of TQEM was derived) actually achieves is less than what the rhetoric would suggest. While it is believed to incorporate important aspects of all the key developments in organisation theory, they suggest that obvious problems tend to be dealt with first and that on-going improve-ment thereafter is difficult to sustain [24].

The later USEPA guide suggests that these types of management systems provide useful mechanisms for on-going improvement (see Ref. [4]). Guidance appears to extend beyond the purely mechanistic by recognising the

importance of organisational culture and a shared vision, core values and beliefs (see Ref. [4]). While these innovations occurred after the TZ evaluation, they are important and are further discussed in light of the TZ results and in relation to the framework that is presented in Part II of this paper.

In summary, earlier guides recognise the importance of on-going improvement, but appear to provide inadequate and simplistic advice on how to achieve it. Like commitment, the importance of on-going improvement tends to be stressed at the start of earlier guides. However, advice on how to achieve it tends to be included as the last step in a programme and tends to focus on monitoring and review. While monitoring and review can contribute towards on-going improvement, they do not necessarily do so on their own. The importance of incorporating CP/PP into business strategy and planning is emphasised, but little detail is given on how to achieve this.

There is again emphasis on the need for commitment as a precursor to on-going improvement, but little (other than environmental policy) is suggested as a means to ensure that commitment is actually achieved and that it does lead to on-going improvement. Internal communication, and staff awareness and involvement are also recommended, but details on how to ensure that they lead to on-going improvement are lacking. There seems to be over-optimism about participants' willingness and abilities to ensure that on-going improvement occurs, as well as under-emphasis of the significance of non-technical obstacles that will be encountered and the methods that can be used to overcome them.

While overcoming technical obstacles tends to rely heavily on technical expertise, overcoming non-technical obstacles can be influenced considerably by the organisational context within which participants operate. The focus on goals, structure, costs and benefits in common CP/PP guides suggest mechanistic tendencies that ignore, simplify or under-emphasise the political and cultural characteristics of the organisation itself.

4. Enhancing commitment and on-going improvement

Previous sections have already alluded to the contrast between the essentially mechanistic nature of traditional CP/PP programmes and developments in organisation theory. It seems useful, therefore, to consider how relevant theoretical developments may help to address the difficulties in achieving commitment and on-going improvement. In order to do so, it is pertinent to consider what exactly commitment and on-going improvement mean, particularly within the context of the role that top-level managers play within organisations. (This is because top-level managers remain key players in the change process. Some knowledge of the role they play is necessary to determine what sort of approach would be most likely to fit in with their existing work and whether it is feasible for them to be able to respond.)

With regard to what commitment means, it is interesting to note that none of the above-mentioned examples of CP/PP literature define top-level commitment. Coverage in traditional guides tends to be limited to how it may be expressed (e.g. through an environmental policy or the allocation of resources). Similarly, its importance is frequently referred to in the literature on organisation change, but it does not appear to be defined there either.

The most relevant definition provided by the Oxford Compact Dictionary (1996) suggests that commitment is "…an obligation that restricts freedom of action". It could, therefore, be argued that commitment by top-level managers would equate with them *restricting the activities of their businesses to those that are consistent with sustainability*. There are examples of businesses where some such restrictions are not only evident, but also attributed to CEO commitment (e.g. The Body Shop International). However, it seems likely that the majority of CEO's do not restrict business activities in this way. Or, if they do, that the restrictions are only partial.

The results from the TZ evaluation suggest that none of the participating organisations had this level of commitment. Particularly noteworthy were the relatively superficial nature of the changes in even the better performing businesses, the poorly rated contributions of top-level managers and the low incidence of indicators such as the inclusion of environmental performance in staff appraisals. While it is possible that this level of commitment did, indeed, exist but was not being reflected in action, there was no evidence in the TZ results to suggest that this was the case. It seems reasonable to assume, therefore, that for the majority of TZ organisations, gaining top-level commitment to restrict business activities in this way would be a major undertaking.

The prominence given to top-level commitment in the CP/PP literature may suggest a top-down approach. This type of approach could be consistent with a rational/mechanistic approach to organisation theory, where the CEO occupies a position at the top of a structure that has been developed using rational principles and is ultimately responsible for maximising the organisation's mechanical efficiency. The emphasis on cost-benefit analysis for marketing and implementation purposes suggests a bias towards rational principles. (Indeed, the systematic, goal-driven approach that is commonly used for CP/PP appears to have mechanistic tendencies.) It is not surprising, given this mechanistic bias, that so much emphasis is placed in the CP/PP literature on top-level commitment. Neither is it surprising that the advice given on how to gain or

enhance such commitment tends to involve a cost-benefit analysis. This rational/normative decision-making model (and the associated high level of confidence in the ability of a cost-benefit analysis to convince top-level managers to commit their organisations to CP/PP principles) is consistent with a mechanistic approach. It tends to ignore the well-established fact that behavioural decision-making is seldom, if ever, rational (see Ref. [27] for a thorough overview of developments in this regard as they relate to organisations).

