# PREFERRED STRATEGIES FOR IMPLEMENTING ENVIRONMENTAL MANAGEMENT SYSTEMS IN OKLAHOMA CITIES

By

MATT ALBRIGHT

Bachelor of Science in Biology
Portland State University
Portland, Oregon
1980

Master of Science in Environmental Science
Oklahoma State University
Stillwater, Oklahoma
2002

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Dissertation Approved:

Dr. William Focht

Dissertation Adviser

Dr. Anthony Brown

Dr. Camille DeYong

Dr. Mark Payton

Outside Committee Member

Dr. Sheryl A. Tucker

Dean of the Graduate College

.

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# CHAPTER I

# INTRODUCTION

Environmental management is a relatively young field, starting at the birth of the environmental protection movement in the late 1960s. It developed out of a growing concern of how we as people interact with the environment. Initially, the United States (U.S.) focused its efforts on industry's interactions with the environment. During the 1970s, the U.S. incorporated compliance as the primary mechanism to encourage industry to meet environmental standards (EPA 1993). In the 1980s, the U.S. shifted its emphasis to risk-based management as the strategy for improving environmental performance (NRC 1983). In the latter part of the century, environmental management systems (EMS) were increasingly adopted by industry to integrate compliance and risk with pollution prevention (Voorhees and Woellner 1998).

EMS has now started to move from the private to the public sector. In August 1997, a pilot program was sponsored by the U.S. Environmental Protection Agency's (EPA's) Office of Wastewater Management and Office of Compliance. The pilot program researched the adoption of EMS by local government entities. The EPA renewed this program twice, and it ended in 2004. Thirty-two local government authorities have benefited – both environmentally and economically – from this program (EPA 2000, 2002, 2005).

On June 12, 2003, the EPA issued formal guidance for the use of EMS in enforcement settlements as injunctive relief and supplemental environmental projects (EPA 2003). The agency started using EMSs in supplemental settlements as early as 2000 (U.S. v. Nucor Corporation, Inc) and used it on numerous occasions across the public and private sectors for settlements of the Clean Air Act (CAA), Clean Water Act (CWA), and Resource Conservation and Recovery Act (RCRA). Such settlements as:

- U.S. v. Massachusetts Institute of Technology (2001)

- U.S. v. National Railroad Passenger Corp. (AMTRAK) (2001)
- U.S. v. Department of Energy, Brookhaven National Laboratory (2002)
- U.S. v. Koppers Industries, Inc. (2003) (EPA, 2003)

In 2006, the City of Dallas, Texas, signed a consent decree with the EPA over its Storm Water Program. Part of this decree was development of an EMS for eleven of the city's facilities (EPA 2006). But, prior to the decree the city had already decided to do an EMS for eleven of their departments. Today, 10,000 of the city's 13,000 employees are covered by their EMS. In spring 2011, Dallas's EMS program was recertified ISO 14000:2004 by outside auditors (Camp 2011).

Today, the EPA and Department of Justice use EMSs in their settlements with private industry as well as the governmental sector (ABA 2010). The U.S. Government has mandated that all of its entities adopt an EMS (Executive Order 13148, 2000, which was superceded by Executive Order, 13423, 2007). The Department of Environmental Quality (DEQ) in many states has developed EMS programs and incentives. Such diverse states as Virginia, through its Virginia Environmental Excellence Program (VEEP 2000), and Utah, through its Clean Utah Program (UTAH DEQ 2011), are working closely with their cities, businesses, and universities on EMS.

In 2002, the PEER Center was formed through collaboration between the Office of Water at U.S. EPA and the Global Environment & Technology Foundation (GETF). PEER stands for Public Entity EMS Resource Center and provides a broad array of information and tools to help public entities sustainably manage their organizations using environmental management systems and similar approaches**.** There are eleven organizations around the country called PEER Local EMS Resource Centers (LRC) that are reaching out to local governments to help them adopt EMSs and other sustainable management approaches (PEER Center, www.peercenter.net assessed 1/10/2012). Four of the five states that border Oklahoma have an LRC. Table 1 presents the PEER center organizations and locations.

Environmental management is an approach to environmental stewardship that integrates ecology, policymaking, planning, and social development. Its goals include:

1. preventing and resolving environmental problems;
2. establishing limits on pollution and resource consumption;

**Table 1. PUBLIC ENTITY EMS RESOURCE CENTERS**

| ORGANIZATION (LRC) | LOCATION |
|---|---|
| Arkansas Department of Environmental Quality | Little Rock, AR |
| Georgia Tech Enterprise Innovation Institute | Atlanta, GA |
| Kansas State University | Manhattan, KS |
| Missouri University of Science and Technology | Rolla, MO |
| Sustainable Earth Initiative | Oakland, CA |
| Texas Commission on Environmental Quality | Austin, TX |
| University of Colorado | Denver, CO |
| University of Florida | Gainesville, FL |
| University of Massachusetts-Lowell | Lowell, MA |
| Virginia Polytechnic Institute & State University | Roanoke, VA |
| Zero Waste Alliance | Portland, OR |

(http://www.peercenter.net/whocanhelp/lrc.cfm)

3. establishing and nurturing institutions that effectively support environmental research, monitoring, education, and policies;
4. early warning of hazards and identifying opportunities for hazard prevention and mitigation;
5. sustaining and, if possible, improving existing resource supplies;
6. improving “quality of life”; and
7. identifying new technologies that improve sustainability (Buckholtz, 1998).

Although environmental management is a new field, concern for the environment has old roots.

**The Evolution of Environmental Management**

Stages of environmental concern:

1. Conservation
    a. Early 20th century

b. Use resources wisely and do not deplete them needlessly. Emphasized efficient development and use of natural resources.

c. Ethics – instrumental view of nature in that nature has utility only as it serves human purposes.

d. National park system.

2. Preservation

a. 1930s – 1950s.

b. Certain areas of the country are to be preserved in their natural state and closed to development.

c. Ethic – nature has intrinsic value in its own right apart from the services it provides for human beings.

3. Protection

a. 1960s – 1990s.

b. Focused on pollution control and dangers to human health.

c. Ethic – human-centered.

4. Sustainability

a. Early 21$^{st}$ century.

b. Concerned with global problems, sustainable growth, and equity consideration.

c. Ethic and eco-centered (Buckholtz 1998).

On January 1, 1970, President Richard Nixon signed into effect the 1969 National Environmental Policy Act (NEPA). This act required developers (those using federal lands or federal funds) to meet environmental standards and effectively promoted the precautionary rule. In December of 1970, the President formed the Environmental Protection Agency (EPA) by executive order. In 1973, the United Nations established the UN Environmental Program (UNEP). These were soon followed by a deluge of publications and ensuing acts and laws (the birth of green politics).

Business was prompted by legislation, public opinion, and self-interest to start paying attention to the environment. Some companies took this as an opportunity,

while most adhered to a wait-and-see program. Soon, the “end-of-pipe” solution (cleaning up rather than prevention) was a more costly alteration (not to mention the bad public image), and environmental management could be seen as a way to cut costs and comply with ever-increasing regulations.

The Brundtland Report (World Commission on Environment and Development, 1987) increased awareness of the need for environmental care. In 1990, the Pollution Prevention (P2) Act was issued in the U.S. ushering in “a basic reorientation of the nation’s approach to pollution that would prevent problems before they occurred (EPA P2 Website 2011). By the 1992 UN Conference on the Environment and Development, Rio (the Earth Summit), most countries had environmental ministries, and media interest had vastly increased. 1992 was also the year in which the first mainstream EMS was developed.

**Environmental Management Systems Development**

BS7750

1992, the world’s, first eco-audit was published – British Standards Institute’s BS7750 Specification for Environmental Management Systems. A number of European countries adopted the standard (see Eco-Management and Audit Scheme (EMAS)). It is committed to cycles of self-improvement through internal eco-audit. There are three elements to BS7750: (1) possession of an environmental policy; (2) a documented EMS; (3) a register of effects on the environment.

People argued that it was possible to get the standard by promising to do better and giving out little information to the public. BS7750 was used as one of the major building blocks for the international standards (see ISO 14000).

EMAS

The Eco-Management and Audit Scheme (EMAS) was launched in 1993 and came into force in UK (and Europe) in 1995 (European Union Council Regulation 186/93). EMAS goes beyond eco-audit to require an approved EMS and the production of an independently verified public statement. EMAS seeks to encourage industries in the EU to adopt a site-specific, proactive approach to environmental management and improve their performance. A special logo and “green credentials” go with certification. EMAS requires that an independent third party verifies all requirements.

In 2001, EMAS was opened to all economic sectors including public and private services (Regulation (EC) No 761/2001 of the European Parliament and of the Council of 19 March 2001). In addition, EMAS was strengthened by the integration

of EN/ISO 14001 as the environmental management system required by EMAS (European Commission Energy, 2012). Participation is voluntary and extends to public or private organizations operating in the European Union and the European Economic Area (EEA) - Iceland, Liechtenstein, and Norway. Critics charge that EMAS auditing criteria is vague; it disrupts activities of an organization, may reveal trade secrets, and perhaps causes hostility in the public and workforce.

ISO 14000

The International Standards Organization (ISO) developed a standard for the world that was broadly compatible with EMAS and BS7750. In 1996, ISO published the 14000 series, its International Standard on Environmental Management. This standard was made more user-friendly and easier to understand than either BS7750 or EMAS. The ISO 14000 series is closely related to the ISO 9000 series (management systems) that has been adopted by businesses across the globe. In 2004, the ISO 14000 series was rewritten and updated and incorporated a combined (ISO 14000/ISO 9000) auditing standard. In late 2010, the ISO 14000 series was augmented with a standard for phased implementation (ISO 14005) to better suit small and medium-sized organizations.

Program critics again argue that there is no set of standards to meet, only those set by the company. It can also be an expensive certification (and recertification) process due to third party requirements and the complexity of implementing the entire program. ISO14005 phased implementation was developed to help overcome the complexity and cost issues associated with ISO14001.

**ISO 14000 Family of Documents**

1. *14001-14005 = Environmental Management Systems (EMS)*
    - 14001 establishes the EMS strategic decision-making protocol
    - 14004 provides guidance on how to implement 14001
    - 14005 provides guidance for phased implementation of 14001
2. *14015 = Environmental Assessment of Sites and Organizations (EASO)*
3. *14020-25 = Environmental Labeling*
    - defines terms and uses of product-oriented labeling
4. *14031-32 = Environmental Performance Evaluation (EPE)*

- establishes standards for internal baseline and continuous improvement evaluations

5. *14040-49 = Life Cycle Analysis (LCA) [France is chair]*

   - establishes the protocol for the conduct of cradle-to-grave impact assessments from products

6. *14050 = Terms and Definitions*

7. *14060 = Product Standards*

   - establishes standards for product manufacture

8. *14061 = Information to Assist Forestry Organizations in use of ISO 14001 and ISO 14004*

9. *14062 = Environmental Aspects in Product design and development*

10. *14063 = Environmental Communications*

11. *14064-65 = Greenhouse Gases*

12. *19011 = Quality and/or Environmental Auditing (*ISO Website 2012)

ISO Defines an EMS as:

"An environmental management system (EMS) is a systematic approach to dealing with the environmental aspects of an organization." It is a "tool" that enables an organization of any size or type to control the impact of its activities, products, or services on the natural environment. The ISO 14001 standard *"Environmental management systems--Specification with guidance for use"* is the standard within the ISO 14000 series that specifies the requirements of an environmental management system" (http://www.tc207.org/).

Why develop an EMS?

1) Pragmatic reasons – fear and common sense make people or administrators seek to avoid problems and risks.

2) Desire to save costs – it may be cheaper to avoid problems or counter them than to suffer the consequences (pollution, litigation, etc.). There may also be advantages in waste recovery, energy conservation, and maintaining environmental quality.

3) Compliance – individuals, local government, companies, states, etc., may be required by laws, national, or international agreements to care for the environment.

4) Shift of ethics – research, the media, individuals, or groups of activists may trigger new attitudes, agreements, or laws.

5) Macro-economic – promotion of environmental management may lead to economic expansion: a market for pollution control equipment, use of recovered waste, more secure and efficient energy, and raw materials supply (Barrow 1999).

***FIVE BASIC STAGES OF ISO 14001 EMS***

1. Policy: EMS goal statement of the desired end-state

   - Establish senior management commitment to EM and promulgate a comprehensive environmental policy, which includes strategic goals and priorities

   - Include corporate vision, environmental goals, guiding principles, pollution prevention and compliance commitments, stakeholder concerns and communications, commitment to continual improvement, interfaces with other organizational principles, site-specific requirements, all consistent with Total Quality Management

2. Planning: EMS Manual

   - This is the plan to implement the EMS program so as to meet the goals stated in the policy

   - Identify legal requirements (with procedures for identifying, accessing, and understanding them)

   - Identify and quantify aspects and their impacts

   - Develop measurable objectives (operationalized goals that are specific and measurable) and targets (realistic benchmarks) at all levels of the organization to meet goals

   - Explicitly recognize constraints that limit the ability to meet goals and reflect these in setting targets

   - Develop an implementation program that specifies the means to accomplish objectives and targets, including identification of responsible parties,

description of their duties and authorities, provision of resources to meet their responsibilities, schedules for task accomplishment, communication and reporting procedures, document control, operational control (aspects and their management), training, consequences of noncompliance with policy and manual, emergency preparedness, program surveillance, corrective action, and management review

3. Implementation: EMS program

    - Perform program activities specified in the plan

4. Monitoring and Measurement: EMS surveillance and auditing and corrective action

    - Regularly monitor performance of the EMS program against objectives and targets
    - Conduct external audits each six months to maintain certification
    - Perform preventative and corrective action for nonconformances
    - Maintain records and issue reports

5. Management Review and Continual Improvement: EMS evaluation

    - Senior management. review of EMS performance reports and audits to ensure continuous improvement
    - Changes in the policy, manual, or implementation made as necessary (ISO 14001:2004)

**ISO 14001 ELEMENTS**

4.1 General Requirements

4.1.1 The environmental management system model

4.1.2 Top management commitment and leadership

4.1.3 Scope of the environmental management system

4.1.4 Initial environmental review

4.2 Environmental Policy

4.3 Planning

4.3.1 Environmental aspects

4.3.1.1 Overview

4.3.1.2 Understanding activities, products, and services

4.3.1.3 Identifying environmental aspects

4.3.1.4 Understanding environmental impacts

` 4.3.1.5 Determining significant environmental aspects

4.3.2 Legal and other requirements

4.3.2.1 Legal requirements

4.3.2.2 Other requirements

4.3.3 Setting objectives and targets

4.3.3.2 Programs for achieving objectives and targets

4.3.3.3 Performance indicators

4.4 Implementation and Operations

4.4.1 Resources, roles, responsibility and authority

4.4.2 Competence, training, and awareness

4.4.3 Communications

4.4.3.1 Internal communications

4.4.3.2 External communications

4.4.3.3 Communications processes

4.4.4 Documentation

4.4.5 Control of documents

4.4.6 Operational control

4.4.6.1 Identifying needs for operational controls

4.4.6.2 Establishing operational controls

4.4.7 Emergency preparedness and response

4.5 Checking and Corrective Action

4.5.1 Monitoring and measurement

4.5.2 Evaluation of compliance

4.5.3 Nonconformity, corrective action, and preventative action

4.5.4 Control of records

4.5.5 Internal audits

4.6 Management Review

4.6.1 Review of the environmental management system

4.6.2 Continual improvement

4.6.2.1 Opportunities for improvement

4.6.2.2 Implementation of continual improvement (IS0 14001:2004)

**ISO 14005 Phased Implementation of ISO 14001**

In December 2010, ISO Technical Committee (TC) 207 published ISO 14005 titled Environmental management systems – Guidelines for the phased implementation of an environmental management system, including the use of environmental performance evaluation. The forward states the purpose of the standard as:

> "to encourage and guide organizations, especially small-and medium-sized enterprises (SMEs), to adopt and implement an environmental management system (EMS) that meets the requirements of ISO 14001" (ISO 14005:2010)

It further states, "Many organizations have profited from having a formal environmental management system. But many more organizations, especially SMEs, do not have such a system, even though it could benefit them greatly. This International Standard uses a phased approach to implement an environmental management system that can grow to meet the requirements of the International Standard for environmental management systems" ISO 14001 (ISO 14005:2010).

The standard points out that there are multiple benefits to managing entities' environmental aspects. But "organizations can be deterred from applying a systematic approach to environmental management, if they perceive this as being an inflexible, limiting, bureaucratic or costly process. They can also be overwhelmed by the apparent size of the task (ISO14005:2010, 5)". These barriers can be overcome through a phased implementation process.

This phased implementation provides several advantages over one-time implementation. These advantages include:

- Easy evaluation of how the time and money invested in an EMS provides a return;
- Assessment of how environmental improvements reduce costs;
- Improvement in community relations;
- Assistance in demonstrating compliance with legal and other requirements, and
- Support for users to them live up to stakeholder expectations (ISO14005 2010).

The system allows SMEs to track benefits with each phase or step, adding new ones that can provide value to the entity. This process will allow a SME to do as little or as much as they want and proceed to certification, if that is their ultimate aim. The standard can be implemented in three different phases or in a combination of these three phases.

The three phases of ISO 14005 are:

1. Undertaking an environmental-related project to secure management support and commitment to begin the phased implementation of an EMS (section 4 of the standard)
2. Elements that support the implementation and maintenance of an EMS (section 5 of the standard)
3. Development and implementation of an EMS (section 6 of the standard) (ISO 14005 2010

ISO 14005 phases start with section 4 (section 1-3 cover scope, terms and definitions, and process).

**Section 4 – Undertaking an environmental-related project to secure management support and commitment to begin a phased implementation of an EMS**

Section 4 is a five-step process that follows the Plan-Do-Check-Act (PDCA) management model:

1. P = Plan:  Identify and select a project and prepare a preliminary environmental action plan;
2. D = Do:  implement the action plan, including assigning roles and responsibilities;
3. C = Check:  monitor, measure, and evaluate the achievements;
4. A = Act:  review the progress and decide on future actions in a management review (ISO14005:2010, 8).

Step one (4.2.2) concerns obtaining “top management” involvement, commitment, and support.  This support must be demonstrated throughout the organization on a continuing basis.  This step also requires a project leader be assigned.  A project leader is equivalent to a management representative that is required when implementing a fully ISO 14001-compliant EMS.

Step two (4.2.3) concerns identification and selection of a project.  It guides the users to look at a wide range of environmental issues ranging from regulatory issues to negative-impact issues to cost issues. It further states, “The selected project should be sufficiently limited in scope to be manageable with limited resources” and that it “demonstrate value to the organization with a reasonable period of time” (ISO14005 2010, 8).  This project needs to be carefully evaluated to level of effort, resources required, and return on investment, including the potential benefits and future opportunities.

Step three (4.2.4) is planning and implementation of the selected project.  First, one prepares an action plan that outlines outcomes, value to entity, and how it will be achieved.  The action plan states that a review may be conducted looking at legal and contractual requirements and the main impacts on the environment.  It is not meant to be exhaustive but to a scale to reflect the value added by the project.  It also states that it “may be necessary to perform some quantitative evaluation of the environmental aspects and their associated costs, where such information does not already exist” (ISO14005 2010, 9), and these are known as performance indicators. From these indicators, objectives and targets can be set for the project.  This action plan should eventually define:

- the actions necessary to reach these objectives and targets;
- the corresponding resources (both human and financial);
- timescales; in particular, a precise time limit should be set for the completion of the project;

- adequate responsibilities for its implementation (ISO14005:2010, 9).

This plan needs top management approval. Training may be required for all aspects of the plan to be implemented.

Section four (4.2.5) involves checking of the selected project. In this section, progress is checked on a periodic schedule against chosen indicators. Such items as resources, expenditures, delays, deviations, and progress with respect to the indicators are reviewed and actions taken as needed.

Section five (4.2.6) concerns the review of the selected project. It requires that top management review the project in the following areas:

- if the planned actions have been adequately implemented;
- whether improvements in environmental performance have been achieved;
- The level of achievements made against the planned goals;
- The financial outcomes;
- The possible consequences for the organization's structure; and
- Other costs and benefits of the project, including possible reactions of interested parties (ISO14005 2010, 10).

After the review, the top management should be in a position to decide on a next step. They may decide to expand the project, or start an additional project, or even proceed to a full implementation. If full implementation is selected, it may be reached by proceeding to section 5 and 6 of this standard or by implementing ISO 14001.

**Section 5 - Elements that support the implementation and maintenance of an EMS**

In this section, a step-by-step procedure is provided to develop the supporting and maintenance sections of an EMS. The first part (5.1) of this section is to develop an environmental communications system. This is broken down into five steps: recognizing the need and value of communicating on environmental issues; identifying what will be communicated and to whom; making a plan on how information will be communicated with interested parties; implementing the communications process; and monitoring the results of communications to determine if they have been effective (ISO14005 2010, 13).

The next part (5.2) of this section is to define roles, responsibilities, and authority. The section is broken down into four steps: recognize the need to have defined resources, roles, and responsibilities and authority of top management of the organization and of implications of the EMS; identify and define roles, responsibilities, and appropriate resources within the organization; appoint a specific management representative for the EMS; and communicate the roles and responsibilities to all those affected, and ensure that they understand and agree with them and to assign the needed resources (ISO14005 2010, 14).

The next section (5.3) covers competence, training, and resources. This section is broken down into four steps: recognize the need to have competent personnel in the organization who are aware of the implications of the EMS; determine the competence required for carrying out activities that relate to the organization's significant environmental impacts and develop and implement an awareness procedure; develop and implement a training program as necessary and assess competence against the requirements to ensure that they are met; and maintain the competence training and awareness program (ISO14005 2010, 15).

Section 5.4 covers records required for the ISO implementation. This is a three-step section: recognize the need to maintain records as evidence of its ongoing EMS; determine which records are required and establish and implemented procedure for their records; and review and maintain records as necessary (ISO14005 2010, 16).

Section 5.5 covers the documentation requirements. This section consists of four steps: within the scope of the EMS, recognize the need to have documentation; determine which documentation is required; prepare and organize documentation; and implement documentation (ISO14005 2010, 17).

Section 5.6 outlines document control. This section consists of four steps: within the scope of the EMS, recognize the need to have control of documentation; develop a procedure for the control of documentation; prepare and organize documentation control; and implement and maintain control of documents (ISO14005 2010, 17).

**Section 6 Development and Implementation of an EMS**

In section 6.1, the organization determines how its activities, products, and services interact with the environment (known as its environmental aspects) and determines which of these are most important (their environmental significance). This section consists of four steps: recognize that the organization's activities, products, and services interact with the environment; develop and implement a procedure to identify the organization's environmental aspects; develop and implement a procedure to determine those aspects that have, or can have, significant impact(s)

on the environment; and compile and keep an up-to date list of significant aspects (ISO14005 2010, 18).

Section 6.2 covers the identification of the organization's legal and other requirements. This section is covered in four steps: recognizing that the organization may need to comply with legal and other requirements that relate to its environmental aspects; identify relevant legal and other requirements; determine how the legal and other requirements apply to the organization's environmental aspects; and keep an up-to-date understanding of the legal and other requirements which are applicable to the organization (ISO14005 2010, 21).

Section 6.3 is the evaluation of compliance with the organization's legal and other requirements. This is covered in four steps: recognize that the organization is subject to legal and other requirements and that it needs to comply with them; identify and plan methods used to monitor and measure; periodically evaluate compliance with all legal and other requirements; and, record and report the results of the evaluation, including compliance and/or non-compliance with all legal and other requirements (ISO14005 2010, 22).

Section 6.4 covers the preparation and implementation of an environmental policy. The sections is covered in four steps: recognize the need to have an environmental policy for the organization; prepare a preliminary environmental policy suitable for the organization; finalize the environmental policy document; and make the environmental policy available to the public and make all those working for and on behalf of the organization aware of its contents and meaning (ISO14005 2010, 22).

Section 6.5 is the setting of objectives and targets and establishing programs. This section is covered in the following four steps: recognize the need to establish and implement goals in order to improve performance; gather information which will enable objectives, targets, and programs to be developed; develop and document objectives, targets, and programs in order to improve performance; and work towards achieving objectives and targets through the implementation of the program (ISO14005 2010, 24).

Section 6.6 covers operational controls. This section is covered in four steps: recognize the need for controlling whose operations are associated with significant environmental aspects; plan the way in which operations related to the organization's significant aspects are to be controlled; develop and implement the controls; and review the effectiveness of the implemented controls (ISO14005 2010, 25).

Section 6.7 is the planning for and responding to emergencies. This section is covered in the following five steps: recognize that emergency situations may occur and need to be managed; identify which emergency situations may occur and their potential environmental impacts; establish a procedure that responds to the identified potential emergency situations; implement and test (where practical) procedures that respond to the potential emergency situations; and review responses to emergency situations and revise procedures, if necessary (ISO14005 2010, 27).

Section 6.8 covers environmental performance evaluation, including monitoring and measurement. This section is covered in the following five steps: recognize the need to evaluate environmental performance and develop indicators for that purpose; gather information on the key characteristics and define the performance indicators; develop a procedure to monitor and measure in accordance with the environmental performance indicators of the organization; collect, measure, analyze, and evaluate performance of the organization, calibrate equipment, and retain records; and evaluate suitability of the indicators (ISO14005 2010, 28).

Section 6.9 covers internal audits. This section is covered in the following five steps: recognize the need to ensure that the system is properly implemented and meets planned arrangements; gather information in order to develop the audit program; plan and implement an audit program; report the audit findings to management and act upon them; and identify improvements to internal auditing (ISO14005 2010, 30).

Section 6.10 concerns managing when things do not go as planned. This section is covered by the following five steps: recognize that things can go wrong (nonconformity) and that actions should be taken to correct and/or avoid their occurrence; identify what went wrong and correct it; analyze why it went wrong and identify actions to avoid reoccurrence; identify what could go wrong and take actions to prevent occurrence; and review the effectiveness of corrective action(s) and take preventive action(s) (ISO14005 2010, 32).

Section 6.11 covers management review of progress and performance. This section is covered in the following three steps: recognize the need to review the performance of an EMS; identify inputs to the review process; and review the suitability, adequacy, and effectiveness of the EMS, identify improvement opportunities and secure improvements to the system and/or actual performance (ISO14005:2010, 33).

As can be seen in the previous three sections, ISO 14005 provides a path for an organization to achieve an ISO 14001 EMS by working within their own timeframe

and within their own abilities. It provides different paths for organizations depending on a variety of factors such as:

- size;
- locations;
- existing management structure;
- the extent to which environmental issue have been incorporated into the day-to-day operational activities;
- cultural needs and aspirations;
- staff availability and experience;
- limitations of resources (ISO14005 2010, 5).

**ISO 14001 AND 14005**

For the purpose of this study, ISO 14001 will be known as “Full” implementation and ISO 14005 will be known as “Phased” implementation. Table 2 presents the relationship between ISO 14001 and ISO 14005.

## Table 2. ISO 14001 AND ISO 14005 RELATIONSHIPS

| ISO 14001 SECTION | ISO 14005 SECTION | | |
|---|---|---|---|
| | PART 4 | PART 5 | PART 6 |
| 4.2 Policy | | | 6.4 |
| 4.3.1 Aspects | | | 6.1 |
| 4.3.2 Legal & Other Requirements | | | 6.2, .3 |
| 4.3.3 Objective, Targets, Programs | | | 6.5 |
| 4.4.1 Resources, Roles, Responsibilities & Authority | | 5.2 | |
| 4.4.2 Competence, Training & Awareness | | 5.3 | |
| 4.4.3 Communications | | 5.1 | |
| 4.4.4 Documentation | | 5.5 | |
| 4.4.5 Control of Documents | | 5.6 | |
| 4.4.6 Operational Control | | | 6.6 |
| 4.4.7 Emergency Preparedness & Response | | | 6.7 |
| 4.5.1 Monitoring and Measurement | | | 6.8 |

| ISO 14001 SECTION (CONTINUED) | ISO 14005 SECTION | | |
|---|---|---|---|
| | PART 4 | Part 5 | PART 6 |
| 4.5.2 Evaluation of Compliance | | | 6.10 |
| 4.5.3 Nonconformity, Corrective & Preventative Action | | | 6.10 |
| 4.5.4 Control of Records | | 5.4 | |
| 4.5.5 Internal Audit | | | 6.9 |
| 4.6 Management Review | | | 6.11 |

ISO 14005 part 4 is project-driven and is designed to lead to part 5 and ultimately part 6 and full EMS implementation. This phased approach should help SMEs adopt an EMS at their own pace as resources become available and management begins to see the benefits.

## Research Question

WHAT STRATEGIES ARE MOST PERFERRED TO OVERCOME THE BARRIERS AND TAKE ADVANTAGE OF THE BENEFITS OF IMPLEMENTING AN ENVIRONMENTAL MANAGEMENT SYSTEM?

During the past few years, cities have been facing the stark reality of increasing costs and decreasing revenue. Layoffs, furloughs, downsizing, privatization and even bankruptcy have been front page news across the nation. Cities struggle to adjust to increasing populations or to adapt to a loss of citizens and businesses. Increasing the tax base has been a hard sell in our current recession. Revenues are slowly recovering, but budgets are tight across the state and country, which leaves cities with having to do more with current revenues or cut services and employees.

Cities also grapple with a multitude of environmental issues such as air pollution, clean water, storm drainage, solid and municipal waste disposal, resource consumption, environmental regulations and permitting, and an aging infrastructure. Again, cities must find ways to handle these environmental issues and problems with limited resources.

One possible solution to help reduce costs and deal with environmental issues is for the cities to successfully adopt an EMS. As seen from previous municipal adoptions, an EMS can help reduce environmental issues while saving the cities money.

Terms used in this question are defined below.

**Cities:**

- A community with a population greater than 20,000 in Oklahoma (see Appendix A)
- These cities were selected because they were large enough to contain diverse environmental operations (water treatment, waste water treatment, public works, parks and recreation, garbage disposal, solid waste disposal, streets and transportation, etc).
- All these cities were run by city managers and most had assistant city managers. Mayors may be elected or selected from city council members.

**Implement:**

- A means of achieving an end; an instrument or agent (American Heritage Dictionary)

**Environmental Management System:**

- Systematic approach to dealing with the environmental aspects of an organization (ISO 14000)

**PURPOSE**

I propose to develop and test strategies to implement an EMS in cities in Oklahoma with populations over 20,000 (see Appendix A).

To develop the strategies, I have reviewed what municipal managers from cities in the U.S. that have participated in the EPA EMS pilot programs have reported. The purposes of these programs were to: (1) characterize problems during the EMS program adoption processes (see Appendix C), (2) characterize the benefits of the EMS process (see Appendix C), and (3) characterize possible measures for successful adoption. I have also talked with environmental professionals working in a cross-section of cities (from 20,000 to 2,000,000) about program implementation.

I then assessed the information gained from this review by interviewing the environmental managers/leaders of all 21 cities in Oklahoma with populations greater than 20,000 (see appendix A). This interview included an ISO 14000 education section, followed by information on the benefits and barriers of EMS implementation in cities. These interviews also use clustering of the benefits and barriers and cognitive (concept) mapping.

The results of these interviews were used to develop a decision-making protocol, Analytical Hierarchy Process (AHP), through cluster analysis (using Ward's Analysis contained in SPSS).

I then electronically administered two AHP protocols to the 21 municipal managers. During this process, the managers/leaders used the AHP to come to a decision on EMS implementation. The AHP provided which option (full, phased, or no implementation) that the cities desired and why they selected this option. This information was used to help develop strategies for EMS implantation.

I then developed possible strategies to overcome the barriers and enhance the benefits presented in the interviews and AHP survey results. Once developed, the strategies were vetted by talking with large and small cities. An acceptability survey was tested by surveying all 21 municipal managers.

# CHAPTER II

## REVIEW OF LITERATURE

Environmental management is a relatively new field. It was born in the U.S. during the 1970s, our "decade of the environment." It developed along many different lines and in many different sectors with little or no emphasis on developing a single cogent system.

In 1992, the British Standards Institute's BS7750 Specification for Environmental Management Systems, the world's first eco-audit, was published. BS7750 strived to provide a single EMS to incorporate all sectors of business. Soon after in 1993, the European Union launched the Eco-Management and Audit Scheme (EMAS). It came into force in the United Kingdom and Europe in 1995 (European Union Council Regulation 186/93).

Building on BS7750 and EMAS, in 1996 the International Standards Organization developed and published ISO14000 series for Environmental Management. The ISO 14000 series provides a worldwide EMS that is constantly being expanded and reviewed. Today it is the most widely used EMS in the world, with over 223,149 certified entities (certified to ISO14000 2004) at the end of 2009 (ISO 2010).

ISO defines an EMS "as a systematic approach to dealing with the environmental aspects of an organization" (ISO14050 2009). The National Data Base on Environmental Management Systems (NDEMS) defines an EMS as "a formal set of procedures and policies that define how an organization will manage its potential impacts on the natural environment and on the health and welfare of the people who depend on it" (Andrews, et al., 1999). The EPA further refines the definition as "a set of management processes and procedures that allow an organization to integrate environmental considerations into daily decisions and practices" (EPA 2004). EPA Region 6, on its website, amplifies the definition of

an EMS as “a continuous approach to evaluate the plans and daily operations of a business or organization that impact the environment, then planning and taking action to reduce those impacts. EMS provides a framework to manage and reduce effects on the environment” (EPA Region 6, 2011).

As can be seen in these definitions, an EMS is a systematic approach to evaluate, plan, and take action on environmental aspects (elements of an organization’s activities or products or services that can interact with the environment (ISO 14001 2004: Terms and Definitions)) and their resultant impacts (any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization’s environmental aspects (ISO 14001 2004: Terms and Definitions)). It looks at real time and potential effects upon the environment and what can be done to minimize or eliminate these effects. The idea of worldwide standardization of management systems is not a new approach. ISO 9000 Quality Management recently celebrated its 25$^{th}$ anniversary with 1,064,785 certified entities at the end of 2009 (ISO 2010).

Since its inception, there have been critics of consolidated management systems. Even those systems that have third party certification (outside entities) are not immune. For example, ISO 14000 program critics argue that there is no set of standards to meet, only those set by the company, and it does not mandate improved environmental performance but “only calls for process improvement” (Aravind 2008 p6). It can also be an expensive certification (and recertification) process due to third party requirements and the complexity of implementing the entire program (Jiang and Bansal 2003; Potoshki and Aseem 2005,). ISO also noted that 14001 can be seen as an “inflexible, limiting, bureaucratic or costly process” (ISO14005, 5).

**ISO 14000**

International Organization for Standardization (ISO) is a network of the national standards institutes of 163 countries, one member per country, with a headquarters in Geneva, Switzerland. Founded by 25 countries in 1947, it is the largest developer and publisher of international standards. ISO is a “non-governmental organization that forms a bridge between the public and private sectors” (ISO Website 2012). The American Standards National Institute (ANSI) represents the U.S. in ISO. ISO's commitment to support the objective of sustainable development discussed at the United Nations Conference on Environment and Development**,** in Rio de Janeiro, gave birth to the ISO 14000 family of international standards on Environmental Management (ISO Website 2012).

Standards are developed by technical committees (TCs) that are formed by experts from member countries. In 1996, TC 207 developed the first international environmental management system (EMS) standard, ISO 14001 as part of the ISO 14000 family. TC 207 worked closely with TC 176 which produced ISO 9000, the family of international standard for Quality Management, in the areas of auditing, management, and related terminology (ISO 2009). To date, TC 207 has produced 27 standards (and updates) with a committee membership of 76 participating countries (TC 207 2012). In 2004, ISO 14001and its accompanying guidelines (ISO 14004) were updated to reflect new changes and to bring them closer in line with ISO 9000. In December of 2010, TC 207 published ISO 14005, a standard for phased implementation to better suit small and medium-sized organizations.

In developing the ISO 14001, TC 207 wanted organizations to minimize harmful effects on the environment caused by its activities and to achieve continual improvement of its environmental performance (ISO Website 2012). Using the systems of processes and their interactions, a Plan-Do-Check-Act (PDCA) cycle was applied to environmental management (ISO14001 2004, vi), thus making its elements align with other management systems already in use in an organization, managements systems such as “those for quality, occupational health and safety, financial and risk management” (ISO14001 2004, vii), providing for easier adoption across a wide variety of countries, companies, and organizations.

Once published, ISO 14001 spread across the international stage (Russo 2001) (although not as readily or as completely as ISO 9000). It was noted early that Europe and Asia rapidly adopted the standard while the American companies “seem less eager to adopt this voluntary standard” (Delmas 2001, 92). Delmas (2002) reported in his survey that strong constraints against adoption were uncertainty with regulatory agencies’ utilization of EMS audit information (62%), potential legal penalties from voluntary disclosure (60%), and lack of regulatory flexibility (69%). In terms of cost, Delmas (2002) reported that design (implementation) costs were heavy constraints (75%), while annual and registration costs were also noteworthy (65%). He also noted that a majority of firms (62%) considered the time (or the lack of) to implement a quality EMS as a constraint, while 58% felt that a lack of personnel to implement and manage a system was also a barrier. He also noted that 31 % of certified firms had headquarters outside of the U.S. In 2003, Babakri, Bennett, and Franchetti noted that their survey of United States industrial companies revealed that certification costs and lack of

available resources were the greatest obstacles to EMS 14001 implementation.

By 1999, only 14,000 companies worldwide were certified. Early researchers found that companies that sought out ISO certification within the first two years were those who “had a considerable environmental legacy and a strong international presence” (Bansal and Hunter 2003, 297). Also, companies that already had International Certifications like ISO 9000 were prone to adopt ISO 14000 more readily (Bansal and Hunter 2003).

During this period, the automotive industry in the U.S. (and the world) was starting to gain ISO 14001 certification. By 2003, the big three, General Motors, Ford, and Chrysler, all adopted the EMS standard. Once the large automakers were certified, they started to require that their supply chain partners be certified (Jiang and Bansal, 2003). The auto industry requirements, along with other industries that had worldwide trading partners (electronics, industrial tools, construction equipment), helped the U.S. to more widely accept the ISO 14001 EMS standard. By 2003, 66,070 entities were certified with a growth rate now approaching 30% a year (ISO Annual Report, 2003). The U.S. now had 3553 companies that were certified.

Up to the end of December 2006, at least 129,199 ISO 14001:2004 certificates had been issued in 140 countries and economies (ISO Certification Survey 2006). The U.S. was now at 5585 certificates issued. As of 2010, ISO 14001 is now used by at least 223,149 organizations in 159 countries and economies, growing at approximately 34,000 entities a year (ISO Press Release 10/25/2010). The U.S. is still significantly lagging the rest of the industrialized countries of the world (2010 data not available for U.S.).

***Benefits to implementing an ISO 14001EMS***

The benefits to implementation of an ISO 14001 EMS were seen relatively soon after its publication. Businesses not only began to see economic advantage but also found a higher conformance with legislative and regulatory requirements (Sheldon 1997). This conformance benefit was also reported by the EPA after its first pilot study with municipalities (EPA 2000). This reduction of risk related to environmental liability and regulations was coupled with a cost saving realized by reductions in waste and materials usages (Delmas 2001). ISO 14000 also provided an international standard that was good worldwide, which allowed companies to subscribe to one EMS

across a growing number of environmental systems independent of country or region.

Researchers began to publish studies about ISO 14000, and common benefits began to emerge both in the private and public realm (NDEMS 1999; Delmas 2001; Bansal and Hunter 2003; Babakri, Bennett and Franchetti 2003; Jiang and Bansal 2003; EPA 2000, 2002, 2005, 2005; ISO 2003, 2006, 2009). Table 3 presents the benefits to businesses and municipalities of adopting an EMS.

## Table 3. BENEFITS TO EMS IMPLEMENTATION

| BENEFITS | BUSINESS | MUNICIPAL |
|---|---|---|
| Reduced costs (cost savings) | X | X |
| Environmental efficiencies | X | X |
| Improved environmental performance (compliance) | X | X |
| Better relationships with regulators | X | X |
| Better communications (inside and outside) | X | X |
| Improved bond rating | | X |
| Increased stock attractiveness | X | |
| Reduced insurance premiums | X | X |
| Operational efficiencies and consistency | X | X |
| Improved labor relationship with management | X | X |
| Employee succession | X | X |
| Risk reduction | X | X |

There are very few differences in the possible benefits between businesses and municipalities. The benefits are defined as:

- Reduced cost
    - Conservation of water, electricity, fuel
    - Recycling
    - Reuse
    - Reduction of raw materials and resources
- Environmental efficiencies
    - Best management practices
    - System upgrades
    - Improvement of procedures

- Improved environmental compliance
    - Better understanding of all environmental regulations
    - Understanding by operators who control environmental aspects
    - Centralized collection of environmental regulations, permits, and requirements
- Improved relationship with regulators
    - States' involvement in EMS
        - Pennsylvania, Arkansas, Colorado, Idaho, Illinois, Indiana, Kansas, Kentucky, Minnesota, Mississippi, Oregon, Texas, Utah, Virginia, and Wyoming
    - EPA involvement with EMS
- Better communications
    - Inside of the department and organization as a whole
    - With outside entities and stakeholders
- Improved bond rating
    - Increased attractiveness of bonds for cities
- Increased attractiveness of investment for businesses
- Reduced insurance premiums
    - Reduced risk
        - Both environmental and safety
- Operational efficiency and consistency
    - Work procedures
    - Operators looking at systems
    - Document and record controls
- Improved labor relationships
    - Top Management, managers, and workers are part of EMS
    - Communications improvement
- Improved employee succession
    - Training, work procedures, employee buy-in
- Risk reduction
    - Environmental
    - Safety
        - Combination of EMS and OSHA

Along with the many benefits of ISO 14000 EMS, there are also barriers to its implementation.

***Barriers to implementing an ISO 14001EMS***

Just as with the benefits, barriers emerged to ISO 14001 EMS as soon as implementation started. Delmas (2001) noted cost and time as two of the major barriers to implementation in the U.S. Jiang and Bansal (2003) added maintaining the certification as another cost that could possibly deter implementation. As research into ISO 1400 ramped up, a common set of barriers emerged (NDEMS 1999; Delmas 2001; Bansal and Hunter 2003; Babakri, Bennett and Franchetti 2003; Jiang and Bansal 2003; EPA, 2000, 2002, 2005; ISO 2003, 2006, 2009). Table 4 presents the barriers encountered by businesses and municipalities when implementing an EMS.

## Table 4. BARRIERS TO EMS IMPLEMENTATION

| BARRIERS | BUSINESS | MUNICIPAL |
|---|---|---|
| Top Management Involvement | X | X |
| Dedicated Resources | X | X |
| Employee Buy-in | X | X |
| Public (Stakeholder) Awareness | X | X |
| Political Support Uncertainty | | X |
| Dedicated Implementation Team | X | X |
| Employee Training | X | X |
| Program Design | X | X |
| Incremental Implementation | X | X |
| Communications | X | X |
| Outside guidance and support | X | X |

Again, it is seen that there is very little difference between businesses and municipalities when it comes to barriers to EMS implementation. The barriers are defined as:

- Management Involvement
  - Requires Top Management leadership and commitment
  - Requires Middle Management leadership and commitment
- Dedicated Resources
  - Time
  - People
  - Money

- Employee Buy-in
    - Requires all employees to participate
    - Requires workers who have direct interaction with the environment to understand their systems
- Dedicated Implementation Team
    - People must be assigned to team
    - There must be a leader assigned
    - Must allot time for team meetings and work
- Employee Training
    - Top Management
    - Middle Management
    - Employees
    - Implementation Team
- Public Awareness
    - Support from stakeholders, citizens, businesses
    - Buy-in
- Political Support Uncertainty
    - Need for municipal adoptions
- Program Design
    - Complicated implementation
    - Build off of other program
        - ISO 9000 (Quality management)
        - ISO 18000 (Safety)
        - Other environmental and management programs
- Incremental Implementation
    - Time consuming
    - Do one facility or part at a time
    - Build off preceding step
    - Implement steps when they are accomplished
- Communications
    - Increased communications internally
    - Increased communications externally
    - Multiple means (written, oral, electronic, etc).
- Outside guidance and support
    - Contractors
    - Non-profit
    - Other businesses

In 1996, Global Environmental and Technology Foundation (GETF) estimated that the initial implementation and certification would cost between $24,000

and $128,000, depending on the size of the facility and the procedures needed. They also estimated that it would cost between $5,000 and $10,000 annually to maintain the system. These costs did not seem to deter larger companies, even those that were experiencing some financial difficulties (Bansal 2002) but definitely deterred small and medium-sized businesses from implementation and certification (ISO 14005 2010). Issuance of ISO 14005 Phased Implementation is a direct effort of ISO to reach small and medium-sized entities. In a 2006 survey of ISO 14000 certified companies, the University of Pennsylvania's Wharton Risk Management and Decision Process Center found most respondents "indicated that the cost of implementing ISO 14001 and becoming certified was $50,000 or less while reporting roughly equivalent savings over the first two years" (Environmental Systems Update 2006). They also noted that some companies reported seeing a one year payback.

Issued in 1996 and revised in 2004, ISO 14000 EMS is spreading across the globe with ever-increasing speed (ISO yearly reports). Starting from a handful of large multinational corporations in its early years, it is now open to an ever-increasing market of small and medium business and governmental agencies across the world. With Asia and Europe taking the lead in certification (ISO, 2009), North America, especially the U.S., needs to find a way to make EMS implementation and certification easier to obtain. Hope lies in ISO 14005, which perhaps can be the spark to ignite an EMS revolution in our businesses and municipalities.

**Program Implementation**

The study of policy (program) implementation is a relatively new phenomenon that can be traced back to the early 1970s. Its roots are based in the social science fields including sociology, social psychology, political science, and public administration (Van Meter and Van Horn 1975). With the advent of public programs in the 1930s, people began to look at how the new policies affected both the organizations that administered them and the people that these policies were meant to help.

In 1949, Philip Selznick (a sociologist) published "TVA and the Grass Roots," which looked at the Tennessee Valley Authority in 1942 and 1943 as it carried out its job "for unified development of the resources of a region (Selznick 6)." In his findings he noted that the "meaning into any given administrative policy will thus require an excursion into its effects" (Selznick 253) and that "these effects ramify widely, and those we select for study may not always seem relevant to the formal goals in terms of the policy established" (Selznick 253).

One of the first major works on implementation of public policy was written by Jeffrey Pressman and Aaron Wildavsky, faculty members (political science department) at the University of California at Berkeley, in 1973. Their work was aptly named *"Implementation"* and looked at the U.S. Economic Development Administration's employment effort from 1966-1969 in Oakland, California. Their findings set the groundwork for studies on public policy implementation. The full title of the book still resonates with the federal programs of today, *Implementation: How Great Expectations in Washington are Dashed in Oakland; Or, Why It's Amazing That Federal Programs Work At All –This Being a Saga of the Economic Development Administration as Told By Two Sympathetic Observers Who Seek to Build Morals on a Foundation of Ruined Hope.*

What they and their graduate students found was that while there was one agreed-upon goal, to reduce unemployment; the implementation had two decision paths. One was the financing of construction of public works projects, and the other was developing a hiring plan to ensure the firms would actually employ targeted workers (Pressman and Wildavsky, 110). These dual paths and multiple interests led to inevitable conflicts and delays among a multitude of organizations at the local, state, and federal levels. The authors noted that "delay in time may be equivalent to defeat in substance" (p 113) Multiple paths led to numerous intended and unintended decision points that had to be acted upon by a diverse field of players, which ultimately resulted in a gridlock situation.

The findings of *Implementation* still apply to public policy today as they did nearly forty years ago, findings such as simplicity in policy is much desired (p 147), implementation must be adaptive (p. 146), implementation must learn from experience (p. 147), and implementation must be part of the initial formulation of policy (p. 143).

In 1980, Michael Lipsky published *Street-Level Bureaucracy: Dilemmas of the Individual in Public Services*, a look at the people who truly implement public policy. He looked at "schools, police and welfare departments, lower courts, legal services offices and agencies whose workers interact with and have a wide discretion over the dispensation of benefits or the allocation of public sanctions" (p. xi). He noted that these individuals "adjust work habits and attitudes to reflect lower expectations for themselves, their clients, and the potential public policy" (p. xii) (those that do not either burn out or drop out). He further stated "ultimately, these adjustments permit acceptance of those clients receive the best that can be provided under prevailing circumstances" (p. xiii). Lipsky found that individuals implement policy and programs the best way they can, given limited resources and administrative constraints.

By the end of the 1980s and early 1990s, there was a variety of books and papers being written on implementation of public policy, both in the United States and Europe. In the U.S., Daniel Mazmanian and Paul Sabatier published *Implementation and Public Policy*, in which they developed six conditions of effective implementation:

1. Statute contains clear and consistent policy directives,
2. Statute incorporates sound causal theory identifying sufficient factors and target groups to attain statutory objectives,
3. Statute not only provides jurisdiction over target groups but also structures implementation to maximize probability of compliance from implementing officials and target groups by,
    a. Assignment to a sympathetic agency.
    b. Hierarchically integrated implementing agencies with few veto points and adequate incentives for compliance.
    c. Supportive decision rules.
    d. Financial resources.
    e. Formal access to supporters.
4. Commitment and skill of top implementing officials,
5. Continuing support from constituency groups and sovereigns, and
6. Changing socioeconomic conditions (and thus political support) over time (Mazmanian and Sabatier, 41).

They then applied these criteria to evaluate policy implementation across a variety of federal and state policies.

Up to this point, implementation research had progressed from looking at single federal programs (Pressman and Wildavsky 1973), known as first-generation research, to looking at state and federal program implementations (Nakuamura and Smallwood 1980, Mazmanian & Sabatier 1979, Van Horn and Van Meter 1975) on why they succeeded or failed, known as second-generation research. These works and most works done in the U.S. looked at the "top-down" model of policy implementation, i.e. "they started with a policy decision (usually a statute) and examined the extent to which its legally-mandated objectives were achieved over time and why" (Mazmanian and Sabatier 1979, 288). An exception to this

was Lipsky's Street Level Bureaucrats, which looked at "bottom-up" implementation, "which starts with an analysis of the multitude of actors who interact at the operational (local) level on a particular problem or issue" (Mazmanian and Sabatier 1979, 288).

In Europe, work had been progressing on implementation by bottom-up theorists since the early 1980s (Hanf and Scharpf 1978, Barrett and Fudge 1981, Hjern and Hull 1982, Hanf 1982). In the process, "the familiar policy stages of formulation, implementation, and reformulation tend to disappear. Instead, the focus has been on the strategies pursued by various actors in pursuit of their objective" (Mazmanian and Sabatier 1979 p 288). In 1986, Paul Sabatier suggested a new model of implementation that was a synthesis of top-down and bottom-up approaches. This synthesis model melded the two approaches, ushering in a third generation of research.

In 1990, Malcom L. Coggin, Ann O'M. Bowman, James P. Lester, and Laurence J. O'Toole, Jr., published *Implementation Theory and Practice: Toward a Third Generation*, which used communications theory to integrate the top-down and bottom-up perspective. They developed a model that "integrates the major concerns and variables of the top-down and bottom-up research traditions into a single framework" (p. 198). They also noted that each implementation is different but has a number of things in common, and "implementation is not a monolithic whole. Neither is it entirely idiosyncratic: There is not a completely unique experience attached to each instance of implementation" (p. 199).

Michael Hill and Peter Hupe wrote *Implementing Public Policy* a book on the development of implementation studies, in 2002. The book contains a review of implementation literature that was "welcomed by academics and their students" (Colebatch 2005), and linked implementation to governance. The authors state that "implementation inevitably takes different shapes and forms in different cultures and institutional settings" and that this point "is particularly important in an era in which processes of 'government' have been seen as transformed into 'governance.' The latter means that a wider range of actors may be participating and that simplistic hierarchical models are being abandoned" (p. 1). This book further ushered in the third generation of research.

This third generation of research also started a debate around the question of the state of implementation research. Many contemporary authors have suggested a decline in research to a point of needed revitalization (Barrett 2004, Lester and Coggin 1998, Schofield and Sausman 2004). In 2005, Harald Satren researched this topic in-depth with his paper titled, *Facts and Myths about Research on*

*Public Policy Implementation: Out-of-Fashion, Allegedly Dead, But Very Much Alive and Relevant.*

Satren found that the implementation research had not died, but merely shifted from core journals (political science, public administration, and public policy) to non-core journals in law, economics, and the environment (p. 564). This decline of core journal articles he explained by six factors: 1) the top-down versus bottom-up debates of the 1980s which frustrated scholars; 2) the change of state-society relationships from unilateral and hierarchical to more reciprocal and less hierarchical ones; 3) the lack of political backing due to pronounced failure bias in studies; 4) scholars' doubts about the extent that the policy process could be neatly segmented into stages for study due to its nature; 5) the ease of writing something that gets published earlier in a new research genre than later when being new and original is much harder; and 6) implementation falling from fashion and no longer holding policy scholars' attention (p. 572,573). He stated, "Considering the phenomenal growth in the research literature . . . , the need for knowledge accumulation should be that much more pressing" (p. 574), that the "time was overdue with respect to initiating efforts toward synthesizing the policy implementation literature" (p.575).

Today, scholars across the world continue to review and study program implementation through the eyes of third-generation researchers. Articles continue to be published in a vast array of journals relating to program and policy implementation in all areas of societies. Articles look at interagency and intergroup cooperation (Lundin 2007), the role of public managers (Hicklin and Godwin 2009), and governance and public policy better complementing each other (Robichau and Lynn 2009), to name a few new areas. These studies are no longer just North American and European in nature. Today, Japan and most significantly China, have surged forward in implementation research, followed most recently by the worlds' emerging economies (countries) of central Asia, Africa, and South America.

**EPA Governmental Entity Initiatives**

From August 1997 through December 2004, the EPA sponsored three EMS Initiatives for Governmental Entities. The EPA, in conjunction with the Global Environment and Technology Foundation (GETF), provided training and technical assistance to 32 municipal entities throughout the U.S. (see Appendix B). GETF published final reports for each initiative.

*First Initiative*

From August 1997 through July 1999, the EPA sponsored an EMS pilot program to assess the applicability, compatibility, and benefits of an EMS in municipal entities. The initiative was to focus on "environmental performance, compliance, pollution prevention and stakeholder involvement in local government operations" (GETF, 2000). Nine entities participated in the first program (see appendix B) across a wide array of governmental programs and functions (wastewater treatment plants, parks and recreation, administration facilities, prisons, water resources, etc.). Data and information collected from this first initiative "suggested that EMSs are entirely applicable to operations managed by local governments. Without exception, each of the nine participants found the EMS to be a useful tool for managing environmental issues, promoting compliance and pollution prevention approaches, increasing environmental awareness and stewardship, and improving operational efficiency and control throughout the organization" (GETF 2002). The success of this pilot program led the EPA to continue with the initiatives.

*Second Initiative*

From April 2000 through March 2002, the EPA sponsored the first follow-on to the pilot program. There were 14 governmental entities participating in the second initiative (see Appendix B). Again, a wide variety of governmental facilities and organizations participated (transportation, water and wastewater, solid waste, recycling, etc.). The second initiative also proved to be highly successful. GETF noted in their third report, issued in April, 2005, that:

> "The positive results for the first two EMS Initiatives for Local Governments generated Federal and local government support for the 3rd EMS Initiative for Public Entities project, which commenced in January 2003. Supported by the U.S. EPA's Office of Water, the Third Initiative leveraged the wealth of information and tools resulting from the first two pilot projects and looked to further test the applicability of EMS within a wide-range of sectors."

*Third Initiative*

From January 2003 through December 2004, the EPA sponsored the final EMS Initiatives for Local Governments. There were nine governmental entities participating in the third initiative (see Appendix B). A final workshop was held in Washington, D.C. in April 2005. Jim Connaughton, Chairman of the White House Council on Environmental Quality, discussed the "need to continue the promotion and adoption of EMS in the local government sector" (EPA 2005). Mr. Connaughton explained, "We had 32 public entities implementing EMSs with the

pilot projects. We should make it 1000! Take the experience and replicate it. See what works and what does not – then copy the positive and apply it to your local needs" (EPA 2005)." This was the final EMS Governmental Initiative sponsored by the EPA.

**Analytic Hierarchy Process**

The Analytic Hierarchy Process (AHP) is an approach to decision making developed by Thomas L. Saaty in the 1970s. Based on mathematics and psychology, its foundation is a set of axioms that delimit the scope of the problem environment (Saaty 1986).

> "It is designed to cope with both the rational and the intuitive to select the best from a number of alternatives evaluated with respect to several criteria. In this process, the decision maker carries out simple pairwise comparison judgments which are then used to develop overall priorities for ranking the alternatives (Saaty and Vargas 1994, 1)."

AHP has been used across a wide variety of applications by varying entities, from government agencies to businesses large and small, from the military to healthcare to university settings, all seeking a way to make decisions in a complex world. Broad areas where AHP has been employed include: selection of one alternative from many; resource allocation; forecasting; total quality management; business process re-engineering; quality function deployment; and the balanced scorecard (Forman and Glass 2001). AHP has three primary functions, structuring complexity, measurement and synthesis.

Structuring Complexity

Saaty found that "the simplest form used to structure a decision problem is a hierarchy consisting of three levels: the goal of the decision at the top level, followed by a second level consisting of the criteria by which the alternatives , located in the third level, will be evaluated (Saaty and Vargas 1994,1)." He found this hierarchical decomposition was a basic device the human mind used to cope with diversity. This structuring allows a complex problem to be deconstructed into interacting parts that can be dealt with in a very simple format.

Measurement Scales

Nominal – invariant under one-to-one correspondence (people in bakery line, male/female).

Ordinal –invariant under monotone transformations where things are ordered by number, but the magnitudes of the numbers only serve to designate order, increasing or decreasing (race results).

Interval - invariant under a positive linear transformation (temperature).

Ratio – invariant under a similarity transformation (proportion-time)

Absolute – invariant under the identity transformation (X=X, number of people in a room). Saaty identified absolute scale as the fundamental scale for AHP used to "answer the basic question in all pairwise comparison: how many times more dominant is one element than the other with respect to a certain criterion or attributes? "(Saaty 2009, 10)

Synthesis

Analysis is defined as: separation of a whole into its component parts (Merriam-Webster's 2003). It is used to determine either their nature (qualitative analysis) or their proportions (quantitative analysis). The process of AHP starts with analysis as we break our complex issue down into workable parts. Then we must work with these parts to recombine them into a cogent answer. This process is known as synthesis. Synthesis is defined as the composition or combination of parts or elements so as to form a whole (Merriam-Webster's, 2003). Forman and Glass stated, "Complex decisions or forecasts or resource allocations often involve too many elements for humans to synthesize intuitively. Needed is a way to synthesize over many dimensions" (Forman and Glass 2001, 471)." And that way is through the use of AHP.

Three Related Principles of AHP

Saaty defined three related principals of AHP as decomposition, comparative judgments, and hierarchic composition or synthesis of priorities (Saaty 1994b). Decomposition is the breaking down of a complex problem into a hierarchy of clusters, sub-clusters, sub-sub clusters, etc. Comparative judgments are applied to the construct of pairwise comparisons of all elements in a cluster with respect to the parent cluster. These comparisons are used to derive priorities with respect to parent clusters. Hierarchic composition or synthesis "is applied to multiply the local priorities of the elements of a cluster by the 'global' priority of the parent element, producing global priorities throughout the hierarchy and then adding the global priorities for the lowest level elements (usually the alternatives)" (Forman and Glass 2001).

Axioms

AHP is based on three relatively simple axioms (with one added later); as with all theories the simpler and fewer axioms, the more general and applicable the theory (Forman and Glass 2001).

1. Reciprocal axiom - $P_c(E_A,E_B)$ - a paired comparison of elements A and B with respect to their parent C, representing how many times more the element A possesses a property than does element B, then $P_c(E_B, E_A) = 1/ P_c(E_A,E_B)$. For example, if A is 5 times larger than B, then B is one-fifth as large as A.
2. Homogeneity axiom – elements being compared should not differ by too much (no more than one order).
3. Judgment axiom- judgments or priorities of the elements in a hierarchy do not depend on lower-level elements.
4. This was added later by Saaty – individuals who have reason for their beliefs should make sure that their ideas are adequately represented for the outcome to match these expectations (the generality of an AHP makes it possible to apply AHP in a variety of ways, and adherence to this axiom prevents applying AHP in inappropriate ways).

Public Policy

Forman and Glass stated,

> "Public Policy decisions are complicated not only because they involve competing objectives, but also because they impact multiple economic sectors and sometimes overlapping jurisdictions. Communications of competing constituencies' objectives (and their relative importance) is necessary in developing policies that are acceptable to more than one constituency. Traditional dialogs tend to focus on alternative, rather than objectives. The structure provided by AHP allows competing constituencies to better understand each other and to develop "win-win" solutions (2001, 475)."

Preference Reversal and Consistency Index

In pairwise comparisons, if you say, "I like A more than B", "I like B more than C", and, "I like C more than A", you would be inconsistent in your pairwise judgments. This is known as preference reversal. If this occurs, the decision maker must change their comparisons to get rid of the preference reversal.

In AHP, there needs to be a consistency in the pairwise comparisons. Saaty concluded that "it would be pointless to try to discern any priority ranking from a set of random judgments (Saaty 2009, 29)." Therefore one should not proceed

“unless the consistency index of a pairwise comparison matrix is very much smaller than the corresponding random index value (Saaty 2009, 30).” If this consistency ratio (C.R.) is larger than desired you can do these three things:

1. Find the most inconsistent judgment in the matrix,
2. Determine the range of values to which the judgment can be changed corresponding to which the inconsistency would be improved,
3. Ask the decision maker to consider, if they can, changing his or her judgment to a plausible range. If they are unwilling, try with their second most inconsistent judgment and so on (Saaty 2009, 30)

Saaty states in his book *Decision Making* that if the C.R. “is not less than 0.10, study the problem and revise the judgment . . . An inconsistency of 10 percent or less implies that the adjustment is small compared to the actual values of the eigenvector entries” (p. 9).

AHPs are used throughout the world to help make complex decisions. A variety of software (MakeitRational, Expert Choice) and freeware has become available to make AHP decisions more accessible to people outside of the statistical field. A quick document search will reveal thousands of articles and hundreds of doctoral dissertations worldwide that have used AHP.

# CHAPTER III

# METHODOLOGY

Chapter III is designed to summarize the qualitative and quantitative methods used for this project. Methodologies include both techniques for data collection and data analysis. Figure 1 presents the methodology flow chart for this study.

Data collection was performed using interviews and surveys that employ the Analytic Hierarchy Process (AHP), Concept Mapping, acceptability scales, and opened-ended questions.

Statistical analysis of data was performed using methods contained within SPSS, Microsoft Excel, and SAS. Qualitative analysis was used for the interpretation of text data.

## Data Collection

### *Target Population*

All Oklahoma communities with populations greater than 20,000 (see Appendix A).

### *Review Population*

32 communities that have participated in the EPA program for ISO 14001 EMS adoption – representing a range of populations, geographic locations, and economic base (see Appendix B), the cities of Tulsa and Sapulpa, Oklahoma, and the city of Dallas, Texas.

