EPA Cleaner Greener Production Programme:

Experiences, Impacts and Outcomes for Participant Organisations

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Executive Summary

This report presents the results of a survey of past and present participants, across all four phases of the EPA's Cleaner Greener Production Programme (CGPP). The goal of the CGPP is to promote and support cleaner greener production and eco-efficiency as the established norm in Ireland. The programme challenges organisations to produce goods and services in more environmentally friendly ways, targeting the minimisation of emissions through cleaner production methods. The EPA hopes that other businesses will learn from and build on past success stories.

This report synthesizes the findings from two data collection exercises, representing a dataset covering the experiences of 46 percent of all CGPP participants. The original survey[i], carried out in 2005, collected data from participants in Phase 1 and Phase 2 of the CGPP. The second survey, carried out in 2010, used the same questionnaire and collected data from participants in Phase 3 and Phase 4 of the survey. The survey collected information on the impact of programme participation, focusing on technological changes, economics impacts, environmental improvements as well as organisational changes in the areas of changes to skills, knowledge and attitudes. As part of the 2010 survey exercise we also collected data on the longer term impact of CGPP participation, asking previous participants from Phases 1, 2 and 3, about ongoing achievements in technological change, environmental awareness, as well as economic and resource savings.

The results show that participation in the CGPP programme has a significant and lasting impact on the technology base, organisational capabilities and environmental awareness of the programme organisations. Organisational changes achieved include the introduction of new technology (by 53 percent of organisations) but also the introduction of a wide range of new expertise, with 82 percent of organisations bringing new skills to their workforce.

All organisations report enhanced environmental awareness post CGPP participation. 81 percent of organisations see a changed managerial attitude, with 71 percent of organisations saying environmental issues continue to be influential, and in 77 percent of organisations managers always or often consider the environment in taking major decisions. There is evidence from these organisations that the

environmental commitment is both at the highest level and broadly spread throughout the organisation.

The impact of the CGPP is profound, but also sustained. The overwhelming majority of firms continue to maintain their CGPP funded project, with 76 percent of organisations continuing to see a benefit. 43 percent of organisations have extended their CGPP project post-funding. 33 percent of organisations have gone on to develop further initiatives.

The quality of the programme and the projects is also observable in these results. 76 percent of organisations are still operating their CGPP project, and only 19 percent of organisations identifying any significant obstacles to implementation. 88 percent of organisations said that participation in the programme met their expectations. 90 percent of organisations would participate in the programme again. This is an extremely high rate of success for technology and organisational change projects, and points to the quality of the organisations selected and the structure of the programme.

Over half of the projects involved manufacturing processes, although organisational practices and product design were also significant areas. The key areas being tackled are materials reduction (35 percent) and waste minimisation (29 percent) and reuse (20 percent). Despite being a largely small and medium sized enterprise (SME) cohort, 66 percent of organisations have an environmental department and 53 percent have a formal environmental management system (EMS). Even across the small number of organisations that quantified environmental savings, significant environmental impacts reported a reduction of almost 1300 tonnes of greenhouse gasses, the saving of 765 MWh and a reduction of 5530 tonnes of solid waste.

There is a close alignment for organisations between their CGPP projects and broader business objectives. 65 percent of organisations identified improved competitive advantage from their CGPP project. For a quarter of organisations, the identified aims of their project were business related rather than purely environmental and the new expertise acquired by organisations include many capabilities contributing to the broader development of the business. In addition to the type of environmental process and management skills you might expect to be the subject of these projects, 19 percent of organisations identified more general business efficiency skills that were acquired.

Key Findings

Survey of 69 organisations funded by the EPA's CGPP scheme and still in operation at the time of the research.

- 76% of organisations continue to see a benefit and maintain their CGPP projects.
- 65% of organisations identified improved competitive advantage from their CGPP project.

- 43% of organisations have extended their CGPP project post-funding.
- 33% of organisations have gone on to develop further initiatives
- 81% of organisations see changed managerial environmental awareness.
- 71% of organisations saying environmental issues continue to be influential
- 77% of organisations managers always/often consider the environment in taking major decisions.

- 88% of organisations said that the programme met their expectations.
- 90% of organisations would participate in CGPP again.

Key Outcomes:

- Significant environmental improvements.
- Economic advantages – cost savings and revenue growth.
- Reputational improvements – national & international eco-business awards
- Four companies have patented new innovations.
- Creation of new expertise and broadening of the technology base within organisations.

Contents

1. Introduction

This report presents the results of a survey of past and present participants, across all four phases of the EPA's Cleaner Greener Production Programme (CGPP). The survey collected information on the impact of programme participation, focusing on technological changes, economics impacts, environmental improvements as well as organisational changes in the areas of changes to skills, knowledge and attitudes. The study also collected data on the longer term impact of CGPP participation, asking previous participants about ongoing achievements in technological change, environmental awareness, as well as economic and resource savings.

The goal of the CGPP is to promote and support cleaner greener production and eco-efficiency as the established norm in Ireland. The EPA hope that other businesses will learn from and build on past success stories and that will work towards CGPP's tagline objective: "Better Business in a Better Ireland". The programme challenges organisations to produce goods and services in more environmentally friendly ways, targeting the minimisation of emissions through cleaner production methods. The objective is to achieve a balance between economic activity and protection of the environment.

The report provides an overview of the range of projects carried out; the organisational approaches taken by organisations to achieving their projects; organisations' perceptions of the benefits of CGPP participation and of environmental technology projects. It also provides an assessment of the impact of those projects, including the longer-run impact on organisations

2. The Potential of Cleaner Production

In recent years, concern for the protection of the environment has become a central feature of social, political and economic life. It has become ever more obvious that for the economy to become environmentally sustainable, business and industry must change technology and practices. As society, governments and a range of stakeholders, such as suppliers, customers and employees, become increasingly sensitive to the environmental impact of business activities, many organisations are developing technological innovations to improve their environmental performance.

