IFMA FOUNDATION
ACADEMICS • STUDENTS • RESEARCH

Sustainability "How-To Guide" Series

Global Green Cleaning

VERSION II

Jennifer Corbett-Shramo
IFMA Fellow
CEO, Innovative Cleaning Services; CEO, Clean Solutions Inc.

Bill Conley (update)
IFMA Fellow, CFM, SFP, FMP, LEED AP
Facility Manager
Yamaha Motor Company

Dan Wagner
Director of Facility Service Programs
ISSA

Dorothy Scholnick (update)
FMP
Staff Professional
Facility Engineering Associates

Palle Esbensen
Group Marketing Manager
ISS World Services A/S

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

The authors would like to thank ISSA -The Worldwide Cleaning Industry Association; Jim Peduto and David Frank of the American Institute of Cleaning Sciences (AICS); Stephen Ashkin of The Ashkin Group; Vinnie Del Borrello of Ryan Companies; and the pool of CIMS/CIMS-GB certified cleaning organizations for their expertise, guidance and support. The authors also acknowledge the IFMA Foundation, DCS Global Enterprise and Innovative Cleaning Services.

The team also would like to thank the following organizations and individuals who provided case studies and helped to source photos for the guide: Kimberly Thomas of University of Georgia Physical Plant, Bill Crouch of MMMM and Barbara Whitstone of CleanPower.

-Jennifer Corbett-Shramo, Dan Wagner and Palle Esbensen

External Reviewers

Marc Liciardello, CFM*, MBA, CM, Vice President, Corporate Services, ARAMARK*

Bill Conley, CFM*, CFMJ, LEED AP, IFMA Fellow, Owner and Chief Sustainability Officer, Conley Facility Management (CFM2)*

Editorial Board

Advisors

Eric Teicholz, IFMA Fellow

Bill Conley, IFMA Fellow, CFM, SFP, FMP, LEED AP

Editor-at-Large

Liv Hadden, Trybal Performance, LLC

ABOUT THE AUTHORS

Jennifer Corbett-Shramo, IFMA Fellow

CEO, Innovative Cleaning Services; CEO, Clean Solutions Inc.

Jennifer Corbett-Shramo entered the commercial cleaning industry in 1985. Over the last 31 years, she built and now leads one of the largest, most respected, stable and innovative services in Southern California. Her passion for excellence in an industry that is wrought with stigmas has been continuously fueled by her love of the custodial community and her drive to provide clean, healthy workplaces for her clients and employees. In 1999 when the concept of green was just entering the vernacular of the cleaning industry, Jennifer was pioneering sustainable cleaning for her firm.

In 2008 as an IFMA Foundation Trustee, Jennifer served as the champion and subject matter expert for the newest benchmark book for the cleaning industry, *The Business of Green Cleaning* by Stephen Ashkin and David Holly. This remarkably successful book is now the guide for cleaning green in the built environment. Jennifer is recognized around the globe for her steadfast contributions to the cleaning industry and has been recognized by the International Facility Management Association (IFMA) on multiple occasions. As an IFMA trustee, Jennifer also created the concept and led a team of authors in the publication of *Cut It Out!* a book about how managers of the built environment should respond during stressed economic times. Jennifer is CEO and owner of Clean Solutions Inc., which provides global, sustainable and technical cleaning consulting, and is also CEO and owner of Innovative Cleaning Services, a foremost environ- mentally centric and efficient custodial firm. In addition, she serves on the faculty of Diversey/Sealed Air's HHPC Day Cleaning Program and served on the IFMA Foundation board and executive committee for ten years. Jennifer is CIMS-GB and CITS certified from ISSA. Jennifer is also an IFMA Fellow.

Dan Wagner

Director of Facility Service Programs, ISSA

Dan Wagner is ISSA's Director of Facility Service Programs. In this role, he is primarily responsible for leading the association's Cleaning Industry Management Standard (CIMS) and CIMS-Green Building Certification Program; was one of the primary authors of the CIMS and CIMS-GB Certification Guides; and has published numerous articles and spoken at various conferences, workshops and seminars on CIMS, standardization and management principles.

Dan is also a noted subject matter expert on green cleaning and a sought after speaker on environmental preferability, sustainability, and green operations and maintenance. He has served as a subject matter expert for the International Facility Management Association and IFMA Foundation, and was a primary contributor to the foundation's Business of Green Cleaning.

Dan is ISSA's director of facility service legislative affairs and in-house legal counsel, having received his Juris Doctor degree from DePaul University in 1998. He is a licensed attorney in the State of Illinois; a member of the American Bar Association, the Illinois Bar Association and the American Society of Association Executives; and serves on the board of directors of the National Floor Safety Institute.

Palle Esbensen

Group Marketing Manager, ISS World Services A/S

Throughout his 15 years within the service industry, Palle Esbensen has gained insight and expertise in most aspects of service management and outsourcing. He started his international career in Asia and Europe where he worked in sales and marketing, supply chain and business development. In recent years Palle has been working for ISS in several positions, mainly within business development and marketing. Palle developed and conceptualized ISS Green Cleaning Services for global rollout, which is a key focal point of the ISS Group.

Palle holds a master's degree in international business economics from University of Aalborg, Den- mark, a diploma in managing the service delivery system from SIMI (Scandinavian International Management Institute) and a diploma from The International Advertising Association (IAA) in Marketing Communications from the Commercial School in Copenhagen.

Bill Conley (update author)

IFMA Fellow, CFM, SFP, FMP, LEED AP

Bill Conley has more than 35 years of experience in the facility management profession and has been a proponent of sustainable operations for more than 20 years. During his tenure as a facility manager and through his training and experience with sustainable operations, Bill has come to understand the importance of the facility contribution to the financial success of a company. He has managed facilities for VeriFone, Hewlett-Packard, and SCAN Health Plan and has served as Managing Director of the LEED® Sustainable Development Group for Pacific Building Care (PBC).

He is a past president of the Orange County Chapter of IFMA, as well as the Facility Management Consultants Council and has served on the IFMA Board of Directors. He is a former director on the board of the Orange County Chapter of IFMA; a member of IFMA's International Sustainability Committee; and an IFMA Qualified Instructor. He is a Global Reporting Initiative Certified Reporter for both G3.1 and G4 and currently serves as Facility Manager for Yamaha Motor Corporation in Cypress, California, USA.

Dorothy Scholnick (update author)

FMP

As a recent graduate of Temple University's Facilities Management program, Dorothy Scholnick has prior experience with the facilities management industry through coursework and past internships. While attending school in Philadelphia, Dorothy has led Temple University's own Facilities Management student group as President of Temple University Facility Management Association (TUFMA). She has also had the opportunity to work in construction and healthcare facilities during internships.

Dorothy has been directly involved with IFMA as the Philadelphia Chapter Student Liaison working under the Education Committee and also received the IFMA Philadelphia Chapter Scholarship in October of 2015. She continues to stay connected with IFMA through involvement with the Capital Chapter. Dorothy currently serves as a Facility Consulting Services Staff Professional at Facility Engineering Associates (FEA) located in Washington, D.C. Metro Area.

FOREWORD

Regardless of the size and scope of an organization, the shared responsibility of creating and implementing focused, well-defined sustainability strategies is the right thing to do for the environment, for the communities in which they are implemented and for the individuals who live and work there.

In recent years the focus on the triple bottom line of people, planet and profit has evolved from a fad of early adopters to the mainstream of standard business practices. Private entities are looking for competitive advantages in green markets while federal, state and local governments are increasingly applying regulatory constraints on design, construction and facility operations standards.

With this change has come renewed focus on finding people with necessary knowledge and skills. In fact, while technology continues to improve at staggering rates, it is the facility management (FM) professional who has the most critical part to play in choosing and operating that technology in the field.

Modern FM professionals around the world must be able to clearly communicate the benefits and positive economic impact of sustainability and energy-efficient practices to key stakeholders and decision makers. One way to accomplish this is to utilize rating systems, which are an optimal way to evaluate the performance of a facility. The rating systems reviewed in this document can provide a practical structure for FM professionals to achieve widespread and effective sustainability within their facilities by utilizing the system that best fits their circumstances.

This document is the result of a collaboration between the International Facility Management Association (IFMA) Environmental Stewardship and Sustainability Strategic Advisory Group and the IFMA Foundation working toward a shared goal of advancing sustainability knowledge on behalf of those responsible for its execution.

It is our hope that everyone who reads this report will join our efforts to advance sustainable practices. This resource is a good place to start. If you are interested in learning more, IFMAs fastest-growing professional credential — the Sustainability Facility Professional® (SFP®) — may be for you and your organization.

Tony Keane, CAE
President and CEO
International Facility Management Association

IFMA Environmental Stewardship and Sustainability Strategic Advisory Group

Purpose

The Environmental Stewardship and Sustainability Strategic Advisory Group (ESS SAG) serves as an advisory resource for the integration of the ESS core competency into the practice of facility management. The ESS SAG is responsible for the production of IFMA's Sustainability How-to Guide series.

I. **Direction and Authority**

The IFMA Board of Directors authorizes the ESS SAG, within the parameters of its role and responsibilities, to act in an advisory role to the board and the ESS community in the integration of ESS into the core competencies of the association.

II. **Role and Responsibilities**

Environmental stewardship and sustainability is a strategic theme and core competency of facility management that touches every aspect of the association. The primary responsibility of the ESS SAG is to further the development of the ESS competency area by acting in an advisory capacity with respect to the policies and strategies that pertain to IFMA's performance as a sustainable organization, development of the ESS topical area within IFMA's Online Community and input on the development of ESS as a core competency.

III. **Membership**

SAG members include: * Bill Conley, IFMA Fellow, CFM, SFP, FMP, LEED AP; Laurie Gilmer, P.E., CFM, SFP, LEED AP; Christopher Laughman, CFM, SFP, LEED AP O+M; Sheila Sheridan, IFMA Fellow, RCFM, LEED AP; Eric Teicholz, IFMA Fellow (SAG chair); Jenny M. Yeung, CFM, CEnv.

*as of April 2016

The general objectives of the How-to Guides series are:

1. To provide data associated with a wide range of subjects related to sustainability, energy savings and the built environment;
2. To provide practical information associated with how to implement the steps being recommended;
3. To present a business case and return-on-investment analysis wherever possible, justifying each green initiative being discussed;
4. To provide information on how to sell management on the implementation of the sustainability technology under discussion;
5. To provide case studies of successful examples of implementing each green initiative;
6. To provide references and additional resources (e.g., websites, articles, glossary) where readers can go for additional information; and
7. To work with other associations for the purpose of sharing and promoting sustainability content.

The guides are reviewed by an editorial board, an advisory board and, in most cases, by invited external reviewers. Once the guides are completed, they are distributed for free online by IFMA and the IFMA Foundation.

IFMA Foundation
800 Gessner Road, Suite 900
Houston, Texas 77024-4257 USA
Phone: +1-713-623-4362
www.ifmafoundation.org

The IFMA Foundation originated the Sustainability How-to Guide series. The ESS SAG took over production of the guides in 2014.

Established in 1990 as a non-profit, 501(c)(3) corporation, and separate entity from IFMA (the International Facility Management Association), the IFMA Foundation works for the public good to promote priority research and educational opportunities for the advancement of facility management. The IFMA Foundation is supported by the generosity of the FM community including IFMA members, chapters, councils, corporate sponsors and private contributors who share the belief that education and research improve the FM profession. To learn more about the IFMA Foundation, visit www.ifmafoundation.org.

Global Workforce Initiative Charter Advisory Partner

C&W SERVICES

2016 IFMA Foundation Sponsors

Major benefactors

• East Bay Chapter of IFMA • New York Chapter of IFMA •Los Angeles Chapter of IFMA

Gold sponsors

A&A MAINTENANCE INTEGRATED FACILITY SOLUTIONS • Sodexo •Capital Chapter

Silver sponsors

• Greater Phoenix Chapter of IFMA • San Diego Chapter of IFMA

Bronze sponsors

• Innovative Cleaning Services, Inc. • Atlanta Chapter of IFMA • Denver Chapter of IFMA • Charlotte Chapter of IFMA
• San Francisco Chapter of IFMA • Westchester County-Hudson Valley Chapter of IFMA • Hawaii Chapter of IFMA
• Silicon Valley Chapter of IFMA • Orange County Chapter of IFMA • Central Ohio (Columbus) Chapter of IFMA
• Chesapeake Chapter of IFMA • Delaware Chapter of IFMA

Friends of the foundation

• Austin Chapter of IFMA • Nashville Chapter of IFMA • Chicago Chapter of IFMA • Frank Boettcher
• Cincinnati Chapter of IFMA • Dallas-Fort Worth Chapter of IFMA • Nevada Chapter of IFMA
• Suncoast Chapter of IFMA • Greater Triangle Chapter of IFMA • NY Tech Valley Chapter of IFMA

• Southern Arizona Chapter of IFMA

IFMA Foundation Academic Awards

ARAMARK Facility Services • San Fernando Valley Chapter

Foundation Chairman's Reception & Foundation Booth Expo

Steelcase

Inaugural 5K Foundation Fun Run/Walk

• Knoll • JLL

Student FM e-Poster Competition

• Utah Chapter

Part 1 - EXECUTIVE SUMMARY

'Expand knowledge of the built environment, in a changing world, through scholarships, education and research'

- The Vision Statement of the IFMA Foundation

Sustainability in the built environment includes many operational roles. These roles are often defined by the objectives and professional responsibilities of facility and property management. Some organizations' entire mission is driven by sustainability, while others integrate environmentally preferable objectives into their operations as directed by management or as natural outcomes of service providers. The one thing that all organizations who engage in sustainability have in common is the desire to manage today's needs without compromising the ability of future generations to meet their own needs (Brundtland 1987).

In its green, or sustainable, infancy, the commercial cleaning industry sought opportunities to be able to clean effectively while protecting those who were performing the cleaning. Given the human performance component of cleaning, this was natural. Today, green cleaning has grown to be very sophisticated from both a tooling, chemical, equipment and performance process and a human engagement perspective.

This guide has been created to serve as an instrument for those in the built environment who either manage their own employees or contract with a cleaning service provider. Further, this guide is designed to help readers understand the objectives of a green cleaning program, assist in the implementation of a comprehensive program and help measure the effectiveness of such a program.

Given the international background and experience of the guide authors, the guide integrates cleaning operations that are found outside of North America- hence "Global Green Cleaning." The authors chose to develop this guide using the spectrum approach, thus providing readers with a range of green cleaning options. Through this approach, the authors provide information about each of the building blocks of a cleaning structure, ranging from the most basic to the most robust and comprehensive. The guide is divided into the following sections:

- Introduction, which defines green cleaning and sustainability
- Detailed findings, which further define what green cleaning is, and detailed discussions on the topics of:
  - How to develop a green cleaning program
  - Green cleaning products
  - Green cleaning equipment
  - Indoor air quality
  - Greenwashing
  - How to find a green cleaning service provider, including both in-house and contracted service approaches
  - Importance of performance measurement
  - Information about the possible future of green cleaning and potentially revolutionary processes on the cleaning horizon
  - Making the business case, which provides practical tips and suggestions on quantitative benefits of green cleaning
  - Case studies of three green cleaning programs, including a university campus, office building and museum

Part 2 - INTRODUCTION

2.1 What Is Green Cleaning?

The first question that most ask when considering the adoption and implementation of a green cleaning program is "What exactly does green cleaning mean?" Of course, it is probably also one of the most difficult questions to answer. Although many definitions of green have been suggested, a consistently applied, universal definition of green largely remains elusive, presenting quite a challenge for a facility management professional who is committed to implementing a comprehensive and effective program. Furthermore, there are those who no longer even refer to green cleaning, preferring the more nebulous concept of sustain- able cleaning.

There is a great deal written about sustainability, and as with green cleaning, much of it can be confusing and at times contradictory. Some have even suggested that sustainability is simply the latest business fad soon to be replaced with the next vogue. As more organizations adopt sustainability practices and offer more sustainable products and services, competitive advantages and differentia- tors will diminish, requiring businesses to differentiate themselves in new ways.

However, two enduring considerations promise to ensure that sustainability, whatever its title and however the definition is interpreted, will remain core to future business operations:

- The global economic recession toward the end of the last decade demonstrated to even the most eco-sceptic business leaders that they could operate efficiently with reduced resources and, in doing so, bolster earnings.
- The world population will continue to increase placing greater demands on finite resources such as oil, with the likely consequence of reduced availability and increased cost, resulting in businesses having to become even more efficient and sustainable.

The same is true for green cleaning. At its out- set, green cleaning was essentially involved with the use of environmentally preferable chemicals. Although an acceptable initial approach, in no way does green cleaning stop there. Rather, the concept has gone through a number of developments to incorporate environmentally preferable tools, equipment and paper goods.

Further, green cleaning practices have started to incorporate not only the environmental preferability of specific products and how, when and where they are procured and used, but also a focus on the health and safety of both cleaning personnel and building occupants, as well as innovative programs, such as daylight cleaning. In North America particularly, green cleaning has become more formalized and accredited through methods available from the U.S. Green Building Council Leadership in Energy and Environmental Design (LEED) rating systems and ISSA's Cleaning Industry Management Standard (CIMS).

Yet, despite a growing recognition of the benefits associated with green cleaning, in many respects, it remains the exception rather than the rule. The trend toward increased environmental preferability is undeniable, especially as regional legislation is adopted; organizations better understand the economic, social and environmental benefits and the competition to go green intensifies. Ultimately, the convergence of these factors and many others will result in green cleaning becoming more wide- spread and the norm.

2.1.1 What Is Sustainability?

Any attempt to define green cleaning must start with an understanding of what is meant by sustainability. After all, green cleaning is an integral element of sustainability. Although the terms sustainability, green and environmental are used interchangeably, the most widely cited and accepted definition for sustainability comes from the frequently referenced Brundtland Report (1987): "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland 1987).

The Brundtland Commission, formally the World Commission on Environment and Development (WCED), was convened by the United Nations (UN) in 1983. The commission was created to address growing concern "about the accelerating deterioration of the human environment and natural resources and the consequences of that deterioration for economic and social development" (Brundtland 1987). In establishing the com- mission, the UN General Assembly recognized that environmental problems were global in nature, and determined that it was in the common interest of all nations to establish policies for sustainable development.

The Brundtland definition has been further refined to focus on the triple bottom line, sometimes referred to as 3BL or TBL, and is currently the most often cited definition of sustainability, especially by large national and international organizations. The triple bottom line of environmental, social and economic considerations, often simply referred to as "people, planet, profit," provides a framework and expanded scale of values and criteria for measuring an organization's success (Figure 1).

Figure 1: Components of sustainability (adapted from Barbier 1987)

2.1.2 Answering the Question: What Is Green Cleaning?

Given the definition of sustainability, it is reasonable to expect that a comprehensive green cleaning program should encompass not only environmental considerations, but also social and economic considerations as well. In the United States, the most accepted definition of green cleaning is cleaning to protect health without harming the environment, defined in Executive Order 13101 (The President 1998). In an effort to focus governmental purchases on more environ- mentally friendly (green) alternatives, the order defines these products as products and services that reduce the health and environmental impacts compared to similar products and services used for the same purpose. The order goes on to say that the "comparison may consider raw materials acquisition, production, manufacturing, packaging, distribution, reuse, operation, maintenance, or disposal of the product or service" ensuring that product life cycle is fully considered, including the opportunity to influence the ultimate outcome during the use stage: operation and maintenance.

The Presidential Executive Order definition certainly provides guidance and a good starting point, but, ultimately, its utility is limited. After all, a product or service may have less of an effect when compared with an alternative, but its overall impact may be undesirable and the product or service may, therefore, not fit into a green program that truly meets its goals.

Taking this into consideration, as well as the goals for a green cleaning program, green cleaning can further be defined. Ultimately, the primary goal of a green cleaning program should be to reduce the impact of the cleaning process on the natural and built environment without having a negative effect on human health. At first glance this appears to be a simple concept, but peeling back the layers reveals a rather complex notion, especially when one considers the inherent nature of the cleaning process-the removal of harmful contaminants resulting in a clean and healthy indoor environment. Therefore, it is not enough to just use products, equipment and materials that are the least toxic or least harmful alternatives. Rather, a facility manager needs to ensure that such products are actually performing their job as expected.

This is a point that cannot be overstated and demonstrates that a successful green cleaning program is dependent on ensuring that it does, in fact, result in a healthy environment. Once this caveat is understood, it is possible to both see the crucial importance of cleaning and to under- stand that effective cleaning actually serves as the foundation for a green cleaning program. In other words, when considering the implementation of a green cleaning program, a facility manager should understand that for a cleaning program to be green, environmentally preferable, or sustain- able, it is necessary to ensure that the facility is in a condition that is conducive to the health of its occupants, which, in turn, demands that it be cleaned effectively.