However, it is interesting to note that once they have emphasised the importance of top-level commitment (and the use of cost–benefit analysis to achieve it), traditional CP/PP guides appear to extend beyond the purely rational/mechanistic to include humanist and contingency approaches to organisational change. While the rational approach is demonstrated by the pre-dominance of policies, goals and/or targets as drivers, and structure (roles and responsibilities) for achieving them, the humanist approach is demonstrated by requirements for staff involvement and teamwork (although it could be argued that the goal-oriented way in which these elements are prescribed for CP/PP programmes has more to do with rational than humanist principles). The contingency approach is demonstrated by the contribution that the organisational environment (e.g. regulations, markets) is expected to make to goals and strategies.

While the other major areas of interest for organisational change management − organisational politics and culture − tend to receive little or no attention in traditional CP/PP guides, it follows from the inclusion of humanist principles that commitment needs to be instilled within other staff, not just top-level managers.

Keogh and Polonsky [28] suggest that it is not clear to what extent the values of individuals affect policy-making and implementation. They believe that *organisational* commitment can only occur if "a critical mass of organisational members" is committed [28]. They define "corporate environmental commitment" as:

"The process whereby the corporation and its individual members embrace a concern for the natural environment in such a way that it becomes an integral component of the corporation's core values. This must go beyond minimum legislative prescriptions and involve all levels of the corporate structure. It requires that the corporation seek, through the attitudes and behaviours of its individual members, constantly and progressively to minimise the detrimental environmental impacts of all its activities, while ensuring that the necessary monitoring and funding are in place to enable all objectives, including environmental objectives to be achieved." [28].

This definition suggests the need for changes to the "core values" of an organisation, or what Schein [29] refers to as "basic underlying assumptions" and Argyris and Schön [22] refer to as "theories-in-use". Understanding of these concepts has the potential to enhance our ability to develop sustainability programmes that deliver commitment and on-going improvement. Before introducing them, it is important to recognise their place within the context of organisational culture and learning. Schein's definition of organisational culture provides a useful basis for doing so.

According to Schein [30], organisational culture is "*the pattern of basic assumptions that a given group has invented, discovered or developed to cope with its problems of external adaptation and internal integration, and that have worked well enough to be considered valid, and therefore to be taught to new members as the new way to perceive, think and feel in relation to those problems*". Organisational culture is therefore the manifestation of the learning that has occurred within an organisation to enable members to deal with the two main problems that the members of groups face: integrating with each other and responding to external influences.

Basic underlying assumptions are the deepest of three levels at which organisational culture is manifested, the other two more superficial levels being "artefacts" and "espoused values". Artefacts are described as the tangible or visible features that occur at the surface level of an organisation's culture, e.g. architecture, language, technology, products and style. They may be easy to identify, but their significance in terms of the organisation's culture may be hard to decipher. Espoused values are described as the "strategies, goals and philosophies" that are presented as the values of the organisation. They differ from "basic assumptions" because they are not considered to have been validated by shared experiences of success [29].

An example of an espoused value is the expression in a particular organisation that "customers come first". While this may be relayed as the organisation's philosophy, it does not become a basic assumption until members of the group have experienced its value and accept, as a group, its validity. Values or beliefs that begin as basic hypotheses, but are repeatedly shown to be effective in response to a particular situation, gradually move through what Schein refers to as a "cognitive transformation". They progress to become shared values or beliefs and finally, basic assumptions that are "so taken for granted that [there is] little variation within a cultural unit" [29].

Argyris and Schön [20] developed their concept of "theories-of-use" when considering that the difficulties faced by people learning new theories may have been more a function of their old theories than the difficulties associated with the new ones. They used the term in reference to the theories that underlie the actions that people know to undertake in a particular situation in order to achieve a certain outcome (see Ref. [20]).