At the same time the competitive challenge for business is success 'is increasingly coming to favour those organisations which can mobilize knowledge, technological skills and experience to create new products, processes and services'.[ii] Organisations that innovate see results in improved survival and profitability. Furthermore, the process of undertaking innovation can transform an organisation by strengthening its internal capabilities and enabling it to become more perceptive, more flexible and more adaptable. Cleaner production practices provide a win-win that enhances progress towards both these goals. The importance of this for the Irish economy has recently been recognized in the development of a policy framework, Building Ireland's Smart Economy,[iii] which explicitly links the goals of increased innovativeness and competitiveness with that of enhanced environmental sustainability.

Cleaner production practices are 'production equipment, methods and procedures, product designs, and product delivery mechanisms that *conserve energy and natural resources*, *minimize environmental load* of human activities and *protect the natural environment*.'[iv] This definition highlights the broad scope of impact that environmental technologies have, ranging from product development and design, through the production process and onto distribution, involving changes not only to equipment and processes but also operating procedures and the management approach of the organisation.

The drivers for the uptake of cleaner production practices are (i) demand from customers for environmentally sustainable goods and services; (ii) meeting the demands of regulation and (iii) cost advantage from achieving better efficiency in

resource use. There is growing evidence that adoption of cleaner production practices has a positive impact on key competitiveness indicators of cost, quality and speed.[v]

Organisations find innovating difficult in general, but there are additional barriers that specifically affect the adoption of cleaner production practices.

> The cost of developing solutions as environmental technologies may incur longer payback periods than conventional investments, which means that managers cannot rely solely on a cost analysis to justify their actions.
>
> The relative recentness of the environmental dimension means that managers lack the know-how and environmental information or even the awareness required to take positive action.
>
> Organisational inertia represents a further barrier as organisations operate through set patterns and routines, and actors may resist changes to established procedures and systems.[vi]

It is generally accepted that environmental technologies positively impact upon the environmental performance of companies, and industrial technological innovation is seen as one of the key strategies in achieving sustainable development.[vii] However, despite the existence of both regulatory and economic incentives, corporate investment in clean technologies remains limited.[viii]

Policy makers have a role to support and push the development and implementation of specifically environmental innovations, and can go as far as stimulating the expansion of new environmental technologies, processes and products in organisations. The EPA's Cleaner Greener Production Programme is one such policy approach, aimed at addressing the obstacles identified in the adoption of cleaner production practices by organisations. This programme is aimed at providing funding to projects that have the potential to develop cleaner production practices and to serve as a demonstration of those practices to encourage the diffusion of new approaches more widely in the economy. It serves as a highlight to organisations of the economic potential of cleaner production practices, provides funding to overcome the issues of uncertainly over pay-back and availability of resources, as well as a stimulus to overcome organisational resistance to change.

The integration of environmental considerations into business operations impacts dramatically on all aspects of the organisation. Traditional paradigms are challenged and the fundamental values and beliefs of the organisation are called into question. The relationship between strategic, technological and organisational dimensions is highly complex and the introduction of an environmental perspective into the company setting raises a multitude of issues.

This study explores the impact of environmental initiatives on strategy, technology and change in companies, and combines elements from environmental innovation, strategic management and organisational change literature in order to examine the experiences of participants in the EPA's Cleaner Greener Production Programme.

3. Project Methodology

The research study examined all the organisations that have taken part in the CGPP from 2001 to the present day, through document analysis and the distribution of a self-report questionnaire.

Research Sample

The project incorporates the results of an existing dataset, compiled in 2005 and covering participants in CGPP Phases 1 and 2. This original research was carried out by Valerie Parker (under the supervision of Dr Rachel Hilliard) as part of her MBS in Corporate Strategy and People Management, completed at NUI Galway in 2005. This has been supplemented with a new baseline survey on recent (Phase 3) and current (Phase 4) participants, who were asked the same set of questions as the original research. This was extended then with a follow-up survey of past participants of CGPP Phases 1, 2 and 3 to assess longer-term outcomes from participation. In total 75 organisations have received funding via CGPP programmes; however for the purposes of this survey a population of 69 extant organisations was available for the collection of primary data.

TABLE 1: SURVEY RESPONSE

Phase	Number of organisations	Response Rate CGPP experience survey	Response Rate CGPP long-run impact survey
Phase 1	29	10	13
Phase 2	22	08	05
Phase 3	03	03	03
Phase 4	15	11	n/a
Total	69	32 (46%)	21 (39%)

Document Analysis

Using data publicly available from the EPA, this study develops a profile of the characteristics of participating organisations and the range and type of projects funded across the full set of 69 extant CGPP participants. Data on the size,

nationality, industrial sector was collected, as well as data on the area, type and method of the specific projects being carried out.

Postal Questionnaire

The original dataset was collected using a postal questionnaire. This targeted the key individual who supervised the company's involvement in CGPP. A special effort was made to counteract non-response and inaccurate data being collected. With this in mind, the design of the questionnaire was important. The layout, format and presentation of the questions were simple and consistent, and clear instructions were given.

Online Questionnaire

For the extension of the dataset to Phases 3 and 4 participants, as well as the follow-up survey of Phase 1 and 2 participants, the study employed an online survey tool. It was considered that both administration and completion of the questionnaire would be easier, and response rates improved. A request to participate in the research was made by telephone to the identified contact person for each CGPP project. This was followed up with an email, and two subsequent email reminders.