After all, if the cleaning is ineffective and does not remove contaminants that could lead to a public health outbreak it simply cannot be green.

Ensuring a healthy environment has never been more important. With recent public health threats, such as H1N1, MRSA, norovirus, avian flu, SARS and others, facility managers have an increasing responsibility to ensure that they are doing everything to defend against a possible outbreak. This is where cleaning plays a crucial, albeit, all- too- often underrated role.

So what does all this mean for the definition of green cleaning? Well, if green cleaning is equated with providing a healthy environment and it is un- destroy that a healthy environment is dependent on effective cleaning, a green cleaning program is truly best defined as one that has the least impact on human health and the natural environment while ensuring that the necessary level of unwanted and potentially harmful contaminants are removed as the result of effective cleaning.

2.1.3 Summary: What Is Green Cleaning?

Given an understanding of how effective cleaning practices incorporate the use of products and materials that have the least impact on the indoor and natural environment, it is now easier to consider the question posed at the beginning of this section: What is green cleaning? Ultimately, facility managers who wish to implement a successful, comprehensive green cleaning program need to take a fresh look at the cleaning process and con- sider a new approach. By focusing on the concept of cleaning for health and adopting a cleaning program based on such a concept, facility managers can demonstrate their commitment to sustainability and validate their role as an innovative environmental steward.

2.2 Different Shades of Green

Once the concept of green cleaning is understood, it is possible to take the next step and begin to consider how to implement an effective program. Many immediately think that a green cleaning program primarily involves the use of products, equipment and materials that are environmentally preferable. However, while the use of green products is undeniably crucial, a comprehensive program involves a number of different elements and, in many cases, demands a shift in a facility management team's approach to cleaning, as well as an unwavering commitment to meeting the ultimate goal. The truth is that such change will not happen overnight and can be overwhelming.

As a new green cleaning program is developed, or a program is maintained, it is essential to know what is currently being done in the facility, as all-too-often reality differs greatly from perception and expectation. Additionally, aligning departmental goals with corporate sustainability goals is paramount to the overall program success.

Over the past decade, and especially the past few years, there has been rapid growth in the corporate awareness of green issues, and green cleaning in particular. Only a short time ago, if green was considered, it might show up as a comment in a company's corporate report in the social responsibility section.

That being said, while it is necessary to view a green cleaning program as comprehensively as possible, a tiered approach may be most sensible during early efforts to invest in green cleaning. Under such an approach, a green cleaning program can be looked at as a series of stages and allows a facility's program to evolve over time.

Although there certainly are an unlimited number of possibilities, it is easiest to consider a green cleaning program in three primary stages. A stage one program would include the development of a clear green cleaning policy, as well as the transitioning of certain products (i.e., chemicals and equipment) from traditional to green, while always ensuring that such products are less impactful but also effective. When selecting green products, it is important to ensure that cleaning professionals are trained to use them appropriately.

A stage two program should move the green cleaning program forward and add additional pieces to the puzzle. The green cleaning policy should be more robust and include detailed information on how green processes will be utilized, managed and measured. Green product selection should be expanded to include environmentally preferable paper products, trash liners, hand soaps and other cleaning materials, including microfiber. Alternative technologies can be tested and implemented, where appropriate, and all processes should be tailored to ensure that they have the least impact possible. Facility managers should also begin to consider the overall impact of the program on all aspects of their operations.

A stage three program involves a holistic approach to green cleaning and demonstrates a full commitment to sustainability. This is where a cleaning program can truly move from green to sustainable. At this level,

- Environmentally preferable products should be used for all product categories
- Processes should be completely implemented to ensure the least negative environmental impact
- All decisions should be made so they are clearly consistent with the principles of sustainability.

For example, activities should be designed to complement the ideals of resource conservation (i.e., use of water in the cleaning process) and human resource issues should consider social responsibility ideals (i.e., social equity). A stage three program also demands that such activities are consistent with both the cleaning organization's and the facility's commitment to corporate sustainability, requiring that all stakeholders work together as a cohesive unit in the development and implementation of the program.

Yet, even as organizations invest in a true stage three program, there is much more that can be done. Beyond green cleaning is comprehensive sustainable cleaning, where companies start measuring their carbon footprint, define long and short-term objectives and take well-defined actions to make a positive impact on the environment, or at least better limit their negative impact.

2.3 One World and Corporate Responsibility

Green cleaning is undeniably a universal concept. A well-designed and implemented program will be equally effective regardless of whether a facility is located in the United States, Italy, Japan, Sierra Leone or anywhere else. That being said, different parts of the world are inarguably at different places on the green/sustainable cleaning path.

For example, while more and more companies in North America are adopting widespread sustainability platforms and embracing the concept of corporate social responsibility, in many cases, things are much further along in the European Union. For many European companies, such ideals-especially social responsibility- have been the norm for many years. Of course, innovation can come from anywhere. A successful program should include a constant review of global developments in green cleaning to ensure that all factors are considered; continuous improvement is a primary characteristic of the program; and the latest innovations are implemented wherever and whenever practical.

Implementation of green practices and making a commitment to sustainability is not enough. Measuring and tracking the global environmental impact of companies against short- and long- term targets to develop approaches that meet the needs of the present without compromising the ability of future generations to meet their needs is crucial. Accountability and communication are the way to success. In order to share this with key stakeholders, such as employees, customers and shareholders, more and more companies are publishing annual corporate social responsibility reports. These reports indicate current state, actions, results and future objectives from their sustainability perspective.

Part 3 - DETAILED FINDINGS

3.1 Why Green Cleaning?

Organizations cannot focus solely on profits, but must also consider the impact of their activities and operations on people and the environment. The icon for the triple bottom line is a three-legged stool because each of the three legs must be strong, and no one leg is more important than the others. A sustainable business, organization or industry depends on a balance between profit, people and the planet.

As previously mentioned, green cleaning is tied closely to the concept of sustainability and the triple bottom line (Figure 2). Recently, the triple bottom line concept has proven useful in terms of clarifying what it takes to become a sustainable company. The triple bottom line suggests that an organization's license to operate in society comes not just from sustained growth and profits (the economic bottom line), but also from improving its environmental and social bottom lines. Vice versa, a highly responsible yet unprofitable company is unsustainable in the long term.

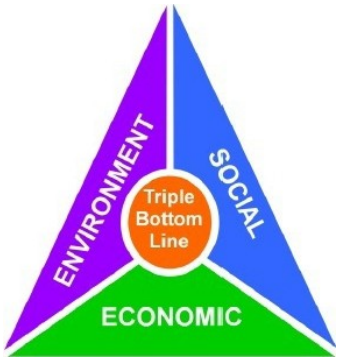

Figure 2: Triple bottom line (Hodges 2009)

3.2 Green Cleaning and the Triple Bottom Line

Cleaning service providers are becoming increasingly aware that they cannot solely focus on profits, but must also consider impacts on people, especially given that they are often truly seen as a people management organization. In this respect, the triple bottom line and sustainability are powerful reminders of the ways products and processes used impact organizations, finances, workers and the environment. Economic, social and environ- mental objectives are often interconnected and must be understood as such.

Thus, green cleaning needs to take a conceptual approach that effectively balances the well-being of

- People and their activities
- Economic value and the generation of the maximum value for all parties involved
- Environmental impact

Only then will it be possible to create a sustain- able business model into the future. The following subsections discuss the concepts of people, profit and planet as they relate to green cleaning.

3.2.1 People

While green cleaning's impact on the economic and environmental legs of the sustainability stool is documented and understood, the third leg, social impact, has historically been neglected. Traditionally seen as a commodity or even a necessary expense, cleaning is viewed as a low-price, low- profit business. As the concept of green cleaning continues to evolve and move toward truly sustain- able cleaning, many of these old ways of thinking will be challenged.

In general, building service contractors (BSCs) are constrained in their ability to provide their workers with better compensation and training largely by their inability to charge more for their services. As facility managers seek to create sustainable facilities, it will be important for facility managers to start considering the impacts on the building occupants and employees and, as a result, place a greater emphasis, or value, on cleaning. It is obvious that cleaning products and equipment are necessary for maintaining attractive conditions in the home and workplace however the resulting impact on occupant health and well-being must also be considered.

Simply stated, facility management professionals need to better under- stand that the removal of dust, allergens and infectious agents is crucial to maintaining a healthful in- door environment. Yet, while offering undeniable health benefits, conventional cleaning products and equipment can also present several health and environmental concerns. Cleaning products may contain or spread chemicals that can cause eye, skin or respiratory irritation, or other human health issues. The chemicals pose a potential hazard not only to the cleaning employees but also the people associated with the cleaning activity in any form, including building occupants and those who visit or simply pass by.

More than 4 million people are employed in the cleaning industry in the United States (BLS 2016). The vast majority of these people are those who actually perform cleaning service, actively using products and equipment to maintain facilities. These workers often have long-term exposure to cleaning chemicals, some of which are believed to cause both long- and short-term health issues, such as eye and skin burns, respiratory irritation, asthma, reproductive and developmental problems, and many more.

The use of poorly designed mopping systems and powered equipment, and the requirements to lift heavy objects, can also cause chronic musculoskeletal problems.

Currently, there is growing occupant demand for clean, healthy buildings, with people influencing how and when cleaning will take place in an effort to achieve an optimum result. There is also in- creasing interest by occupants for improved indoor air quality, reduction of noise levels, decreasing risks for slip and fall accidents, and conscious use of resources. With people becoming more and more outspoken and consumers and occupants having endless sources of information, their influence in the preferred choice for cleaning concepts is increasing.

3.2.2 Profit

Despite positive or negative economic indicators in the United States and throughout the world, in the authors' experience green cleaning continues to prove to be a good investment. Although many immediately equate green products with a higher cost, the truth is that a comprehensive green cleaning program should have a positive economic impact and result in a return on investment due to the many business advantages of green cleaning. For example, green cleaning operations can reduce a facility's demand for energy, water and waste removal- reducing direct costs. Green cleaning also typically improves productivity, which in return also leads to a reduction in costs. At the end of the day, green cleaning has proven to be an excellent bargaining chip for savvy facility managers who wish to present properties that are green and maintained with a green program.

DAYLIGHT CLEANING

Daylight cleaning can reduce costs of wages by reducing the number of worker shifts, which helps to reduce energy and heating costs. Cost savings from less staff and reduced energy costs outweigh the costs of new cleaning equipment that may need to be acquired for usage during business hours. Moreover, building occupants' perception of cleaning improves as they witness the cleaning process, which results in more satisfied building occupants who have far fewer concerns about cleaning in the workplace.

The growing queue for buildings seeking USGBC Leadership in Environmental Design (LEED) or similar certification, for both new construction and existing buildings, is evidence of the growth of green and the positive economic implications. Further, interviews with the heads of major corporations worldwide (as reported in the *Wall Street Journal* and the London *Financial Times)* reveal a commitment to moving forward with their green programs. For example, the experiences of large retail chains have shown that changing floor care cleaning methods to ones that consume less water and no chemicals have resulted in significant savings.

ECONOMIC AND ENVIRONMENTAL SAVINGS: GREEN CLEANING FOR A RETAIL CHAIN

Consider a retail chain with 300 stores worldwide, with 32,000 square feet (3,000 m^2) per store of which 21,500 square feet (2,000 m^2) is cleaned six days each week. Per annum, there was a reduction of 7.9 x106 gallons (30MM liters) of water and a reduction of more than 130,000 gallons (500,000 liters) of chemicals. The chemical reduction equaled an annual savings of close to 850,000 euros. (Figures based on retailer tests throughout multiple European countries).

3.2.3 Planet

The global cleaning industry is made up of more than 250,000 companies, many of which have multiple facilities, cars, delivery and maintenance trucks, and other vehicles (Ashkin and Holly 2008). All of these operations consume fuel, water, electricity and other resources, as well as produce byproducts, and contribute to environmental emissions. This represents a significant opportunity for facility managers and other end users to choose vendors and suppliers who have a proven commitment to sustainable practices.

The cleaning industry impacts the environment in a number of other ways as well. Rather than reading this as an indictment of the cleaning industry, however, the impact should be recognized for the opportunity it offers. In fact, a significant portion of manufacturer research and development efforts and resources are directed specifically at creating the products, equipment and supplies to address these environmental impacts. The above-mentioned economic benefits (reduced costs due to reduced water, chemical and energy consumption) directly reduce the environmental impact. To put the impact of cleaning into perspective, one must look at how cleaning directly affects the environment and helps shape what it looks like, while considering the massive opportunity presented, that is made achievable by working together and seeking ways to reduce environmental impacts.

- A minimum of 6 billion pounds (2.7 billion kilograms) of cleaning chemicals are consumed annually in the performance of cleaning tasks. While chemicals are often necessary to properly clean a facility, misuse and overuse due to lack of training are very common. The majority of cleaning products are still made from scarce, nonrenewable resources.
- Over 4.5 billion pounds (2 billion kilograms) of janitorial paper consumed each year are still primarily composed of virgin tree fiber, equivalent to more than 30 million trees. The

manufacturing and bleaching processes have enormous environmental and health impacts, offering significant opportunities for improvement.

- Approximately 1 billion pounds (0.5 billion kilograms), or 40 dump truck loads, of discarded janitorial equipment heads to landfills every year (Ashkin and Holly 2008). The overall impact of this waste goes far beyond the impact on landfills. Every part of the product life cycle is impacted, from raw material extraction to manufacturing, packaging, distribution, use and disposal. Poorly designed or constructed equipment, along with throw-away vacuum cleaners and other products designed for limited or one-time use, consume tremendous amounts of resources, may cause worker injuries and generally do not clean well.

3.3 Developing a Green Cleaning Program: Products

A comprehensive green cleaning program makes sense from an economic, social and environmental perspective. Yet, as has been mentioned earlier, misunderstandings and marketplace confusion make it difficult to ensure that a program contains all the necessary elements, will be effective and will garner the desired results.

There are many valid, and arguably as many invalid, interpretations or definitions of what is truly a green cleaning product. Many definitions and interpretations go beyond what the product should contain, and what it should not contain. Factors such as product classification, human health, environmental health, and packaging amount and type are also often included.

First, look for a valid product eco-marking in identifying a green or environmentally friendly chemical product. There are many different third-party certification programs across the world which can differ in their standards based on their interpretations. Many of these programs are unified under the Global Ecolabelling Network which contains more than 30 members across the globe. For example, programs such as the EU Ecolabel (the "Flower") and the Nordic Ecolabel (the Swan) in Europe, and Green Seal Ecologo and the U.S. Environmental Protection Agency's Design for the Environment program (DfE) have garnered much support in both the public and private sectors.

Although there are many similarities between these eco-programs, there are also many differences. To illustrate this point, consider one environmentally questionable material: phosphorus (Table 1).

As shown in the table, phosphorus is treated quite differently depending on the document consulted. For example, a cleaning product containing 2 percent phosphorus that is used at 0.541b/gal (50g/L) or 5 percent would be green under EU Ecolabel and Green Seal, but would not be green under Nordic Ecolabel and Ecologo.

This example is certainly not intended to note that one program is better or worse than another, but rather to illustrate the differences between programs and stress that an ecolabel may not be a definitive definition of green.

Table 1: Summary of institutional cleaning products certification organizations and their respective phosphorus guidelines

Cleaning Products for Industrial Use Sixth Edition GS-37	Certification UL 2759 Standard for Sustainability for Hard Surface Cleaners	EU Ecolabel Criteria for All Purpose Cleaners and Cleaners for Sanitary Facilities	Nordic Ecolabelling: Ecolabelling of Cleaning Products, Version 5.3
September 1, 2011	September 26, 2011	December 2014	March 2013 – December 2017
Product as used shall not exceed 0.5% by weight of total phosphorus	Banned	All-purpose cleaner: Total phosphorus shall not exceed 0.02g/fu Cleaner for sanitary facilities: Total phosphorus shall not exceed 1g/fu Window cleaning products: Shall not contain phosphorus (fu = dose in g/L of water)	Phosphorus is prohibited from use in the final product and must not be actively added to ingredients Solid soap products may as a total contain 0.06% EDTA and phosphonates

Moreover, few, if any, ecolabels have criteria for products that make disinfection or sanitizing claims. As such, a facility that mandates ecolabel products would essentially eliminate only the use of disinfectants and sanitizers. However, before making such a decision, one should consider social and economic impacts of employee illness or absenteeism, customer compensation and/or action by the authorities that could result from having unhygienic catering and washroom facilities.

Apart from ecolabels, other definitions of green require that the product is biodegradable and/or natural. However, these classifications also raise issues.

3.3.1 Biodegradable

Many cleaning products claim to be 100 percent biodegradable. In Europe, there are two important points to note on biodegradability:

- Biodegradability is only defined for organic substances, that is, those substances that contain carbon. Inorganic substances that do not contain carbon, such as sodium hydroxide, are, by definition, not biodegradable.
- Technically, biodegradability is defined for substances (single raw materials), and not for mixtures.

Given that the vast majority of cleaning products are a mixture of a number of organic and inorganic substances, including water, it would be inaccurate to claim that a product is 100 percent biodegradable. Given that it has been legislated in Europe since 1978 that surfactants be biodegradable, unless there was something unique or specific about biodegradability of the surfactants used (which should be identified by the manufacturer), a user cannot nor should not infer that one product is superior to another solely by a biodegradability claim.

3.3.2 Natural

There are a growing number of products claiming to be natural. However, it is important to question whether natural is necessarily green or better for human and/or environmental health. After all, in nature there are many things that are harmful, such as asbestos, cyanide and mercury.

The discussion document *Meeting Natural Expectations,* published by the UK Cleaning Products Industry Association, concludes that categorizing products as natural or chemical is irrelevant and essentially meaningless. The report stresses that "all substances are just arrangements of atoms of the same 90-odd chemical elements of which the planet is made" (UKCPI 2007).

It is true that initial consideration suggests that natural materials are preferable to petroleum-based materials as they are more renewable, but one has to question the cost. The extensively used palm oil is highly renewable, but its production has resulted in the deforestation of many parts of the world, including Sumatra and Borneo.

Arguably, the greatest use of natural materials in the cleaning industry involves fragrances. Due to human health concerns with some fragrance ingredients, ecolabels tend to control or limit their use, and are even banned under the Ecologo UL 2759 Standard for Sustainability for Hard Surface Cleaners, September 2011.

Moreover, it should be noted that the vast majority of natural materials contained in cleaning products undergo some kind of chemical reaction to turn them into a useful, functional material. In essence, the raw material actually used is chemically synthesized and not truly found in nature. Furthermore, the synthesis process often uses materials such as ethylene oxide to produce surfactants called alcohol ethoxylates. According to the Australian Government's Department of Sustainability, Environment, Water, Population and Communities, "no significant natural sources of ethylene oxide are known"(National Pollutant Inventory 2010). As such, the ethylene oxide used in the synthesis of a natural surfactant is likely to come from petroleum.

Additionally, there are many potential sustainability issues with natural materials, including:

- The use of pesticides and fertilizers to maximize harvest
- Genetically modifying crops to increase yield
- Diverting the crop from food or other uses
- Factors of growing the additional crop
    - Deforestation
    - Loss of $CO_{2\ sink}$
    - Destruction of wildlife
    - Displacement of indigenous peoples
    - Child labor
    - Transportation or energy consumption
- The additional effort required to generate/produce
    - Increased health and safety issues
    - Reduced productivity
- The impact on packaging manufacture, transportation, waste, and storage due to high concentration levels
- Increased energy consumption by hot water/machinery used to achieve desired result
- Poor results-client/customer dissatisfaction, leading to turnover and loss of jobs

3.4 Green Cleaning Equipment

Environmental, social and economic factors can also be applied to green cleaning equipment. At one level, it can be argued that all equipment is sustainable (Table 2). As equipment contributes to all factors, the considerations for selecting equipment are far more comparative between machine and manufacturers, than for chemical products.

Table 2: Environmental, social and economic factors for green cleaning equipment

Environmental	• The improved mechanical action reduces the amount of chemicals and the need for more environmentally hazardous products to be used • Effective cleaning, such as vacuuming of carpets, reduces wear and tear, and will prolong the life of the floor
Social	• Reduced exposure to hazardous chemicals due to the improved mechanical action • Less arduous, particularly muscle strain, compared to manual methods
Economic	• Improved productivity compared to manual methods • Reduced chemical requirements • Reduced floor damage

In North America there are useful programs for identifying green cleaning equipment, such as the Carpet and Rug Institute's Green Label. However, there are no comparable European programs nor are there regulations similar to those adopted by the California Air Resources Board.

Overall, there are very few European accreditation schemes for industrial or commercial cleaning equipment. Standards that exist tend to be legislated, meaning that there is no differentiation across machines or manufacturers. Moreover, given the broad range of equipment including vacuums, scrubbers, driers, sweepers, wet pick-ups, rotaries and carpet extractors, it is highly likely that not all equipment will have the opportunity to be identified as "green."