### *Interview Population*

Municipal managers such as city managers, council members, public utility directors, public works directors, sustainable directors, environmental managers,

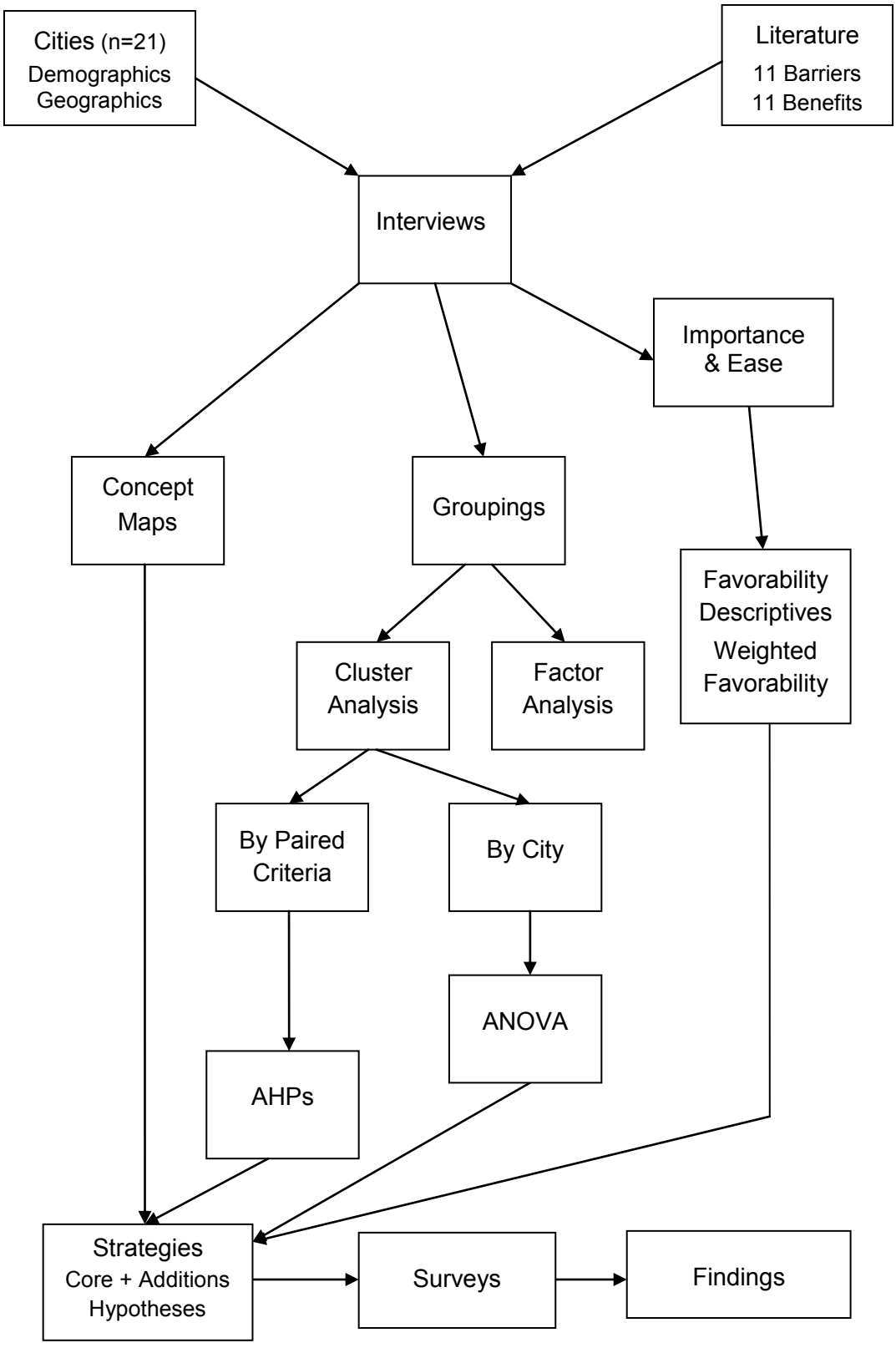


**Figure 1. METHODS FLOW CHART**

or selected department heads in cities in Oklahoma with a population greater than 20,000 will be interviewed (n=21 cities).

*AHP Survey Population*

21 Municipal managers previously interviewed.

*Strategy Testing Population*

21 Municipal managers previously interviewed while developing the strategies.

**Methodologies**

***Literature Review***

The three EPA pilot program reports were downloaded from the PEER Center. PEER stands for Public Entity EMS Resource Center and provides a broad array of information and tools to help public entities sustainably manage their organizations using a proven Plan-Do-Check-Act framework embodied in environmental management systems and similar approaches**.** The PEER Center is a collaboration between the Office of Water at U.S. EPA and the GEFT (PEER Center Website 1/5/2012).

Frank Camp, from the Office of Environmental Quality, Dallas, Texas, was used as a resource for EMS program implementation. He was an employee when the city adopted an EMS in eleven of their departments. This makes Dallas the only city in the U.S. with a comprehensive certified EMS. The city of Tulsa's Sustainable Director (Brett Fidler) and the Sapulpa Assistant Town Manager (David Gilliland) were also used as resources for general program implementation information.

Following the methodology flow chart in Figure 1, a seven step research process was designed.

***7 Step Research Design***

The research was completed using the following seven steps:

1. Education of municipal managers on EMS and two approaches (full and phased) to its implementation.

2. Discussion of EMS benefits of and barriers to EMS implementation in their cities and rating of their importance and ease of implementation.

3. Grouping of barriers and benefits based on similarity of importance and implementation ease.
4. Development of concept maps that provide insight into how EMS implementation can be accomplished.
5. Elicitation preferences for EMS implementation approaches (phased, full, none) based on benefit/barrier groups using AHP.
6. Development of strategies for implementation based on results above and validation of strategies with selected cities.
7. Testing the acceptability of these strategies through a survey of municipal managers.

*Step 1 EMS Education and Opportunities*

Interviews were conducted with 21 municipal managers from cities in Oklahoma with a population of greater than 20,000 (see appendix A). The interview tools consisted of an introduction, a demographic section, an ISO 14000 EMS education section, and a rating sheet (see Appendix I). The ISO 14000 education section discussed the two EMS implementation strategies – ISO 14001 (full implementation) and ISO 14005 (phased implementation). Benefits and Barriers to EMS implementation were also discussed as part of this education section.

*Step 2 Discussions and Rating of EMS Benefits and Barriers*

Based on the review of relevant literature, a list of 11 benefits and a list of 11 barriers to EMS implementation were developed. Each was discussed in detail with the city managers. Once this review was complete, the managers rated both the relative importance and relative ease of implementation of barriers and benefits to their cities using a rating sheet (importance was rated high, medium, or low, and ease was rated easy, medium, or hard ) and their reasoning for their selections were noted (see Appendix I).

From the rating sheet, a series of cards was developed. The size of cards indicated relative importance of each benefit and barrier to EMS implementation with the large cards being high importance, medium cards being medium importance, and small cards being low importance (see Concept Maps in Appendix E).

Next, colored dots were placed on cards to indicate how easy or hard it would be to take advantage of benefits or to overcome the barriers. Green dots

represented easy to implement, yellow dots represented medium to implement, and red dots represented hard to implement. (see Concept Maps in Appendix E).

At the finish of step 2, there were 11 benefits and 11 barriers on cards with their relative importance to implementation and relative ease of implementation denoted.

*Step 3 Grouping of Benefits and Barriers*

Now, the managers placed benefits into piles based on perceived similarities in relationship to implementing an EMS (how the managers thought they were related). Then they placed the barriers into piles based on their perceived similarities in relationship to implementing an EMS. These groups were used in developing the AHP hierarchy.

*Step 4 Concept Mapping*

In Step 4, concept maps (using influence diagramming) were used to reveal how respondents conceptualize the relationships between benefits and barriers in their cities, the interpretation of which provides insight into how implementation could be accomplished (see Appendix E).

The managers arranged the 11 benefit and 11 barrier cards in such a manner as to represent their overall conception of EMS implementation in their cities. There was no correct answer for this mapping. Each map was unique to the person and city.

Then the managers explained how they would take advantage of benefits and overcome barriers (referring to the concept map) in order to successfully implement an EMS (basically, telling how and why they developed their concept map).

*Step 5 EMS Implementation Preferences*

AHP = Analytic Hierarchy Process (Saaty) was used to analyze rationales for choices.

> It is a “basic approach to decision making. It is designed to cope with both the rational and the intuitive to select the best from a number of alternatives evaluated with respect to several criteria. In this process, the decision maker carries out simple pairwise comparison judgments which are then used to develop overall priorities for ranking alternatives (Saaty and Vargas, 1994, p. 1).”

To develop the AHP, the data were cluster-analyzed (using Ward's algorithm of agglomerative clustering- SPSS) to identify groups of paired barriers and paired benefits. The paired benefits and barriers were also factor-analyzed using SPSS. The clusters were used to inform the development of the AHP criteria.

Next, a hierarchy was created using benefit and barrier clusters data as decision criteria. The AHP goal (focus) was EMS implementation approach preference, and the alternatives (choices) were full, phased, and no-implementation. Criteria and subcriteria are related to the goal, and alternatives are selected. Figure 2 shows a four-level hierarchy.

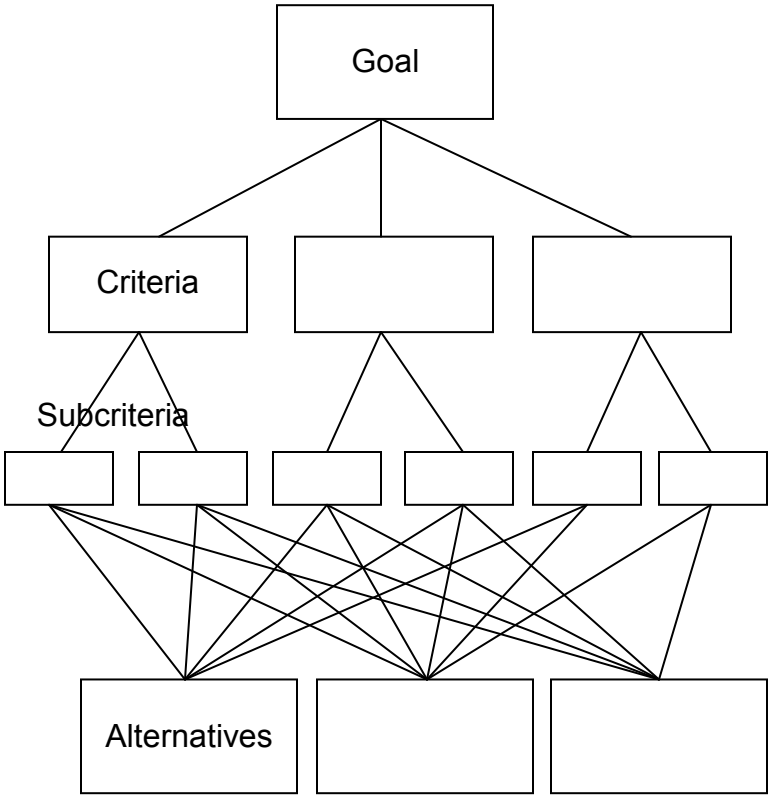


**Figure 2. AHP Framework**

The AHP was completed online by the managers. They performed pairwise comparisons of the decision criteria (derived from clusters) and implementation choices using MakeitRational © software. This software allowed for remote data collection and data analysis.

The software has correction features to prevent preference reversals and ensure a consistency ratio (C.R.) of less than 0.10.[1] It is important for the C.R. to be less than 0.10

> "Since it would be pointless to try and discern any priority ranking from a set of random comparison judgments, we should probably be comfortable about proceeding unless the consistency index of a pairwise comparison matrix is very much smaller than the corresponding random index value" (Saaty 2009, 30).

*Step 6 Strategy Developments and Validation*

The AHP results were interpreted using MakeitRational© software to identify both implementation approach preferences and reason for these preferences.

Using all the previous results (concept map(s), benefits and barriers, favorability, cluster analysis, and AHPs), strategies to encourage EMS implementation were developed. A core strategy (good for all cities) and nine additional strategies (good for individual cities) were placed into a questionnaire.

When the strategies to encourage EMS were developed, they were validated by at least one large and one small city and then revised as necessary. This was done in person and by phone.

*Step 7 Acceptability Test*

Interviews of city managers in all 21 cities (via telephone or in-person) were conducted to determine the acceptability of the proposed strategies for EMS implementation. Questionnaires were sent by e-mail, and acceptability was measured using a high (most preferred), low (least preferred), medium scale with an elicitation of short explanations of these judgments. The responses were developed into finalized recommendations for EMS implementation in cities.

**City Interviews**

21 municipal managers were interviewed in their offices over a two-week period. Interviews averaged about two hours in length and were normally conducted during business hours. Three of the interviews were conducted with multiple people present although only one person was selected as the manager of record.

[1] The consistency ratio (C.R.) is obtained by comparing the consistency index (C.I.) (C.I. = $(\lambda \max - n)/(n-1)$ with the appropriate number from a set of numbers from an average random consistency index derived from a sample of randomly generated reciprocal matrices. $\lambda\ max$ is the largest or principal eigenvalue. (Saaty and Vargas 1994).

Data were collected using demographic sheets, benefit and barrier sheets, and concept map pictures (see Appendix I for interview documents). The concept map pictures were later converted to Word documents (see Appendix G). Notes were taken during the interviews about the concept maps and to gather relevant city information.

### *Demographic*

Managers were asked to answer the following seven questions:

1. Current position
2. Former position
3. How long they have worked in the present position
4. How long they have worked in their present occupation
5. Higher education background
6. Factors of professional success
7. City size

### *Demographic Data Analysis*

Municipal managers were interviewed from the following city areas:

- Environmental or environmental-related – 9 managers
- Public works – 6 managers
- Sustainability – 2 managers
- Others – 4 managers
    - These included Community Development, General Services, Special Programs, and City Engineering

Many of the managers held multiple titles and jobs. A few had served on city council, and two were Assistant City Managers. Most of the managers were long-time city employees that had worked their way up through the city to their present jobs.

They were asked to rate factors of professional success in their cities as high, medium, or low. The following eight factors were rated by each manager:

1. Political support
2. Citizen support
3. Legal liabilities
4. Environmental considerations
5. Budgetary considerations
6. Intergovernmental relations

7. Economic development
8. Social justice

These data were used to help gain insight into how the managers answered questions and constructed their concept maps and what they felt was important in their respective cities.

***Geographic***

The 21 cities were placed in the following three categories:

- East or Central
    - Cities in proximity to I-35 (within 30 miles east) and to the west were designated as central.
        - East – 8 cities
        - Central – 13 cities
- Urban or Rural
    - Cities within 30 miles of a major metropolitan area were designated as urban.
        - Urban – 13 cities
        - Rural – 8 cities
- Large or Small
    - Cities near or over a population of 80,000 were designated as large.
        - Large – 6 cities
        - Small – 15 cities

The cities were assigned these geographic identifiers to help further differentiate the data.

***Relevant Information***

Notes were taken on general information about each city. Items such as water supply, waste treatment, solid waste disposal, recycling, age of infrastructure, relations with other cities (water, sewer, electric), employees, and city councils were considered. These data were used in concept map explanation and as general knowledge about city operations.

## Relative Importance and Ease of Implementation

### *Relative Importance to Implementation*

Managers were asked to rate the relative importance to EMS implementation in their city of 11 benefits and 11 barriers. These were rated as high, medium, or low. They were directed to select only three as high and three as low, with the rest being medium. This forced distribution was used to preclude anyone rating all as high, medium, or low and to get a more representative answer.

They were also asked if any one of their selected high importance benefits or barriers was more important than the other highs and conversely, if any one of the low importance was lower than the other lows. If they said yes, they placed an asterisk on the respective sheet by that benefit or barrier (the H or L). Not all of the managers thought one was more important or less important. About 70% of the managers placed one or more asterisks on their sheets.

### *Benefit and Barrier Relative Importance*

Data tables for benefits and barriers relative importance, relative ease of implementation, and favorability are contained in Appendix D.

*Benefit Data*

Managers rated the relative importance to EMS implementation in their city of 11 benefits. These ratings of high, medium, and low were assigned numbers for data analysis (high = 3, medium = 2, low =1).

Barrier Data

Managers rated the relative importance to EMS implementation in their city of 11 barriers. These ratings of high, medium, and low were assigned numbers for data analysis (high = 1, medium = 2, low =3).

### *Relative Ease of Implementation*

Managers were asked to rate the 11 benefits and 11 barriers to their relative ease of implementation in their city. These were rated as easy, medium, or hard. They were directed to select only 3 as easy and 3 as hard with the rest being medium. This forced distribution was used to preclude anyone rating all as easy, medium, or hard and to get a representative answer.

They were also asked if any one of their hard implementation benefits or barriers was harder than the other and conversely, if any one of the easy implementation benefits or barriers was easier than the others. If they said yes, they placed an

asterisk by that benefit or barrier (H or E). Not all of the managers thought one was harder or one was easier to implement. About 70% of the managers placed one or more asterisks on the sheets.

***Benefit and Barrier Relative Ease of Implementation***

Managers were asked to rate the 11 benefits and 11 barriers as to their relative ease of implementation in their city. These ratings of easy, medium, or hard were assigned numbers for data analysis (easy = 3, medium = 2, hard =1).

**Benefit and Barrier Favorability**

*Benefit Favorability*

The relative importance and relative ease were added together. They were assumed to be dependent upon each other, so they were added (if they were independent, they would be multiplied). Table 5 relates importance and ease to the benefit favorability ratings.

**Table 5. BENEFIT FAVORABILITY**

| IMPORTANCE | EASE | TOTAL | FAVORABILITY |
|---|---|---|---|
| High = 3 | Easy = 3 | 6 | MOST BENEFICIAL |
| High = 3 | Medium = 2 | 5 | DESCENDING FAVORABILITY |
| Medium = 2 | Easy = 3 | 5 | |
| Medium = 2 | Medium = 2 | 4 | |
| High = 3 | Hard = 1 | 4 | |
| Low = 1 | High = 3 | 4 | |
| Medium = 2 | Hard = 1 | 3 | |
| Low = 1 | Medium =2 | 3 | |
| Low = 1 | Hard =1 | 2 | LEAST BENEFICIAL |

The higher the total scores, the more beneficial the benefit, and the lower the total scores, the least beneficial the benefit (data tables Appendix D).

*Medians and Means*

The medians and means were calculated for relative importance, relative ease, and favorability for each of the 11 benefits. Means are not normally used for

ordinal data but were used in this study to try and further differentiate the data. Table 6 reports the medians and Table 7 reports the means.

**Table 6. BENEFIT MEDIANS**

| | REDCOST | ENVR EFF | COMPLIA | REGULAT | COMMS+ | BOND | INSUR | OPERAT | LABMAN | SUCCESS | RISK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| IMPORTANCE | 3 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 2 |
| EASE | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| FAVORABILITY | 4 | 4 | 5 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 |

Reduced cost had the highest relative importance median and the lowest relative ease median of all the barriers. The managers see this as the benefit that is most important but hardest to gain. The benefit with the most favorable median is improved environmental performance (compliance).

**Table 7. BENEFIT MEANS**

| | REDCOST | EEFFIC | COMPLIA | REGULAT | COMMS+ | BOND | INSUR | OPERAT | LABMAN | SUCCESS | RISK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| IMPORTANCE | 2.52 | 1.86 | 2.33 | 1.90 | 2.19 | 1.43 | 1.81 | 2.19 | 1.71 | 1.86 | 2.19 |
| EASE | 1.76 | 1.76 | 2.29 | 2.24 | 1.86 | 1.86 | 1.95 | 2.10 | 2.00 | 1.95 | 2.24 |
| FAVORABILITY | 4.38 | 3.52 | 4.52 | 4.24 | 4.05 | 3.29 | 3.76 | 4.29 | 3.81 | 3.81 | 4.33 |

Means matched the median results with the improved environmental performance being the benefit with the highest favorability mean.

***Barrier Favorability***

The relative importance and relative ease were added together. They were assumed to be dependent upon each other, so they were added (if they were independent, they would be multiplied). Table 8 relates importance and ease to barrier favorability.

**Table 8. BARRIER FAVORABILITY**

| IMPORTANCE | EASE | TOTAL | FAVORABILITY |
|---|---|---|---|
| Low = 3 | Easy = 3 | 6 | EASIEST TO OVERCOME |
| Low = 3 | Medium = 2 | 5 | DESCENDING FAVORABILITY |
| Medium = 2 | Easy = 3 | 5 | |
| Medium = 2 | Medium = 2 | 4 | |
| Low = 3 | Hard = 1 | 4 | |
| High = 1 | High = 3 | 4 | |
| Medium = 2 | Hard = 1 | 3 | |
| High = 1 | Medium =2 | 3 | |
| High = 1 | Hard =1 | 2 | HARDEST TO OVERCOME |

The higher the total scores, the easier the barrier is to overcome, and the lower the total scores, the harder the barrier is to overcome (data tables Appendix D).

*Medians and Means*

The medians and means were calculated for relative importance, relative ease, and favorability for each of the 11 barriers. Means are not normally used for ordinal data but were used in this study to try and further differentiate the data. Table 9 reports the medians and Table 10 reports the means.

**Table 9. BARRIER MEDIANS**

| | TOPMAN | RESOUR | BUY-IN | PUBLIC | POLITIC | IMPTEAM | TRAINING | PRODESG | INCREMT | COMMS- | OUTSIDE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| IMPORTANCE | 1 | 1 | 2 | 3 | 1 | 2 | 2 | 2 | 3 | 2 | 2 |
| EASE | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| FAVORABILITY | 3 | 2 | 4 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |

Top management involvement, dedicated resources, and political support had the highest relative importance (importance was reverse-coded (high =1, medium = 2, and low =3)). Dedicated resources were rated as being the barrier that was hardest to overcome. Dedicated resources was also seen as the least favorable barrier with public support as the most favorable.

**Table 10. BARRIER MEANS**

| | TOPMAN | RESOUR | BUY-IN | PUBLIC | POLITIC | IMPTEAM | TRAINING | PRODESG | INCREMT | COMMS- | OUTSIDE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| IMPORTANCE | 1.24 | 1.62 | 2.14 | 2.67 | 1.62 | 1.90 | 2.00 | 2.10 | 2.52 | 1.95 | 2.24 |
| EASE | 1.95 | 1.33 | 2.14 | 2.33 | 1.95 | 1.90 | 2.33 | 2.10 | 1.86 | 1.95 | 2.14 |
| FAVORABILITY | 3.19 | 2.95 | 4.29 | 5.00 | 3.57 | 3.81 | 4.33 | 4.19 | 4.38 | 3.90 | 4.38 |

Means matched the results with the exception that the dedicated implementation team was not seen as the hardest barrier to overcome. In means public awareness, incremental implementation and outside guidance and support were seen as easier to overcome.

## Favorability Weighting

### *Squaring of Data for Favorability*

Once the favorability data were reviewed, a question needed to be answered: Which cities would rate the best for EMS implementation using favorability scores? The totals of importance and ease (called favorability) were first assessed. Due to the forced distribution of the importance and ease, the totals were all the same (44).

Data weighting was used to overcome the forced distribution problem. The data were weighted to give those criteria with a total of 6 (selected as high importance (3) and low ease of implementation (3)), as being the most desired and those criteria with a total of 2 (selected as low importance (1) and hard ease of implementation (1)), as being the least desired.

First, the raw values were squared. Table 11 presents the totals.

**Table 11. RAW FAVORABILITY DATA SQUARES**

| TOTAL | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| SQUARE | 4 | 9 | 16 | 25 | 36 |

The squaring of the raw data didn't give enough emphasis to 6s over the 5s and no emphasis to the 2s; therefore, it did not achieve the desired results.

Next, the data were recoded to plus and minus and squared. Table 12 presents these recoded and squared values.

**Table 12. FAVORABILITY RAW DATA RECODED (+ AND -)**

| TOTAL | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| PLUS AND MINUS | - - | - | 0 | - | + + |
| NEW VALUE | -2 | -1 | 0 | +1 | +2 |
| SQUARE (KEEPING SIGN) | -4 | -1 | 0 | 1 | 4 |

Data signs were kept with the squared data to give proper emphasis to the desirability (+ are desirable and – are undesirable). Now the data set was in a format that made the criteria that were seen by the cities as most favorable (6) as having the highest priority and the data that were seen as having the lowest favorability (2) as having the lowest priority. Data values that ranked as a 3 or 5 (having somewhat less of a priority) were now a + 1or – 1. Data that ranked as a 4 (medium priority) were now a 0.

The new range of the recoded data were from -6 to +6. Both the benefits and barriers favorability was recoded, squared, and then added across benefits and barriers. These data were then sorted from high to low. The results are reported in Table 13.

Using weighted favorability data, the following cities rated highest for EMS implementation (+4): EMS02, EMS 20, and EMS21. EMS06 and EMS10 also had positive scores (+2) and would also be considered candidates for implementation. Nine cities had a negative score with EMS12 (-4) and EMS04 (-6) being the worst candidates for implementation.

These data will be used in strategy development and will be taken into consideration when purposing likely candidates for a possible EMS implementation pilot project.

**Table 13. FAVORABILITY BY CITY (WEIGHTED DATA)**

| CITY | BENEFITS | BARRIERS | TOTAL |
|---|---|---|---|
| EMS02 | 4 | 0 | 4 |
| EMS20 | 2 | 2 | 4 |
| EMS21 | 0 | 4 | 4 |
| EMS06 | -4 | 6 | 2 |
| EMS10 | 4 | -2 | 2 |
| EMS01 | 2 | -2 | 0 |
| EMS03 | 2 | -2 | 0 |
| EMS09 | 0 | 0 | 0 |
| EMS11 | 0 | 0 | 0 |
| EMS14 | 2 | -2 | 0 |
| EMS16 | -2 | 2 | 0 |
| EMS17 | 0 | 0 | 0 |
| EMS05 | 0 | -2 | -2 |
| EMS07 | 0 | -2 | -2 |
| EMS08 | -2 | 0 | -2 |
| EMS13 | -2 | 0 | -2 |
| EMS15 | -2 | 0 | -2 |
| EMS18 | 0 | -2 | -2 |
| EMS19 | 0 | -2 | -2 |
| EMS12 | 0 | -4 | -4 |
| EMS04 | -2 | -4 | -6 |

## Groupings

### Sort Piles (Grouping)

While the managers were filling in the benefit and barrier sheets, cards were developed reflecting the relative importance and relative ease for each benefit and barrier. Those criteria that were selected as high were placed on large cards

(5”X8”), medium on medium cards (4”x6”), and low on small cards (3”x5”). These cards were color-coded with green printing for benefits and red printing for barriers. Next, dots were placed on the cards reflecting the relative ease of implementation. A green dot denoted easy, a yellow dot denoted medium, and a red dot denoted hard.

The managers were then asked to stack the 11 benefit cards into piles that they felt had a relationship between the cards. They could have as many or as few piles as they liked. Once the benefits were stacked into piles, the managers named and explained their sort piles. The names were recorded on the benefit sheet for each stack along with which cards were in each stack. The process was repeated for the barriers. The number of piles ranged from 2 to 5 with 3 being the most common.

### *Cluster Analysis by Benefits and Barriers*[2]

*Benefits*

Managers sorted the 11 benefits into piles that they felt were related. The number of piles ranged from two to five. The piles totals were as follows:

- 2 piles 2 10% of cities
- 3 piles 9 42% of cities
- 4 piles 8 38% of cities
- 5 piles 2 10% of cities

*Benefit Pairs*

Normally, cluster analysis would be done on the piles (stacks) but could not be done due to the variability of number of stacks (2, 3, 4, or 5). To alleviate this variability of stack problem, cluster analysis was done on how the benefits were paired together in each stack. Using the formula for possible combinations, the number of benefit pairs was calculated.

*Formula for Number of Pairs*

The following equation was used for possible combinations:

[2] Factor analysis was performed across the benefit and barrier pairs as well as across cities (the same as was done in cluster analysis) using SPSS. The factor analysis supported some of the cluster analyses but produced little new information. Therefore, these results were not included in the study.

$$C = \frac{n!}{(n-r)!\,r!}$$

Where:

n= 11 (benefits or barriers)

r= 2 (a pair of benefits or barriers)

$$C = \frac{11!}{(11-2)!\,2!}$$

$$C = 55$$

There are 55 possible combinations of benefit pairs and 55 possible combinations of barrier pairs.

The benefit stack data was recoded to 1s if the pair existed in the stack and 0s if the pair did not exist in the stack across the 55 benefit pairs for each city.

Ward's Method

The 55 benefit pairs were cluster-analyzed using Ward's method. The paired benefits clustered into 3 areas (see cluster data Appendix F). The cluster data are as follows:

- Set I Operations
- Set II Environmental Operations
- Set III Cost Savings and Better Relationships

These data informed the development of the benefit AHP.

*Barriers*

Managers sorted the 11 barriers into piles that they felt were related. The number of piles ranged from two to five. The piles totals were as follows:

- 2 piles 5 23% of cities
- 3 piles 11 52% of cities
- 4 piles 4 20% of cities
- 5 piles 1 05% of cities

*Barrier Pairs*

The barrier stack data were recoded to 1s if the pair existed in the stack and 0s if the pair did not exist in the stack across the 55 barrier pairs for each city.

Ward's Method

The 55 barrier pairs were cluster-analyzed using Ward's method. The paired barriers clustered into 4 areas (see cluster data Appendix F). The cluster data are as follows:

- Set I Internal Support and Resources for Program Design and Implementation
- Set II Assistance in Program Design and Implementation
- Set III Commitment to and Resources for Program Design and Implementation
- Set IV Support

These data informed the development of the barrier AHP.

***Cluster Analysis by Cities***

In the benefits and barriers cluster analysis, the 55 pairs were clustered across the 21 cities. In city analysis, the 21 cities were clustered across the 55 pairs of benefits and barriers.

*Benefits*

Ward's method was used to cluster-analyze the 21 cities across the 55 benefit pairs. The cities clustered into 5 sets. The sets were as follows:

- Set I 10 Cities (EMS 01, 03, 05, 07, 08, 12, 14, 17, 20, 21)
- Set II 5 Cities (EMS 02, 10, 13, 15, 19)
- Set III 3 Cities (EMS 06, 16, 18)
- Set IV 2 Cities (EMS 04, 09)
- Set V 1 City (EMS 11)

These data were used in designing the strategies for EMS implementation.

*Barriers*

Ward's method was used to cluster-analyze the 21 cities across the 55 benefit pairs. The cities clustered into 4 sets. The sets were as follows:

- Set I 9 Cities (EMS 01, 02, 06, 07, 10, 12, 18, 19, 21)
- Set II 4 Cities (EMS 05, 08, 14, 20)
- Set III 3 Cities (EMS 09, 13, 16)
- Set IV 5 Cities (EMS 03,04,11,15, 17)

These data were used in designing the strategies for EMS implementation.

### *Concept Map*

The individual and composite maps are contained in Appendix E.

The managers were asked to place all 22 cards in a map representing how they thought EMS implementation could be accomplished in their city. There was no direction given to the managers on how to arrange the cards although the maps had to fit on the surface (usually a table or desk). Once the map was complete, the managers were asked to name the various areas of their map and to place themselves within the map. Notes were taken as each manager explained their map.

The 21 concept maps were used as one of the sources for developing the implementation strategies. They were also used to try and develop a comprehensive composite map for all the cities in this study.

### Analytical Hierarchy Process

Using the sort piles data, which were cluster-analyzed, an AHP was developed for the benefits and barriers (see Appendix G). The goal of the AHPs was "What is the preferred option for EMS implementation in your city?" and the alternatives were "full implementation, phased implementation, or no implementation." Criteria and subcriteria were developed using cluster analysis and benefit and barrier data.

Due to the fact that the sort piles were variable (2, 3, 4 or 5) for each city, cluster analysis could not be accomplished for the 11 benefits and the 11 barriers. The paired benefits and paired barriers (what was in the stack with each benefit or barrier) were used (please see cluster analysis section of this chapter for further explanation). This produced 55 benefit pairs and 55 barrier pairs. These pairs were cluster-analyzed using Ward's method. In SPSS 17.0 Statistical Procedures Companion, Marija Norusis (2008) defined Ward's method as:

> "For each cluster, the mean for all variables are calculated. Then, for each case, the squared Euclidean distance to the cluster means is calculated. These distances are summed for all of the cases. At each step, the two clusters that merge are those that result in the smallest increase in the overall sum of the squared within-cluster distances."

These data were used to inform the development of the criteria and subcriteria for the benefit and barrier AHPs.

These AHPs were done online by municipal managers using MakeitRational© software (see Appendix H for software format). They used pairwise selections to ultimately reach one of the three alternatives, either full implementation, phased implementation, or no implementation. The software developed the benefit option and barrier option for each city. The auto correction feature of the software prevented preference reversal and ensured a C.R (or inconsistency) of less than 0.10.

*Benefit AHP*

The three criteria and related subcriteria for the benefit AHP were as follows:

- Environmental Benefits
  - Better Relationship with Regulators
  - Environmental Efficiencies
  - Improved Environmental Performance (Compliance)
  - Risk Reduction
- Organizational Benefits
  - Better Communications
  - Easier Employee Succession
  - Improved Labor Relationship with Management
  - Operational Efficiencies and Consistency
- Economic Benefits
  - Improved Bond Rating
  - Reduced Costs
  - Reduced Insurance Premiums

*Data Analysis of Benefit AHP*

The individual results of the AHPs are contained in Appendix G. Table 14 shows the overall benefit AHP results.

**Table 14. BENEFIT AHP RESULTS**

| CRITERION | IMPLEMENTATION | | |
|---|---|---|---|
| | FULL | PHASED | NO |
| ENVIRONMENTAL BENEFITS | 4* | 6* | 0 |
| ORGANIZATIONAL BENEFITS | 0 | 2 | 1 |
| ECONOMIC BENEFITS | 4 | 5 | 0 |
| TOTAL | 8* | 13* | 1 |

* One city split evenly between full and phased

Phased implementation was favored over full implementation by 38%, and full and phased were heavily favored over the no implementation alternative.

*Barrier AHP*

The four criteria and subcriteria for the barrier AHP were as follows:

- External Support
  - Outside Guidance and Support
  - Political Support
  - Public Awareness
- Internal Commitment
  - Employee Buy-in
  - Top Management Involvement
- Internal Resources
  - Dedicated Implementation Team
  - Dedicated Resources
- Program Design and Implementation
  - Employee Training
  - Incremental Implementation
  - Communications
  - Program Design

*Data Analysis Barrier AHP*

The individual results of the AHPs are contained in Appendix G. Table 15 shows the overall barrier AHP results.

**Table 15. BARRIER AHP RESULTS**

| CRITERION | IMPLEMENTATION | | |
|---|---|---|---|
| | FULL | PHASED | NO |
| EXTERNAL SUPPORT | 0 | 0 | 0 |
| INTERNAL COMMITMENT | 7 | 5 | 0 |
| INTERNAL RESOURCES | 2 | 3 | 0 |
| PROGRAM DESIGN | 1 | 3 | 0 |
| TOTAL | 10 | 11 | 0 |

Full implementation and phased implementation were evenly split, and no cities selected the no implementation option.

***Analysis of Variance (ANOVA)***

To determine if the benefit and barrier card size and dot color (the relative importance and relative ease of implementation) had any bearing on pile (stack) selection by municipal managers, an ANOVA was run using SAS software (SAS Institute, Cay, NC).

**Pr > F**

"This is the p-value associated with the F statistic of a given source. The null hypothesis that the predictor has no effect on the outcome variable is evaluated with regard to this p-value. For a given alpha level, if the p-value is less than alpha, the null hypothesis is rejected. If not, then we fail to reject the null hypothesis" (UCLA Academic Technology Services 2012).

*Benefit ANOVA*

Three cities had a p of <0.05

EMS10 (p =0.0274)

This manager placed the most favorable benefits together in one stack. These were the only cards in this stack, which was named "base" or foundation. This manager stacked the benefits in 5 stacks.

EMS11 (p=0.0030)

This manager placed a majority of favorable benefits together in one stack. The cards were of a higher average than the other stack (4.2 versus 3.6) and was named "doing things better with less environmental impact." This manager stacked the benefits in 2 stacks.

EMS17 (p=0.0415)

This manager placed three of the most favorable cards in one stack. This stack only had three cards (it was named "goals"). The other highly favorable cards were dispersed among the other stacks. This manager stacked the benefits in 4 stacks.

*Barrier ANOVA*

Two cities had a p of <0.05

EMS09 (p=0.0070)

This manager equated the hardest barriers to overcome (least favorable) together in a stack that was named “road blocks” that they felt could not be subverted. This manager had a total of 2 stacks.

EMS19 (p=0.0028)

This manager equated the least favorable (hardest barriers to overcome) together in a stack (pile) that was called buy-in. The cards were rated 2 or 3 (with 2 being the lowest) in this stack. This manager had a total of 3 stacks.

*Conclusion*

It is possible that card size (relative importance) and dot color (relative ease of implementation) had a very small effect in which piles the managers placed their cards. It appears to be most prevalent in the cities that had 2 stacks (EMS09 in barriers and EMS11 in benefits).

Cluster analysis data were reviewed to see if this stack bias had any visible effects. Of the five cities that had a $p < 0.05$ only EMS 11 may have been affected in the benefits cluster analysis. It ended up being the only city in benefit cluster V.

**Strategies**

Upon completion of the AHPs, strategies were developed for EMS implementation. A core strategy that addressed common barriers and benefits along with alternative strategies that addressed unique barriers and benefits were developed by using inputs from all the previous sections. The municipal managers were sent the strategy surveys through e-mail (see Appendix I). Then they were either called or interviewed in person. They were asked to access the core strategy and evaluate the nine additional strategies. They could pick three of the additional strategies as high (those that the city would need), three as medium (those that the city would like to have), and three as low (those that the city didn’t need). Additionally, they were asked to answer ten follow-up questions (see appendix H).

The core strategy and nine additional strategies were developed by accessing all the data previously collected from the 21 cities. These included demographics, geographics, interviews, benefits and barriers, favorabilities, weighted favorabilities, cluster analysis (across pairs and cities), concept maps, and AHPs.

The core strategy that was developed covered the following benefits and barriers:

- Benefits
    - Improved environmental performance (compliance)
    - Reduced costs
- Barriers
    - Dedicated resources
    - Top management involvement
    - Program design
    - Employee training (city wide)

The additional nine strategies covered the following barriers and benefits:

A. Dedicated implementation team
B. Political support
C. Communications
D. Employee buy-in and training
E. Operational efficiencies and consistency
F. Risk reduction
G. Better relationships with regulators
H. Environmental efficiencies
I. Better labor relationship with management and easier employee succession.

***Core Strategy***

The two barriers and four benefits of the core strategy were derived from interviews, benefit and barrier favorability, cluster data analysis (cluster findings), AHP data (benefit, barrier, and No AHP (main drivers for the No implementation option percentage in both benefits and barriers)), and concept maps (CM). These core data were used to determine the core strategy that will go to each city (see Appendix H).

Data analysis revealed the following core benefits needed to be enhanced:

1. Improved environmental performance (compliance)
    a. Cluster findings, AHP, CM
2. Reduced costs (cost savings)
    a. AHP and No AHP, CM

The data analysis revealed the following core barriers needed to be overcome:

1. Dedicated resources
    a. Cluster findings, AHP, CM
2. Top management involvement
    a. AHP, CM
3. Employee training
    a. Cluster
4. Program design
    a. CM

*Core Benefits*

Improved environmental performance (compliance): cities want to be able to improve their compliance. Many cities in this study have or have had compliance issues, and all the cities would like to improve their environmental performance.

Reduced costs: cities are all looking to save money while improving services.

*Core Barriers*

Dedicated resources: money must be supplied to cities to implement an EMS. This money needs to be earmarked and can't be diverted to other projects.

Top management involvement: getting city managers involved is the key to implementation. Not only must they approve the program, they must be involved in its implementation and maintenance.

Employee training: supplying EMS training for the city. Train the trainer and auditors.

Program design: simplified program for city to follow that is tailored to each city and entity.

***Additional Strategies***

Nine additional strategies were revealed from data analysis. Five were barriers and four were benefits.

The four benefits revealed were:

1. Operational efficiencies and consistency
    a. CM
2. Risk reduction
    a. AHP
3. Better relationships with regulators
    a. Cluster findings

4. Environmental efficiencies
    a. Cluster findings

The five barriers were:

1. Dedicated implementation team
    a. Cluster findings, AHP, No AHP
2. Political support
    a. CM
3. Employee buy-in and training
    a. Cluster
4. Communications
    a. AHP

***Additional Benefits***

Operational efficiency and consistency: being able to improve city operations and become more consistent.

Risk reduction: reducing risk to workers and the city during operations.

Better relationships with regulators: building relationships with regulators and striving to make the city more environmentally proactive.

Environmental efficiencies: Increasing environmental efficiency for all operations.

Labor: Increasing improving labor relationships with management and making employee succession easier.

***Additional Barriers***

Dedicated implementation team: having enough qualified individuals and leadership to implement an EMS.

Political support: help providing information to the mayor, city council, businesses, and the public.

Communications: help in improving internal communications.

Employee buy-in and training: additional resources and initial training for city employees.

**Core strategy for EMS implementation**

Each city will be provided with the following:

- Dedicated funding for EMS implementation for a single entity (department or operation).
- Top managers will be provided with EMS training that will include drivers for implementation (benefit/cost, pay back, etc).
- EMS program director and other key individuals will receive in-depth EMS training and certification (as needed).
- A basic program design for your individual city and entity. This program will stress improved environmental performance and reducing costs.

**Additional strategies for EMS implementation**

In addition to the core strategy, each city selected three of the following strategies as high (those they would need), three as medium (those they would like), and three as low (those they would not need).

***Strategy A - Team***

The city will be provided with additional help in forming and operating the implementation team.

***Strategy B - Political***

The city will be provided with training tailored for the city council (and other interested parties such as businesses or the public as needed).

***Strategy C - Communications***

The city will be provided with additional help for communications within the city. Training and personnel will be available as needed.

***Strategy D - Employee***

The city will be provided with additional help in employee training and to gain employee buy-in.

***Strategy E – Operations***

The program will be designed to stress operational efficiency and consistency for all operations (this includes operations outside of environmental).

***Strategy F – Risk***

The program will be designed to specifically reduce risks for all operations and areas included in the EMS.

***Strategy G – Regulators***

The program will be designed to develop better relationships with regulators.

***Strategy H – Environmental Efficiency***

The program will be designed for environmental efficiency for all operations and areas included in the EMS.

***Strategy I – Labor***

The program will be designed for better labor relationships with management and easier employee succession.

**Additional Questions**

Municipal managers were asked to answer the following 10 additional questions related to EMS strategies and implementation:

1. Does the core meet your cities needs?
2. What does your city consider as a good payback time?
3. What is the minimum amount of resources that the city would like to implement a program? ¼? ½? ¾? Or all?
4. Which do you feel is more important, a facilitator to make things happen or person power to do things?
5. How much outside involvement in city programs is your city comfortable with? Very little? Some? Or a lot?
6. Do you feel that a central clearing house for environmental information and EMS program help would be beneficial to Oklahoma?
7. Do you think your city would like to participate in an EMS pilot program?
8. Why do you feel that your city is not environmentally proactive?
9. What kind of incentives do you feel ODEQ should offer to cities that implement an EMS?
10. What do you feel is the ideal time frame for program implementation would be? 6 months? 9 months? 1 year? 1.5 years? 2 years?

**Hypotheses**

Nine hypotheses were developed to predict how the needs that were reported by cities during the interviews would be revealed in their strategy surveys. The data were analyzed, and the following nine hypotheses were formed:

1. Strategy A – Team

    a. These cities reported a lack of staff or a lack of qualified individuals to implement a program.

    b. Cities - EMS 01, 02, 03, 04, 05, 06, 08, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20.

2. Strategy B – Political

    a. These cities felt that they needed help gaining political support for EMS implementation. This was especially true of fast- growing small cities, those cities that are not environmentally proactive, and large cities.

    b. Cities - EMS 01, 02, 04, 05, 06, 07, 08, 09, 10, 11, 12, 14, 15, 16, 17, 20, 21.

3. Strategy C-Communications

    a. These cities felt that they need help with internal communications or that they were looking at ways to become better communicators.

    b. Cities - EMS 01, 02, 03, 05, 06, 07, 08, 09, 10, 12, 15, 16, 17, 18, 19, 20, 21.

4. Strategy D- Employee

    a. These cities felt that they needed help gaining employee buy-in or doing additional training with employees.

    b. Cities - EMS 01, 03, 05, 06, 07, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21.

5. Strategy E – Operations

    a. These cities wanted to improve their operational efficiencies and consistency.

b. Cities – EMS 01, 02, 03, 04, 05, 06, 07, 08, 09, 11, 12, 13, 16, 17, 19, 20, 21.

6. Strategy F – Risk

    a. These cities wanted to reduce environmental risk.

    b. Cities - EMS 01, 02, 03, 04, 06, 08, 11, 14, 15, 16, 17, 20.

7. Strategy G - Regulators

    a. These cities wanted to improve relationships with regulators.

    b. Cities - EMS 03, 04, 06, 07, 08, 11, 15, 17, 18, 19.

8. Strategy H – Environmental efficiencies

    a. These cities wanted to become more environmentally efficient in their operations.

    b. Cities - EMS 02, 04, 05, 06, 07, 09, 10, 14, 17, 19, 20, 21.

    .

9. Strategy I – Labor

    a. These cities wanted improved labor management relations and easier employee succession.

    b. 10 Cities - EMS 06, 08, 09, 12, 13, 17, 18, 20.

Municipal managers will either select the above additional strategies as most preferred or medium preferred.

# CHAPTER IV

## FINDINGS

Chapter IV is designed to summarize the results of the qualitative and quantitative methods used for this project. Data collection was performed using interviews and surveys that employ the Analytic Hierarchy Process (AHP), Concept Mapping, acceptability scales, and opened-ended questions. Statistical analysis of data was performed using methods contained within SPSS, Microsoft Excel, and SAS. Qualitative analysis was used for the interpretation of text data.

### Demographic and Cities

The municipal managers interviewed averaged 8.3 years in their current positions and 17.4 years in their current occupations. The shortest time on the job was 0.5 years and the longest was 21 years. Most of the managers worked their way up through the city to their present positions working in related areas. For example, a common path to public works director is from water treatment or wastewater treatment where they started as an operator and ultimately became plant manager.

Their average level of education was a four-year college degree. Three had degrees in environmental fields, three in chemistry, and three in civil engineering. The rest had degrees in a variety of fields ranging from advertising to physics. Seven individuals held masters degrees. Those individuals that didn't have a degree had various state certifications such as Waste Water Operator and Water Treatment Operator.

The managers were asked to rate the factors of professional success in their city as high (3), medium (2), or low (1). Table 16 presents the means of all professional success questions.

**Table 16. PROFESSIONAL SUCCESS FACTOR MEANS**

| FACTOR | POLITICAL SUPPORT | CITIZEN SUPPORT | LEGAL LIABILITY | ENVIR CONSIDER | BUDGET CONSIDER | INTERGOV RELATIONS | ECONOMIC DEVELOP | SOCIAL JUSTICE |
|---|---|---|---|---|---|---|---|---|
| MEAN | 2.9 | 2.4 | 2.6 | 2.4 | 2.8 | 2.0 | 2.6 | 1.8 |

Managers rated political support and budgetary considerations as the two most important factors to professional success. This supports how all the managers constructed their concept maps (either being at the top or beginning of the map), and a majority rated the barrier favorability of dedicated resources and political support (as being of high importance). Social justice was the lowest of the factors. Most managers reported that there were no social justice issues in their cities.

## Interviews

### Relative Importance and Relative Ease of Implementation

Municipal managers rated the relative importance of implementation and relative ease of implementation (on a 1-3 scale), of 11 benefits and 11 barriers.

#### *Relative Importance of Implementation*

*Benefit*

Table 17 reports the median, means, and the total for the relative importance of each of the benefits across all 21 cities.

**Table 17. BENEFIT RELATIVE IMPORTANCE**

| | RED COST | ENVR EFFIC | COMPLIANCE | REGULATAT | COMMS+ | BOND | INSURANCE | OPERATION | LAB MAN | SUCCESS | RISK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MEDIAN | 3 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 2 |
| MEAN | 2.52 | 1.86 | 2.33 | 1.90 | 2.19 | 1.43 | 1.81 | 2.19 | 1.71 | 1.86 | 2.19 |
| TOTAL | 53 | 39 | 49 | 40 | 46 | 30 | 38 | 46 | 36 | 39 | 46 |

In this table, the higher the number, the greater the importance of the benefit. Reduced costs (cost savings) and improved environmental performance (compliance) had the highest relative importance. Saving money is what all cities are currently trying to do in these hard economic times. Various cities in this study have compliance issues (most are wastewater overflow issues) and would like to reduce or stop their noncompliance issues.

These benefits were followed by better communications, operational efficiencies and consistency, and risk reduction. Here are three areas of which cities place a great deal of importance and that they would like to be able to improve.

*Barrier*

Table 18 reports the median, means, and the total for the relative importance of each of the barriers across all 21 cities.

**Table 18. BARRIER RELATIVE IMPORTANCE**

| | TOP MAN | RESOURCES | BUY-IN | PUBLIC | POLITIC | IMP TEAM | TRAINING | PRO DESIGN | INCREMT | COMMS- | OUTSIDE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MEDIAN | 1 | 1 | 2 | 3 | 1 | 2 | 2 | 2 | 3 | 2 | 2 |
| MEAN | 1.24 | 1.62 | 2.14 | 2.67 | 1.62 | 1.90 | 2.00 | 2.10 | 2.52 | 1.95 | 2.24 |
| TOTAL | 26 | 34 | 45 | 56 | 34 | 40 | 42 | 44 | 53 | 41 | 47 |

For the ease of interpretation, barrier importance was coded so high importance was a 1 instead of a 3. This was done to make the barriers that were ranked as high favorability as easiest to overcome, while low favorability barriers were difficult to overcome.

In this table, the lower the number, the greater the importance of the barrier. Top management involvement was viewed by managers as the barrier of highest importance. This was an expected result given how city administrations in this study operate. Next highest in importance was dedicated resources and political support. This was also an expected result given how city administrations operate.

***Relative Ease of Implementation***

Table 19 reports the median, means, and the total for the relative ease of implementation of each of the benefits across all 21 cities.

In this table, the higher the number, the easier benefits were to implement. Improved environmental performance (compliance), better relationships with regulators, and risk reduction were viewed as benefits that would be easy to implement. Cities feel that better compliance will aid in gaining the other two benefits. Of note is that cities view reducing costs and environmental efficiencies as hard things to accomplish. Cities are always trying to reduce costs and know that it is hard to do while maintaining services and a workforce.

**Table 19. BENEFIT RELATIVE EASE**

| | RED COST | ENVR EFFIC | COMPLIANCE | REGULATOR | COMMS+ | BOND | INSURANCE | OPERATION | LAB MAN | SUCCESS | RISK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MEDIAN | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| MEAN | 1.76 | 1.76 | 2.29 | 2.24 | 1.86 | 1.86 | 1.95 | 2.10 | 2.00 | 1.95 | 2.24 |
| TOTAL | 37 | 37 | 48 | 47 | 39 | 39 | 41 | 44 | 42 | 41 | 47 |

Environmental efficiencies are seen as hard to implement because few cities have attempted anything environmentally related outside of compliance.

*Barrier*

Table 20 reports the median, means, and the total for the relative importance of each of the barriers across all 21 cities.

**Table 20. BARRIER RELATIVE EASE**

| | TOP MAN | RESOURCES | BUY-IN | PUBLIC | POLITIC | IMP TEAM | TRAINING | PRO DESIGN | INCREMT | COMMS- | OUTSIDE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MEDIAN | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| MEAN | 1.95 | 1.33 | 2.14 | 2.33 | 1.95 | 1.90 | 2.33 | 2.10 | 1.86 | 1.95 | 2.14 |
| TOTAL | 41 | 28 | 45 | 49 | 41 | 40 | 49 | 44 | 39 | 41 | 45 |

In this table, the lower the number, the harder a barrier is to overcome. Dedicated resources were seen as the barrier that was hardest to obtain. This was an expected result for most cities in these hard economic times. This was followed by incremental implementation as being the next hardest barrier. Here, managers understand the need to step-wise implementation but feel that having the manpower and extra time will make this very hard. The third hardest was having a dedicated implementation team. This again was an expected result due to the fact that smaller cities make up the bulk of the cities in this study, and they are normally short on qualified people.

*Conclusion*

Relative importance of implementation and ease of implementation data were used to produce a favorability score. This score will be used to help decide which benefits need to be enhanced for implementation and which barriers will need to be overcome for implementation.

**Favorability**

Relative importance of implementation and relative ease of implementation for the 11 benefits and 11 barriers were added together and their total was called favorability.

***Benefit***

The higher the score (6 being maximum), the more favorable the benefit was to a city. Table 21 reports the median, mean, and total of the favorability of implementation of the 11 benefits across all 21 cities.

**Table 21. BENEFIT FAVORABILITY OF IMPLEMENTATION**

| | RED COST | ENVR EFFIC | COMPLIANCE | REGULATOR | COMMS | BOND | INSURANCE | OPERATION | LAB MAN | SUCCESS | RISK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MEDIAN | 4 | 4 | 5 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 |
| MEAN | 4.38 | 3.52 | 4.52 | 4.24 | 4.05 | 3.29 | 3.76 | 4.29 | 3.81 | 3.81 | 4.33 |
| TOTAL | 92 | 74 | 95 | 89 | 85 | 69 | 79 | 90 | 80 | 80 | 91 |

Improved environmental performance (compliance, highlighted in green) had the highest favorability of the benefits. As previously noted, many cities in this study were having or have had compliance issues (most related to wastewater). But all cities feel that gaining better compliance will be a great benefit.

This was followed closely by reducing costs (saving money), risk reduction, operational efficiencies and consistency, and better relationships with regulators (highlighted in yellow). Cities viewed these benefits as interrelated. Municipal managers know that becoming more compliant will aid in better relationships with regulators while reducing risk and becoming operationally efficient and hopefully reducing insurance premiums and reducing costs.

Barrier

The higher the score (6 being highest), the easier the barrier was to overcome, while the lower the score (2 being lowest), the harder the barrier was to overcome. Table 22 reports the median, mean, and total of the favorability of implementation of the 11 barriers across all 21 cities.

**Table 22. BARRIER FAVORABILITY OF IMPLEMENTATION**

| | TOP MAN | RESOURCES | BUY-IN | PUBLIC | POLITIC | IMP TEAM | TRAINING | PRO DESG | INCREMT | COMMS- | OUTSIDE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MEDIAN | 3 | 2 | 4 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| MEAN | 3.19 | 2.95 | 4.29 | 5.00 | 3.57 | 3.81 | 4.33 | 4.19 | 4.38 | 3.90 | 4.38 |
| TOTAL | 67 | 62 | 90 | 105 | 75 | 80 | 91 | 88 | 92 | 82 | 92 |

Here this study was interested in the low scoring barriers. Strategies needed to be developed to overcome these barriers that were high in importance and hard to implement, while high scoring barriers were seen as easy to surmount and would not require a strategy. Of note is how high that public awareness scored. As pointed out in many of the sections of this study, most cities feel that they don't need public input in their day-to-day operations and that as one manager stated, "The only time the public is interested is when taxes or rate increases are involved."

Dedicated resources (highlighted in red), were seen as the barrier that was least favorable and thus needed to be overcome the most. Again, this was an expected result for most cities in these hard economic times. This was followed by top management involvement and political support (highlighted in yellow). Here managers understand very well how their cities operate. One must have the city manager's and city council's support to make any program happen. The next two barriers that were seen as hard to overcome were gaining a dedicated implementation team and internal communications (highlighted in yellow). Here managers were being realistic in the face of staffing shortfalls and their understanding of how communications work in their respective cities.

## Grouping

## Cluster Analysis

Cluster analysis was run on the benefit and barrier paired data using Ward's Method in SPSS. Analyses were done by clustering the 55 paired criteria across the 21 cities and by clustering the 21 cities across the 55 paired criteria (cluster data is contained in Appendix F).

### *By paired criteria*

*Benefits*

The 55 benefit pairs clustered into 3 sets.

Set I

Set I consists of 23 benefit pairs. The pairs in this set were clustered as follows:

- Set I: Operations
  - Set IA1: Employee succession
  - Set IA2a: Improved labor relationship with management/better communications/reduced bond and insurance
  - Set 1A2b: Reduced insurance premiums-cost savings and improved environmental operations
  - Set 1A3a: Cost savings through improved environmental operations
  - Set IA3b: Operational efficiencies-consistency with better bond rating and insurance premiums
  - Set IB: Employee succession and improved environmental performance

Set II

Set II consists of 20 benefit pairs. The pairs were clustered as follows:

- Set II: Environmental Operations
  - Set II A: Improved operations and improved environmental operations
  - Set II B: Risk reduction and improved bond rating through improved performance
  - Set II B 1a: Risk reduction through operational and environmental efficiencies

- Set II B 1b: Improved bond rating and better operational and environmental efficiencies and communications
- Set II B 2: Operational cost saving and better communications through improved environmental operations
- Set II B 2a: Better communications and environmental operations
- Set II B2b: Operational cost saving through easier employee succession and better labor relations with management

Set III

Set III consists of 12 benefit pairs. The pairs were clustered as follows:

- Set III: Cost Savings (Bond, Insurance, and Risk) and Better Relationships
  - Set III A: Cost saving through better bond rating, insurance rates and risk reduction – Better communications lead to better labor relationships with management and easier employee succession
  - Set III B 1: Better relationships with improved environmental operations
  - Set III B 2: Insurance and bond savings through risk reduction

These finding were used to inform the development of the AHP hierarchy using the 11 benefits as follows:

Criteria and Subcriteria:

**I. Environmental Operations**

*A. Environmental Efficiencies*

*B. Improved Environmental Performance*

*C. Better Relationship with Regulators*

**II. Overall Operations**

*A. Better Communications (inside and outside)*

*B. Operational Efficiencies and Consistency*

*C. Improved Labor Relationships with Management*

*D. Easier Employee Succession*

**III. Cost Savings**

A. *Reduced Costs*

B. *Improved Bond Rating*

C. *Reduced Insurance Premiums*

D. *Risk Reduction*

*Barriers*

The 55 barrier pairs clustered into 4 sets.

Set I

Set I consists of 10 barrier pairs. The pairs in this set were clustered as follows:

- Set I: Internal Support and Resources for Program Design and Implementation
  - Set I A: Resources related to communications and training
  - Set I B: Internal support for program design and implementation

Set II

Set II consists of 4 barrier pairs. The pairs in this set clustered as follows:

- Set II: Assistance in Program Design and Implementation

Set III

Set III consists of 12 barrier pairs. The pairs in this set clustered as follows:

- Set III: Commitment to and Resources for Program Design and Implementation
  - Set III A: Resources related to program design and implementation
  - Set III B: Shared commitment
  - Set III B 1: Shared commitment and assistance related to program design and implementation
  - Set III B 2: Shared commitment related to buy-in and communications

Set IV

Set IV consists of 29 barrier pairs. The pairs in the set cluster as follows:

- Set IV: Support

- Set IV A: External support related to resources and employee participation
- Set IV B: External support related to implementation
- Set IV B 1: Official support related to implementation, communications, and training
- Set IV B 2: External support related to operations
- Set IV B 2a: External support related to operations and implementation team
- Set IV B 2b: Support related to program design
- Set IV B 2c: External support related to internal operations

These finding were used to inform the development of the AHP hierarchy using the 11 barriers as follows:

Criteria and Subcriteria:

**I. Internal Commitment**

*A. Top Management Support*

*B. Employee Buy-in*

**II. Program Design and Implementation**

*A. Program Design*

*B. Incremental Implementation*

*C. Employee Training*

*D. Internal Communications*

**III. Internal Resources**

*A. Dedicated Resources*

*B. Dedicated Implementation Team*

**IV. External Support**

*A. Political Support*

*B. Public Awareness*

*C. External Assistance and Guidance*

The cluster analysis of the 55 pairs of benefits and barriers informed the development of the AHPs that were completed by the municipal managers.

***By City***

*Benefits*

The 21 cities were clustered into 5 sets.

Set I

Set I consists of 10 cities (47% of the total). This group contained mostly environmental managers and public works directors (9 of 10). The group was predominantly small cities (only one large). They rated economic development as a key factor to professional success in their cities. This set was statistically representative for urban/rural and east/central.

These cities also shared how they relate between certain paired benefits. Table 23 presents these relationships for the cities in Set I.

**Table 23. CITY BENEFIT PAIRS RELATIONSHIPS (SET I)**

| BENEFIT PAIRS | | OUT OF 10 CITIES |
|---|---|---|
| Improved bond ratings | Reduced insurance premiums | 10 |
| Reduced costs | Improved bond ratings | 9 |
| Reduced costs | Reduced insurance premiums | 9 |
| Labor relationship with management | Employee succession | 9 |
| Environmental efficiencies | Improved environmental performance | 8 |
| Better communications | Easier employee succession | 8 |
| Risk reduction | Improved bond ratings | 8 |
| Risk reduction | Reduced insurance premiums | 8 |
| Improved environmental performance | Better relationships with regulators | 7 |
| Better communications | Labor relationship with management | 7 |
| Environmental efficiencies | Better communications | 7 |

This group of municipal managers believes that the steps one takes to improve bond ratings will lead to a reduction in insurance premiums. They see that one of

these steps is risk reduction. They also see a connection between better communications and improved labor relationships with managers, easier employee succession, and environmental efficiencies. These cities see that as they improved environmental performance, they will gain better relationships with regulators and environmental efficiencies. They also equate improved labor relationships with management with easier employee succession.

Set II

Set II consists of 5 cities (24% of the total). This group was predominantly large cities (3 of 5), predominantly central (4 of 5), and they were all urban cities. This group had the highest average educational level (almost all masters) and rated environmental considerations as key factors to professional success in their cities.

These cities also share how they relate between certain paired benefits. Table 24 presents these relationships for the cities in Set II.

**Table 24. CITY BENEFIT PAIRS RELATIONSHIPS (SET II)**

| BENEFIT PAIRS | | OUT OF 5 CITIES |
|---|---|---|
| Reduced costs | Risk reduction | 5 |
| Environmental efficiencies | Easier employee succession | 4 |
| Improved environmental performance | Labor relationship with management | 4 |
| Improved environmental performance | Operational efficiencies | 3 |
| Improved bond ratings | Reduced insurance premiums | 3 |
| Reduced insurance premiums | Risk reduction | 3 |
| Labor relationship with management | Easier employee succession | 3 |

This group of municipal managers related risk reduction with reducing costs. They see that as one reduces one's risks, one saves money on insurance, lost employee hours, and work place injuries. They also equate environmental efficiencies with easier employee succession. Development of work procedures and increased interaction with employees will lead to easier succession. This group also equated improved environmental performance (compliance) with better labor relationships with management and operational efficiencies and consistency. Of note is that the last three pairs are held in common with Set I.

Set III

Set III consists of 3 cities (14% of the total). This group was all small central cities and predominantly rural (2 of 3). They had the longest time in their current positions (10.7 years).

These cities also share how they relate between certain paired benefits. Table 25 presents these relationships for the cities in Set III.

**Table 25. CITY BENEFIT PAIRS RELATIONSHIPS (SET III)**

| BENEFIT PAIRS | | OUT OF 3 CITIES |
|---|---|---|
| Environmental efficiencies | Improved environmental performance | 3 |
| Environmental efficiencies | Better relationships with regulators | 3 |
| Environmental efficiencies | Risk reduction | 3 |
| Improved environmental performance | Better relationships with regulators | 3 |
| Improved environmental performance | Risk reduction | 3 |
| Better relationships with regulators | Risk reduction | 2 |
| Environmental efficiencies | Operational efficiencies | 2 |
| Improved environmental performance | Operational efficiencies | 2 |
| Better relationships with regulators | Operational efficiencies | 2 |
| Better communications | Labor relationship with management | 2 |
| Operational efficiencies | Risk reduction | 2 |

This group of municipal managers relates improved environmental operations (efficiency and performance) with risk reduction, operational efficiencies and consistency, and better relationships with regulators. They see that as they improve their compliance and efficiency that the other benefits are natural outcomes. These cities also see the benefits of better communications on the relationship between labor and management.

Set IV

Set IV consists of 2 cities (10% of the total). Both cities in this group were large, eastern cities. This group had the shortest time on the job (0.5 years) and shortest time in the profession (4.7 years). Both of these numbers were

significantly lower than the other groups. These two cities rated citizen support as a low factor to professional success in their city.

These cities also share how they relate between certain paired benefits. Table 26 presents these relationships for the cities in Set IV.

**Table 26. CITY BENEFIT PAIRS RELATIONSHIPS (SET IV)**

| BENEFIT PAIRS | | OUT OF 2 CITIES |
|---|---|---|
| Environmental efficiencies | Improved bond rating | 2 |
| Environmental efficiencies | Reduced insurance premiums | 2 |
| Environmental efficiencies | Risk reduction | 2 |
| Improved environmental performance | Better relationships with regulators | 3 |
| Improved environmental performance | Improved bond rating | 2 |
| Improved environmental performance | Reduced insurance premiums | 2 |
| Better relationships with regulators | Improved bond rating | 2 |
| Better relationships with regulators | Reduced insurance premiums | 2 |
| Better communications | Operational efficiencies | 2 |
| Better communications | Labor relationship with management | 2 |
| Better communications | Easier employee succession | 2 |
| Improved bond rating | Reduced insurance premiums | 2 |

These two municipal managers equate improved environmental operations (efficiency and performance) with improved bond ratings, reduced insurance premiums, risk reduction, and better relationships with regulators, all outcomes of better environmental operations. They also see better communications as key to operational efficiencies and consistency, improved labor relationships with management, and easier employee succession.