The baseline questionnaire was divided into four distinct sections:

- *General information*, which provided background information and also examined why the organisations participated in the CGPP and what were their motivations for improving environmental performance
- *Technology*, which posed questions on the technological implications of cleaner production
- *Management and strategy*, which looked at strategic and managerial issues relating to the CGPP project
- *Learning and change*, which explored the level of learning and change that occurred as a result of the project.

A large proportion of the questions were open response questions. This was to encourage a greater degree of accuracy and information from respondents.

The follow-up questionnaire asked for information from organisations that had completed their CGPP project about continuing impacts in the areas of:

- Technological improvements

- Organisational changes
- Cost and resource savings, and reduced environmental impacts.

Limitations to the research

There are several limitations to the research method employed. It was not possible to ensure that the correct person filled out the questionnaire, nor was it possible to eliminate possible survey fatigue, which could result in inaccurate responses and unanswered questions.

Furthermore, because the questionnaire targeted just one person in each company, the answers given reflect the opinion of that person. Opinions are subjective by nature and are prone to personal biases and attitudes. Therefore the data gathered may not truly reflect the exact implications of the CGPP project for the company.

There is also the question of social desirability bias amongst respondents. It is beneficial for organisations to be seen by all their stakeholders as actively pursuing efforts to improve their environmental performance. The person completing the questionnaire may also not want to admit that their organisation is not fulfilling its commitment to the environment.

Another issue to note is that in the original data collection a significant proportion of the responding organisations were currently involved in Phase 2 of the CGPP and had yet to complete their project. Similarly, in the current data collection, the responding organisations from Phase 4 are currently involved in on-going projects. It is possible that these organisations would change their responses after project completion.

4. Survey Findings

The following analysis focuses firstly on the profiles of the 69 extant participating organisations, and secondly on the survey responses of 32 organisations reporting on their projects, and 21 organisations (from Phases 1, 2 and 3 only) reporting on the longer-term impact of the project.

Company profiles

As can be seen from the Table 2 sixty nine organisations were funded by the EPA through the CGPP scheme. Using project descriptions provided by the EPA and additional information obtained from company websites, a detailed profile of all the sixty nine organisations that have so far participated in the CGPP was compiled.

TABLE 2: CGPP FUNDED PARTICIPANTS

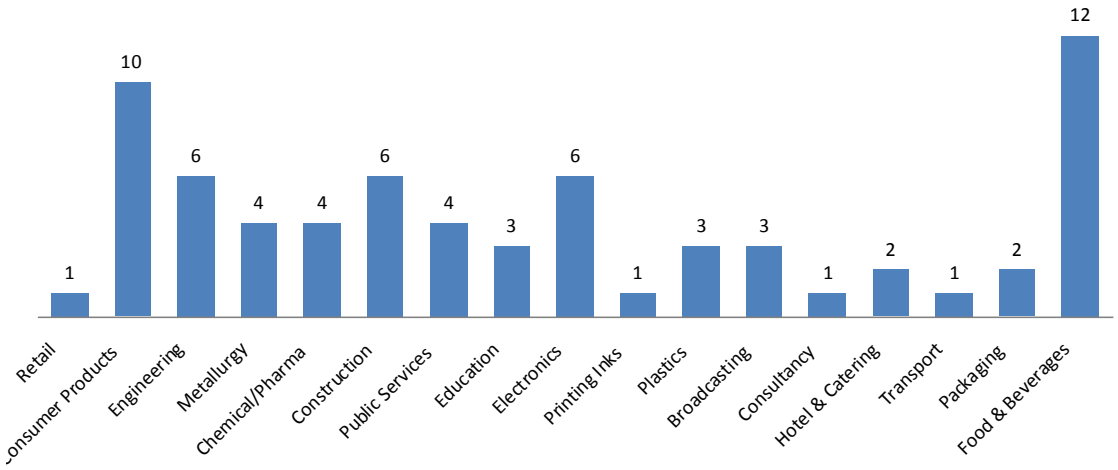
Phase	Number of organizations
Phase 1	29
Phase 2	22
Phase 3	03
Phase 4	15
Total	69

The majority (54 percent) of participating organisations are small and medium sized enterprises (employing less than 250 employees). Irish large and multi-national organisations account for 28 percent of the projects, while foreign-owned multinationals account for 19 percent of the projects.

TABLE 3: ORGANISATIONS BY NATIONALITY AND SIZE

		NATIONALITY			
		Foreign MNC	**Irish**	**Irish MNC**	**Total**
Size	Non-SME	13	10	9	32
	SME	0	37	0	37
Total		13 (19%)	47 (68%)	9 (13%)	69

FIGURE 1 INDUSTRY SECTOR of PARTICIPATING ORGANISATIONS



Participating organisations come from a wide range of sectors, as shown in Figure 1. Food and beverages is the sector with the highest representation, with 17 percent of CGPP participants processing and producing foodstuffs and beverages. Consumer products, which included organisations involved in the manufacture of sports materials and seaweed products, also featured strongly at 14 percent. Engineering, electronics and construction account for 9 percent each, while chemicals/pharmaceuticals, metallurgy and public services each represent 6 percent of projects.

Project profiles

Using the information publicly available the study examined all the funded projects to identify the areas within organisations where projects are most often targeted. Table 4 shows that projects aimed at making changes within the manufacturing processes of organisations accounted for over half of all projects.