3.4.1 Environmental Considerations of Green Cleaning Equipment

The main environmental issue with equipment is equipment efficiency, particularly water and energy use. However, noise pollution and protection of floors are also important environmental considerations. Each of these topics is discussed in the following order: noise, energy consumption and water consumption.

Noise pollution is more often associated with aircraft and factories, particularly at unsociable times. However, noisy equipment, such as vacuum cleaners, can also pose a significant disturbance, particularly in an office environment when people are making telephone calls and conducting business. This disturbance often means that cleaning is done early in the morning or late at night, which requires lighting, heating and cooling outside of business hours. As such, there has been a general increase in daytime or daylight cleaning regimes, which have many environmental, social and economic benefits. To achieve these benefits, low-noise-level equipment is required.

One key noise factor that is often misunderstood is decibels (dB). Sound pressure levels, measured in decibels, are based on a logarithmic scale. They cannot be added or subtracted in the usual arithmetical way. If one machine emits a sound level of 50 dB, and a second identical machine is placed beside the first, the combined sound level is 53 dB, not 100 dB. In other words, each increase of 3dB represents a doubling of the sound, conversely a reduction of 3dB represents halving of the sound. As such, small increases or decreases in the decibel level can have a significant impact on noise pollution.

Low noise equipment may be desirable for daytime cleaning operations in offices, but may not be best suited in environments, such as supermarkets, where audible alarms are often used to alert shoppers.

The theoretical energy consumption of AC-powered equipment is easy to calculate but much harder to define from an environmental perspective. Consider two similar machines, one rated at 800 watts (W), the second 1,000W (or 1 kW). In theory, for every hour of use, the first will consume 0.8kWh of energy, the second 1kWh or be 25 percent less energy efficient. However, the more efficient machine may achieve the same results in half of the time, only consuming 0.5kWh, or 37.5 percent of the energy, plus adding benefits of increased productivity. Therefore, to determine the sustainable benefits for AC-powered equipment, it is important to consider the energy efficiency, as well as increased productivity, when quantifying potential benefits.

Although the same arguments regarding power consumption can be applied to battery-powered equipment, the principal environmental consideration is battery charge efficiency. Battery charge efficiency not only directly reduces/increases energy consumption, but also has an impact on battery life. Improving battery life also helps to mitigate any environmental consequences of the disposal and/or recycling of batteries.

Traditional batteries used in cleaning equipment are wet cell batteries, very similar to those used in cars. One common type of wet battery, the lead acid battery, contains lead, lead oxide, plates, and a liquid electrolyte solution containing 65 percent water and 35 percent sulphuric acid. When a load is attached to the battery terminals, a chemical reaction between the lead, lead oxide and the sulphuric acid occurs.

As a result of the reaction, electricity flows through the terminals to the load. Given the above and the environmental and human health impacts of lead, lead oxide and sulphuric acid, and the release of hazardous gases during the charging process, this type of wet cell battery is less sustainable.

Gel batteries are often used, but these have a very similar chemistry and environmental concerns as wet batteries. The main difference is that the gases that are produced during the charging process are converted to liquid within the gel battery. This recombination process prevents any hazardous gases from escaping.

For some applications, there is a growing use of solid batteries, such as nickel-cadmium. These batteries utilize a technology that minimizes over-all human and environmental impacts. The best examples have a number of sustainability benefits:

- Fully charged from flat in as little as 3 hours
- Not damaged by repeated charging in a 24-hour period (opportunity charging)
- Will typically last up to 3 years, while conventional gel batteries last 18 months
- Smaller than normal batteries, with the same run time as normal gel batteries
- Lower price premium than conventional batteries
- Consume up to 25 percent less electricity than conventional gel or wet batteries

Among the technologies used for reducing water consumption are those that ensure that exactly the right amount of cleaning solution is dosed onto the floor, depending on how fast the machine is go-ing. The slower the travel (e.g., around corners), the less solution is supplied. The result is no puddles around corners, delivering up to a 30 to 50 percent savings in cleaning solution (water and chemical), reducing the risk of slip and fall injuries, and significantly increasing the productivity of the machine.

3.4.2 Reliability, Durability and Servicing

An often overlooked environmental consideration is the reliability and durability of the equipment, and if something goes wrong, the servicing of the machine. Any breakdowns or parts that need to be replaced not only incur the environmental impact of the repair person visiting the site, but also the environmental impact (manufacture, transportation and storage) of spare or standby equipment. Further, there are additional impacts, including lost productivity, cost and inconvenience, when equipment is unreliable.

3.4.3 Chemicals Used With Cleaning Equipment

Conventional dosing of chemicals for use with equipment occurs with the use of a wash-water tank. This is particularly effective when the entire tank of cleaning solution will be used in a single operation. However, in-tank dosing can have a couple of sustainability drawbacks, especially when the entire tank is not used.

First, many floor cleaning chemicals have a neutral pH, especially at as-used dilution. Neutral pH products are likely to contain a preservative to protect the product from bacterial contamination when in concentrated form. However, this protection will be absent in the tank. Unused cleaning solutions that are left for some time, particularly in warm conditions, will allow bacterial growth. Consequently, unused solution should be discarded if there is likely to be any delay in further use. This waste of both chemicals (and associated packaging) and water is not environmentally friendly and increases overall cleaning costs. Second, on occasion, it may be necessary to use two different products in one area, or in adjacent areas. Again, in-tank dosage requires draining of the cleaning solution between products with the same concerns as previously stated, or the use of two machines.

Systems that dose the concentrated product proportionate to the amount of water at the point of use (close to the brushes or pads) ensure that the wash tank only ever contains water. As such, these systems with super-concentrated products offer a number of environmental and other sustainability benefits (Table 3).

3.4.4 Social Benefits of Green Cleaning Equipment

There are two principal social benefits associated with green cleaning equipment. First is their low noise profile, which is more conducive to daytime (daylight) cleaning programs. The benefit of these programs to the operator is that cleaning is carried out at more sociable times and generally involves full-time rather than part-time employment (which tends to involve a greater investment by the employer in formal training and education and may lead to a professional qualification).

The second key aspect involves health and safety. On the presumption that all equipment is constructed with suitable safety features (e.g., double- insulation of electrical components, audible/visual warning where appropriate, interlocks/deadman's handle) then the differences in machines/manufacturers focus on the ergonomics of design, slip and fall mitigation and indoor air quality.

3.4.5 Ergonomics

Generally, floor care equipment is large and heavy. Therefore, potential injury due to manual handling will always be a risk. As such, all users of floor care equipment need to be adequately trained to minimize such risks. There are two main issues associated with poor ergonomic design: posture and vibration effects.

In terms of posture, floor care equipment, where appropriate, should have a natural height adjustment, such as tub vacuum cleaners, where the wand is used at the appropriate angle for the person's height, or an integral height adjustment mechanism, such as adjustable handle heights on rotary machines.

Table 3: Environmental, social and economic considerations for cleaning equipment

Environmental	• No overdosing, reducing chemical and packaging waste (plus transportation and storage impacts) • No unused cleaning solution drainage, saving chemicals, packaging and water • No need to change chemicals during operation, preventing the need to drain and clean the tank • Concentrated products reduce transportation, storage and packaging
Social	• Easy to install product and operate equipment • No pouring into tank minimizes the risk of splashing • Closed-loop systems minimize the risk of the user coming into contact with the chemicals • Small pouches do not create manual handling problems
Economic	• Increased control on cleaning costs because an accurate dosing is practically guaranteed • Consistent cleaning performance, as accurate dosing for each cleaning task and type of floor is possible • No damage to floors by eliminating application errors (use of the wrong chemical and/or wrong concentration)

Many floor care machines, particularly rotary machines, will vibrate during their use. A worker may be exposed to this vibration for significant periods, especially if daytime/daylight cleaning programs are used. These vibrations can lead to significant injuries, most of which are report- able in many countries to the appropriate health and safety authorities. Most vibration injuries can be categorized as work-related upper limb disorders (WRULDs). The main illnesses due to the use of floor care equipment include carpal tunnel syndrome, hand-arm vibration syndrome (HAVS) and vibration syndrome, typically vibration white finger. These illnesses can involve pain, swelling, restricted joint movement, tingling and numbness, blanching, and even permanent disability.

Therefore, the equipment should be designed and constructed to be adjustable, thus minimizing the risks associated with potential posture and vibration effects. Additionally, vibration should be reduced to an absolute minimum through a number of different control measures.

3.4.6 Slip and Fall

Cleaning operations invariably use water. On hard floors this raises the risk of slip and fall incidents and injuries that often occur in public spaces, such as supermarkets and airports. Therefore, particularly with scrubber driers, measures are paramount to control the amount of water used and to control water removal. Design features, particularly on scrubber driers, that help to reduce the risk of slip and fall are listed in Table 4.

3.4.7 Indoor Air Quality

Of growing concern are the effects of pollutants and allergens on human health and the indoor environment. This concern has now been made a feature of some building rating systems, such as the United States Green Building Council (US- GBC) Leadership in Energy and Environmental Design for Existing Buildings: Operations and Maintenance (LEED-EBOM).

The number of people with allergic asthma and similar illnesses is rising around the world. According to the most recent update by the Global Asthma Report of 2014, 334 million people suffer from asthma globally and that number continues to rise (Global Asthma Network 2014). Dust mite allergens are one of the most common triggers of asthma.

Table 4: Design features that reduce slip and fall accidents

Water reduction	• Systems that ensure that as the machine moves more slowly, such as around corners, the water flow is reduced, preventing puddles. • Micro-oscillating brushes are more efficient at minimizing the amount of cleaning solution that is required, and minimize splashing outside of the machine's footprint. • Solution outlets are directed toward the center of the brushes, minimizing splashing outside of the machine's footprint.
Water removal	• The squeegee height is automatically adjusted to ensure that it is in constant contact with the floor. • "W" shaped squeegees are highly efficient at collecting used solution. • Two vacuum hoses significantly improve water removal. • The vacuum utilizes direct suction (essentially straight hoses) to maximize efficiency. • If puddles should occur, the maneuverability of the machine ensures that the water is easily collected.

Dust mites can trigger allergic reactions such as asthma, eczema and rhinitis (runny nose). Reducing the number of mites may reduce these reactions. Mites are harmless to most of people, however, they can cause allergic symptoms in some people. These symptoms are caused by breathing in substances that are contained in the mites' droppings. The droppings are tiny, dry pellets that form a large part of the dust in areas where mites are found. The pellets are so small that they can become airborne, and may then be breathed in. The size of the dust mite droppings is so small that they can readily pass through vacuum cleaner bags. As such, the act of vacuuming can create a more severe problem for allergen sufferers. Therefore 3-stage or high-efficiency particulate air (HEPA) filters within vacuums can significantly reduce the risk (Figure 3)

Figure 3: Green cleaning building service worker with HEPA filter vacuum

The *Indoor Environment Characterization of a Non-Problem Building: Assessment of Cleaning Effectiveness* study (Cole et al 1994) identified that appropriate cleaning regimes and equipment can reduce the amount of airborne dust. The study identified that the average amount of airborne dust over a five-month period of a normal housekeeping regime was 7.4×10^{-10} lb./ft.^{3} (11.9 µg/m^3).

Following the introduction of a new regime including efficient vacuum cleaners and bags, walk-off mats and dust cloths that capture rather than disperse (e.g., microfiber), the five-month average of air- borne dust dropped by 52 percent to 3.5×10^{-10} (5.7 µg/m^3). The study also found that volatile organic compounds (VOCs) and bio-pollutants (bacteria and fungi) were also considerably reduced by introducing measures such as hot water extraction of carpets.

3.4.8 Economic Benefits

The environmental and social benefits detailed above can and will bring economic benefits, whether they are savings in energy, water, chemicals, waste, or reduced illness and injuries and the associated management, and, possibly, compensation costs. Overall, this can also help with employee recruitment and retention, as well as reducing operating costs. The environmental and social aspects of appropriate equipment can also enhance top-line growth through enhanced brand value and customer relationships. However, a key economic benefit of choosing the correct equipment is productivity. Productivity aspects of equipment are multifaceted and include:

- Downtime, including filling, draining and cleaning of scrubber driers
- Reliability, such as downtime due to machine faults
- Coverage rates, such as square feet per hour (square meters per hour)

The downtime and reliability aspects of equipment have been discussed above. Coverage rates generally increase as equipment size increases, including tank capacity, brush/pad width or vacuum head width. However, a large ride-on scrubber-drier that has a very good coverage rate may be less productive than a smaller one, simply because the user has to constantly move furniture or these areas are subsequently cleaned manually. Also, a larger tank scrubber-drier may be less efficient than a smaller one, if the smaller one uses water more efficiently. Indeed, it may be more economically viable to have multiple machines. One example is the use of both a relatively large scrubber-drier for aisles and a smaller one for checkouts in a supermarket.

3.5 Greenwashing

Even if one considers all the environmental, social and economic impacts of the products and equipment that can be used, there is still the fear that a product may not live up to its green promise. Coined by New York environmentalist Jay Westerveld in 1986, "greenwashing" is a growing concern as users attempt to ensure that the products they are using are, in fact, environmentally preferable. Essentially, greenwashing is the practice of companies disingenuously spinning their products and policies as environmentally friendly.

In December 2007, the environmental marketing firm TerraChoice released a study called *The Six Sins of Greenwashing (*TerraChoice 2007) that found that more than 99 percent of 1,018 common consumer products in North America randomly surveyed were guilty of greenwashing. A total of 1,753 environmental claims were being made, with some products making more than one, and out of the 1,018 studied, only one was found not guilty of making a false or misleading green marketing claim.

In April 2009, TerraChoice Environmental Marketing Inc. published a second report on the subject. This report noted the emergence of a seventh sin -the "sin of worshiping false labels" (TerraChoice 2009). The sin of worshiping false labels is committed by a product that, through either words or images, gives the impression of third-party endorsement where no such endorsement actually exists. In other words, the label is a fake.

The seven sins of greenwashing are summarized in Table 5.

Table 5: Seven sins of greenwashing

Sin	Example
Sin of the hidden trade-off	Energy-efficient electronics that contain hazardous materials
Sin of no proof	Shampoos claiming to be certified organic, but with no verifiable certification
Sin of vagueness	Products claiming to be 100 percent natural when many naturally occur- ring substances are hazardous, like arsenic and formaldehyde
Sin of irrelevance	Products claiming to be CFC-free, even though CFCs were banned 20 years ago
Sin of fibbing	Products falsely claiming to be certified by an internationally recognized environmental standard like EU Ecolabel
Sin of lesser of two evils	Organic cigarettes or environmentally friendly pesticides
Sin of worshipping false labels	Products give the impression through words or images of a third-party endorsement where no such endorsement actually exists

In April 2008, the sustainability communications firm Futerra published the Greenwash Guide (Futerra 2008), identifying 10 signs of greenwashing, many of which were very similar to TerraChoices' seven sins:

- Fluffy language: Words or terms with no clear meaning, such as "eco-friendly"
- Green product versus dirty company: Efficient light bulbs made in a factory that pollutes rivers
- Suggestive pictures: Green images that indicate a (unjustified) green impact, such as flowers blooming from a car exhaust pipe
- Irrelevant claims: Emphasizing one tiny green attribute when everything else is not green
- Best in class: Declaring that a company or product is slightly greener than the rest, even if the rest are pretty terrible
- Just not credible: Eco-friendly cigarettes; greening a product does not make it safe
- Gobbledygook: Jargon and information that only a scientist could check or understand
- Imaginary friends: A label that looks like a third-party endorsement, except it is made up
- No proof: It could be right but no evidence is provided
- Outright lying: Totally fabricated claims or data

Greenwashing is not just a North American problem. Studies in Europe have found similar numbers and types of greenwash environmental claims.

When considering the sustainability of a product, often only the environmental aspects are considered. As discussed earlier, sustainability is a balance of environmental, social and economic factors. That is not to say that every attribute or benefit of a product needs to encompass all three factors, but that all of the attributes/benefits, when combined, address all three issues. Moreover, even within a single attribute, consideration should be given to the consequences of a given feature. To consider an extreme example, water is a natural, environmentally friendly, relatively inexpensive and an often effective cleaner. So why is water not used for all cleaning applications? Well, one has to consider all the implications. For example, the cleaning process is likely to be more arduous, resulting in reduced productivity.

Furthermore, there is a question regarding whether the cleaning will be effective, especially if the proper tools are not used. Finally, there may be concerns with the environmental impacts of heating the water and the potential effects on health and safety. Consequently, the sustainability attributes of a product may be far broader and possibly harder to identify than it would initially appear.

3.6 Green Product Procurement: Concentrates and Dilution Control

With all of the various environmental claims, many of which should rightfully be considered green-washing, it is difficult to understand which cleaning products are truly sustainable. Ultimately, it is important to consider the total sustainability impacts of a purchasing decision, including price.

Often, it is easier if there is a green purchasing policy in place. However, it should be noted that in this case, green does not specifically mean environmental, but also should take into consideration social and economic factors.

Additionally, any policy should be flexible and pragmatic. For example, it may be appropriate to review monthly budgeting as the purchase of super-concentrates may exceed the monthly budget, particularly for the smaller, one-cleaner sites. However, it is likely that the annual budget may be significantly lower. Conversely, in smaller sites, super-concentrates may take a number of years to consume, much longer than the manufacturer's shelf-life guarantee.

When procuring cleaning products, it is generally important to look for products that:

- Are as concentrated as possible
- Are in the largest container as possible or practical
- Have integrated dilution control measures

Products that are as concentrated as possible, or practicable, reduce the amount of manufacturing energy, transportation to and from the manufacturer, and packaging. Super-concentrates also reduce the environmental impacts of storage and possibly inventory management and invoicing. Consider a 1 gallon (3.8 liter) bottle of product, with all of the associated environmental impacts, used directly and undiluted from the container produces 1 gallon (3.8 liters) of in-use solution; if diluted at 10 percent, 2.6 gallons (9.8 liters) of in-use solution is produced. If diluted at 1 percent, 26 gallons (98.4 liters) of solution are produced.

For most cleaning and sanitation applications, dilution rates of 5 percent or better should be achievable. For some applications, it may be necessary to use higher concentrations of product but these should be as effective as possible. For example, oven cleaners should be thickened products to cling to the oven, reducing the amount of product required. Similarly, floor coatings should be as durable as possible as this reduces not only the amount of product, packaging and transportation of the finish, but also the amount of stripper used.

Products that are in the largest container as possible/practicable can help to reduce packaging waste. Also be sure to consider the practicality of large containers, as they can create issues during manual handling, storage, budgeting and shelf-life. In general, the smaller the package, the greater the packaging to product ratio. For example, a typical ratio of plastic packaging to product for a 1 gallon (3.8 liter) bottle is 0.6 lb./gal (74 grams of plastic per liter of concentrate); for a 0.5 gallon (2 liter) bottle it is 0.42 lb./gal (50g per liter); and 1.3 gallons (5 liters) is only 0. 23 lb./gal (27 grams of plastic per liter) of concentrate.

Products with integrated dilution control measures not only reduce the amount of chemical waste due to overdosing but also the resultant waste packaging, transportation and the overall impacts of using too much chemical. Of course, control measures can be as simple as training supported by wall charts, but unless managed carefully, trials have indicated that even this results in overconsumption of up to 67 percent. Built-in portion control measures—systems that are incorporated into the packaging that deliver a known quantity of concentrate— are much better. These systems are particularly effective for fixed volumes of cleaning solution; such as trigger sprays. Dilution control systems are an effective strategy to reduce waste because these systems automatically mix product with water. They are particularly effective for bucket applications because only the required amount of cleaning solution needs to be prepared.

It is important to note that other sustainability issues arise with inaccurate cleaning solution concentrations. For example, cleaning solutions that are too concentrated may require rework to remove smears, reducing productivity, and/or are more likely to damage the surface being cleaned. Similarly, under concentrated cleaning solutions can create productivity issues if extra work or effort is required. Moreover, under concentrated disinfection or sanitizing products may lead to hygiene issues.

To illustrate this point, a conventional product is compared to a super-concentrated product in Table 6.

It may always be possible to find a greener or more socially acceptable and/or lower priced product, but at what cost? Is an ecolabeled, natural, non-classified, low-price product the most sustainable? It may be, so long as many checks and balances are answered: Has the product resulted in deforestation and/or created significant impacts due to transportation, storage and waste? Was child labor used at any stage in the manufacturing process? Is the product difficult to train users on handling or does it create hazards, such as exposure to allergens? Is the process labor-intensive, creating productivity issues or client dissatisfaction?