Argyris and Schön's work provides a link between the learning behaviour of individuals and the learning behaviour of organisations [31]. Their early work focused on theories-of-relevance to human actions, particularly in organisations, and how they could be used to bring about changes to the status quo. This led them to an in-depth analysis of organisational learning, which they defined in terms of *outcomes*, as well as the *processes* used to achieve those outcomes. They described two sources of learning: the creation of a "match" between intention and effect, and the detection and correction of a "mis-match" (see Fig. 2). A match between intention and effect serves to confirm governing variables (synonymous with Schein's basic underlying assumptions). A mis-match, on the other hand, has two possible outcomes: learning that serves to change behaviour and learning that serves to change the theories that underlie behaviour [20].

Argyris and Schön pointed out that learning requires processes that involve the "framing" or design of an idea, and its implementation. They suggested that the extent to which learning occurs depends on the actor's (or organisation's) theories-of-use. They distinguished theories-of-use from "theories-of-action" in that the former actually govern actions, while the latter are merely espoused (i.e. they are communicated to others, but do not necessarily govern action). Theories-in-use include assumptions not only about "self, others and the situation", but also the relationships between "action, consequence, and situation" [20]. This distinction is consistent with Schein's distinction between espoused values and basic underlying assumptions (see Ref. [29]). It is important because it is believed to provide an explanation for inadequacies in the application of common change management models (e.g. those based on Lewin's "unfreezing, moving and refreezing" model – (e.g., cf. [24,32]). While Lewin's model and its derivatives were believed to be of value at an abstract level, when applied, there were gaps between what was expected to happen and what actually happened (similar to the situation when CP/PP programmes are expected to act as organisational change agents). These gaps were attributed to the inadequacy of the model/s in bringing about changes to the basic assumptions or "governing

variables" of the individuals' theories-in-action, i.e. their theories-in-use [32].

In order to develop a model for breaching these gaps, Argyris and Schön advanced the concepts of "single- and double-loop learning" (see Refs. [20,32,33]). Single-loop learning is described as learning that brings about a change in theories-of-action *without* changing theories-of-use, while double-loop learning brings about changes to the latter (see Fig. 2) [33].

While Keogh and Polonsky's use of the term "core values" [28] could be taken to suggest "espoused values", rather than basic underlying assumptions, the emphasis that they place on critical mass appears consistent with the social validation that Schein associates with basic underlying assumptions rather than espoused values. This is also suggested by the distinction that Keogh and Polonsky make between commitment as defined above and "superficial lip-service", the latter possibly synonymous with espoused values. However, their suggestions for gaining or enhancing commitment appear to be limited to the investigation and analysis of the "mental models" of individuals who will be involved in the programme, and the use of this knowledge to design communication strategies that will generate "cooperative approaches to the achievement of…environmental goals" (see Ref. [28]).

Keogh and Polonsky use Meyer and Allen's [34] three components or dimensions of organisational commitment as a basis for the mental models they believe should be investigated. The three components can be described as "affective" commitment (which is associated with "emotional attachment to, identification with, and involvement in supporting environmental issues"), "continuance" commitment (which is associated with aversion to the economic and social costs associated with environmental effects), and "normative" commitment (which is associated with a sense of obligation) [34].

While Keogh and Polonsky recognise a relationship between commitment and mental models, their consideration of them as a means to achieve an end suggests a mechanistic approach to organisational change. They provide an example of the manipulation that is commonly criticised in humanist approaches (e.g., [27]). The most telling suggestion of this comes from Keogh and Polonsky's affirmation of Mueller's assertion that "team working can be regarded as a modern attempt to re-align individual motivation with organizational rationality" (cf. [28]).

This approach is in strong contrast to Argyris and Schön [20], Schein [29] and Senge [35] who advocate the need to initiate a learning process that serves to *change* theories-in-use, basic underlying assumptions or mental models (respectively), rather than use them for manipulative (and mechanistic) purposes.
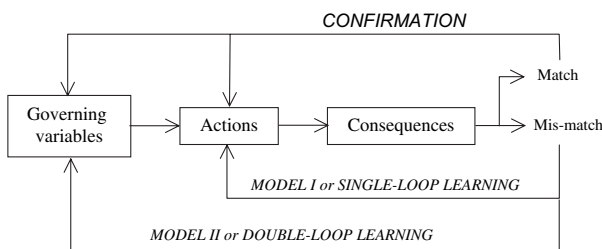

Fig. 2. The relationship between single- and double-loop learning within the context of the key components of learning. Source: [32].