Set V

Set V consists of 1 city (5% of the total). It is a small, rural, central city. The manager had the longest time in their current occupation (34 years).

*Barriers*

The 21 cities were clustered into 4 sets.

Set I

Set I contained 9 cities (43% of the total). Most of the large cities were in this cluster (62.5%). This group had the lowest mean time in their current positions of 6.7 years. This set was statistically representative for urban/rural and east/central.

These cities also share how they relate between certain paired benefits. Table 27 presents these relationships for the cities in Set I.

**Table 27. CITY BARRIER PAIRS RELATIONSHIPS (SET I)**

| BARRIER PAIRS | | OUT OF 9 CITIES |
|---|---|---|
| Dedicated resources | Dedicated implementation team | 9 |
| Program design | Incremental implementation | 8 |
| Political support | Outside guidance and support | 7 |

Municipal managers understand that they must have dedicated resources and people (team) to make a program viable. They also see that this is a complex program that will have to be accomplished in a step-by-step manner. They also equate gaining outside help with having political support.

Set II

Set II contained 4 cities (19% of the total). This set was comprised of all small cities and all public works directors. These managers had the most time in their current positions (12.8 years). These managers rated citizen support, legal liability, and environmental considerations as keys to success in their cities. This set was statistically representative for urban/rural and east/central.

These cities also shared how they relate between certain paired benefits. Table 28 presents these relationships for the cities in Set II.

Municipal managers from these four cities see the relationship between dedicated resources and a dedicated implementation team with employee buy-in, top management involvement, and outside guidance and support. They also see that communications has a bearing on program design and implementation. These managers also know that top management involvement and political support are keys to program success.

**Table 28. CITY BARRIER PAIRS RELATIONSHIPS (SET II)**

| BARRIER PAIRS | | OUT OF 4 CITIES |
|---|---|---|
| Employee buy-in | Designated implementation team | 4 |
| Employee buy-in | Employee training | 4 |
| Designated implementation team | Employee training | 4 |
| Program design | Incremental implementation | 4 |
| Top management involvement | Dedicated resources | 3 |
| Top management involvement | Political support | 3 |
| Dedicated resources | Outside guidance and support | 3 |
| Program design | Communications | 3 |
| Incremental implementation | Communications | 3 |

Set III

Set III contained 3 cities (14% of the total). These managers had the highest level of education (two had masters and one had a bachelors). They rated budgetary considerations and legal liabilities as low in factors of professional success in their city. This set was statistically representative for urban/rural and east/central. These cities also share how they relate between certain paired benefits. Table 29 presents these relationships for the cities in Set III.

**Table 29. CITY BARRIER PAIRS RELATIONSHIPS (SET III)**

| BARRIER PAIRS | | OUT OF 3 CITIES |
|---|---|---|
| Top management involvement | Dedicated resources | 3 |
| Top management involvement | Employee buy-in | 3 |
| Top management involvement | Designated implementation team | 3 |
| Dedicated resources | Employee buy-in | 3 |
| Dedicated resources | Designated implementation team | 3 |
| Employee buy-in | Designated implementation team | 3 |
| Employee training | Incremental implementation | 3 |
| Employee training | Communications | 3 |
| Incremental implementation | Communications | 3 |

These three municipal managers see the relationships between top management involvement and employee buy-in, dedicated resources, and dedicated implementation team. They know that for a program to be successful, it needs top management, employees, a team, and resources. These managers also see communications as a key in training and implementation.

Set IV

Set IV contained 5 cities (24% of the total). These managers had the longest time in their current professions (20 years). They rated citizen support and social justice as low factors for professional success in their city. This set was statistically representative for urban/rural and east/central.

These cities also shared how they relate between certain paired benefits. Table 30 presents these relationships for the cities in Set IV.

**Table 30. CITY BARRIER PAIRS RELATIONSHIPS (SET IV)**

| BARRIER PAIRS | | OUT OF 5 CITIES |
|---|---|---|
| Top management involvement | Public awareness | 5 |
| Top management involvement | Political support | 5 |
| Public awareness | Political support | 5 |
| Incremental implementation | Outside guidance and support | 5 |
| Employee buy-in | Communications | 4 |
| Employee training | Communications | 4 |
| Designated implementation team | Incremental implementation | 4 |
| Designated implementation team | Outside guidance and support | 4 |
| Employee buy-in | Designated implementation team | 3 |
| Political support | Outside guidance and support | 3 |
| Designated implementation team | Employee training | 3 |

Municipal managers understand that without inside city support (top management) and outside city support (political and public), a program will not be successful and that the key to gaining employee buy-in is communications, a designated team, and training. They also see that outside guidance and support will be needed to implement the program and that city council will need to support this outside help.

## Concept Maps

As part of the interview process, the municipal managers used the 11 benefits and 11 barriers cards that were developed from the relative importance of implementation and relative ease of implementation to make a concept map of how they believed an EMS could be implemented in their respective cities (maps are in Appendix E).

These maps were analyzed and the information generated was used in developing a composite concept map and development of strategies for implementation. This concept map will be used to explain how the cities, as a whole, view EMS Implementation.

### *Composite Map*

For the composite map, the benefit and barrier median and means for relative importance of implementation and relative ease of implementation were used to decide on card size and color of the dots (this is how the majority of cities rated them). The three highest relative importances were the largest cards, the three lowest were small cards, and the five remaining were medium cards. The three rated as having the easiest relative ease of implementation were given green dots, the five rated as medium were given yellow dots, and the three barriers rated as hard were given red dots. Benefit cards were printed in green and barrier cards were printed in red. Figure 3 shows the composite concept map.

First, the 21 maps were sorted by barriers and the following information was revealed:

- 18 cities rated top management involvement as being of high importance.
- 11 of these 18 cities see political support as being of high importance.
- 11 of these 18 cities see dedicated resources as being of high importance.
- 7 of these 18 cities see a dedicated implementation team as being of high importance.
- Other barriers that were seen as being of high importance were outside guidance and support (4 cities), employee buy-in (3 cities), and communications (3 cities).
- 2 cities rated dedicated resources as being of high importance along with a dedicated implementation team.

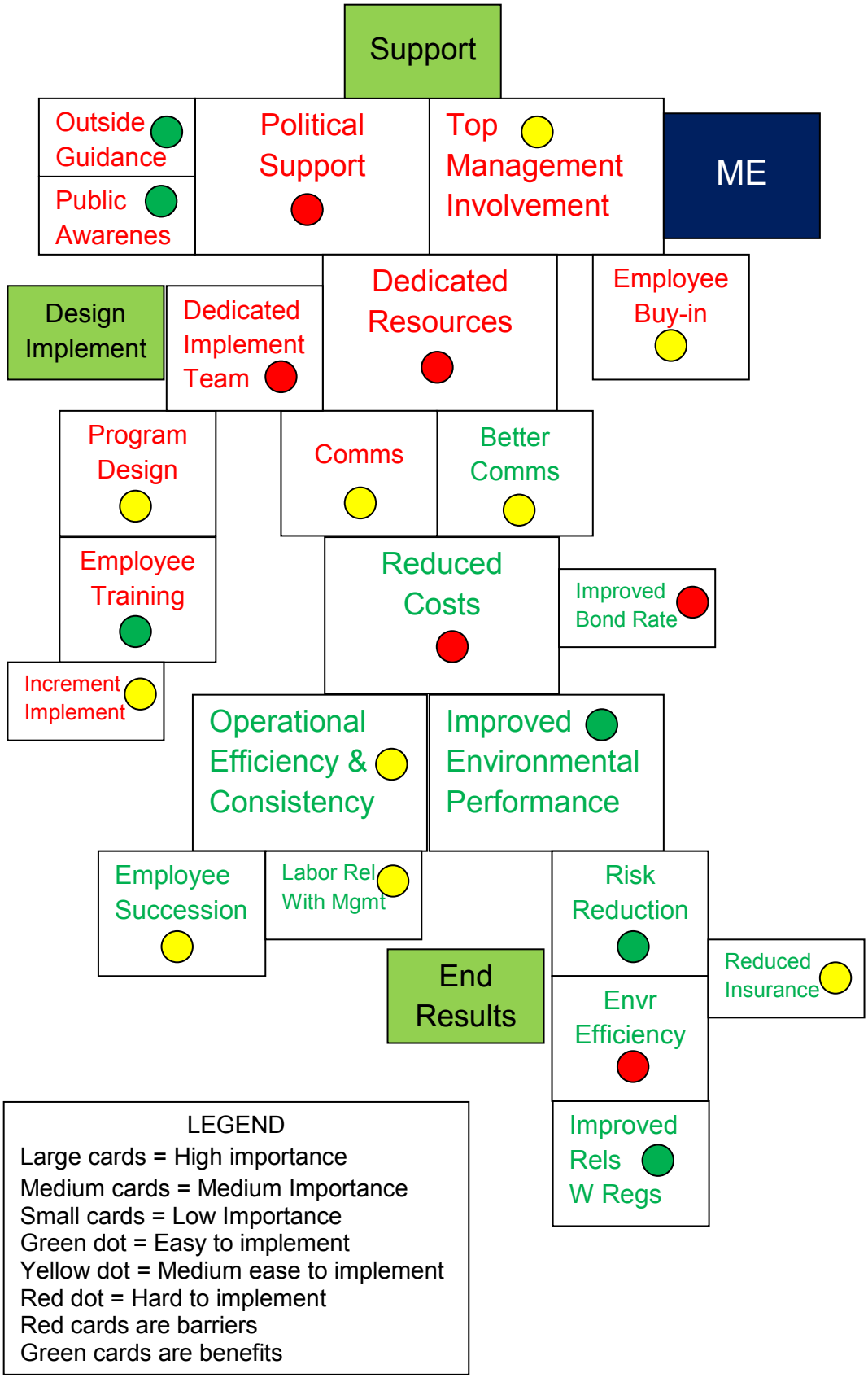


**Figure 3. COMPOSITE CONCEPT MAP**

During conversations with the managers, top management involvement was the number one barrier to EMS implementation and consequently was placed at the top of the map. Political support was also seen as a major barrier that was essential to making a program happen and also placed at the top of the map. Dedicated resources were seen as another major barrier by managers in a majority of cities; therefore, it was also placed at the top of the map. Other barriers were placed as how the majority of cities linked them to each other.

Next, the benefits of the 21 maps were sorted and revealed the following information:

- 13 cities rated reduced costs as being of high importance.
- 9 cities rated operational efficiencies and consistency as being of high importance.
- 9 cities rated improved environmental performance (compliance) as being of high importance.
- Other benefits that were seen as being of high importance were risk reductions (6 cities), better relationships with regulators (5 cities), improved communications (5 cities), and employee succession (5 cities).

Reducing costs was rated by managers as being the most important of the benefits. This was followed by operational efficiencies and consistency and improved environmental performance (compliance) as also being of high relative importance. These three were placed at the top of the benefits. Other benefits were placed as how the majority of cities linked them to each other.

*Map construction*

The map was created with the barriers at the top. A majority of the managers reported that these barriers are the first things that need to be addressed in order for the benefits to be seen. They saw outside guidance, public awareness, political support, top management involvement, and employee buy-in as the support needed to implement an EMS.

Most managers view program design and implementation as a separate arm or set of steps. The transition from poor internal communications to better internal and external communications was the point in which a transition occurs to the benefit portion of the map.

Here benefits fell into two branches, operational efficiencies and consistency and improved environmental performance. Reduced costs were the lead-in to these branches. Managers saw that the end result of an EMS as better relationships

(management and regulators), easier employee succession, reduced risks, environmental efficiencies, and reduced insurance premiums.

The managers saw themselves as either program drivers or program implementers depending on their positions in their city.

**AHPs**

Municipal managers completed AHPs on-line using MakeitRational© software (data is contained in Appendix G).

***Benefits AHP***

Table 31 reports the benefit hierarchy means across cities for full, phased, and no implementation. The shaded areas highlight those criteria and subcriteria with the highest percentages for each implementation option (full, phased, or no)

Table 31 shows that full implementation (62.18%) is slightly more preferred than phased (55.50%) and no implementation (44.03%). Environmental benefits (31.03%) were more preferred in the full implementation driven by environmental efficiency (11.08%), improved environmental performance (compliance) (14.85%), and risk reduction (13.96%).

Organizational benefits (15.80%) were more preferred in phased implementation driven by easier employee succession (5.72%), and operational efficiencies and consistency (9.87%). Improved bond rating was higher in phased implementation (8.06%).

Organizational benefits were more preferred in the no implementation option (13.33%). It was driven by easier employee succession (31.90%), and improved labor relationships with management (23.6%). This was the only city in this category.

Phased implementation was the preferred option to take advantage of benefits. 13 cities selected phased implementation, 8 selected full implementation, and 1 selected no implementation. One city selected both phased and full, making the total 22 not 21.

***Barrier AHP***

Table 32 reports the barrier hierarchy means across cities for full, phased and no implementation.

## Table 31. AHP ANALYSIS: BENEFIT HIERARCHY MEANS ACROSS CITIES

| FULL IMPLEMENTATION | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CITY | OPTION | ENVR | ORG | ECON | REG | EFF | PER | RSK | COM | SUC | LAB | OPS | BON | COS | INS |
| MEAN | 62.18 | 31.03 | 11.79 | 19.35 | 6.59 | 11.08 | 14.85 | 13.96 | 5.56 | 2.64 | 7.05 | 5.23 | 5.18 | 21.05 | 6.81 |
| **PHASED IMPLEMENTATION** | | | | | | | | | | | | | | | |
| CITY | OPTION | ENVR | ORG | ECON | REG | EFF | PER | RSK | COM | SUC | LAB | OPS | BON | COS | INS |
| MEAN | 55.50 | 20.07 | 15.80 | 19.62 | 7.98 | 6.97 | 10.52 | 9.45 | 8.38 | 5.72 | 5.56 | 9.87 | 8.06 | 18.75 | 6.35 |
| **NO IMPLEMENTATION** | | | | | | | | | | | | | | | |
| CITY | OPTION | ENVR | ORG | ECON | REG | EFF | PER | RSK | COM | SUC | LAB | OPS | BON | COS | INS |
| MEAN | 44.03 | 1.17 | 40.84 | 2.01 | 3.6 | 1.1 | 4.7 | 0.7 | 6.7 | 31.9 | 23.6 | 5.1 | 1.3 | 13 | 8.2 |

**Shaded areas highlight the criteria and subcriteria with the highest percentages for each implementation option**

## Table 32. AHP ANALYSIS: BARRIER HIERARCHY MEANS ACROSS CITIES

| FULL IMPLEMENTATION | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CITY | OPTION | INT COM | DESG | EXT SUP | INT RES | OUT | POL | PUB | BUY | MAN | TEA | RES | TRN | IMP | COM | DES |
| MEAN | 61.44 | 26.64 | 8.55 | 8.18 | 18.06 | 3.30 | 6.20 | 4.75 | 6.95 | 34.12 | 9.84 | 19.74 | 3.87 | 1.97 | 4.24 | 5.04 |
| **PHASED IMPLEMENTATION** | | | | | | | | | | | | | | | |
| CITY | OPTION | INT COM | DESG | EXT SUP | INT RES | OUT | POL | PUB | BUY | MAN | TEA | RES | TRN | IMP | COM | DES |
| MEAN | 55.16 | 20.20 | 13.33 | 5.20 | 16.35 | 4.70 | 3.89 | 2.18 | 12.21 | 22.80 | 10.80 | 19.46 | 4.25 | 8.41 | 5.78 | 5.47 |

**Shaded areas highlight the criteria and subcriteria with the highest percentages for each implementation option**

Full implementation (61.44%), is slightly more preferred than phased implementation (55.16%). Internal commitment (26.64%), was more preferred in the full implementation and was driven by top management involvement (34.12%) External support (8.19%) was also more preferred in full implementation and was driven by political support (6.20%), and public awareness (4.75%).

Program design and implementation (13.33%) was more preferred in phased implementation and was driven by incremental implementation (8.41%). Employee buy-in was higher in phased implementation (12.21%).

Full and phased implementations were evenly split with 10 cities opting for full and 11 cities opting for phased.

***Overall***

There is no discernible relationship between criteria and options between benefits and barriers. Phased implementation was preferred by 24 cities while full implementation was preferred by 18 cities with no implementation only preferred by one city. After reviewing all the AHP data, it was decided to not make separate strategies for both full and phased implantation. The strategies will be designed to address the benefit and barrier preferences for the implementation options.

**Strategies**

A core strategy and nine additional strategies were developed from all the previous steps of this study. A survey was sent by e-mail to all 21 cities composed of the core strategy, nine additional strategies, and ten questions. The municipal managers were either interviewed on the phone or in person to elicit their responses (see Appendix H).

***Core strategy***

The core strategy was supplied to all cities. One of the ten questions assessed if the core strategy meets each city's needs.

***Additional strategies***

The cities were asked to rate the nine additional strategies with three as most preferred (high – those they needed to have), three as intermediate (medium - those they would like to have), and three least preferred (low - those they do not need). Table 33 reports the results of these ratings.

## Table 33. ADDITIONAL STRATEGIES SELECTIONS

| STRATEGY | MOST PREFERRED | INTERMEDIATE | LEAST PREFERRED |
|---|---|---|---|
| A – Team | 15 | 3 | 3 |
| B – Political | 9 | 5 | 7 |
| C - Communications | 12 | 8 | 1 |
| D – Employee | 7 | 10 | 4 |
| E – Operations | 6 | 11 | 4 |
| F – Risk | 5 | 6 | 10 |
| G – Regulators | 1 | 8 | 12 |
| H – Envr Efficiency | 5 | 9 | 7 |
| I – Labor | 2 | 3 | 16 |

This table shows that strategy A (Team) was most preferred (15 cities), followed by strategy C (Communications) (12 cities) and strategy B (Political) (9 cities). The least preferred was strategy I (Labor) (16 cities) followed by strategy G (Regulators) (12 cities), and strategy F (Risk) (10 cities). Strategy E (Operations) (11 cities), strategy D (Employee) (10 cities), and strategy H (Environmental Efficiency) (9 cites), were the selected the most of the intermediately preferred strategies

Table 34 reports the means of the nine additional strategies.

## Table 34. ADDITIONAL STRATEGIES MEANS

| STRATEGY | A-Team | B-Political | C-Comms | D-Employee | E-Operations | F-Risk | G-Regulators | H-Envr Effic | I-Labor |
|---|---|---|---|---|---|---|---|---|---|
| MEAN | 2.57 | 2.10 | 2.52 | 2.14 | 2.10 | 1.76 | 1.48 | 1.90 | 1.33 |

Strategy A (Team), has selected by the cities as being the most preferred just slightly ahead of strategy C (communications). The next most preferred were strategies D (employee), B (political), and E (operations). The least preferred strategies were K (labor) and H (regulators).

### *Strategy Implementation Questions*

Ten questions related to the EMS strategies and EMS implementation were part of the survey. For statistical analysis, the answers for questions 1-7 and 10 were recoded as follows:

- Question 1: Core
  - Yes = 1, No = 0
- Question 2: Payback time
  - Reported in years, multiple years were averaged (2 to 5Y = 3.5Y)
- Question 3: Resources
  - All = 1, the rest of the answers were fractions
- Question 4: Facilitator or people
  - Facilitator = 2, People = 1
- Question 5: City involvement allowed
  - Very little = 1, Some = 2, A lot = 3
- Question 6: PEERS center
  - Yes = 1, No = 2, Maybe = 1.5
- Question 7: Pilot program
  - Reporting yeses
- Question 10: Time frame for program
  - Reported in years

Table 35 reports the means of questions 1-7 and 10.

**Table 35. SURVEY QUESTIONS RECODED RESULTS**

| QUESTION | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 10 |
|---|---|---|---|---|---|---|---|---|
| | CORE | PAY BACK | RESOURCE | FAC OR PEO | INVOLVE | PEER | PILOT | TIME |
| MEAN | 0.95 | 4.19 | 2/3 | 1.62 | 2.14 | 0.93 | 9 | 1.49 |

*Question 1: Does the core meet your cities needs?*

20 out of 21 cities rated core strategy as meeting the cities needs. The other city rated it as very close, but felt that it needed to include time for the manager to do implementation outside of their normal job.

*Question 2: What does your city consider a good payback time?*

The answers range from one to ten years with the average being 4.19 years. The average payback for an EMS in business is two years with some

organizations seeing their costs paid for in one (Environmental Systems Update 2006).

Question 3: What is the minimum amount of resources that the city would like to implement a program?

The cities ranged from 1/4 funding to complete funding with the average being 2/3 funding. Seven cities opted for all the funds and seven cities opted for 1/2 the funds.

Question 4: Which do you feel is more important? A facilitator to make things happen or person power to do things?

Thirteen cities selected a facilitator and eight cities selected people, thus the average was 1.62 leaning toward facilitator. Manager reported that the facilitator would need the authority to make decisions about resources (money and people).

Question 5: How much outside involvement in city programs is your city comfortable with?

Six cities selected a lot, four selected very little, and eleven selected some. This made the average slightly greater than some involvement in city programs. Four of the six cities that said a lot to outside involvement said yes to an EMS pilot program while the other two cities said maybe to a pilot program. Only three of the cities that said some to outside involvement said yes to an EMS pilot program with eight saying maybe and one saying no. Of the four cities that said very little to outside involvement two said yes to a pilot program, one said maybe, and one said no

Question 6: Do you feel a central clearing house for environmental information and EMS program help would be beneficial to Oklahoma?

19 cities said yes, one said maybe, and one said no. The city that said maybe wanted it to be outside of ODEQ and the city that said no has no interest in environmental programs outside of compliance.

Question 7: Do you think your city would like to participate in an EMS pilot program?

Nine cities said yes, ten cities said maybe, and 2 cities said no. Of the two cities that said no, one felt that they couldn't due to management and the other felt that they didn't have the time available for a pilot program.

*Question 8: Why do you feel that you city is not (or is) environmentally proactive?*

Not Proactive

The thirteen cities that reported that they were not proactive fell into two camps, either cost or education. Those that picked cost were that way due to limited budget (not accounting for environmental costs) or old habits (i.e. they just didn't think about environmental aspects outside of compliance) or didn't think they had enough employees. Those that opted for education believed they needed general environmental training for the city or benefit/cost training.

Are Proactive

The eight cities that reported that they were proactive all had different reasons. They ranged from leadership (mayor, city manager or staff, pw director) to having sustainability plans. All had recycling, felt they were in compliance, and involved environmental planning in city business. Many felt that their citizens were drivers for their environmental change.

*Question 9: What kind of incentives do you feel ODEQ should offer cities that implement and EMS?*

11 cities thought they should provide funding (grants or matching funds). This was followed by various incentive programs such as fewer inspections, less hoops for new programs, fast tracking, and ODEQ providing help and training for EMS.

Question 10: What do you feel the ideal timeframe for program implementation would be?

The answers range from 1-2 years with the average timeframe being 1.5 years. Managers who picked longer time frames felt that a lack of personnel would make the program last longer.

**Hypotheses**

Hypotheses were formed around the nine additional strategies by reviewing interview benefit and barrier data. Table 36 shows the results of the hypotheses. A plus (+) means that a city was hypothesized to select that strategy and they did, and a minus (-) means that a city was hypothesized to select that strategy and they didn't.

## Table 36. HYPOTHESIS RESULTS

| City | Predicted Strategy Preferred | | | | | | | | | Percentage correctly predicted |
|---|---|---|---|---|---|---|---|---|---|---|
| | A – Team | B – Political | C -Communications | D – Employee | E – Operations | F – Risk | G – Regulators | H – Envr Efficiency | I – Labor | |
| EMS01 | + | - | + | + | + | + | + | - | - | **78** |
| EMS02 | + | + | + | - | + | + | - | + | - | **100** |
| EMS03 | + | - | + | + | + | + | + | - | - | **100** |
| EMS04 | + | + | + | - | + | + | - | - | + | **78** |
| EMS05 | + | + | + | + | + | - | - | + | - | **100** |
| EMS06 | + | - | + | - | + | + | + | + | - | **56** |
| EMS07 | - | + | + | + | + | - | + | + | - | **78** |
| EMS08 | + | + | + | - | + | + | + | - | - | **78** |
| EMS09 | - | + | + | + | + | - | + | + | - | **78** |
| EMS10 | + | + | + | + | - | - | + | + | - | **78** |
| EMS11 | + | - | - | + | + | + | + | + | - | **78** |
| EMS12 | - | + | + | + | + | - | - | + | + | **78** |
| EMS13 | + | - | + | + | + | - | - | + | + | **78** |
| EMS14 | + | + | + | + | - | + | + | - | - | **78** |
| EMS15 | + | + | + | + | - | + | - | + | - | **78** |
| EMS16 | + | + | + | + | + | - | - | - | + | **78** |
| EMS17 | + | + | + | + | + | + | - | - | - | **78** |
| EMS18 | + | - | + | + | - | - | + | + | + | **78** |
| EMS19 | + | + | + | + | + | - | - | + | - | **78** |
| EMS20 | + | - | + | + | + | + | - | + | - | **100** |
| EMS21 | + | + | + | + | + | + | - | - | - | **78** |
| **Percentage correctly predicted %** | **90** | **86** | **95** | **90** | **76** | **62** | **71** | **52** | **100** | **81** |

Legend:

| Strategy Prediction | Strategy Selection | |
|---|---|---|
| Preferences | Selected | Not Selected |
| Most or Medium Preferred | + | - |
| Least Preferred | - | + |

*Plus sign in a green-shaded cell = the predicted strategy was selected by the municipal manager.*

*Minus sign in a green-shaded cell = the strategy was not predicted and was not selected.*

*Plus sign in a white-shaded cell = a strategy was selected but was not predicted.*

*Minus sign in a white-shaded cell = the predicted strategy was not selected.*

The percentage column reports how many of the hypothesized strategies the municipal manager selected. The average over the 21 cities was 81% correct selections.

The bottom row reports the percent of cities that were hypothesized to select that strategy. The average over the 9 additional strategies was 80% correct selections.

Hypothesis

Strategy A – Team, 90%, EMS10 did select, EMS12 didn't select.

Strategy B – Political, 86%, EMS16 did select, EMS01and 06 didn't select.

Strategy C– Communications, 95%, EMS11 didn't select.

Strategy D- Employee, 90%, EMS 7 did select, EMS06 didn't select

Strategy E– Operations, 76%, EMS08, 11, and 19 did select, EMS15 and 18 didn't select.

Strategy F – Risk, 62%, EMS0, 04 and 21 did select, EMS07, 09, 10, 16, and 19 didn't select.

Strategy G – Regulators, 71%, EMS06 and 14 did select, EMS 04, 13, and 17 didn't select.

Strategy H – Environmental efficiencies, 52%, EMS06, 07, 12, 13, and 17 did select, EMS08, 14, and 21 didn't select

Strategy I – Labor, 100%

Cities didn't select the predicted strategies for one of two reasons: misdiagnosis of EMS implementation benefits or barriers or changes in the favorability ratings of benefits and barriers between the initial interview and the strategy survey concerning a favorability rating. Misdiagnoses can be caused by ties in favorability ratings of two or more benefits and/or barriers. During the initial phase of hypothesis selection, the benefit and barrier favorability scores were used to predict the preferred strategies. If the favorability ratings of a barrier and benefit were tied, then the barrier governed the strategy selection. The table 37 identifies the reason why the selected strategy did not match the predicted strategy.

Table 37. Explanations of Failed Predictions

| CITIES | MISDIAGNOSIS | CHANGED MIND | BASIS FOR STRATEGY PREFERENCE |
|---|---|---|---|
| EMS01 | | Risk over Political | Selected a 3-rated benefit over a 2-rated barrier |
| EMS04 | | Risk over Regulator | Selected a 3 rated benefit over a 5 rated benefit |
| EMS06 | Labor=Risk | EE over Political | Selected a 2 rated benefit over a 3 barrier |
| EMS07 | | EE over Risk | Selected a 3 rated benefit over a 6 rated benefit |
| EMS08 | | Ops over EE | Selected a 4 rated benefit over a 5 rated benefit |
| EMS09 | | EE over Risk | Selected a 2 rated benefit over a 5 rated benefit |
| EMS10 | | Team over Risk | Selected a 5 rated barrier over a 4 rated benefit |
| EMS11 | Ops=Comms | | |
| EMS12 | | EE over Team | Selected a 2 rated benefit over a 4 rated barrier |
| EMS13 | | EE over Regulator | Selected a 4 rated benefit over a 5 rated benefit |

| CITIES | MISDIAGNOSIS | CHANGED MIND | BASIS FOR STRATEGY PREFERENCE |
|---|---|---|---|
| EMS14 | Regulator=EE | | |
| EMS15 | | EE over Ops | Selected a 3 rated benefit over a 5 rated benefit |
| EMS16 | | Political over Risk | Selected a 5 rated barrier over a 5 rated benefit |
| EMS17 | Emp=Regulator | | |
| EMS18 | Risk=EE | | |
| EMS19 | Ops=Risk | | |
| EMS21 | EE=Risk | | |

EE is Environmental Efficiency, Ops is Operational Efficiency, Emp is Employee

# CHAPTER V

## DISCUSSION OF EMS PROGRAM DESIGN CONSIDERATIONS

During this research, municipal managers have been asked three distinct questions about EMS implementation. First, how do they see their cities in regards to the benefits and barriers of EMS implementation (real world condition)? This question was answered during the interviews and subsequent data analysis. Second, what is their preferred method of EMS implementation (ideal world condition)? These methods the managers revealed in the AHP barrier and benefit results. And third, what did these managers need to implement an EMS (real world meets ideal world). These needs were revealed in the strategy survey and analysis.

The answers to these three questions have produced an EMS implementation process. This process was born out of what exists today, right now in the cities of this study (not some ideal or estimate of what conditions are like). It was shaped by how these cities would like to implement an EMS (what they see as the best method to make the program work for them). The process consists of a core strategy that is needed by all cities and additional strategies that allow each city to tailor the implementation process.

### Core Strategy

A core strategy was developed to overcome the biggest barriers and enhance the biggest benefits of a majority of cities in this study. It was based on data collected from the cities during interviews and from the on-line AHPs. The core strategy would need to be supplied to all cities as the starting point of the EMS.

All the cities in this study reported that the core strategy met their cities' needs with one exception. That manager was concerned about being given the time to do an implementation. They felt that top management wouldn't allow them the needed time outside of their regular job. This time issue can be addressed during top management involvement briefing and training.

### *Common Benefits to EMS Implementation*

There were two common benefits revealed by data analysis and interviews. They were reduced costs (cost savings) and improved environmental performance (compliance).

*Reduced Costs (Cost Savings)*

Saving money is a major benefit and selling point of adopting an EMS. It was found to be a major benefit of all three EPA pilot programs (EPA 2000, 2002, 2005) and in businesses that adopt an EMS (Bansal 2003). What is lacking here is a set of definitive numbers from EMS implementation in cities. Up to now, estimates are made by looking at similar programs adopted by companies. No definitive data exist on overall cost savings.

Reducing costs and maintaining services is the mantra of all cities (without raising taxes or employee layoffs). This is especially true in these trying economic times. Cities struggle on a daily basis to supply clean water, sewer services, transportation, roads, parks, business development, infrastructure repair and improvements, solid waste disposal, etc., in a fair and economical way. With rising prices and reduced resources, this has proven to be a very difficult task. As one municipal manager stated, “Cities are businesses that have a hard time passing on costs to their customers” while another lamented “everyone wants everything (services) for free.”

Reducing costs and saving money is the major selling point of EMS adoption in this study. In a state that is not “environmentally progressive,” this key benefit needs to be used to gain management and political support.

*Improved Environmental Performance (Compliance)*

In areas of the country that are more environmentally progressive, improved environmental performance was a common result of implementing an EMS (see Appendix B). This benefit was a finding in all three EPA pilot programs (EPA 2000, 2002, and 2005) and led to the adoption of EMS as being part of EPA compliance orders (EPA 2003).

Improving environmental performance and becoming more compliant to all applicable laws, regulations, and permits is a major benefit of implementing an EMS. While saving money and reducing costs is good for cities, staying in compliance (and not being fined) was viewed as the most favorable benefit of this study. This finding was somewhat unexpected. It was found that even those cities that don’t have compliance issues still want to improve their compliance.

This key benefit is also a major selling point to gain top management and political buy-in for EMS program implementation in the study area. As noted in this study, many of the cities have, or have had, compliance issues.

### *Common Barriers to EMS Implementation*

There were four common barriers that were revealed during data analysis and interviews. They were top management involvement, dedicated resources, initial (city) training, and program design. These common barriers must be overcome to implement an EMS.

#### *Top Management Involvement*

Literature and personal experience have shown that one of the main keys to EMS implementation is involvement and support of top management. A lack of top management involvement and support was found to be a major barrier to implementation in 32 cities and governmental entities in all three of the EPA pilot projects (EPA 2000, 2002, 2005) and by the city of Dallas (Camp 2001).

All cities in this study had city managers, and most had one or two assistant city managers. These individuals are much the same as a CEO or managing director of a business. They are in charge of all city operations and employees. Their job is to run the day-to-day operations of the city. In this study, 86% (18 of 21) of the cities rated top management involvement as being of high importance, one as medium importance, and two as low importance (both of these managers were high in the administrations of their city and considered themselves part of top management).

An EMS requires top management to be involved in a variety of implementation processes and to be actively engaged in the program. Municipal managers know that for a program to be viable, they need top management support. They reported that “a benefit/cost analysis” would be needed to sell the program, that they would need data on resources and payback times to show how an EMS could save the city money while being “more sustainable.”

#### *Dedicated Resources*

Needing dedicated resources to implement an EMS was an anticipated finding as cities, states, and the country struggle to climb out of the current recession. Even as city budgets recover and money becomes available, getting funds for new programs is hard. Even in good economic times, dedicated resources were found to be another one of the main barriers to implementation in cities and governmental entities (EPA 2000, 2002, 2005). Funding sources are beyond the

scope of this study, but additional dedicated money will need to be supplied to cities if they are to implement an EMS.

Having dedicated resources for program implementation was seen by a majority of cities in this study as being of high importance while being seen as the hardest barrier to implement (money is important and hard to get). Surprisingly, only eleven cities saw this as being of high importance, while seven saw it as being of medium importance, and three saw it as being of low importance. What was not a surprise is that all cities view dedicated resources as difficult to obtain. Money might be available in the budget, but getting funds earmarked for environmental programs is viewed by managers as a hard sell. One manager succinctly described their city's policy on environmental programs as "everything else comes first, second, and third, leaving environmental improvements out of the picture."

*City Training*

Before cities start to implement an EMS, they will have to be trained. Managers and program implementers will require initial and follow-on training to implement the program. This training will need to be carried out by certified individuals and tailored to each location. The cities that participated in the EPA pilot programs were trained by consultants and non-profits (EPA 2000, 2002, 2005), and companies were trained by consultants.

Once key individuals are trained, they can train teams and other employees as the program is implemented. Additional training will be required for internal auditors as part of EMS implementation. Managers were split on how they viewed additional training. They either saw this as training that would be added to "normal training requirements of employees" or something that "they didn't know how they would find the time to accomplish."

Training will need to be supplied to cities that want to implement an EMS. The extent and duration of training will have to be evaluated for each city. Professional personnel will need to carry out this training at the beginning of implementation and at various times throughout implementation.

*Program Design*

Designing an environmental management system can be a complicated process. It has many steps to accomplish and numerous requirements that need to be met. The larger the scope (fenceline), the more intricate the design becomes. Many smaller cities felt that they didn't have enough staff or qualified individuals

to design a program. Managers reported that they would need a template or "boilerplate" manual that was designed for their specific department or entity.

The information and, in some cases, manuals exist already. A quick internet search reveals governmental entities, non-profits, and consultants that will supply EMS program templates for free or at little cost. These can be tailored as needed and supplied to cities. Once they have been used for implementation, they can be updated and supplied to other cities.

## Additional Strategies

Additional strategies were developed to meet the unique needs of cities in this study. In these strategies, barriers that were rated as must be overcome and benefits that needed to be enhanced were selected by the individual cities. They were based on data collected from the cities during interviews and from on-line AHPs.

### *Additional Barrier Strategies for EMS Implementation*

*Dedicated Implementation Team*

EMS implementation requires a dedicated team (and team leader). These individuals require time to meet and do their EMS jobs. They require more intense training to be able to accomplish implementation. Many managers in this study (usually in smaller cities) feel that they either don't have qualified individuals or they don't have enough employees, while other cities are accustomed to operating in team mode and view this as a standard operating procedure (usually larger cities). It was not unique in this study to talk with one-person departments, especially in smaller cities. One such department manager related to me, "I have been trying to fill two open assistant jobs, but the city manager can't even fill his assistant job due to the budget problems – what chance do I have?" Another manager pointed out that "we have one-half the employees we had forty years ago and twice the work."

The cities that selected this strategy will need help in developing an implementation team and with team operations. This barrier was found in the second EPA pilot program (EPA 2002). It should be noted that most of the EPA pilot programs were in larger cities or entities (see Appendix B).

*Political Support*

To make an EMS program viable requires support of the mayor and city council. In Oklahoma, city councils control budgeting (dedicated resources) and need to

support or not stand in the way of an EMS program. There were three distinct divisions on political support in this study: 1) small cities that have support of their city council; 2) small cities that are growing rapidly and need help with city council; and 3) large cities that need help with their city council. One director told me, “I spend over half my time in front of city council justifying my jobs instead of doing them.”

The cities that selected this strategy will need help in gaining council support (this might include business leaders and citizens). This barrier was evident in all three EPA pilot projects (EPA 2000, 2002, 2005). Again, it should be noted that most participants in the pilot projects are large cities or entities (see Appendix B).

*Communications*

To implement an EMS will require a city to communicate more often and through a variety of mediums. This can prove to be a daunting task to most cities, but cities that implemented an EMS found that in the end, their internal and external communications were vastly improved. This study revealed that as cities become larger and more complex, communications become much more difficult. One manager stated, “I can communicate with my department, but other departments pretend that we don’t exist unless they want something from us.”

The cities that selected this strategy will need help and training in becoming better communicators. This barrier and benefit were found in EPA pilot project 1 and 3 (GEFT 2000, 2005). One manager of a large city told me the key to making any new project happen wasn’t funding or personnel but “communications.”

*Employee Buy-in*

The most essential part of an EMS is employee participation, especially those individuals that have direct interaction with environmental operations. They are the backbone of the program, and their buy-in is essential. Here, cities in the study fell into three distinct areas: 1) those cities that felt employees will do what is needed and embrace the program; 2) those cities that felt that their employees would be receptive to the program but require some coaxing to get on-board; and 3) those cities that felt employees would be a hard sell. One manager related to me that “Our employees are already working 50 hour week. Why would they want to add more to their plate?”

Employee buy-in was seen as a barrier in all three EPA pilot projects (EPA 2000. 2002, 2005. This buy-in needs to be organic and not directed. An EMS program doesn’t ensure compliance; the people that work there do (Traves 2009). Cities

that operate under the theory (as one manager so succinctly put it), “If they want to get paid, they will do as they are told,” will find an EMS unworkable.

### *Additional Benefit Strategies for EMS Implementation*

*Operational Efficiency and Consistency*

Cities that implement an EMS find that a major benefit is they become more operationally efficient and consistent. An EMS requires work procedures, documentation control, records, testing and measurement standards, and increased training. It requires employees to look at the processes and think of better and safer (both to the environment and employee) ways of doing their jobs.

This could possibly be the only formal management system a city has in place, as opposed to the business sector that has many of them in place (ISO 9000 Quality Management, Lean Manufacturing, Six Sigma, etc) to help gain efficiency and consistency. This will also be a major selling point to gain top management and political support.

This benefit was seen in EPA pilot project 2 (EPA 2002). Many cities in this study reported that they had few work procedures in place outside of compliance areas and felt that implementing an EMS could help them gain more formalized operations.

*Risk Reduction*

Another benefit of EMS implementation is environmental and safety risk reduction. As employees start to look at work procedures and processes, they may find better and safer ways to do their jobs. They may find alternatives to toxic chemicals (avoiding personal risk and city liability), new ways of accomplishing tasks (avoiding injury, lost time, and city liability), and better ways of interacting with the environment (such as shifting of engines to natural gas, reducing idling time, producing less waste, increasing recycling, reusing products, reducing spills, etc).

Risk reduction could lead to reducing insurance premiums and saving the city money. This benefit was seen in EPA pilot project 3 (EPA 2005). This study revealed that cities that already see themselves as environmentally proactive tend to look at reducing risk as a logical next step.

*Better Relationships with Regulators*

A major benefit of implementing an EMS is gaining better relationships with regulators. Implementation of an EMS demonstrates that the city is environmentally proactive and is moving away from the command and control (compliance) model of environmental operations. The city is no longer just doing what the "permit requires" but looking at how they can become more sustainable. Many of the cities in this study have, or have had, compliance issues and would like to have a better relationship with regulators in the future.

This benefit was seen in all three EPA pilot projects (EPA 2000, 2002, 2005). Entities that adopt an EMS are seen as going above and beyond their legal requirements (EPA 2009).

*Environmental Efficiencies*

Becoming more environmentally efficient is another major benefit of adopting an EMS. Cities that have implemented an EMS have gained a better understanding of environmental issues. They use less energy, fewer toxic chemicals, prevent pollution, manage their contractors environmental aspects better, and interact with their citizens over a broad range of environmental issues. Cities in this study were split between proactive cities that want to gain environmental efficiencies and rate this as most preferred and non-proactive cities that rated this as least preferred.

This was another of the major benefits seen in all three of the EPA pilot programs (EPA 2000, 2002, and 2005). Cities that have implemented an EMS cite this area as where they see improved involvement and morale in their employees. Here, employees interact directly with work procedures and policies, gain a sense of empowerment (EPA 2000), and become more environmentally aware (Environmental Systems Update 2006).

*Improved Labor Relationship with Management and Easier Employee Succession*

Adopting an EMS requires management and employees to work closer together and communicate at a much higher level. Cities have found that this creates a better relationship between management and employees. Also, an EMS requires formal work procedures (for those jobs that have environmental implications) and increased training of those employees who have these jobs. Cities have found that this leads to easier employee succession. When an employee leaves or retires, they no longer take the "corporate knowledge" with them. The avenues now exist for someone else to take their place with little or no problems. A few cities in this study reported issues between management and labor and an

employee succession problem. Succession problems exist most in small urban cities where managers reported that "once the employees are trained, they move to higher paying jobs in bigger cities."

EPA pilot programs 2 and 3 (EPA 2002 and 2005) noted these two as important benefits of EMS implementation. It should be noted again that many cities in this study reported that they didn't have an abundance of work procedures or formalized documentation outside of compliance areas.

***Design Consideration Conclusion***

Not all benefits or barriers require a strategy for implementation. Benefits such as reduced insurance premiums and an improved bond rating were viewed as something that managers felt they had no control over, or that these benefits would naturally come from EMS implementation. Barriers such as public awareness and outside guidance and support were viewed as easy to overcome and would not require any special actions.

Table 38 shows the relationship between how the EPA pilot program benefits relate to this study's EMS core strategy and additional strategies.

**Table 38. EPA PILOT PROGRAMS AND STUDY EMS STRATEGIES BENEFITS**

| BENEFITS TO IMPLEMENTING AN EMS | EPA PILOT PROGRAM | | | EMS STRATEGY | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | CORE | ADDITIONAL |
| Reduced costs | X | X | X | X | |
| Improved environmental performance (compliance) | X | X | X | X | |
| Environmental efficiencies | X | X | X | | X |
| Better relationships with regulators | X | X | X | | X |
| Better communications | X | | | | X |
| Improved bond rating | | X | | | |
| Reduced insurance premiums | | X | | | |
| Operational efficiencies and consistency | | X | | | X |
| Improved labor relationship with management | | X | | | X |
| Employee succession (easier) | | | X | | X |
| Risk reduction | | | X | | X |

Four of the benefits and barriers that were held in common in all the EPA pilot projects were also held in common by the cities in this study and helped form the core strategy.

The two benefits of reduced costs and improved environmental compliance are covered in the EMS core strategy. The other common benefits of environmental efficiencies and better relationships with regulators were covered under the additional EMS strategies. Additional strategies also covered operational efficiencies and consistency, improved labor relationships with management, employee succession, and risk reduction.

Table 39 shows the relationship between how the EPA pilot program barriers relate to this study's EMS core strategy and additional strategies.

**Table 39. EPA PILOT PROGRAMS AND STUDY EMS STRATEGIES BARRIERS**

| BARRIERS TO IMPLEMENTING AN EMS | EPA PILOT PROGRAM | | | EMS STRATEGY | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | CORE | ADDITIONAL |
| Top Management Involvement | X | X | X | X | |
| Dedicated Resources | X | X | X | X | |
| Employee Buy-in | X | X | X | | X |
| Public Awareness | X | | | | |
| Political Support Uncertainty | X | | | | X |
| Dedicated Implementation Team | | X | | | X |
| Employee Training | | X | | X | |
| Program Design | | | X | X | |
| Incremental Implementation | | | X | X | |
| Communications | | | X | | X |
| Outside Guidance and Support | | | X | | |

The two barriers of top management involvement and dedicated resources are covered in the EMS core strategy. The core strategy also covered program design and incremental implementation. The other common barrier of employee buy-in is covered under the additional EMS strategies. Additional strategies also covered political support, employee training, communications, employee succession, and risk reduction.

The major differences between the common benefits and barriers reported in EPA pilot programs and the core strategy revealed in this study are due to when the data were gathered. The pilot program's data were taken after the implementation (*a posteriori)* when the benefits and barriers were known, while this study is being done prior to EMS implementation *(a priori)* when the benefits and barriers must be envisioned or related to other programs.

# CHAPTER VI

## CONCLUSIONS AND RECOMMENDATIONS

This study was carried out in an area of the country that is not known for environmental innovation (Reed 2009, Wingfield and Marcus 2007, Bacot and Dawes 1997). Its major industries are not on the cutting edge of the green revolution, and its governments are not being seen as environmentally friendly. If that is true, why carry out research on environmental management?

Because today the cities in this state are waking up to a new era of environmental change and need to find a way to be able to adapt to this change. They are plagued by compliance problems, consent decrees, solid waste disposal issues, garbage problems, wastewater overflows, air pollution, and a host of other environmental issues. Informed citizens want their cities to become more sustainable while not increasing taxes. All this occurs while cities face aging infrastructure, rapid growth in urban areas, drought and resultant water problems, rising fuel costs, loss of employers, stagnant or shrinking budgets, and disappearing work forces. One possible solution to some of these pressing issues is to adopt an Environmental Management System.

All the cities in this study share key commonalities (structure, operations, sales taxes, compliance, region, etc.) but also have distinct differences (top management, city councils, budgeting, funding, environmental views, etc). Literature on EMS implementation by governmental entities (EPA 2000, 2002, 2005) provided the common benefits and barriers while interviews with municipal managers provided information on how each one of these benefits and barriers impacted their city. No two cities were alike in their responses although some cities held similar views.

This study has revealed some key commonalties and differences between cites in this state in regards to EMS implementation:

1. Commonalities and differences.
    a. Small cities tend to have stable and supportive mayors and city councils.
        i. Except the cities experiencing rapid growth.
    b. Political support in large cities is complicated and ever changing.
    c. A strong city manager or mayor can make a program happen.

    d. Resources and budgetary considerations vary immensely from city to city.
        i. It is not dependent on size or location.
    e. Age, background, gender, and educational field appear to have a great deal to do with how managers view environmental issues (observations).
    f. Manager views are dictated by their respective level in the city administration.
        i. The higher you are, the more you see yourself as top management.
    g. Communications need to be enhanced in all cities.
        i. The larger a city gets, the more complicated and complex the communications.
    h. Cities tend to have stable work forces.
        i. Except those small cities who don't have high enough pay rates.
    i. Cities in this study reflected what cities in the EPA pilot programs felt were important benefits and barriers.
2. There is a need, and a desire, for cities to improve environmental operations (compliance and efficiency).
    a. There is a belief in some cities that they will never be environmentally proactive.
3. Cities would like to implement a program but need help with funding, implementation, training, and program design.
4. Many cities lack qualified personnel (or just personnel) to implement a new program.
5. City managers are the key to EMS programs, but employees are the backbone of the EMS.
6. Cities are really businesses with citizens being customers and shareholders.
7. There needs to be an entity that can provide environmental information and research that isn't also responsible for enforcement and inspections.
8. A benefit/cost analysis needs to be developed for EMS implementation.
9. Citizens are becoming more active in this state in regards to environmental issues and sustainability and are demanding cities take action.
10. Cities that are environmentally proactive are usually driven by a single person or single group (citizens, mayor, city manager, or department director/manager).

11. Implementation will need to be top-down directed (city manager) and bottom-up implemented (employee).
12. Benefits are harder to envision than barriers.
    a. Cities understand barriers and their abilities to overcome them better than they can envision benefits and their ability to enhance them.
        i. Managers run into barriers with many other programs on a day-to-day basis in their jobs.

**Limitations**

This study was carried out in cities in Oklahoma with populations greater than 20,000 and reports only the views of these cities. Although all cities carry out day-to-day operations in a similar manner, it may not be applicable to cities with smaller populations. Future research is needed in these cities. The study was carried out in a state with a relatively small population (3.7 million) and consequently only 21 cities larger than 20,000. The study was based on a variety of city sizes from across the U.S. and supports the findings of other studies.

This study was carried out in an area of the country that is not environmentally innovative and therefore, may not be representative of cities in other areas of the country. Although, the study was based upon managers' views of the benefits and barriers identified in previous studies from across the U.S. (EPA 2000, 2002, 2005; Dallas 2011), and not on additional benefits and barriers that may be unique to Oklahoma.

All cities in this study had similar city administrations (city managers) and, therefore, it may not be applicable to other forms of city administration. Again, although the study is based on managers' views of the benefits and barriers identified in previous studies from across the U.S. (EPA 2002, 2002, 2005; Dallas 2011), the results should be reflective of and applicable to cities in other regions.

**Future Work**

Municipal managers were asked EMS implementation follow-up questions during the strategy survey. The following recommendations for future work are based upon these questions and their respective answers.

***Take the developed strategies and turn it into a pilot project.***

Nine cities in this study would like to participate in a pilot program. I recommend starting with the city that has the least amount of work, will take the shortest time,

and expend the fewest resources. This would help define the benefits and costs that would be expected for other cities and gauge the time it will take to implement a program. This pilot program can be used to develop a follow-on program or another pilot program. This pilot program can help raise environmental awareness about EMS implementation throughout the state.

***There needs to be a center to provide environmental information for cities.***

An environmental clearinghouse and research center for cities in Oklahoma needs to be established. Research universities seem to be the best places to house such a center. It should be separate from, but work with, the regulatory agencies. OSU as a land-grant institution seems the ideal location. Research into forming a Public Entity EMS Information and Research (PEER) Center seems to be warranted.

**Further Research**

***Benefit/Cost Analysis for cities that want to adopt an EMS***

Currently, there is no definitive research on benefit analysis for EMS implementation. The cost to implement programs has been researched by surveys, pilot projects, and reports (GETF 1996; NDEMS 1999; EPA 2002, 2002, 2005;Environmental.Systems Update 2006), but very little has been done to quantify benefits. Information on payback time for cities could also be generated during this research.

Many of the municipal managers in this study related that a benefit/cost analysis would be needed to sell the program to top management and city councils. Providing accurate payback times and benefits dollars would be valuable in selling the program in areas of the country that are not “environmentally innovative” and to cities that are having “fiscal issues.”

***Assess the environmental needs of all cities in Oklahoma***

Develop a survey to measure how the cities of this state (with populations under 20,000) view their environmental operations. This would provide a baseline for all Oklahoma cities for EMS implementation.

***EMS Surveys for other states***

Surveys need to be performed in other states and especially those states who are not “environmentally innovative” to assess whether an EMS makes sense for the cities in those states.

## Conclusion

An EMS will provide cities a management system to enhance their environmental operations and give them the opportunity to see a variety of benefits, benefits that can save money, provide operational efficiencies, improve external and internal relationships, reduce risks, empower employees, improve communications, enhance city image, and change how the city and its employees view the environment. It will take the environmental issues from being the "last thing that is looked at" to becoming part of everyday operations and planning. It will help them reduce or eliminate many of their environmental problems while maintaining services and saving tax dollars.

This study revealed that what stands in the way of this environmental progress is leadership. Someone must take the first step and implement an EMS. Once it has been done, there will be cost and benefit data that may support other cities adopting an EMS. Once it has been done, the lessons learned can help produce streamlined processes that can provide for easier program implementations. Once it has been done, city managers can sell the program to their peers and adjacent cities. Once it has been done, Oklahoma can start to be an "environmentally innovative" state and responsive to its citizens.

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APPENDICES

APPENDIX A—OKLAHOMA CITIES WITH POPULATIONS OVER 20,000

(2010 U.S. CENSUS)

| GEOGRAPHIC AREA | CENSUS |
|---|---|
| **UNITED STATES** | **308,745,538** |
| **OKLAHOMA** | **3,751,351** |
| 1. Oklahoma City city | 579,999 |
| 2. Tulsa city | 391,906 |
| 3. Norman city | 110,925 |
| 4. Broken Arrow city | 98,850 |
| 5. Lawton city | 96,867 |
| 6. Edmond city | 81,405 |
| 7. Moore city | 55,081 |
| 8. Midwest City city | 54,371 |
| 9. Enid city | 49,379 |
| 10. Stillwater city | 45,688 |
| 11. Muskogee city | 39,223 |
| 12. Bartlesville city | 35,750 |
| 13. Shawnee city | 29,857 |
| 14. Owasso city | 28,915 |
| 15. Ponca City city | 25,387 |
| 16. Ardmore city | 24,283 |
| 17. Duncan city | 23,431 |
| 18. Yukon city | 22,709 |
| 19. Del City city | 21,332 |
| 20. Bixby city | 20,884 |
| 21. Sapulpa city | 20,544 |

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APPENDIX B—U.S. ENVIRONMENTAL PROTECTION AGENCY ENVIRONMENTAL MANAGEMENT SYSTEM INITIATIVES FOR GOVERNMENTAL AGENCIES

## FIRST INITIATIVE – AUGUST 1997 TO JULY 1998

| ENTITY | FENCELINE (AREA OF EMS) |
|---|---|
| City of Lowell, Massachusetts | Waste Water Utility |
| City of Gaithersburg, Maryland | Public Works, Parks Maintenance and Engineering Admin Facility |
| City of Londonderry, New Hampshire | Public Works Department |
| Massachusetts Corrections Institute Norfolk, Massachusetts | MCI Norfolk |
| New York City Transit Authority New York, New York | Capital Program Management Department |
| City of Scottsdale, Arizona | Financial Services and Water Resources |
| Wayne County, Michigan | Wyandotte Wastewater Treatment Facility |
| Indianapolis, Indiana | Department of Public Works Operations Garages |
| Lansing, Michigan | Erickson Station – Coal Burning Electrical Generation |

## SECOND INITIATIVE - APRIL 2000 TO MARCH 2002

| ENTITY | FENCELINE (AREA OF EMS) |
|---|---|
| City of San Diego, CA | Refuse Disposal Division |
| Port of Houston, TX | Barbour's Cut Container Terminal and the Turning Basins Central Maintenance Facility |
| Jefferson County, AL | General Services Department and Fleet Mgmt |
| Tri-County Metropolitan Transportation District, Portland, OR | Maintenance Facilities (5) |
| Wisconsin Department of Transportation Madison, WI | Benzene Reduction Action Team Company |
| University of Massachusetts, Lowell, MA | Onley Science Building |
| City of Berkley, CA | Solid Waste Management Division |
| New Hampshire Department of Transportation, Concord, NH | Bureau of Traffic |
| King County Solid Waste Division, Seattle, WA | Solid Waste Division |

| SECOND INITIATIVE – APRIL 2000 TO MARCH 2002 (continued) | |
|---|---|
| **ENTITY** | **FENCELINE (AREA OF EMS)** |
| Massachusetts Department of Environmental Protection, Lawrence, MA | Wall Experiment Station (water and wastewater research) |
| City of Detroit, MI | Recreation Department and the Public Lighting Department |
| Florida Gulf Coast University, Ft. Myers, FL | Solid Waste, Stewardship of Mitigation/Greenspace Areas, Energy Efficiency and Purchasing |
| Louisville and Jefferson County Metropolitan Sewer District, Louisville, KY | Morris Foreman Wastewater Treatment Plant |
| Little Blue Valley Sewer District, Independence, MO | Entire Organization |

## THIRD INITIATIVE - JANUARY 2003 TO DECEMBER 2004

| ENTITY | FENCELINE (AREA OF EMS) |
|---|---|
| City of Charlottesville, VA | Parks and Recreation Division |
| City of Kansas City, MO | Household Hazardous Waste and Solid Waste Divisions |
| Clarke County Department of Public Works, Vancouver, WA | Equipment Services Department |
| Kent County Department of Public Works, Dover, DE | Wastewater Treatment Facility |
| Metro Waste Authority, Des Moines, IA | Landfill and Regional Collection Center |
| Oakland County Drain Commissioner's Office, Waterford, MI | Wastewater Treatment Plant Complex |
| Orange County Convention Center, Orlando, FL | Building Services and Waste Management |
| Rivanna Water and Sewer Authority, Charlottesville, VA | Moore's Creek Wastewater Treatment Plant |
| Sacramento Municipal Utility District, Sacramento, CA | Energy Supply Business Unit |

# APPENDIX C—SUMMARY RESULTS OF EPA EMS INITIATIVES FOR GOVERNMENTAL ENTITIES

## Summary of First US EPA Initiative for Governmental Entities – August 1997 to July 1998

### Lowell, MA (Wastewater Treatment Plant)

Drivers

1. Enhance city image.
2. Improve its environmental performance.
3. Help lead private sector toward ISO.
4. Maximize efficiency, reduce costs and avoid environmental emergencies thus saving tax payer money.

Keys to success

1. Support of upper management and dedicated staff.
2. Consultant – filled gap on document control and EMS manual development.

Hurdles

1. Time - education.
2. Money-work time and consultant.
    a. In-kind donations from the community were significant.
3. Staff turnover – hurt.
4. Show of support and community buy-in.

Benefits

1. Communications – up and down.
2. Shared decision making.
3. Employee empowerment-big picture of city.
4. Increased efficiency
5. Cost Savings measured in 2006 (Business and the Environment, 2006)
    a. Waste reduction 28% ($100,000 savings)
    b. Energy Reduction 6% ($300,000 savings)

Lessons learned

1. Bring on consultant early – training, education.

2. Do additional facilities – reduced the amount of duplication of effort (training and education).
3. Difficulty developing metrics – new process have to develop baselines.

Cost ($)

Labor – 27,100

Consultant – 10,500

Travel – 3,100

Materials 1,700

**Gaithersburg, MD (Parks Maintenance & Engineering Administration's facility)**

Drivers

1. Help do a more thorough and accurate job in monitoring and controlling environmental impacts.
2. Increase the efficiency and productivity while meeting the environmental obligations.
3. Increase employee and citizen environmental awareness.
4. Help attract new business.
5. Identify areas for continuous improvement through measurement and monitoring.

Keys to success

1. Core team – had representatives of City Manager and PW Departments – they control budget and capital improvement.
2. Management support.
3. Creation of an Environmental Specialist position – overseeing EMS.

Hurdles

1. Identifying lead requirements.
2. Introducing project to employees.
3. Conducting a gaps analysis.
4. Developing a baseline.
5. Developing a documentation plan.
6. Implementing documentation where none was needed in the past.
7. Missing work procedures.

Benefits

1. Defining roles and responsibilities with regard to legal requirements.
2. Identifying responsibility for compliance issues.
3. Better communication between divisions.
4. Documentation of procedures and work instructions provides consistent and reliable methods for dealing with environmental aspects.
5. Identification of goals to reduce the cities environmental impacts.
6. Improved safety and hazardous awareness for workers.
7. Potential water and cost savings.

Lessons Learned

1. Involve everyone from the beginning (get everyone motivated).
2. Utilize community efforts that are already in place.

Cost ($)

Labor – 22,600

Consultant – 0

Travel – 3,600

Materials -700

**MCI Norfolk MA (MCI)**

Drivers

1. Model for other facilities.
2. Improve relations with community and regulators.
3. Monitor compliance with regulations

Keys

1. Top management commitment.
2. Outside help.
3. Hard work.

Hurdles

1. Time-designated one day as ISO day solve most problems.
2. Difficultly in setting goal and objectives.
3. Lack of time, money and staff.

Benefits

1. Better control of activities with work procedures.
2. Develop work procedures where sloppy work behavior or performance existed in past.
3. Unified work procedures.

Lessons learned

1. Top management support – resources, time, people.
2. Keep it small and manageable.
3. Do not hesitate to ask for help and advice.

Cost ($)

Labor – 53,000

Consultant – 0

Travel – 2,700

Materials – 1,100

**NYC Transit Authority, NY, NY (Capitol Program Management Department)**

Drivers

1. Improve overall environmental performance.
2. Increase energy efficiency.
3. Improve resource conservation.
4. Reduce environmental Impacts.
5. Incorporate Design for Environment in planning, design and construction.

Keys

Team Approach

1. Excellent communications and follow-up skills.
2. Dedicated top management support.
3. Dedicated leadership and management.
4. Building good working relationships within division and NYCTA.
5. Exercising patience.
6. Being a good listener.
7. Allowing widespread EMS ownership (by all).
8. Good auditing program

Hurdles

1. Must deal with entities with which you have no control.
2. Time.
3. Outside force had to be reasoned with.
4. Politics involved within large organization.
5. Documentation control in large organization troublesome.
6. Significance is important.
7. Keep it simple as possible.
8. May need alternate methods of monitoring and measurement.

Benefits

1. New evaluation of contractors and consultants – different perspectives now.
2. Provides structure, discipline and context to previous program.
3. Collection and storage of records in organized manner.
4. Promoted Design for the Environment.
5. Improved communications within and without.
6. Volunteer employee teams.
7. Improved environmental performance.
8. Improved environmental communications across organization.
9. Potential cost savings.
10. Improved public image.
11. Positive external publicity.
12. Increased internal credibility and awareness of EMS.

Lessons Learned

1. Total commitment of senior management.
2. Positive commitment of employees through awareness training and volunteers.
3. Define fence line.
4. Early involvement of all units and operating departments

Cost ($)

Labor – 121,000

Consultant – 143,000

Travel – 14,000

Materials – 900

**Scottsdale, AZ (Financial and Water Resources Department)**

Drivers

1. Improved environmental performance.
2. Enhanced customer trust.
3. Improved regulatory partnerships.
4. Reduce liability.
5. Improved compliance.
6. Improved public image.
7. Improved environmental sustainability indicators.
8. Reduced costs.

Keys

1. Partnering with local organizations (doing the same type thing).
2. Communications throughout organizations.
3. Example of benefits and how it adds value.
4. Identify departmental champions.
5. Resource commitment (human and financial).
6. Establish a strong core team.
7. Have core team meet on regular basis.
8. Keep accurate documentation.
9. Keep top management involved throughout.
10. Attain support of not only top management but also middle management.
11. Demonstrate to those involved that outcome with benefit their departments and divisions.

Hurdles

1. Initial establishment of structure for oversight, core and steering committee.
2. Generating buy-in from all participants – get them involved early.
3. Work from general to specific with large organizations.

Benefits

1. Coordination of environmental issues, reduction of liability, local publicity, improvement in relationships with private business community.
2. Wider understanding of project, legal and regulatory requirements.
3. Departmental control of compliance with centralized tracking, record keeping and document control.

Lessons Learned

1. Create EMS infrastructure at onset.
2. Communicate effectively with staff through various media.
3. Directs communications based on audience's needs.
4. Indentify issues and outcomes the staff can relate to.
5. Involve top management.
6. Meet regularly with core team.
7. Benchmark with other organizations throughout process.
8. Limit size of oversight/technical support and steering committee.
9. Know and understand the ISO 4001 standard.
10. Implement policies and procedures as you go.
11. Applaud all those involved efforts.

Cost ($)

Labor – 103,000

Consultant – 0

Travel – 10,000

Materials – 23,000

**Wayne County, MI (Wastewater Treatment Facility)**

Drivers

1. Increase the efficiency in which the facility is managed and resource utilized.
2. Reduce risk and liability associated with potential EH&S violations.
3. Improved community relations.
4. Promote effective inter-communication and sharing of informational resources between departmental/divisional components.
5. Improve competitiveness and reduce the risk of privatization.