Table 6: Sample savings from use of a super-concentrated product

	Conventional product	Concentrated product	Percent savings
Case size	6 x 0.2 gallons (6 x 750 mL)	0.4 gallons (1.5 L)	---
Equivalent number of cases	83.3	1	---
Total chemical shipped	99 gallons (375 L)	0.4 gallons (1.5 L)	99.6 %
Waste plastic generated	82 lb (37.0 kg)	0.46 lb (0.21 kg)	99.4 %
Waste cardboard generated	44 lb (20.0 kg)	0.35 lb (0.16 kg)	99.2 %
Manufacturing energy required	46.9 kWh	0.2 kWh	99.6 %
Total carbon dioxide equivalence	201 lb (91.11 kg)	1.2 lb (0.55 kg)	99.4 %

The most sustainable/green product is the one that satisfies most of the sustainability criteria, most of the time.

3.7 Implementing a Green Cleaning Program

3.7.1 Getting Started

After an organization decides to go green, the key to a successful green cleaning program is to understand that effective cleaning is the foundation. This includes understanding that:

- The protection of human health is a paramount part of the decision process
- Green cleaning involves more than just the use of green cleaning products
- The real work is just beginning

In Part 2, the different shades of green and how to implement a program in stages was discussed. Each stage has its own set of activities and involves a different level of commitment. As one considers the different elements of a potential program, it should be kept in mind that the basic principles remain the same regardless of whether cleaning is performed by an in-house department or by a third-party cleaning service contractor. In other words, the key elements of a comprehensive green cleaning program should be implemented as part of a self-performed in-house program or demanded from a third-party cleaning provider.

3.7.2 Developing an Approach

Building a successful green cleaning program is not an easy task. Thus, there are a number of elements that are recognized as key components of an effective program. Further, by carefully defining the goals of a program, a facility can more easily navigate the green cleaning process. For example, most programs are built around the twin concepts of reduction and conservation, striving to invest in cleaning activities that reduce waste and toxicity, while conserving energy, water and other resources.

There are a number of road maps that can be used in the development of an effective program. For example, with the growing interest in LEED certification, many facility managers build their programs by using the green cleaning requirements found in the LEED for Existing Buildings: Operations and Maintenance (LEED-EBOM) rating system.

Similarly, cleaning organizations and facility management professionals have found value in the Cleaning Industry Management Standard (CIMS) and Cl MS-Green Building (CIMS-GB) green cleaning criteria. Administered by ISSA- The Worldwide Cleaning Industry Association, CIMS and CIMS- GB set forth management and green criteria that are based largely on the green cleaning requirements found in LEED-EBOM and, therefore, provide a framework for the development of a comprehensive program. The green cleaning criteria set forth below are based on the ClMS and Cl MS-GB standard, although facility managers are encouraged to review all possible green cleaning road maps to determine which aligns best with the needs of the facility manager.

3.7.3 Management as a Foundation

Regardless of whether the facility team is committed to implementing a stage one, stage two or stage three green cleaning program, laying a foundation for effective management is the first step that should be taken before a facility manager begins considering the adoption of elements that are traditionally associated with going green. This is necessary because of the correlation between successful cleaning and effective management, and includes making sure that a cleaning service provider, regardless of whether it is an in-house operation or a building service contractor, has instituted a quality management structure built around five pillars of success:

- Quality systems: A cleaning service provider should implement a framework for effective operations and continuous improvement, including ensuring that both the facility and the provider understand the cleaning service requirements in terms of the tasks to be performed and the frequency at which they are to be performed. A quality plan to measure whether the cleaning requirements are met (more commonly known as a custodial effectiveness assessment) should be used.
- Service delivery: A cleaning service provider should adopt policies and procedures for the effective delivery of service. This includes the utilization of work loading, staffing and budgeting methodologies; work instructions; emergency response and contingency planning; and standardized purchasing procedures.
- Human resources: A cleaning service provider should invest in the efficient management of human capital, including adopting hiring practices, providing orientation and training, and ensuring that timekeeping and payroll systems are in place.
- Health, safety and environmental stewardship: A cleaning service provider should ensure compliance with all laws and regulations, including Occupational Safety and Health Administration (OSHA) hazard communication and personal protective equipment (PPE) requirements; establish a commitment to environmental ethics; and have a comprehensive workplace safety and health program in place.
- Management commitment: A cleaning service provider should implement a system to ensure effective operations and the capability to meet customer needs and expectations even at times of organizational change. Such a system should include a corporate mission, appropriate planning mechanisms, organization and responsibility parameters, and plans for effective communication and risk management.

Once a facility is assured that the necessary cleaning management structure is in place, the next step can be taken and an effective green cleaning program can be developed. Once again, regardless of whether the facility hopes to implement a stage one, two or three program, the program starts with the creation of a green cleaning policy that defines the facility's program parameters and outlines the standard operating procedures that will represent the day-to-day processes followed by the cleaning service provider.

This includes how the program will be managed, how the specific green practices will be utilized, and how the program will be measured and evaluated. In a sense, the green cleaning policy can be thought of as a constitution for the green cleaning program. The importance of the green cleaning policy simply cannot be overstated. After all, it specifically sets forth what should be managed and what should be measured and dictates how the program is to be implemented. This includes a discussion of what the facility hopes to accomplish through its green and sustainability programs, a conversation that necessitates careful consideration of budgetary implications and a determination of what is affordable and what is practical. The bottom line is that a facility management team may wish to invest in a holistic, sustainability plat- form, but may discover that it is simply not feasible to do so.

Ultimately, the policy needs up-front management commitment and support and a champion, or team of champions, to ensure its effective implementation. The policy is also likely to be based on an understanding of the impacts the built environment has on public health, the environment, worker productivity and the general concept of sustainability. The policy may also be based on the principles of reduce, reuse and recycle, and closely consider issues like product procurement, occupant health and safety, indoor air quality and resource conservation. After all, a successful green cleaning program is dependent on the facility manager's understanding that it is his or her job to manage the policy and not the job of the cleaning service provider.

Beyond the green cleaning policy, a stage one program will focus primarily on green product procurement. The most common products to be transitioned are chemicals, including general purpose cleaners, restroom and glass cleaners and equipment, including vacuum cleaners, auto scrubbers and other floor maintenance machines.

Facility managers should ensure that the chemicals and equipment used meet applicable and recognized green criteria, including having demonstrated compliance with a third-party eco-certification standard, such as Green Seal, Ecologo, the United States Environmental Protection Agency's Design for the Environment (DfE) or the Carpet and Rug Institute's testing program. Other environmental preferability criteria may also apply depending on the specific product category.

Besides initial green product procurement and use, a stage one program should ensure that training has been provided, including safety, technical and customer service training of all cleaning personnel and management representatives. Most significantly, technical training needs to be specific to the green products and equipment that will be used as part of the program. After all, it is difficult to see how a facility can be cleaned effectively, and therefore green, if products are not used as intended.

A stage two program takes green cleaning a couple of steps further. As far as product procurement and use is concerned, such a program expands the categories of products that should be green. Besides chemicals and equipment, disposable janitorial paper, trash liners and hand soaps (Figure 4) should meet environmental preferability criteria.

Figure 4: Soap dispenser with Green Seal certified hand soap

For example, paper towels should meet the certification criteria of a third- party certification provider or comply with the U.S. EPA's Comprehensive Procurement Guideline (CPG) program. Chemical concentrates with appropriate dilution control systems should be used to minimize chemical use to the maximum extent possible, and environmentally preferable cleaning materials, such as microfiber tools and wipes, should be used whenever practical. Facilities and their cleaning service providers may even wish to investigate the possible use of emerging cleaning techniques and applications, such as ionized water, which can be used both in routine cleaning of surfaces and in automated scrubbing machines. Chemical-free cleaning and water-based technologies are discussed in section 3.12 What Is Next in the World of Green Cleaning?

Figure 5: Paper towel dispensers with recyclable content paper towels

A stage two program should go well beyond green product use and also demonstrate a commitment to processes that reduce the potential impact of cleaning activities. This can include floor and carpet care maintenance procedures that occur as part of a written and planned process; hand hygiene strategies; and chemical handling, storage and disposal. Controlling pollutants from even entering the indoor environment through the effective use of walk-off mats are another possible element of a robust green cleaning program.

A stage three program takes green cleaning to its furthest reaches and relies on a total commitment to sustainability in all cleaning activities, as well as in all corporate activities. In addition to the elements outlined as part of a stage one or stage two program, a stage three program considers the impact of everything a cleaning service provider does to ensure that the environmental and human health impact is minimized to the greatest extent possible. This includes energy efficiency, water conservation, reduced packaging and solid waste management, as well as integrated pest management and the adoption of exterior and hardscape management techniques that have a reduced en-vironmental impact. Further, consideration should be given to the effects of transportation activities, and social equity should be adopted as a guiding principle under which the facility and cleaning service provider embraces diversity and equal opportunity.

Perhaps the easiest way to capture the true essence of a stage three program is to stress its reliance on overall corporate and social responsibility. Establishing such a program involves a commitment of all corporate stakeholders who must work closely with outside partners in a cohesive effort to achieve sustainability. It is undoubtedly a difficult road but the benefits as outlined in the triple bottom line make it well worth it.

3.7.4 Informed Decision-Making

Even the adoption of a comprehensive stage three program does not end the green cleaning journey. New green technologies and innovations continue to emerge at a tremendous rate, offering opportunities to take a program to an even higher level. Yet, facility managers can never lose sight of the crucial importance of effective cleaning, which may mean that even the most innovative, respected green cleaning program does not utilize green products and techniques under each and every circumstance. The bottom line is that if a green product or process does not effectively clean as needed, the use of such product or process at the expense of a clean and healthy facility runs counter to the principles of going green. Ultimate- lee, facility managers and their cleaning service providers may have to engage in a balancing act to determine the benefits and risks associated with using a particular product.

As mentioned, it can also be difficult to identify products that truly are environmentally preferable and an appropriate fit for a green cleaning pro- gram. Facility managers and procurement professionals are understandably skeptical of many environmental preferability claims, jaded by past reports of greenwashing. Fortunately, a number of third-party ecolabel and certification providers offer facility managers help in identifying which products have an improved environmental health and safety profile. Organizations like Green Seal, Ecologo and the U.S. EPA's Design for the Environment have set forth specific green criteria for various product categories and offer products an opportunity to validate their green claims by undergoing analysis, testing and certification. While such programs may not provide all the answers, they certainly provide an excellent starting point.

However, while such programs are useful, they award product certification on a pass/fail basis, making it very difficult for facility managers to differentiate between products and gain a sense of which products truly have the lowest possible human health and environmental impact. To help facility managers compare the environmental, safety and health attributes of products, ISSA The Worldwide Cleaning Industry Association has created an online database that contains independently verified disclosure of relevant green product information, thereby allowing purchasers to make more informed choices in product selection and ensure that the product truly has a preferred environmental profile

3.8 The Provider Search

3.8.1 Finding a Qualified Green Cleaning Service Provider

Once a facility manager commits to implementing a green cleaning program and decides how comprehensive the program should be, the facility manager can start working with all necessary stakeholders, including the cleaning service provider, to put the program in place. Using the potential elements outlined above, the facility man- ager can choose specific pieces that work best toward the goals and needs of the facility.

How can a facility manager ensure that their cleaning service provider is capable of delivering green cleaning activities as specified in the green cleaning program? Far too many facility managers have selected a contractor who claimed to be able to meet the needs of the facility only to quickly discover that the service provider did not have the necessary management, professional ism and/or operational capability to deliver. The truth be told, any time a facility manager chooses a third-party cleaning service provider, there is a risk that the organization hired will not be capable of meeting the needs of the facility. This is due to a number of factors, including the cleaning industry's low cost of entry, lack of sophistication and generally poor self-esteem, all of which result in a proliferation of unprofessional and unreliable companies.

Earlier in this guide, the ISSA Cleaning Industry Management Standard (CIMS) and CIMS-Green Building (CIMS-GB) criteria were mentioned. Fortunately, the Cl MS and Cl MS-GB programs provide facility management professionals with a valuable tool that can be used to prequalify a cleaning service provider. A cleaning service contractor who wishes to be certified to the CIMS and CIMS-GB standard is required to undergo a comprehensive assessment performed by an independent, accredited assessor. Selecting a certified provider offers a level of assurance that the contractor complies with the standard, and, therefore, has instituted the necessary management structure and is capable of delivering comprehensive green cleaning services.

In fact, facility managers with State Farm Insurance, Seneca One Realty, state and local governments, federal armed forces facilities, Blue Cross/Blue Shield and many other entities actually require Cl MS and/or ClMS-GB certification from their cleaning service provider. Further, the Cl MS-GB criteria is based on the green cleaning requirements in LEED-EBOM, meaning that a CIMS-GB certified provider has demonstrated its capability to directly partner with a facility manager's LEED certification efforts.

3.8.2 The Green Cleaning Request for Proposal (RFP)

If it has been determined that it is necessary for the facility to go out for tender/bid with a group of potential service providers, it is necessary to provide prospective bidders with a request for proposal (RFP) that truly reflects the sustainable goals of the facility operations and company. These goals may range from a cleaning program that provides basic green cleaning processes to the most sophisticated programs that use the Cl MS-Green Building standard and/or corporate energy reduction goals.

As mentioned above, the development of a green cleaning policy for a property or facility is crucial to communicate the needs and goals of the program. The policy may include:

- Adherence to the policy guidelines by all employees that are responsible for cleaning or suppliers that are responsible for cleaning
- Impacts of potentially harmful cleaning products and procedures for the building occupants, staff and the general environment
- Purchasing of chemicals, their use and storage
- Goals of the cleaning program as a whole, such as LEED certification
- Measuring and tracking of supply purchases
- Monitoring and maintaining the equipment used
- Measuring the performance of the contractor in its adherence

Providing a clear green cleaning policy to custodial operators offers guidance on the expectations of the facility management team and corporate sustainability objectives for the facility.

Within the RFP, a continual emphasis on the goals and initiatives of the facility is critical. A request for proposal template, found in Appendix D, can assist facility managers in the procurement of a sustainable cleaning service operation.

3.9 Green Cleaning Specifications and Performance Compliance

As with the development of specifications for all facility services, clarity, measurable goals and a thorough understanding of what is to be expected is at the heart of any green cleaning program. Specifications are the road map for the employees or outsourced contractor of the facility. A complete set of specifications can include:

- **Glossary of terms:** A clear set of definitions of the expectations to supply a performance-based or a schedule-based scope of work.
- **Corporate and departmental goals:** Reiteration of the sustainable initiatives, which serves to reinforce the requirements.
- **The measurements of facility performance:** This is a very vulnerable area for a cleaning service contractor. There are many recognized methods of measuring cleaning performance, including Cleaning Makes Sense by BOMA, IFMA Annual Benchmark reports and other standards. Frequently the method of measurement changes with the initiating institution, and the supplier must rely on the manager for accuracy. Ultimately the supplier will build its cleaning model based on unit area numbers (square feet or square meters), so accuracy is essential.
- **Areas to be cleaned:** Designation of the areas to be cleaned is second only to unit area to be cleaned when the supplier is determining staffing

requirements for the project. There- fore, clearly calling out the areas of the project that are not cleaned, such as boiler rooms, data centers, storage areas and/or retail areas, will remove any questions of what is cleanable space.

- **Frequency:** In the event that the facility manager chooses to supply a minimum schedule for the cleaning requirements of the facility, and not a performance-based specification, it will be necessary to develop a scope of work outlining the areas to be cleaned, the tasks in those areas, and the frequency at which such tasks should be performed. When developing a scope and frequency document it is important to understand the time that it takes to do certain tasks, such as vacuuming an area.

There are many good resources for under- standing the work-loading component of building a scope of work. ISSA has an industry- accepted benchmark guide, 612 Cleaning Times, that acts to assist with understanding the time it takes to perform certain duties.

- **Quality measurements and guidelines:**
  Once the specifications have been drafted, it is important to have a method to ensure that the tasks are being completed to required satisfaction, commonly referred to as a quality plan. Advising the supplier that it will be evaluated by certain performance metrics will hedge the facility manager's efforts to having a contractor or in-house employees that will execute the plan correctly. There are certain things that serve as great tools for measuring the implementation of a cleaning plan that either the supplier or facility manager can set up:
    - Scheduling of period work, such as floors, vents and grill and/or window coverings: Periods are one of the most common areas that the con- tractor or employees can push out in order to save labor or time. Once a written schedule is received from a supplier, the facility team can randomly check the work.
    - Auditing custodial closets: A simple review of custodial closets can tell a lot about the organization and the level of care used in a cleaning pro gram. Things to look for that do not represent a high level of care include:
      - The presence of non-green certified chemicals, tools and equipment as outlined earlier in this guide.
      - Safety hazards, such as unlabeled bottles, room disorganization, unsafe conditions, including boxes that could fall down, items placed on or around heating or electrical elements, or equipment that has damaged cords.
      - Items that are not normally things a cleaning contractor would have in a closet, such as buckets of paint, light bulbs or other things that may have crept into the custodial storage space.
- Review of purchasing processes: By reviewing the items that are being purchased for the cleaning of the facility it is possible to see if the proper green commodities are being brought into the facility.
- Review of maintenance logs for the equipment: Most powered cleaning equipment has a useful life, a period of time during which a piece of equipment performs at its most efficient level. When cords are damaged or beater bars are missing, a vacuum will not function properly. The evaluation of maintenance logs in tandem with random closet audits provides a good sense of how the facility's cleaning is being managed and maintained.

3.10 Understanding the Operation

3.10.1 Know the Details

When selecting a sustainable contractor or developing an in-house cleaning operation, it is always prudent to understand what is actually being supplied in terms of supervision, hours worked, rates of pay, cost of benefits (such as employee health care and bonuses), cost of equipment and supplies, and the general overhead and profit margins that are being considered for the project. From this information, it is possible to gather information, such as the pace at which the crews will be performing the tasks within specifications developed for the facility, and from work-loading knowledge it will be possible to gather the reasonableness of a proposed staffing model.

Having the aforementioned information on contractors will allow proposals to be compared more clearly from various cleaning firms. It will also provide a tool for understanding future cost increases, such as wages or benefits.

One last reason that this information is important is when a facility is located in a state where subcontracting is common practice, such as Texas or Georgia. A completed cost analysis will at least provide a snapshot of how the subcontractors are being paid and if they are being paid according to the state and federal guidelines.

3.10.2 Measurement Matters

A successful green cleaning program needs to be based on the principles of continuous improvement, which necessitates ongoing performance measurement. Many professionals are familiar with the quality control principle stating that what cannot be measured, cannot be managed. While many management and quality control scholars now agree that there are clearly things that cannot be measured, innovative measurement systems and techniques have evolved to the point where measurement can and should be incorporated in a green cleaning program. A perfect example is sustainability dashboard tools, a new software package that allows an organization or facility management team to measure its performance in such areas as greenhouse gas emissions and track its progress toward achieving LEED-EBOM credits.

Measurement is also a critical factor in ensuring the cleanliness of a facility and, therefore, whether it is in a condition that is conducive to good health. There are now a number of tools that measure cleanliness that can be used to compare products and procedures, as well as provide validation that microbial contaminants have been removed from a surface. For example, ATP meters measure adenosine triphosphate (ATP), the universal energy molecule found in all animal, plant, bacterial, yeast and mold cells, and, therefore, the concentration of potentially harmful contaminants that are present on a surface. Performing such measurements, an approach that is known as integrated cleaning and measurement (ICM), allows a facility manager to verify that cleaning products and materials are as effective as they need to be.

3.11 A Sample of Green Cleaning Certification Programs Around the World

3.11.1 LEED Certification and Green Cleaning

The U.S. Green Building Council Leadership in Energy and Environmental Design (LEED) for Existing Buildings: Operations and Maintenance rating system is undeniably one of the primary drivers of green cleaning. Facility managers who wish to pursue LEED-EBOM certification recognize that up to 25 percent of the points needed toward certification can be attained strictly through green cleaning activities, while having a green cleaning policy is actually a certification prerequisite: IEQ Prerequisite 3 Green Cleaning Policy under LEED-EBOM version 4). As such, many facility managers view green cleaning as a relatively straightforward and cost-effective way to progress toward LEED certification.

Facility managers can achieve points toward certification for cleaning activities, such as implementing a high-performance cleaning program that includes training staff in the use of chemical concentrates; performing a custodial effectiveness assessment; the purchase of sustainable cleaning products, materials and equipment; providing entryway matting; and performing a waste-stream audit. The LEED-EBOM version 4 credits relevant to green cleaning include

- IEQ Credit 3.2 Green Cleaning- Custodial Effectiveness Assessment
- IEQ Credit 3.3 Green Cleaning- Products and Materials
- IEQ Credit 3.4 Green Cleaning- Equipment

The bottom line is that making a commitment to pursue LEED certification necessitates a broad commitment from all facility stakeholders. Yet, investing in a comprehensive green cleaning program can take a facility a quarter of the way there, while having a positive impact on the health of the facility's occupants and protecting the environment.