TABLE 4: AREAS OF ACTIVITY MOST IMPACTED BY PARTICIPATION IN THE CGPP

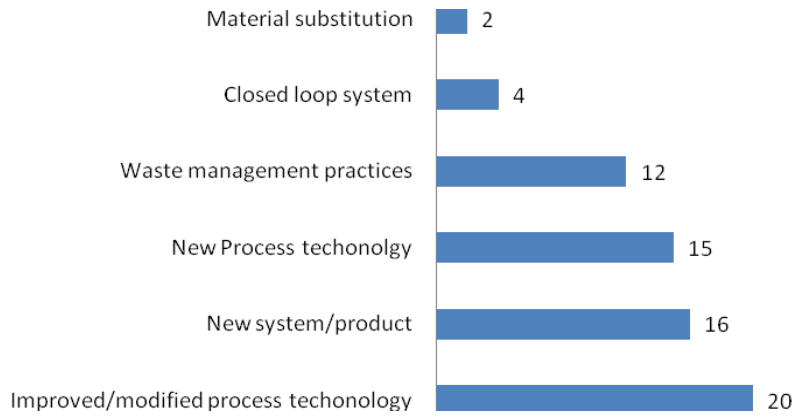
	Number	Percent
Manufacturing process	38	55%
Product/Packaging Design	14	20%
Organisational Practices	13	19%
Services	04	6%
Total	69	100%

Table 5 below outlines the main type of environmental improvement pursued by organisations that participated in the CGPP. Waste management initiatives, such as waste recovery, reuse, reduction and recycling accounted for half of the projects undertaken. Materials usage reduction projects represent a third of projects. Six organisations (9 percent) implemented ways to reduce emissions and a further three (3 percent) specifically tackled the use of solvents and the resulting VOC emissions in manufacturing processes. Two organisations (3 percent) undertook projects that aimed to raise awareness of environmental issues in other organisations, while one company (1 percent) each looked at transport issues and product recovery.

TABLE 5: TYPES OF ENVIRONMENTAL IMPROVEMENTS

	Number	Percent
Material usage reduction	24	35%
Waste reduction/recycling	20	29%
Waste recovery/re-use	13	20%
Emissions reduction	06	9%
Solvent emissions reduction	02	3%
Environmental awareness raising	02	3%
Distribution/Transport	01	1%
Product recovery	01	1%
Total	69	100%

FIGURE 2 METHODS OF ENVIRONMENTAL IMPROVEMENT



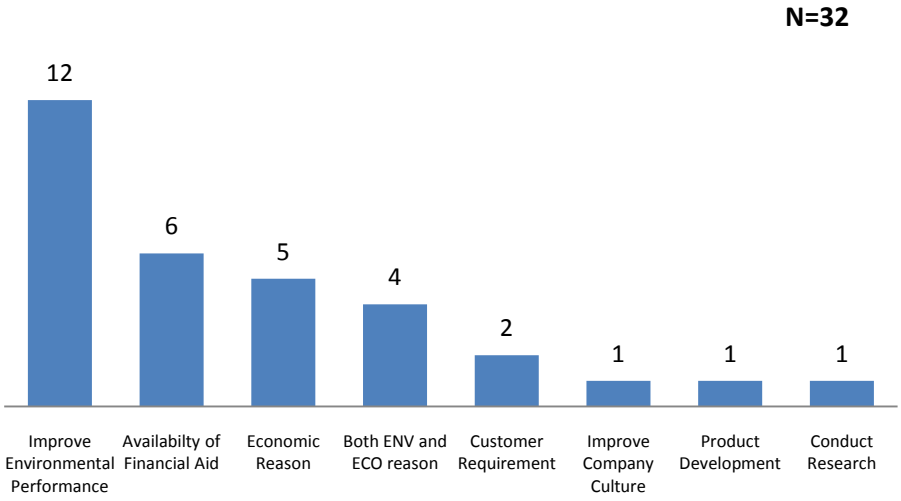
As Figure 2 shows, the majority of projects (20 projects, 27 percent) led to improved or modified process technologies. Waste management practices (12 projects) account for 17 percent of improvement methods, while new systems or products account for 22 percent and new process technologies account for 23 percent. Four (6 percent) organisations introduced a closed loop system in order to meet their environmental objectives, while two (3 percent) used alternative materials.

Experience of CGPP Participants

The baseline questionnaire was designed to find out more about the organisations that participated in the CGPP and specifically the details of the projects and their implementation. Results are reported here for the 32 organisations that responded to our two rounds of data collection. Please note not all respondents provided an answer for each question.

CONTEXT FOR CGPP PARTICIPATION

FIGURE 3 REASONS FOR PARTICIPATING IN CGPP



As Figure 3 shows, the most common reason given for participation was to improve environmental performance (38 percent). Availability of financial aid ranked next as (19 percent). Other reasons given were: economic reasons (16 percent), both environmental and economic reasons (13 percent), customer requirements (7 percent), to improve company culture (3 percent), product development (3 percent) and to conduct research (3 percent).

Organisations were seeking to improve their environmental performance for a wide diversity of reasons as described in Table 6 below. The most frequent reason given was environmental: 31 percent of organisations wanted to reduce negative impact on environment. 25 percent of the organisations surveyed have business goals for their project: either to increase revenues, reduce costs or pursue strategic goals. Only 16 percent of organisations were using their project in support of compliance

with regulations. 19 percent of organisations were pursuing corporate social responsibility objectives, such as sustainable development, improving health and safety and enhancing their reputation in their community. Only 3 organisations (10 percent) explicitly cited customer requirements as driving their project, though organisations looking to increase revenues are also pursuing market-driven results.