Keys

1. Research EMSs and similar industries.
2. Chose a Fenceline that organization has resource (and control over) to accomplish.
3. Commitment from top to bottom (all) before you start.
4. Put together a core team that has well rounded skills (technical, internal and external requirements, etc).

5. Top management commitment.
6. EMS point person with resources and authority to make it happen.
7. Continual communications during the process.

Hurdles

1. Determining training needs and providing training.
2. Availability of training materials internally.
3. Internal electronic communications.
4. Getting project management team going.
5. Implementing projects.

Benefits

1. Interdepartmental data sharing, communications and cooperation to achieve a common goal.
2. Better interdepartmental communications, allocation of resources and time to complete tasks.
3. Increase in the knowledge base of environmental, regulatory and legal policies and procedures that impact the facility.
4. Impact facility has on environment and correlation with organizational policies and procedures (or lack of) being realized at managerial level.
5. Facility management and core team beginning to realize complexity of issues of environmental management and all connecting processes.
6. Top management support help move EMS forward.

Lessons Learned

1. Keep it simple. Most of what was needed already existed. It needed to be pulled together in an organized and documentable system.
2. Spread the responsibility. Involve everyone.
3. As soon as something is developed get it out.
4. Top management and core team must really understand EMS and what will be required (resources).

Cost ($)

Labor -88,320

Consultant – 2,400

Travel – 15,719

Material – 4,150

**Indianapolis, IN (DPW Maintenance Garages)**

Drivers

1. Reduce environmental impact in a cost-effective manner.
2. Effective and efficient service to customers.
3. Improve working environment for employees.
4. Enhance the City's image as an environmentally responsible and competitive city.
5. Give the City experience with making cost effective environmental improvements that will put the city in position to argue against environmental initiative that are not cost effective.

Keys

1. Active support by upper management – leading the way.
2. Clear measures of success are needed to sell program.
3. Clear definition of responsibilities for various participants in EMS effort.
4. Core team needs to be inclusive (labor unions).
5. Maintenance of momentum is critical.

Hurdles

1. Initial assessment of an operation can produce an apparently overwhelming number of issues. Use technical experts from those areas.
2. Inability to quantify benefits of EMS.
3. Loss of people to other projects.
4. Reassigning of critical staff to other projects.
5. Failure to clearly defining roles and responsibilities at onset.

Benefits

1. Provided a unified system for inventory, management, and disposal of chemicals.
2. Shared awareness of activities that have environmental aspects.
3. Development of New Products Committee (less harmful chemicals and better safety result)
4. Improved communications with workers.
5. Drum program: reduce waste, reduce spills, saves money.

Cost ($)

Labor – 39,000

Consultant – 9,700

Travel – 6,000

Materials – 0

**Lansing, MI (Coal Burning Power Plant)**

Driver

1. Improve internal and external communications.
2. Organize, streamline, and consistently manage environmental issues and regulatory responsibility.

Keys

1. Highly skilled technical core team.
2. Ability of that team to work as a group, providing positive support in all problem solving activities.

Hurdles

1. Limited resources for design and implementation – undergoing restructuring at time.
2. Difficult to overcome organizational attitude and culture tied to production.
3. Difficulty in scheduling meetings.
4. Time.
5. Group work.

Benefits

1. Understanding of ISO 14000.
2. Process analysis and mapping.

Lessons Learned

1. Need more diverse and inclusive core team.
2. Detailed project schedule and buy-in.
3. Management buy-in and leadership.
4. Implement each stage as developed.

Cost ($)

Labor – 53, 500

Consultant – 0

Travel – 2,100

Material – 0

**Summary of Second US EPA Initiative for Governmental Entities – April 2000 to March 2002**

**Tri-Met, Portland, OR (Maintenance Facilities (5))**

Key Drivers

1. Improve employee participation in the facility's environmental performance.
2. Improve overall environmental performance.
3. Improve compliance with environmental regulations; and use employee creativity to move beyond regulation.
4. Increase support from environmental professionals (EPA, DOE, and DEQ).
5. Governor Executive order mandating sustainable state offices by 2025.

Benefits

1. Streamline communications concerning environmental practices. Better defined roles and responsibilities allowing for more freedom to implement EMS procedures.
2. Identification of areas where utility savings existed.
3. Allow employees the freedom to design their systems to fit their needs rather than having to change operations to fit environmental regulations.
4. Reduce Tri-Met's environmental footprint through more efficient operations.
5. Focus on continual improvement of maintenance, ridership and EMS.

Costs ($)

Labor and Consultant – 89,241 (Labor time -2,809 hrs)

**San Diego, CA (Solid Waste – Refuse Disposal)**

Key Drivers

1. Improve employee participation in environmental performance.
2. Improve city's environmental performance.
3. Gain competitive advantage for city when it comes to privatization.
4. Availability of government assistance for EMS program.
5. Valuable public relations tool.

Benefits

1. Significant saving in potable water usage, fuel and equipment usage (savings approaching 886K/y).
2. Increased environmental awareness as employee s view operations and processes from an EMS prospective.
3. Opportunity to identify environmental impacts throughout the division (both positive and negative).
4. Ability to see more clearly the environmental consequences of our operations by focusing on flow charting of impacts and aspects.
5. Operational cost savings realized by viewing our fenceline with an EMS perspective. Saving realized as the operational controls are implemented throughout the Environmental Management Programs.

Cost ($)

Direct labor - 195,563.67

Consultant – 18,345.26

Hours – 6091

**Jefferson County, AL (General Services and Fleet Management)**

Key Drivers

1. A conviction that insurers and bond agencies could reward the adoption of an EMS, acknowledging a safe work environment and reduced risks with better rates.
2. Valuable marketing and public relations tool the clearly demonstrated the County's desire to hold itself to higher environmental conduct.
3. Numerous regulatory benefits and potential for improving employee participation in the facility's environmental performance.
4. Improve facility compliance with environmental regulations.
5. The widening enthusiasm for the EMS concept with environmental professionals.
6. The high availability of governmental assistants programs to aid in an EMS development.
7. The ability to partner environmental management with existing health and safety programs.

Benefits

1. Increased employee environmental awareness.

2. Operating procedures that have been established are standardizing the flow of work, ensuring that our activities are both efficient and as sensitive as possible to environmental concerns.
3. The EMS has opened opportunities with departments outside of the fenceline.

Cost ($)

Labor – 92,734

Hours - 3877

**Port of Houston, TX (Container Terminal, Central Maintenance Facility)**

Key Drivers

1. Potential to improve environmental performance.
2. Improve employee's awareness of environmental issues and participation in the environmental program.
3. Reduction in cost.
4. Potential for regulatory benefits.
5. Valuable public relations and marketing tool.
6. Consistent with the PHA's overall environmental principals.

Benefits

1. Improved environmental performance –through process mapping and development of objectives and targets (increase recycling, decrease use of products, and reduce storm water runoff impacts).
2. Increased internal environmental awareness.
3. Enhance management confidence in the environmental program.
4. Leaders in the Industry!

Cost ($)

Labor – 97,256

Hours – 3685

**Benzene Reduction Action Team (Company), WI (Manage Benzene Emissions)**

**Joint virtual company between state and industry (WDNR and WCMA)**

Key Drivers

1. Systematic management of a pollutant will enable BRAT Co to shift towards reductions in Benzene though education and best practice base on pollution prevention an provide a regulatory framework to recognize these efforts vice a regulatory framework the restricts operations.

Lessons learned

2. Aspect identification exercises lead to a better understanding of the complexity and interconnections of regulatory and industrial activities.
3. Working as partners in BRAT Co builds understanding of how regulatory work is perceived by those outside of WI Department of Natural Resources.
4. Allows learning by doing.

Benefits

1. Management system approach provides the Department and Industry with response to increase public awareness and concerns about benzene.
2. Provides a tool for reducing benzene emissions outside of current regulatory structure.
3. Provides an opportunity to pilot alternative regulatory approaches.
4. Promotes environmental quality by sharing knowledge, responsibility, decision making, recognition and costs.

Cost ($)

Labor – 350,323

Hours – 6271

**King County, Seattle, WA (Solid Waste Division)**

Key Drivers

1. Competitive advantage over private sector.
2. Regulatory Benefits.
3. Improved compliance with environmental regulations.
4. Improvement in environmental performance.
5. Potential for improvement employee participation in facility's environmental performance.

Lessons Learned

Getting staff to meetings is hard.  All need to be reminded of every meeting.

1. Communications methods vary on staff.
2. Diverse committee from both field and office with diverse expertise.
3. Field staff participation is limited to meetings.

Benefits

1. Reduction in water and electrical usage.
2. High level of involvement to change culture of organization into one that is more inclusive and participatory.
3. All environmental regulations in one clear document.
4. Areas needing improvement in regulations management found during process.
5. EMS process pointed out both strengths and weakness and areas of opportunity.

Cost ($)

Labor – 119.828.59

Hours 3,330

**New Hampshire DOT (Traffic Division)**

Key Drivers

1. Adoption of EMS as a Supplemental Environmental Project (DOT driven)
2. Consistent with overall environmental principals.
3. Improved compliance with regulations and may lead to regulatory benefits.
4. Improve employee's environmental performance.
5. May reduce cost of operational activities.
6. Valuable public relations tool.
7. Pilot program to implement in whole department.

Benefits

1. Consistent message delivered to field.
2. Flow diagrams developed for environmental hot spots were used to conduct job hazard analyses to pinpoint safety areas.
3. Flow diagrams use in new employee orientation for environmental and safety.
4. Effort to incorporate EMS and safety programs.

Cost ($)

Labor – 96,817

Hour – 3909

**City of Berkley, Ca (Solid Waste Management)**

Key Drivers

1. Improving employee's participation in facility's environmental performance.
2. Improving overall environmental performance.
3. EMS consistent with the City's overall environmental principals
4. May be valuable marketing tool.
5. May be valuable public relations tool.
6. May reduce cost.
7. May provide competitive advantage.

Benefits

1. Found serious conditions in need of immediate mitigation.
2. Met some legal requirements (Cal-OSHA) through additional training.
3. Reduce air pollution through bio-diesel.
4. Respect and better cooperation on budget changes and purchase requirements related to environmental improvements.
5. Core team called upon by many outside entities for information and consultation.

Cost ($)

Labor – 93,266

Hours – 3813

**Louisville and Jefferson County, KY (Water Treatment Plant)**

Key Drivers

More structure for implanting CERES principals into day-to-day operations.

1. Improved individual employees performance in fulfilling environmental responsibilities would improve the facility's overall environmental performance.
2. Environmental auditing team need expanded area of operations (CERES principal 10)
3. Local and Industry leadership role in environmental stewardship furthered.
4. Supports strategic business plan.
5. Gain valued based experience and training (from EPA)

Lessons Learned

1. Get upper management support – when resistance to change happens- you have backing.
2. Need big picture and detail oriented people – management to shop floor.
3. Assign tasks based on aptitude and interest - not necessarily the organization chart.
4. Communicate, communicate, and then communicate.
5. Help middle level managers with first drafts for review.
6. Meet with key personnel to help them with worries and to gain understanding and find compromises.
7. Look for quick wins of importance to implementation team.

Benefits

1. Employees have increased awareness, understanding, and interest in the environmental impacts of their jobs.
2. Specific objectives and targets show employees and external stakeholders that the environmental commitment goes beyond broad based policies.
3. Systematic reviews of environmental impacts provide valuable insights.
4. Formalized procedures and process allow picking up of things that would otherwise fall through cracks.

Cost ($)

Labor – 67,102

Hours – 2486

**UMASS Lowell, MA (Science Building)**

Key Drivers

1. Students need to understand “standard environmental operating procedures.’
2. Valuable education, outreach, and public marketing tool.
3. Empower and engage everyone to participate in management of building.
4. Position UMASS for more grants and contracts.
5. Improve employee participation in facilities environmental regulations.
6. Environmental management professionals supporting EMS.
7. Availability of government assistance (EPA).
8. Consistent with UMASS overall environmental leadership principles.

Benefits

1. People coming together and actively communicating.
2. Empowering people by seeking their thoughts and environmental concerns.
3. Clear understanding of important issues to stakeholders.
4. Coming together of administration and employees.

Cost ($)

Labor – 181,163

Hours – 4568

**City of Detroit, MI (Recreation and Public Lighting Departments)**

Key Drivers

1. Adoption of an EMS may reduce City costs.
2. Adoption of an EMS may improve City employee's participation in the facility's environmental performance.
3. An EMS is expected to improve environmental performance.
4. An EMS may improve facility compliance with environmental regulations.
5. Insures may reward EMS implementation.
6. EMS adoption may be a valuable public relations tool.
7. Environmental management professionals increasing support EMS.
8. Adoption of an EMS is supportive of the City facilities overall environmental principals.

Benefits

1. EMS is an employee based process; it gave them control over the EMS.
2. Gave the departments the skills to implement standard operating procedures.
3. Aided in training employees to be more effective and conscious of their work environment.
4. Increased performance and at the same time improved safe work practices.
5. Reduced the amount of waste oil stored at facilities.
6. Provided interaction with other municipalities/industries.
7. Improved relations among departments involved.

Cost ($)

Labor – 131,759.45

Hours -3,536

**MASS Department of Environmental Protection (Wall Street Station – Water, Wastewater R&D)**

Key Drivers

1. Reduce costs.
2. Consistent with overall environmental principals.
3. Improve environmental performance.
4. Leading by example.
5. Encouraging use of EMS.
6. Raising staff awareness of EMS.
7. Learn firsthand what it takes to implement an EMS.
8. Prevent/reduce environmental impacts.
9. Reduce operational exposure.
10. Demonstrate leadership in lab community.

Benefits

1. Increased awareness of EMS by lab community.
2. Great awareness and understanding of EMS by DEP Staff (>200)
3. Enthusiasm among project staff about reducing impacts to the environment, resource conservation and operational improvements.
4. Key staff received extra training.
5. Enhanced cross program communications.

**Florida Gulf Coast University, Ft. Meyers, FL (Various)**

Key Drivers

1. First academic institution to have EMS integrated into academics, operations, and planning areas of the university.
2. EMS adoption may be valuable marketing tool.
3. EMS adoption may be a valuable public relations tool.
4. May provide competitive edge over privatization.
5. May improve employee's participation in the facility's environmental performance.
6. Consistent with facilities overall environmental principals.
7. Strengthen understanding and cooperation of all university personnel toward achieving FCCU environmental goals.

Benefits

1. Public relations benefit; community supportive of initiative with EPA.
2. Potential project opportunities with local agencies.
3. National visibility; growing interest in FCCU environmental initiatives.

Cost ($)

Labor – 188,900

Hours – 5,500

**Little Blue Independent Sewer District, Independence, MO (Entire Organization)**

Key Drivers

1. Adoption of EMS may reduce our costs.
2. Adoption of EMS may provide a competitive advantage versus privatization.
3. Adoption of EMS may improve our employee's participation in the facility's environmental performance.
4. Adoption of EMS may improve compliance with environmental regulations.
5. Adoption of EMS is consistent with the facility's overall environmental principals.
6. Support Missouri Quality Award Goal
7. Support several strategic goals.

Benefits

EMS was stopped to build new facility.

**Summary of Third US EPA Initiative for Governmental Entities – January 2002 to December 2004**

**City of Charlottesville, VA (Parks and Recreation)**

Key Drivers

1. City policy mandated an EMS.
2. Creditability and accountability with community and regulators.
3. Desire to be innovator and leader in environmental stewardship.
4. Need to capture institutional knowledge to deal with staff turnover.
5. Need to quickly adjust to changing operations.
6. Minimize environmental impacts and maximize improvements.

7. An ultimate goal of attaining sustainable operations.
8. Risk reduction.

Benefits

1. Citywide chemical management program.
2. Citywide fuel oil storage tank program.
3. Water consumption baseline established.
4. Significant changes in vegetative debris program.
5. Clear guidelines and guidelines for vehicle and equipment washing.
6. Enhance compliance posture and accountability (cost avoidance).
7. Enhance internal communications, training, and documentation of institutional (tribal) knowledge.
8. Improved record keeping.
9. Environmental awareness at a level not previously seen.
10. Current and future projects linked to EMS.
11. Legitimized /justified expenses on improvement projects.
12. Vehicle for dialogue on many issues.
13. Employees feel good that management wants to improve their work environment and protect the natural environment.
14. Provided visibility of the City's environmental commitment.
15. Public recognition (VODEQ)
16. Tremendous citizen support.

Cost ($)

Labor - 57,851

Consultant - 0

Travel – 6,795

Material – 10,000 (software split with Rivanna)

Time -2,393hrs

**Clark County, Vancouver, WA (Public Works – Equipment Services)**

Key Drivers

1. Leaving a lighter ecological footprint.
2. Improve employee participation in environmental performance.
3. Improve overall environmental performance.

4. Improve facility compliance with environmental regulation; an opportunity to use employee creativity to move beyond regulation.
5. Increase support from environmental regulators (EPA, Washington Department of Ecology, and local regulators).

Lessons Learned

1. Cross training and standards leads to smooth transition and hiring into system (turnover)

2. Internal audit is vitally important.

Benefits

1. Work instructions now written for shop efficiency and safety.
2. Diesel Fuel Cost Saving (10K/Y)
3. Hot Water High Pressure Washer (One time 6K savings)
4. Internal Audits.
5. Additional work and saving across board.

Cost ($)

Direct labor - 103,968

Hours – 2765

**City of Kansas City, MO (Solid Waste Division and HH Hazardous Waste)**

Key Drivers

1. Regulatory compliance – meets or exceeds all environmental regulations.
2. Employee morale- provides a work place that allows employee to put for their best effort.
3. Sustainable environment – preserve and enhance the natural environment and serves as a model of sustainable practices.
4. Public involvement – include the public as an active member.
5. Efficiency – use all resource as effectively and sustainably as possible.
6. Continuous improvement.

Benefits

1. Significant environmental improvements.
    a. Newer fuels, fuel conservation.
        i. Fewer emissions – ozone reduction.
2. Cost savings

a. Change in purchase of new trucks (APWA 2005)
    i. $367,000/yr saving on top of paying for trucks
        1. Fewer landfill trips
        2. Fewer miles driven
        3. Less maintenance required
        4. Less fuel used

**Kent County Department of Public Works, Milford, DE (Wastewater Treatment Facility)**

Key Drivers

1. Maintain compliance with all permits.
2. Reduce emissions into air, water, etc.
3. Optimize nutrient loading on local farms.
4. Improve plant safely.
5. Optimize use of operational resources.
6. Be in better fiscal shape to lower bond and insurance costs.
7. Build a better relationship with contractors.
8. Be an EMS leader within the State of Delaware and Kent County with respect to other governmental agencies and local industry.
9. Be a better environmental steward.
10. Improve relationship with general community and other interested stakeholders.
11. Be better able to handle job succession issues as related to “tribal knowledge.”
12. Receive third party certification (I4000, 18000).

Benefits

1. Energy savings.
2. Employee succession – Standard Operating Procedures.
3. Reduction in air pollution.
4. Improvement in the Chlorine Delivery System.
5. Sanitary Sewer Overflow Reductions.
6. Improved public image.
7. EMS leader in Delaware and region.

Cost ($)

Labor – 84,000

Hours – 2933

**Metro Waste Authority, Des Moines, IA (Landfill and Household Waste Collection Center)**

Key Drivers

1. Become more efficient and cost effective.
2. Establish MWA as forward thinking and environmentally sensitive.
3. Reduce liability and improve compliance.
4. Better communicating MWA environmental ethics and economic goals.

Benefits

1. Consistency in managing environmental impacts.
2. Driver for innovation and a new way of thinking.
3. Establishing an “environmental culture.”
4. Continual improvement in what we do and the way we do it.
5. Integrated processes and standards into a single system.
6. Better communication throughout the organization.
7. Improve handling of documents and records.
8. Demonstrated MWA’s commitment to going above and beyond environmental requirements.

Cost ($)

Labor – 69,761

Hours – 2482

**Oakland County Drain Commission, MI (Engineering and Construction, Operations and Maintenance)**

Key Drivers

1. Improve employee awareness of environmental issues.
2. Building positive working relationships with federal and state agencies.
3. Improving success in the environmental arena.
4. Positive impact on helping our customers.
5. Potential for improvement employee participation in facility’s environmental performance.

Lessons Learned

1. Getting staff to meetings is hard.  All need to be reminded of every meeting.
2. Communications methods vary on staff.

3. Diverse committee from both field and office with diverse expertise.
4. Field staff participation is limited to meetings.

Benefits

1. Retention of institutional knowledge through forms, procedures, and work instructions.
2. Commitment to customers is shown.
3. Continuous improvement.

**Orange County Convention Center, Orlando, Fl (Solid Waste)**

Key Drivers

1. Reduce trash to landfill.
2. Reduce tipping fees (cost savings).
3. First convention center in US.
4. Leader in Orange County government in EMS.

Benefits

1. Streamline environmental communications.
2. Increase environmental awareness among employees.
3. Better defined roles and responsibilities.
4. $30K/Y saving through recycling (tipping fee).
5. 157,000 cubic yards of landfill not used.
6. 3100 tons diverted for remanufacturing.
7. 50% recovery of all waste.
8. $11,000 in recycling rebates.
9. 260 tons of cardboard recycled.

Cost ($)

Labor – 61,517

Hour – 1723

**Rivanna Water and Sewer Authority, Charlottesville, VA (Wastewater Treatment Plant)**

Key Drivers

1. More effective operations
2. Lessen impact on the environment.
3. Expand communications with external stakeholders.

4. Gain positive community recognition.

Benefits

1. Increase environmental and worker protection.
2. Better understanding of operations.
3. Increase communications and trust.
4. Environmental suggestion incentive awards.
5. Odor, effluent, resource reductions.

Cost ($)

Labor – 49,000

Hours – 1820

**Sacramento Municipal Utility District, Sacramento, CA (Power Generation Department)**

Key Drivers

1. Provide added structure, organization, management oversight, and compliance associated with environmental affairs.
2. Reduce loss of institutional knowledge due to retirement and turnover.
3. Better define the operational roles and responsibilities for environmental management.
4. Improve awareness, communications, and integration of environmental protection with operations.
5. More closely align operational environmental performance with board direction and management policy.

Benefits

1. Installing new emergency generators with 3 times lower NOx emissions.
2. Installing new propane standby emergency generators with NOx 10 times lower than gasoline.
3. Repair to tunnels save $50-110K.
4. Conserving natural gas ($680K/Y).
5. Removal and resale of fuel oil ($37K).
6. Received P2 model shop award.

Cost ($)

Labor – 133,020

Hours – 1964

**Other EMS Data related to cost savings:**

**Commissioner of Public Works, Charleston, SC**

- Cost Savings (University of South Carolina, 2001)
  - 23% reduction in fuel cost
  - $175,000 in electrical savings at plants.
  - 108,000 kilowatt/hrs saved by changing lighting in the administration building
  - Most departments realized O&M saving that far outweighed cost of program

**Palm Bay Utilities Department, Palm Bay, FL**

- Cost Savings (Roberts 2010)
  - 34% reduction in energy costs over 3 years.
  - $1,150,000 saved over three years at water and wastewater plants with no change in service delivery when EMS combined with other continuous improvement programs
  - Improved Bond Rating Standard and Poor and Moody's
    - 9 and 18 months after EMS certification

**Water Treatment Plant, Richmond, VA**

- Cost Savings (City of Richmond, 2008)
  - Improved dewatering realized a savings of $368,335 in reduced hauling in one year.
  - $23,996 reduction in polymer costs.
  - Reduced phosphorus loading in river 10%

**Springdale Water Treatment Plant, Natick, MA**

- Savings (EPA 2005)
  - Approximately $40,000 avoided because a documented EMS standard operating procedure alleviated the need for back-up equipment (regulatory requirement).
  - Increased efficiency and operational consistency has resulted in a variety of cost and waste reductions (disposal cost decreases, recycled paper as a commodity, mixed compost).

**Wastewater Treatment Plant, Camden, NJ**

- Savings (EPA 2005)
    - Regularly discharging effluent that ranged from 12-18ppm, having struggled in the late 1990's to meet 30 ppm limits on a consistent basis.
    - 25% reduction in operations and maintenance costs from $21.2 million in 1996 to $16 million in 2000, resulting in a 6% lower rate than in 1996.
    - 20% increase in tonnage of sludge removed from the plant from 46,000 tons in 1999 to 55,000 tons in 2000.
    - 90% reduction in verified odor complaints from 16 in 1997-1998 to 2 in last 6 years.

**Eugene/Springfield Regional Water Pollution Control Facility, Eugene, OR**

- Savings (City of Eugene, 2002)
- Examples of savings realized in 2001 include:
    - Electrical power savings: Approximately $18,000, plus $28,500 in credits.
    - Paper use savings: Approximately $1700 (Combination of paper savings and reduced copier costs)
    - Garbage disposal savings: $2800.

APPENDIX D —BENEFIT AND BARRIER DATA

## BENEFIT RELATIVE IMPORTANCE DATA FROM INTERVIEWS (1-3 Scale)

| SUBJECT NUMBER | REDCOST | EEFFIC | COMPLIA | REGULAT | COMMS+ | BOND | INSUR | OPERAT | LABMAN | SUCCESS | RISK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EMS01 | 3 | 2 | 3 | 1 | 2 | 1 | 2 | 3 | 2 | 1 | 2 |
| EMS02 | 3 | 2 | 2 | 1 | 2 | 1 | 1 | 3 | 2 | 2 | 3 |
| EMS03 | 2 | 1 | 3 | 2 | 2 | 3 | 3 | 1 | 2 | 1 | 2 |
| EMS04 | 3 | 1 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 1 | 1 |
| EMS05 | 3 | 3 | 2 | 2 | 2 | 1 | 3 | 1 | 2 | 2 | 1 |
| EMS06 | 2 | 1 | 3 | 2 | 3 | 1 | 2 | 3 | 2 | 1 | 2 |
| EMS07 | 2 | 1 | 2 | 2 | 1 | 2 | 2 | 3 | 1 | 3 | 3 |
| EMS08 | 2 | 2 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 3 |
| EMS09 | 3 | 1 | 2 | 1 | 2 | 2 | 3 | 3 | 1 | 2 | 2 |
| EMS10 | 3 | 3 | 3 | 1 | 2 | 1 | 2 | 2 | 1 | 2 | 2 |
| EMS11 | 2 | 2 | 2 | 3 | 2 | 1 | 2 | 3 | 1 | 1 | 3 |
| EMS12 | 3 | 1 | 2 | 1 | 3 | 1 | 2 | 2 | 3 | 2 | 2 |
| EMS13 | 3 | 2 | 1 | 2 | 2 | 1 | 1 | 3 | 2 | 3 | 2 |
| EMS14 | 3 | 2 | 3 | 2 | 2 | 1 | 2 | 1 | 2 | 1 | 3 |
| EMS15 | 3 | 1 | 1 | 1 | 3 | 2 | 2 | 2 | 2 | 3 | 2 |
| EMS16 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 3 | 1 | 2 | 3 |
| EMS17 | 1 | 2 | 3 | 3 | 2 | 1 | 1 | 2 | 2 | 3 | 2 |
| EMS18 | 1 | 2 | 3 | 3 | 2 | 1 | 1 | 2 | 3 | 2 | 2 |
| EMS19 | 3 | 3 | 2 | 2 | 3 | 1 | 1 | 2 | 2 | 1 | 2 |
| EMS20 | 2 | 3 | 2 | 1 | 3 | 2 | 2 | 1 | 1 | 3 | 2 |
| EMS21 | 3 | 2 | 3 | 2 | 2 | 1 | 1 | 3 | 1 | 2 | 2 |
| **MEDIAN** | 3 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 2 |
| **MEAN** | 2.52 | 1.86 | 2.33 | 1.90 | 2.19 | 1.43 | 1.81 | 2.19 | 1.71 | 1.86 | 2.19 |
| **TOTAL** | 53 | 39 | 49 | 40 | 46 | 30 | 38 | 46 | 36 | 39 | 46 |
| **% POSSIBLE TOTAL** | 84.1 | 61.9 | 77.8 | 63.5 | 73.0 | 47.6 | 60.3 | 73.0 | 57.1 | 61.9 | 73.0 |

## BENEFIT RELATIVE EASE DATA FROM INTERVIEWS
## (1-3 Scale)

| SUBJECT NUMBER | REDCOST | EEFFIC | COMPLIA | REGULAT | COMMS+ | BOND | INSUR | OPERAT | LABMAN | SUCCESS | RISK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EMS01 | 1 | 3 | 3 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 3 |
| EMS02 | 3 | 1 | 1 | 2 | 1 | 2 | 2 | 3 | 2 | 3 | 2 |
| EMS03 | 1 | 1 | 3 | 2 | 2 | 3 | 3 | 1 | 2 | 2 | 2 |
| EMS04 | 1 | 1 | 1 | 2 | 3 | 2 | 2 | 2 | 3 | 3 | 2 |
| EMS05 | 1 | 1 | 2 | 3 | 1 | 2 | 2 | 2 | 3 | 3 | 2 |
| EMS06 | 2 | 1 | 3 | 2 | 3 | 1 | 2 | 3 | 2 | 1 | 2 |
| EMS07 | 3 | 2 | 2 | 3 | 1 | 2 | 2 | 1 | 2 | 1 | 3 |
| EMS08 | 2 | 3 | 3 | 2 | 2 | 2 | 1 | 3 | 1 | 1 | 2 |
| EMS09 | 3 | 1 | 2 | 2 | 2 | 2 | 2 | 1 | 3 | 1 | 3 |
| EMS10 | 3 | 3 | 3 | 2 | 1 | 2 | 2 | 2 | 1 | 1 | 2 |
| EMS11 | 2 | 3 | 3 | 2 | 2 | 1 | 1 | 1 | 2 | 2 | 3 |
| EMS12 | 3 | 1 | 1 | 2 | 1 | 2 | 3 | 3 | 2 | 2 | 2 |
| EMS13 | 1 | 2 | 1 | 3 | 3 | 2 | 2 | 2 | 3 | 1 | 2 |
| EMS14 | 3 | 2 | 3 | 2 | 2 | 1 | 1 | 3 | 2 | 2 | 1 |
| EMS15 | 1 | 2 | 3 | 1 | 2 | 1 | 2 | 3 | 2 | 2 | 3 |
| EMS16 | 1 | 1 | 2 | 3 | 3 | 1 | 2 | 2 | 3 | 2 | 2 |
| EMS17 | 1 | 2 | 2 | 2 | 1 | 2 | 2 | 3 | 1 | 3 | 3 |
| EMS18 | 1 | 2 | 2 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 2 |
| EMS19 | 1 | 1 | 3 | 2 | 1 | 2 | 2 | 3 | 2 | 2 | 3 |
| EMS20 | 2 | 2 | 3 | 3 | 2 | 1 | 1 | 2 | 2 | 3 | 1 |
| EMS21 | 1 | 2 | 2 | 3 | 1 | 3 | 3 | 1 | 2 | 2 | 2 |
| **MEDIAN** | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| **MEAN** | 1.76 | 1.76 | 2.29 | 2.24 | 1.86 | 1.86 | 1.95 | 2.10 | 2.00 | 1.95 | 2.24 |
| **TOTAL** | 37 | 37 | 48 | 47 | 39 | 39 | 41 | 44 | 42 | 41 | 47 |
| **% POSSIBLE TOTAL** | 58.7 | 58.7 | 76.1 | 74.6 | 61.9 | 61.9 | 65.0 | 69.8 | 66.6 | 65.0 | 74.6 |

## BENEFIT FAVORABILITY DATA FROM INTERVIWEWS
## (Benefit Importance and Ease were added together)

| SUBJECT NUMBER | REDCOST | EEFFIC | COMPLIA | REGULAT | COMMS+ | BOND | INSUR | OPERAT | LABMAN | SUCCESS | RISK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EMS01 | 6 | 3 | 4 | 4 | 4 | 3 | 4 | 5 | 5 | 3 | 3 |
| EMS02 | 6 | 3 | 3 | 3 | 3 | 3 | 3 | 6 | 4 | 5 | 5 |
| EMS03 | 3 | 2 | 6 | 4 | 4 | 6 | 6 | 2 | 4 | 3 | 4 |
| EMS04 | 4 | 2 | 3 | 5 | 5 | 5 | 4 | 4 | 5 | 4 | 3 |
| EMS05 | 4 | 4 | 4 | 5 | 3 | 3 | 5 | 3 | 5 | 5 | 3 |
| EMS06 | 4 | 2 | 6 | 4 | 6 | 2 | 4 | 6 | 4 | 2 | 4 |
| EMS07 | 5 | 3 | 4 | 5 | 2 | 4 | 4 | 4 | 3 | 4 | 6 |
| EMS08 | 4 | 5 | 6 | 5 | 4 | 4 | 3 | 4 | 2 | 2 | 5 |
| EMS09 | 6 | 2 | 4 | 3 | 4 | 4 | 5 | 4 | 4 | 3 | 5 |
| EMS10 | 6 | 6 | 6 | 3 | 3 | 3 | 4 | 4 | 2 | 3 | 4 |
| EMS11 | 4 | 5 | 5 | 5 | 4 | 2 | 3 | 4 | 3 | 3 | 6 |
| EMS12 | 6 | 2 | 3 | 3 | 4 | 3 | 5 | 5 | 5 | 4 | 4 |
| EMS13 | 4 | 4 | 2 | 5 | 5 | 3 | 3 | 5 | 5 | 4 | 4 |
| EMS14 | 6 | 4 | 6 | 4 | 4 | 2 | 3 | 4 | 4 | 3 | 4 |
| EMS15 | 4 | 3 | 4 | 2 | 5 | 3 | 4 | 5 | 4 | 5 | 5 |
| EMS16 | 4 | 3 | 4 | 5 | 5 | 2 | 3 | 5 | 4 | 4 | 5 |
| EMS17 | 2 | 4 | 5 | 5 | 3 | 3 | 3 | 5 | 3 | 6 | 5 |
| EMS18 | 2 | 4 | 5 | 6 | 5 | 4 | 3 | 3 | 4 | 4 | 4 |
| EMS19 | 4 | 4 | 5 | 4 | 4 | 3 | 3 | 5 | 4 | 3 | 5 |
| EMS20 | 4 | 5 | 5 | 4 | 5 | 3 | 3 | 3 | 3 | 6 | 3 |
| EMS21 | 4 | 4 | 5 | 5 | 3 | 4 | 4 | 4 | 3 | 4 | 4 |
| **MEAN** | 4.38 | 3.52 | 4.52 | 4.24 | 4.05 | 3.29 | 3.76 | 4.29 | 3.81 | 3.81 | 4.33 |
| **MEDIAN** | 4 | 4 | 5 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 |
| **TOTAL** | 92 | 74 | 95 | 89 | 85 | 69 | 79 | 90 | 80 | 80 | 91 |
| **% POSSIBLE TOTAL** | 73.0 | 58.7 | 75.4 | 70.6 | 67.5 | 54.8 | 62.7 | 71.4 | 63.5 | 63.5 | 72.2 |

## BARRIER RELATIVE IMPORTANCE DATA FROM INTERVIEWS
## (1-3 Scale)

| SUBJECT NUMBER | TOPMAN | RESOUR | BUY-IN | PUBLIC | POLITIC | IMPTEAM | TRAINING | PRODESG | INCREMT | COMMS- | OUTSIDE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EMS01 | 1 | 2 | 2 | 2 | 1 | 1 | 2 | 3 | 3 | 2 | 3 |
| EMS02 | 1 | 3 | 2 | 3 | 1 | 2 | 2 | 2 | 3 | 2 | 1 |
| EMS03 | 1 | 1 | 2 | 3 | 3 | 1 | 2 | 2 | 3 | 2 | 2 |
| EMS04 | 1 | 1 | 3 | 3 | 1 | 2 | 2 | 2 | 2 | 3 | 2 |
| EMS05 | 1 | 1 | 2 | 3 | 2 | 1 | 2 | 3 | 2 | 2 | 3 |
| EMS06 | 1 | 2 | 2 | 3 | 1 | 2 | 2 | 3 | 3 | 2 | 1 |
| EMS07 | 1 | 2 | 1 | 1 | 3 | 3 | 2 | 3 | 2 | 2 | 2 |
| EMS08 | 1 | 2 | 3 | 2 | 1 | 2 | 1 | 2 | 3 | 2 | 3 |
| EMS09 | 2 | 1 | 1 | 3 | 1 | 2 | 2 | 2 | 3 | 2 | 3 |
| EMS10 | 1 | 2 | 1 | 3 | 1 | 2 | 2 | 2 | 3 | 2 | 3 |
| EMS11 | 1 | 3 | 2 | 2 | 1 | 3 | 2 | 1 | 2 | 2 | 3 |
| EMS12 | 1 | 1 | 3 | 2 | 1 | 2 | 3 | 2 | 3 | 2 | 2 |
| EMS13 | 1 | 3 | 2 | 3 | 2 | 1 | 2 | 2 | 3 | 1 | 2 |
| EMS14 | 1 | 1 | 2 | 3 | 2 | 1 | 2 | 2 | 3 | 3 | 2 |
| EMS15 | 3 | 1 | 3 | 3 | 2 | 1 | 2 | 2 | 2 | 2 | 1 |
| EMS16 | 1 | 2 | 3 | 3 | 1 | 3 | 2 | 1 | 2 | 2 | 2 |
| EMS17 | 1 | 1 | 2 | 3 | 1 | 2 | 2 | 2 | 3 | 2 | 3 |
| EMS18 | 1 | 2 | 3 | 2 | 2 | 3 | 1 | 2 | 2 | 1 | 3 |
| EMS19 | 1 | 1 | 2 | 3 | 3 | 1 | 2 | 2 | 2 | 2 | 3 |
| EMS20 | 3 | 1 | 1 | 3 | 2 | 2 | 3 | 2 | 2 | 1 | 2 |
| EMS21 | 1 | 1 | 3 | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 1 |
| **MEAN** | 1.24 | 1.62 | 2.14 | 2.67 | 1.62 | 1.90 | 2.00 | 2.10 | 2.52 | 1.95 | 2.24 |
| **MEDIAN** | 1 | 1 | 2 | 3 | 1 | 2 | 2 | 2 | 3 | 2 | 2 |
| **TOTAL** | 26 | 34 | 45 | 56 | 34 | 40 | 42 | 44 | 53 | 41 | 47 |
| **% POSSIBLE TOTAL** | 41.3 | 54.0 | 71.4 | 88.9 | 54.0 | 63.5 | 66.7 | 69.8 | 84.1 | 65.1 | 74.6 |

## BARRIER RELATIVE EASE DATA FROM INTERVIEWS
## (1-3 Scale)

| SUBJECT NUMBER | TOPMAN | RESOUR | BUY-IN | PUBLIC | POLITIC | IMPTEAM | TRAINING | PRODESG | INCREMT | COMMS- | OUTSIDE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EMS01 | 3 | 1 | 1 | 2 | 1 | 3 | 3 | 2 | 2 | 2 | 2 |
| EMS02 | 1 | 1 | 2 | 2 | 2 | 1 | 3 | 2 | 3 | 2 | 3 |
| EMS03 | 1 | 1 | 2 | 3 | 3 | 1 | 2 | 3 | 2 | 2 | 2 |
| EMS04 | 1 | 1 | 2 | 3 | 1 | 3 | 3 | 2 | 2 | 2 | 2 |
| EMS05 | 2 | 1 | 3 | 2 | 2 | 1 | 2 | 2 | 1 | 3 | 3 |
| EMS06 | 2 | 2 | 1 | 3 | 2 | 1 | 2 | 3 | 3 | 1 | 2 |
| EMS07 | 1 | 3 | 1 | 2 | 2 | 3 | 3 | 2 | 2 | 1 | 2 |
| EMS08 | 1 | 1 | 3 | 2 | 3 | 2 | 3 | 2 | 1 | 2 | 2 |
| EMS09 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 1 | 2 | 2 | 3 |
| EMS10 | 3 | 2 | 3 | 2 | 1 | 3 | 1 | 2 | 2 | 2 | 1 |
| EMS11 | 3 | 1 | 2 | 3 | 3 | 1 | 2 | 2 | 2 | 2 | 1 |
| EMS12 | 1 | 1 | 2 | 2 | 1 | 2 | 3 | 3 | 2 | 2 | 3 |
| EMS13 | 3 | 2 | 1 | 2 | 2 | 2 | 1 | 2 | 1 | 3 | 3 |
| EMS14 | 3 | 1 | 3 | 1 | 2 | 1 | 2 | 2 | 2 | 3 | 2 |
| EMS15 | 3 | 1 | 3 | 3 | 2 | 1 | 2 | 2 | 2 | 2 | 1 |
| EMS16 | 2 | 2 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 3 |
| EMS17 | 3 | 1 | 2 | 3 | 2 | 1 | 3 | 2 | 2 | 2 | 1 |
| EMS18 | 1 | 2 | 3 | 3 | 2 | 1 | 1 | 2 | 3 | 2 | 2 |
| EMS19 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 3 |
| EMS20 | 3 | 1 | 2 | 1 | 2 | 3 | 3 | 2 | 1 | 2 | 2 |
| EMS21 | 2 | 1 | 3 | 3 | 2 | 3 | 2 | 2 | 1 | 1 | 2 |
| MEAN | 1.95 | 1.33 | 2.14 | 2.33 | 1.95 | 1.90 | 2.33 | 2.10 | 1.86 | 1.95 | 2.14 |
| MEDIAN | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| TOTAL | 41 | 28 | 45 | 49 | 41 | 40 | 49 | 44 | 39 | 41 | 45 |
| % POSSIBLE TOTAL | 65.1 | 44.4 | 71.4 | 77.8 | 65.1 | 63.5 | 77.8 | 69.8 | 61.9 | 65.1 | 71.4 |

## BARRIER FAVORABILITY DATA FROM INTERVIWEWS
## (Benefit Importance and Ease were added together)

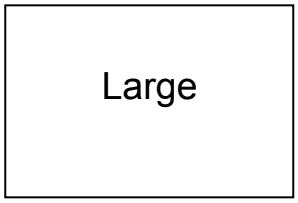
| SUBJECT NUMBER | TOPMAN | RESOUR | BUY-IN | PUBLIC | POLITIC | IMPTEAM | TRAINING | PRODESG | INCREMT | COMMS- | OUTSIDE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EMS01 | 4 | 3 | 3 | 4 | 2 | 4 | 5 | 5 | 5 | 4 | 5 |
| EMS02 | 2 | 4 | 4 | 5 | 3 | 3 | 5 | 4 | 6 | 4 | 4 |
| EMS03 | 2 | 2 | 4 | 6 | 6 | 2 | 4 | 5 | 5 | 4 | 4 |
| EMS04 | 2 | 2 | 5 | 6 | 2 | 5 | 5 | 4 | 4 | 5 | 4 |
| EMS05 | 3 | 2 | 5 | 5 | 4 | 2 | 4 | 5 | 3 | 5 | 6 |
| EMS06 | 3 | 4 | 3 | 6 | 3 | 3 | 4 | 6 | 6 | 3 | 3 |
| EMS07 | 2 | 5 | 2 | 3 | 5 | 6 | 5 | 5 | 4 | 3 | 4 |
| EMS08 | 2 | 3 | 6 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 5 |
| EMS09 | 3 | 2 | 3 | 5 | 3 | 5 | 5 | 3 | 5 | 4 | 6 |
| EMS10 | 4 | 4 | 4 | 5 | 2 | 5 | 3 | 4 | 5 | 4 | 4 |
| EMS11 | 4 | 4 | 4 | 5 | 4 | 4 | 4 | 3 | 4 | 4 | 4 |
| EMS12 | 2 | 2 | 5 | 4 | 2 | 4 | 6 | 5 | 5 | 4 | 5 |
| EMS13 | 4 | 5 | 3 | 5 | 4 | 3 | 3 | 4 | 4 | 4 | 5 |
| EMS14 | 4 | 2 | 5 | 4 | 4 | 2 | 4 | 4 | 5 | 6 | 4 |
| EMS15 | 6 | 2 | 6 | 6 | 4 | 2 | 4 | 4 | 4 | 4 | 2 |
| EMS16 | 3 | 4 | 6 | 6 | 3 | 5 | 4 | 2 | 3 | 3 | 5 |
| EMS17 | 4 | 2 | 4 | 6 | 3 | 3 | 5 | 4 | 5 | 4 | 4 |
| EMS18 | 2 | 4 | 6 | 5 | 4 | 4 | 2 | 4 | 5 | 3 | 5 |
| EMS19 | 2 | 2 | 3 | 5 | 5 | 3 | 5 | 5 | 4 | 4 | 6 |
| EMS20 | 6 | 2 | 3 | 4 | 4 | 5 | 6 | 4 | 3 | 3 | 4 |
| EMS21 | 3 | 2 | 6 | 6 | 4 | 6 | 4 | 4 | 3 | 3 | 3 |
| **MEAN** | 3.19 | 2.95 | 4.29 | 5.00 | 3.57 | 3.81 | 4.33 | 4.19 | 4.38 | 3.90 | 4.38 |
| **MEDIAN** | 3 | 2 | 4 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| **TOTAL** | 67 | 62 | 90 | 105 | 75 | 80 | 91 | 88 | 92 | 82 | 92 |
| **% POSSIBLE TOTAL** | 53.2 | 49.2 | 71.4 | 83.3 | 59.5 | 63.5 | 72.2 | 69.8 | 73.0 | 65.1 | 73.0 |

# APPENDIX E—CONCEPT MAPS

The 21 municipal managers constructed concept maps with the 11 benefit and 11 barrier cards developed during the first part of the interview process. The meanings of the cards in the concept maps presented in this appendix are described below:

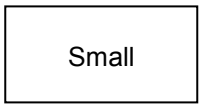
Red printing (dark grey) is barriers

Green printing (light grey) is benefits




Large cards - benefits and barriers that were rated as high importance.


Medium cards – benefits and barriers that were rated as medium importance.




Small cards – benefits and barriers that were rated as low importance.

Red dot (dark grey) – benefits and barriers that were rated as hard in ease of implementation.

Yellow dot (light grey) - benefits and barriers that were rated as medium in ease of implementation.

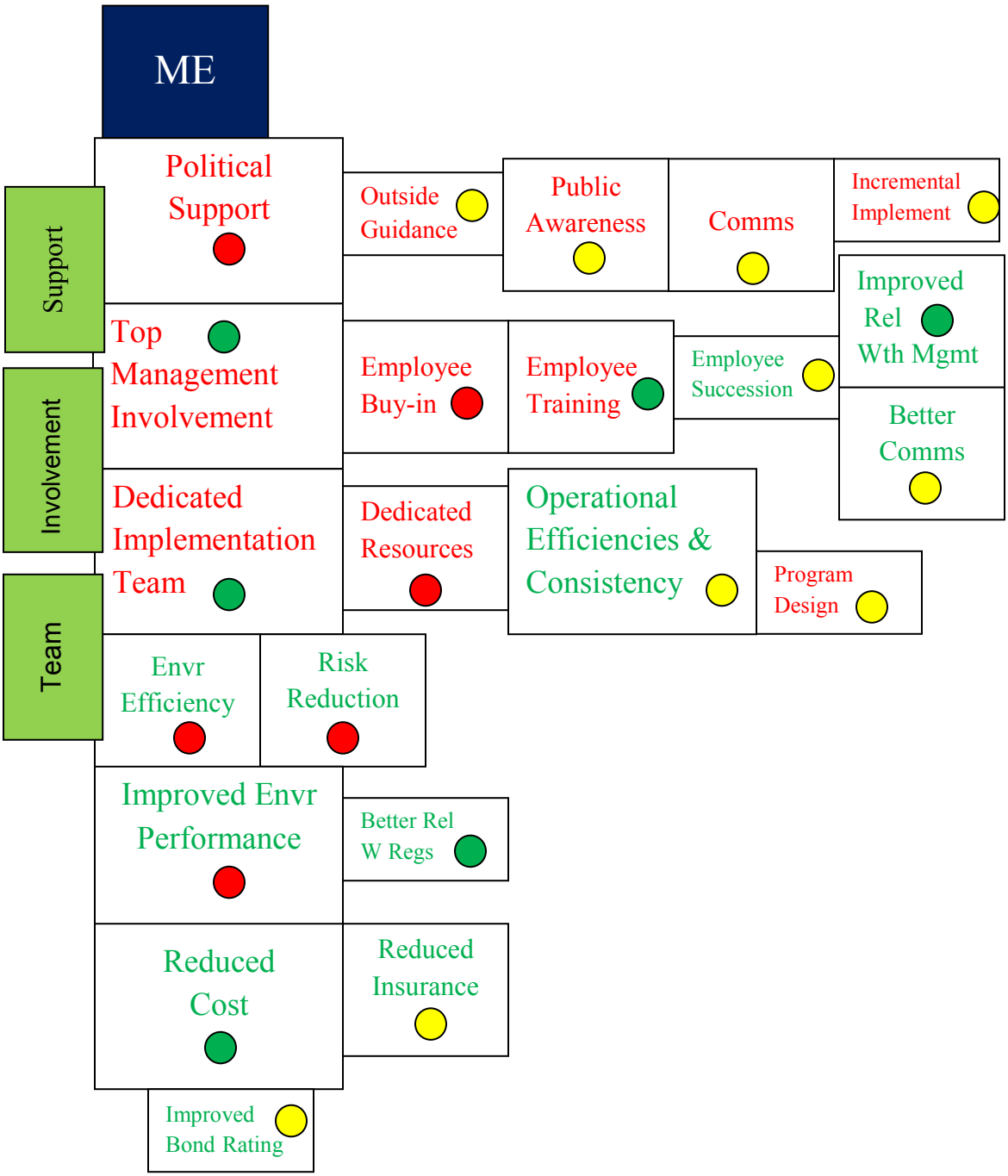
Green dot (medium grey) - benefits and barriers that were rated as easy in ease of implementation.


Label cards (medium grey) – sections of map named by the municipal manager.


Municipal manager card (black) – where in the implementation process the manager saw themselves

**EMS01**

**CONCEPT MAP OF IMPLEMENTATION**



# EMS 01 Concept Map Explanation

Public Works Director

The Public Works Director (PW) would be the major driving force behind EMS implementation. They would take the project to top management (city manager) to get their approval. They see top management as a barrier of high importance, but their support is seen as easy to gain. The PW rated reduced costs, improved environmental performance and operational efficiencies and consistency as having the highest importance to EMS implementation which makes them the main drivers for this project. Once the PW director has top management approval he will then need to gain political support

Support

They will take the project to City Council for their approval. Political support is seen a barrier of high importance and hard ease of implementation. With council approval the PW will raise public awareness and improve internal communications, both are barriers of medium importance and medium ease of implementation. They will also seek outside support (if needed), and prepare for an incremental implementation of the EMS; two barriers of low importance and medium ease of implementation.

Involvement

Once the EMS is approved, top management will get employee buy-in and ensure employee training; with both of medium importance to implementation where buy-in seen as of hard ease of implementation and training seen as easy to implement. The PW sees three benefits to this branch: first, easier employee succession which has low importance and medium ease of implementation; second, improved labor relationships with management which is of medium importance and easy to implement; and third, better communications throughout the city which is of medium importance and medium ease of implementation.

Team

Top management with political and public backing will get the dedicated implementation team in place; which is seen as a barrier of high importance but easy to implement (the city is used to working with teams). This team will design, plan, and implement the EMS. Top management will ensure the dedicated resources are available to implement the EMS. The PW sees this as medium in importance and hard to implement. Program design is seen as a barrier of low

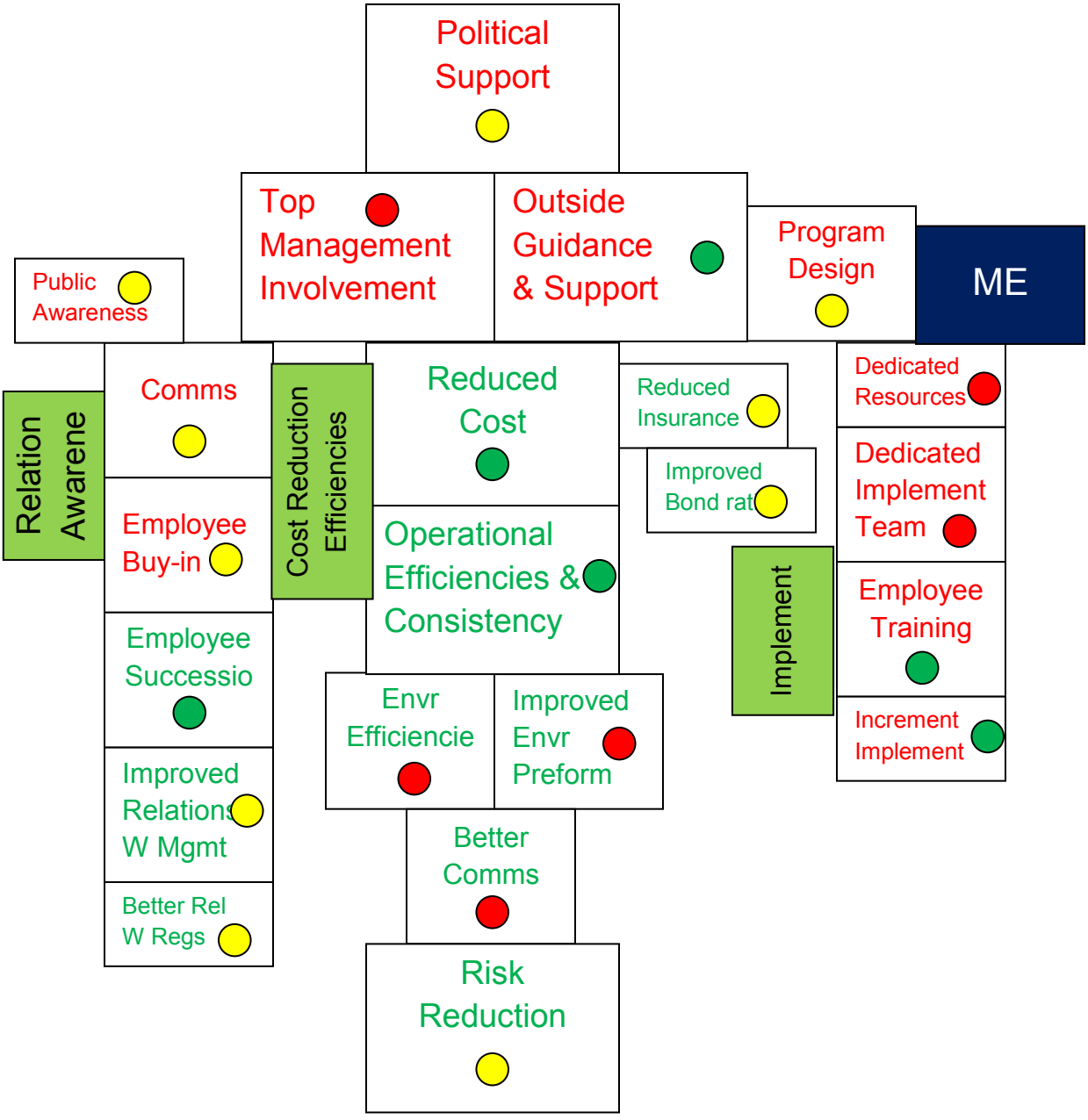
importance and medium ease of implantation. Benefits seen in this branch include environmental efficiencies, operational efficiencies and consistency, risk reduction, improved environmental performance, better relationship with regulators, reduced costs, reduced insurance premiums and improved bond ratings. Operational efficiencies and consistency, improved environmental performance and reduced cost are all seen as being of high importance; with reduced cost seen as being the easiest to implement, operational efficiencies and consistency as medium to implement, and improved environmental performance as the hardest to implement. Improved environmental efficiencies, risk reduction, and reduced insurance premiums are all of medium importance with environmental efficiencies and risk reduction seen as hard to implement and reduced insurance as medium ease of implementation. Better relationships with regulators and improved bond rating as view as being of low importance, with regulator relationships being easy to implement while bond rating is seen as medium in ease of implementation.

The PW sees political support is seen as the hardest step in EMS implementation with reduced cost as being the greatest driver.

The city is in a period of rapid growth. This growth is coupled with tight budgetary constraints and reluctance to improve quality of life through city projects. The PW director has seen environmental improvements (slowly) as the city reworks sewer and water projects to match growth.

**EMS02**

**CONCEPT MAP OF IMPLEMENTATION**



# EMS 02 Concept Map Explanation

General Services Director

The General Services Director (GS) would take the EMS project to top management (City Manager) to get their approval. They would emphasis the benefits of operational efficiencies and consistency, reduced cost, and risk reduction and how these benefits related to the cores business of the city. Once the EMS is approved, they would assist top management in getting political support (city council). They would also assist in getting outside guidance. The GS rated the barriers of political support, outside guidance and support, and top management involvement as having high importance with outside guidance being easy to implement, political support as medium to implement, and top management support as hardest to gain for implementation.

Relations Awareness

In this branch the GS sees increasing public awareness, improving internal communications and gaining employee buy-in with easier employee succession, improved labor relationship with management, and better relations with regulators as benefits. They see the barriers of communications and employee buy-in as being of medium importance and medium ease of implementation and public awareness as low importance and medium ease of implementation. They see the benefits of employee succession and improved labor relations with management as medium importance with employee succession being easy to implement and improved labor relations as medium ease of implementation. The benefit of better relationships with regulators is seen as low importance and medium ease of implementation.

Cost Reduction and Efficiencies

Here the GS sees the major share of benefits of the EMS. They see reduced costs, operational efficiencies and consistency, and risk reduction as being of high importance; with reduced costs and operational efficiencies as easy to implement and risk reduction as medium to implement. They rate environmental efficiencies, improved environmental performance and better communications as being medium importance and hard in ease of implementation. Of these benefits, the GS thinks that operational efficiencies and consistency is most important to the city.

Implementation

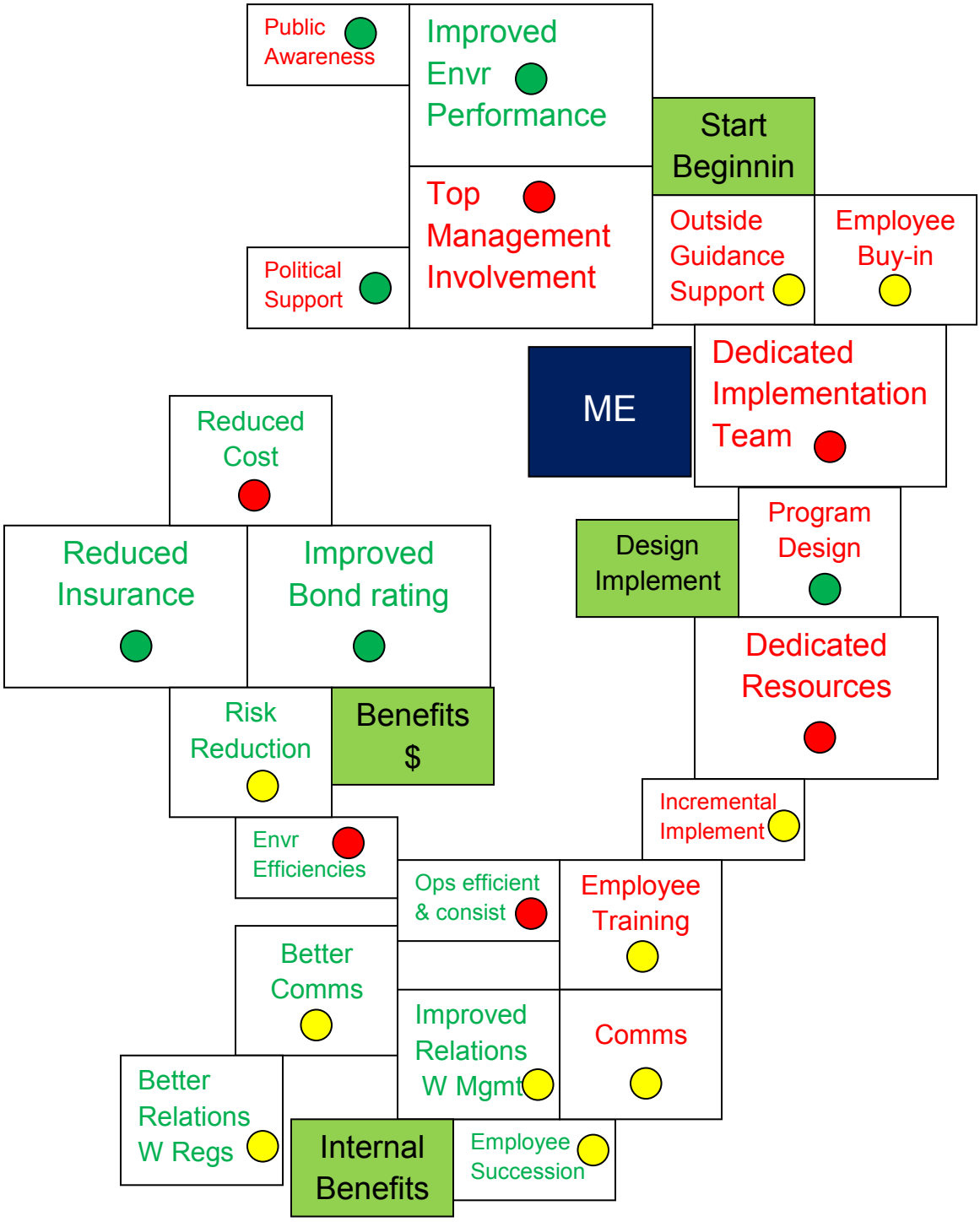
The GS will be part of the implementation process. They will be on the team that designs, obtains dedicated resources, plans the process, trains the employees and implements the EMS. They see the barriers of program design, dedicated implementation team and employee training being of medium importance; with training being easy to implement, design being medium, and dedicated team as being hard to implement. Dedicated resources and incremental implementation are seen a low importance with incremental implementation as being easy to implement resources as hard to gain for implementation.

The GS sees top management involvement is seen as the biggest barrier to EMS implementation while operational efficiencies and consistencies are seen as the most important benefit (driver).

A major stumbling block to EMS process is a lack of manpower to implement the EMS. Most departments are understaffed and are working over capacity. Those departments that have adequate staffing may be reluctant to help without top management direction.

EMS03

CONCEPT MAP OF IMPLEMENTATION



# EMS 03 Concept Map Explanation

Community Development Director

Start/ Beginning

The Community Develop Director (CD) would take the project to top management (city manager) to get their approval. The barrier of top management involvement is seen as being of high importance and hard to gain for implementation. The major benefits of improved environmental performance, improved bond rating, and reduced insurance premiums would be the major selling points. Once the project is approved, top management will get the political support (city council). Once this is obtained they will get outside guidance and support (consultant might be hired) and employee buy-in where both barriers are seen to be of medium importance and of medium ease for implementation. The main benefit of improved environmental performance is rated as high importance and easy to implement while the barriers of public awareness and political support are rated as low importance and easy to implement.

Design/Implement

Once top management has needed outside support the CD will work directly with program design, program planning, obtaining dedicated resource, employee training and improving internal communications. They see the barriers of getting a dedicated implementation team and gaining dedicated resources as being of high importance and hard to implement. They also see the barriers of program design, employee training and communications as being of medium importance with design as easy to implement and training and communications as medium in ease of implementation.

Benefits/$

The process of implementing an EMS will lead to many benefits and cost savings (reduced costs, reduced insurance premiums, improved bond ratings, and risk reduction) which are very important to the city. The CD sees the major benefits of reduced insurance and improved bond rating as being of high importance and easy to implement. They see the benefits of reduced costs and risk reduction as being of medium importance with reduced costs being hard to implement and risk reduction as being medium to implement.