3.11.2 LEED, LEED-EBOM and International Considerations

LEED has its origins in the United States, and can be used for any business or building type. Thus, it is becoming the accreditation of choice, particularly for US-based companies with facilities in Europe, the Middle East or Africa. Also, many of the references and requirements within the rating system are specific to the US, such as Green Seal and the Carpet and Rug Institute, which are not generally available or applicable elsewhere. However, the requirements for Green Seal and other US-specific requirements tend to be optional points, allowing accreditation even where such products are not available.

It may be relatively easy to source some products, such as hand soaps with no antimicrobial agents, outside the US. However, it is unlikely that these products would constitute at least 30 percent of the total cost of cleaning products and materials.

As there is a high cost of testing and certifying products given the relatively low demand, it is unlikely that products outside of North America will be registered for Green Seal and/or Ecologo. There have been reports that some chemical manufacturers are willing to import Green Seal or Ecologo products into the Environmental Management Association (EMA). However, it is possible that these products would not meet legislative requirements, such as labeling and registration, evaluation, authorization and restriction of chemical substances (REACH), particularly in Europe. Moreover, to achieve the 30 percent purchase volume requirement, a combination of both Green Seal/Ecologo chemicals and paper goods would be required.

LEED has begun to address this issue and work to make its program more accessible to areas outside of the US by including Alternative Compliance Paths (ACPs) for projects originating outside of the US. For example, products and materials certified by a member of the Global Ecolabelling Network may be used in lieu of Green Seal UL Ecolabel standards. Some of the listed approved alternatives include the EU Ecolabel and the Nordic Environmental Label, the Swan, as well as others depending on the requirement.

3.11.3 BRE Environmental Assessment Method (BREEAM)

BRE Environmental Assessment Method (BREEAM) is arguably the leading and most widely used environmental assessment method for buildings in Europe. BREEAM has more building-specific accreditations schemes than LEED, including standards for health care, offices, retail education industrial and prisons. However, cleaning and maintenance requirements within BREEAM are limited. Recently. BREEAM has made a presence in the US through a partnership among US-based certification consultant Building Wise and BRE. The resulting collaborating of BREEAM USA aims to target many of the existing buildings that do no currently use a building certification program and are looking for more flexible, inexpensive, yet effective sustainability certifications.

3.11.4 ISSA Cleaning Industry Management Standard for Green Buildings (CIMS-GB)

ISSA's Cleaning Industry Management Standard (CIMS) was originally developed to improve professionalism in the cleaning industry and assist both building service contractors and in-house service providers in the development of an effective management and operational structure. That being said, CIMS was originally centered on five categories of management best practices:

- Quality system
- Service delivery
- Human resources
- Health, safety and environmental stewardship
- Management commitment

In 2009, to help meet the growing demand for green and LEED certification, the CIMS program was expanded to include the green building (CIMS-GB) component. Implemented as the sixth module of CIMS, the new criteria and designation offer cleaning organizations a certification that is closely tailored to provide their customers with what they need to secure points under the LEED-EBOM rating system while greening their operations overall.

The benefits of CIMS-GB certification are clear inasmuch as a client seeking LEED-EBOM does not have to worry about a number of elements, and is an independent certification of the cleaning provider's sustainability credentials. However, whereas the requirements for Green Seal, EcoLogo or Green Label certified sustainable cleaning products, materials and equipment are optional but point-scoring criteria within LEED-EBOM, they are essentially mandatory in CIMS-GB. (Although CIMS-GB permits the use of products that are not certified by Green Seal/EcoLogo, the standard does require that such products are independently assessed and confirmed as meeting or exceeding the requirements of the relevant certification. Given the current small demand for such products in EMA and the high cost and complexity of independent analysis, it is unlikely that manufacturers of chemicals, paper goods and equipment will undertake an assessment program.)

3.11.5 Nordic Ecolabelling of Cleaning Services

This is a relatively new addition to the suite of Nordic Swan certifications and is aimed at facility services and cleaning companies. Like other Swan certifications, the scheme is comprised of mandatory and point-scoring criteria. All of the mandatory elements and a minimum of 16 points out of a possible total of 27 points must be scored. If the service provider does not use vehicles in the cleaning service or only uses vehicles for purposes other than cleaning, a minimum of 13 points may be scored out of a possible 22 points.

The scheme is made up of the following elements:

Chemical consumption
Proportion of ecolabeled chemicals
Concentrated products
Transport (fuel consumption and fuel efficiency)
Waste, measured by the number and size of bags
Sorting of waste
Use of ecolabeled products
Purchase of ecolabeled services (e.g., laundry, car wash)
Quality
Ethics, working environment, and environmen-tal and quality management

However, there are two potential issues for some facility services and cleaning providers. First, the scheme is only available to services within the Nordic zone: Denmark, Norway, Iceland, Sweden and Finland. Second, the certification is applicable to the business as a whole. That is, the service provider cannot offer ecolabeled cleaning to only a selected group of customers. However, if the service provider is split into distinct business groups, such as aviation, retail and health care, then individual business groups can be certified.

3.11.6 Life+/CISDP

Life+/CISDP is not an accreditation scheme but a set of guiding principles for sustainability within facility services Life+ originated in 2010 from the European Commission's funding for a two-year Cleaning Industry Sustainable Development Programme (CISDP) project. The project was led by the French trade organization FEP, with input from other European trade bodies, including BIV (Germany), CSSA (UK), FISE (Italy), UGBN (Belgium) and EFCI/FENI (Europe).

The CISDP, aims to reduce cleaning companies' environmental impacts by, among other things, helping cleaning companies to integrate sustainable development in their activities. FEP has developed 51 principles covering health and quality of life, social commitment, natural resources preservation and environmental protection, and contribution to business sustainability and local aesthetics. The 51 principles have been categorized across five programs:

- Social Responsibility Action Programme
- Environmental Responsibility Action Programme
- Partnership Action Programme
- Economical Perpetuity Action Programme
- Governance Action Programme

Each of the country trade bodies involved in the project reviewed these 51 "criteria" and defined the 20 to 30 most relevant for their country or market, resulting in different criteria across Europe. The project successfully achieved its objectives upon completion in 2012 with the following results: 300 SME's representing over half of the cleaning industry in France implemented the Sustainable Development Programme, employees in these companies were educated on best environmental practices, and a large scale network was created to promote sustainable development. The project led to a voluntary agreement being signed with the French Ministry for the Environment, and it has initiated changed in European laws and directives on CSR management (CISDP 2013).

The CISDP was initially focused on small to medium enterprises, which made any variation between countries a small concern, however, as the program expands to larger, multinational providers and/or considers a resultant accreditation program, any disparity among the principles require further negotiations to harmonize the criteria.

3.11.7 GREENGUARD

Cleaning systems and products can significantly contribute to indoor air pollution, which is ranked as one of the greatest health risks in the United States. Current medical data indicate that over 60 million Americans suffer from debilitating asthma and allergies (AAFA 2016), as well as respiratory disease and general illness associated with indoor air pollution.

GREENGUARD has developed an indoor air quality standard for cleaning systems and products that is based upon allowable chemical emissions criteria. The program measures chemical off gassing of the products during recommended use and application, and then compares the measured emission levels against publicly available short-term (acute) and long-term (chronic) risk exposure levels. Consistent with the established third-party standards upon which GREENGUARD relies, GREENGUARD assumes that continuing long-term emissions will be equal to the amount

of short-term emissions measured on the second day of testing. Only products that meet or fall below the established risk levels can be certified as low emitting under the GREENGUARD program.

Maximum allowable emission levels are based on Washington state's indoor air quality program for new construction, the U.S. Environmental Protection Agency's procurement specifications, the recommendations from the World Health Organization and Germany's Blue Angel Program for electronic equipment.

In essence, the GREENGUARD certification provides assurance, from an independent third party, that a cleaning product has been tested to identify potentially harmful chemical emissions, and that the levels are within emissions limits selected by GREENGUARD from existing third-party standards

3.11.8 The Global Ecolabelling Network

The Global Ecolabelling Network (GEN) was established in 1994 with the mission to promote a platform for increased communication and exchange of information between ecolabel entities across the world. The network includes over 25 organizations that certify Type 1 ecolabels as defined by ISO 14024 standards. Some of the members include Good Environmental Choice Australia, UL Environment Ecologo, US Green Seal, Nordic Ecolabel, the German Blue Angel Ecolabel, the Hong Kong Green Label Scheme, Green Label Thailand, Vitality Leaf of Russia and others. The network is made of many different certification programs that are centered under the same mission and core values in order to bring together the many entities in green cleaning product standards.

3.12 What Is Next in the World of Green Cleaning?

A book by W. Chan Kim and Renee Mauborgne entitled *Blue Ocean Strategies* (Kim and Mauborgne 2004) is a tactical planning tome that speaks about how corporations can create a systematic approach for differentiating themselves and gain market share. In the green cleaning industry, we have seen a variety of "blue ocean strategies" appearing in the marketplace, including the use of chemical-free technology, such as floor equipment that relies exclusively on water and can, therefore, reduce the cost of refinishing floors and allow workers to improve productivity, and daylight cleaning. Both strategies represent the potential future of green cleaning and a promising shift in the way facilities are maintained, especially as their impact on the triple bottom line is better understood.

3.12.1 Planet

Studies have shown that daylight cleaning reduces the amount of energy needed to illuminate a commercial office building by 4 to 8 percent annually (Ashkin and Holly 2008). This in turn reduces the amount of greenhouse gas emissions produced when energy is produced. The chemicals used to clean during the daytime must be environmentally preferable to work around tenants and employees, hence an improvement in indoor air quality.

Further, while many facility managers are committing to using only green cleaning chemicals, others have taken it a step further and are beginning to consider whether it is possible to effectively clean without the use of any chemicals at all. While chemical-free cleaning may seem like an unrealistic notion at first, new water- and vapor-based technologies providers are suggesting that it is becoming increasingly possible to eliminate the use of many chemicals.

Specifically, there are now cleaning tools and equipment that electrolyze regular tap water, thereby allegedly transforming it into a powerful cleaner. This new paradigm in cleaning, sanitizing and disinfection results in savings, sustainability and simplicity. Generally electrolyzed water is produced on-site diminishing the traditional process of ordering, shipping, using and reordering chemical cleaning supplies. The on-site system uses tap water, salt and electricity to generate a cleaning solution, which has the potential to bring production to as little as 2 cents per gallon (Krall). This process is sustainable not only in its use of renewable materials, but also in the fact that is decreases the environmental impact of producing and shipping traditional chemical materials.

The cleaning solution is a result of the process of electrolysis, where salt containing water is subjected to an electrical current (Krall). The current produces two solutions: sodium hydroxide (non-corrosive cleaner) and hypochlorus acid (sanitizer and disinfectant). The use of electrolyzed water in place of traditional chemical products is becoming more prevalent at all types of facilities for the surface cleaning.

The U.S. Environmental Protection Agency (EPA) and Centers for Disease Control (CDC) recognize electrolyzed water as a disinfectant, and it is also listed for use in food processing by the Federal Drug Administration (FDA). The use of this solution has been widely accepted and continues to grow with the push for more sustainable initiatives. Such technology has already been incorporated into both floor auto-scrubbers and hand-held spray devices, leaving one to wonder how the technology may be applied next.

The benefits of such water-based technology are numerous. From a green cleaning perspective, the elimination of potentially harmful chemicals helps protect the health and safety of cleaning workers, as well as facility employees and guests. Further, because there is no residue left behind, concerns over chemical disposal are eliminated.

From an economic standpoint, the potential to purchase and use fewer chemicals can have a positive impact on the bottom line.

3.12.2 Profit

Daylight cleaning (Figure 6) can reduce the amount of electricity needed to light the building as the crews are now working during daylight hours. In turn reduced electrical consumption lowers the amount of money spent on energy bills for the facility, decreasing operating costs.

Staffing can occasionally be reduced by redundancies that are created with the overlap of day porter and night janitors now cleaning during daylight hours. This in turn reduces janitorial costs. Further, the use of water-based technology can potentially reduce a facility's chemical procurement costs, resulting in an improved bottom line.

Figure 6: Building service worker cleaning a glass door with microfiber cloth during the day

Global cleaning trade shows feature some of the most advanced developments in cleaning across the globe. For ISSA/INTERCLEAN Amsterdam, the prominent new trend featured at the 2016 conference was the presence of robotics. One seminar, "The Rise of Robots" reported that the floor cleaning robot is the largest and fastest growing category. Some industry projections estimate that the floor robot will be a $600 million industry by 2020, with North America accounting for 55% of the market share (Weltin).

The benefits that can result from supplementing human labor with robotic support in floor cleaning include the ability to fill in staffing gaps, where employees are freed to complete more complex tasks while the robot takes care of repetitive tasks such as vacuuming and mopping. Robotic equipment can also be designed to reach intricate areas, and bring a new level of productivity and consistency. The technology varies, but most equipment uses laser scanners and ultrasonic detectors to read the surrounding environment to avoid obstacles. These robots can be programed to cover certain routes, make announcements, return to its station and recharge with batteries, among other possibilities. Another added feature of using robotic floor cleaning equipment is the ability to easily track and monitor performance using wireless reporting systems compatible with the machine. The development of robotic equipment in addition to floor cleaning is also making an appearance in duct cleaning, window cleaning, and special purpose cleaning such as robots specifically designed to kill bacteria in hospital rooms (Curcio).

Robotic floor equipment also has the potential for sustainability opportunities because there are some pieces of equipment that are specifically designed to use water more efficiently than the typical cleaning equipment. Traditional floor cleaners use more than 100 gallons of wastewater and associated chemicals over a four-hour period (Intellibot). Advanced robotic equipment can intricately filter water and control the release of water, providing clean, reusable water that eliminates wastewater and chemicals by up to 85% to significantly lessen the environmental impact. Further opportunities for sustainability come from the continued improvements in productivity, accuracy, and decrease in chemical use.

Currently, these types of robotic equipment prove to be cost-effective over time for certain organizations depending on their organizational need and built environment. However, the added maintenance and energy requirements of using robotic equipment should also be considered. Robotic equipment is currently not cost-effective for some environments but is expected to become more and more commonplace as the technology becomes more advanced and affordable. Some examples of space types that are currently using this type of technology include hospitals and airports. Industry expects robotics to be widely accepted due to their ability to guarantee consistent quality cleaning. The trend is expected to continue growing over the years.

3.12.3 People

Daylight cleaning creates a new relationship between those individuals who were once enigmas to the tenants of the buildings- the front line cleaning workers. Cleaning crews become integral parts of the building and tenant operations and are recognized for the work they are doing. Further, the employees or tenants feel that they are receiving more care in cleaning as they can actually see the work being performed.

The cleaning crews also have better opportunities to participate in public transportation for commuting to work, as scheduled transportation tends to be more frequent during normal working hours. Finally, the employees and tenants of the building feel more secure knowing who, and exactly when, the cleaning crew is in their space. In the case of water-based cleaning, it is easy to see the potential people benefits associated with a reduced use of chemical cleaning products and the positive health implications.

Daylight cleaning and chemical-free technology both pose a promising solution for all stakeholders in the area of green cleaning. Facility managers will have to decide if they want to consider a radical, but very practical new methodology of cleaning.

Part 4 - MAKING THE BUSINESS CASE

4.1 Introduction

The decision to implement green cleaning today is more practical than it has been in the past. The impediment to making progress in greening a custodial program is generally the lack of knowledge, as opposed to a financial issue, like many other sustainable operational changes. A basic understanding of the principles of green cleaning, which has been outlined in Part 3, provides the foundation for making the business case for green cleaning in a facility.

Initially, when the janitorial market began evaluating the possibility of utilizing more environmentally preferable products and processes, the available alternatives were deemed ineffective and expensive. However, today, with chemical dilution systems, microfiber and cost-competitive tooling there are only limited expense obstacles that should hinder progress.

There are several products on the market that are both green and can reduce the cost of a green cleaning program: concentrated chemicals microfiber and high-efficiency particulate air (HEPA) filtered backpack vacuums.

4.1.1 Concentrated Chemicals

Today one can purchase concentrated chemicals that can be diluted at a ratio of 1:64. Not only is the dilution delivery system nearly infallible, preventing the "glug, glug" problem of the past, it is simple and easy to use. This system can allow the end user to make effective glass cleaner for less than $0.20 per quart ($0.19 per liter) (US dollars) as compared to purchasing ready-to-use at a cost of nearly $2.29 per quart ($2.15 per liter) (US dollars).

Further the bottle that was filled with the water and concentrate can be reused, reducing the amount of plastic and packing waste added to the waste stream.

4.1.2 Microfiber

Microfiber (Figure 7) has many applications in the cleaning process. It can be found in wipers, string mops, flat mops and dust covers. This cleaning material can be washed up to 500 times in cold water prior to it becoming ineffective, as opposed to cotton tools for the same use that can only be laundered up to 25 times. Microfiber needs less cleaning agent to perform the work required due to its physical structure (small positively charged spindles) thus reducing the amount of chemical needed to get the desired effect. Finally, microfiber has no need to be wrung out repeatedly due to its high water retention (up to 7 times its weight). This reduces the amount of time needed to stop and wring out the mop, and hence saves labor.

Figure 7: Building service worker dusting with a microfiber duster

4.1.3 High-Efficiency Particulate Air (HEPA) Filtered Backpack Vacuums

The backpack vacuum has been in the market-place for years. However, the addition of the HEPA filtration systems makes this tool doubly useful when it comes to sustainable cleaning. First the productivity rate of a backpack vacuum (7,273 square feet per hour or 675 square meters per hour) is nearly three times that of the traditional upright (2,239 square feet per hour or 208 square meters per hour) (ISSA 2009. Secondly, the HEPA filtration captures the fine dust particulates that are put back into the environment by traditional vacuums. By capturing this dust, the amount of dusting labor in surrounding areas is reduced.

4.2 Tips from a Facility Manager of an Award-Winning Green Cleaning Program

In Part 5 of this guide, a case study of the University of Georgia (UGA) is presented. UGA has been awarded the ISSA CIMS program Green Building designation with Honor's distinction for its green cleaning program; was selected as a 2010 Co-Grand Champion in the *American University & School Magazine's* annual Green Cleaning Award for Schools and Universities; and the students of the university have recognized UGA building service workers for their efforts at a campus sustainability event. In 2011 updated its green cleaning certification and became the first university to achieve CIMS Green Building Certification. Some tips that the facility manager at UGA recommends for successfully making the business case include:

- Determine how to justify the program as a self-sustaining program, not a continual bud- get liability
- Calculate the return on investment to ensure the green cleaning program is focused, sound and strategic
- Determine how to implement a purchasing model within the procurement system, including how to keep facility users excited and interested in supporting green cleaning and changes that may be taking place in the buildings in which they work
- Develop a business-oriented marketing plan to help gain management support
- Clearly demonstrate the benefits, such as reduced accidents and injuries, reduced worker compensation numbers, less chemicals purchased and fewer chemical spills

Figure 8 demonstrates the reduction in lost labor hours as green cleaning was implemented across the University of Georgia campus. In 2007, only a green cleaning pilot program was in place within one building. In 2008 and 2009 the green cleaning program was implemented across the campus. From the figure, the number of lost labor hours between 2007 and 2008 decreased 53 percent. Comparing 2010 lost labor hours to 2007, before the program started, lost labor hours have decreased 73 percent.

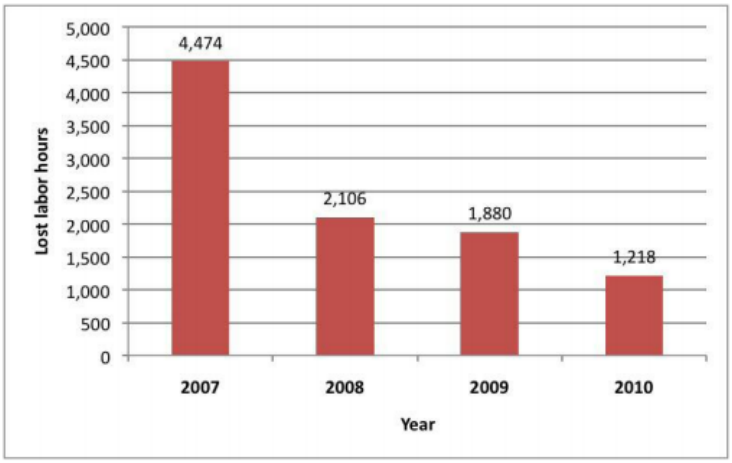

Figure 8: Reduction of lost labor hours as green cleaning was implemented at UGA

Part 5 - CASE STUDIES

Three case studies are presented to demonstrate characteristics of a successful green cleaning program. The first case study, the University of Georgia, showcases how a green cleaning pro- gram can start as a pilot program and be further implemented across an entire university campus. The second and third case studies, Alberici Constructors corporate headquarters and the Harley- Davidson Museum, demonstrate how a green cleaning program can be implemented in an office building and museum, respectively.