Argyris and Schön [20] distinguish between external and internal commitment. The former (consistent with continuance and normative commitment, as described by Keogh and Polonsky [28]) involves an externally-driven reward or penalty, while the latter (consistent with affective commitment) involves the personal satisfaction that comes from a particular choice of action. Internal commitment is one of the governing variables of Model II theory-in-use, which Argyris and Schön believe results in double-, rather than single-loop learning. The governing variables for the two models are summarised in Table 2.

Comparison of the two sets of variables suggests that the methods advocated in traditional CP/PP literature for enhancing commitment (e.g. the use of cost-benefit analyses) are more consistent with the governing variables identified for Model I theory-in-use, than with those identified for Model II. If this is the case, then the resulting CP/PP programmes seem more likely to deliver superficial changes to actions than the cultural changes that are required for commitment and on-going improvement.

According to Argyris and Schön's models, the governing variables mentioned above provide the basis for "action strategies" that have behavioural, as well as learning consequences. The action strategies that are associated with the two theories-in-use are also presented in Table 2. Those for Model I theories-in-use result in defensiveness, reinforcement of existing theories and decreased effectiveness, while those for Model II result in reflection, changes to existing theories and increased "long-run" effectiveness [20]. The value of Model II is that it provides opportunities for uncovering theories-in-use and their consequences, inventing and

testing more effective ones, and continually improving the process [31]. The latter differs from on-going improvement advocated in traditional CP/PP literature, because it is the *learning process* that is improved, not the ability to achieve CP/PP goals.

This process of "learning how to learn" is described by Cummings and Worley as "deutero-learning" [31]. In terms of organisations, deutero-learning, is not just learning how to learn, but learning how to learn *together*. An important feature of deutero-learning is the motivation that comes from internal commitment (as referred to by Argyris and Schön) and what Senge refers to as "personal mastery": a commitment to learning through a continual process of clarification, focus, patience and objectivity (see Ref. [35]).

Senge quotes O'Brien when he suggests that "genuine commitment" can only be achieved if it is to "something larger than ourselves", i.e. beyond self-interest [35]. It seems reasonable to assume that neither top-down directives nor marketing exercises based on cost-benefit analyses are unlikely on their own to achieve such commitment.

It follows that corporate (or organisational) commitment will only be gained if people in organisations learn to learn together. In terms of environmental sustainability, they will need to learn to identify and reflect on existing theories-in-use that prevent them from committing their organisations to sustainability, to develop and test new ones and use what they have learnt to continue the learning process. This approach was absent in the TZ project and the approaches that tend to be advocated by traditional CP/PP literature.

On-going improvement is a cornerstone of what Moxen and Strachan refer to as "managerial strategies" (e.g. ISO14001 and the EU's EMAS). They believe that these strategies tend to be mechanistic, aiming to provide organisations with the ability to set environmental standards, monitor progress and take corrective action. They believe that they improve on purely "scientific and technical strategies", because they attempt to create a climate of "reflection, constructive criticism and innovative thinking" [25].

However, Moxen and Strachan also believe that managerial strategies are "self-defeating" because the methods they advocate for managing and organising people are "wholly unsuited to the tasks envisaged for them". They explain that this is because they are "closely associated with formal structures and organisation cultures that tend to inhibit, rather than promote, change and innovation". They believe that the mechanistic, managerially driven systems that are set up in response to ISO14001 and EMAS are likely to create cultures wherein traditions are maintained, and precedents, formal rules and procedures followed. They believe that the "confusion, puzzlement and…bewilderment" that is felt within organisations pursuing accreditation for these

Table 2
Governing variables and action strategies for single- vs. double-loop learning

	Model I theory-in-use (resulting in single-loop learning)	Model II theory-in-use (resulting in double-loop learning)
Governing variables	Definition and pursuit of goals	Validity of information
	Maximising winning vs. losing	Free and informed choice
	Minimising negative feelings	Internal commitment to and evaluation of choice
	Rationality	
Action strategies	Unilateral design and management of the organisational environment	Design of the organisational environment to enable discovery and experience
	Unilateral control of tasks	Joint control of tasks
	Protection of self and others	Joint self-protection intended to promote personal growth Bilateral protection of others

Source: [20].

standards is due, in part, to the way in which they contradict trends towards participatory management and organisation [25].