TABLE 6: REASON FOR IMPROVING ENVIRONMENTAL PERFORMANCE

REASON	**Number**	**Percent**
Reducing Environmental Impact	10	31%
Increase Revenue/Reduce Costs	7	22%
Compliance with regulations	5	16%
Corporate Social Responsibility	6	19%
Customer Requirement	3	10%
Enterprise Strategy	1	3%
Total	32	100%

** Note: Where respondents gave multiple reasons, the first was taken as being the most significant.*

Twenty one (66 percent) of companies said they would have still pursued the project without funding through the CGPP, citing economic reasons, corporate objectives, licence conditions, legal requirements, corporate social responsibility, six sigma

processes, energy savings and environmentally superior products as some of their motives to doing so. Eight companies (25 percent) said they would not have pursued the project, due to resource constraints.

Fifteen, or just under half the respondents (47 percent) found that the project had cost more than originally budgeted, thirteen (41 percent) claimed that it hadn't, three (9 percent) did not respond to the question, and one (3 percent) stated it was too early to comment. Projects that had a cost overrun did so either because of changes/improvements to the original specifications for the project or underestimation of the costs of reengineering process, capital investment and IT. All the companies had participated in other efforts outside of the CGPP to improve environmental performance. When asked to explain the nature of these efforts, responses were very wide-ranging, as seen in Table 7 below. The most common projects were in the areas of material usage reduction (28 percent), waste reduction/reuse and recycling (28 percent) and resource efficiency improvements.

TABLE 7: ENVIRONMENTAL EFFORTS MADE BY COMPANIES OUTSIDE OF CGPP

	Number	Percent
Material usage reduction	9	28%
Waste reduction/reuse/recycling	9	28%
Resource efficiency	5	16%
Product Changes	2	6%
Introduced ISO14001	2	6%
Environmental Option for Customers	1	3%
Sustainability Award	1	3%
Waste Treatment	1	3%
Licence Compliance	1	3%
Total	31*	100%

* *Note: Not all respondents provided an answer to this question*

TECHNOLOGY

The study was interested in the impact that CGPP participation had on the technology base of the responding companies. Twenty respondents (63 percent) introduced a new technology as part of their CGPP project. In most cases this was acquired but five (16 percent) organisations developed the technology in-house. Table 8 gives details of how organisations acquired technology from variety of sources: four acquired the technology from other manufactures in the same field; two developed the technology in conjunction with suppliers; six worked with Irish and European vendors; one company acquired from USA and one company acquired the new technology from a university campus company. Four organisations were patenting their technologies. Eight companies (40 percent) identified the project as being outside the current expertise of the company. Of the responding companies nine (29 percent) had in house R&D departments which are all were involved in the CGPP project.

TABLE 8: NEW TECHNOLOGIES

Response	New Tech	New Tech Dev In-House	Patented	Outside expertise
Yes	20(63%)	5 (16%)	4 (13%)	8 (25%)

Respondents were asked about the new skills that employees had learned as a result of participating in the CGPP. The responses were very diverse, as seen in table 9 below. In addition to the type of environmental process and management skills you might expect to be the subject of these projects, 19 percent of organisations identified more general business efficiency skills that were acquired.

TABLE 9: NEW SKILLS LEARNED

	Number	Percent
Business Skills: six sigma skills; problem-solving; data preparation and analysis; IT skills; lean manufacturing	5	19%
Environmental Management Skills: awareness; staff training	6	22%
Operation of new systems/technology	4	15%
Eco design	3	11%
Energy management	3	11%
Better understanding of chemicals	2	7%
Improved waste management skills	1	4%
Improvement of indoor air	1	4%
Not yet known	2	7%
Total	27*	100

** Note: Not all respondents provided an answer to this question*

MANAGEMENT AND STRATEGY

Twenty one (66 percent) of the responding organisations have an environmental department, two of which were established as a result of the CGPP; a third of organisations do not have an environmental department. As might be expected, larger organisations are more likely to have a dedicated environmental department, but half of the SME participants do also.

TABLE 10: ORGANISATION SIZE AND ENVIRONMENTAL DEPARTMENT

		Environmental Department		
		Yes	**No**	
Size	**SME**	7	7	14
	Non-SME	14	4	18
Total		21	11	32

In the organisations without a specific environmental division various departments and various members of the workforce had the responsibility of supervising environmental matters.

Seventeen organisations (53 percent) responded that they had introduced new management practices, such as environmental management systems as a result of participating in the CGPP. Four organisations had not made any such change. The remaining organisations explained that, although they hadn't introduced a specific environmental system, they now had greater control over waste and recycled when possible. Four organisations already had ISO 14001 certificates and had therefore introduced a new management practices, while in another the parent company conducted regular environmental audits.