Figure 9: Exterior of Old College

5.1 University of Georgia

The University of Georgia (UGA) is a Tier Ire- search institution in Athens, Ga. About 35,000 students and 9,000 faculty and staff occupy 9.7 million square feet (0.9 million m^2) of space, which includes 212 residential instruction campus buildings. Functions of the campus buildings include classrooms, labs, academic spaces, libraries, offices, auditoriums, auxiliary spaces and public access areas. The campus is cleaned by an in-house custodial team. Between 2005 and 2007, the university implemented a green cleaning pilot program at one of the buildings on campus, Old College (Figure 9). Old College is a 20,576 square foot (1,912m^2) academic and administration building that is about 200 years old. The building has a brick exterior and was extensively renovated in 2005.

5.1.1 Implementing the Pilot Program

Implementing the green cleaning pilot program included six primary steps. Table 7 identifies these steps and summarizes how UGA completed each step. Success of the green cleaning program was dependent upon the involvement of university leadership. Key university leadership roles involved in the pilot program included the safety coordinator, training specialists, ISSA-CIMS certification expert, hazmat specialist, building services superintendent, administrative assistant/ Web designer and assistant director of the physical plant division services department.

Table 7: Key steps to implementing a green cleaning program

#	Implementation step	UGA's approach to implementation
1	Identify location for the pilot program	Old College was selected because a renovation of the building was recently completed, and the new faculty and staff occupying the building were receptive to changes in the cleaning program.
2	Identify key stakeholders	Key stakeholders included university leadership, trainers and a consultant who would help to implement and guide the program. It was important that the consultant was familiar with green cleaning products and was invested in UGA's green cleaning goals.
3	Train building service workers	Building service workers were trained through the Building Service Worker Academy (see section 5.1.5 Training for more information).
4	Implement a substitution plan	The substitution plan should include how traditional cleaners will be moved and used within buildings that currently do not use green cleaning practices.
5	Develop a marketing and public relations plan	UGA worked with an undergraduate public relations/marketing class to help market the green cleaning program, identify an acceptable program logo (Figure 10) and provide ideas for a Web site to support the program.
6	Implement the plan	The plan was implemented first at Old College and then campuswide.

Figure 10: UGA green cleaning program logo

Since the pilot program was very successful, the green cleaning program was implemented further across campus, starting with the north campus. During the implementation, faculty and staff on the south campus were eager to have the green cleaning program implemented in their buildings as well, which demonstrated that faculty and staff were very happy with the program.

Different color cleaning cloths are used for different space types. For example, red cloths are used to clean sanitary areas inside of restrooms, such as toilet and urinal fixtures, and yellow cloths are used to clean administrative offices, desktops, touch points and windows in common areas. In the spring of 2011, UGA plans to introduce green microfiber cloths to represent the green cleaning program in a more visual way. Green cloths will be used to clean all general common areas, offices and labs. The yellow microfiber cloths will then be used to clean windows in the restroom areas only.

5.1.2 Moving from a Pilot Program to a Campus Wide Green Cleaning Program

To implement the program across the campus, a process similar to what was listed in Table 7 was used. The largest change in the process was that the program was adapted to align with the needs of the campus on a much larger scale.

As the program was implemented, it was necessary to develop a chemical transfer program, identify older equipment for replacement and work closely with other sustainably minded groups across the campus. The chemical transfer pro- gram included a process for traditional cleaning chemicals to be used on parts of the campus that had not yet instituted the green cleaning program. As green cleaning practices were applied more widely across UGA, the traditional chemicals were given to other campuses that use traditional cleaning practices. Giving the traditional cleaning chemicals to other campuses was a sustainable decision economically, environmentally and socially. Socially, it was the right decision because the traditional cleaning chemicals were purchased using state funds. Transferring the chemical to campuses using traditional cleaning chemi-cals saved taxpayers money, while reducing the environmental impact from the disposal of unused cleaning chemicals. Transferring the chemicals also supported UGA's goals because it allowed UGA to start using green cleaning practices across the entire campus more quickly.

As older, unproductive equipment was identified, it was replaced with green cleaning equipment. As the green cleaning equipment was added to the equipment inventory, daily and weekly preventive maintenance programs were also established for the equipment.

The physical plant division services department works closely with other campus sustainability efforts, including the UGA office of sustainability. Current efforts include:

- Promoting and implementing a Green Office Certificate program with faculty and staff across the campus to continue to reduce office paper waste and encourage indoor and outdoor recycling
- Working with campus architects to use the green restroom specification in design and renovation plans for campus buildings

Working with the university architects is especially important to help the architects understand the reasons why it is necessary to follow the green restroom specification. The green restroom specification limits the specification of hand soap and paper towel dispensers to one type.

Thus, the standard limits the number of products that must be kept in the warehouse to supply the restrooms.

The program took 2.5 years to implement across the entire campus, a total of 212 residential instruction buildings. UGA was pleased with this rate of implementation, as it had set a goal to implement the program within a period of three years.

5.1.3 Benefits of Green Cleaning

The University of Georgia uses a green cleaning program because it provides a healthy learning and working environment for students, faculty and visitors to the campus. More specifically, the green cleaning program has improved indoor air quality, increased workplace safety and provided an opportunity for better staff training, cost savings and better customer service. As a result of the green cleaning program, UGA building service workers are working more efficiently with dilution control green certified cleaners (or in some cases water); using more ergonomically designed equipment and supplies to reduce muscle fatigue; better trained to identify and avoid workplace safety hazards; and more conscious that they are public relations ambassadors throughout the campus. Additional benefits of green cleaning recognized at UGA are summarized in Table 8.

Table 8: Sustainable benefits of the green cleaning program

Environmental	• Improved indoor air quality • Reduced environmental impact from chemical use
Economic	• Reduction in funds spent to purchase cleaning chemicals • Reduction in lost labor hours from accidents and sick leave • Improved productivity of building service workers
Social	• Increased workplace safety • Increased opportunity for training • Increased morale of building service workers

5.1.4 Cost to Implement Green Cleaning at UGA

The initial cost to implement the green cleaning program at Old College in 2005 was $550 (US dollars). The money was spent to upgrade custodial equipment, including a HEPA vacuum and cleaning tools; install a microfiber system; install a dilution control system; purchase three green cleaning products; switch to Green Seal certified recycled content paper products and hand soap; and install new dispensers. The Green Seal certified cleaning products included all-purpose cleaner and window cleaner and green-rated neutral disinfectant in concentrated form rather than ready-to-use bottles. After the green cleaning program was in place for one year at Old College, only $250 (US dollars) of additional funds were needed to resupply Old College. This resulted in an annual savings of $700 (US dollars) for Old College.

As the green cleaning program was implemented across the entire campus, the cost of cleaning chemicals dropped significantly. Between January 2009 and August 2010, cleaning chemicals for the entire campus cost about $197,000 (US dollars); prior to implementing the green cleaning program the cost of chemicals was over $1 million (US dollars) (Figure 11). Before the green cleaning program was implemented, over 351 cleaning chemicals were used. Now, only three non-toxic cleaning chemicals are used, and in some cases, water is used instead of a cleaning chemical.

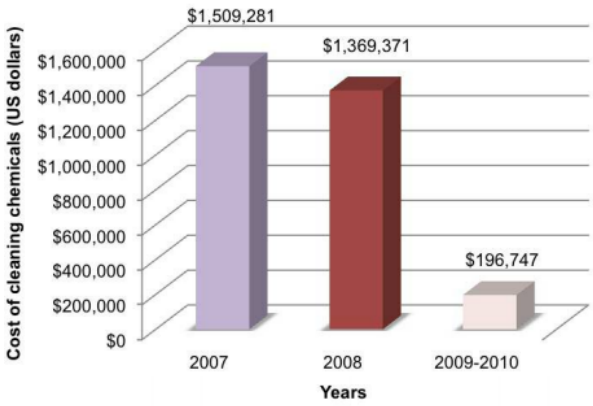

Figure 11: Decreasing cost of cleaning chemicals used

5.1.5 Training

The development of a training program was important to the success of the green cleaning program at UGA. Three main groups received training at UGA: key members of the leadership team, building service workers and building inhabitants. Key members of the leadership team were trained about green cleaning processes, as well as emergency response procedures, hazmat emergency response procedures and the CIMS standard. Building inhabitants training was held for building occupants to learn why different color cleaning cloths and different chemicals were being used.

Most importantly, training was provided for all building service workers. The training was provided through the UGA Building Service Worker Academy. A curriculum for the academy was developed using green cleaning standard operating procedures. The curriculum included information on the green cleaning program (how to use microfiber tools, ergonomic equipment, color-coded system for mops, and the double bucket system and green cleaners), workplace safety, conflict resolution and preventive maintenance practices for cleaning equipment. The program lasts for two weeks and includes one week of classroom learning and one week of hands-on learning. The courses are completed during half of the work day and staggered to provide time for the buildings to be cleaned. At the end of the program, all students are required to take a test about green cleaning. All building service workers completing the training earn a certificate at the end of the program. Through this program, building service workers were also given support to earn their graduation equivalency diploma (GED), associate or bachelor's degree.

5.1.6 Greatest Challenges

As with any organizational change, challenges arose. Challenges that surfaced as the green cleaning program was implemented across UGA included continual effort to demonstrate the benefits of green cleaning, overcoming public perception and looking at the project from a strategic perspective. Despite having well-developed marketing materials and a mission statement, it was still necessary to convince some members of the university about the benefits of green cleaning. This included continually demonstrating the business case of green cleaning and how green cleaning is financially sound.

In a few cases, it was also necessary to overcome public perception. Many people do not understand that the custodial function of a university is a multimillion dollar operation; it is not like cleaning one's house.

To look at the implementation of the green cleaning program from a strategic perspective, a strategic plan was developed and implemented in small steps. Implementing the program in small steps allowed small successes to be achieved. This helped stakeholders to understand the successes without being overwhelmed by the enormous task of changing the cleaning practices across the entire campus, especially during a time of economic hardship.

5.1.7 Results

The green cleaning program at UGA has been very successful and has been implemented in all 212 resident instructional buildings on the cam- pus. The green cleaning program was very well received by the campus community and supported by the university president. In fact, the university president works in the building where the pilot program was completed. Students also embraced the idea.

The Building Service Worker Academy has conducted 20 classes and retrained about 315 custodial employees and supervisors. The training program also provided an opportunity for the building service workers to get to know each other and meet workers from other parts of the campus they would not have otherwise met.

An in-house promotional program was created where an incumbent building service worker I (the entry-level position) who completes the training program and is in good standing (no disciplinary actions) is placed on a promotional list for the next level, building service worker II. This program has increased the morale of the staff and ensures that their hard work and training benefits them after at least one year on the job. In addition, at least eight employees have also successfully completed their GED to enhance their earning and promotional capabilities.

A diversity award program was also established by the physical plant division services department to recognize and track the number of minorities and women who have been promoted to building service worker II and supervisor positions since the start of the program.

In November 2010, UGA received the ISSA CIMS program Green Building designation with Honor's distinction (Figure 12).

The students of UGA also recognized the building service workers for their efforts at a campus sustainability event. honor. UGA was also selected as a 2010 Co- Grand Champion in the American University & School Magazine's annual Green Cleaning Award for Schools and Universities and became CIMS Green Building certified in 2011. The students of UGA also recognized the building service workers for their efforts at a campus sustainability event.

The most successful part of implementing the green cleaning program was that it increased the morale and confidence of the building service workers. The program has taught the building service workers the true value they provide to the campus: as public health and safety specialists and public relations ambassadors for the department, and that their role is an essential part of the success of the university.

Figure 12: UGA earns ISSA CIMS Green Building designation with Honor's distinction

5.1.8 Lessons Learned

Lessons learned during the implementation of the green cleaning program across the UGA campus included:

- The importance of spending time to learn and understand the processes for green cleaning and how they will impact the operation before implementing any changes.
- How to identify opportunities for small successes. Small successes should be achieved first and involve as many people as possible. Using this approach, all members of the team remain invested in the primary goal.
- The importance of being patient, while at the same time maintaining forward momentum to continue to progress toward the goals.
- The importance of identifying a local trainer or consultant who was invested in green cleaning and not just trying to sell products.

5.1.9 Future Plans

UGA has achieved much success and recognition with the implementation of its green cleaning program. However, UGA is committed to further success and improvement. Thus, additional goals have been set to:

- Provide opportunities for custodial staff members to receive ISSA CIMS management certification to better maintain the green cleaning program in the future
- Work with other universities and schools that are interested in implementing or ramping up their green cleaning programs
- Continue improving the existing program

5.2 Alberici Constructors Corporate Headquarters

The 110,000 square foot (10, 200 m^2) LEED-NC Platinum Alberici corporate headquarters in Overland, Mo., has been cleaned by MMMM, a cleaning contractor, using a green cleaning program since 2006. Prior to Alberici occupying the building, a major renovation was completed to transform the building from a 50-year old manufacturing facility to Class A office space.

The goal of the current green cleaning program used at the Alberici headquarters is to provide the best cleaning service possible while balancing the triple bottom line (social, environmental and economic factors). The green cleaning program was implemented because of Alberici's and MMMM's commitment to the environment and the safety of the cleaning team members. Key benefits of the green cleaning program include:

- Reduced health and safety risk to members of the cleaning team and building occupants
- Reduced environmental impact from cleaning

5.2.1 Implementing the Green Cleaning Program

The implementation of the green cleaning program involved all members of the cleaning team for the facility, the cleaning contractor project manager, and the regional and corporate support teams. Implementing the green cleaning pro- gram at Alberici corporate headquarters allowed the cleaning team to refocus on what the client wanted. The development of policies and procedures helped to align the needs of the client with the services the cleaning contractor provided.

To implement the green cleaning program, the cleaning contractor relied primarily on two re- sources. First, it was necessary to work with supplier partners to understand what equipment and chemicals were available and the procedures that needed to be followed to meet the needs of the customer using the available equipment and chemicals.

Second, the ISSA CIMS-GB standard was a valuable resource. With the help of these resources, the cleaning contractor deter- mined Green Seal Certified and environmentally preferred cleaning products and identified green cleaning practices. The next step of the process was to compare current practices and supplies to the green cleaning findings to determine what changes were needed. After requisite changes were identified, it was necessary to develop new policies and procedures that demonstrated an understanding of the green cleaning program and the level of commitment required.

Finally, training was provided by equipment and chemical supply partners. The training included reasons why green cleaning practices were being used and the impacts of green cleaning on the facility, building occupants and environment.

5.2.2 Justifying Costs of Implementation

It was not necessary to justify the additional cost or calculate the return on investment of the green cleaning program at the Alberici headquarters be- cause implementing the program did not require a major investment that would require the customer to pay more for cleaning services.

BALANCING THE TRIPLE BOTTOM LINE WHEN MAKING GREEN CLEANING EQUIPMENT DECISIONS

One example of balancing the triple bottom line when making green cleaning equipment decisions is the purchase and use of maintenance-free batteries in cleaning equipment. Although a maintenance-free battery is about 50 percent more expensive to purchase and the charge does not last as long as a conventional flooded cell battery, maintenance-free batteries have a large benefit: the water levels of maintenance-free batteries do not need to be checked weekly (like a flooded cell battery). This saves the cleaning team time, which translates into labor hours, and also reduces opportunity for injury from filling the battery. Thus, over the life cycle of maintenance-free batteries, the economics support the social and environmental benefits.

5.2.3 Occupant Education

In order for a green cleaning program to be successful, building occupants must be aware of differences in chemicals used and new practices occupants may be required to support, such as recycling programs and to wipe one's feet on entry mats when entering the building.

5.2.4 Lessons Learned

Several lessons were learned as a result of implementing a green cleaning program at the Alberici headquarters, as well as other facilities the cleaning contactor provides services to, including:

- When selecting green cleaning products, it is important to evaluate if the use of a green product will require the facility or portions of the facility to be cleaned more often. To M M M M, it was important that the cleaning frequency not increase when green cleaning products were used.
- In some cases, because green cleaners are less caustic, it is necessary that cleaning team members scrub a bit more to sufficiently clean some surfaces.
- Some green cleaning equipment can be more expensive than conventional cleaning equipment. To minimize additional costs for purchasing green cleaning equipment, replace conventional cleaning equipment with green cleaning equipment upon equipment end life of the conventional equipment.
- The most convenient cleaning methods are not necessarily the greenest. Two examples include:
    - Use of paper towels versus cloth towels that must be washed
    - Use of low-cost vacuums without filters versus vacuums with filters that may have a higher capital cost

5.3 Harley-Davidson Museum

Harley-Davidson motorcycles are known as a "great American institution." The Harley-Davidson Museum was opened in July 2008 in Milwaukee, Wis. The 130,000 square foot (12,100 m^2), three-building museum complex is cleaned using green cleaning practices by CleanPower, a Cl MS-GB certified cleaning contractor that pro- vides cleaning services in Wisconsin and Illinois.

Green cleaning practices are used at the Harley-Davidson Museum (Figure 13) because it was important to the museum managers to protect both the contents of the museum and the health of museum visitors. In September 2009, the Harley- Davidson Museum was recognized as the first museum to receive the honor of GREENGUARD Indoor Air Quality Certification for Cleaners and Cleaning Maintenance Systems. The certification can be renewed annually, as long as the required cleaning practices are used.

Figure 13: Harley-Davidson Museum

As the Harley-Davidson Museum was not the first building at which the cleaning contractor used green cleaning practices, two important previously learned lessons were applied at the museum.

The Harley-Davidson Museum follows the green cleaning guidelines of the GREENGUARD Indoor Air Quality Certification program to define the required cleaning performance of the cleaning contractor.

First, the importance of explaining why certain processes must be practiced when using green cleaning products and equipment was emphasized. If the reasons why green cleaning practices are being used are not explained, cleaning employees may revert to old habits. Once they understand the "why" behind a new process, they become enthusiastic about the idea and adhere to the program. The second lesson applied was the use of microfiber mops instead of string mops. Although most of the polished concrete floor is cleaned with a foaming, low water flow auto- scrubber, some areas must be hand mopped with flat microfiber mops. Benefits of microfiber mops include:

- Removal of more dirt than cotton string mops
- Reduced airborne particulate matter from use
- Elimination of the dirt buildup that can occur along baseboards if cotton string mops are not used properly

Two disadvantages of microfiber flat mops are that they must be changed more frequently since they pick up so much dirt, and they are more expensive. The method the cleaning contactor used at the museum to manage the microfiber mop washing was to install a small on-site laundry facility. This reduced the number of sets of microfiber mops needed, decreasing the initial cost. Without an on-site laundry facility, three sets of mops would have been needed: one currently in use, one in transport and one being washed. To date, the museum visitors are very satisfied with the level of cleanliness of the museum and the managers of the museum remain enthusiastic about the green cleaning program.

5.4 Conclusion

The impact that the cleaning industry has on the environment, people and economy is significant. There are also growing concerns about human health around the world and the prevention of dis-ease transfer and disease epidemics. However, the use of a comprehensive approach to green and sustainable cleaning, while monitoring the cause and effect in all ancillary actions, can have a measurable impact on reducing environmental impacts in an economic and socially beneficial manner

Part 6 - APPENDICES

6.1 Appendix A: References

AAFA (2016). Asthma and Allergy Foundation of America. www.aafa.org. Accessed July 12, 2016.

Ashkin, S. and D. Holly (2008). *The Business of Green Cleaning.* IFMA Foundation. Houston, Texas. http://cdn.ifma.org/sfcdn/membership-documents/ifmafoundation-business-of-green-cleaning.pdf?sfvrsn=0. Accessed July 11, 2016

Ashkin, S. and D. Holly (2007). *Green Cleaning for Dummies: ISSA Special Edition.* Wiley Publication.

Balek, B. (2009). *Green Cleaning and LEED® for Existing Buildings: Operations and Maintenance, What's the Connection.* ISSA® The Worldwide Association for the Cleaning Industry. November 2, 2009. http://www.issa.com/data/moxiestorage/regulatory_education/green_cleaning/green-cleaning-and-leed-ebom_11-2-09.pdfAccessed July 11, 2016.

Barbier, E. (1987). "The Concepts of Sustainable Economic Development." *Environmental Conservation.* 14:101-110.

BeFSA-CSR (2003). *Principles for Global Corporate Responsibility: Bench Marks for Measuring Business Performance.* . http://www.bench-marks.org/execsumm.shtml. Accessed July 13, 2016.

BLS (2016). Bureau of Labor Statistics. U.S. Department of Labor. Occupational Outlook Handbook, http://www.bls.gov/ooh/AccessedJuly 12, 2016.

Brundtland, G. (1987). *Our Common Future: The World Commission on Environment and Development.* Oxford: Oxford University Press.