Internal Benefits

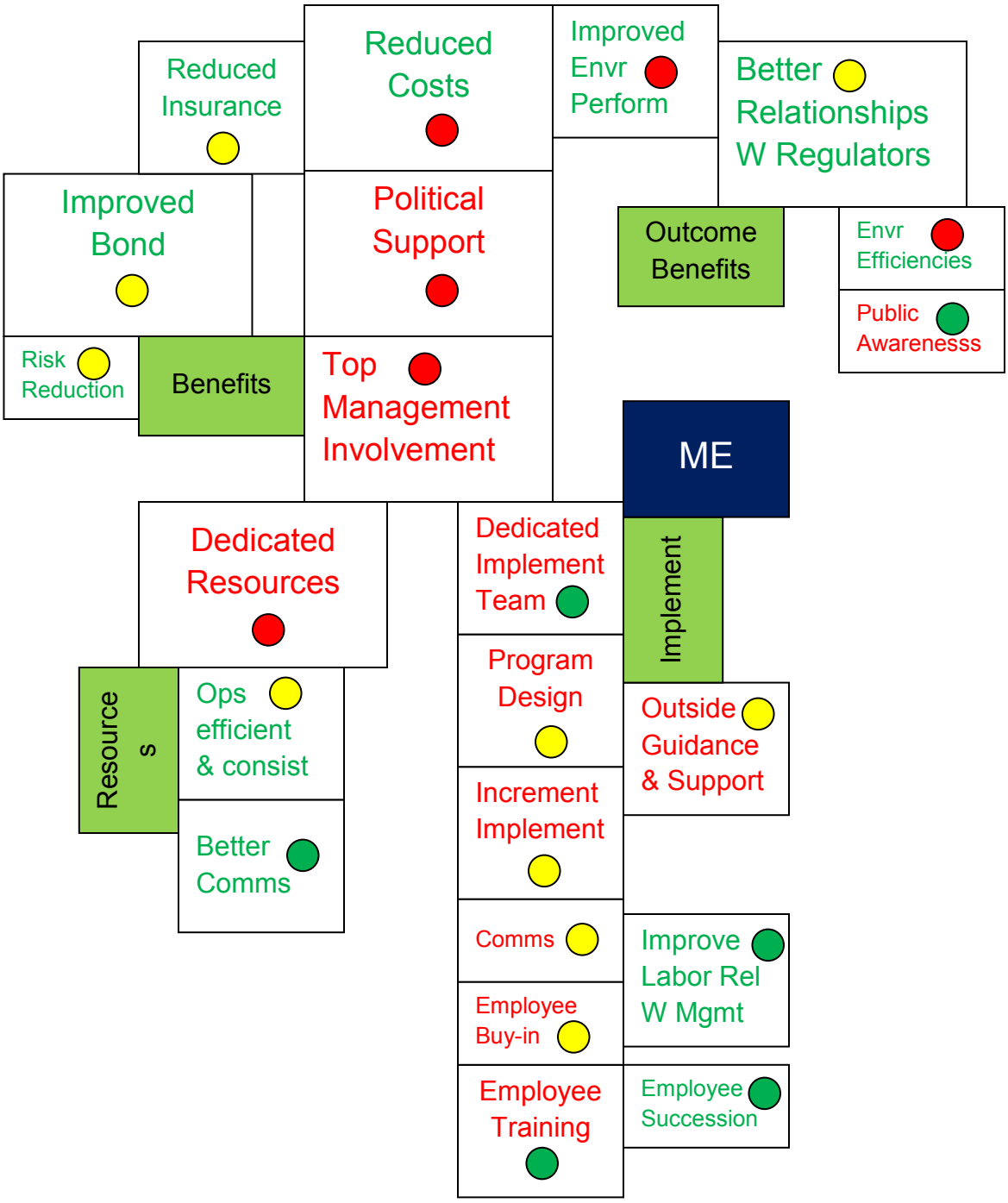
The process of implementing an EMS will lead to many internal benefits for the city such as: operational efficiencies and consistency, environmental efficiencies, better communications inside and out, improved labor relationship with management, improved relationship with regulators and easier employee succession. The CD rates better communications, improved labor relationship with management, and better relationships with regulators as being of medium importance and of medium ease of implementation. They rate environmental efficiencies, operational efficiencies and consistency, and employee succession as low importance with environmental efficiencies and operations efficiencies as hard to implement and employee succession as medium in ease of implementation.

The CD sees top management involvement as the hardest step to EMS implementation while improved environmental performance is the major benefit (driver).

There is very little public and political participation in this city. The city government tends to be reactive and not proactive.

EMS04

CONCEPT MAP OF IMPLEMENTATION



# EMS 04 Concept Map Explanation

## Environmental Director

The Environmental Director (ED) would take the EMS program to the Public Works Director. They would take the project to top management (City Manager) to get approval. They would need to show the major benefits of reduced costs, better relationships with regulators, and improved bond ratings to top management. Then they along with top management will present the benefits of the EMS to city council to get the needed political support. Top management involvement and political support are both seen as barriers of high importance and being hard to get for implementation.

## Benefits

Reduced costs and improved bond rating are the drivers in this branch. Both of these benefits are seen as being of high importance with reduced costs being hard to gain and improved bond rating being medium in ease of implementation. Reduced insurance premiums are rated as being of medium importance and medium ease for implementation. Risk reduction is seen as being of low importance and medium in ease of implementation. These benefits need to be presented to top management and city council along with the outcomes benefits branch.

## Outcome Benefits Branch

A better relationship with regulators is the driver of this branch. It is seen as being of high importance and medium ease of implementation. The benefit of improved environmental performance is viewed as being of medium importance and hard in ease of implementation. The benefit of environmental efficiencies is seen to be of low importance and hard in ease of implementation. This branch also seeks to improve public awareness to help overcome this barrier that is rated as being of low importance and easy to implement.

## Resources Branch

The EMS will require dedicated resources that can't be taken away for other projects. They are seen as being of high importance and hard to gain for implementation. The benefits of operational efficiencies and consistencies coupled with better communications inside are both seen a being of medium importance with efficiencies and consistency being seen as medium to implement and better communications being seen as easy to gain from implementation.

Implementation Branch

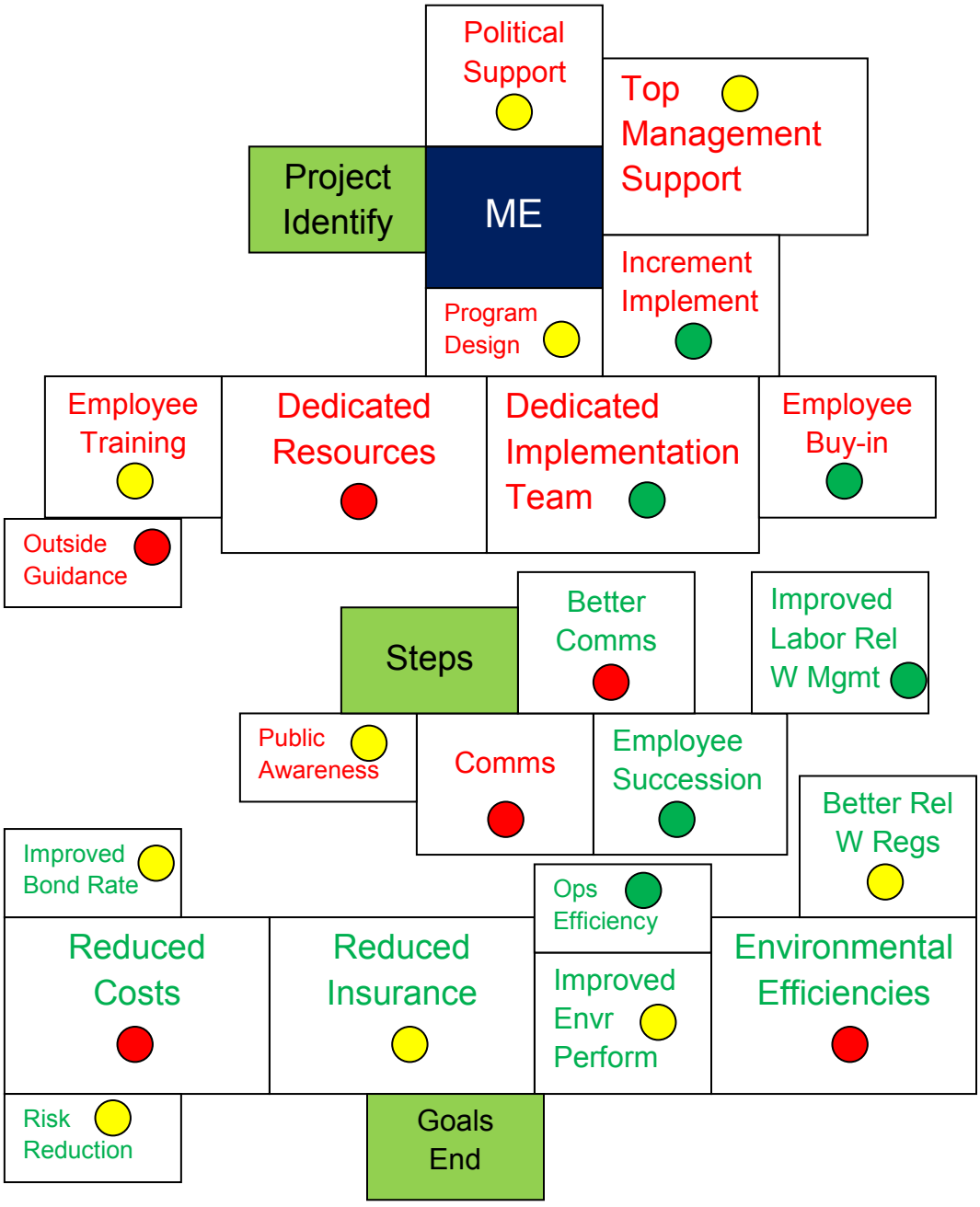
The ENVR director is part of the implementation team. They will help design, plan, train, and implement the EMS. Here the ED sees the barriers of dedicated implementation team, program design, incremental implementation, outside guidance and support, and employee training as being of medium importance with training and implementation team as being easy to implement while program design and incremental implementation are seen as medium is ease of implementation. They see the barriers of communications and employee buy-in as being of low importance and medium ease of implementation. The medium importance benefit of improved labor relationship with management and low importance benefit of employee succession are in this branch. Both of these benefits are seen as easy to implement.

Top management involvement, political support and dedicated resources are seen as three major barriers to EMS implementation. Enhancing the benefits of the EMS will be paramount to overcoming the barriers.

A major stumbling block to EMS implementation is a lack of environmental consciousness in the city. The Environmental Department is new and still trying to find its niche in the Public Works Department. An environmental department is reflective of a larger city that is still growing and that has increased environmental risks.

EMS05

CONCEPT MAP OF IMPLEMENTATION



# EMS 05 Concept Map Explanation

Public Works Director

Project Identify

The Public Works Director (PW) would take the project to top management (City Manager) to get approval. Top management support is seen as a barrier of high importance with a medium ease of implementation. Major selling points of the EMS are reduced costs, environmental efficiencies, and reduced insurance premiums. Once the project is approved, the director with top management will get the political support (city council). Political support is viewed as a barrier of medium importance and medium ease of implementation. This city has a unified council that is supportive of city government. Once there is approval the PW will be involved with the EMS implementation. They view the barriers of dedicated resources and dedicated implementation team as highly important with dedicated resources being hard to obtain and the dedicated team as easy to form for implementation. Program design and outside guidance and support are seen a low importance barriers, with outside guidance hard to obtain and program design as medium ease for implementation. They also view incremental implementation, employee training and employee buy-in as being of medium importance with incremental implementation and employee buy-in being easy to implement and employee training as medium to implement.

Steps

The director sees the implementation as a step wise process. Communications becomes the main thrust of this branch. Overcoming the barriers of internal communications and public awareness will lead to better communications throughout the city, improved labor relationship with management and easier employee succession. They view the barrier of communications as medium importance and hard to implement while they see the barrier of public awareness as low in importance and medium in ease of implementation. The benefits of this branch are better communications, improved labor relationship with management, and employee succession are all seen as being of medium importance with better communications being hard to realize while improved labor relationships and employee succession are seen as easy to gain.

Goals/End Results

The process of implementing an EMS will lead to many benefits and cost savings. They include reduced costs, reduced insurance premiums, environmental efficiencies, improved bond ratings, risk reduction, operational

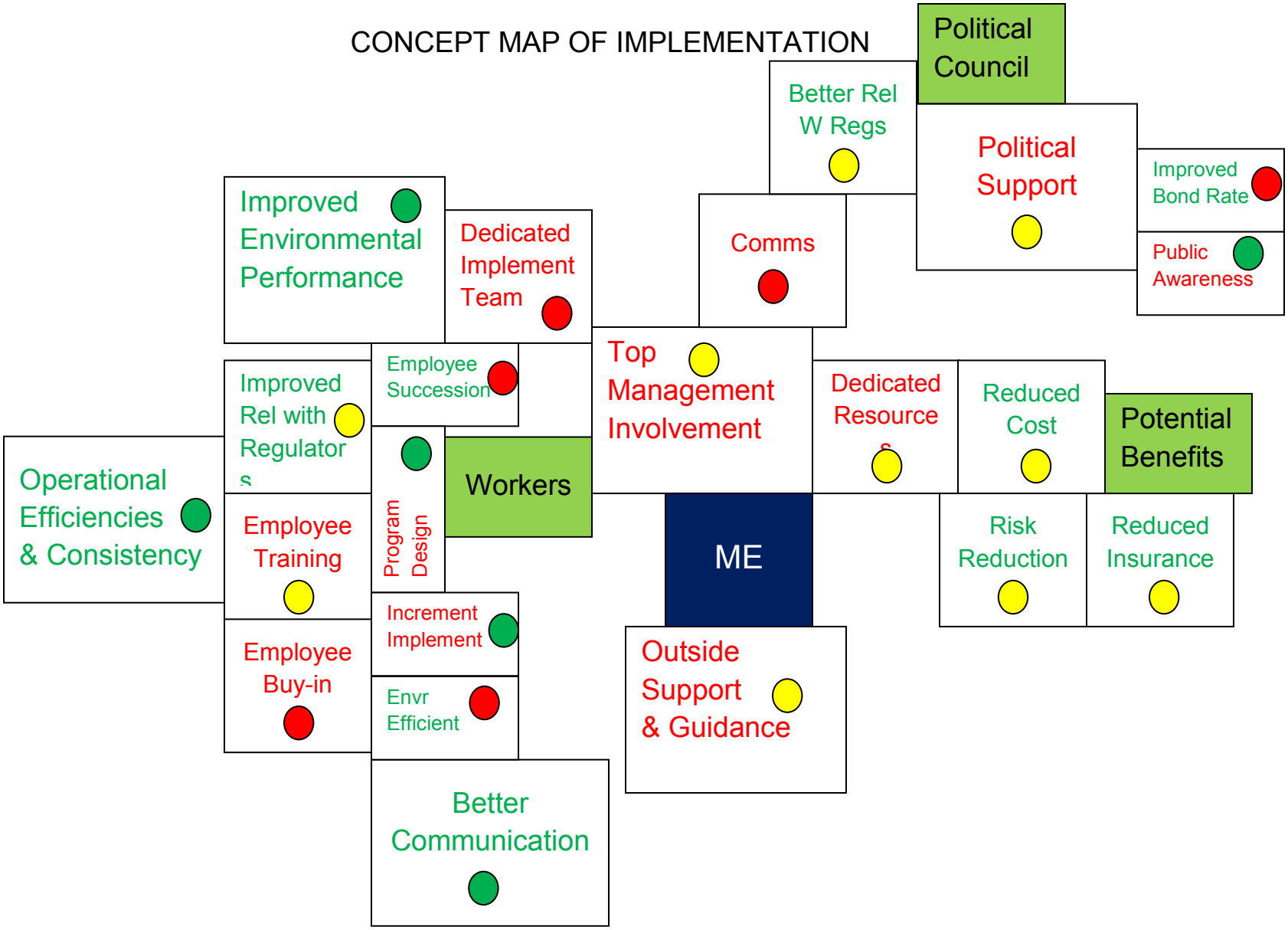
efficiencies and consistency, improved environmental performance, and better relationship with regulators. Reduced cost and environmental efficiencies are seen as high importance and hardest to implement while reduced insurance is seen as high importance and of medium ease to implement. Better relationships with regulators and improved environmental performance are both seen as being of medium importance and medium ease of implementation. Improved bond ratings, risk reductions and operational efficiencies and consistency are seen as being of low importance with bond rating and risk reduction being of medium ease of implementation while operational efficiencies and consistency in view as easy to implement.

The PW sees dedicated resources as the biggest barrier to EMS implementation and reduced costs are seen as the primary driver to EMS implementation.

This city is having a manpower problem due to low pay coupled with the availability of qualified individuals. This lack of manpower will be a major problem in EMS implementation.

EMS06

CONCEPT MAP OF IMPLEMENTATION



# EMS 06 Concept Map Explanation

## Public Works Director

The Public Works Director (PW) is part of top management (core group). They would propose the project to the core group to get city manager approval. Top management involvement is seen as a barrier of high importance with a medium ease of implementation. They would need to highlight the benefits of operational efficiencies and consistency, better communications inside and outside of the city, and improved environmental performance that would result from EMS Implementation. Once the project is approved, the city manager will get the political support (city council). This city has a unified council that is supportive of city government and works well together. Political support is also viewed as a barrier of high importance with a medium ease of implementation. This city increasingly uses outside support and guidance (consultants) due to time and manpower constraints (also a lack of expertise in some areas) and the PW sees this barrier as high importance with a medium ease of implementation.

## Workers

This branch is about how the city will implement an EMS. Included here are the program design, planning, training, employee buy-in and implementation. Top management will provide a dedicated implementation team that is rated as medium importance and hard to implement. Other barriers in this branch include two of medium importance, employee training and employee buy-in. The PW sees employee buy-in as hard to implement and employee training as medium ease to implement. Program design and incremental implementation are both of low importance and both easy to implement. The PW sees the benefits of improved environmental performance, operational efficiencies and consistency, environmental efficiencies, and better communications rated as high importance but easy to implement. Improved relationship with regulators is seen as being of medium importance and of medium ease to implement while environmental efficiencies and employee succession are of low importance and hard to implement.

## Political Council

The director sees the internal communications as a key to gaining political support and greater public awareness for EMS implementation. Communications are rated as medium importance but hard to implement. They also see benefits of this branch as better relations with regulators which are rated as medium importance and medium ease of implementation. The barrier of

public awareness is viewed as low importance and easy for implementation while the benefit of improved bond rating is also of low importance but seen as hard to implement.

Potential Benefits

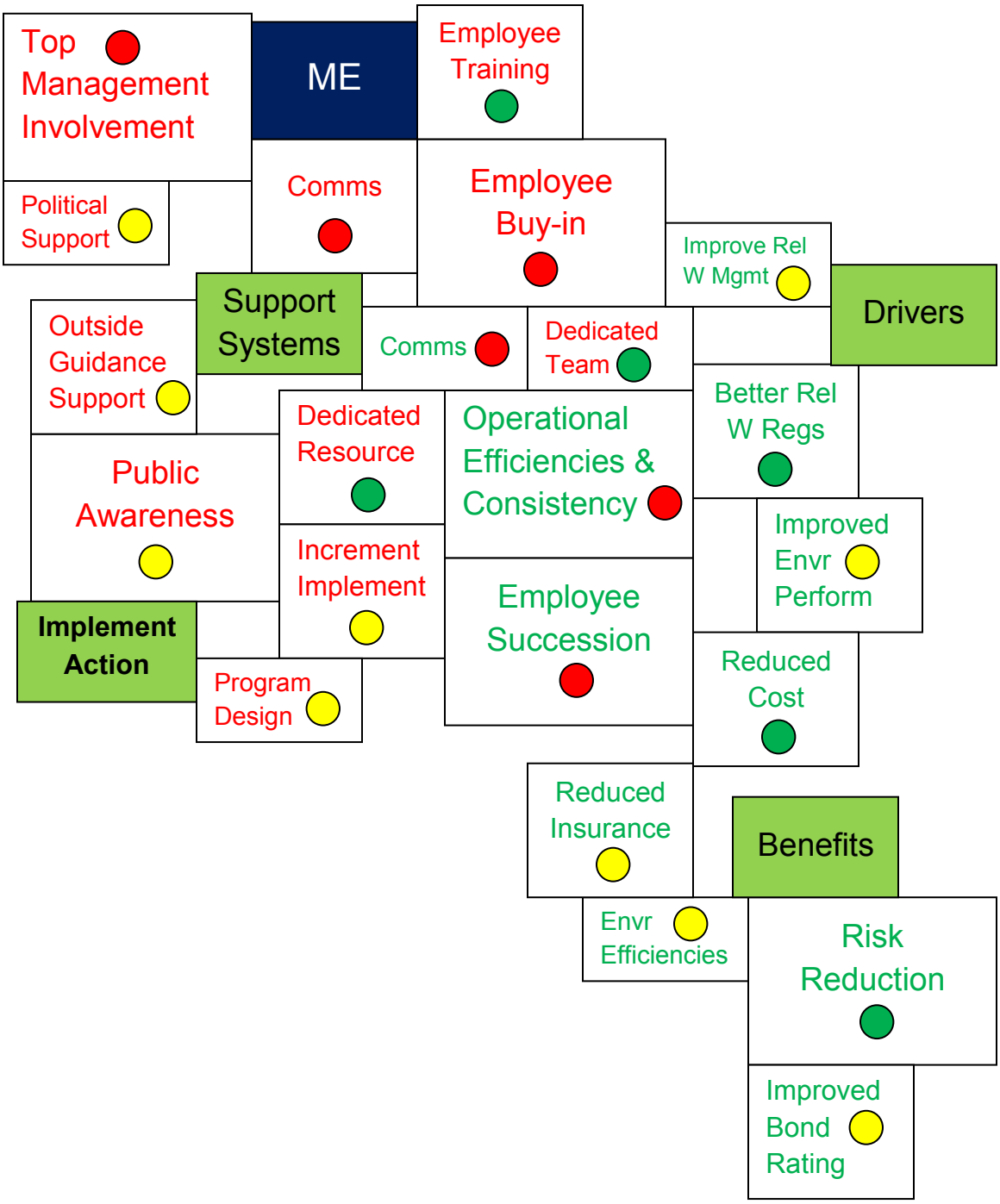
When the dedicated resources are assigned by top management the EMS will lead to reduced costs, reduced risk and ultimately reduced insurance premiums for the city. The PW sees dedicated resources as being of medium importance and medium ease of implementation. They also see the benefits of reduced costs, risk reduction, and reduced insurance as being of medium importance and medium ease of implementation.

The PW sees a **dedicated implementation team** as the hardest step to EMS implementation while **operational efficiencies and consistency** is the most important driver for EMS implementation.

This city has a stable workforce but sees environmental improvements as a triple bottom line nicety. A lack of manpower will be a major problem in EMS implementation. Also attracting skilled individuals has been an ongoing problem for the city and city businesses.

EMS07

CONCEPT MAP OF IMPLEMENTATION



# EMS 07 Concept Map Explanation

## Environmental Programs

The Environmental Programs Director (EP) is part of top management (core group of decision makers). They would propose the project to the directors to get city manager approval. Top management involvement is viewed as being of high importance and hard to obtain for implementation. Once the project is approved, the city manager and directors will get the political support (city council). The EP sees political support as being of low importance and medium in ease of implementation. This city has a council that is somewhat supportive of city government and can works well together. The ENVR manager is a driving force for the EMS implementation. They will be involved with improving internal communications which is seen as being of medium importance and hard to implement, gaining employee buy-in which is a major barrier that will be hard to gain, and training of the employees which is viewed as being of medium importance and easy to institute. The EP believes that that employee buy-in and training will lead to improved labor relationship with management which is rated as being of low importance and medium ease of implementation.

## Support Systems

The EP sees outside guidance, public awareness, and a dedicated team as needed support for EMS implementation. They see public awareness as a major barrier that is of high importance and of medium ease of implementation. Outside guidance and support and dedicated resources are view as being of medium importance with resources being easy to obtain while outside guidance will be medium in ease of implementation. Better communications both inside and out will be the driver for this support.

## Implement Action

Once the dedicated team is assigned dedicated resources will need to be provided. The EP sees the barriers of resources and incremental implementation as being of medium importance with resources easy to implement and incremental implementation as medium in ease of implementation. They view program design as low importance and medium in ease of implementation.

## Drivers

Many of the benefits of an EMS are seen as driver for EMS implementation. Such items as operational efficiencies and consistency, better relationships with regulators, improved labor relationship with management, employee succession, improved environmental performance and reduced costs.

Drivers

The EP sees the many benefits of an EMS as the main drivers for implementation. They rate operational efficiencies and consistency and employee succession as being of high importance with both being hard to gain during implementation. Better relationships with regulators, reduced costs, and improved environmental performance are rated as being of medium importance with both relations with regulators and reduces cost being easy to gain while improved environmental performance is seen as medium in ease of implementation.

Benefits

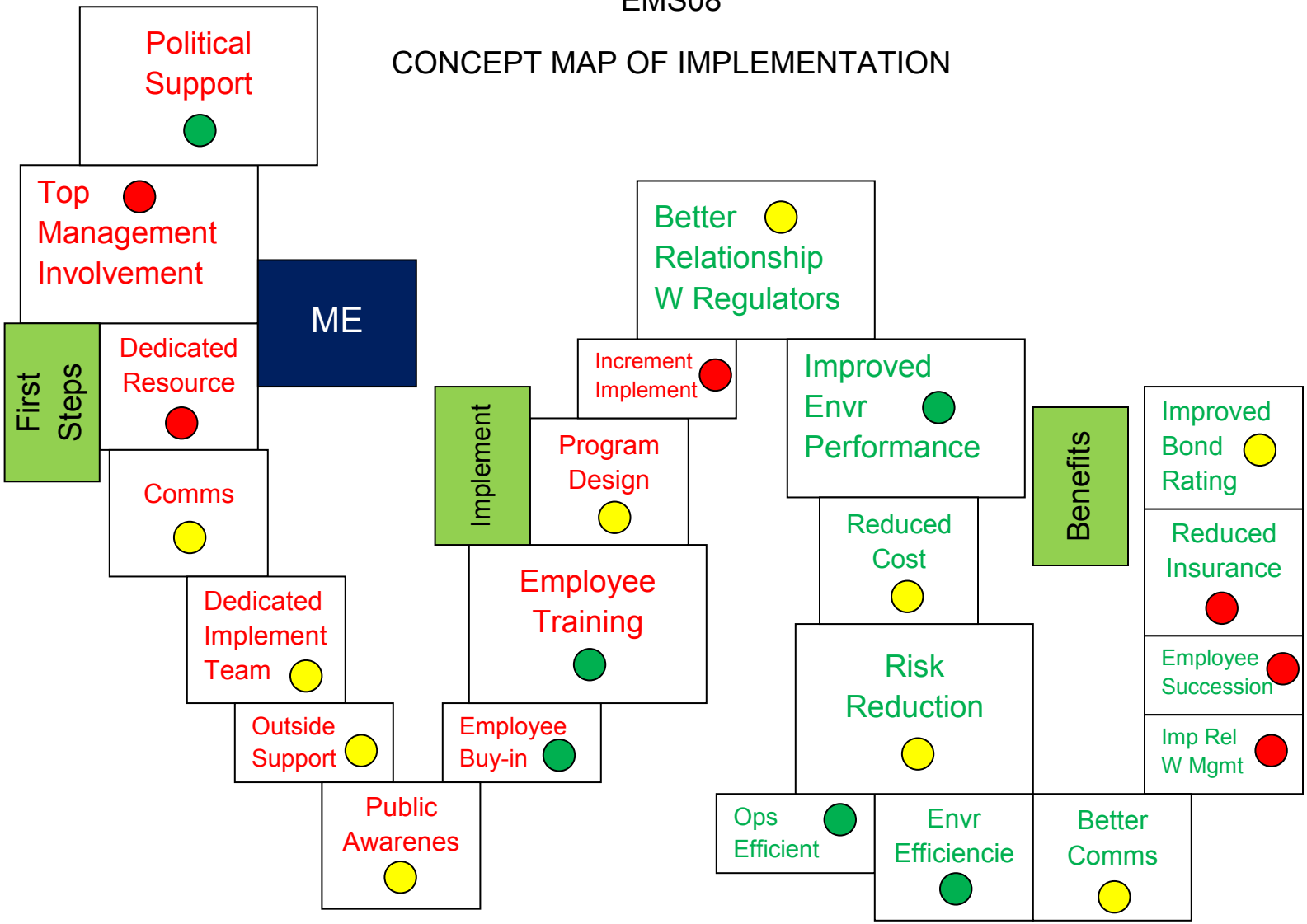
The benefits of EMS implementation are seen by the EP as reduced insurance premiums environmental efficiencies, risk reduction and improved bond rating. They rate risk reduction as being high importance and easy to implement, reduced insurance premiums as medium importance and medium in ease of implementation, and environmental efficiencies as low importance and medium in ease of implementation.

The EP sees top management involvement and employee buy-in as the hardest step to EMS implementation and operational efficiencies and consistency are seen as the biggest drivers for EMS implementation

This city is in the process of administrative change. There is increasing public involvement as the city continues to slowly grow. Time is right for environmental action.

EMS08

CONCEPT MAP OF IMPLEMENTATION



# EMS 08 Concept Map Explanation

## Public Works Director

The Public Works Director (PW) would propose the project for the top management (city managers) approval. They see top management support as a barrier that is of high importance but hard to obtain. Major selling points are improved environmental performance, better relationships with regulators, and risk reduction. Once the project is approved, the PW directors will need to get the political support (city council). Political support is viewed as being of high importance but easy to obtain. Benefits must be shown to outweigh costs. This city has a council that is supportive of city government and can work well together. The PW director will be the driving force for the EMS implementation. The PW director sees EMS implementation as a step wise process.

## First Steps

Top management will provide dedicated resource for the project. Improved internal communications will be needed along with a dedicated implementation team and outside support. The next steps will be to get public awareness, employee buy-in and then do employee training. The PW rates employee training as a barrier of high importance but easy to implement. They see dedicated resources, communications, dedicated implementation team and public awareness as being of medium importance with resources being hard to get and a dedicated team, communications and public awareness as being of medium ease to obtain.

## Implementation

In this step the program design and implementation will be carried out. Program design is seen as being of medium importance and medium ease of implementation. Incremental implementation is seen as being of low importance but hard to implement. The PW see this leading to the following benefits: better relationship with regulators, improved environmental performance, reduced costs, reduced risk, operational efficiencies and consistency, environmental efficiencies.

## Benefits

The PW director see the benefits of implementation as better communications both within and outside of city government, improve labor relationships with management, easier employee succession, reduced insurance premiums and improved bond ratings. They view better relationships with regulators, improved

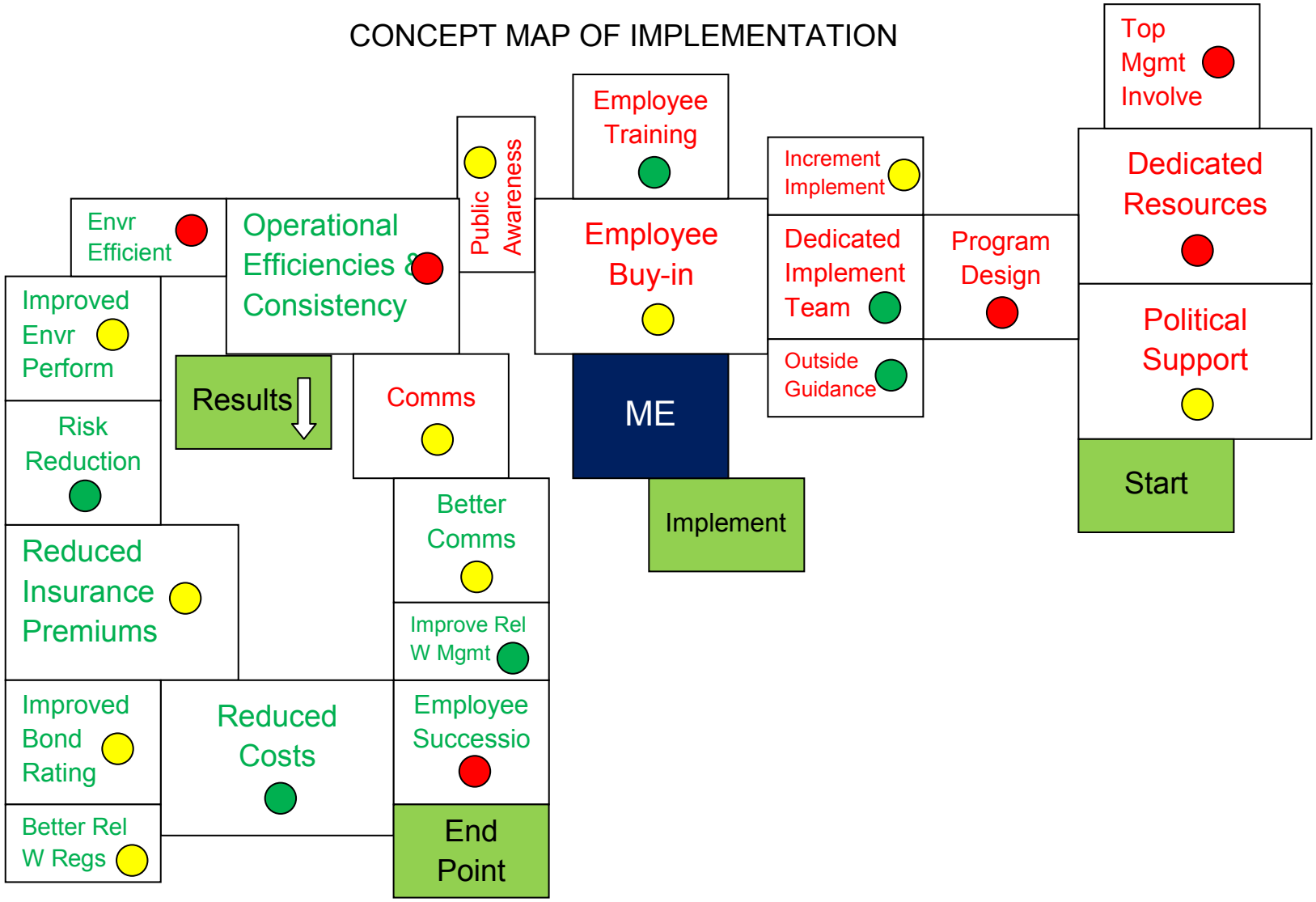
environmental performance, and risk reduction as being of high importance with relationships and risk reduction as medium in ease of implementation and improved environmental performance as easy to implement. They see reduced costs, better communications, and environmental efficiencies as all being of medium importance with reduced costs and better communications as medium in ease of implementation and environmental efficiencies as easy to implement. Operational efficiencies and consistency is seen as low importance and easy to implement.

The PW director sees top management support as the hardest step to EMS implementation and both improved environmental performance and improve labor relationships with management as the major drivers for EMS implementation.

The city is growing rapidly and experiencing growing pains. They would like to gain better relationships with regulators. The workforce is fairly stable and will do what is directed from above. Citizen involvement is low (unless tax increase is involved). City has passed quality of life measures (parks and sports facilities).

EMS09

CONCEPT MAP OF IMPLEMENTATION



# EMS 09 Concept Map Explanation

Sustainable Program Coordinator

Start

The sustainable director (and sustainable program coordinator (SPC)) would propose the project for the top management (city managers) approval. Top management involvement is view as medium importance but hard to obtain. Once the project is approved, the city manager will need to get the political support (city council). Political support is of high importance and of medium ease to implement. Cost reductions through operational efficiencies and consistencies are the major selling point of the EMS. This city has a council that is supportive of city government and can work well together. The SPC will be the driving force for the EMS implementation. Top management will allocate dedicated resources to the implementation team who will design and plan the EMS project. Outside guidance (if needed) is part of the starting step. The SPC sees program design and dedicated implementation team as being of medium importance with design as hard to implement and the dedicated team as easy to implement. They view incremental implementation and outside guidance as being of low importance with incremental implementation as medium in ease of implementation and outside guidance as easy to obtain.

Implementation

The SPC would be involved in the implementation step. They would train employees, gain employee buy-in and help increase public awareness of the EMS project. They see employee buy-in as barrier that will be of high importance and medium in ease of implementation, employee training as being of medium importance and easy to implement, and public awareness as low importance and medium in ease of implementation.

Results

The benefits of implementing an EMS are seen as operational efficiencies and consistency, environmental efficiencies, improving internal communications, improved environmental performance, risk reduction. Communications is seen as a driver of these results. The SPC sees operational efficiencies and consistency as a major benefits that is of high importance and hard to obtain, improved environmental performance as being of medium importance and medium to implement, and environmental efficiencies as being of low importance and hard to obtain.

End Point

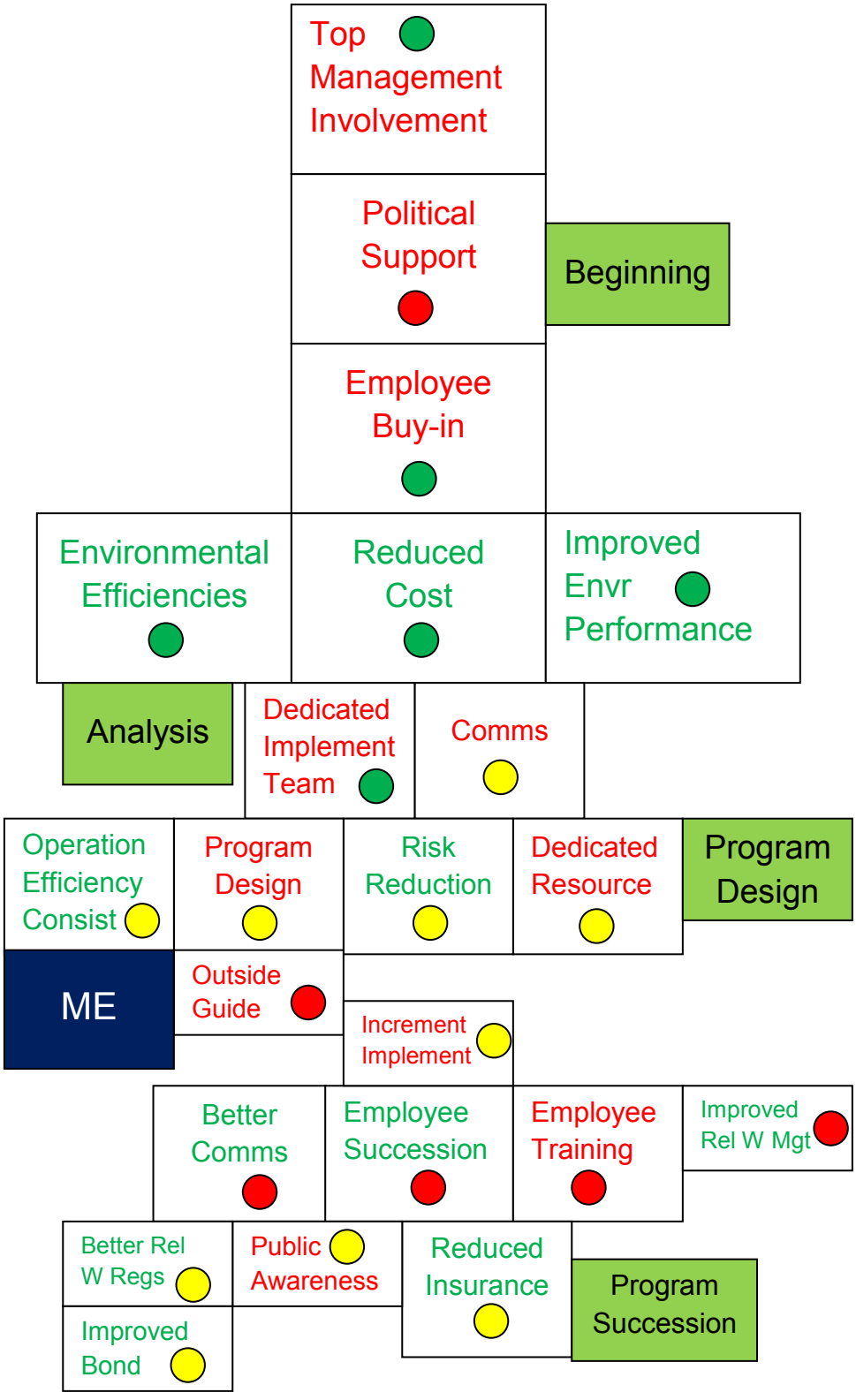
The SPC sees the benefits of implementation as better communications both within and outside of city government, improve labor relationships with management, easier employee succession, reduced costs, and reduced insurance premiums, improved bond ratings and better relationship with regulators. Reduced costs and reduced insurance premiums are viewed as being of high importance and easy to obtain. Better communications, improved bond rating and employee succession are all seen as being of medium importance with communications and bond rating being medium in ease of implementation while employee succession hard to implement. Improved labor relationships with management are view a being of low importance and easy to implement while better relationships with regulators are seen as low importance and medium is ease of implementation.

The SPC see the gaining of dedicated resources as the hardest step to EMS implementation while reduced costs will be the major driving force for EMS implementation.

The city is growing slowly and experiencing resource problems. The city is not very environmental conscious nor environmentally progressive.

EMS10

CONCEPT MAP OF IMPLEMENTATION



# EMS 10 Concept Map Explanation

Sustainable Planner

Start

The sustainable planner (SP) would propose the project for top management (city managers) approval. Top management support is view as barrier that is of high importance but easy to obtain. Once the project is approved, the SP would hold a council workshop to gain political support (city council). Political support is seen as a barrier that is of high importance and hard to obtain. Cost reductions, environmental efficiencies, and improved environmental performance are the major selling point of the EMS. This city has a council that is very supportive of city government and works well together. The SP see employee buy-in as a barrier of high importance but easy to obtain for implementation. Top management will drive the EMS project. They view the benefits of environmental efficiencies, reduced costs, and improved environmental performance as being of high importance and easy to implement.

Analysis

The dedicated implementation team will be assigned to analyze the EMS process and improve internal communications. The SP sees the dedicated implementation team and communications as being of medium importance with the team being easy to implement while communications will be medium in ease of implementation.

Program Design

The SP will be involved with program design. As part of the team he will design, plan, allot resources, and seek outside guidance (if needed). Operational efficiencies and risk reduction will be used to guide design and planning. Here the SP sees the barriers of program design and dedicated resources as being of medium importance and medium in ease of implementation. They also see the benefits of operational efficiencies and consistency and risk reduction as being of medium importance and medium in ease of implementation.

Program Succession

The SPC sees the benefits of implementation as better communications both within and outside of city government leading to better public awareness, improve labor relationships with management, easier employee succession through increase training, reduced insurance premiums, improved bond ratings,

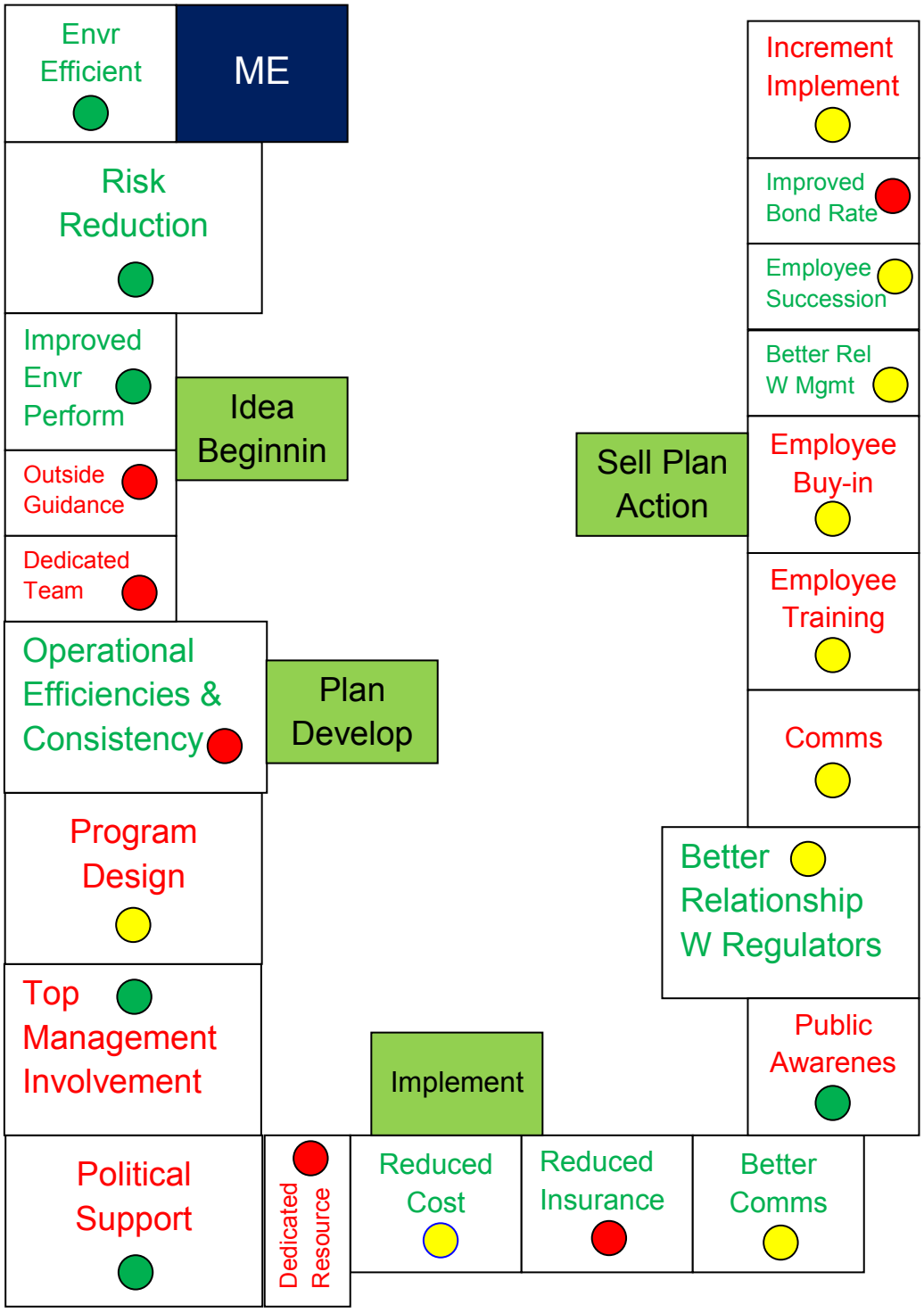
better labor relationship with management and better relationship with regulators. They view the barriers of outside guidance and support, incremental implementation, and public awareness as being of low importance with public awareness and incremental implementation as being medium to implement while outside guidance and support will be hard to gain. The barrier of employee training is seen as being medium in importance but hard to accomplish. The SPC views the benefits of better communications, employee succession, and reduced insurance premiums as all being of medium importance with communications and succession will be hard to implement while reduced insurance will be medium in ease of implementation. They see the benefits of improved labor relationships with management, better relationships with regulators, and improved bond rating as being low in importance with improve labor relationship with management as being hard to obtain while better relationships with regulators and improved bond ratings are seen as medium in ease of implementation.

Gaining political support is seen as the hardest step to EMS implementation.

The city is growing and working on water and wastewater efficiencies. They have drafted a sustainability plan. Staffing is currently low with retirements looming. Public is active in city and can present a roadblock.

EMS11

CONCEPT MAP OF IMPLEMENTATION



# EMS 11 Concept Map Explanations

## Assistant City Engineer

The Assistant City Engineer (ACE) would propose the project to get top management (city managers) approval. Once the project is approved, the top management would gain political support (city council). This city has a council that is very supportive of city government and works extremely well together. The ACE will drive the EMS project as sees it as a step by step process.

## Idea Beginning

The ACE will look at environmental efficiencies, risk reduction (the major driver) and improved environmental performance as drivers for the EMS. They will also help with team assignment and outside guidance and support (if needed). They see the benefit of risk reduction as being of high importance and easy to implement. The benefits of environmental efficiencies and improved environmental performance are viewed as being of medium importance and easy to implement. The barriers of outside guidance and support and dedicated implementation team are view as being of low importance and hard to obtain for implementation.

## Plan Development

The SP will look at operational efficiencies and consistency while working on program design. This will be taken to top management and then to city council. They will allocate dedicated resources for EMS implementation. The benefit of operational efficiencies and consistency is view as being of high importance but hard to get. The barriers of program design, top management involvement, and political support are seen as being high in importance with program design being medium in ease on implementation and top management and political support are easy to obtain for implementation. The SP view dedicated resources as being of low importance but hard to obtain for implementation.

## Implementation

Reduced costs, reduced insurance premiums, and better communications throughout the city will help raise public awareness and aide in better relationship with regulators. The SP sees the benefit of better relationships with regulators as being of high importance and medium in ease of implementation. They view the benefits of reduced costs, reduced insurance premiums, and better communications as being of medium importance with reduced insurance as hard

to get while reduced costs and better communications were medium in their ease of implementation.

Sell Plan/Action

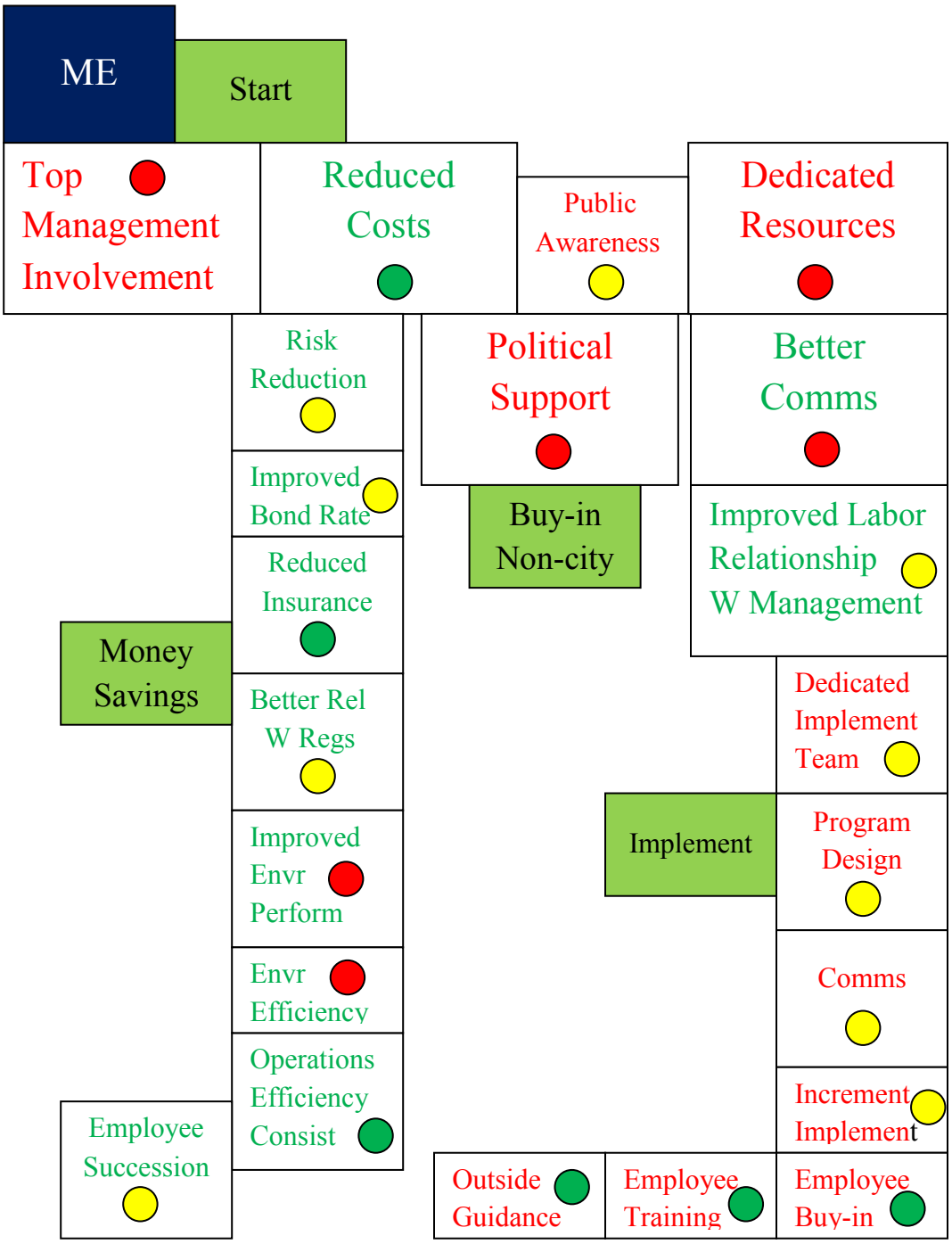
Employees will be training, internal communications will be improved, and employee buy-in will be gained in this step. Better labor relationship with management, easier employee succession, and improved bond ratings are seen as the benefits of this step. The ACE sees the EMS as being incrementally implemented in their city. They see the barriers of communications, employee training, employee buy-in, and incremental implementation as medium in importance and medium in ease of implementation. The view the benefits of better labor relations with management, employee succession and improved bond rating as being low in importance with bond rating as hard to change while succession and labor relationships with management are seen as medium in ease of implementation.

Dedicated resources were seen as the hardest step to EMS implementation and risk reduction is view as the major driver for EMS implementation.

The city is static in its growth. As employers have downsized and left, new companies have moved in and people have retrained. The workforce is stable and infrastructure is being updated.

EMS12

CONCEPT MAP OF IMPLEMENTATION



# EMS 12 Concept Map Explanations

Environmental Engineer

Start

The Environmental Engineer (EE) would propose the project to the city engineer. They would then both get top management (city managers) approval. Top management involvement is viewed as a barrier of high importance that will be hard to obtain. Cost savings would be the major selling point of the EMS. Once the project is approved, the top management would gain political support (city council) and increase public awareness of the project. Political support is view as a barrier that is of high importance but hard to obtain while public awareness is view as being of medium importance and medium in ease of implementation. This city has a council that is very supportive of city government and works extremely well together. The city manager will also need to allocate dedicated resources for the EMS implementation. Dedicated resources are seen as a barrier that is of high importance and will be hard to obtain. The EE will drive the EMS project as sees it as 2 branch process.

Buy-in Non City

Political support and public awareness are considered as non-city buy-in. It will be gained by the city manager.

Money Savings/Selling Points

The benefits of implementation are seen selling points for all concerned. They are risk reduction, improved bond rating, reduced insurance premiums, better relationship with regulators, improved environmental performance, environmental efficiency, operational efficiencies, and easier employee succession. The EE sees risk reduction, reduced insurance premiums, better relationships with regulators, improved environmental performance, operational efficiencies and consistency, and employee succession all being of medium importance. They believe that improved environmental performance and environmental efficiencies will be hard to obtain. Employee succession, better relationships with regulators and risk reduction will be medium in ease of implementation. Operational efficiencies and reduced insurance are seen as easy to implement.

Implementation

The EE sees this as where the program design, planning, training, team identification and outside guidance are located. Improved communications

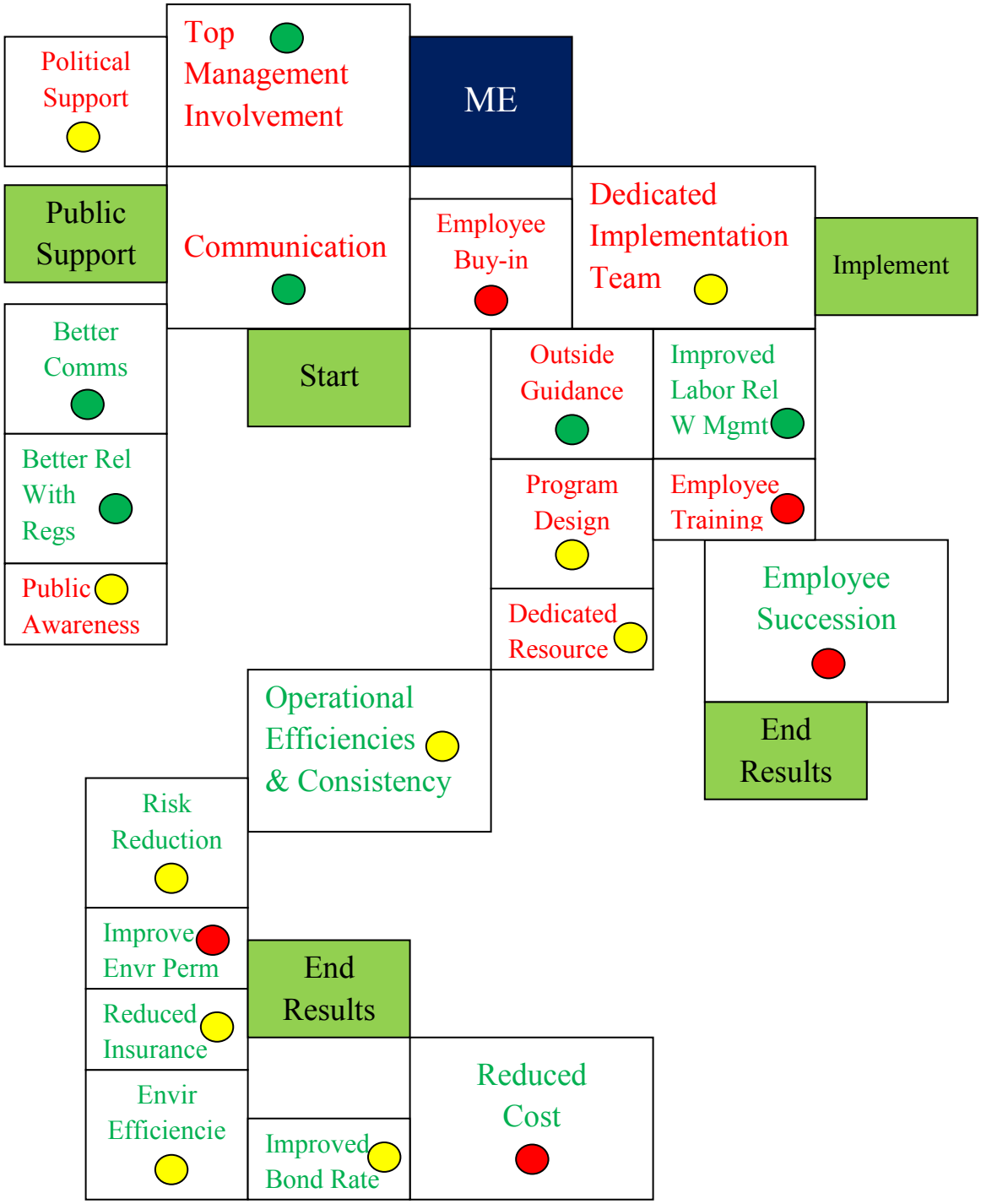
internally and better communications throughout the city are a driving factor and major benefit of this step. The benefits of better communications and improved labor relationships with management are seen as being of high importance with better communications view as hard to obtain and better labor relationship with management as medium in its ease of implementation. They see the barriers of dedicated implementation team, program design, and communications all being of medium importance and medium in ease of implementation. The barriers of incremental implementation, employee buy-in, employee training, and outside guidance and support are all seen as being of low priority with incremental being of medium ease of implementation and employee buy-in, training, and outside guidance seen as easy to implement.

Top management involvement and political support are seen as the hardest step to EMS implementation while improved labor relationship with management is the major driver of EMS implementation.

The city is static in its growth. Environmental concerns are second to all other aspects of city operations. This will be a major barrier to implementation.

EMS13

CONCEPT MAP OF IMPLEMENTATION



# EMS 13 Concept Map Explanations

Public Works Director

Start

The Public Works Director (PW) would propose the project top management (city managers) for their approval. Top management involvement is seen as a barrier of high importance and easy to obtain. Operational efficiencies and consistency, risk reduction and improved employee succession would be the major selling point of the EMS. Once the project is approved, the top management would gain political support (city council) for the project. The barrier of political support is seen as medium in importance and medium in ease to obtain. This city has a council that is very supportive of city government and works extremely well together. Top management would work on communicating information to all concerned about EMS implementation. The PW would be the major force behind the EMS.

Public Support

The PW sees better communications outside of the city administration as a driving force for this branch. They view the benefits of better communications, and better relationships with regulators as both being medium in importance and easy in implementation. They view the barrier of public awareness as low in importance and medium in ease of implementation.

Implement

The PW sees this branch as where the following steps take place: program design, planning, training, outside guidance, employee buy-in, team identification, and resource allocation. The barrier of dedicated implementation team is view as being of high importance and medium in ease of implementation. The barriers of outside guidance and support and program design are view as medium in importance with outside guidance viewed as easy to implement while program design is view as medium in ease of implementation. The barriers of employee training, incremental implementation, and dedicated resources are all viewed as low in importance with training and incremental implementation seen as hard to implement and dedicated resources seen as medium in ease of implementation. The PW sees the benefit of improved labor relationship with management as being of medium importance and easy to obtain.

End Results

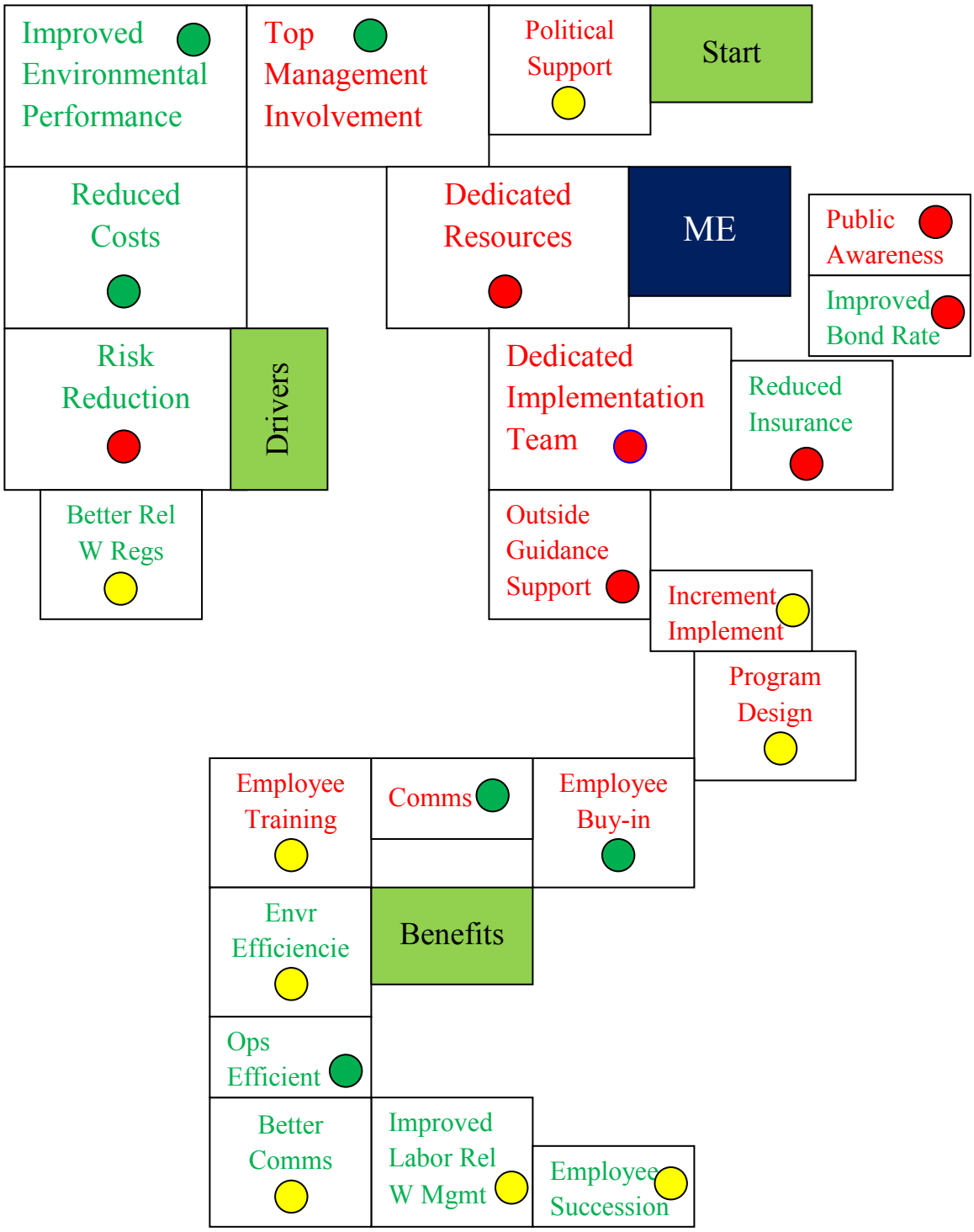
The many benefits of implementation are seen as the end results. The PW sees the benefit of employee succession as being of high importance and hard to obtain in one branch. They see operational efficiencies and consistency and reduced costs as being of high importance with efficiencies and consistencies are medium in ease of implementation and reduced costs as hard to obtain. The benefits of risk reduction and environmental efficiencies are both view as being of medium importance and medium in ease of implementation. Improved environmental performance, reduced insurance premiums, and improved bond ratings are all seen as having low importance with improved environmental performance being hard to obtain and reduced insurance premiums and improved bond rating are seen as medium in ease of implementation.