FIGURE 4 INFLUENCE OF ENVIRONMENTAL ISSUES ON COMPANY STRATEGY

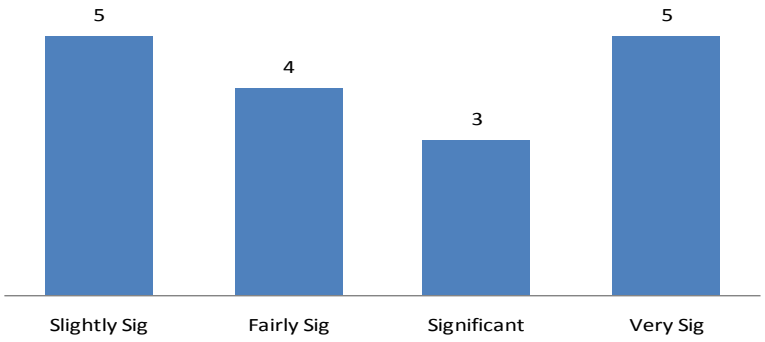


FIGURE 5 IMPACT OF ENVIRONMENTAL ISSUES ON DECISION MAKING

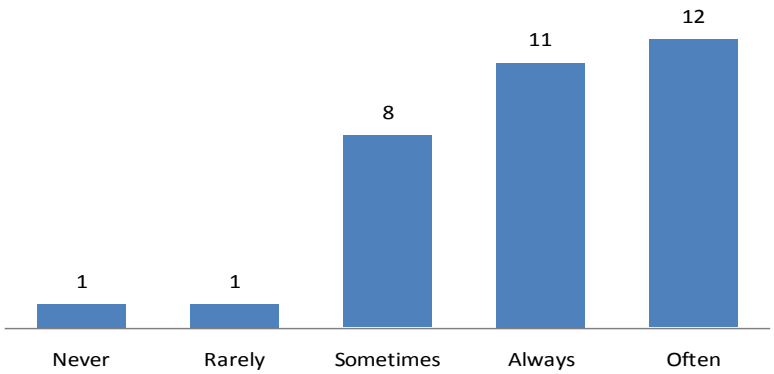


Figure 4 shows that twenty two organisations out of thirty one (71 percent) identified environmental issues as being either influential or very influential on their

medium or long term strategy. Figure 5 shoes that twenty three respondents (77 percent) stated that mangers often or always (36 percent) considered the environment when making strategic decision. Only two (6 percent) organisations believed that managers rarely or never think about environmental issues when making strategic decisions.

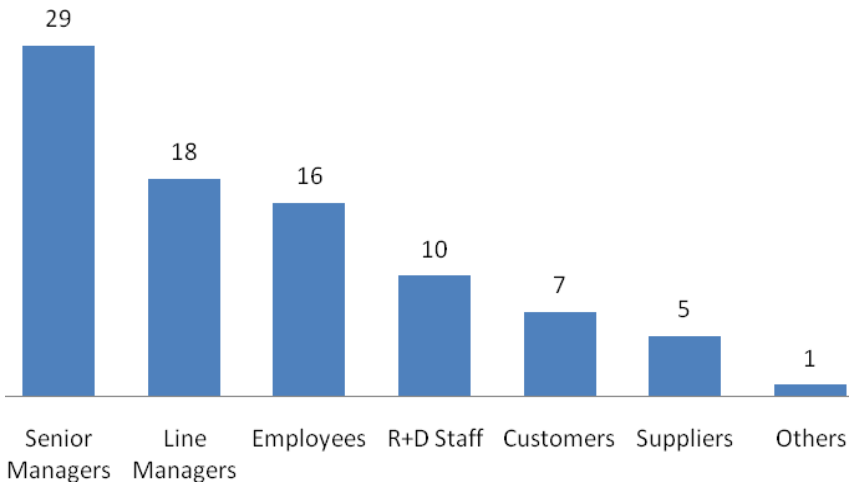
Respondents were also asked whether participation in CGPP had changed managerial attitude towards their organisations' impact on the environment. The majority (81 percent) agreed that that it had. This changing attitude was reflected in various ways: nine respondents (29 percent) said mangers were now more aware of environmental awareness and issues, in four organisations mangers were more aware of cost savings, in one company the managers found solution to intractable problems and in another one there is an increased focus on energy and waste minimizations.

Respondents were questioned as to whether they believed their organisation would continue to improve its environmental performance after the CGPP project ended: thirty respondents (94 percent) anticipated that their organisations would continue to improve. Of the thirty respondents, ten (33 percent) said that they had a policy of 'continuous improvements'.

LEARNING AND CHANGE

The fourth section of the questionnaire explored the instances of learning and change in organisations as a result of participating in the CGPP. Respondents were asked to identify the key actors in environmental improvement efforts (see figure 6 below).

FIGURE 6 KEY ACTORS IN ENVIRONMENTAL IMPROVEMENTS



The main proponents of environmental improvements were senior managers, with twenty-nine out of thirty two companies (91 percent) citing them as the main figure in environmental improvement efforts. Line managers and employees staff came next 18 (57 percent) and 16 (50 percent) each. R&D staff was cited ten (32 percent) times, customers 7 (22 percent) times, suppliers five times.

FIGURE 7: DEPARTMENTS INVOLVED IN CGPP PROJECT

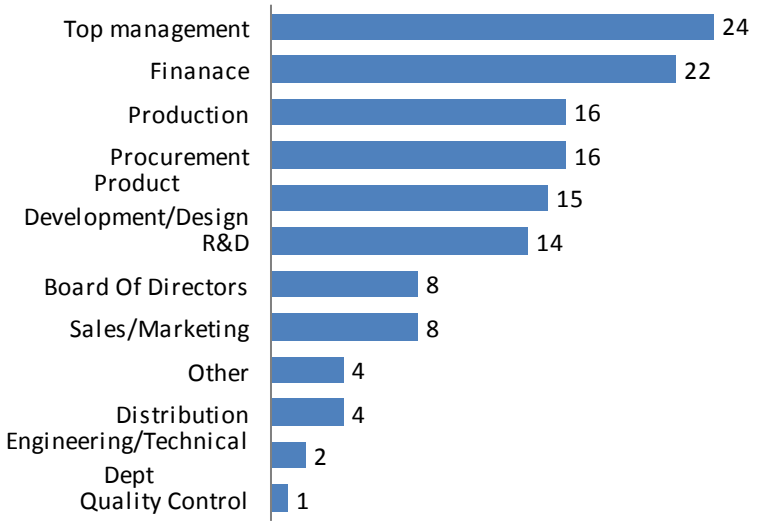


Figure 7 shows that of the thirty two respondents the average number of departments involved in the project were five. The department involved in most projects was top management, which was involved in twenty four out of thirty two projects (75 percent). The finance department was the next most involved (69 percent), with production and procurement contributing 50 percent each. Product development/design (47 percent), R&D contributed (44 percent). Board of directors and Sales/Marketing contributed (25 percent) each. Other and distribution contributed 13 percent each. Engineering (7 percent) and Quality control (3 percent) respectively.