CISDP (2013). LIFE+ Cleaning Industry Sustainable Development Programme. Le Monde De La Propreté. http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3406. Accessed July 12, 2016.

Cole, E.C., D. L. Franke, K. E. Leese, P.O. Dulaney, K. K. Foarde, D. A. Green, R. M. Hall, and M. Berry (1994). *Indoor Environment Characterization of a Non-problem Building: Assessment of Cleaning Effectiveness.* Research Triangle Report Number 94U-4479-014. March 1994. Research Triangle Institute: Research Triangle, N.C.

Curcio, Katharine. "Robots: The Future of Cleaning?" Green Review Services. MediaEdge Communications, LLC, 13 Dec. 2012. Web. 21 Dec. 2016.

Deardoff, A. (2010). Deardoffs' Glossary of International Economics. www-personal.umich.edu/-alandear/glossary/1.html. Accessed January 22, 2011.

Economic Policy Institute (2010). "Economic Policy Institute, Research and Ideas for Shared Prosperity." http://www.epi.org/.. Accessed July 8, 2016.

Elkington, J. (1994). "Towards the sustainable corporation: Win-win-win business strategies for sustainable development." *California Management Review.* 36(2):90-100.

EPA (2010). "Environmentally Preferable Purchasing (EPP): Basic Information." U.S. Environmental Protection Agency. https://www.epa.gov/greenerproducts/about-environmentally-preferable-purchasing-program.Accessed July 12, 2016.

EPA (2010). "Integrated Pest Management (IPM) Principles." U.S. Environmental Protection Agency. www.epa.gov/opp00001/factsheets/ipm.htm. Accessed January 19, 2011.

EPA (2010). "Basic Information: Product Stewardship." U.S. Environmental Protection Agency.https://archive.epa.gov/wastes/conserve/tools/stewardship/web/html/basic.html Accessed July 11, 2016.

EPA (2006). "Terms of Environment: Glossary, Abbreviations and Acronyms." U.S. Environmental Protection Agency. www.epa.gov/OCEPAterms. Accessed January 19, 2011.

Futerra (2008). "Greenwash Guide." Futerra Sustainability Communications. http://communication-responsable.aacc.fr/sites/default/files/3-Greenwash_Guide_Futerra.pdf. Accessed July 12, 2016.

ISSA (2009). The Official ISSA 540 Cleaning Times Calculator. International Sanitary Supply Association, Inc.

Kim, W.C. and R. Mauborgne (2004). *Blue Ocean Strategy.* Harvard Business Press.

Krall, Daniel. "Green Cleaning Trends: Cleaning With Electrolyzed Water." Today's Facility Manager October (2013): n. pag. Facility Executive. Web.

Hodges, C. (2009). Getting Started. Sustainability How-To Guide Series. IFMA Foundation. Houston, Texas. http://cdn.ifma.org/sfcdn/docs/default-source/default-document-library/01_getting-started.pdf?sfvrsn=0. Accessed July 11, 2016.

"Intellibot Robotics." Automated Robotic Floor Care. N.p., n.d. Web. 21 Dec. 2016.

OSHA (2006). "Hazardous Waste Operations and Emergency Response -1910.120." United States Department of Labor Occupational Safety and Health Administration. https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=9765 Accessed July 12, 2016.

National Pollutant Inventory (2010). "Ethylene oxide: Sources of emissions." Australian Government Department of Sustainability, Environment, Water, Population and Communities. http://www.npi.gov.au/resource/ethylene-oxide-sources-emissions. Accessed July 8, 2016.

Nordic Ecolabelling (2013). "Nordic Ecolabelling of Cleaning Products Version 5.3."Nordic ecolabeling.org, http://www.nordic-ecolabel.org/Templates/Pages/CriteriaPages/CriteriaGetFile.aspx?fileID=1625. Accessed July 12, 2016.

TerraChoice (2007). "The 'Six Sins of Greenwashing™'." TerraChoice Environmental Marketing. http://sinsofgreenwashing.com/index6b90.pdf Accessed July 11, 2016.

TerraChoice (2009). "The Seven Sins of Greenwashing." TerraChoice Environmental Marketing. http://sinsofgreenwashing.com/index3c24.pdf. Accessed July 11, 2016

Texas Forest Service (2008). "Trees of Texas: Tree Dictionary." texastreeid.tamu.edu/content/treeDictionary. Accessed January 22, 2011.

The President (1998). Executive Order 13101 – *Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition.* Federal Register. Vol. 63, No. 79. September 16, 1998. Washington, D.C.

The Global Asthma Network (2014). The Global Asthma Report 2014. Auckland, New Zealand. http://www.globalasthmareport.org/resources/Global_Asthma_Report_2014.pdf. Accessed July 12, 2016.

UKCPI (2007). *Meeting natural expectations.* United Kingdom Cleaning Products Industry Association. http://www.ukcpi.org/_Assets/custom-docs/pdfs/Meeting_Natural_Expectations.pdf Accessed July 11, 2016.

Weltin, Dan. "Robotic Cleaning Takes Center Stage At Industry's Largest Trade Show" CleanLink. 23 June 2016. Web. 21 Dec. 2016.

WHO (1948). "WHO definition of Health." World Health Organization. http://who.int/about/definition/en/print.html Accessed January 19, 2011.

WHO (2008). "Chronic Respiratory Diseases: Asthma." World Health Organization. 61st World Health Assembly. May 19, 2008. www.who.int/respiratory/asthma/en. Accessed February 14, 2011.

WordNet (2010). WordNet. A lexical database for English. wordnetweb.princeton.edu/perl/webwn?s=minimum%20wage. Accessed January 22, 2011.

Workrite (2010). "Glossary." Workrite Ergonomics. http://workriteergo.com/glossary/ Accessed July 12, 2016.

6.2 Appendix B: Additional Resources

Standard Development, Regulatory Bodies and Standards

American National Standards Institute (ANSI): www.ansi.org

A private, nonprofit organization that oversees the development of voluntary consensus standards for products, services, processes, systems and personnel in the United States. ANSI also accredits organizations that carry out product or personnel certification in accordance with requirements defined in international standards.

ASTM (formerly the American Society for Testing and Materials): www.astm.org

The largest and oldest standard-setting organization in the United States, formed in 1898. Using a consensus process, ASTM supports thousands of volunteer technical committees, which draw their members from around the world and collectively develop and maintain more than 12,000 standards.

- ASTM E1971: www.astm.org/DATABASE.CART/HISTORICAL/E1971-98.htm
  An abbreviation for the Standard Guide for Stewardship for the Cleaning of Commercial and Institutional Buildings, which covers a procedure to assist owners and operators of commercial and institutional buildings in the stewardship of cleaning and housekeeping operations. The focus of this guide is to address appropriate cleaning activities and processes, to promote eco-efficiency and sustainability, and to avoid adverse impacts on the building occupants, cleaning personnel, the building structure itself and the environment. Adherence to the principles set forth in this guide can lead to greater tenant/occupant satisfaction, reduced operational costs and greater productivity (of occupants and cleaning personnel).

Cleaning Industry Management Standard (CIMS):
www.issa.com/?id=cleaning_industry_management_standard_cims

A management standard developed by the International Sanitary Supply Association (ISSA). CIMS sets forth a management framework designed to assist building service contractors and in-house service providers to develop quality, customer-centered organizations, and is based on universally accepted principles that have proven to be the hallmarks of well-managed, successful cleaning operations.

International Organization for Standardization (ISO): www.iso.org/iso/home.htm

A nongovernmental organization and the world's largest developer and publisher of international standards. It is a network of the national standards institutes of 157 countries with a central secretariat in Geneva, Switzerland, that coordinates the system. Two ISO standards that apply to green cleaning are:

- ISO 9000: A family of standards for quality management systems maintained by ISO. Certification to an ISO 9000 standard does not guarantee the compliance, and therefore the quality, of end products and services. Rather, it certifies that consistent business processes are being applied.
- ISO 14000: A family of standards for environmental management systems maintained by ISO. ISO 14000 is similar to ISO 9000 quality management in that both pertain to the process, the comprehensive outcome of how a product is produced, rather than to the product itself. The overall idea is to establish an organized approach to systematically reduce the impact of the environmental aspects that an organization can control.

Occupational Safety and Health Administration (OSHA): www.osha.gov

The United States Department of Labor established OSHA in 1971 to ensure employee safety and health in the US by working with employers and employees to create better working environments.

- OSHA Hazard Communication Standard (29 CFR 1910.122):
  https://www.osha.gov/Publications/OSHA3514.htmlProtection under OSHA's Hazard Communication Standard (HCS) includes all workers exposed to hazardous chemicals in all industrial sectors. This standard is based on a simple concept:

employees have both a need and a right to know the hazards and the identities of the chemicals they are ex- posed to when working. They also need to know what protective measures are available to prevent adverse effects from occurring.

Registration, Evaluation, Authorization and Restriction of Chemical Substances (REACH): ec.europa.eu/environment/chemicals!reach/reach_intro.htm
A new European Community regulation on chemicals intended to improve the protection of human health and the environment, to give greater responsibility to industry to manage the risks from chemicals and to provide safety information on the substances. The regulation also calls for the progressive substitution of the most dangerous chemicals when suitable alternatives have been identified.

Professional Associations, Coalitions, Organizations and University Centers

The Apollo Alliance Project: http://www.bluegreenalliance.org/apollo A coalition of business, labor, environmental and community leaders working to catalyze a clean energy revolution in the US, cut carbon emissions and expand opportunities for American businesses and workers. The Apollo Alliance promotes policies and initiatives to speed investment in clean energy technology and energy efficiency, and put millions of Americans to work in a new generation of well-paid, green collar jobs.

APPA (formerly the Association of Physical Plant Administrators): www.appa.org
A professional organization focused on the operations, maintenance and quality of educational facilities. APPA represents over 1,500 institutions, including facilities professionals from colleges and universities; medical and law schools; K-12 schools and districts; museums and parks; military installations; and government. APPA provides a variety of educational tools, guidance documents, and manuals intended to maximize the effectiveness of educational facilities as supportive learning environments.

Carpet and Rug Institute (CRI): www.carpet-rug.org
The Carpet and Rug Institute is a nonprofit trade association representing the manufacturers of carpets, carpet suppliers and carpet service providers. The CRI provides technical information, education and public relations for the industry, as well as hosting the Green Label and Green Label Plus programs, which test carpet, cushion and carpet adhesives for chemical emission levels and impacts on indoor air quality.

Center for Clean Products:
http://isse.utk.edu/ccp/ Housed at the University of Tennessee, Knoxville, the center has a mission to develop, evaluate and promote cleaner products and cleaner technologies that minimize pollution at the source and contribute to long-term sustainable development. The center has led the technical development of a number of important product certification standards in the North American cleaning industry.

Global Ecolabelling Network (GEN): globalecolabelling.net
A nonprofit association of third-party, environmental performance labeling organizations founded in 1994 to improve, promote and develop the "ecolabelling" of products and services. Currently there are 25 members representing the following countries/regions: Australia, Brazil, Canada, Croatia, Czech Republic, the European Union, Germany, Hong Kong, India, Indonesia, Japan, Korea, New Zealand, Nordic 5 Countries, Philippines, Russia, Singapore, Sweden, Taiwan, Thailand, Ukraine, the United Kingdom and the United States.

Green for All: greenforall.org
A US organization dedicated to building an inclusive green economy strong enough to lift people out of poverty by advocating for local, state and federal commitment to job creation, job training and entrepreneurial opportunities in the emerging green economy, especially for people from disadvantaged communities. Green for All fights both poverty and pollution at the same time.

Green Seal: www.greenseal.org
An independent nonprofit organization that provides science-based environmental certification standards. Green Seal works with manufacturers, industry sectors, purchasing groups and governments at all levels to green the production and purchasing chain. Green Seal (GS) provides standards for cleaning products including chemicals (GS-37), floor finishes and strippers (GS-40), hand soaps (GS-41) and janitorial paper products (GS-01 and GS-09), as well as for cleaning services (GS-42).

GREENGUARD Environmental Institute (GEI): www.greenguard.org
GEI is an independent nonprofit organization establishing acceptable indoor air standards for indoor products, environments and buildings. The GREENGUARD program provides third-party certification for a wide variety of building, cleaning and furnishing products, based on the chemical and particle emissions released by those products. Certified products include cleaning products, paints and finishes, construction materials, and furniture and furnishings.

International Facility Management Association (IFMA): www.ifma.org
The world's largest and most widely recognized international association for professional facility managers, supporting more than 19,000 members in 60 countries. The association's members, represented in 125 chapters and 15 councils worldwide, manage more than 37 billion square feet of property and annually purchase more than $100 billion (US dollars) in products and services.

International Facility Management Association Foundation (IFMA Foundation): www.ifmafoundation.org
A nonprofit corporation that is separate from IFMA and works to promote research and educational opportunities for the advancement of facility management.

International Sanitary Supply Association (ISSA): www.issa.com
A global cleaning industry association whose members include more than 5,500 distributors, manufacturer, building service contractor and in-house service provider companies. ISSA offers cleaning shows around the world; a vast array of educational videos and resources; networking on local, national and international levels; industry management standards; legislative and regulatory services; and industry news specifically focused on the world's cleaning community.

U.S. Green Building Council (USGBC): www.usgbc.org
The U.S. Green Building Council is a nonprofit organization focused on promoting and expanding sustainable building design, construction and operations practices. The USGBC is composed of over 17,000 member organizations including private, public and nonprofit entities, representing the breadth of the design, construction, and operations and maintenance community. In 2000, the USGBC released the Leadership in Energy and Environmental Design (LEED) rating system, a third-party certification program that is the leading benchmark for the design, construction and operation of sustainable buildings.

World Federation of Building Service Contractors (WFBSC): www.wfbsc.org
A union of national and international cleaning service provider associations dedicated to achieving universal recognition for the building service contracting industry and to improving awareness of the industry, knowledge and professional competence. Members of the federation include Argentina, Australia, Belgium, Brazil, Canada, France, Germany, Japan, Korea, Netherlands, New Zealand, Taiwan, the United Kingdom and the United States.

World Green Building Council (WorldGBC): www.worldgbc.org
The World Green Building Council is a union of national councils aligning national not-for-profit organizations committed to promoting the design, construction and operation of sustainable buildings around the world. Founded in 1999, the WorldGBC supports the development of sustainability rating systems, provides critical organizational and technical tools, and seeks to accelerate market transformation toward green design, building and operations. The WorldGBC currently has 12 member councils and five additional emerging councils.

Certification and Rating Systems

Environmental Choice EcoLogo: www.ecologo.org

EcoLogo was launched by the Canadian federal government in 1988. EcoLogo, part of Underwriters Laboratory Inc., develops environmental standards and certifies products in more than 120 categories. EcoLogo certifications exist for a large number of chemical cleaning products, including hand cleaners and hand soaps (UL 2784), cleaning and degreasing compounds (UL 2792), hard surface cleaners (UL 2759), hard floor care (UL 2777), and carpet and upholstery care (UL 2795), as well as for janitorial paper products, including toilet tissue and hand towels (UL 175) and hand towels.

Leadership in Energy and Environmental Design (LEED):
www.usgbc.org/DisplayPage.aspx?CMSPageI0=222

LEED is a series of rating systems that define the requirements for sustainable construction of new buildings, operations and maintenance, schools, interiors and other aspects of buildings. LEED is a product of the U.S. Green Building Council.

Clearing Houses

Green Cleaning Network (GCN): greencleaningnetwork.org

The Green Cleaning Network (GCN) is an information clearinghouse and communication hub intended to support the adoption of green cleaning practices for the benefit of human health and the environment. The GCN seeks to facilitate linkages between organizations, companies and customers interested in green cleaning and to educate both providers and customers as to the benefits of green cleaning, as well as technical and policy developments in the field.

Unions

Service Employees International Union (SEIU): www.seiu.org

A North American trade union representing 2 million working people. The SEIU's focus is in three sectors where it is the largest property services union, with 225,000 members in the building cleaning and security industries, including janitors and doormen and women. The union also represents health care and public service workers.

6.3 Appendix C: Glossary

Biodegradable: Capable of decomposing under natural conditions (EPA 2006). More preferable products biodegrade rapidly, compared to similar products that biodegrade more slowly, which can increase potential harm to health or the environment.

Bleaching process: While some janitorial paper products are unbleached, most products use a variety of bleaching processes to whiten the final paper. Some bleaching processes use elemental chlorine. This process produces dioxin, a known carcinogen that is persistent in the environment, meaning that it does not go away. The use of chlorine dioxide, which is also known as elemental chlorine-free (ECF), reduces the amount of dioxin by approximately 90 percent and is thus preferable compared to the use of elemental chlorine bleaching. The use of hydrogen peroxide and other compounds, known as totally chlorine- free (TCF) bleaching, can further reduce the amount of dioxin and would be preferable compared to other bleaching processes (Ashkin and Holly 2008).

Certification: The process by which a third party, typically a nonprofit, evaluates a product according to a specific standard to certify that the product meets stated requirements. Certification makes it easier for both manufacturers and purchasers to address complicated health, safety, environmental and performance criteria and has become an important tool used to accelerate the adoption of green cleaning (Ashkin and Holly 2008).

Chemical minimization: Chemicals are often a necessary and valuable part of an effective cleaning program. However, it is essential to ensure that they are used in only minimum amounts required to complete the task at hand. Chemicals used inefficiently enter the natural environment and can have unpredictable and negative effects both on ecosystems and human health. Thus it is preferable to select powered janitorial equipment that minimizes or eliminates the use of cleaning chemicals compared to similar equipment that can be used for the same purpose (Ashkin and Holly 2008).

Corporate social responsibility: A decision-making and implementation process that guides all company activities in the production and promotion of international human rights, labor and environmental standards, and compliance with legal requirements within its operations and in its relations to the societies and communities in which it operates (BeFSA-CSR 2003).

Dyes: Ingredients whose sole purpose is to affect the color and does not contribute to the cleaning efficacy of the product itself. Dyes can be valuable from a safety perspective to reduce potential product misuse by cleaning personnel who use color to differentiate between products. Some dyes are made from heavy metals, such as cobalt, and can cause health and environmental impacts when they enter the environment after the disposal of the product. More preferable dyes typically do not contain heavy metals and other components that may affect health and the environment compared to less preferable alterna-tives that contain more harmful components (Ashkin and Holly 2008).

Employee notification: Any information concerning the chemical, physical and toxicological properties of each substance known or expected to be present on site that is available to the employer and relevant to the duties an employee is expected to perform shall be made available to the affected employees prior to the commencement of their work activities. The employer may utilize information developed for the hazard communication standard for this purpose (OSHA 2006).

Environmentally preferable purchasing (EPP): The term environmentally preferable purchasing was codified by the US EPA in 1993 to formally initiate the EPA's work on developing standards and processes to identify environmentally preferable products for targeted purchasing by the federal government. Environmentally preferable purchasing (EPP) recognizes the power of purchasers and the use of the market-place to drive environmental and health improvements (EPA 2010).

Ergonomics: Ergonomics is the science of designing the job, equipment and workplace to fit the worker (Workrite 2010). Proper ergonomic design is necessary to prevent repetitive strain injuries, which can develop over time and can lead to long-term disability. Equipment that is of the appropriate design, weight

and fit is preferable to prevent injuries to cleaning personnel compared to similar equipment that may not be as appropriate. For example, a vacuum cleaner that is properly balanced and easier to push will reduce the likelihood of back and other musculoskeletal injuries compared to one that is not balanced and is difficult to push.

Extended product responsibility: An emerging principle for a new generation of pollution prevention policies that focus on product systems, instead of production facilities. It uses life-cycle analysis to identify opportunities to prevent pollution and reduce resource and energy use in each stage of the product chain through changes in product design and process technology. All actors along the product chain share responsibility for the life-cycle environmental impacts of products, from the upstream impacts inherent in selection of materials and impacts from the manufacturing process itself, to downstream impacts from the use and disposal of the products.

Flashpoint: The lowest temperature at which evaporation of a substance produces sufficient vapor to form an ignitable mixture with air (EPA 2006). More preferable products have a higher flashpoint compared to those with low flashpoints, which increase the risk of flammability during storage, use and disposal.

Fragrances: Ingredients whose sole purpose is to *affect* the odor or smell of a product and does not contribute to the cleaning efficacy of the product itself. Fragrances can be valuable to mask the malodor of some basic ingredients, without which may result in occupant complaints and the use of additional products to eliminate the perception of the lack of cleanliness actually due to the malodor of the cleaning product itself. Some fragrances are made from hundreds of individual compounds that are typically high in volatile organic compounds (VOCs) and when inhaled can cause a variety of health problems, such as dizziness and nausea, and trigger asthma, especially among vulnerable and sensitive populations. Furthermore, some cleaning products contain higher concentrations of fragrances compared to others. More preferable products contain fragrances that minimize impacts on health and the environment either based
on the formulation of the fragrance or due to the use of lower concentrations (enough to simply mask the malodor of the basic ingredients) in the cleaning product compared to other products used for the same purpose (Ashkin and Holly 2008).