The PW sees communication as the biggest problem to EMS implementation and operational efficiencies and consistency as the major driver for EMS implementation.

The city has limited growth opportunities with a major city on its boundary. They have a solid work force, although it is small in size. A major road block to EMS implementation is a small workforce.

EMS14

CONCEPT MAP OF IMPLEMENTATION



# EMS 14 Concept Map Explanations

Public Works Director

Start

The Public Works Director (PW) would propose the project top management (city managers) for their approval. Top management involvement is seen as a barrier that is of high importance and easy to obtain. Improved environmental performance, cost savings, risk reduction and improved relationship with regulators would be the major selling point of the EMS. Once the project is approved, the top management would gain political support (city council) for the project. Political support is viewed as a barrier that of medium importance and medium in ease of implementation. This city has a council that is very supportive of city government and works extremely well together. Top management will provide dedicated resources for the EMS project which are viewed as a barrier that is high in importance and hard to obtain. The PW would be the major force behind the EMS.

Drivers

The benefits of improved environmental performance, cost savings, risk reduction and improved relationship with regulators are the major drivers for EMS implementation in the city. The PW sees improved environmental performance, reduced costs and risk reduction as being of high importance with environmental performance and reduced costs as being easy to implement and risk reduction as hard to implement. They also see better relationships with regulators as being of medium importance and of medium ease of implementation.

Implementation

The PW sees this branch as where the following steps take place: program design, planning, employee training, outside guidance, employee buy-in, increased public awareness, and better internal communications. Reduced insurance premiums and improved bond ratings are seen as benefits of implementation branch. The PW views the barrier of dedicated implementation team as being of high importance and hard to obtain. They also see the barriers of outside guidance and support, program design, employee buy-in, and employee training as being of medium importance with outside guidance being hard to implement and program design, employee training being medium in ease of implementation, and employee boy-in viewed as easy to implement. Public awareness, incremental implementation, and communications are seen as being of low importance with public awareness being hard to obtain, incremental

implementation as being medium in ease of implementation, and communications as easy to implement. The two benefits of this branch are reduced insurance premiums, which are viewed as medium in importance and hard in implementation, and improved bond rating that is seen as hard to implement.

Benefits

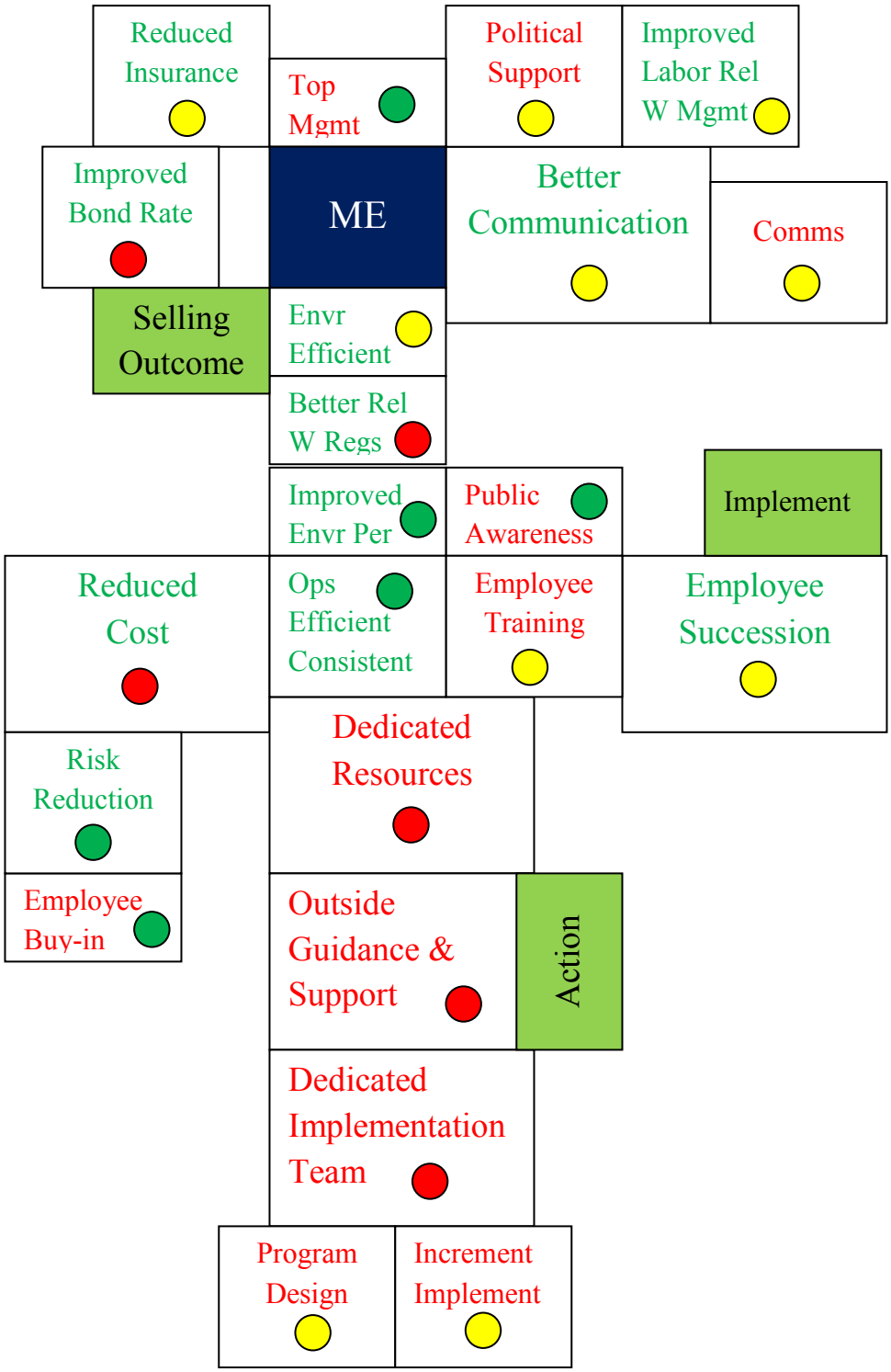
The many benefits of implementation are seen as the end results. They are environmental efficiencies, operational efficiencies and consistency, better communications throughout the city, improved labor relationships with management, and easier employee succession. The PW sees environmental efficiencies, better communications, and improved labor relationships with management as being medium in importance with all of them being medium in ease of implementation. Operational efficiencies and consistencies and employee succession are benefits viewed having low importance with operations efficiencies and consistencies as being easy to implement and employee succession as medium in ease of implementation.

The PW sees dedicated resources and implementation team as the hardest steps to EMS implementation and improved environmental performance as the key driver for EMS implementation.

The city is surrounded by other cities and has limited growth opportunities. They have a solid work force, although they are not paid as well as surrounding communities (thus losing trained employees to higher wages). Citizens in the community are active and responsive. A major road block to EMS implementation is a small workforce.

EMS15

CONCEPT MAP OF IMPLEMENTATION



# EMS 15 Concept Map Explanations

## Environmental Services Director

### Selling Outcomes

The Environmental Services Director (ES) would propose the project top management (city managers) for their approval. Top management involvement is a barrier viewed as low importance and easy to obtain. Better communications, reduced costs and employee succession would be the major selling point of the EMS. Once the project is approved, the ES would gain political support (city council) for the project. Political support is a barrier seen a medium in importance and medium in ease of implementation. This city has a council that is very supportive of city government and works very well together. The other barrier of this branch is public awareness that is view as being of low importance and easy to implement. The ES rates the benefits of improved labor relationships with management, reduced insurance premiums, and improved bond rating as being of medium importance with improve labor relationships with management and reduced insurance premiums as medium in ease of implementation while improved bond rating is view as hard to implement. They also see the benefits of environmental efficiencies, better relationships with regulators and improved environmental performance as being of low importance with better relationships with regulators as hard to implement, environmental efficiencies and medium in ease of implementation, and improved environmental performance and easy to implement. The ES would be the major force behind the EMS.

### Implementation

The PW sees this branch as where employee training and employee buy-in take place. They also see easier employee succession, reduced cost, operational efficiencies and consistency, and risk reduction as benefits of implementation branch. They see the barriers of employee training as being of medium importance and medium ease of implementation and employee buy-in as low importance with easy implementation. The benefits of reduced cost and employee succession are seen as being of high importance with reduced cost being hard to obtain and employee succession as having a medium ease of implementation. The benefits of operational efficiencies and risk reduction are both view as medium importance and being easy to implement.

### Action

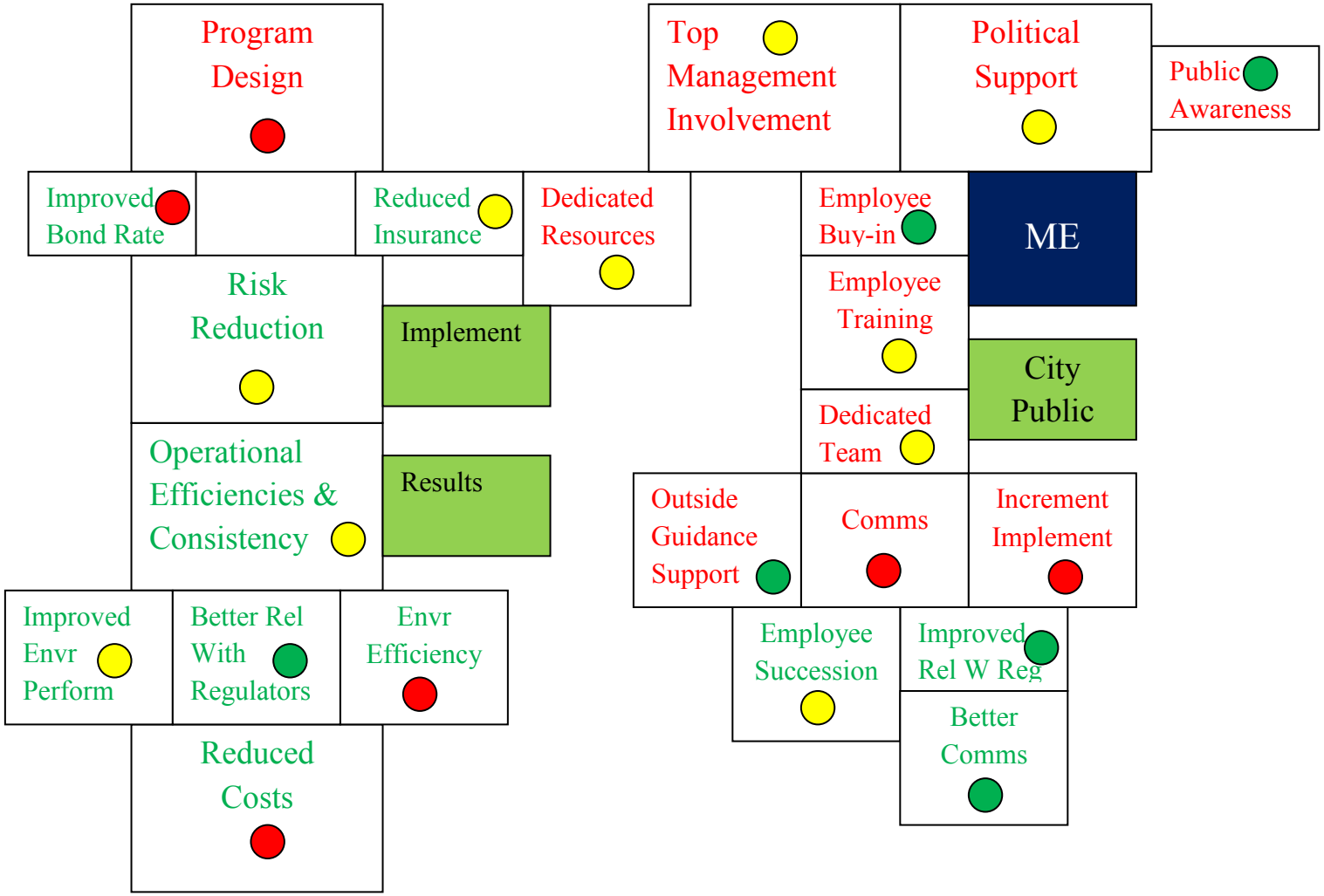
In this branch dedicated resources, implantation team and outside support design and execute the program. The PW sees the barriers of dedicated resources, outside guidance and support, and dedicated implementation team as being of high importance and hard to obtain. They also see the barriers of program design and incremental implementation as both being medium in importance and medium in ease of implementation.

Dedicated resources are seen as the hardest step to EMS implementation and easier employee succession is the major driver for EMS implementation.

The city is close to other cities. They have a solid work force, although they are not paid as well as surrounding communities (thus losing trained employees to higher wages). The city is environmentally progressive especially in water and waste water areas.

EMS16

CONCEPT MAP OF IMPLEMENTATION



# EMS 16 Concept Map Explanations

Environmental Manager

City/Pubic

The Environmental Manager (EM) would propose the project top management (city managers) for their approval. Top management involvement is seen as a barrier of high importance and medium in ease of implementation. Reduced cost, operational efficiencies and consistency, and risk reduction would be the major selling point of the EMS. Once the project is approved, the city manager would gain political support (city council) and increase public awareness for the project. Political support is viewed as a barrier of high importance and medium in ease of implementation while public awareness is seen as a barrier of low importance and easy to implement. This city has a council that is very supportive of city government and works very well together. The EM would be the major force behind the EMS. They would provide employee training, ensure employee buy-in, be part of the implementation team (leader), identify outside support (if needed), and improve internal communications. The EM rates the barriers of employee buy-in, employee training, outside guidance, communications and incremental implementation as medium in importance with outside guidance seen as easy to implement, employee training as medium in ease of implementation, and communications and incremental implementation as hard to implement. They view the benefits of employee succession and better communications as being of medium importance with employee succession rated as medium in ease of implementation and better communications as easy to implement. They also view the benefit of improved relationships with regulators as low importance and easy to implement.

Implementation

The PM sees this branch as where resources are dedicated and the program is designed for the city. They also see improved bond rating, reduced insurance premiums and risk reduction as benefits of this branch. They rate the barrier of program design as high in importance and hard to implement while the barrier of dedicated resources is rated as medium importance and medium in ease of implementation. Risk reduction benefit is viewed as highly important and medium in ease of implementation. The benefits of improved bond rating and reduced insurance premium are both seen as low importance with bond rating seen as hard to implement and reduced insurance is seen as medium in ease of implementation.

Results

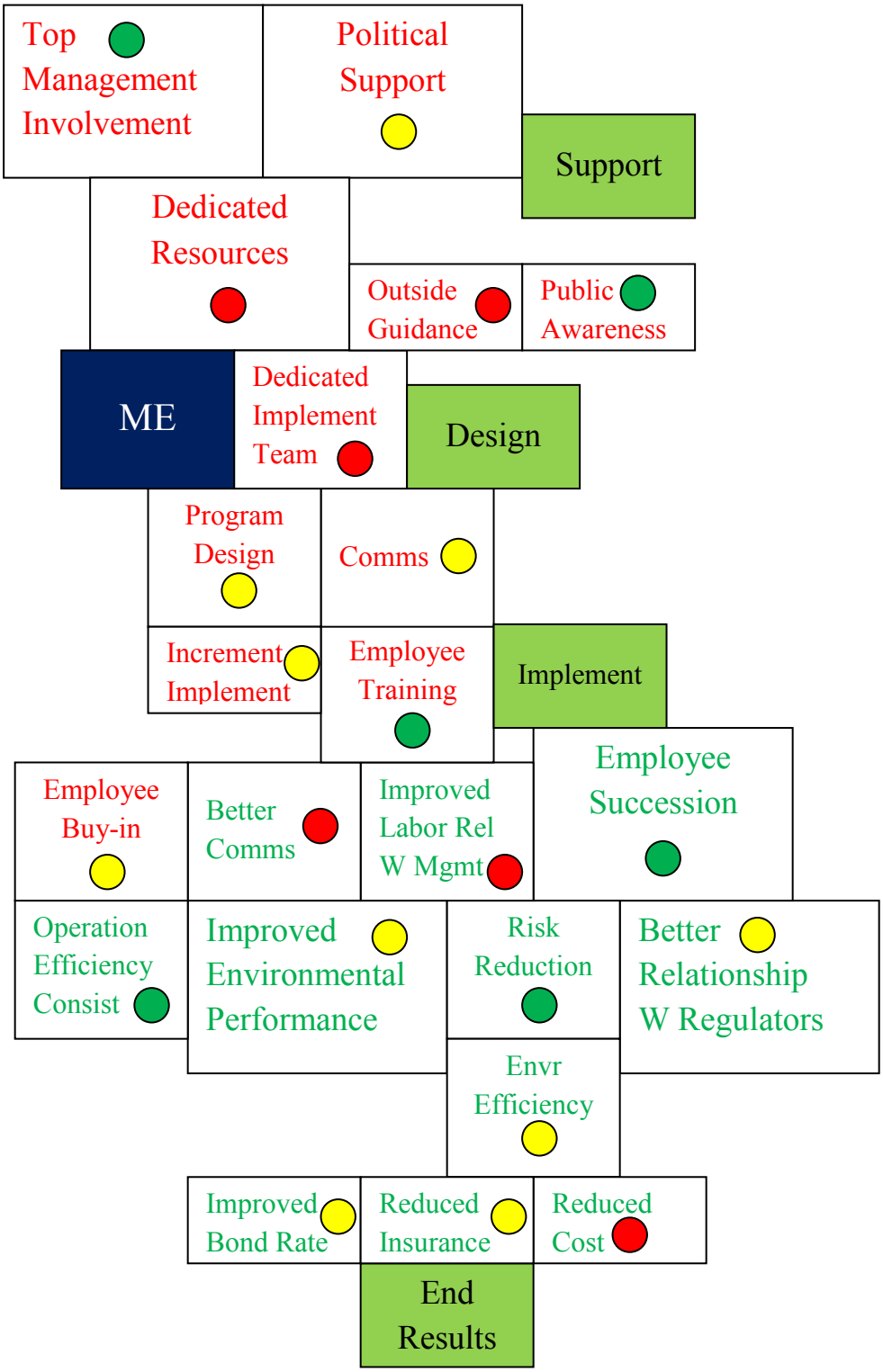
In this branch operational efficiencies and consistency, better relationships with regulators, environmental efficiencies and reduced costs are beneficial results of the EMS implementation. The PM sees operational efficiencies and consistencies and reduced costs as being of high importance with reduced costs as hard to obtain and operational efficiencies and consistencies as medium is ease of implementation. They see improved environmental performance, better relationships with regulators, and environmental efficiencies as all being medium in importance with better relations being view as easy to implement, improve environmental performance as medium in ease of implementation, and environmental efficiencies as hard to implement.

The PM sees program design as the hardest step to EMS implementation and reduced costs as the primary driver for EMS implementation.

They have a solid work force and stable workforce. The city is environmentally progressive for the state. The city has the resources to commit to environmental programs.

EMS17

CONCEPT MAP OF IMPLEMENTATION



# EMS 17 Concept Map Explanations

## Environmental Manager

### Support

The Environmental Manager (EM) would propose the project to Public Works Director (PW). The PW would propose to top management (city managers) for their approval. Top management support is seen as a barrier of high importance that will be easy to obtain. Improved environmental compliance, better relationships with regulators, and easier employee succession would be the major selling point of the EMS. Once the project is approved, the city manager would gain political support (city council). Political support is viewed as a barrier of high importance that has medium ease of implementation. This city has a council that is very supportive of city government and works very well together. There is also a new mayor in the city. The top management would dedicate resources, provide outside support, and increase public awareness for the EMS project. Dedicated resources are a barrier seen as being highly important and hard to obtain. The barriers of outside guidance and public awareness are seen as being of low importance with outside guidance being hard to obtain and public awareness as easy to implement.

### Design

The EM would be part of this process. They would be a member to the implementation team (leader) and aide in its formation. They would be involved in program design, planning, and improving internal communications. They view the barriers of dedicated implementation team, program design, and communications as being of medium importance with program design and communications having a medium ease of implementation and dedicated implementation team as being hard to implement.

### Implementation

The EM sees this branch as where employee training and buy-in take place. They see the EMS implementation as being done incrementally. Better communications throughout the city, improved labor relationship with management and easier employee succession are seen as the benefits of this branch. Barriers of this branch are employee training that is seen as medium in importance and easy in implementation, employee buy-in that is view as medium importance and medium ease in implementation, and incremental implementation which is seen as low importance with a medium ease of implementation. They view employee succession as a benefits as high

importance that is easy to implement. They also see the benefits of better communications and improved labor relationship with management as being of medium importance and both are hard to implement.

End Results

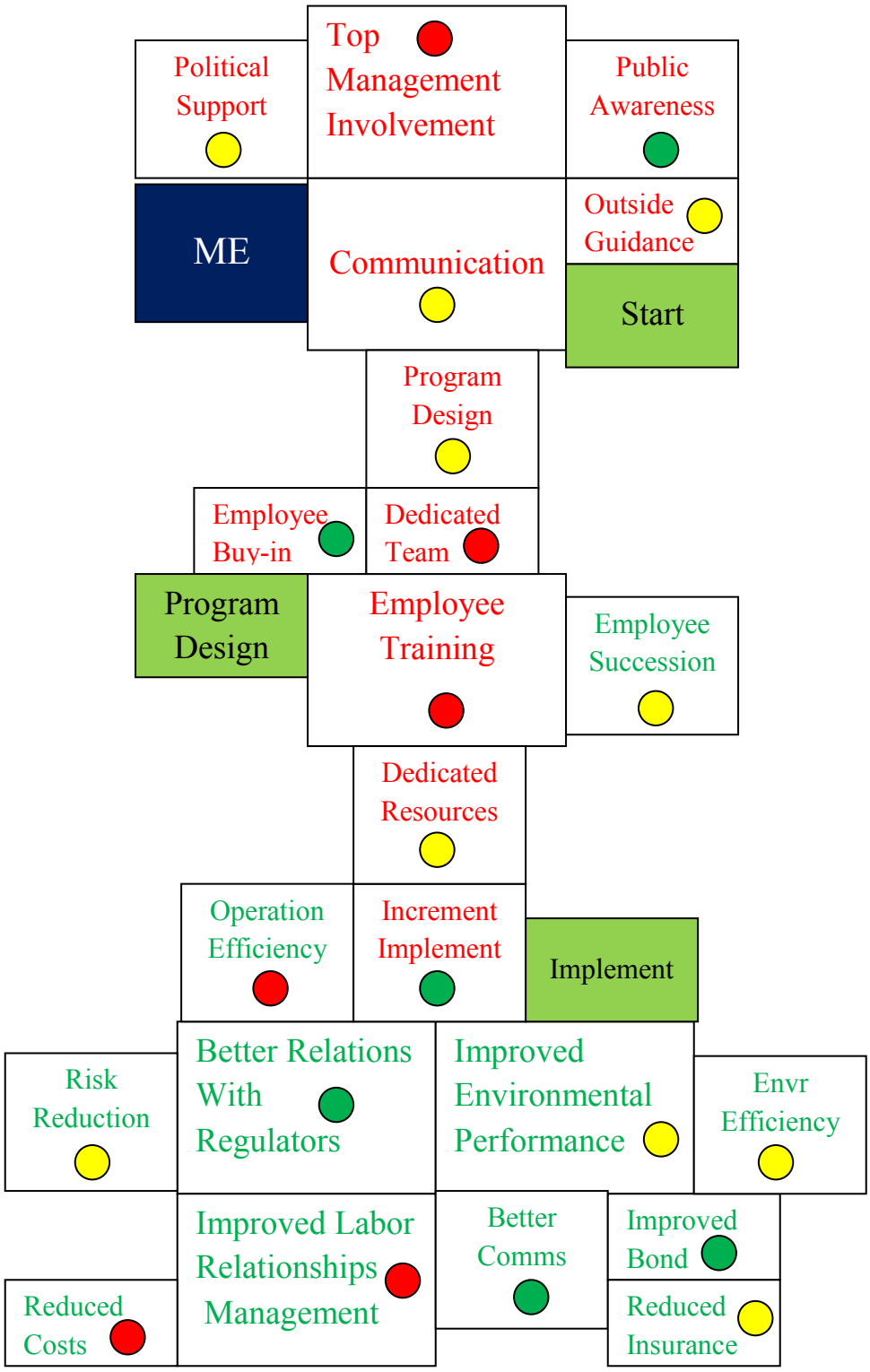
In this branch operational efficiencies and consistency, improved environmental performance, risk reduction better relationships with regulators, environmental efficiencies, improved bond rating, reduced insurance premiums and reduced costs are beneficial results of the EMS. The EM sees improved environmental performance and better relationships with regulators as being of high importance and medium in ease of implementation. They see operational efficiencies and consistencies, risk reduction, and environmental efficiencies as being of medium importance with operational efficiencies and consistencies and risk reduction having an easy implementation and environmental efficiencies having a medium ease of implementation. Improved bond rating, reduced insurance premium, and reduced costs are seen having a low importance with bond rating and insurance being medium in ease of implementation while reduced costs is seen as being hard to implement.

The EM sees dedicated resources are seen as the hardest step to EMS implementation and improved environmental performance as the major driver for EMS implementation.

The city is just starting to address environmental aspects. A lack of employees is the major stumbling block to EMS implementation. The city is experiencing change with a new mayor, city manager and restructuring.

EMS18

CONCEPT MAP OF IMPLEMENTATION



# EMS 18 Concept Map Explanations

Special Projects Manager (and Deputy Utility Director)

Start

The Special Project Manager (SP) (ME 2 in the concept map) along with the Deputy Utility Director (DU) (Me in the concept map) would propose the project to the Public Works Director (PW). The PW would propose the project to top management (city managers) for their approval. Top management involvement is seen as a barrier of high importance that will be hard to obtain. Improved environmental compliance, better relationships with regulators, and improved labor relationship with management would be the major selling point of the EMS. Once the project is approved, the city manager would gain political support (city council). Political support is viewed as a barrier with medium importance and medium in ease of implementation. This city has a council that is very supportive of city government and works well together. Top management would seek to improve city communications, increase public awareness and provide outside guidance (as needed) for the EMS project. The SP sees the barrier of communications as having a high importance and medium ease of implementation, the barrier of public awareness as having a medium importance and easy implementation, and the barrier of outside guidance and support as having low importance and medium ease of implementation.

Program Design

The SP would be part of this process. They would be a member to the implementation team (leader) and aide in its formation. They would be involved in program design, planning, employee training and employee buy-in. They would also seek dedicated resources for program implementation. They see the barrier of employee training as having high importance and rate it as hard to implement. They also see the barriers of program design and dedicated resources as being of medium importance with medium ease of implementation. Employee buy-in and dedicated implementation team are seen as barriers of low importance with the dedicated team being hard to obtain and the employee buy-in as easy to implement. The SP sees the benefit of employee succession as being of medium importance and medium in ease of implementation in this branch.

Implementation

The SP sees the EMS as being implemented incrementally. In this branch operational efficiencies and consistency, risk reduction, better relationships with

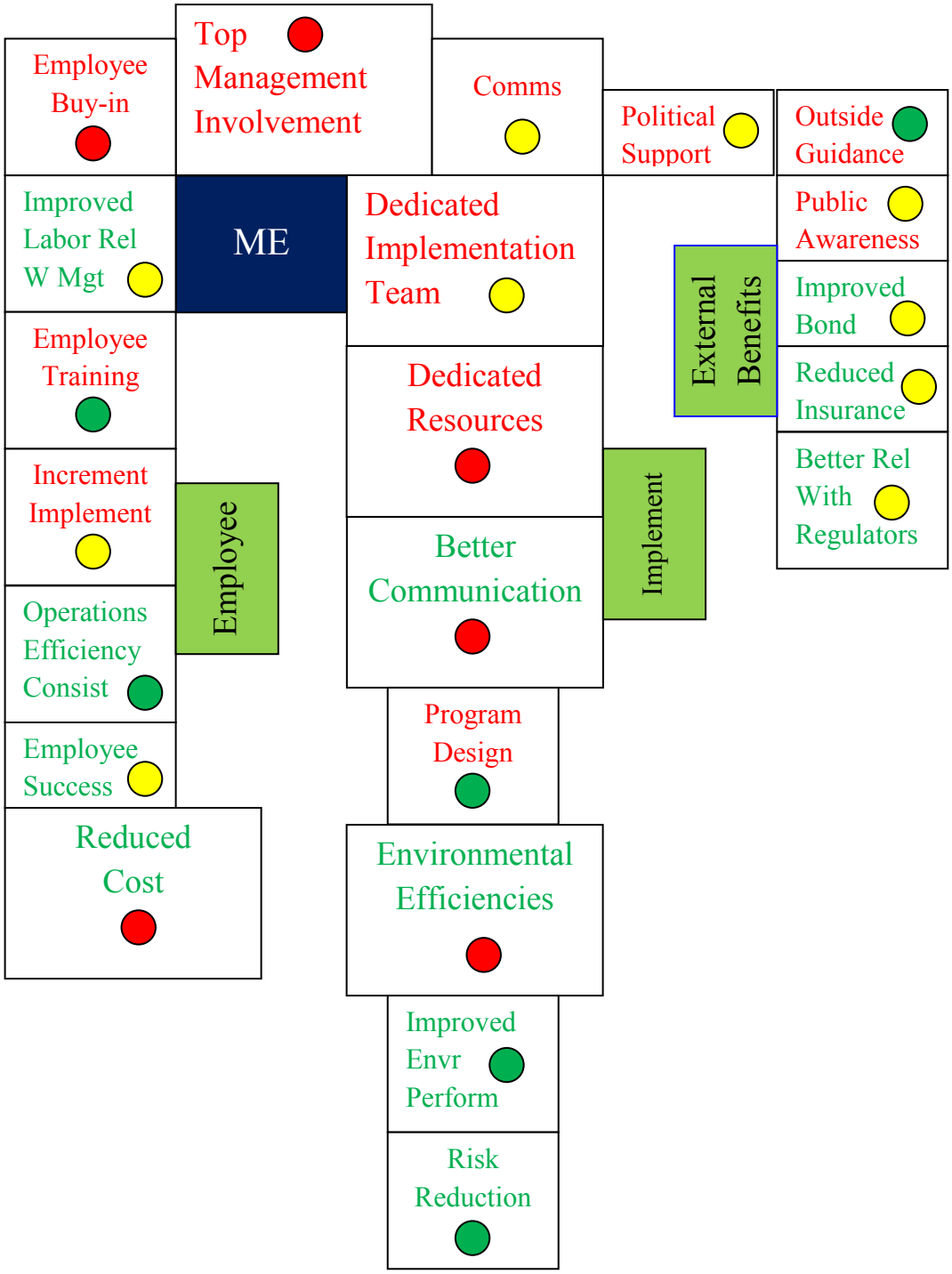
regulators, improved environmental performance, environmental efficiencies, reduced costs, improved labor relations with management, better communications, improved bond rating, and reduced insurance premiums are beneficial results of the EMS. They see the benefits of better relationships with regulators, improved environmental performance, and improved labor relationships with management all as being of high importance with relations with regulators as easy to implement, improved environmental performance as medium in ease of implementation, and improved labor relationships with management as hard to implement. The benefits of risk reduction, environmental efficiencies, and better communications are viewed as having medium importance with risk reduction and environmental efficiencies having a medium ease of implementation, and better communications being easy to implement. The SP sees the benefits of reduced costs, reduce insurance ratings, and improved bond rating as having a low importance with reduced costs being hardest to implement, reduced insurance as being medium in ease of implementation, and improved bond rating as easy to implement.

The SP and DU see top management involvement and employees training as the hardest steps to EMS implementation and improved environmental compliance as the main driver for EMS implementation.

The city is addressing environmental issues. A lack management involvement is a major stumbling block to EMS implementation. Management support is unlikely and poor relations exist between labor and management.

EMS19

CONCEPT MAP OF IMPLEMENTATION



# EMS 19 Concept Map Explanations

## Environmental Services Coordinator

The Environmental Services Coordinator (EC) would propose the project to the Public Works Director. The Public Works Director would propose the project to top management (city managers) for their approval. Top management involvement is seen as a barrier of high importance and will be hard to obtain. Better Communications inside and outside of the city, reduced costs, and environmental efficiencies would be the major selling point of the EMS. Once the project is approved, the city manager would gain political support (city council). Political support is view as a barrier of low importance and medium in ease of implementation. This city has a council that is supportive of city government and can work together. Top management would seek to improve city communications, and provide outside guidance (as needed) for the EMS project. The EC sees the barrier of communications as being of medium importance and medium in ease of implementation and the barrier of outside guidance to be of low importance and easy to implement.

## Implementation

The SP would be part of this process. They would be a member to the implementation team (leader) and aide in its formation. They would be involved in program design, planning, and gaining dedicated resources for EMS implementation. Better communications throughout the city, environmental efficiencies, improved environmental performance, and risk reduction are the benefits seen in this branch. The SP rates the barriers of dedicated implementation team and dedicated resources as being high in importance with resources being hard to obtain, and implementation team as being medium in ease of implementation. They also rate the barrier of program design as medium in importance and easy to implement. They rate the benefits of better communications and environmental efficiencies as being of high importance and both are seen as hard to implement. Also they rate the benefits of improved environmental performance and risk reduction as being of medium importance and both a seen an easy to implement.

## Employee

The EC sees the EMS as being implemented incrementally. In this branch they would be involved in employee training and employee buy-in. Improved labor relations with management, operational efficiencies and consistency, easier employee succession and reduced cost are benefits seen in this branch. They

rate the barriers of employee buy-in, employee training, and incremental implementation as being of medium importance with buy-in seen as hard to implement, incremental implementation as medium in ease of implementation, and training as easy to implement. The EC sees the benefit of reduced costs as being of high importance and hard to obtain. They also see the benefits of improved labor relations with management and operational efficiencies and consistency as having a medium importance with labor relations seen a medium in ease of implementation and operations efficiencies and consistencies are seen as easy to implement. Employee succession is viewed as a benefit of low importance and medium in ease of implementation.

External Benefits

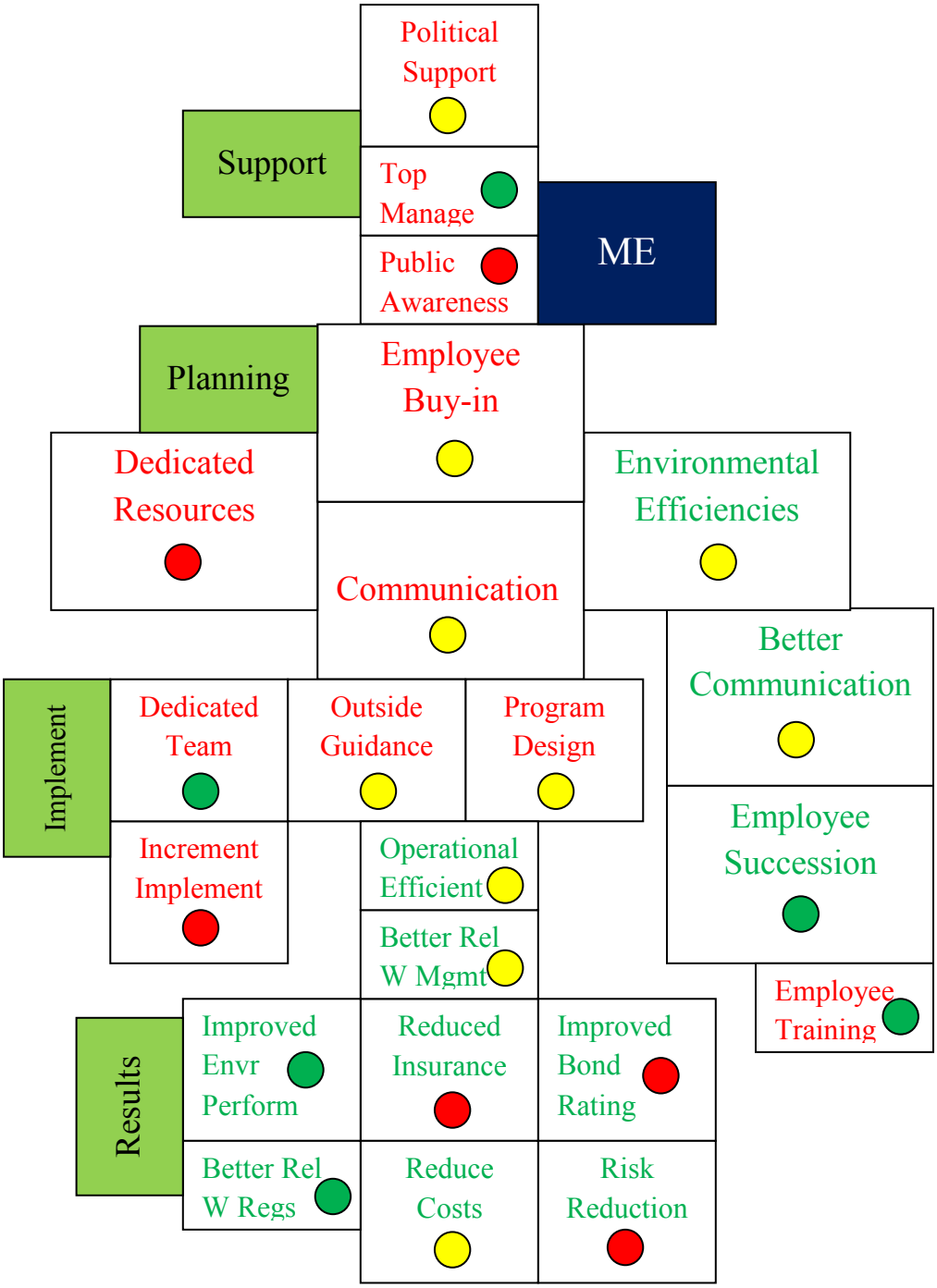
Improved public awareness coupled with improved bond rating, reduced insurance premiums and better relationships with regulators are external beneficial results of the EMS. The EC views the barrier of public awareness as being of low importance and medium in ease of implementation. They see the benefit of better relationships with regulators as having a medium importance and medium ease of implementation. The benefits of improved bond rating and reduced insurance premiums are both seen as having low importance and medium ease of implementation.

The EC sees top management involvement and dedicated resources are seen as the hardest step to EMS implementation and better communications inside and outside of the city as the primary driver for EMS implementation.

The city is a leader in environmental issues, although there is a sense of frustration with management on being proactive.

EMS20

CONCEPT MAP OF IMPLEMENTATION



# EMS 20 Concept Map Explanations

Public Works Director and Assistant City Manager

Support

The Assistant City Manager (ACM) (and Public Works Director) is part of top management. They would brief the city managers to gain their approval. Top management involvement is seen as a barrier of low importance and easy to obtain. Environmental efficiencies, better communications throughout the city, and easier employee succession would be the major selling point of the EMS. Once the project is approved, the city manager would gain political support (city council). Political support is viewed as being a barrier of medium importance and medium in ease of implementation. This city has a council that is very supportive of city government and works very well together. Top management would seek to improve public awareness for the EMS project where this awareness in rated as a barrier that is of low importance and hard implementation.

Planning

This step will include employee buy-in and training, dedicated resources, and improving internal city communications. Better communications throughout the city, environmental efficiencies, and easier employee succession are the benefits seen in this step. The ACM sees the barriers of employee buy-in, dedicated resources, and communications as having a high importance with resources being hard to obtain, and buy-in and communications are of medium ease in implementation. They also see the barrier of employee training as being of low importance and easy to implement. Environmental efficiencies, better communications, and improved employee succession are seen as benefits of high importance with employee succession seen as easy to implement and better communications and environmental efficiencies are seen a medium in ease of implementation.

Implementation

In this step would involve forming the implementation team, gaining outside guidance, program design, planning, and implementation. The ACM view the barriers of dedicated implementation team, outside guidance and support, program design, and incremental implementation as being of medium importance with incremental implementation being seen as hard to implement, outside guidance and program design are seen as medium in ease of implementation, and dedicate team is seen as easy to implement.

Results

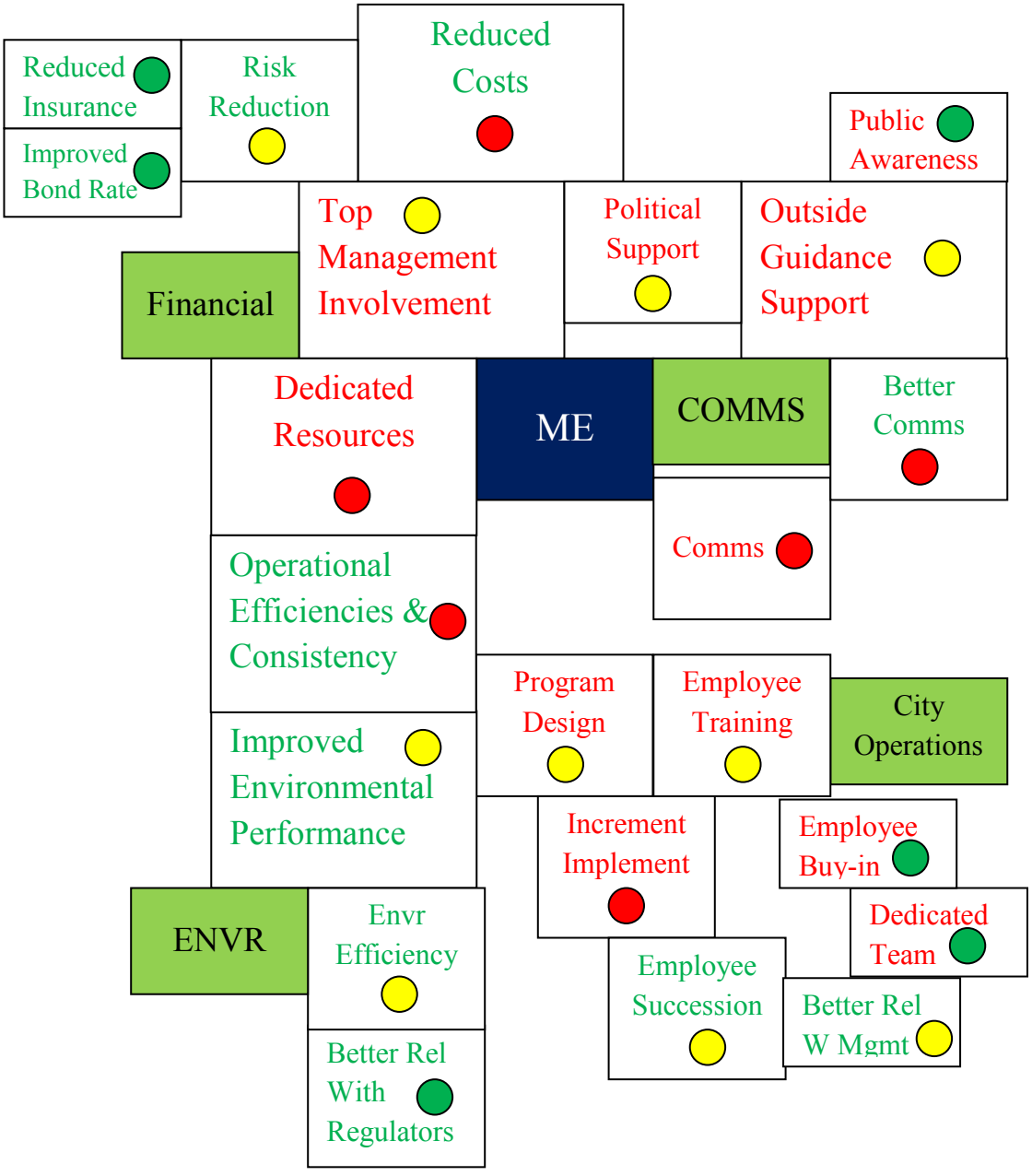
In this step the major benefits such as operational efficiencies, better relationships with regulators, improved environmental performance, reduced insurance premiums, improved bond ratings, better labor relationship with management, risk reduction and reduced costs will be seen as a result of the EMS. The ACM rates improved environmental performance, reduced insurance premiums, improved bond ratings, reduce costs, and risk reduction as being of medium importance with reduce insurance, bond rating, and risk reduction seen as hard to implement, reduced costs seen as medium in the ease of implementation, and improved environmental performance as easy to implement. They also see better relationships with regulator as being of low importance and easy to implement.

The ACM sees dedicate resource as the hardest step to EMS implementation and environmental efficiencies as the major driver for EMS implementation.

The city is growing slowly. There is a lack of employees and the city is using less outside help (contractors) due to budgetary constraints. Resources (money and people) will be a major hurdle to EMS implementation.

EMS21

CONCEPT MAP OF IMPLEMENTATION



# EMS 21 Concept Map Explanations

## Solid Waste Service Manager

### Financial

The Solid Waste Service Manager (SW) would brief the Public Works Director on EMS implementation. The Public Works Director would brief top management (city managers) to gain their approval. Top management involvement is seen a barrier of high importance with a medium ease of implementation. Reduced costs, risk reduction, and improved bond rating would be the major selling point of the EMS. Once the project is approved, the SW and city manager would gain political support (city council). Political support is seen as a barrier of medium importance and medium ease of implementation. This city has a new council that is supportive of city government and appears to work well together. Top management would seek to improve public awareness and seek outside support (if needed) for the EMS project. Outside guidance and support is viewed by the SW as a barrier of high importance that is of medium ease of implementation. The barrier of public awareness is seen as being of low priority and easy to gain. Top management would also supply dedicated resources to support the EMS process. These dedicated resources are a barrier that is of high importance and will be hard to obtain. The SW sees reduced costs as a benefit of high importance that will be hard to achieve. They see risk reduction as a benefit that is of medium importance that will be of medium ease to implement and reduced insurance premiums and improved bond ratings as low importance benefits that will be easy to implement.

### Communications

The SW feels that communications is paramount is any program implementation. Experience has shown how poor internal communications has hurt programs while good communications have made a great difference for other programs. They rate both the barrier and benefit of communications as medium importance and hard implementation.

### Environmental

The SW sees improved environmental performance, environmental efficiencies, and better relationships with regulators as environmental benefits of the EMS. They rate operational efficiencies and consistencies and improved environmental performance as being of high importance with operational efficiencies and consistencies as hard to implement and improved environmental performance as medium in ease of implementation. Environmental efficiencies and better

relationships with regulators are both rated of medium importance with environmental efficiencies seen as medium in ease of implementation and relationships with regulators seen as easy to implement.

City Operations

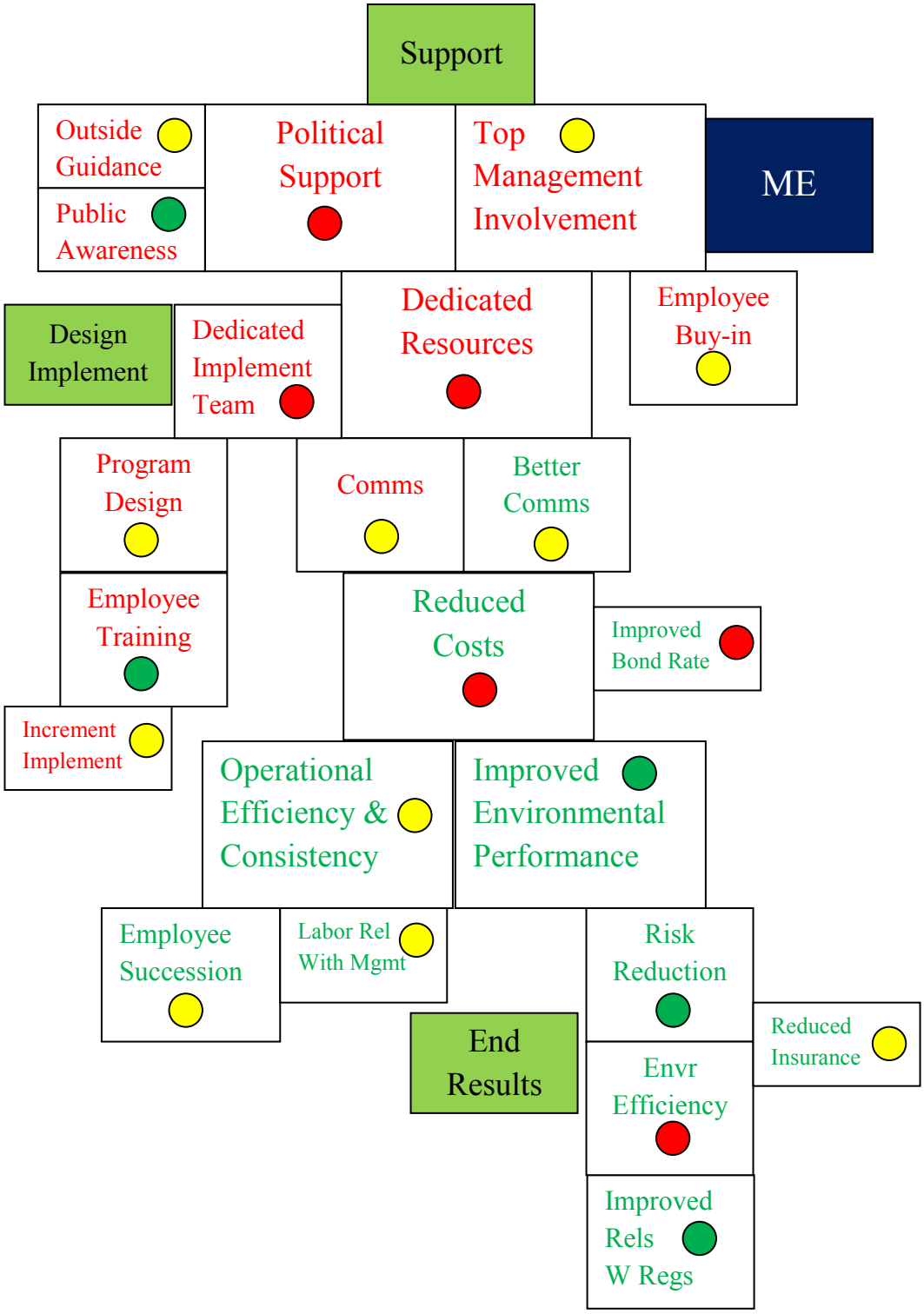
In this branch the EMS is implemented by the city. The EMS is designed, planned and implemented. Here the team is assigned, the program designed, employee trained, and employee buy-in is accomplished. Easier employee succession and better labor relationships with management are benefits that are seen in this branch. The SW sees the barriers of program design, employee training, and incremental implementation as medium importance with incremental implementation viewed as hard to implement and program design and employee training as viewed as medium in ease of implementation. The barriers of employee training and dedicated implementation team are both seen as medium importance and easy to implement. The SW sees the benefit of employee succession as being of medium importance and medium in ease of implementation. They see the benefit of better labor relationship with management as being of low importance and medium in ease of implementation.

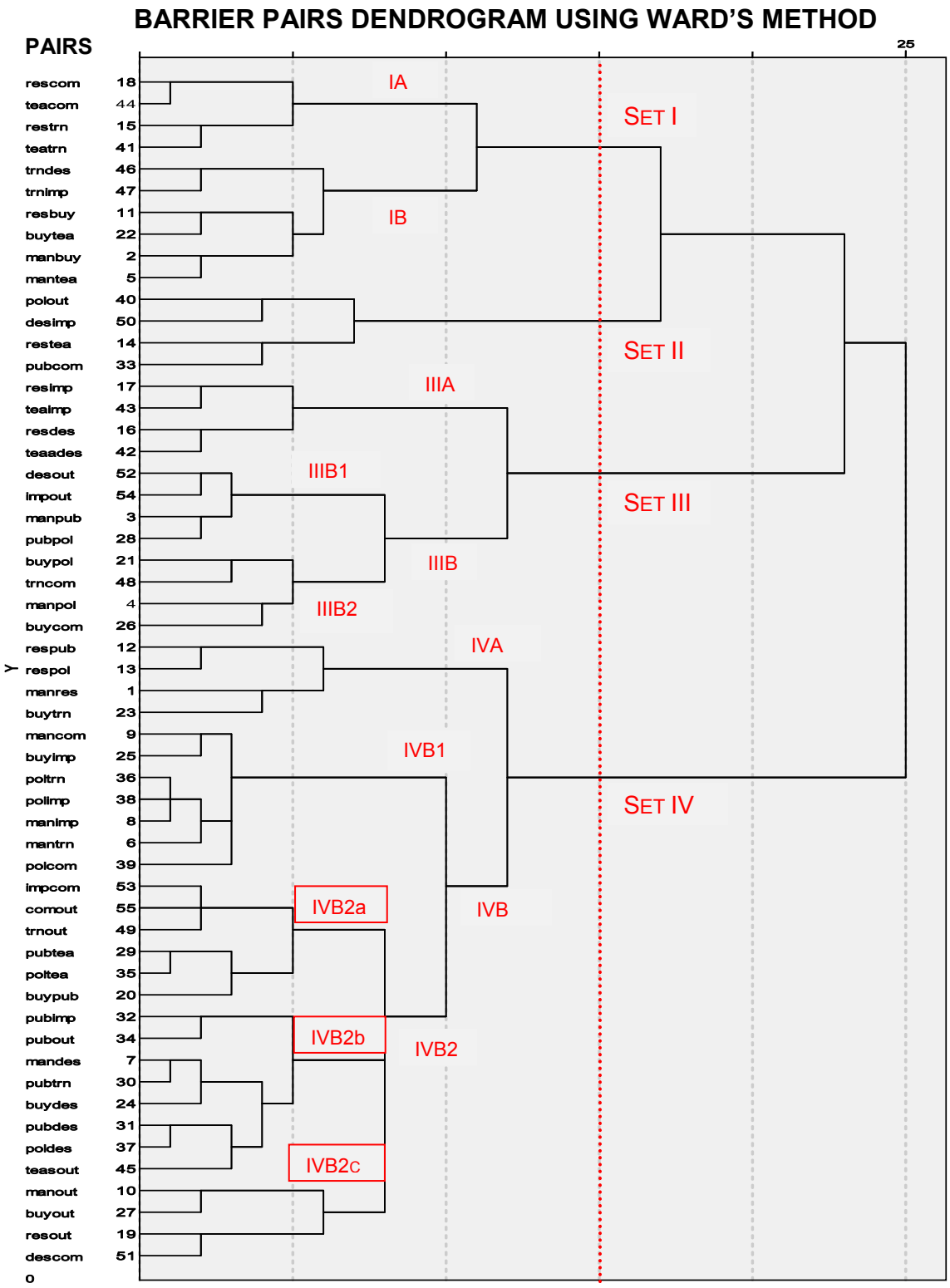
The SW sees dedicated resources as the hardest step to EMS implementation while operational efficiencies and consistencies and reduced costs are seen as major drivers for EMS implementation.

The city is growing slowly. Its environmental progress is following a slow but steady increase in environmental awareness. A new city council and city manager seem to be looking to move the city ahead. Citizens are engaged and supportive of environmental programs.

COMPOSITE

CONCEPT MAP OF IMPLEMENTATION




BARRIER PAIRS DENDROGRAM USING WARD'S METHOD
PAIRS
25
rescom 18
teacom 44
restrn 15
teatrn 41
trndes 46
trnimp 47
resbuy 11
buytea 22
manbuy 2
mantea 5
polout 40
desimp 50
restea 14
pubcom 33
resimp 17
teaimp 43
resdes 16
teaades 42
desout 52
impout 54
manpub 3
pubpol 28
buypol 21
trncom 48
manpol 4
buycom 26
respub 12
respol 13
manres 1
buytrn 23
mancom 9
buyimp 25
poltrn 36
polimp 38
manimp 8
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polcom 39
impcom 53
comout 55
trnout 49
pubtea 29
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teasout 45
manout 10
buyout 27
resout 19
descom 51
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Y
IA
IB
IIIA
IIIB1
IIIB
IIIB2
IVA
IVB1
IVB2a
IVB
IVB2b
IVB2
IVB2c
SET I
SET II
SET III
SET IV

**CLUSTER ANALYSIS OF PAIRED BARRIERS TO EMS IMPLEMENTATION**
**(based on similarity of judgments about importance and ease of implementation)**

N = 21 cities with populations over 20,000 based on the 2010 US Census

*Set I: Internal Support and Resources for Program Design and Implementation*
*Set IA: Resources related to Communications and Training*
Dedicated Implementation Resources and **Internal City Communications**
Dedicated Implementation Team and **Internal City Communications**
Dedicated Implementation Resources and **Employee Training**
Dedicated Implementation Team and **Employee Training**
*Set IB: Internal Support of Program Design and Implementation*
**City Employee Training** and Program Design
**City Employee Training** and Incremental Implementation
**Employee Buy-in** and Dedicated Implementation Resources
**Employee Buy-in** and Dedicated Implementation Team
**Top Management Involvement** and Employee Buy-in
**Top Management Involvement** and Dedicated Implementation Team
*Set II: Assistance in Program Design and Implementation*
Political Support and External Support and Guidance
Program Design and Incremental Implementation
Public Awareness and Internal City Communications
Dedicated Resources and Dedicated Implementation Team
*Set III: Commitment to and Resources for Program Design and Implementation*
*Set IIIA: Resources related to Program Design and Implementation*
Dedicated Implementation Resources and **Incremental Implementation**
Dedicated Implementation Team and **Incremental Implementation**
Dedicated Resources and **Program Design**
Dedicated Implementation Team and **Program Design**
*Set IIIB: Shared Commitment*
*Set IIIB1: Shared Commitment and Assistance related to Program Design and Implementation*
Program Design and **External Support and Guidance**
Implementation and **External Support and Guidance**
**Public Awareness** and Top Management Involvement
**Public Awareness** and Political Support
*Set IIB2: Share Commitment related to Buy-in and Communications*
**Employee Buy-in** and **Political Support**
Employee Training and **Internal City Communications**
Top Management Involvement and **Political Support**

**Employee Buy-in** and Internal City Communications

*Set IV: Support*

*Set IVA: External Support related to Resources and Employee Participation*

**Dedicated Implementation Resources** and Public Awareness

**Dedicated Implementation Resources** and Political Support

**Dedicated Implementation Resources** and Top Management Involvement

Employee Buy-in and Employee Training

*Set IVB: External Support related to Implementation*

*Set IVB1: Official Support related to Implementation, Communications and Training*

**Top Management Involvement** and **Internal City Communications**

Employee Buy-in and Incremental Implementation

**Political Support** and Employee Training

**Political Support** and Incremental Implementation

**Top Management Involvement** and Increment Implementation

**Top Management Involvement** and Employee Training

**Political Support** and **Internal City Communications**

*Set IVB2: External Support related to Program Operation*

*Set IVB2a: External Support related to Communications and Implementation Team*

**Internal City Communications** and Incremental Implementation

**Internal City Communications** and **External Support and Guidance**

Employee Training and **External Support and Guidance**

**Public Awareness** and **Dedicated Implementation Team**

Political Support and **Dedicated Implementation Team**

Employee Buy-in and **Public Awareness**

*Set IVB2b: Support related to Program Design*

**Public Awareness** and Incremental Implementation

**Public Awareness** and External Support and Guidance

Top Management Involvement and **Program Design**

**Public Awareness** and Employee Training

Employee Buy-in and **Program Design**

**Public Awareness** and **Program Design**

Political Support and **Program Design**

Dedicated Implementation Team and External Support and Guidance

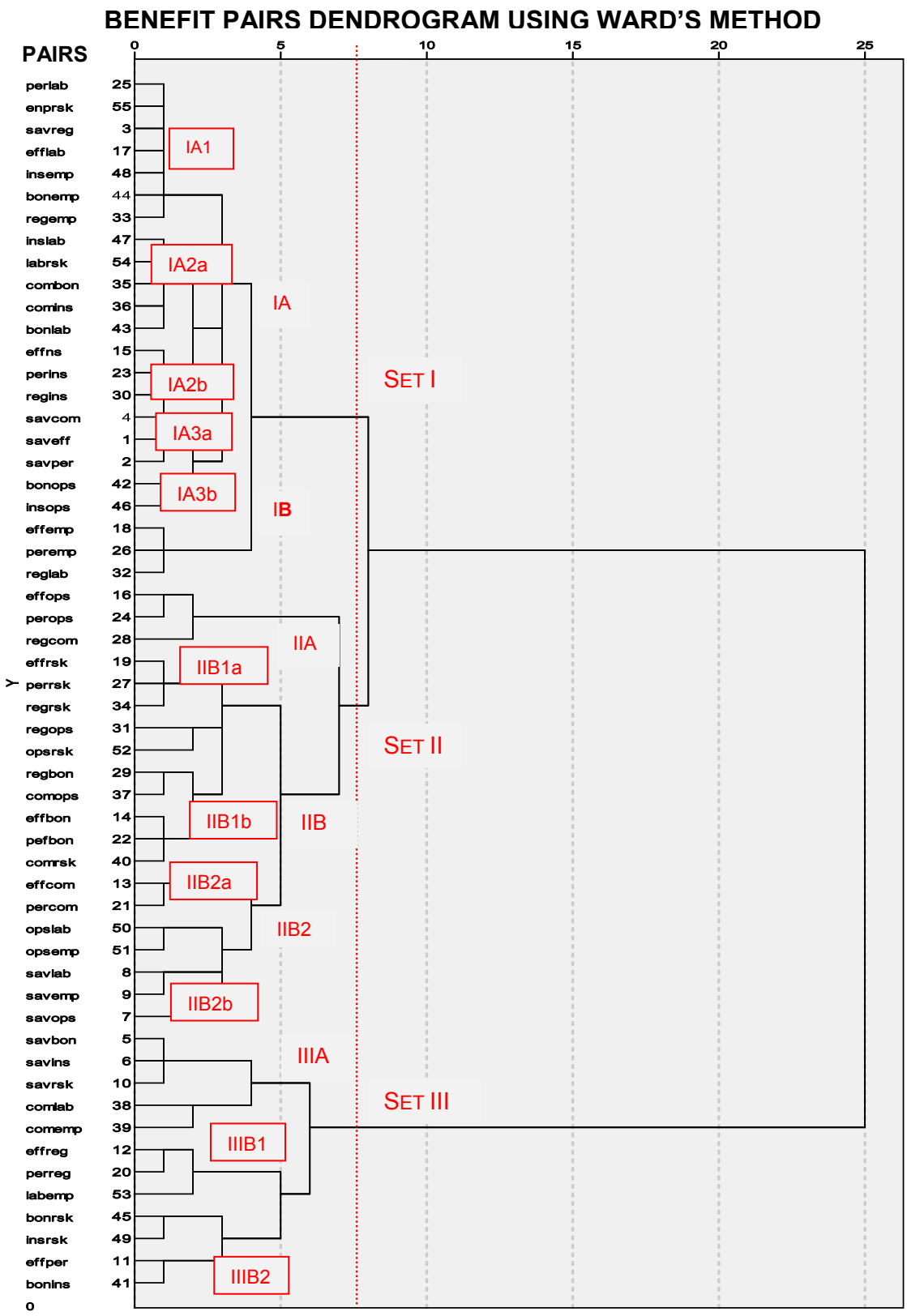
*Set IVB2c: External Support related to Internal Operation*

Top Management Involvement and **External Support and Guidance**

Employee Buy-in and **External Support and Guidance**

Resources and **External Support and Guidance**

Program Design and Internal Communications


BENEFIT PAIRS DENDROGRAM USING WARD'S METHOD
PAIRS
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savreg 3
efflab 17
insemp 48
bonemp 44
regemp 33
inslab 47
labrsk 54
combon 35
comins 36
bonlab 43
effns 15
perins 23
regins 30
savcom 4
saveff 1
savper 2
bonops 42
insops 46
effemp 18
peremp 26
reglab 32
effops 16
perops 24
regcom 28
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labemp 53
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insrsk 49
effper 11
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IA3b
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IIB
SET II
IIB2a
IIB2
IIB2b
IIIA
SET III
IIIB1
IIIB2

**CLUSTER ANALYSIS OF PAIRED BENEFITS TO EMS IMPLEMENTATION**
**(based on similarity of judgments about importance and ease of implementation)**

N = 21 cities with populations over 20,000 based on the 2010 US Census

*Set I: Overall Operations*
*Set IA1: Employee Succession*
- Improved Environmental Performance and Improved Labor Relationship with Management
- Employee Succession and Risk Reduction
- Cost Saving and Improved Relationships with Regulators
- Environmental Efficiencies and Improved Labor Relationship with Management
- Employee Succession and Reduced Insurance Premiums
- Employee Succession and Improved Bond Rating
- Employee Succession and Better Relationships with Regulators

*Set IA2a: Improved Labor Relationship with Management/Better Communications/Reduced Bond and insurance*
- Improved Labor Relationship with Management and Reduced Insurance Premiums
- Improved Labor Relationship with Management and Risk Reduction
- Better Communications and Improved Bond Rating
- Better Communications and Reduced Insurance Premiums
- Improved Labor Relationship with Management and Improved Bond Rating

*Set IA2b: Reduced Insurance Premiums-Cost Savings and Improved Environmental Operations*
- Reduced Insurance Premiums and Environmental Efficiencies
- Reduced Insurance Premiums and Improved Environmental Performance
- Reduced Insurance Premiums and Better Relationship with Regulators
- Cost Savings and Better Communications

*Set IA3a: Cost Savings through Improved Environmental Operations*
- Cost Saving and Environmental Efficiencies
- Cost Saving and Improved Environmental Performance

*Set IA3b: Operational Efficiencies-Consistency with Better bond Ratings and Insurance Premiums*
- Operational Efficiencies - Consistency and Improved Bond Rating
- Operational Efficiencies - Consistency and Reduced Insurance Premiums

*Set IB: Employee Succession and Improved Environmental Operations with Improved Relationships*
- Employee Succession and Environmental Efficiencies
- Employee Succession and Improved Environmental Performance

Improved Relationships with Regulators and Improved Labor Relationships with Management

*Set II: Environmental Operations*

*Set IIA: Improved Operations and Improved Environmental Operations*

Operational Efficiencies - Consistency and Environmental Efficiencies

Operational Efficiencies - Consistency and Improved Environmental Performance

Better Communications and Better Relationships with Regulators

*Set IIB: Risk Reduction and Improved Bond Ratings through Improved Performance*

*Set IIB1a: Risk Reduction through Operational and Environmental Efficiencies*

Risk Reduction and Environmental Efficiencies

Risk Reduction and Improved Environmental Performance

Risk Reduction and Better Relationships with Regulators

Risk Reduction and Environmental Efficiencies

Better Relationships with Regulators and Operational Efficiencies - Consistency

Risk Reduction and Operational Efficiencies – Consistency

*Set IIB1b: Improved Bond Rating and Better Operational and Environmental Efficiencies and Communications*

Improved Bond Rating and Better Relationships with Regulators

Better Communications and Operational Efficiencies – Consistency

Improved Bond Rating and Environmental Efficiencies

Improved Bond Rating and Improved Environmental Performance

Better Communications and Risk Reduction

*Set IIB2: Operational Cost Savings and Better Communications through Improved Environmental Operations*

*Set IIB2a: Better communications and Environmental Operations*

Better Communications and *Environmental* Efficiencies

Better Communications and Improved Environmental Performance

*Set IIB2b: Operational Cost Savings through Easier Employee Succession, Consistency and Better Relations with Management*

Operational Efficiencies – Consistency and Improved Labor Relationship with Management

Operational Efficiencies – Consistency and Employee Succession

Cost Savings and Improved Labor Relationship with Management

Cost Savings and Employee Succession

Cost Savings and Operational Efficiencies – Consistency

*Set III: Cost Savings (Bond, Insurance and Risk) and Better Relationships*

*Set IIIA: Cost Saving through Better Bond Rating, Insurance Rates and Risk Reduction – Better Communications lead to Better Labor Relationships with Management and Easier Employee Succession*

Cost Saving and Improved Bond Rating
Cost Savings and Reduced Insurance Premium
Cost Saving and Reduced Risk
Better Communications and Improved Labor Relationship with Management
Better Communications and Employee Succession

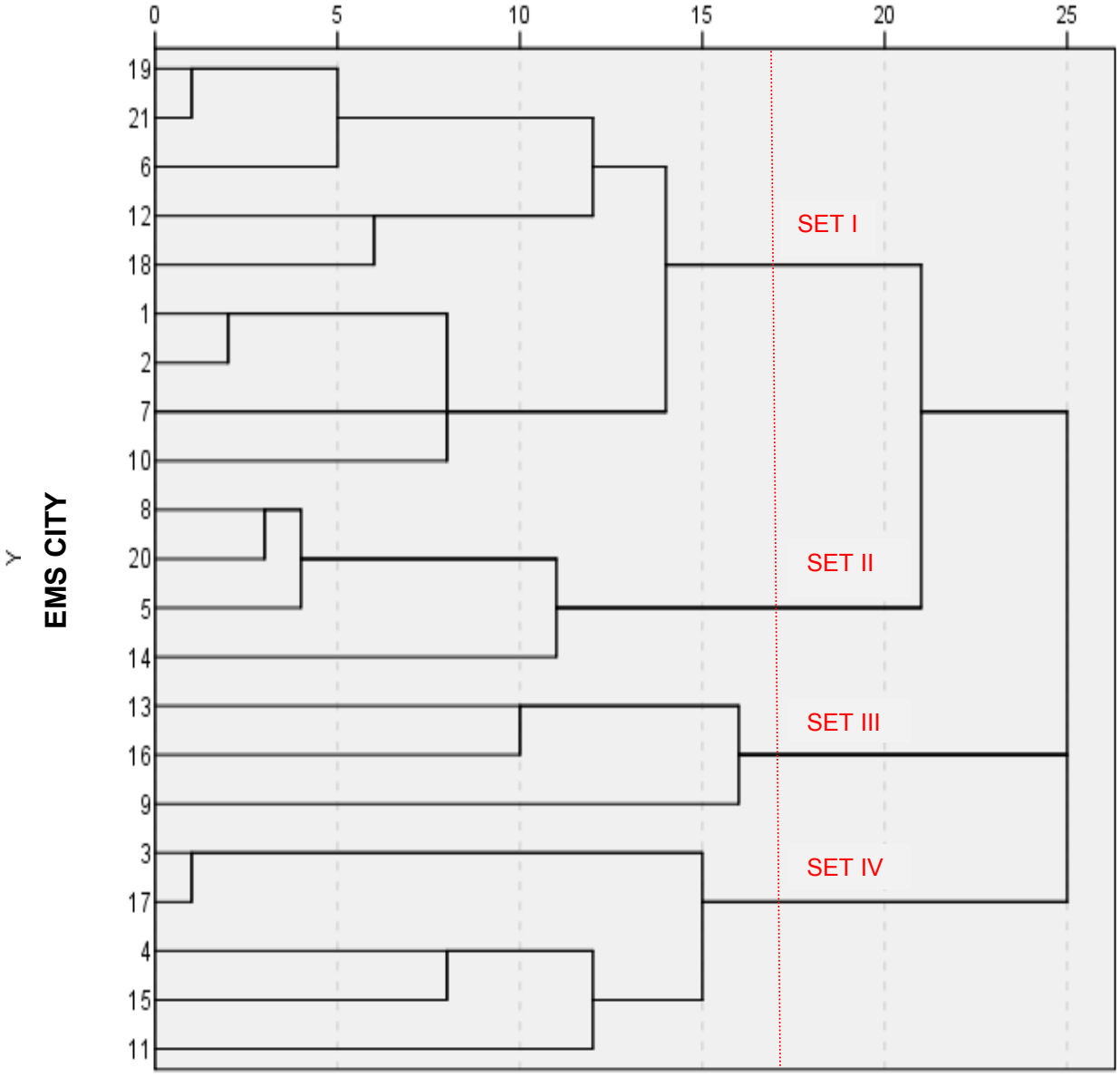
*Set IIIB1: Better Relationships with Improved Environmental Operations*

Better Relationships with Regulators and Environmental Efficiencies
Better Relationships with Regulators and Improved Environmental Performance
Better Labor Relationship with Management and Employee Succession

*Set IIIB2: Insurance and Bond Savings through Risk Reduction*

Risk Reduction and Improved Bond Rating
Risk Reduction and Reduced Insurance Premiums
Environmental Efficiencies and Improved Environmental Performance
Improved Bond Rating and Reduced Insurance Premiums

## BARRIER CITY DENDROGRAM USING WARD'S METHOD



**CLUSTER ANALYSIS OF CITY BARRIERS TO EMS IMPLEMENTATION**
**(based on similarity of judgments about importance and ease of implementation)**

N = 21 cities with populations over 20,000 based on the 2010 US Census

The analysis reveled 4 clusters (also called sets).