Sixteen out of thirty two (50 percent) organisations had involved members of the supply chain. For one company it was component suppliers, one company had consulted suppliers of raw materials, two had involved customers/end users in their decisions, two had involved in packaging reduction, one had involved chemical supplier and machine suppliers, one has involved paint reduction, one more in carbon reduction and plastic savings, one company had brought in technical and fabrication consultants.

In majority of respondent organisations (26 or 82 percent) staff had undergone some form of training/development, including eco design training; lean manufacture training/six sigma training; operation of new systems/equipment training; environmental awareness training; waste prevention; equipment and chemical training as well as staff training in environmental management.

All respondents agreed unanimously that participation in CGPP has made the organisation more aware of environmental issues.

A minority of organisations (19 percent) reported staff related obstacles to the CGPP project: two believed that staff were reluctant to change traditional work practices, while two companies experienced problems because of conflicting views regarding environmental versus cost/production output. One company that had introduced a new technology experienced difficulties with the system start- up phase, and staff were frustrated as a result. Another organisation had problems in resource management.

Companies were asked whether participation in the CGPP met their company's expectations. Of thirty one respondents, twenty eight (88 percent) said that it had, while the remaining three (12 percent) replied that it had not. They were asked to explain the gap between expected and achieved results. One company explained that customers who had initially expressed interest in their new product, and were the driving motivation behind the development, had not followed through on the sale. Another company disclosed that some of their processes specs had not been achieved and they had also been negatively affected by a fall in demand for their product, which resulted in a longer payback. Another organisation believed the time frame was too short to allow for project implantation.

Respondents were asked about the main difficulties encountered during the project. Formality of process and time constraints were the most commonly cited difficulties. Nine companies reported that no difficulties had been experienced, and one respondent who claimed that the formality of the process has been a difficulty stated that as the project progressed, these constraints were offset by the benefits of a well-structured formal programme.

Respondents were asked if they would participate in another phase of the CGPP. Of the respondents from the earlier Phase 1 and 2, 83 percent responded that they would or possibly would. Of the respondents from the later Phase 3 and 4, 100 percent would take part in a further round. The most commonly cited reason is that

the programme gives focus, as well as making resources available. Furthermore it is considered to be well-managed by the EPA.

Organisations that participated in Phase 1 of the CGPP but did not participate in Phase 2 were asked about their decision. The reasons for non participation related mostly to internal organisation-specific factors with 4 of the 9 organisations not having a viable project to present for funding. One organisation gave too much paperwork as a reason, while two said they were not aware of Phase 2.

The companies were asked to identify the most significant long term impact on their company as a result of participating in CGPP (see Table 11). For half of all organisations these changes were in environmental practices, and another 19 percent saw benefits in greater environmental focus. For 16 percent of organisations, the benefits are business related; only 13 percent of organisations were not able to point to a long-term benefit, and for some of those it is because the project is still on-going.

TABLE 11 ANTICIPATED LONG TERM IMPACT OF CGPP PARTICIPATION

	Number	Percent
Greater Environmental focus	6	19%
Awareness of areas for improvement	2	7%
Efficiency measurement	3	10%
Significant reduction achieved	3	10%
Treatment and recycling over disposal	1	3%
Waste management and reduction	5	16%
Lean manufacturing and eco design	1	3%
Technology transfer	1	3%
Business: secured customers; at forefront of sector; more attractive to investors; venture capital investment	5	16%
Easier to comply with IPC licence	1	3%
None as yet	4	13%
None	1	3%
Total	32	100%

LONG TERM IMPACT OF CGPP

This section deals with the actual long term impact of CGPP. We surveyed participants in Phases 1, 2 and 3 of the CGPP, whose projects have been completed, to so see what the continuing impact of the project might be. Fifty four organisations took part in the CGPP across these three phases and we received survey responses from twenty one organisations, a response rate of 39 percent.

Sixteen (76 percent) of the 21 organisations report continued benefits from the project and eighteen (86 percent) still have their CGPP project in place. Benefits were seen in sustained environmental improvements; learning benefits resulting in research collaborations and funding; manufacturing process improvements. Only three (15 percent) organisations are not continuing to benefit from their original project.

All respondents report that environmental awareness within their organisation has been increased as a result of their CGPP participation.

A majority of organisations (thirteen or 65 percent) have experienced a competitive advantage from their CGPP project.

In terms of changes made post-CGPP participation, eighteen (86 percent) or organisations have developed new operating practices that will result in savings of input or energy costs. Similarly, eighteen (86 percent) or organisations have developed new operating practices that will result in a reduction in emissions or waste.

Eight (39 percent) organisations have developed new products or services. These include: an eco friendly computer, sustainability support services, an energy efficient chimney, coated paper with printed water based ink, hold mats for elderly.

A majority of the organisations now have environmental management systems in place. Six (29 percent) have accredited systems, eight (38 percent) have in-house systems and only seven (33 percent) of organisations do not have any EMS.

Eighteen (86 percent) organisations have gone on to develop collaborations with other organisations as an outcome of their CGPP project. Twelve (57 percent) companies developed links with research organisations, including: Eneritan energy, Sligo IT, Fraunhofer Research Institute in Germany, United Nations STeP organisations, NIBRT, IDA, SEI, university of Limerick, DCU, UCC and DIT.