While some authors dispute whether these trends exist, the TZ results appear to confirm that on-going improvement will not simply occur because it has been ordained as part of a top–down mechanistic approach. A striking example was provided by one of the more successful TZ organisations (measured on the basis of the economic and environmental benefits achieved during the course of the project). At the end of the 2-year facilitated process, the staff member who had been allocated responsibility for the project (and whose enthusiasm, motivation and diligence appear to have contributed significantly to short-term success) was summarily assigned to other, non-related duties. The senior manager who made the decision, apparently did so because s/he believed the project had been completed. The staff member with responsibility for the TZ programme expressed frustration at being unable to continue the work s/he had begun and with which s/he believed s/he had achieved considerable success.

In a departure from the mechanistic approach characterised by standards such as ISO14001, Harrington and Knight [17] identify a set of steps that they believe should be used for the purpose of achieving continual improvement. They involve: assessing the organisation's "personality"; establishing "environmental vision statements"; setting objectives and targets for performance improvement; defining "desired behaviour and habit patterns"; developing and implementing improvement plans, and measuring the results [17].

These steps are interesting because they are consistent with a strategic approach to organisational change. While many authors have identified the importance of such an approach, it is useful to stress that strategic management tends to be driven by the desire to develop or improve competitive advantage (see Ref. [36]). Its value for achieving on-going improvement towards sustainability may therefore rest on the ability of environmental initiatives to deliver competitive advantage. The results of the TZ evaluation, and critical accounts of the EM literature (e.g., [10]) suggest that competitive advantage is by no means a guaranteed outcome of environmental initiatives. The reliance that strategic management has on competitive advantage may make it a tenuous base upon which to rest on-going improvement towards sustainability.

In addition, as Maxwell et al. point out, corporate environmental strategy is one thing, but "the real challenge lies in moving from the formalities, generalities, and value statements" to the "reality of implementation at the plant or project level" [36]. The strategic management approach seems more consistent with Model I, rather than Model II theories-in-use. Therefore, while it may result in operational changes, it is unlikely to result in double-loop learning and the internalisation that appears necessary to bring about on-going improvement.

One of the benefits of the CP/PP approach, as opposed to generic approaches such as EMS and strategic management is that it can provide organisations with the opportunity to undertake a practical exercise that is virtually guaranteed to deliver environmental and economic improvements[3]. In an illustrative study of 24 national and regional CP/PP projects involving more than 1500 Dutch companies, de Bruijn and Hofman found that the projects were all successful in increasing the efficiency of the organisations involved (in economic, as well as in environmental terms) (see Ref. [5]). They also found that the changes implemented were more profound and that there was greater potential for on-going improvement when a thorough audit methodology was used. Participants appear to have benefited from the opportunity that the waste audit provided for learning about the resource flows within their organisations. However, de Bruijn and Hofman also concluded that improvement did occur after the "end" of the projects, but tended to be limited to standard environmental indicators such as water and energy use, hazardous waste generation and so-on [5]. Like TZ and other projects (e.g. those carried out as part of the ECOPROFIT initiative in Austria − see Ref. [6]), the learning process does not appear to have extended beyond technical changes, although in the absence of publicly available and relevant evaluations, it is not possible to be certain.

de Bruijn and Hofman's study draws attention to an important distinction between on-going improvement and continuous learning. Their study suggests that the audit methodology advocated by earlier CP/PP guides (and applied in the TZ project) can bring about on-going improvement, but that this will not shift from technical to organisational change unless it is accompanied by continuous *learning*. A key feature of the prescriptive approach that is common in traditional CP/PP guides is that it minimises the opportunities for double-loop learning. As mentioned above, double-loop learning involves an iterative process of critical questioning, testing, practising and reflecting (e.g., [20,35]). Without these essential ingredients, the potential for internalising new behaviour is limited [37,38].

Moxen and Strachan believe that prescriptive approaches are unlikely to result in on-going improvement because they do not bring about the "generative learning"[4] that is necessary for internalisation to occur [25]. They believe that the mechanistic nature of

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[3] The TZ project provides further evidence of this, despite the shortcomings identified in the evaluation (see Table 1).

[4] *Generative learning* is described by Senge [35] as learning that "expands [a person's] ability to create".

prescriptive approaches results in the creation of "role cultures", which emphasise "maintaining traditions, following precedents and observing formal rules and procedures". They suggest that these need to be replaced by "task cultures" where "conventional management philosophies" are laid aside and there is innovation, not only in the management of people, but also in the "design and operation of formal structures" [25].