**Cluster I**

Cluster I consisted of the following 9 cities: EMS01, 02, 06, 07, 10, 12, 18, 19, and 21.

Data from the raw cluster analysis (1s and 0s) was totaled for each variable pair for the cities. A 1 means they were paired and a 0 means they were not paired. Since the data is only 0 or 1, all 1s would add to 9 and all 0s would add to 0. These totals were recoded for ease of reporting as follows:

| RAW DATA TOTALS | | RECODED VALUES |
|---|---|---|
| 1s | 0s | |
| 9 and 8 | 0 and 1 | 3 |
| 7 | 2 | 2 |
| 6 | 3 | 1 |
| 5 | 4 | 0 |

**Highest Variable Pair Correlations (3)**

| RECODED VARIABLE PAIR TOTAL OF 3 | | | |
|---|---|---|---|
| VARIABLE PAIRS | RECODED VALUE | PAIRS & TYPES | |
| | | TOTAL | TYPE |
| restea | 3 | 9 | 1 |
| desimp | 3 | 8 | 1 |
| mandes | 3 | 9 | 0 |
| manimp | 3 | 9 | 0 |
| respub | 3 | 9 | 0 |
| respol | 3 | 9 | 0 |
| resout | 3 | 9 | 0 |
| pubtea | 3 | 9 | 0 |
| pubdes | 3 | 9 | 0 |

| RECODED VARIABLE PAIR TOTAL OF 3 (continued) | | | |
|---|---|---|---|
| VARIABLE PAIRS | RECODED VALUE | PAIRS & TYPES | |
| | | TOTAL | TYPE |
| poltea | 3 | 9 | 0 |
| poltrn | 3 | 9 | 0 |
| poldes | 3 | 9 | 0 |
| polimp | 3 | 9 | 0 |
| teaout | 3 | 9 | 0 |
| trnout | 3 | 9 | 0 |
| impcom | 3 | 9 | 0 |
| mantrn | 3 | 8 | 0 |
| buypub | 3 | 8 | 0 |
| buyout | 3 | 8 | 0 |
| pubtrn | 3 | 8 | 0 |
| pubimp | 3 | 8 | 0 |
| polcom | 3 | 8 | 0 |
| descom | 3 | 8 | 0 |
| desout | 3 | 8 | 0 |
| comout | 3 | 8 | 0 |

**9 out of 9 cities paired**

Designated resources and designated implementation team

100% of the Cluster I cities paired these two barriers together.

***Explanation***

Municipal managers related designated resources and a designated implementation team as a key to the EMS program. They reported that having resources (money and people) that can't be taken by another program is essential to a successful implementation.

**8 out of 9 cities paired**

Program design and incremental implementation

89% of the Cluster I cites paired these two barriers together.

***Explanation***

Municipal managers related program design and an incremental implementation. They see that ISO 14000 is a complex program that must be properly designed and be completed is a step wise fashion.

**9 out of 9 cities did not pair**

Top management involvement and program design
Top management involvement and incremental implementation
Dedicated resources and public awareness
Dedicated resources and political support
Dedicated resources and outside guidance and support
Public awareness and dedicated implementation team
Public awareness and program design
Political support and dedicated implementation team
Political support and employee training
Political support and program design
Political support and incremental implementation
Employee training and outside guidance and support
Incremental implementation and communications

100% of the Cluster I cities did not pair these two barriers together.

***Explanation***

Municipal managers didn't see top management involvement with program design and implementation, which they saw as the job of the dedicated implementation team. They did not see a link between dedicated resources and public awareness, political support, and outside guidance and support. They see dedicated resources provided by management. They also see no link between the political support and dedicated implementation team, employee training and incremental implementation. Here managers do not see city council involved in normal city operations. These cities also see no link between public awareness and employee training and program design.

**8 out of 9 cities did not pair**

Top management involvement and employee training
Employee buy-in and public awareness
Employee buy-in and outside guidance and support

Public awareness and employee training
Public awareness and incremental implementation
Political support and communications
Program design and communications
Program design and outside guidance and support
Communications and outside guidance and support

89% of the Cluster 1 cities paired these two barriers together.

***Explanation***

Municipal managers do not related political support or public awareness with normal city operations unless it involves a councilor directly or involves tax issues. They do not link outside guidance and support with employee buy-in, program design, and communications. They also see no linkage between top management involvement and employee training. Here they see training belonging to the implementation team.

**Medium Variable Pair Correlations (2)**

| RECODED VARIABLE PAIR TOTAL OF 2 | | | |
|---|---|---|---|
| VARIABLE PAIRS | RECODED VALUE | PAIRS & TYPES | |
| | | TOTAL | TYPE |
| polout | 2 | 7 | 1 |
| manpub | 2 | 7 | 0 |
| resimp | 2 | 7 | 0 |
| buypol | 2 | 7 | 0 |
| buydes | 2 | 7 | 0 |
| buyimp | 2 | 7 | 0 |
| impout | 2 | 7 | 0 |

**7 out of 9 cities paired**

Political support and outside guidance and support

78% of the Cluster I cities paired these two barriers together.

***Explanation***

Municipal managers see political support as key to be able to use outside guidance and support.

**7 out of 9 cities did not pair**

Top management involvement and public awareness
Dedicated resources and incremental implementation
Employee buy-in and political support
Employee buy-in and designated resources
Employee buy-in and incremental implementation
Incremental implementation and outside guidance and support

78% of the Cluster I cities did not pair these two barriers together.

***Explanation***

Municipal managers did not see a relationship between employee buy-in and political support, dedicated resources, and incremental implementation. Most managers felt that employees will do as they are directed. They also didn't see a relationship between incremental implementation and dedicated resources or outside guidance and support. Again the public was not seen as an integral part of normal city operations.

**Low Variable Pair Correlations (1)**

| RECODED VARIABLE PAIR TOTAL OF 1 | | | |
|---|---|---|---|
| VARIABLE PAIRS | RECODED VALUE | PAIRS & TYPES | |
| | | TOTAL | TYPE |
| manpol | 1 | 6 | 0 |
| mancom | 1 | 6 | 0 |
| manout | 1 | 6 | 0 |
| resdes | 1 | 6 | 0 |
| buytrn | 1 | 6 | 0 |
| pubout | 1 | 6 | 0 |
| teaimp | 1 | 6 | 0 |
| trnimp | 1 | 6 | 0 |

**6 out of 9 cities did not pair**

Top management involvement and political support
Top management involvement and communications
Top management involvement and outside guidance and support
Dedicated Resources and program design

Employee buy-in and employee training
Public awareness and outside guidance and support
Dedicated implementation team and incremental implementation
Employee training and incremental implementation

67% of the Cluster I cities did not pair these two barriers together.

***Explanation***

Municipal managers didn't relate top management involvement political support, communications, and outside guidance and support. Here the managers saw themselves or the implementation team in charge. Here dedicated resources were seen as something that was internal to the administration and had little effect on the design and internal communications. Again training was viewed as normal city operations. Incremental implementation was not linked to dedicated implementation team or incremental implementation.

**Cluster II**

Cluster II contains cities EMS05, 08, 14, and 20.

Data from the raw cluster analysis (1s and 0s) was totaled for each variable pair for the cities. A 1 means they were paired and a 0 means they were not paired. Since the data is only 0 or 1, all 1s would add to 4 and all 0s would add to 0. These totals were recoded for ease of reporting as follows:

| RAW DATA TOTALS | | RECODED VALUE |
|---|---|---|
| 1S | 0S | |
| 4 | 0 | 3 |
| 3 | 3 | 2 |
| 2 | 2 | 0 |
| 1 | 1 | 0 |

**Highest Variable Pair Correlations (3)**

| RECODED VARIABLE PAIR TOTAL OF 3 | | | |
|---|---|---|---|
| VARIABLE PAIRS | RECODED VALUE | TOTALS & TYPES | |
| | | TOTAL | TYPE |
| buytea | 3 | 4 | 1 |
| buytrn | 3 | 4 | 1 |
| teatrn | 3 | 4 | 1 |
| desimp | 3 | 4 | 1 |
| mandes | 3 | 4 | 0 |
| manimp | 3 | 4 | 0 |
| mancom | 3 | 4 | 0 |
| resdes | 3 | 4 | 0 |
| resimp | 3 | 4 | 0 |
| rescom | 3 | 4 | 0 |
| buypub | 3 | 4 | 0 |
| buypol | 3 | 4 | 0 |
| buydes | 3 | 4 | 0 |
| buyimp | 3 | 4 | 0 |
| buycom | 3 | 4 | 0 |
| pubtea | 3 | 4 | 0 |
| pubtrn | 3 | 4 | 0 |
| pubout | 3 | 4 | 0 |
| poltea | 3 | 4 | 0 |
| poltrn | 3 | 4 | 0 |
| teades | 3 | 4 | 0 |
| teaimp | 3 | 4 | 0 |
| teacom | 3 | 4 | 0 |
| trndes | 3 | 4 | 0 |
| trnimp | 3 | 4 | 0 |
| trncom | 3 | 4 | 0 |

**4 out of 4 cities paired**

Employee buy-in and dedicated implementation team
Employee buy-in and employee training
Dedicated implementation team and employee training
Program design and incremental implementation

100% of the Cluster II cities paired these two barriers together.

***Explanation***

Municipal managers related a need for employee buy-in to have a dedicated implementation team and increased training. They saw these two benefits as interrelated. They also thought that the program is complex and will require good design and step wise implementation.

**4 out of 4 cities did not pair**

Top management involvement and program design
Top management involvement and incremental implementation
Top management involvement and communications
Dedicated resources and program design
Dedicated resources and incremental implementation
Dedicated resources and communications
Employee buy-in and public awareness
Employee buy-in and political support
Employee buy-in and program design
Employee buy-in and incremental implementation
Employee buy-in and communications
Public awareness and dedicated implementation team
Public awareness and employee training
Public awareness and outside guidance and support
Political support and dedicated implementation team
Political support and employee training
Dedicated implementation team and program design
Dedicated implementation team and incremental implementation
Dedicated implementation team and communications
Employee training and incremental implementation
Employee training and communications

100% of the Cluster II cities did not pair these two barriers together.

***Explanation***

Municipal managers didn't see top management involvement in program design, incremental implementation, or communications. They see this as an implementation team job. They did not equate dedicated resources and dedicated implementation team with program design, incremental implementation, or communications. Public awareness and political support were not related to dedicated implementation team or employee training with public awareness also not related to outside guidance and support. These managers didn't see a relationship between employee buy-in and public awareness, political support, program design, incremental implementation, and communications. Once again, municipal managers don't view a linkage between the city council and public with daily city operations unless it affects them directly or raises taxes.

**Medium Variable Pair Correlations (2)**

| RECODED VARIABLE PAIR TOTAL OF 2 | | | |
|---|---|---|---|
| VARIABLE PAIRS | RECODED VALUE | TOTALS & TYPES | |
| | | TOTAL | TYPE |
| manres | 2 | 3 | 1 |
| respol | 2 | 3 | 1 |
| resout | 2 | 3 | 1 |
| descom | 2 | 3 | 1 |
| impcom | 2 | 3 | 1 |
| manpub | 2 | 3 | 0 |
| resbuy | 2 | 3 | 0 |
| respub | 2 | 3 | 0 |
| restea | 2 | 3 | 0 |
| restrn | 2 | 3 | 0 |
| buyout | 2 | 3 | 0 |
| poldes | 2 | 3 | 0 |
| polimp | 2 | 3 | 0 |
| polcom | 2 | 3 | 0 |
| teaout | 2 | 3 | 0 |
| trnout | 2 | 3 | 0 |

| RECODED VARIABLE PAIR TOTAL OF 2 (continued) | | | |
|---|---|---|---|
| VARIABLE PAIRS | RECODED VALUE | TOTALS & TYPES | |
| | | TOTAL | TYPE |
| desout | 2 | 3 | 0 |
| impout | 2 | 3 | 0 |
| comout | 2 | 3 | 0 |

**3 out of 4 cities paired**

Top management involvement and dedicated resources
Top management involvement and political support
Dedicated resources and outside guidance and support
Program design and communications
Incremental implementation and communications

75% of the Cluster II cities paired these two barriers together.

***Explanation***

Municipal managers see that they will need dedicated money and political support to make the EMS program viable and that top management involvement will make this happen. They also view a dedicated resources and outside guidance and support as linked. These cities view communications related to program design and incremental implementation.

**3 out of 4 cities did not pair**

Top management involvement and public awareness
Dedicated resources and employee buy-in
Dedicated resources and public awareness
Dedicated resources and dedicated implementation team
Dedicated resources and employee training
Employee buy-in and outside guidance and support
Political support and program design
Political support and incremental implementation
Political support and communications
Dedicated implementation team and outside guidance and support
Employee training and outside guidance and support
Program design and outside guidance and support
Incremental implementation and outside guidance and support

Communications and outside guidance and support

75% of the Cluster II cities did not pair these two barriers together.

***Explanation***

Municipal managers did not see a relationship between top management involvement and public awareness. They also didn't see a relationship between dedicated resources and public awareness, dedicated implementation team, and employee buy-in and training. There was also no linkage to political support and program design, incremental implementation and communications. These managers also didn't relate outside guidance and support with dedicated implementation team, employee training, program design, incremental implementation, or communications. Again the public was not seen as an integral part of city operations. Here managers didn't see a linkage between resources and team and didn't see outside guidance helping with the implementation team.

**Cluster III**

Cluster III contains city EMS09, 13 and 16.

Data from the raw cluster analysis (1s and 0s) was totaled for each variable pair for the cities. A 1 means they were paired and a 0 means they were not paired. Since the data is only 0 or 1, all 1s would add to 3 and all 0s would add to 0. These totals were recoded for ease of reporting as follows:

| RAW DATA TOTALS | | RECODED VALUE |
|---|---|---|
| 1S | 0S | |
| 3 | 0 | 3 |
| 2 | 1 | 0 |
| 1 | 2 | 0 |

With only three cities in this cluster only 100% matches (all 3's or all 0's) were evaluated.

**Highest Variable Pair Correlations (3)**

| RECODED VARIABLE PAIR TOTAL OF 3 | | | |
|---|---|---|---|
| VARIABLE PAIRS | RECODED VALUE | TOTALS & TYPES | |
| | | TOTAL | TYPE |
| manres | 3 | 3 | 1 |
| manbuy | 3 | 3 | 1 |
| mantea | 3 | 3 | 1 |
| resbuy | 3 | 3 | 1 |
| restea | 3 | 3 | 1 |
| buytea | 3 | 3 | 1 |
| trnimp | 3 | 3 | 1 |
| trncom | 3 | 3 | 1 |
| impcom | 3 | 3 | 1 |
| manpub | 3 | 3 | 0 |
| respub | 3 | 3 | 0 |
| buypub | 3 | 3 | 0 |
| pubtea | 3 | 3 | 0 |
| pubdes | 3 | 3 | 0 |
| polout | 3 | 3 | 0 |
| desimp | 3 | 3 | 0 |

**3 out of 3 cities paired**

Top management involvement and dedicated resources
Top management involvement and employee buy-in
Top management involvement and dedicated implementation team
Dedicated resources and employee buy-in
Dedicated resources and dedicated implementation team
Employee buy-in and dedicated implementation team
Employee training and incremental implementation
Employee training and communications
Incremental implementation and communications

100% of the Cluster III cities paired these two barriers together.

***Explanation***

Municipal managers related a need for top management involvement and obtaining dedicated resources, employee buy-in, and a dedicated implementation team. They see the dedicated resources are the key to employee buy-in and getting a dedicated implementation team. They also see employee buy-in and training as linked to the dedicated team, incremental implementation and communications. First you get top management onboard, then get resources (both people and money) then you get the employees to believe in the program.

**3 out of 3 cities did not pair**

Top management involvement and public awareness
Dedicated resources and public awareness
Employee buy-in and public awareness
Public awareness and program design
Political support and outside guidance and support
Program design and incremental implementation

100% of the Cluster III cities did not pair these two barriers together.

***Explanation***

Municipal managers didn't see top management involvement related to public awareness. They didn't see a relationship between public awareness and dedicated resources, employee buy-in, or program design. They also didn't link political support with outside guidance and support. The common theme of not involving the public in normal city operations is once again reiterated.

**Cluster IV**

Cluster IV contains cities EMS03, 04, 11, 15, and 17.

Data from the raw cluster analysis (1s and 0s) was totaled for each variable pair for the cities. A 1 means they were paired and a 0 means they were not paired. Since the data is only 0 or 1, all 1s would add to 5 and all 0s would add to 0. These totals were recoded for ease of reporting as follows:

| RAW DATA TOTALS | | RECODED VALUE |
|---|---|---|
| 1S | 0S | |
| 5 | 5 | 3 |
| 4 | 4 | 2 |
| 3 | 3 | 1 |
| 2 | 2 | 0 |

**Highest Variable Pair Correlations (3**

| RECODED VARIABLE PAIR TOTAL OF 3 | | | |
|---|---|---|---|
| VARIABLE PAIRS | RECODED VALUE | TOTALS & TYPES | |
| | | TOTAL | TYPE |
| manpub | 3 | 5 | 1 |
| manpol | 3 | 5 | 1 |
| pubpol | 3 | 5 | 1 |
| impout | 3 | 5 | 1 |
| manimp | 3 | 5 | 0 |
| manout | 3 | 5 | 0 |
| resbuy | 3 | 5 | 0 |
| buyimp | 3 | 5 | 0 |
| buyout | 3 | 5 | 0 |
| pubimp | 3 | 5 | 0 |
| pubout | 3 | 5 | 0 |
| polimp | 3 | 5 | 0 |
| polout | 3 | 5 | 0 |
| teatrn | 3 | 5 | 0 |
| teacom | 3 | 5 | 0 |

**5 out of 5 cities paired**

Top management involvement and public awareness
Top management involvement and political support
Public awareness and political support
Incremental implementation and outside guidance and support

100% of the Cluster IV cities paired these two barriers together.

***Explanation***

Municipal managers didn't see a linkage between top management involvement and outside support. They also did not see a relationship between the outside supporters.

Managers believe that normal city operations are the job of the city managers not the city council or the public.

**5 out of 5 cities did not pair**

Top management involvement and incremental implementation
Top management involvement and outside guidance and support
Dedicated resources and employee buy-in
Employee buy-in and incremental implementation
Employee buy-in and outside guidance and support
Public awareness and dedicated implementation team
Public awareness and outside guidance and support and support
Political support and dedicated implementation team
Political support and outside guidance and support and support
Dedicated implementation team and employee training
Dedicated implementation team and communications

100% of the Cluster IV cities did not pair these two barriers together.

***Explanation***

Municipal managers didn't see top management involvement in implementation or working with outside guidance. They also didn't see employee buy-in as needed for incremental implementation or outside guidance and support. Public awareness and political support weren't seen as necessary for a dedicated implementation team or gaining outside guidance and support. These managers did not link the implementation team to employee training or communications. These managers don't see a

relationship between the city council and public with daily city operations unless it affects them directly or raises taxes.

**Medium Variable Pair Correlations (2)**

| RECODED VARIABLE PAIR TOTAL OF 2 | | | |
|---|---|---|---|
| VARIABLE PAIRS | RECODED VALUE | TOTALS & TYPES | |
| | | TOTAL | TYPE |
| buycom | 2 | 4 | 1 |
| trncom | 2 | 4 | 1 |
| desimp | 2 | 4 | 1 |
| desout | 2 | 4 | 1 |
| manres | 2 | 4 | 0 |
| mantea | 2 | 4 | 0 |
| mantrn | 2 | 4 | 0 |
| mandes | 2 | 4 | 0 |
| respub | 2 | 4 | 0 |
| respol | 2 | 4 | 0 |
| restrn | 2 | 4 | 0 |
| rescom | 2 | 4 | 0 |
| buytea | 2 | 4 | 0 |
| buydes | 2 | 4 | 0 |
| pubtea | 2 | 4 | 0 |
| pubtrn | 2 | 4 | 0 |
| pubdes | 2 | 4 | 0 |
| poltea | 2 | 4 | 0 |
| poltrn | 2 | 4 | 0 |
| poldes | 2 | 4 | 0 |
| impcom | 2 | 4 | 0 |
| comout | 2 | 4 | 0 |

**4 out of 5 cities paired**

Employee buy-in and communications
Employee training and communications
Dedicated implementation team and incremental implementation
Dedicated implementation team and outside guidance and support

80% of the Cluster IV cities paired these two barriers together.

***Explanation***

Municipal managers see that they will need to link communications with employee boy-in and training. They also see that the dedicated implementation team will carry out the incremental implementation and work with the outside support.

**4 out of 5 cities did not pair**

Top management involvement and dedicated resources
Top management involvement and dedicated implementation team
Top management involvement and employee training
Top management involvement and program design
Dedicated resources and public awareness
Dedicated resources and political support
Dedicated resources and employee training
Dedicated resources and communications
Employee buy-in and dedicated implementation team
Employee buy-in and program design
Public awareness and dedicated implementation team
Public awareness and employee training
Public awareness and program design
Political support and dedicated implementation team
Political support and employee training
Political support and program design
Incremental implementation and communications
Communications and outside guidance and support

80% of the Cluster IV cities did not pair these two barriers together.

***Explanation***

Municipal managers did not see a relationship between top management involvement and implementing the EMS (resources, people, training, or design). They also didn't see a relationship between dedicated resources and external support, employee buy-in, or communications. They didn't see the need for employee buy-in for gaining an implementation team or designing the program. These managers saw no relationship between external support and gaining a dedicated implementation team, employee training, or program design.

**Low Variable Pair Correlations (1)**

| RECODED VARIABLE PAIR TOTAL OF 1 | | | |
|---|---|---|---|
| VARIABLE PAIRS | RECODED VALUE | TOTALS & TYPES | |
| | | TOTAL | TYPE |
| buytea | 1 | 9 | 1 |
| polout | 1 | 9 | 1 |
| teatrn | 1 | 9 | 1 |
| rescom | 1 | 9 | 0 |
| buycom | 1 | 9 | 0 |
| teades | 1 | 9 | 0 |
| teacom | 1 | 9 | 0 |
| trndes | 1 | 9 | 0 |
| trncom | 1 | 9 | 0 |
| descom | 1 | 9 | 0 |
| manpol | 1 | 8 | 0 |
| manout | 1 | 8 | 0 |

**3 out of 5 cities paired**

Employee buy-in and dedicated implementation team
Political support and outside guidance and support
Dedicated implementation team and employee training

69% of the Cluster IV cites did pair these two barriers together.

***Explanation***

Municipal managers related the need for employee buy-in and a dedicated implementation team to ensure that ISO 14000 implementation would be possible. They reported that without these dedicated (can't be taken away for other projects) team that they could not envision a successful program. They also see that to gain outside guidance and support they will need the support of city council. These cities see a link between a dedicated implementation team and employee training.

**3 out of 5 cities did not pair**

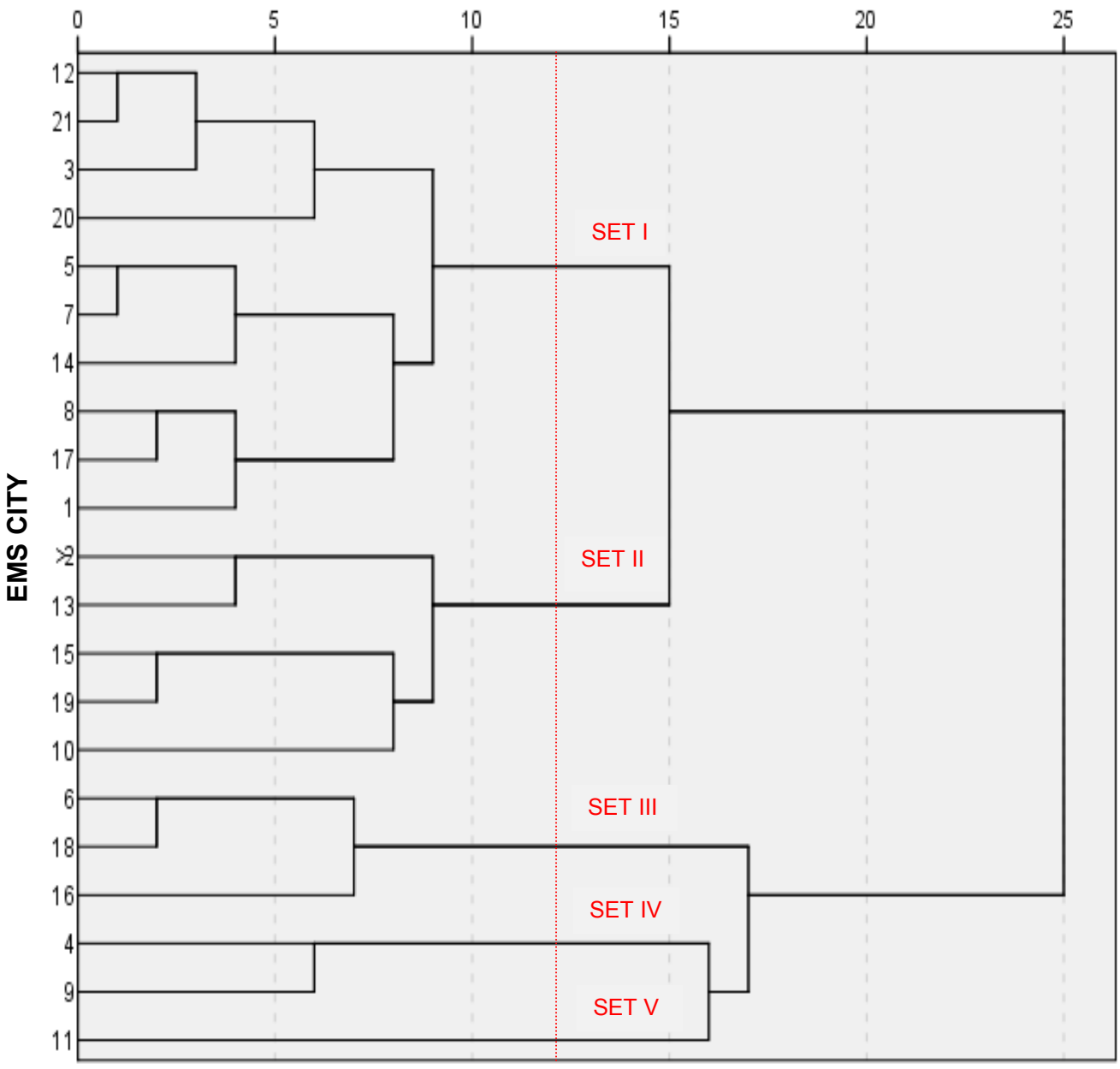
Dedicated Resources and communications
Employee buy-in and communications
Dedicated implementation team and program design
Dedicated implementation team and communications
Employee training and program design
Employee training and communications
Program design and communications

62% of the Cluster IV cites did not pair these two barriers together.

***Explanation***

Municipal managers didn't relate internal communications and dedicated resources, employee buy-in, dedicated implementation team, employee training, or program design. They reported that they felt that their city had good internal communications. They also did not relate a dedicated implementation team with program design and program design with employee training.

**BENEFIT CITY DENDROGRAM USING WARD'S METHOD**



**CLUSTER ANALYSIS OF CITY BENEFITS TO EMS IMPLEMENTATION**
**(based on similarity of judgments about importance and ease of implementation)**

N = 21 cities with populations over 20,000 based on the 2010 US Census

The analysis reveled 5 clusters (also called sets).

### Cluster I

Cluster I consisted of the following 10 cities: EMS01, 03, 05, 07, 08, 12, 14, 17, 20, and 21.

Data from the raw cluster analysis (1s and 0s) was totaled for each variable pair for the cities. Since the data is only 0 or 1, all 1s would add to 10 and all 0s would add to 0. These totals were recoded for ease of reporting as follows:

| RAW DATA TOTALS | | RECODED VALUE |
|---|---|---|
| 1S | 0S | |
| 10 and 9 | 0 and 1 | 3 |
| 8 | 2 | 2 |
| 7 | 3 | 1 |
| 6 | 5 and 4 | 0 |

### Highest Variable Pair Correlations (3)

| RECODED VARIABLE PAIR TOTAL OF 3 | | | |
|---|---|---|---|
| VARIABLE PAIRS | RECODED VALUE | TOTALS & TYPES | |
| | | TOTAL | TYPE |
| bonins | 3 | 10 | 1 |
| savbon | 3 | 9 | 1 |
| savins | 3 | 9 | 1 |
| labemp | 3 | 9 | 1 |
| saveff | 3 | 10 | 0 |
| savper | 3 | 10 | 0 |
| savreg | 3 | 10 | 0 |
| savcom | 3 | 10 | 0 |
| savlab | 3 | 10 | 0 |

| RECODED VARIABLE PAIR TOTAL OF 3 (continued) | | | |
|---|---|---|---|
| VARIABLE PAIRS | RECODED VALUE | TOTALS & TYPES | |
| | | TOTAL | TYPE |
| savemp | 3 | 10 | 0 |
| effbon | 3 | 10 | 0 |
| effns | 3 | 10 | 0 |
| efflab | 3 | 10 | 0 |
| pefbon | 3 | 10 | 0 |
| perins | 3 | 10 | 0 |
| perlab | 3 | 10 | 0 |
| regbon | 3 | 10 | 0 |
| regins | 3 | 10 | 0 |
| combon | 3 | 10 | 0 |
| comins | 3 | 10 | 0 |
| bonlab | 3 | 10 | 0 |
| bonemp | 3 | 10 | 0 |
| inslab | 3 | 10 | 0 |
| insemp | 3 | 10 | 0 |
| labrsk | 3 | 10 | 0 |
| enprsk | 3 | 10 | 0 |
| effemp | 3 | 9 | 0 |
| effrsk | 3 | 9 | 0 |
| peremp | 3 | 9 | 0 |
| comops | 3 | 9 | 0 |
| comrsk | 3 | 9 | 0 |
| opsrsk | 3 | 9 | 0 |

**10 out of 10 cities paired**

Improved bond rating and reduced insurance premiums

100% of the Cluster I cities paired these two benefits together.

***Explanation***

Municipal managers see that when you improve your improved bond ratings you can reduce insurance premiums.

**9 out of 10 cities paired**

Reduced costs and improved bond rating
Reduced costs and reduced insurance premiums
Better labor relationship with management and employee succession

90% of the Cluster I cities paired these two benefits together.

***Explanation***

Municipal managers see that when you improve your bond rating and reduced your insurance premiums that you reduce costs. They also relate improved easier employee succession with better labor relationship with management.

**10 out of 10 cities did not pair**

Reduced costs and environmental efficiencies
Reduced costs and improved environmental performance
Reduced costs and better relationships with regulators
Reduced costs and better labor relationship with management
Reduced costs and employee succession
Environmental efficiencies and improved bond rating
Environmental efficiencies and reduced insurance premiums
Environmental efficiencies and better labor relationship with management
Improved environmental performance and improved bond rating
Improved environmental performance and reduced insurance premiums
Improved environmental performance and better labor relationship with management
Better relationships with regulators and improved bond rating
Better relationships with regulators and reduced insurance premiums
Communications and improved bond rating
Communications and reduced insurance premiums
Improved bond rating and better labor relationship with management
Improved bond rating and employee succession
Reduced insurance premiums and better labor relationship with management
Reduced insurance premiums and easier employee succession
Better labor relationship with management and risk reduction
Easier employee succession and risk reduction

100% of the Cluster I cities did not pair these two benefits together.

***Explanation***

Municipal managers do not relate improved environmental performance and environmental efficiencies (environmental operations) with improved bond rating, reduced insurance premiums, and better labor relationships with management. They do see reduced costs related to better environmental operations, improved external and internal relations, and employee succession. They also do not see a connection between better communications and improved bond rating and reduced insurance premiums. These cities see improved bond rating as not related to easier employee succession and better labor relationship with management. They do not relate better relationships with regulators and reduce insurance premiums or improved bond rating. They also do not see easier employee succession or better labor relations with management as being related to risk reduction.

**9 out of 10 cities did not pair**

Environmental efficiencies and easier employee succession
Environmental efficiencies and risk reduction
Improved environmental performance and employee succession
Better communications and operational efficiencies and consistency
Better communications and risk reduction
Operational efficiencies and consistency and risk reduction

90% of the Cluster I cities did not pair these two benefits together.

***Explanation***

Municipal managers do not see a connection between improved environmental operations with easier employee succession or risk reduction. They also don't relate better communications with operational efficiencies and consistency or risk reduction. These cities see no connection between operational efficiencies and consistency and risk reduction.

**Medium Variable Pair Correlations (2)**

| RECODED VARIABLE PAIR TOTAL OF 2 | | | |
|---|---|---|---|
| VARIABLE PAIRS | RECODED VALUE | TOTALS & TYPE | |
| | | TOTAL | TYPE |
| effper | 2 | 8 | 1 |
| comemp | 2 | 8 | 1 |
| bonrsk | 2 | 8 | 1 |
| insrsk | 2 | 8 | 1 |
| perops | 2 | 8 | 0 |
| perrsk | 2 | 8 | 0 |
| regops | 2 | 8 | 0 |
| regemp | 2 | 8 | 0 |
| regrsk | 2 | 8 | 0 |
| opsemp | 2 | 8 | 0 |

**8 out of 10 cities paired**

Environmental efficiencies and improved environmental performance
Better communications and easier employee succession
Improved bond rating and risk reduction
Reduce insurance premium and risk reduction

80% of the Cluster I cities paired these two benefits together.

***Explanation***

Municipal managers see that when you improve your environmental performance (compliance) that you will also gain environmental efficiencies. They also relate improved bond ratings and reduced insurance premiums to risk reduction. These cities see a link between better communications and employee succession.

**8 out of 10 cities did not pair**

Improved environmental performance and operational efficiencies and consistency

Improved environmental performance and risk reduction
Better relationships with regulators and operational efficiencies and consistency
Better relationships with regulators and easier employee succession
Better relationships with regulators and risk reduction
Operational efficiencies and consistency and easier employee succession

8o% of the Cluster I cities did not pair these two benefits together.

***Explanation***

Municipal managers did not related improved environmental performance with operational efficiencies and consistency or risk reduction. They also did not see a connection between better relationships with regulators and operational efficiencies and consistency, easier employee succession, and risk reduction. The cities did not relate operational efficiencies and consistency and easier employee succession.

**Low Variable Pair Correlations (1)**

| RECODED VARIABLE PAIR TOTAL OF 1 | | | |
|---|---|---|---|
| VARIABLE PAIRS | RECODED VALUE | PAIR TOTALS | |
| | | TOTAL | TYPE |
| perreg | 1 | 7 | 1 |
| comlab | 1 | 7 | 1 |
| effcom | 1 | 7 | 1 |
| effops | 1 | 7 | 0 |
| percom | 1 | 7 | 0 |
| regcom | 1 | 7 | 0 |
| reglab | 1 | 7 | 0 |
| bonops | 1 | 7 | 0 |
| insops | 1 | 7 | 0 |
| opslab | 1 | 7 | 0 |

**7 out of 10 cities paired**

Improved environmental performance and better relationships with regulators
Better communications and better labor relationship with management
Environmental efficiencies and better communications

7o% of the Cluster I cities paired these two benefits together.

***Explanation***

Municipal managers see improved environmental performance (compliance) leading to a better relationship with regulators. They also see better communications as resulting in a better labor relationship with management and environmental efficiencies.

**7 out of 10 cities did not pair**

Environmental efficiencies and operational efficiencies and consistency
Improved environmental performance and better communications
Better relationships with regulators and better communications
Better relationships with regulators and better labor relationship with management
Improved bond rating and operational efficiencies and consistency
Reduced insurance premiums and operational efficiencies and consistency
Operational efficiencies and better labor relationship with management

70% of the Cluster I cities did not pair these two benefits together.

***Explanation***

Municipal managers do not see better overall operations as linked to reducing insurance premiums, improved bond rating, environmental efficiencies or better internal relations. They also do not relate better relationships with regulators and better communications or better labor relationship with management.

**Cluster II**

Cluster II consists of the following 5 cities: EMS02, 10, 13, 15, and 19.

Data from the raw cluster analysis (1s and 0s) was totaled for each variable pair for the cities. Since the data is only 0 or 1, all 1s would add to 5 and all 0s would add to 0. These totals were recoded for ease of reporting as follows:

| RAW DATA TOTALS | | RECODED VALUE |
|---|---|---|
| 1S | 0S | |
| 5 | 0 | 3 |
| 4 | 1 | 2 |
| 3 | 3 | 1 |
| 2 | 2 | 0 |

**Highest Variable Pair Correlations (3)**

| RECODED VARIABLE PAIR TOTAL OF 3 | | | |
|---|---|---|---|
| VARIABLE PAIRS | RECODED VALUE | TOTALS & TYPES | |
| | | TOTAL | TYPE |
| savrsk | 3 | 5 | 1 |
| savins | 3 | 5 | 0 |
| labemp | 3 | 5 | 0 |
| effper | 3 | 5 | 0 |
| comlab | 3 | 5 | 0 |
| effcom | 3 | 5 | 0 |
| effops | 3 | 5 | 0 |
| regcom | 3 | 5 | 0 |
| bonops | 3 | 5 | 0 |
| perops | 3 | 5 | 0 |
| perrsk | 3 | 5 | 0 |
| regemp | 3 | 5 | 0 |
| opsemp | 3 | 5 | 0 |
| peremp | 3 | 5 | 0 |
| comops | 3 | 5 | 0 |
| saveff | 3 | 5 | 0 |
| savper | 3 | 5 | 0 |
| savreg | 3 | 5 | 0 |
| savcom | 3 | 5 | 0 |
| effbon | 3 | 5 | 0 |
| efflab | 3 | 5 | 0 |
| pefbon | 3 | 5 | 0 |
| regins | 3 | 5 | 0 |
| combon | 3 | 5 | 0 |
| labrsk | 3 | 5 | 0 |
| enprsk | 3 | 5 | 0 |

**5 out of 5 cities paired**

Reduced costs and risk reduction

100% of the Cluster II cities paired these two benefits together.

***Explanation***

Municipal managers see that when a city reduces risk that it reduces costs.

**5 out of 5 cities did not pair**

Reduced costs and reduced insurance premiums
Better labor relationship and better labor relationship with management
Environmental efficiencies and improved environmental performance
Better communications and better labor relationship with management
Environmental efficiencies and better communications
Environmental efficiencies and operational efficiencies and consistency
Better relationships with regulators and communications
Improved bond rating and operational efficiencies and consistency
Improved environmental performance and operational efficiencies and consistency
Improved environmental performance and risk reduction
Better relationships with regulators and easier employee succession
Operational efficiencies and consistency and easier employee succession
Improved environmental performance and easier employee succession
Better communications and operational efficiencies and consistency
Reduced costs and environmental efficiencies
Reduced costs and improved environmental performance
Reduced costs and better relationships with regulators
Reduced costs and better communications
Environmental efficiencies and improved bond rating
Environmental efficiencies and better labor relationship with management
Improved environmental performance and improved bond rating
Better relationships with regulators and reduced insurance premiums
Better communications and improved bond rating
Better labor relationship with management and risk reduction
Easier employee succession and risk reduction

100% of the Cluster II cities did not pair these two benefits together.

***Explanation***

Municipal managers do not see better communications as linked to operational efficiencies and consistency, better labor relationships with management, environmental efficiencies, better relationships with regulators, reduced costs, and improved bond rating. They also do not relate improved environmental operations with operational efficiencies and consistency, risk reduction, improved bond rating, and better labor relationships with management. These cities did not see a connection between easier employee succession and improved environmental operations, external relationships, and risk reduction. They also did not see a link between reduced costs and improved environmental operations, external relations and reduced insurance premiums. No relationship between reduced insurance premiums and better relationships with regulators was seen. Better lab or relationships with management and risk reduction were not related and improved bond rating had not relationship with operational efficiencies and consistency.

**Medium Variable Pair Correlations (2)**

| RECODED VARIABLE PAIR TOTAL OF 2 | | | |
|---|---|---|---|
| VARIABLE PAIRS | RECODED VALUE | TOTALS & TYPES | |
| | | TOTAL | TYPE |
| effemp | 2 | 4 | 1 |
| perlab | 2 | 4 | 1 |
| comemp | 2 | 4 | 0 |
| effreg | 2 | 4 | 0 |
| savops | 2 | 4 | 0 |
| reglab | 2 | 4 | 0 |
| insops | 2 | 4 | 0 |
| opslab | 2 | 4 | 0 |
| regrsk | 2 | 4 | 0 |
| effrsk | 2 | 4 | 0 |
| opsrsk | 2 | 4 | 0 |
| perins | 2 | 4 | 0 |
| regbon | 2 | 4 | 0 |
| bonlab | 2 | 4 | 0 |
| inslab | 2 | 4 | 0 |

**4 out of 5 cities paired**

Environmental efficiencies and easier employee succession
Improved environmental performance and better labor relationship with management

80% of the Cluster II cities paired these two benefits together.

***Explanation***

Municipal managers see that when you improve your environmental efficiency your city will have easier employee succession. They also relate improved environmental performance and a better labor relationship with management.

**4 out of 5 cities did not pair**

Better communications and employee succession
Environmental efficiencies and operational efficiencies and consistency
Environmental efficiencies and better relationships with regulators
Reduced costs and operational efficiencies and consistency
Better relationships with regulators and better labor relationship with management
Reduced insurance premiums and operational efficiencies and consistency
Operational efficiencies and consistency and better labor relationship with management
Better relationships with regulators and risk reduction
Environmental efficiencies and risk reduction
Operational efficiencies and consistency and risk reduction
Improved environmental performance and reduced insurance premiums
Better relationships with regulators and improved bond rating
Improved bond rating and better labor relationship with management
Reduced insurance premiums and better labor relationship with management

80% of the Cluster II cities did not pair these two benefits together.

***Explanation***

Municipal managers do not see better environmental operations as linked with operational efficiencies and consistency, better relationships with regulators, risk reduction and reduced insurance premiums. They also do not relate operational efficiencies and consistency with reduced costs, reduced insurance premiums, risk reduction and better labor relationship with management. These cities see no relationship between better relationships with regulators, and risk reduction or improved bond rating. They don't relate better labor relations with management with improved

bond rating, reduce insurance premiums, and better relationships with regulators. Better communications and easier employee succession are not seen as related

**Low Variable Pair Correlations (1)**

| RECODED VARIABLE PAIR TOTAL OF 1 | | | |
|---|---|---|---|
| VARIABLE PAIRS | RECODED VALUE | PAIR TOTALS | |
| | | TOTAL | TYPE |
| perops | 1 | 3 | 1 |
| bonins | 1 | 3 | 1 |
| insrsk | 1 | 3 | 1 |
| labemp | 1 | 3 | 1 |

**3 out of 5 cities paired**

Improved environmental performance and operational efficiencies and consistency
Improved bond ratings and reduced insurance premiums
Reduced insurance premiums and risk reduction
Better labor relationships with management and easier employee succession

60% of the Cluster II cities paired these two benefits together.

***Explanation***

Municipal managers see that when you improve your environmental performance that you have better overall operational efficiency and consistency. They also relate reduced insurance premiums with improved bond rating and risk reduction. These cities also see better labor relationship with management related to easier employee succession.

**Cluster III**

Cluster III consists of the following 3 cities: EMS06, 16, and 18

Data from the raw cluster analysis (1s and 0s) was totaled for each variable pair for the cities. Since the data is only 0 or 1, all 1s would add to 3 and all 0s would add to 0. These totals were recoded for ease of reporting as follows:

| RAW DATA TOTALS | | RECODED VALUE |
|---|---|---|
| 1S | 0S | |
| 3 | 0 | 3 |
| 2 | 1 | 2 |
| 1 | 2 | 1 |

**Highest Variable Pair Correlations (3)**

| RECODED VARIABLE PAIR TOTAL OF 3 | | | |
|---|---|---|---|
| VARIABLE PAIRS | RECODED VALUE | TOTALS & TYPES | |
| | | TOTAL | TYPE |
| effper | 3 | 3 | 1 |
| effreg | 3 | 3 | 1 |
| effrsk | 3 | 3 | 1 |
| perreg | 3 | 3 | 1 |
| perrsk | 3 | 3 | 1 |
| regrsk | 3 | 3 | 1 |
| saveff | 3 | 3 | 0 |
| savper | 3 | 3 | 0 |
| savreg | 3 | 3 | 0 |
| savbon | 3 | 3 | 0 |
| savins | 3 | 3 | 0 |
| savrsk | 3 | 3 | 0 |
| effns | 3 | 3 | 0 |
| efflab | 3 | 3 | 0 |
| effemp | 3 | 3 | 0 |
| perins | 3 | 3 | 0 |
| perlab | 3 | 3 | 0 |
| peremp | 3 | 3 | 0 |
| regins | 3 | 3 | 0 |
| reglab | 3 | 3 | 0 |

| RECODED VARIABLE PAIR TOTAL OF 3 (continued) | | | |
|---|---|---|---|
| VARIABLE PAIRS | RECODED VALUE | TOTALS & TYPES | |
| | | TOTAL | TOTAL |
| regemp | 3 | 3 | 0 |
| combon | 3 | 3 | 0 |
| comins | 3 | 3 | 0 |
| comemp | 3 | 3 | 0 |
| bonops | 3 | 3 | 0 |
| bonlab | 3 | 3 | 0 |
| bonemp | 3 | 3 | 0 |
| bonrsk | 3 | 3 | 0 |
| insops | 3 | 3 | 0 |
| inslab | 3 | 3 | 0 |
| insrsk | 3 | 3 | 0 |
| opslab | 3 | 3 | 0 |
| opsemp | 3 | 3 | 0 |
| labrsk | 3 | 3 | 0 |
| emprsk | 3 | 3 | 0 |

**3 out of 3 cities paired**

Environmental efficiencies and improved environmental performance
Environmental efficiencies and better relationships with regulators
Environmental efficiencies and risk reduction
Improved environmental performance and relationships with regulators
Improved environmental performance and risk reduction
Better relationships with regulators and risk reduction

100% of the Cluster III cities paired these two benefits together.

***Explanation***

Municipal managers see that when you improve environmental operations (performance and efficiency) that you will also gain a better relationship with regulators and reduce risks. They also relate better relationships with regulators and risk reduction.

**3 out of 3 cities did not pair**

Reduced costs and environmental efficiencies
Reduced costs and improved environmental performance
Reduced costs and better relationships with regulators
Reduced costs and better communications
Reduced costs and improved bond rating
Reduced costs and risk reduction
Environmental efficiencies and reduced insurance premiums
Environmental efficiencies and better labor relationship with management
Environmental efficiencies and easier employee succession
Improved environmental performance and reduced insurance premiums
Improved environmental performance and better labor relationship with management
Improved environmental performance and employee succession
Better relationships with regulators and reduced insurance premiums
Better relationships with regulators and better labor relationship with management
Better relationships with regulators and improved bond rating
Better communications and reduced insurance premiums
Better communications and easier employee succession
Improved bond rating and operational efficiencies and consistency
Improved bond rating and better labor relationship with management
Improved bond rating and easier employee succession
Improved bond rating and risk reduction
Reduced insurance premiums and operational efficiencies and consistency
Reduced insurance premiums and better labor relationship with management
Reduced insurance premiums and risk reduction
Operational efficiencies and consistency and better labor relationship with management
Operational efficiencies and consistency and easier employee succession
Better labor relationship with management and risk reduction
Easier employee succession and risk reduction

100% of the Cluster III cities did not pair these two benefits together.

***Explanation***

Municipal managers do not see reduced cost as linked to environmental efficiencies, improved environmental performance, better relationships with regulators, better communications, risk reduction, and improved bond rating. They also do not relate improved environmental operations (efficiency and performance) with better labor relationships with management, reduced insurance premiums, and easier employee succession. These cities did not see a connection between better relationships with

regulators and reduced insurance premiums, better labor relationships with management, and improved bond rating. They did not see a connection between better communications and reduced insurance premiums or easier employee succession. They also did not see a link between improved bond ratings and reduced insurance premiums and operational efficiencies and consistency, better labor relationship with management, and risk reduction. No relationship between operational efficiencies and consistency and premiums and better labor relationship with management and employee succession was seen. Better labor relationships with management and risk reduction were not related nor were easier employee succession and risk reduction.

**Medium and Low Variable Pair Correlations (2 and 1)**

| RECODED VARIABLE PAIR TOTAL OF 2 AND 1 | | | |
|---|---|---|---|
| VARIABLE PAIRS | RECODED VALUE | TOTALS & TYPES | |
| | | TOTAL | TYPE |
| effops | 2 | 2 | 1 |
| perops | 2 | 2 | 1 |
| regops | 2 | 2 | 1 |
| comlab | 2 | 2 | 1 |
| opsrsk | 2 | 2 | 1 |
| savcom | 1 | 2 | 0 |
| savops | 1 | 2 | 0 |
| savlab | 1 | 2 | 0 |
| savemp | 1 | 2 | 0 |
| effcom | 1 | 2 | 0 |
| effbon | 1 | 2 | 0 |
| percom | 1 | 2 | 0 |
| pefbon | 1 | 2 | 0 |
| regcom | 1 | 2 | 0 |
| regbon | 1 | 2 | 0 |
| comops | 1 | 2 | 0 |
| comrsk | 1 | 2 | 0 |
| insemp | 1 | 2 | 0 |
| labemp | 1 | 2 | 0 |

**2 out of 3 cities paired**

Environmental efficiencies and operational efficiencies and consistency
Improved environmental performance and operational efficiencies and consistency
Better relationships with regulators and operational efficiencies and consistency
Better communications and better labor relationship with management
Operational efficiencies and consistency and risk reduction

66% of the Cluster III cities paired these two benefits together.

***Explanation***

Municipal managers see that when you improve your operational efficiencies and consistency that you will also improve your environmental operations (efficiency and performance), gain better relationships with regulators, and reduce the cities risk. They also relate better communications with better labor relationships with management.

**2 out of 3 cities did not pair**

Reduced costs and better communications
Reduced costs and operational efficiencies and consistency
Reduced costs and better labor relationship with management
Reduced costs and employee succession
Environmental efficiencies and better communications
Environmental efficiencies and improved bond rating
Improved environmental performance and communications
Improved environmental performance and improved bond rating
Better relationships with regulators and communications
Better relationships with regulators and improved bond rating
Better communications and operational efficiencies and consistency
Better communications and risk reduction
Reduced insurance premiums and employee succession
Better labor relationship with management and employee succession

66% of the Cluster III cities did not pair these two benefits together.

***Explanation***

Municipal managers do not see reduced costs linked with and better communications, operational efficiencies and consistency, better labor relationship with management, and easier employee succession. They also don't see a relationship between improved

environmental operations (efficiency and performance) and better communications and improved bond rating. These cities see not linkage between better relationships with regulators and better communications or improved bond ratings. They also do not relate better communications with operational efficiencies and consistency and risk reduction. They do not see a connection between reduced insurance premiums and easier employee succession not do they see a connection between better labor relationships with management and easier employee succession.

**Cluster IV**

Cluster IV consists of the following 2 cities: EMS04, and 9.

Data from the raw cluster analysis (1s and 0s) was totaled for each variable pair for the cities. Since the data is only 0 or 1, all 1s would add to 2 and all 0s would add to 0. Variable pairs that did not match total 1.

**High Variable Pair Correlations (2 – 1s)**

| VARIABLE PAIR TOTAL OF 2 | | | |
|---|---|---|---|
| VARIABLE PAIRS | TOTAL VALUE | TOTALS & TYPES | |
| | | TOTAL | TYPE |
| effbon | 2 | 2 | 1 |
| effns | 2 | 2 | 1 |
| perreg | 2 | 2 | 1 |
| pefbon | 2 | 2 | 1 |
| perins | 2 | 2 | 1 |
| regbon | 2 | 2 | 1 |
| regins | 2 | 2 | 1 |
| comops | 2 | 2 | 1 |
| comlab | 2 | 2 | 1 |
| comemp | 2 | 2 | 1 |
| bonins | 2 | 2 | 1 |
| opslab | 2 | 2 | 1 |
| opsemp | 2 | 2 | 1 |

**2 out of 2 cities paired**

Environmental efficiencies and improved bond rating

Environmental efficiencies and reduced insurance premiums
Improved environmental performance and better relationships with regulators
Improved environmental performance and improved bond rating
Improved environmental performance and reduced insurance premiums
Better relationships with regulators and improved bond rating
Better relationships with regulators and reduced insurance premiums
Better communications and operational efficiencies and consistency
Better communications and better labor relationship with management
Better communications and easier employee succession
Improved bond rating and reduced insurance premiums

***Explanation***

Municipal manager from these two cities see that better communications is related to operational efficiencies and consistency, better labor relationship with management, and easier employee succession. They also relate improved environmental operations (efficiency and performance) with improved bond rating, reduced insurance premiums, and better relationships with regulators. These cities see a connection between better relationships with regulators and improved bond rating and reduced insurance premiums. They also see operational efficiencies and consistency related to better labor relationship with management and easier employee succession.