Seven companies (33 percent) have gone on to receive green or innovation awards as a result of their CGPP project. The awards are as follow: winner of product award under European Business awards for the environment, environment 2008 for best SME, judges' commendation for cleaner technologies award, IBEC environment awards for 2003/2004, IBEC eco design award, citation for best practice at the President's CSR awards in 2007 and 2010.

Eight (39 percent) organisations have secured further funding from other agencies/venture capital (for example: SEI, EI, Invest NI, CEBs) as a result of participating in the CGPP and its results.

Six (33 percent) respondents have developed new practices with members of their supply chain involving for example: alternative material use and sourcing, compliance with EU product guidelines, demonstration of CGPP project values during site visits, procuring wind-generated electricity; minimising packaging; materials sourcing; materials elimination.

Nine (43 percent) organisations have extended their CGPP project to other parts of their business or onto other related sites to make further savings. Twelve (57 percent) organisations have not extended their project in this way.

When asked about further changes implemented since the CGPP participation, eight (38 percent) of the companies gave details of a range of initiatives, including: further developments in upgrading waste treatment, in resource use reduction, process optimization, extension of environmental management programmes,

Four companies have filed patents since completing the original projects.

The study asked respondents to provide what information they could on measures of savings and impacts from their CGPP project. The data received here (see Table 12) was very poor, with only about a third of the 21 respondents providing figures. It is not clear why this is the case but difficulty in getting this kind of information is not uncommon in business research. Often organisations have not measured their project outcomes and do not have the data to hand; information can be withheld for reasons of confidentiality; there is also the issue of respondent fatigue – they may not be prepared to make the effort to find the information. Such data as was reported is given here, with the number of respondents in each category indicated.

TABLE 12: TOTAL MATERIALS, EMISSIONS AND COST SAVINGS

	Total savings to date
Cost savings **(10 projects)**	Range: €3000 - €1,000,000 Total: €1,474,000
Waste water **(1 project)**	12000 tonnes
Greenhouse gasses **(3 projects)**	Range: 30 – 850 tonnes Total: 1279 tonnes
Solid waste **(6 projects)**	Range: 32 – 3000 tonnes Total: 5530 tonnes
Water (m3) **(3 projects)**	Range: 2000 – 10000 m3 Total: 17,700 m3
Energy (KWh) **(3 projects)**	Range: 100,000 – 500,000 KWh 765, 000 KWh
Packaging (tonnes) **(2 projects)**	173 tonnes
Material inputs (tonnes) **(5 projects)**	Range: 30 – 3000 tonnes Total: 3618 tonnes

5. Discussion and Conclusions

Participation in the CGPP programme has a significant and lasting impact on the technology base, organisational capabilities and environmental awareness of the programme organisations.

All organisations report enhanced environmental awareness post CGPP participation. 81 percent of organisations see a changed managerial attitude, with 71 percent of organisations say that environmental issues continue to be influential, and in 77 percent of organisations managers always or often consider the environment in taking major decisions.

Reflecting the type of organisation participating in the CGPP, with a large SME participation, organisations were being stretched in terms of their technology base. Eight companies (40 percent) identified the project as being outside the current expertise of the company; only a third of organisations had an in-house R&D department. The range of new skills being brought into to organisations is wide.

There is evidence from these organisations that the environmental commitment is both at the highest level, with 91 percent of organisations identifying top management as having a key input into the CGPP project and broadly spread throughout the organisation, with diffuse involvement in the project across organisational functions. This is in line with the best practice identified for successful innovation and successful change programmes. These projects are benefiting from organisational champions at the highest level of influence and decision-making. They are also maximising the impact on the knowledge base of the organisation, with the potential to benefit the project through accessing the full range of existing organisational knowledge, as well as achieving wide diffusion of the new knowledge into the organisation.

The organisational structure is also oriented towards an increased environmental focus. Despite being a largely SME cohort, 66 percent of organisations have an environmental department, and 53 percent have a formal EMS. Projects carried out fall within the traditional areas of cleaner production. Over half of the projects

involved manufacturing processes, although organisational practices and product design were also significant areas. The key areas being tackled are materials reduction (35 percent) and waste minimisation (29 percent) and reuse (20 percent)

Organisational changes achieved include the introduction of new technology (by 53 percent of organisations) but also the introduction of a wide range of new expertise, with 82 percent for organisations bringing new skills to their workforce.

There is a close alignment between the CGPP projects and organisation's broader business objectives. 65 percent of organisations identified improved competitive advantage from their CGPP project. For a quarter of organisations, the identified aims of their project were business related rather than purely environmental. The new expertise acquired by organisations can also be seen from Table 10 to include many capabilities contributing to the broader development of the business. In addition to the type of environmental process and management skills you might expect to be the subject of these projects, 19 percent of organisations identified more general business efficiency skills that were acquired.

The impact of the CGPP is profound, but also sustained. The overwhelming majority of firms continue to maintain their CGPP funded project, with 76 percent of organisations continuing to see a benefit. 43 percent of organisations have extended their CGPP project post-funding. 33 percent of organisations have gone on to develop further initiatives.

66 percent of respondents would have funded the project without CGPP support. This is open to a number of interpretations – it may be that this is an assessment post-project, when organisations can see the payback of the project. Organisations identify the value of the CGPP programme in bringing a focus to environmental improvement efforts.

The quality of the programme and the projects is also observable in these results. 76 percent of organisations are still operating their CGPP project, and only 19 percent of organisations identifying any significant obstacles to implementation. 88 percent of

organisations said that participation in the programme met their expectations. This is an extremely high rate of success for technology and organisational changes projects, and points to the quality of the organisations selected and the structure of the programme.

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