Green: A term that is used interchangeably with environmentally preferable. The definition comes from Presidential Executive Order 13101, which defines it as products or services that reduce the health and environmental impacts compared to similar products and services used for the same purpose.

Green cleaning: Based on the definition of green, green cleaning is defined as cleaning that protects health without harming the environment. It is important to recognize that green cleaning includes all products used in the cleaning process, including preventive methods, such as entrance mats. Green cleaning also includes the appropriate procedures and staffing levels with an overall goal of creating healthy, high performance buildings with minimal impacts on the environment (Ashkin and Holly 2007).

Greenwashing: A term that describes green advertising, labeling and other sales or promotional activities that use misleading, vague, irrelevant or unsubstantiated environmental claims to sell a product or service (TerraChoice 2007). Greenwashing is a serious problem because it confuses consumers and creates a serious disadvantage for companies and products trying to do the right thing.

Health: The complete state of physical, mental and social well-being and not merely the absence of dis-ease or infirmity. Therefore, health may be regarded as a balance of physical, mental and social aspects of life in a being (WHO 1948).

Ingredient choices: Chemical cleaning and maintenance products are typically made from a combination of individual ingredients. For each category of chemical cleaning and maintenance products, some ingredients have been identified to be more preferable compared to other ingredients used for the same purpose based on a variety of factors, including impacts during the extraction of raw materials, manufacturing, and the short- and long-term impacts on both health and the environment during the ultimate usage of the product or its disposal after use (Ashkin and Holly 2008).

Integrated pest management (IPM): An effective and environmentally sensitive approach to pest management that relies on a combination of common sense practices. IPM includes regular monitoring to detect problems early; acting against pests only when necessary; choosing the most effective option with the least risk to people and the environment; and applying biological knowledge about pests to create long-term solutions (EPA 2010).

Life cycle: The comprehensive examination of a product's environmental and economic aspects and potential impacts throughout its lifetime including raw material extraction, transportation, manufacturing, use and disposal (EPA 2006).

Living wage: The minimum hourly wage necessary for a person to achieve some specific standard of living (Deardorff 2010). In developed countries, this standard generally means that a person working 40 hours a week, with no additional income, should be able to afford a specified quality or quantity of housing, food, utilities, transport, health care and recreation. In the US, information on the hourly wage necessary to meet the living wage in various parts of the country can be found at the Economic Policy Institute Web site, including a living wage calculator (Economic Policy Institute 2010).

Material safety data sheet (MSDS): Material safety data sheets are concise summary documents intended to provide workers and emergency personnel with the critical information necessary for the handling, working with or treatment of exposure to particular substances or products. MSDS present standardized information such as physical data (melting point, boiling point and flashpoint), toxicity, health effects, first aid, reactivity, storage, disposal, protective equipment, and procedures for leaks or spills.

Minimum wage: The lowest hourly, daily or monthly wage that employers may legally pay to employees or workers (WordNet 2010). Equivalently, it is the lowest wage at which workers may sell their labor. Minimum wage laws are now enforced in more than 90 percent of all countries.

Noise: Minimizing the exposure of occupants and cleaning personnel to noise is an important consideration. Noise can be damaging to health and create unnecessary stress. Thus, it is preferable to use equipment that is quieter (less noisy), especially if used when the facility is occupied (Ashkin and Holly
2008).

pH: An expression of the intensity of the basic or acid condition of a liquid that ranges from 0 to 14, where 0 is the most acidic, 7 is neutral and 14 is most basic. Natural waters usually have a pH between 6.5 and 8.5 (EPA 2006). More preferable products are closer to a neutral pH of 7, while products at either extreme closer to 0 or 14 are less preferable, as extreme pHs typically result in a greater risk for the product to be corrosive and irritate or burn eyes and skin.

Pollution prevention: Practices that reduce or eliminate the creation of pollutants through either in- creased efficiency in the use of raw materials, energy, water or other resources, or protection of natural resources by conservation. It is preferable to prevent pollution from happening, as opposed to solving the problem once it has been created.

Post-consumer: A special designation to identify recycled content that was recovered after the material served its intended use as a consumer item. This designation was established to encourage household curbside collection and recycling. The higher amount of post-consumer recycled content is preferable compared to a lower percentage (Ashkin and Holly 2008).

Product stewardship (also known as extended product responsibility): A principle that directs all actors in the life cycle of a product to minimize the impacts of that product on the environment. Product stewardship means that all parties who have a role in designing, producing, selling or using a product assume responsibility for the environmental impacts of that product throughout its life (EPA 2010).

Renewable resource: A natural resource qualifies as a renewable resource if it is replenished by natural processes at a rate comparable or faster than its rate of consumption by humans or other users (Word- Net 2010). While using renewable resources is often preferable when compared to using nonrenewable resources, some renewable resources can be replenished faster than others.

Recycling: The series of activities, including collection, separation and processing, by which materials are recovered from the waste stream for use as raw materials in the manufacture of new products (EPA 2006).

Resource efficiency: Energy and water consumption is perhaps the most critical, current environmental priority. Even small equipment can consume large volumes of energy and water when used regularly. Thus, it is preferable to use efficient equipment to reduce the use of resources, such as energy and water (Ashkin and Holly 2008).

Self-certification: The process where a manufacturer relies only on its own testing to claim that its product is green. To avoid greenwashing, manufacturers should be able to provide test data to substantiate their claims (Ashkin and Holly 2008).

Sustainable forest management: The management of forests according to the principles of sustain- able development. Sustainable forest management uses very broad social, economic and environmental goals (Texas Forest Service 2008). One of the primary environmental goals is to eliminate clear cutting and to ensure that logging is conducted in a manner that protects the long-term health of the forest eco- system. Products derived from sustainably managed forests are preferable compared to those that are not.

Sustainability: A term that became a foundational part of the green movement in 1987 when it appeared in the publication of the World Commission on Environment and Development report, Our Common Future. Also known as the Brundtland Report, this document defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland 1987).

Total recycled content: The total amount of material (fiber) that has been recovered or diverted from the solid waste stream, either during the manufacturing process (pre-consumer) or after consumer use (post-consumer). Using paper products with a high total amount of recycled content is preferable because it can reduce impacts on forest ecosystems compared to the use of virgin tree fiber that requires more tree-cutting, which can negatively impact forest ecosystems. Furthermore, manufacturing impacts on the environment are less when using recycled fibers compared to those using virgin tree fibers (Ashkin and Holly 2008).

Triple bottom line: A phrase coined by John Elkington in 1994 that suggests that organizations cannot solely focus on profits, but must also consider impacts on people and the planet. Often a three-legged stool is used to illustrate then concept because it demonstrates that all three legs must be strong and that none is more important than the others (Elkington 1994).

Volatile organic compounds (VOCs): Any organic compound, such as solvents, that participates in atmospheric photochemical reactions (EPA 2006). More preferable products have lower levels of VOCs, while higher VOCs increase the potential for the products to cause dizziness, respiratory irritation, trigger asthma and other health-related issues, and cause atmospheric reactions, such as smog, when it evaporates during or after product use.

6.4 Appendix D: Request for Proposal Template

The request for proposal template below can be used as a starting point by facility managers seeking out-sourced green cleaning services. The square brackets in the template indicate facility-specific content, while the curved brackets indicate notes for the template user. Text in the curved brackets should be removed when the template is used for an actual project.

Overview

{Provide the prospective suppliers with a brief introduction to the company and its mission (sustainable or green policy can also go here). Next, in detail, discuss the type of facility that will be serviced under the contract.}

[Company Name] is soliciting competitive bids for janitorial services for:

{List the following and any other relevant information for the facilities that will be bid on:}

1. [Facility name
2. Building type, such as manufacturing, office, medical, education
3. Address, such as city, state, country and ZIP/postal code
4. Gross area (square feet or square meters)
5. Cleanable area (square feet or square meters)
6. Number of employees
7. Hours of operation during the day and night crews
8. Corporate objectives, such as LEED certification, improved recycling or diversion programs]

Objectives

{Provide clear objectives for the prospective providers. The objectives will ideally be ones that can be measured. Sample objectives provided below should be customized to the facility's needs.}

The objective of this RFP is to enter into a contractual relationship with a custodial supplier who can:

1. Provide the most competitive price for high-quality green/sustainable cleaning services.
2. Provide a chemical and equipment inventory on an ongoing basis that will illustrate the reduction of bottles, equipment and the like into the waste stream.
    a. Supplier may be called on to illustrate procurement practices of chemicals, tools and equipment in the facility.
3. Maintain the building(s) at a highly professional and green standard that can be determined using a measurement, such as an APPA audit, to determine the custodial effectiveness or another tool that measures and continuously demonstrates the effectiveness of the program. Bidding organization will be required to submit samples of quality measurement tools.
4. Provide all the required labor, equipment and material to perform the scope of work as outlined in the RFP and demonstrate its compliance to the Company's sustainability requirements:

a. All chemicals must meet environmentally preferable certified criterion such as Green Seal, Ecologo, Nordic Ecolabel (Nordic Swan), EU Ecolabel, Design for Environment (DfE) standards. Alternates may be considered where such certified products are not available in the category of cleaning. Alternates must demonstrate that they are the best alternate with the least amount of environmental impact.

b. Evidence of proper training on chemical dilution, labeling and material safety data sheets (MSDS).

c. Evidence of training protocol of all employees and supervision in the event of a new employee

i. All equipment must meet the Carpet and Rug Institute standards for powered equipment.

ii. All tooling, such as wipers or cleaning cloths, must consider the most environmentally preferable available, such as microfiber and those made of recycled materials.

iii. All paper products must meet the Green Seal, Ecologo or alternative criteria for recycled content.

5. Ensure and be able to demonstrate that all safety standards for the custodians and the employees of said company are met regarding the cleaning processes that will be used in the facility.

6. Make recommendations on possible price reductions with improved service levels.

7. Maintain building security while performing janitorial services.

Corporate, Legal and Industry Standard Compliance

Contractors shall ensure and maintain strict compliance with the various global, federal, state, provincial and local laws, ordinances, rules and regulations affecting the sustainable performance of the work in the Company's facility. This compliance is to include, but is not limited to, labor/employment, environmental and contractor regulations. {Such compliance as LEED-EBOM can be inserted in this paragraph. Further, facility managers who wish to rely on a third-party certification program to ensure that the provider meets an industry standard and is capable of delivering a comprehensive green cleaning program will want to mandate certification as part of the RFP For example, many facility managers are now requiring certification to the CIMS-GB standard as part of their custodial services RFP and contract in order to gain assurance that their cleaning service provider will not make empty promises and is truly a professionally managed cleaning organization. Evidence of such compliance should be made available from time to time during the tenure of this contract.}

Proposal Delivery

Responses to this request are due no later than [list date and time]. Please review and complete the enclosed documents with the necessary information and return in a sealed envelope to:

- Name
- Address
- City and state
- ZIP/postal code

In addition, please e-mail a copy to: [e-mail address]

Proposal Compliance Requirements

This request for proposal (RFP) is being made based on the information noted in accordance with all of the dates provided in the referenced/attached enclosures. Bids will not be considered responsive unless there is compliance with the following paragraphs:

1. **Understanding:** The response to this RFP shall be accompanied by a cover letter stating whether or not the quotation includes understanding and compliance of the proposed General Terms and Conditions inclusive of all sustainability initiatives of said company, and if not, what exceptions are taken.

2. **Audit rights:** Acceptance of audit rights (by Company) is required on all agreements, contracts and/or work orders. The Company reserves the right to audit all chemicals, tools and processes used in the process of cleaning the facility. These audits may be performed by third-party auditors and or in-house audit compliance members.

3. **Bid due date:** Bids shall be returned no later than [date, time]

   Note: Bids received later than the date and time indicated will be marked as "Late Bids" unless [Company name] officially extends the bid date. "Late Bids" may or may not be considered in accordance with the then current Company rules and regulations.

4. **Bid period/selection timeline:** All bids submitted shall be considered firm for ninety (90) days, or the period otherwise stated to support quotation pricing. [Company name] will open bids privately. All proposals must remain valid for a period of 90 calendar days after the designated submittal date. [Company name] will not announce publicly, or to individual suppliers, the comparative ranking or individual assessments of proposals submitted. All bid packages submitted become the property of the Company and will not be returned to the individual/company submitting them. It is the intent of the Company to select a sustainable supplier and sign a formal agreement by [date].

5. **Estimated Timeline**
   - [Month date, year] Proposal submission deadline at [time]
   - [Month date, year] Vendor questions and finalists selected
   - [Month date, year] Vendor qualification and contract review
   - [Month date, year] Contract awarded
   - [Month date, year] Finalize and sign contract

6. **Exceptions:** Exceptions taken to any portion of the RFP should be noted. Such exceptions must be stated in detail and the particular components that are being assumed or changed must be notated. No such assumptions will be accepted unless agreed upon by the Company.

7. **Format of Contractor's Response:** The bid response must be returned in exactly the same format as provided, and the RFP must be signed and dated by an authorized agent/person of the Vendor's company.

   Vendor is to submit [number] of copies of the bid/quotation response to [Company]. Note: In response to the format provided, if the Vendor has a different or superior concept, please footnote that section or item and include the additional information as an attachment as is necessary to describe the differences. This does not relieve or change any of the above stated requirements, but it is intended to allow the Vendor a means of expanding or providing clarification when considered necessary.

8. **Insurance:** {Required insurance will vary according to the contracting company. The following provides some sample language for this section of the RFP.}

   Selected Vendor shall procure and maintain in *effect* at all times during the term of this agreement, at its sole cost and expense, the following insurance coverage, which insurance shall be

placed with insurance companies rated at [required insurance rating]. Selected Vendor shall require all of its subcontractors to comply with the requirements of this section. A copy of the Selected Vendor's Certificate of Insurance must be submitted to [Company] prior to the award of any contract. Vendor's response should include all insurance coverage required such as:

- Workers' compensation
- Liability
- Auto/vehicle

Insurances should name [Company] as additionally insured where required by the client firm. {Certain companies require a waiver of subrogation notated on the coverage of insurance.} Selected Vendor shall deliver to [Company] a certificate(s) of insurance certifying that he/she has obtained full workers' compensation and employer 's liability insurance coverage for all persons whom he/she employs or may employ in carrying out the work under the agreement. The Selected Vendor shall not commence nor continue to perform any work unless it has in full force and affect all required insurance. The Selected Vendor shall not permit any work in the building unless they are in compliance with the workers' compensation and all other liability insurance requirements.

9. **Terms and conditions of insurance:** Prior to award of this request, Selected Vendor shall submit a valid/original Certificate of Insurance evidencing that all required insurance is in full force and effect. The Selected Vendor shall maintain current and valid Certificates of Insurance, which shall be kept on file with [Company] at all times during the term of this agreement. Selected Vendor shall not make any changes in or allow the required insurance coverage to lapse without first obtaining prior written approval from [Company]. All policies for insurance shall be in a form satisfactory to [Company] and shall contain an endorsement providing that [Company] must be given thirty (30) days prior written notice of any cancellation or material change in the policy or coverage hereunder. Upon request, Selected Vendor shall furnish [Company] with complete copies of insurance policies required.

10. **Taxes, licenses and permits:** The Selected Vendor shall provide to [Company] a copy of all applicable certificates and business licenses that would be required to perform any part of an ensuing procurement that may result from the RFP. Licenses will be provided by the company responding to the RFP for the Vendor's company and all subcontractors, if any, listed in the pro- posed response. The Selected Vendor is required to pay all sales, use and other taxes of every kind on labor, equipment and materials used in connection with the work. Payment for such taxes is included in the compensation paid by [Company] to the Selected Vendor. Where applicable, Selected Vendor must separately state sales, use and other taxes on all invoices submitted to [Company Name].

11. **RFP submittal not a commitment to purchase:** This RFP is not a commitment to purchase, and any costs borne by the contractor in preparing or submitting a response to this RFP shall not be reimbursed by [Company], nor does [Company] obligate itself with any actions taken or costs incurred by a Vendor responding to this RFP [Company] reserves the right to reject any and all bids submitted in response to this request without any explanations.

12. **Pricing:** For bid purposes all proposals must detail the following

Basic

- Cost for basic service (labor)/month/year
- Cost for basic service (material)/month/year.
- Grand total/month/year

Extra services

- Cost for extra service (labor)/month/year
- Cost for extra service (material)/month/year
  - Windows
  - Carpets
  - Floors

- Grand total/month/year
- Cost for other cleaning service/monthly (be specific on charges)

13. **Supplier request for information and qualifying materials:** {The Company may want to request specific information from the suppliers for qualifying for this contract. In order to ensure that Selected Vendor has an experienced supplier you may want to inquire about its green or sustainable cleaning programs with such inquiries as:}
    - Discuss green training programs
        - Frequency
        - Who does the training?
        - Is there testing or certification?
    - Discuss Vendor methods for ensuring compliance to a comprehensive sustainable program
        - What measurement tools does your firm utilize to ensure compliance?
        - What is your documentation process for your sustainable programs?
    - How do you prevent chemicals and equipment that is not part of your program from creeping into your facilities?
    - What incentives do you have in place for recognizing your employees for complying with the green initiatives of your firm?

{You may find that the criterion for LEED certification, CIMS-GB or the GS-42 Green Seal Environmental Standard for Cleaning Services can serve as a good resource, ensuring that a prospective supplier meets the desired criteria.}

14. **Questions (Related to the RFP): {**It is important that during the selection process there is a knowledgeable person to answer questions regarding the request for proposal. This person should be qualified to speak on behalf of the sustainability initiatives of the Company. You may want to format the question directives as the following:}
    - Contract Manager
    - E-mail address
    - Phone number
    - Address
    - City, state, ZIP/postal code

15. **All bids shall be returned by** [e-mail or other format] marked as follows:
    - Attention to
    - Due date
    - Project name
    - Supplier company name
    - Supplier contact information regarding the submittal

16. **Subcontractors:** The Selected Vendor should provide [Company] with a complete list of all subcontractors, if any, that are included in the quotation, and/or that would be requested to perform any part of an ensuing procurement that may result from the RFP The Selected Vendor's submission should include a description of the subcontractor's scope of work to be performed, estimated total dollars, the subcontractor's name, address, representative, and verification of insurances and licenses as mentioned in the legal and contract compliance sections.

17. **Tax Information:** Responses to the RFP shall include the bidding contractor's tax identification code (i.e., Federal Tax I.D. number).

    Bidders Federal Tax I.D. number: __ __ __ __ __ __ __

18. **Guarantee and/or warranty policy:** Upon written request, [Company] shall be furnished with all reasonable evidence ascertaining that materials, labor and workmanship are in accordance with the requirements of abovementioned green specifications. The inspection of the work shall not relieve the Selected Vendor of any of its obligations to fulfill the agreement as prescribed, and insufficient work shall be made good at no expense to [Company], notwithstanding that such insufficient work and materials may have been previously overlooked or accepted. An example

of where the selected supplier will be held responsible is in the area of chemical compliance; the supplier is required to maintain all chemicals as prescribed by the RFP. In the event that chemicals are found in the custodial closets that are not compliant with the programs of the facility, the contractor will be required, at their cost, to remove the products. Additionally, all metrics of ensuring compliance to the green specifications and duties of this contract are to be kept in duplicate soft copy. (One copy of the performance metrics will be retained in the office of the supplier and one copy in the office of the manager of this RFP)

19. **Confidentiality:** Any confidential information provided to, discovered by or received by the Selected Vendor or its subcontractors in the performance of the agreement shall be kept confidential and shall not be made available to any individual or organization, unless required by law, without prior written approval of [Company]. The selected Vendor and all personnel working for the Selected Vendor may be required to read and sign a confidentially statement in a form provided by [Company] before any work by Selected Vendor commences.

20. **Conflict of Interest:** The prospective vendor ensures that they currently have no interest and shall not acquire any interest, direct or indirect, which would conflict in any manner or degree with the performance of services/purchase of materials under this proposal.

21. **Contractor requirements:** The prospective vendor agrees to abide by the specifications and the Company requirements under this RFP. In the event that they are awarded the contract for this bidding opportunity they warrant they will enter the contract provided to them by [Company]. Any discrepancies will be so noted prior to the inception of the work to be performed.

22. **Agreement:** Total cost for janitorial services (including sales tax if deemed appropriate) for:
    Building
    Address
    Total cleanable space
    Nightly cleaning- Price per hour
    Day porter staff- Price per hour
    Carpet cleaning- Price per unit area (square feet or square meters) (Include the method used unless previously designated)
    Supplies pricing- (Attach the specifications of disposable products to be used in the facility)