The later (2001) USEPA guide [4] does, however, include advice that resonates with some of the issues raised by the TZ evaluation and the organisational learning literature with respect to commitment and on-going improvement. While the guide does not really add much in terms of how to *gain* commitment, it does emphasise the need for a "long-range view" and long-term commitments in order to achieve on-going improvement. It suggests that personal commitment needs to be demonstrated by leadership, valuing employees, partnership development, corporate responsibility and citizenship, integration of quality and CP/PP programmes, and a "long-range outlook" coupled with quicker, fact-based responses and on-going improvement [4]. This is in contrast to the earlier guide [2], where the focus for demonstrating commitment rests on the development policy.

The later guide also advocates the preparation of a "compelling" vision and a mission statement consistent with CP/PP and aligned with the organisation's principles or core values. It also recognises the importance of CP/PP-related values permeating into the organisation's culture, and the need for "persistent application" of the CP/PP philosophy and guiding principles. It recognises the difficulties that are likely to be encountered and emphasises the need for an iterative learning process, including "quick" results, "continual actions that reinforce [PP] behaviour" and a "campaign for hearts as well as minds" [4].

While these are important additions to the advice provided in earlier, more traditional guides, the later guide appears to draw heavily from quality and environmental management systems for operationalising on-going improvement (see Ref. [4]), and thereby runs the risk of reverting to a more mechanistic approach. However, the guide does identify useful strategic reasons for the application of these types of approaches, including their use of a "language that management understands" and is therefore more likely to hold their attention, the opportunities that they present for integration with a more encompassing range of business functions and management, the links to legal obligations and competitive advantage, and the systematic and periodic nature of review and improvement mechanisms. However, it is important to note that the guide also emphasises the importance of a change management process that eliminates bureaucracy, improves communication, and is linked to the strategic needs of the organisation [4]. These recommendations do mitigate some of the criticisms of EM programmes raised earlier in light of the TZ results and are discussed further in relation to the recommendations that are made in Part II of this paper.

5. Conclusions regarding commitment and on-going improvement

Top-level commitment and on-going improvement are identified in traditional CP/PP guides as being essential for CP/PP programmes. However, the results of the TZ evaluation suggest that these types of programmes (and those based on them) may not deliver in this regard. When considered in the context of relevant developments in organisation theory, the advice given on how to gain or enhance commitment and bring about on-going improvement appears simplistic and does not adequately cover the range of non-technical obstacles that may be encountered during a programme.

Gaining commitment tends to be seen as a marketing exercise, and tends to presuppose the existence of a "change agent" within the organisation who is willing, skilled and able to conduct such an exercise. The TZ evaluation suggests that these pre-suppositions are not necessarily correct. Members of CP/PP teams tend to have technical backgrounds and/or positions and lack formal marketing experience. The importance of on-going improvement tends to be stressed early on in traditional CP/PP guides, but advice on how to achieve it is commonly left until last. This tends to take the form of advice on monitoring and review, as well as internal communication and awareness-raising, the assumption being that these will result in on-going identification of opportunities for improvement, which will in turn result in on-going improvement. The TZ evaluation suggests that taking on and accomplishing effective marketing exercises, monitoring, review, awareness-raising and communication relies not only on the willingness and skills of participants, but also on a supportive and conducive organisational context. The evaluation showed clearly that such a context cannot be assumed to exist.

Standardised environmental performance programmes, such as those commonly advocated in traditional CP/PP and EM guides, pay very little attention to the specific nature of the organisational context within which the programme will need to be effective. Consideration of the results of the TZ evaluation within the context of relevant developments in organisation theory suggests that advice provided in CP/PP guides may be too mechanistic, and fails to place sufficient emphasis on the activities and needs of the organisation, as well as its structure, human relations, external environment, politics and culture.

On-going improvement is essential for sustainability to be achieved and commitment is necessary for on-going improvement to occur. Commitment involves the internalisation of a value system. If CP/PP programmes are to contribute towards sustainability on an on-going basis, this internalisation will be necessary. While there is likely to be debate on whether sustainability should be an ultimate aim of CP/PP programmes, it seems safe to say that internalisation of sustainability values will require significant learning and change within most organisations. The works of Argyris and Schön, Schein and Senge, amongst others, on organisational culture and learning and their influence on change appear to have the greatest potential for helping to improve sustainability programmes for business. They suggest that a more strategic approach needs to be taken, whereby programmes are customised according to the specific activities, needs and culture of individual businesses. They need to be designed to ensure that an iterative process of learning is established that leads to critical assessment of existing assumptions, identification and invention of new ones, testing and, ultimately, internalisation of a sustainability ethic within the organisation's culture.

Further conclusions and more detailed recommendations on how to apply these findings can be found in Part II of this paper.

Acknowledgments

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