**High Variable Pair Correlations (2 – 0s)**

| VARIABLE PAIR TOTAL OF 0 | | | |
|---|---|---|---|
| VARIABLE PAIRS | TOTAL VALUE | TOTALS & TYPES | |
| | | TOTAL | TYPE |
| savrsk | 0 | 2 | 0 |
| effcom | 0 | 2 | 0 |
| effops | 0 | 2 | 0 |
| efflab | 0 | 2 | 0 |
| effemp | 0 | 2 | 0 |
| percom | 0 | 2 | 0 |
| perops | 0 | 2 | 0 |
| perlab | 0 | 2 | 0 |
| peremp | 0 | 2 | 0 |

| VARIABLE PAIR TOTAL OF 0 (continued) | | | |
|---|---|---|---|
| VARIABLE PAIRS | TOTAL VALUE | TOTALS & TYPES | |
| | | TOTAL | TOTAL |
| regcom | 0 | 2 | 0 |
| regops | 0 | 2 | 0 |
| reglab | 0 | 2 | 0 |
| regemp | 0 | 2 | 0 |
| combon | 0 | 2 | 0 |
| comins | 0 | 2 | 0 |
| comrsk | 0 | 2 | 0 |
| bonops | 0 | 2 | 0 |
| bonlab | 0 | 2 | 0 |
| bonemp | 0 | 2 | 0 |
| insops | 0 | 2 | 0 |
| inslab | 0 | 2 | 0 |
| insemp | 0 | 2 | 0 |
| opsrsk | 0 | 2 | 0 |
| labrsk | 0 | 2 | 0 |
| emprsk | 0 | 2 | 0 |

**2 out of 2 cities did not pair**

Reduced costs and risk reduction
Environmental efficiencies and better communications
Environmental efficiencies and operational efficiencies and consistency
Environmental efficiencies and better labor relationship with management
Environmental efficiencies and easier employee succession
Improved environmental performance and better communications
Improved environmental performance and operational efficiencies and consistency
Improved environmental performance and better labor relationship with management
Improved environmental performance and employee succession
Better relationships with regulators and better communications
Better relationships with regulators and operational efficiencies and consistency
Better relationships with regulators and better labor relationship with management
Better relationships with regulators and employee succession

Better communications and improved bond rating
Better communications and reduced insurance premiums
Better communications and risk reduction
Improved bond rating and operational efficiencies and consistency
Improved bond rating and better labor relationship with management
Improved bond rating and easier employee succession
Reduced insurance premiums and operational efficiencies and consistency
Reduced insurance premiums and better labor relationship with management
Reduced insurance premiums and easier employee succession
Operational efficiencies and consistency and risk reduction
Better labor relationship with management and risk reduction
Easier employee succession and risk reduction

***Explanation***

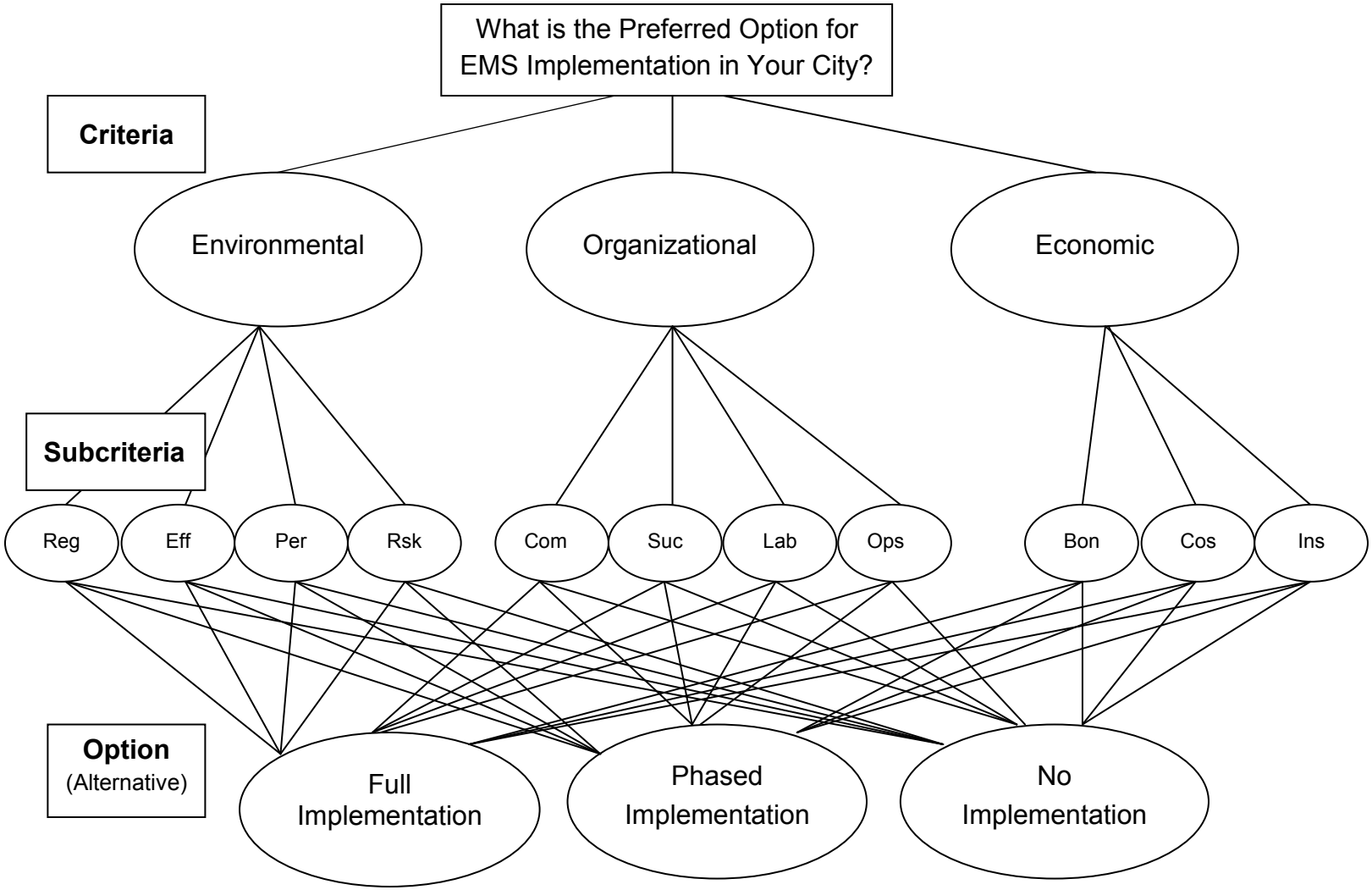
Municipal managers from these two cities did not see relationship between improved environmental operations (efficiency and performance) and better communications, operational efficiencies and consistency, better labor relationship with management, and employee succession. They also did not see a linkage between better relationships with regulators and better communications, operational efficiencies and consistency, better labor relationship with management, and employee succession. These cities did not see a relationship between better communications and improved bond rating, reduced insurance premiums, and risk reduction. They also saw no linkage between improved bond ratings and reduced insurance premiums and operational efficiencies and consistency, better labor relationship with management, and employee succession. Risk reductions was also seen as not being related to operational efficiencies and consistency, reduced costs, better labor relationship with management, and employee succession.

**Cluster V**

Cluster V consists of a single city EMS 11. This city does not cluster with any of the other 20 cities in this study. EMS 11 was one of two cities that only had 2 stacks of benefits, the other was EMS09. This 2 stack effect (and those cards contained in each stack) is largely responsible for EMS11 being seen as an individual in the cluster analysis.

APPENDIX G—AHP DATA

**BENEFIT AHP DIAGRAM**

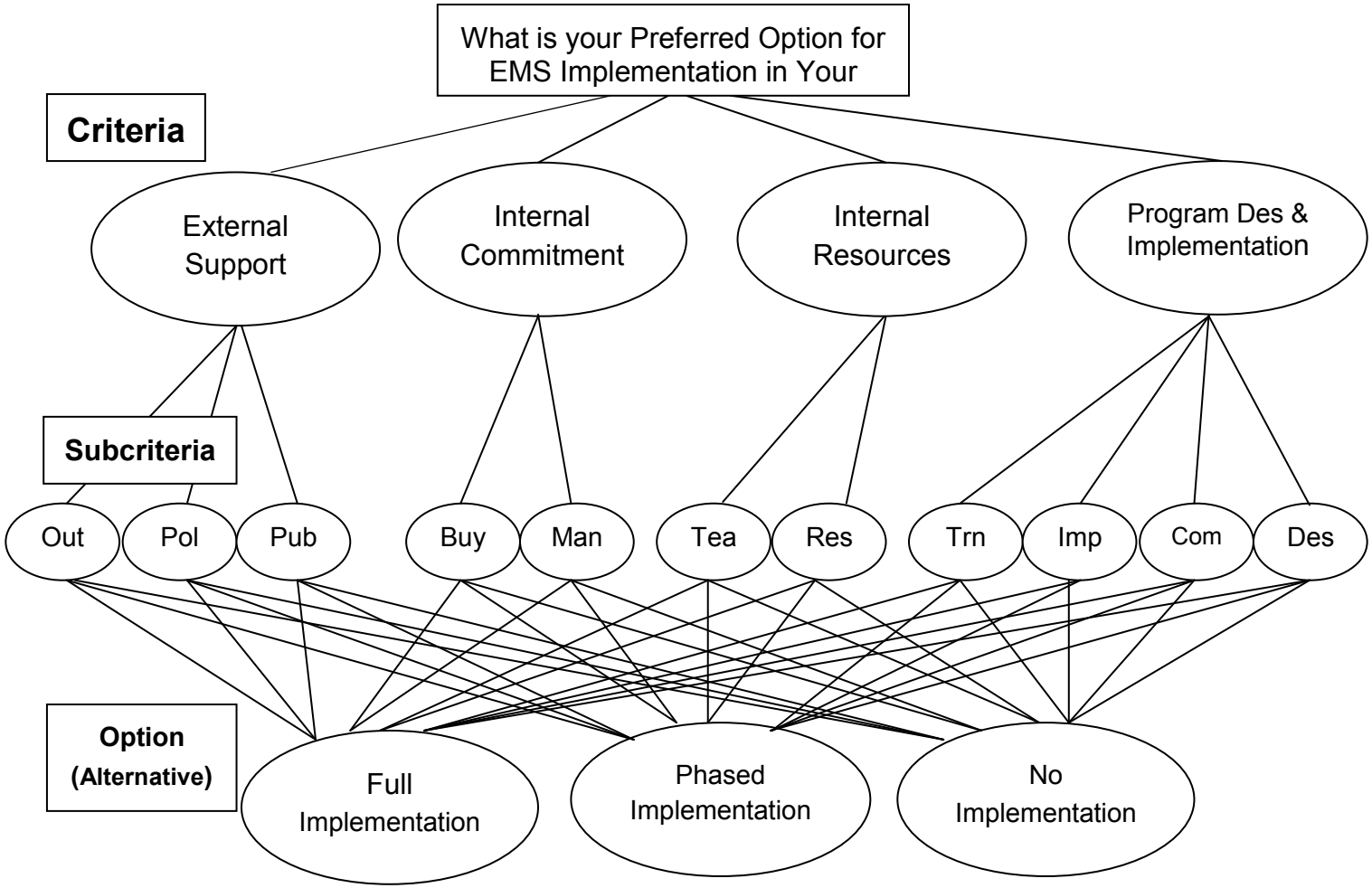


AHP ANALYSIS: BENEFIT HIERARCHY WEIGHTS ACROSS CITIES

(Shaded areas show highest percentage of criteria and subcriteria in each implementation option)

| BENEFIT FULL IMPLEMENTATION | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CITY | OPTION | ENVR | ORG | ECON | REG | EFF | PER | RSK | COM | SUC | LAB | OPS | BON | COS | INS |
| EMS01 | 81.82 | 66.94 | 7.44 | 7.44 | 2.7 | 46.7 | 15.5 | 16.9 | 4.5 | 1.2 | 0.4 | 3.1 | 4.3 | 4.3 | 0.5 |
| EMS04 | 49.33 | 7.75 | 12.3 | 29.28 | 1.7 | 2.8 | 5.4 | 5.3 | 5 | 5 | 5 | 10 | 14.8 | 29.7 | 14.8 |
| EMS11 | 74.52 | 51.63 | 7.28 | 15.6 | 6.6 | 2.9 | 23.1 | 34.8 | 6.4 | 0.6 | 0.5 | 2.5 | 2 | 12.6 | 7.9 |
| EMS14 | 51.12 | 16.87 | 12.09 | 22.16 | 4.3 | 6.1 | 8.6 | 12.1 | 2.7 | 5.4 | 3.8 | 7.6 | 3.1 | 36.6 | 9.6 |
| EMS18 | 42.84 | 27.61 | 13 | 2.23 | 26.2 | 5.9 | 26.2 | 5.9 | 3.7 | 3.7 | 18.3 | 3.7 | 2.2 | 2.2 | 2.3 |
| EMS19 | 57.12 | 6.66 | 23.65 | 26.82 | 0.8 | 5.6 | 1.2 | 3.5 | 17 | 3.6 | 17.6 | 6.2 | 2.9 | 31.9 | 9.7 |
| EMS20 | 70.03 | 50.44 | 13.98 | 5.61 | 3.4 | 14.4 | 23.3 | 30.6 | 3.7 | 0.9 | 10.4 | 4.5 | 0.7 | 5.7 | 2.5 |
| EMS21 | 70.63 | 20.35 | 4.6 | 45.68 | 7 | 4.2 | 15.5 | 2.6 | 1.5 | 0.7 | 0.4 | 4.2 | 11.4 | 45.4 | 7.2 |
| **Mean** | **62.18** | **31.03** | **11.79** | **19.35** | **6.59** | **11.08** | **14.85** | **13.96** | **5.56** | **2.64** | **7.05** | **5.23** | **5.18** | **21.05** | **6.81** |
| **BENEFIT PHASED IMPLEMENTATION** | | | | | | | | | | | | | | | |
| EMS02 | 48.89 | 27.18 | 11.36 | 10.35 | 7.6 | 15.2 | 10.7 | 21.5 | 4.5 | 3.2 | 4 | 11.1 | 6.2 | 11.3 | 3.4 |
| EMS03 | 54.14 | 6.27 | 9.17 | 38.71 | 4.5 | 1.6 | 4.6 | 1.1 | 11.1 | 4.6 | 1.8 | 1.1 | 27.2 | 23.8 | 10.4 |
| EMS05 | 37.89 | 6.72 | 12.68 | 18.49 | 2.8 | 6.3 | 3.6 | 1.3 | 13 | 9.2 | 4.6 | 6.5 | 3.3 | 39.2 | 10.2 |
| EMS06 | 46.89 | 28.24 | 12.09 | 6.57 | 15.4 | 12.3 | 6.5 | 21.5 | 8.8 | 4.4 | 6.2 | 12.5 | 1.8 | 8.4 | 2 |
| EMS07 | 55.07 | 5.06 | 35.55 | 14.46 | 1.3 | 1.8 | 2.6 | 3.7 | 12.2 | 8.7 | 17.3 | 24.5 | 5.5 | 13.8 | 8.7 |
| EMS08 | 61.34 | 16.98 | 6.35 | 38.02 | 14.8 | 7.3 | 2.4 | 1.4 | 4.5 | 0.6 | 1 | 4.3 | 25.2 | 25.2 | 12.7 |
| EMS10 | 55.81 | 22.36 | 11.09 | 22.36 | 2.5 | 14.4 | 15.6 | 7.5 | 6.6 | 4 | 2.8 | 6.6 | 12.4 | 23.3 | 4.4 |
| EMS12 | 62.97 | 4.71 | 28.49 | 29.77 | 0.5 | 1.7 | 0.8 | 4.7 | 15.6 | 18.5 | 6.6 | 5.5 | 2.7 | 30.6 | 12.9 |
| EMS13 | 79.78 | 16.68 | 6.71 | 56.39 | 1.2 | 7 | 4 | 9 | 0.7 | 2.4 | 1.7 | 3.7 | 12.9 | 52.3 | 5.3 |
| EMS15 | 67.82 | 52.08 | 8.28 | 7.46 | 6 | 3.1 | 42.2 | 23.2 | 3.2 | 1.7 | 0.9 | 9.8 | 0.7 | 2.9 | 6.3 |
| EMS16 | 62.43 | 16.48 | 38.2 | 7.74 | 2.3 | 6.4 | 14.9 | 3.3 | 15.2 | 10.8 | 5.8 | 29.7 | 4 | 6.4 | 1.3 |
| EMS17 | 45.59 | 30.58 | 12.45 | 2.56 | 18.7 | 7.6 | 2.7 | 18.7 | 9.9 | 2.5 | 1.3 | 9.3 | 0.7 | 4.3 | 2.7 |
| EMS18 | 42.84 | 27.61 | 13 | 2.23 | 26.2 | 5.9 | 26.2 | 5.9 | 3.7 | 3.7 | 18.3 | 3.7 | 2.2 | 2.2 | 2.3 |
| **Mean** | **55.50** | **20.07** | **15.80** | **19.62** | **7.98** | **6.97** | **10.52** | **9.45** | **8.38** | **5.72** | **5.56** | **9.87** | **8.06** | **18.75** | **6.35** |
| **BENEFIT NO IMPLEMENTATION** | | | | | | | | | | | | | | | |
| EMS09 | **44.03** | **1.17** | **40.84** | **2.01** | **3.6** | **1.1** | **4.7** | **0.7** | **6.7** | **31.9** | **23.6** | **5.1** | **1.3** | **13** | **8.2** |

**BARRIER AHP DIAGRAM**



AHP ANALYSIS: BARRIER HIERARCHY WEIGHTS ACROSS CITIES

(Shaded areas show highest percentage of criteria and subcriteria in each implementation option)

| BARRIER FULL IMPLEMENTATION | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CITY | OPTION | INTER COMIT | PRO DESG | EXT SUP | INT RES | OUT | POL | PUB | BUY | MAN | TEA | RES | TRN | IMP | COM |
| EMS01 | 81.23 | 46.97 | 3.03 | 24.53 | 6.7 | 7 | 1.8 | 21.3 | 5.8 | 51.9 | 7.4 | 0.8 | 2 | 0.4 | 1.4 |
| EMS03 | 61.01 | 31.97 | 1.08 | 0.5 | 27.46 | 2.6 | 1.1 | 0.7 | 5.4 | 42.9 | 4 | 32.2 | 2.5 | 1.2 | 2.4 |
| EMS04 | 49.33 | 19.26 | 6.81 | 13.62 | 9.64 | 8.6 | 13.6 | 5.4 | 9.8 | 29.3 | 4.9 | 14.6 | 3.8 | 2.7 | 5.4 |
| EMS09 | 50.9 | 18.68 | 1.83 | 2.12 | 28.27 | 0.7 | 3.4 | 5.4 | 2.9 | 20.4 | 12.7 | 50.6 | 0.5 | 0.1 | 1.7 |
| EMS10 | 60.56 | 27.86 | 5.02 | 3.49 | 24.19 | 1.5 | 4.3 | 0.8 | 4.3 | 38.3 | 34.1 | 6.8 | 1.7 | 1.2 | 3.8 |
| EMS14 | 48.75 | 24.26 | 7.5 | 1.67 | 15.31 | 1.1 | 3.4 | 0.3 | 9.8 | 48.9 | 5.1 | 20.3 | 6.4 | 3.4 | 0.8 |
| EMS16 | 59 | 19.88 | 25.96 | 8 | 5.16 | 2.5 | 9.4 | 4 | 8.1 | 24.3 | 1.7 | 6.9 | 7 | 3.2 | 9.3 |
| ESM19 | 62.73 | 28.93 | 14.29 | 5.8 | 13.71 | 4.8 | 3 | 1.9 | 14.4 | 28.9 | 18.1 | 2.6 | 4.6 | 2.9 | 10.19 |
| ESM20 | 68.96 | 14.34 | 12.68 | 2.51 | 39.44 | 1.2 | 3.9 | 0.4 | 2.4 | 16.8 | 8.3 | 49.9 | 9.3 | 1.3 | 2.6 |
| ESM21 | 71.91 | 34.21 | 7.34 | 19.59 | 10.76 | 3 | 18.1 | 7.3 | 6.6 | 39.5 | 2.1 | 12.7 | 0.9 | 3.3 | 4.8 |
| **MEAN** | **61.44** | **26.64** | **8.55** | **8.18** | **18.06** | **3.30** | **6.20** | **4.75** | **6.95** | **34.12** | **9.84** | **19.74** | **3.87** | **1.97** | **4.24** |
| **BARRIER PHASED IMPLEMENTATION** | | | | | | | | | | | | | | | |
| EMS02 | 46.44 | 4.23 | 4.35 | 12.52 | 25.33 | 20.3 | 6.4 | 4 | 1.8 | 7.3 | 17.1 | 34.2 | 1.8 | 3.6 | 2.6 |
| EMS05 | 48.05 | 16.35 | 3.44 | 1.67 | 26.59 | 0.8 | 2 | 1.3 | 5.2 | 26.2 | 9.4 | 46.8 | 1.3 | 3.5 | 1.1 |
| EMS06 | 41.74 | 21.19 | 11.45 | 3.08 | 6.02 | 6.6 | 1.7 | 1.7 | 34.3 | 8.6 | 10.3 | 10.3 | 8.8 | 8.8 | 4.4 |
| EMS07 | 67.41 | 29.93 | 9.7 | 5.55 | 22.23 | 3.1 | 1.3 | 5 | 6.7 | 33.5 | 6.4 | 25.7 | 3.5 | 12.9 | 1.3 |
| EMS08 | 57.37 | 19.05 | 23.63 | 3.83 | 10.86 | 0.8 | 4 | 1.8 | 5.1 | 25.6 | 3.9 | 15.8 | 4.4 | 21 | 10.8 |
| EMS11 | 50.67 | 20.69 | 8.34 | 1.05 | 20.59 | 5.2 | 0.6 | 0.6 | 4.4 | 39.9 | 6.1 | 30.4 | 0.9 | 2 | 0.7 |
| EMS12 | 64.83 | 31.33 | 7.6 | 2.7 | 23.2 | 0.9 | 0.4 | 2.8 | 8.1 | 40.5 | 29.6 | 5.9 | 2.6 | 7.6 | 0.6 |
| EMS13 | 76.47 | 22.1 | 34.76 | 8.31 | 11.3 | 5.4 | 3.4 | 2.1 | 24.8 | 3.1 | 13.7 | 1.7 | 4.7 | 20.9 | 8.2 |
| EMS15 | 55.9 | 25.59 | 6.57 | 5.05 | 18.69 | 1.2 | 6.1 | 2.7 | 33.4 | 11.1 | 17 | 17 | 3.8 | 4.1 | 2.3 |
| EMS17 | 53.38 | 31.31 | 11.27 | 7.98 | 2.82 | 2.9 | 11 | 0.9 | 9.9 | 49.3 | 0.9 | 4.4 | 6.5 | 3.3 | 9.9 |
| EMS18 | 44.5 | 1.34 | 25.5 | 5.42 | 12.23 | 4.5 | 5.9 | 1.1 | 0.6 | 5.7 | 4.4 | 21.9 | 8.4 | 4.8 | 21.7 |
| **MEAN** | **55.16** | **20.28** | **13.33** | **5.20** | **16.35** | **4.70** | **3.89** | **2.18** | **12.21** | **22.80** | **10.80** | **19.46** | **4.25** | **8.41** | **5.78** |

## AHP ANALYSIS: CRITERION VERSUS OPTION

| CITY | BENEFITS | | BARRIERS | |
|---|---|---|---|---|
| | Criterion | Implementation Option | Criterion | Implementation Option |
| EMS01 | Environmental 82% | Full 81% | Internal Commitment 58% | Full 81% |
| EMS02 | Environmental 55% | Phased 49% | Internal Resources 51% | Phased 46% |
| EMS03 | Economic 61% | Phased 54% | Internal Commitment 48% | Full 61% |
| EMS04 | Economic 55% | Full 49% | Internal Commitment 39% | Full 49% |
| EMS05 | Economic 53% | Phased38% | Internal Resources 56% | Phased 48% |
| EMS06 | Environmental 56% | Phased 47% | Internal Commitment 43% | Phased 42% |
| EMS07 | Organizational 63% | Phased 55% | Internal Commitment 40% | Phased 67% |
| EMS08 | Economic 64% | Phased 61% | Program Design and Implementation 43% | Phased 57% |
| EMS09 | Organizational 67% | None 44% | Internal Resources 63% | Full 51% |
| EMS10 | Environmental/Economic 40% | Phased 56% | Internal Commitment 43% | Full 61% |
| EMS11 | Environmental 67% | Full 75% | Internal Resources 37% | Phased 51% |
| EMS12 | Organizational/Economic 46% | Phased 63% | Internal Commitment 49% | Phased 65% |
| EMS13 | Economic 71% | Phased 80% | Program Design and Implementation 46% | Phased 76% |
| EMS14 | Economic 49% | Full 51% | Internal Commitment 59% | Full 49% |
| EMS15 | Environmental 75% | Phased 68% | Internal Commitment 45% | Phased 56% |
| EMS16 | Organizational 61% | Phased 62% | Program Design and Implementation 43% | Full 59% |
| EMS17 | Environmental 69% | Phased 46% | Internal Commitment 59% | Phased 53% |
| EMS18 | Environmental 64% | Full 43%*/Phased 43%* | Program Design and Implementation 45% | Phased 45% |
| EMS19 | Economic 44% | Full 57% | Internal Commitment 43% | Full 63% |
| EMS20 | Environmental 72% | Full 70% | Internal Resources 58% | Full 69% |
| EMS21 | Economic 64% | Full 71% | Internal Commitment 46% | Full 72% |

**Benefits totals**: Environmental: 4 full*, 6 phased*; Economic: 4 full, 5 phased; Organizational: 0 full, 2 phased, 1 no; **Grand: 8 full*, 13 phased*, 1 no**

**Barrier totals**: Internal Commit: 7 full, 5 phased Internal Res: 2 full, 3 phased Program Design: 1 full, 3 phased **Grand: 10 full, 11 phased**

**Grand/Grand**: 18 full*, 24 phased*, 1 no *One city split between phased and full on benefits.

Phased and full are almost evenly split to overcome barriers; phased is preferred to take advantage of benefits.

No discernible relationship between criteria and options between benefits of barriers.

Hierarchy weights: full slightly more preferred than phased with both benefits and barriers.

## BENEFIT DATA COMPELLATION FOR IMPORTANCE, EASE, FAVORABLITY, AND AHP

| BENEFIT | REDCOST | EEFFIC | COMPLIA | REGULAT | COMMS+ | BOND | INSUR | OPERAT | LABMAN | SUCCESS | RISK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| IMP % | 84 | 62 | 78 | 63 | 73 | 48 | 60 | 73 | 57 | 62 | 73 |
| MEAN | 2.52 | 1.86 | 2.33 | 1.90 | 2.19 | 1.43 | 1.81 | 2.19 | 1.71 | 1.86 | 2.19 |
| MEDIAN | 3 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 2 |
| | | | | | | | | | | | |
| EASE% | 59 | 59 | 76 | 75 | 62 | 62 | 65 | 70 | 67 | 65 | 75 |
| MEAN | 1.76 | 1.76 | 2.29 | 2.24 | 1.86 | 1.86 | 1.95 | 2.10 | 2.00 | 1.95 | 2.24 |
| MEDIAN | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| | | | | | | | | | | | |
| FAVORABILITY% | 73 | 59 | 75 | 71 | 67 | 55 | 63 | 71 | 63 | 63 | 72 |
| MEAN | 4.38 | 3.52 | 4.52 | 4.24 | 4.05 | 3.29 | 3.76 | 4.29 | 3.81 | 3.81 | 4.33 |
| MEDIAN | 4 | 4 | 5 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 |
| WEIGHTED FAVORABILITY | 16 | -18 | 19 | 5 | 1 | -21 | -3 | 8 | -8 | -4 | 11 |
| | | | | | | | | | | | |
| MOST IMPORTANT | 6 | | 5 | | 1 | | | 5 | 1 | 1 | 1 |
| * ON SHEETS FROM INTERVIEWS | | | | | | | | | | | |
| | | | | | | | | | | | |
| AHP MEANS | 20.14 | 8.3 | 11.15 | 6.38 | 7 | 6.92 | 6.81 | 8.17 | 6 | 6 | 10.92 |
| NO MEANS | 3.32 | 1.37 | 1.84 | 1.05 | 1 | 1.14 | 1.12 | 1.35 | 1 | 1 | 1.8 |

## BARRIER DATA COMPELLATION FOR IMPORTANCE, EASE, FAVORABLITY, AND AHP

| BARRIER | TOPMAN | RESOUR | BUY-IN | PUBLIC | POLITIC | IMPTEAM | TRAINING | PRODESG | INCREMT | COMMS- | OUTSIDE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| IMP% | 41 | 54 | 71 | 89 | 54 | 63 | 67 | 70 | 84 | 65 | 75 |
| MEAN | 1.24 | 1.62 | 2.14 | 2.67 | 1.62 | 1.90 | 2.00 | 2.10 | 2.52 | 1.95 | 2.24 |
| MEDIAN | 1 | 1 | 2 | 3 | 1 | 2 | 2 | 2 | 3 | 2 | 2 |
| | | | | | | | | | | | |
| EASE% | 65 | 44 | 71 | 78 | 65 | 63 | 78 | 70 | 62 | 65 | 71 |
| MEAN | 1.95 | 1.33 | 2.14 | 2.33 | 1.95 | 1.90 | 2.33 | 2.10 | 1.86 | 1.95 | 2.14 |
| MEDIAN | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| | | | | | | | | | | | |
| FAVORABILITY% | 53 | 49 | 71 | 83 | 60 | 63 | 72 | 70 | 73 | 65 | 73 |
| MEAN | 3.19 | 2.95 | 4.29 | 5.00 | 3.57 | 3.81 | 4.33 | 4.19 | 4.38 | 3.90 | 4.38 |
| MEDIAN | 3 | 2 | 4 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| WEIGHTED FAVORABILITY | -29 | -44 | 14 | 35 | -15 | -8 | 9 | 4 | 12 | 0 | 12 |
| MOST IMPORTANT | 8 | 4 | | | 3 | | | | | 1 | |
| *ON SHEETS FORM INTERVIEWS | | | | | | | | | | | |
| | | | | | | | | | | | |
| AHP MEANS | 28.19 | 19.6 | 9.7 | 3.4 | 4.99 | 10.34 | 4.07 | 5.27 | 5.34 | 5.05 | 4.03 |
| NO MEAN | 1.26 | 1.34 | 0.44 | 0.65 | 0.52 | 3.65 | 2.54 | 0.65 | 0.53 | 0.69 | 0.68 |

## EMS STRATEGY QUESTION ANSWERS

| CITY | CORE | PAY BACK | RESOURCE | FAC OR PEO | INVOLVE | PEER | PILOT | PROACTIVE | ODEQ | TIME |
|---|---|---|---|---|---|---|---|---|---|---|
| EMS01 | Y | 5Y | 1/4 | FAC | Lot | Y | Y | Money | Funding | 1.5Y |
| EMS02 | Y | 2-5Y | All | People | Some | Y | Maybe | Cost (Budget) | Funding | 1-2Y |
| EMS03 | Y | 5-7Y | 3/4 | People | Some | Y | No | Cost (Budget) | Leverage on Decree | 1Y |
| EMS04 | Y | 5Y | All | People | Lot | Y | Yes | Cost- Old Habits | Funding | 1.5 Y |
| EMS05 | Y | 1-3Y | All | FAC | Some | Y | Yes | Cost & People | Non regulator help | 1Y |
| EMS06 | Y | 5Y | All | FAC | Lot | Y | Yes | Citizens | Fast Track | 1.5-2Y |
| EMS07 | Y | 2-3Y | All | FAC | Lot | Y | Yes | Old Habits | Exemptions | 2Y |
| EMS08 | Y | 1Y | 1/4 | FAC | VL | Y | Maybe | Cost (Budget) | Incentives-Rewards | 1Y |
| EMS09 | Y | 7-8y | 1/2 | People | Some | Y | Maybe | Cost | Funding/Training | 1Y |
| EMS10 | Y | 5Y | 1/4 | FAC | VL | Y | No | Just Getting- Plan | Report | 1Y |
| EMS11 | Y | 2y | All | FAC | Lot | Y | Maybe | Working | Fast Track | 2Y |
| EMS12 | Y | 10Y | All | FAC | Some | N | Maybe | Education (benefits) | Require in Lieu fines | 2Y |
| EMS13 | Y | 5-10Y | 1/2 | People | Some | Y | Maybe | City Manager | Funding/Help | 2Y |
| EMS14 | Y | 2-3Y | 1/4 | People | Some | Y | Maybe | Cost | Incentives/Certificate | 1Y |
| EMS15 | Y | 3Y | 3/4 | FAC | Lot | Y | Maybe | PW Director | Funding | 1.5Y |
| EMS16 | Y | 2-3Y | 1/2 | FAC | Some | Y | Maybe | Cost (no money) | Funding/Help | 1.5Y |
| EMS17 | Y | 2-5Y | All | FAC | VL | Y | Yes | Cost (Budget) | Grants, Matching | 2Y |
| EMS18 | Y | 2Y | 1/2 | FAC | Some | M | Maybe | Just Getting Staff | Funding | 2Y |
| EMS19 | V Close | 2-5Y | 1/2 | FAC | Some | Y | Yes* | City Staff (Mayor) | Fewer inspections | 1Y |
| EMS20 | Y | 2Y | 1/2 | FAC | VL | Y | Yes | Education (training) | Help | 1Y |
| EMS21 | Y | 7Y | 1/2 | People | Some | Y | Yes | Leadership | Grants, Matching | 2Y |

Highlighted blocks are cities that believe they are already environmentally proactive.

# APPENDIX I—INTERVIEW DOCUMENTATION

## EMS STUDY INFORMATION

Environmental management is an approach to environmental stewardship that integrates ecology, policymaking, planning, and social development. Its goals include:

1. preventing and resolving environmental problems;
2. establishing limits on pollution and resource consumption;
3. establishing and nurturing institutions that effectively support environmental research, monitoring, education, and policies;
4. early warning of hazards and identifying opportunities for hazard prevention and mitigation;
5. sustaining and, if possible improving, existing resource supplies;
6. improving "quality of life"; and
7. identifying new technologies that improve sustainability.

The **ISO 14000** environmental management standards exist to help organizations (a) minimize how their operations (processes, etc.) negatively affect the environment (i.e., cause adverse changes to air, water, or land); (b) comply with applicable laws, regulations, and other environmentally oriented requirements; and (c) continually improve the above.

ISO 14000 is similar to **ISO 9000** quality management standards in that both pertain to the process of how a product is produced, rather than to the product itself. As with ISO 9000, ISO 14000 certification is performed by third-party organizations rather than being awarded by ISO directly.

An EMS that meets the requirements of ISO 14001 is a management tool enabling an organization of any size or type to:

- identify and control the **environmental impact** of its activities, products or services,
- **improve** its environmental performance continually, and
- implement a **systematic approach** to setting and achieving environmental objectives and targets.

The intention of ISO 14001 is to provide a **framework for a holistic, strategic approach** to the organization's environmental policy, plans and actions. As such, ISO 14001 provides **generic requirements** for an environmental management system; it does not prescribe specific levels of environmental performance. This has the effect of establishing a **common reference** for communicating environmental management issues between organizations and their customers, regulators, and other stakeholders.

Because ISO 14001 does not prescribe specific levels of environmental performance, it can be flexibly adapted by a **wide variety of organizations** regardless of their current level of environmental maturity. However, a **commitment to compliance** with applicable environmental legislation is required, along with a commitment to **continual improvement** is required.

ISO 14001 is a guideline for full implementation of an EMS. ISO 14005 is a new guideline that allows phased, step-wise implementation. ISO 14005 can start as a project-driven system that develops over time into a full EMS implementation. Both ISO 14001 and 14005 allow EMS implementation over parts of a city or over the entire city.

## ADVANTAGES AND DISADVANTAGES OF ISO IMPLEMENTATION OPTIONS

| ATTRIBUTES | FULL (ISO 14001) | PHASED (ISO 14005) | NO IMPLEMENTATION |
|---|---|---|---|
| **Advantages** | | | |
| Time to full implementation | 1-2 years | Several years | Never |
| Time to obtain results | Slower | Quicker | Never |
| Certification | Yes | No | No |
| Environmental and operational efficiencies | More | Less | None |
| Reduction in costs/increased saving | More | Less | None |
| Improved environmental performance | More | Less | None |
| Improved bond rating | Likely | Unlikely | None |
| Reduced insurance cost | Likely | Unlikely | None |
| City seen as environmental leader | Yes | Possible | No |
| Enhance city image | Yes | Possible | No |
| Improved internal and external communications | Yes | Partial | None |
| Improved management/labor relationships | Yes | Partial | None |
| Improved relationship with regulators | Yes | Possible | No |
| Employee empowerment | Yes | Possible | None |
| Risk reduction | More | Less | None |
| More effective worker succession | Yes | Possible | None |
| **Disadvantages** | | | |
| Increased cost | $$$ | $-$$ | None |
| Additional time requirement | More | Less | None |
| Additional personnel requirements (management, team, individual) | More | Fewer | None |
| Training requirement | High | Low | None |
| Complexity of implementation | High | Low | No |
| Political support requirement | More | Less | None |
| Management support requirement | More | Less | None |
| Employee support requirement | More | Less | None |
| Citizen support requirement | More | Less | None |
| External assistance (consultant, non-profit) | Likely | Unlikely | None |

## DEMOGRAPHIC INFORMATION

The following questions concern facts about yourself and your city.

1. Current Position

| | | |
|---|---|---|
| [ ] Mayor | [ ] Town/City manager | [ ] Council member |
| [ ] Public works | [ ] Water treatment | [ ] Waste treatment |
| [ ] Environmental | [ ] Parks and Recreation | [ ] Other_____ |

2. Former Position(s) (check all that apply)

| | | |
|---|---|---|
| [ ] Mayor | [ ] Town/City manager | [ ] Council member |
| [ ] Public works | [ ] Water treatment | [ ] Waste treatment |
| [ ] Environmental | [ ] Parks and Recreation | [ ] Other _____ |

3. How long have you worked in your present position? _____

4. How long have you worked in your present occupation? _____

5. Higher Education Background

| | |
|---|---|
| [ ] Associate Degree | Major: _____ |
| [ ] Bachelors | Major: _____ |
| [ ] Masters | Major: _____ |
| [ ] Doctorate | Major: _____ |
| [ ] Certificate | Area: _____ |

6. Factors of professional success in your city (Please rate each consideration below as High, Medium, or Low importance)

| | | |
|---|---|---|
| ___ Political support | ___ Environmental considerations | ___ Economic development |
| ___ Citizen support | ___ budgetary considerations | ___ Social justice |
| ___ Legal liabilities | ___ Intergovernmental relations | ___ other _____ |

7. City or Town Size

| | | |
|---|---|---|
| [ ] 20,000 – 40,000 | [ ] 40,001 – 60,000 | [ ] 60,001 – 80,000 |
| [ ] 80,001 – 100,000 | [ ] >100,000 | |

## RATINGS OF RELATIVE IMPORTANCE AND EASE OF IMPLEMENTATION OF BENEFITS TO EMS IMPLEMENTATION

| BENEFITS | RELATIVE IMPORTANCE | | | RELATIVE EASE OF IMPLEMENTATION | | | SORT PILES | | | | | EXPLANATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | High | Med | Low | Easy | Med | Hard | 1 | 2 | 3 | 4 | 5 | |
| Reduced costs (cost savings) | H | M | L | E | M | H | | | | | | |
| Environmental efficiencies | H | M | L | E | M | H | | | | | | |
| Improved environmental performance (compliance) | H | M | L | E | M | H | | | | | | |
| Better relationships with regulators | H | M | L | E | M | H | | | | | | |
| Better communications (inside and outside) | H | M | L | E | M | H | | | | | | |
| Improved bond rating | H | M | L | E | M | H | | | | | | |
| Reduced insurance premiums | H | M | L | E | M | H | | | | | | |
| Operational efficiencies and consistency | H | M | L | E | M | H | | | | | | |
| Improved labor relationship with management | H | M | L | E | M | H | | | | | | |
| Employee succession (easier) | H | M | L | E | M | H | | | | | | |
| Risk reduction | H | M | L | E | M | H | | | | | | |

## EMS BENEFIT EXPLANATION

| BENEFITS | EXPLANATION |
|---|---|
| Reduced costs (cost savings) | Resource reduction (electric, water, fuel), change in processes and equipment. Standardization across facilities. |
| Environmental efficiencies | Improved environmental awareness, involvement and competency throughout the organization |
| Improved environmental performance (compliance) | Compliance with all local, state, and federal regulations – common system. |
| Better relationships with regulators | EMS demonstrates advanced environmental commitment to DEQ and EPA. |
| Better communications (inside and outside) | EMS requires a great deal of written, verbal, and electronic communications leading to improvements both inside an organization and outside with citizens. |
| Improved bond rating | EMS is about risk reduction and improved operating standards. |
| Reduced insurance premiums | EMS is about risk reduction and improved operating standards. |
| Operational efficiencies and consistency | Record keeping, work procedures, document control, communications, better management practices. |
| Improved labor relationship with management | Workers have large stake in EMS. EMS will require closer interactions with management. |
| Employee succession (easier) | Work procedures, enhanced training |
| Risk reduction | Environmental and safety |

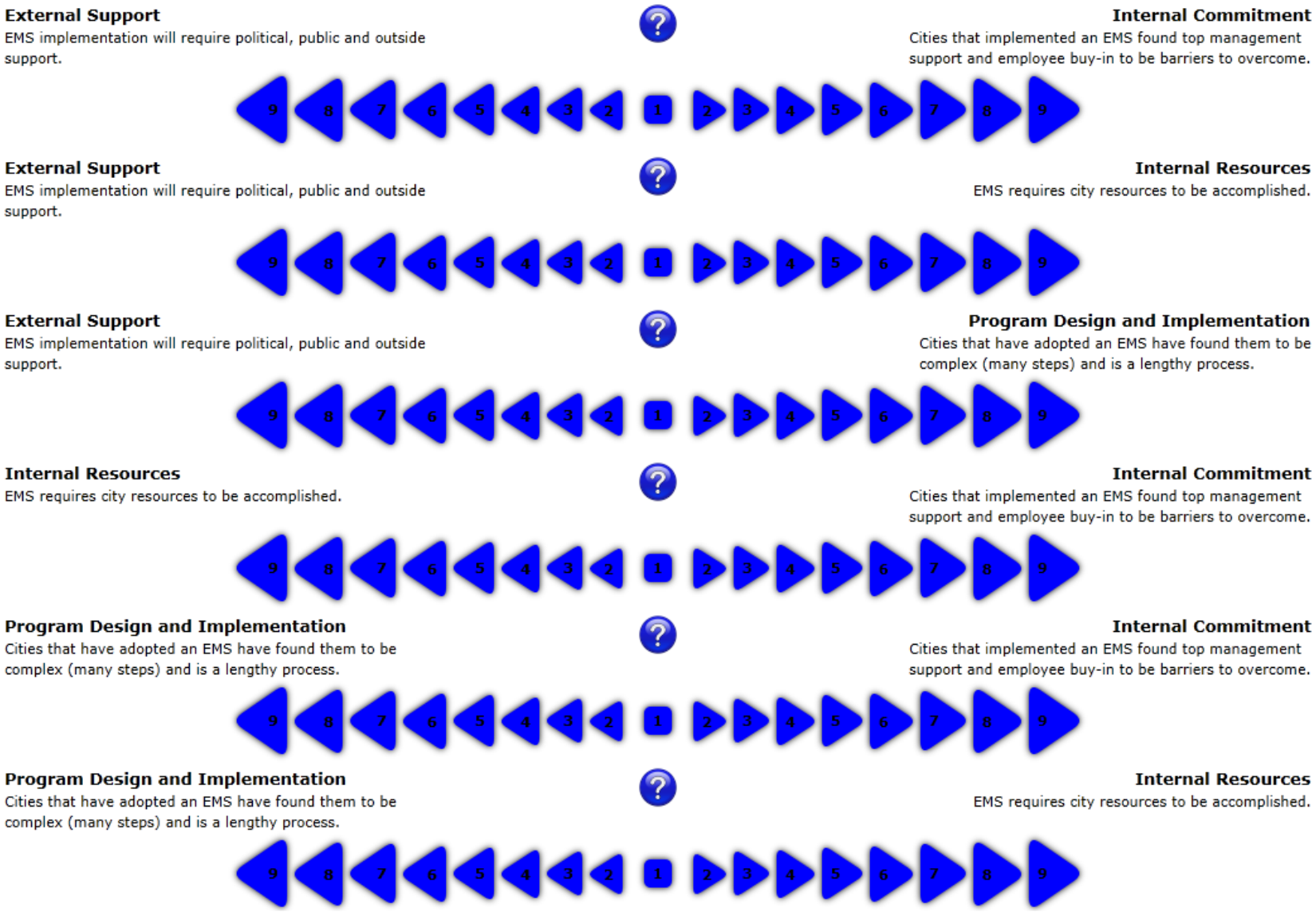
## RATINGS OF RELATIVE IMPORTANCE AND EASE OF IMPLEMENTATION OF BARRIERS TO EMS IMPLEMENTATION

| BARRIERS | RELATIVE IMPORTANCE | | | RELATIVE EASE OF IMPLEMENTATION | | | SORT PILES | | | | | EXPLANATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | High | Med | Low | Easy | Med | Hard | 1 | 2 | 3 | 4 | 5 | |
| Top management involvement | H | M | L | E | M | H | | | | | | |
| Dedicated resources | H | M | L | E | M | H | | | | | | |
| Employee buy-in | H | M | L | E | M | H | | | | | | |
| Public awareness | H | M | L | E | M | H | | | | | | |
| Political support | H | M | L | E | M | H | | | | | | |
| Dedicated implementation team | H | M | L | E | M | H | | | | | | |
| Employee training | H | M | L | E | M | H | | | | | | |
| Program design (KISS) | H | M | L | E | M | H | | | | | | |
| Incremental implementation | H | M | L | E | M | H | | | | | | |
| Communications | H | M | L | E | M | H | | | | | | |
| Outside guidance and support | H | M | L | E | M | H | | | | | | |

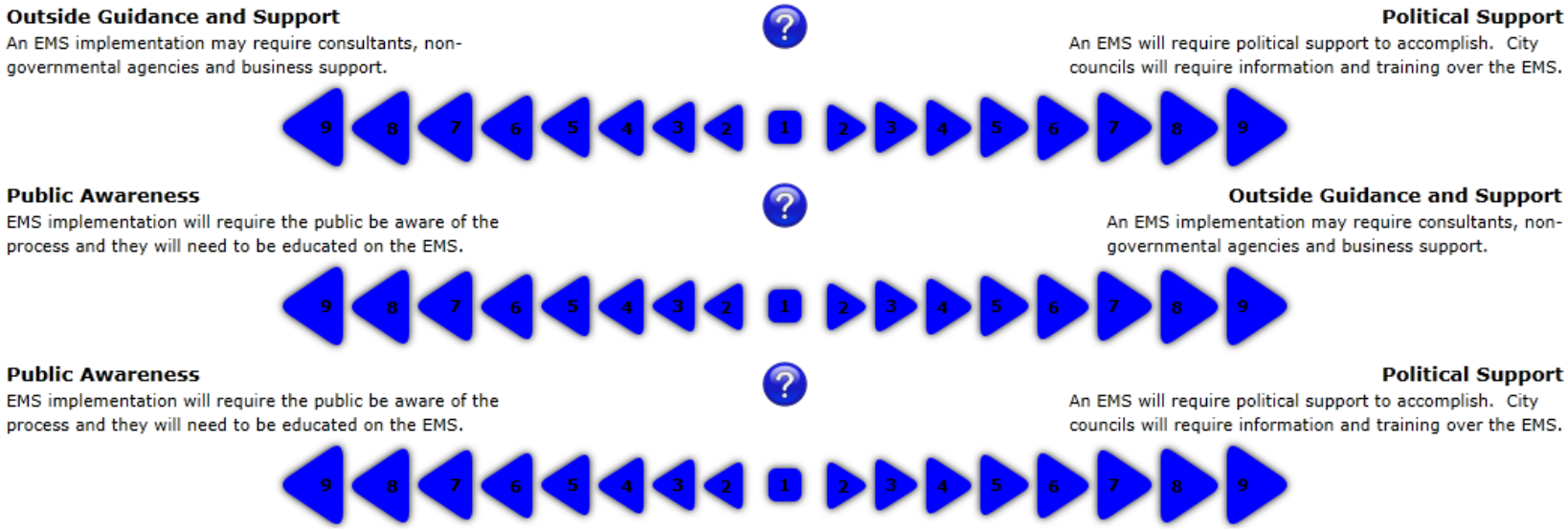
EMS BENEFIT EXPLANATION

| BARRIERS | EXPLANATION |
|---|---|
| Top management involvement | EMS requires that top management be involved in its implementation. They need training and must support the EMS both with people and resources as needed. |
| Dedicated resources | EMS will require money and time to accomplish. Personnel and other resources must be assigned to accomplish. |
| Employee buy-in | Employees are the backbone of the EMS. They have direct interaction with the environment. |
| Public awareness | Citizen's awareness and support can enhance implementation. |
| Political support | City councils, public groups, etc. |
| Dedicated implementation team | Implementation will require personnel assigned to teams and committees (and a leader). |
| Employee training | All employees require EMS training. Those that have direct environmental interaction will require more. |
| Program design (KISS) | EMS has many steps. Can be cumbersome and take time. |
| Incremental implementation | EMS may require incremental implementation – making the process lengthy. |
| Communications | Implementation requires extensive written, verbal, and electronic communications. May require a change in how communications are done both inside and outside. |
| Outside guidance and support | May require consultants, non-governmental agencies, and others. |

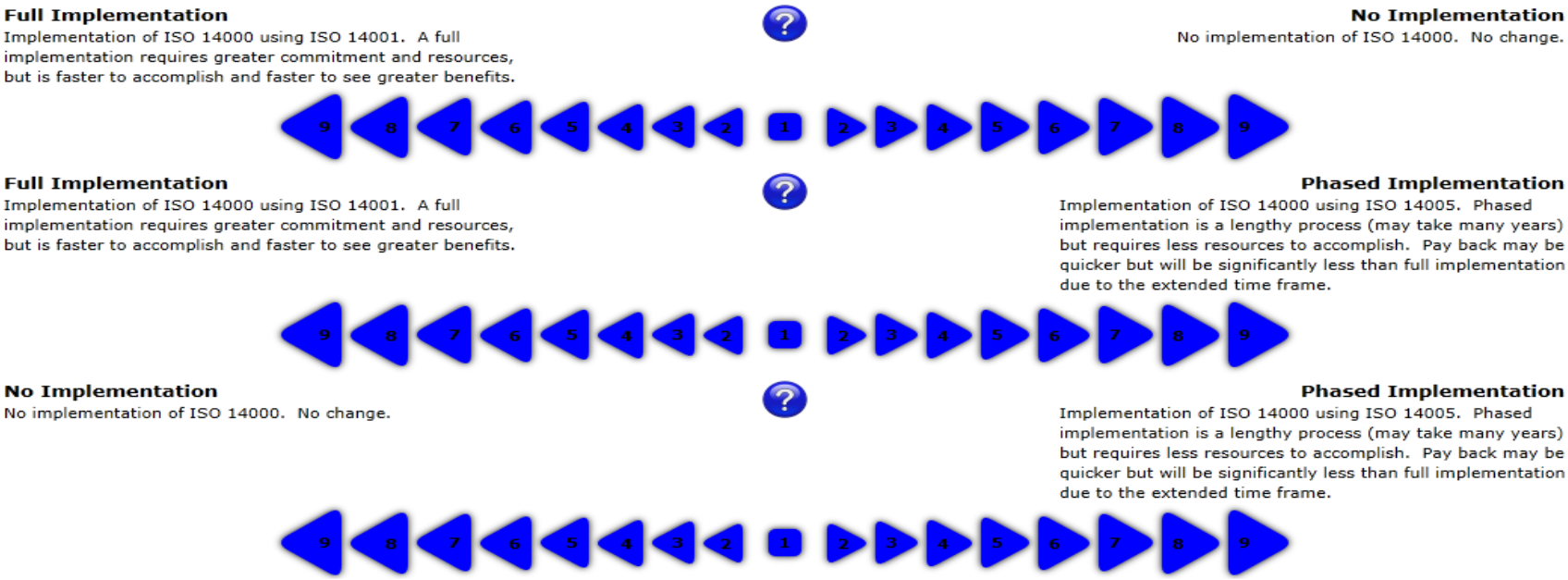
# BARRIER AHP CRITERIA SELECTION (MakeitRational© Software)



# BARRIER AHP EXTERNAL SUPPORT SUBCRITERIA (MakeitRational© Software)



# BARRIER AHP ALTERNATIVE SELECTION OUTSIDE GUIDEANCE AND SUPPORT
## (MakeitRational© Software)



# BARRIER AHP ALTERNATIVE SELECTION POLITICAL SUPPORT

## (MakeitRational© Software)

**Full Implementation**
Implementation of ISO 14000 using ISO 14001. A full implementation requires greater commitment and resources, but is faster to accomplish and faster to see greater benefits.

**No Implementation**
No implementation of ISO 14000. No change.


**Full Implementation**
Implementation of ISO 14000 using ISO 14001. A full implementation requires greater commitment and resources, but is faster to accomplish and faster to see greater benefits.

**Phased Implementation**
Implementation of ISO 14000 using ISO 14005. Phased implementation is a lengthy process (may take many years) but requires less resources to accomplish. Pay back may be quicker but will be significantly less than full implementation due to the extended time frame.


**No Implementation**
No implementation of ISO 14000. No change.

**Phased Implementation**
Implementation of ISO 14000 using ISO 14005. Phased implementation is a lengthy process (may take many years) but requires less resources to accomplish. Pay back may be quicker but will be significantly less than full implementation due to the extended time frame.

# BARRIER AHP ALTERNATIVE SELECTION PUBLIC AWARENESS

## (MakeitRational© Software)

**Full Implementation**
Implementation of ISO 14000 using ISO 14001. A full implementation requires greater commitment and resources, but is faster to accomplish and faster to see greater benefits.

**No Implementation**
No implementation of ISO 14000. No change.


**Full Implementation**
Implementation of ISO 14000 using ISO 14001. A full implementation requires greater commitment and resources, but is faster to accomplish and faster to see greater benefits.

**Phased Implementation**
Implementation of ISO 14000 using ISO 14005. Phased implementation is a lengthy process (may take many years) but requires less resources to accomplish. Pay back may be quicker but will be significantly less than full implementation due to the extended time frame.


**No Implementation**
No implementation of ISO 14000. No change.

**Phased Implementation**
Implementation of ISO 14000 using ISO 14005. Phased implementation is a lengthy process (may take many years) but requires less resources to accomplish. Pay back may be quicker but will be significantly less than full implementation due to the extended time frame.

## BARRIER AHP INTERNAL COMMITMENT SUBCRITERIA (MakeitRational© Software)

**Top Management Support**
EMS requires that top management be involved in its implementation and operation They need training and must support the EMS both with people and resources.

**Employee Buy-in**
Employees are the backbone of the EMS. They have direct interactions with the environment.


## BARRIER AHP ALTERNATIVE SELECTION EMPLOYEE BUY-IN (MakeitRational© Software)

**Full Implementation**
Implementation of ISO 14000 using ISO 14001. A full implementation requires greater commitment and resources, but is faster to accomplish and faster to see greater benefits.

**No Implementation**
No implementation of ISO 14000. No change.


**Full Implementation**
Implementation of ISO 14000 using ISO 14001. A full implementation requires greater commitment and resources, but is faster to accomplish and faster to see greater benefits.

**Phased Implementation**
Implementation of ISO 14000 using ISO 14005. Phased implementation is a lengthy process (may take many years) but requires less resources to accomplish. Pay back may be quicker but will be significantly less than full implementation due to the extended time frame.


**No Implementation**
No implementation of ISO 14000. No change.

**Phased Implementation**
Implementation of ISO 14000 using ISO 14005. Phased implementation is a lengthy process (may take many years) but requires less resources to accomplish. Pay back may be quicker but will be significantly less than full implementation due to the extended time frame.

# BARRIER AHP ALTERNATIVE SELECTION TOP MANAGEMENT INVOLVEMENT

## (MakeitRational© Software)

**Full Implementation**
Implementation of ISO 14000 using ISO 14001. A full implementation requires greater commitment and resources, but is faster to accomplish and faster to see greater benefits.

**No Implementation**
No implementation of ISO 14000. No change.


**Full Implementation**
Implementation of ISO 14000 using ISO 14001. A full implementation requires greater commitment and resources, but is faster to accomplish and faster to see greater benefits.

**Phased Implementation**
Implementation of ISO 14000 using ISO 14005. Phased implementation is a lengthy process (may take many years) but requires less resources to accomplish. Pay back may be quicker but will be significantly less than full implementation due to the extended time frame.


**No Implementation**
No implementation of ISO 14000. No change.

**Phased Implementation**
Implementation of ISO 14000 using ISO 14005. Phased implementation is a lengthy process (may take many years) but requires less resources to accomplish. Pay back may be quicker but will be significantly less than full implementation due to the extended time frame.

## BARRIER AHP INTERNAL RESOURCES SUBCRITERIA (MakeitRational© Software)

**Dedicated Implementation Team**
An EMS will require a dedicated team (and a dedicated leader) be assigned and that they be given time to accomplish the EMS implementation.

**Dedicated Resources**
EMS will require time and money to accomplish. Personnel and other resources must be assigned for EMS implementation.


## BARRIER AHP ALTERNATIVE SELECTION DEDICATED IMPLEMENTATION TEAM (MakeitRational© Software)

**Full Implementation**
Implementation of ISO 14000 using ISO 14001. A full implementation requires greater commitment and resources, but is faster to accomplish and faster to see greater benefits.

**No Implementation**
No implementation of ISO 14000. No change.


**Full Implementation**
Implementation of ISO 14000 using ISO 14001. A full implementation requires greater commitment and resources, but is faster to accomplish and faster to see greater benefits.

**Phased Implementation**
Implementation of ISO 14000 using ISO 14005. Phased implementation is a lengthy process (may take many years) but requires less resources to accomplish. Pay back may be quicker but will be significantly less than full implementation due to the extended time frame.


**No Implementation**
No implementation of ISO 14000. No change.

**Phased Implementation**
Implementation of ISO 14000 using ISO 14005. Phased implementation is a lengthy process (may take many years) but requires less resources to accomplish. Pay back may be quicker but will be significantly less than full implementation due to the extended time frame.

# BARRIER AHP ALTERNATIVE SELECTION DEDICATED RESOURCES

## (MakeitRational© Software)

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# BARRIER AHP PROGRAM DESIGN AND IMPLEMENTATION SUBCRITERIA (MakeitRational© Software)

**Employee Training**
All employees will require additional training for EMS implementation. Those employees that have direct interactions with the environment will require more training.

**Incremental Implementation**
An EMS is complex and needs to be accomplished in steps and this leads to a lengthy process.


**Employee Training**
All employees will require additional training for EMS implementation. Those employees that have direct interactions with the environment will require more training.

**Internal Communications**
EMS implementation requires extensive written, verbal and electronic communications. This may require large changes in how the city communicates.


**Incremental Implementation**
An EMS is complex and needs to be accomplished in steps and this leads to a lengthy process.

**Internal Communications**
EMS implementation requires extensive written, verbal and electronic communications. This may require large changes in how the city communicates.


**Program Design**
An EMS is a complex and requires many steps. It can be cumbersome and take time.

**Employee Training**
All employees will require additional training for EMS implementation. Those employees that have direct interactions with the environment will require more training.


**Program Design**
An EMS is a complex and requires many steps. It can be cumbersome and take time.

**Incremental Implementation**
An EMS is complex and needs to be accomplished in steps and this leads to a lengthy process.


**Program Design**
An EMS is a complex and requires many steps. It can be cumbersome and take time.

**Internal Communications**
EMS implementation requires extensive written, verbal and electronic communications. This may require large changes in how the city communicates.

# BARRIER AHP ALTERNATIVE SELECTION EMPLOYEE TRAINING

## (MakeitRational© Software)

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# BARRIER AHP ALTERNATIVE SELECTION INCREMENTAL IMPLEMENTATION

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# BARRIER AHP ALTERNATIVE SELECTION COMMUNICATIONS

## (MakeitRational© Software)

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# BARRIER AHP ALTERNATIVE SELECTION PROGRAM DESIGN

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# BENEFIT AHP CRITERIA SELECTION PAGE

## (MakeitRational© Software)

**Environmental Benefits**
Cities that have adopted and EMS have seen the following environmental benefits - better relationships with regulators, environmental efficiencies, improved environmental performance, and risk reduction.

**Economic Benefits**
Cities that have adopted and EMS have seen reduced costs, improved bond ratings, and reduced insurance premiums.


**Environmental Benefits**
Cities that have adopted and EMS have seen the following environmental benefits - better relationships with regulators, environmental efficiencies, improved environmental performance, and risk reduction.

**Organizational Benefits**
Cities that have adopted an EMS have seen better communications (both inside and outside of the city government), easier employee succession, improved labor relationship with management, and operational efficiencies and consistency.


**Organizational Benefits**
Cities that have adopted an EMS have seen better communications (both inside and outside of the city government), easier employee succession, improved labor relationship with management, and operational efficiencies and consistency.

**Economic Benefits**
Cities that have adopted and EMS have seen reduced costs, improved bond ratings, and reduced insurance premiums.

# BENEFIT AHP ENVIRONMENTAL BENEFITS SUBCRITERIA (MakeitRational© Software)

**Better Relationship with Regulators**
Cities that have an adopted an EMS demonstrate an advance environmental commitment to EPA and ODEQ.

**Environmental Efficiencies**
Cities that have adopted an EMS see improved environmental awareness, involvement and competency throughout the facility and city.


**Better Relationship with Regulators**
Cities that have an adopted an EMS demonstrate an advance environmental commitment to EPA and ODEQ.

**Improved Environmental Performance (Compliance)**
Cities that adopt an EMS see improved compliance with all local, state and federal regulations.


**Better Relationship with Regulators**
Cities that have an adopted an EMS demonstrate an advance environmental commitment to EPA and ODEQ.

**Risk Reduction**
Cities that adopt and EMS see a reduction in environmental and safety risks.


**Environmental Efficiencies**
Cities that have adopted an EMS see improved environmental awareness, involvement and competency throughout the facility and city.

**Improved Environmental Performance (Compliance)**
Cities that adopt an EMS see improved compliance with all local, state and federal regulations.


**Environmental Efficiencies**
Cities that have adopted an EMS see improved environmental awareness, involvement and competency throughout the facility and city.

**Risk Reduction**
Cities that adopt and EMS see a reduction in environmental and safety risks.


**Improved Environmental Performance (Compliance)**
Cities that adopt an EMS see improved compliance with all local, state and federal regulations.

**Risk Reduction**
Cities that adopt and EMS see a reduction in environmental and safety risks.

# BENEFIT AHP ALTERNATIVE SELECTION BETTER RELATIONSHIPS WITH REGULATORS

## (MakeitRational© Software)

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# BENEFIT AHP ALTERNATIVE SELECTION ENVIRONMENTAL EFFICIENCIES

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# BENEFIT AHP ALTERNATIVE SELECTION IMPROVED ENVIRONMENTAL PERFORMANCE

## (MakeitRational© Software)

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# BENEFIT AHP ALTERNATIVE SELECTION RISK REDUCTION

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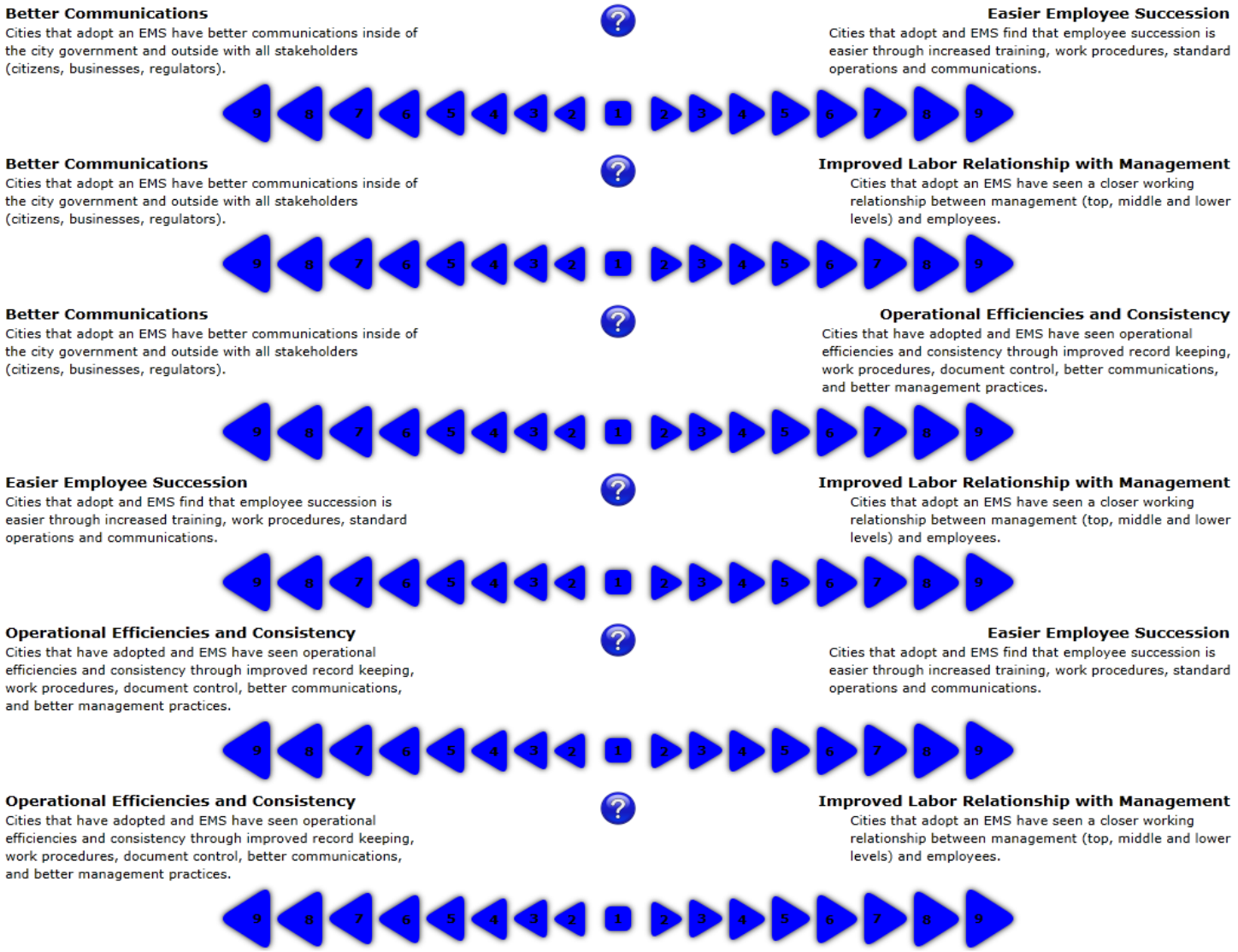
# BENEFIT AHP ORGANIZATIONAL BENEFITS SUBCRITERIA (MakeitRational© Software)



# BENEFIT AHP ALTERNATIVE SELECTION COMMUNICATIONS

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# BENEFIT AHP ALTERNATIVE SELECTION EMPLOYEE SUCCESSION

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## BENEFIT AHP ALTERNATIVE SELECTION IMPROVED LABOR RELATIONSHIP WITH MANAGEMENT (MakeitRational© Software)

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## BENEFIT AHP ALTERNATIVE SELECTION OPERATIONAL EFFICIENCIES AND CONSISTENCY

## (MakeitRational© Software)

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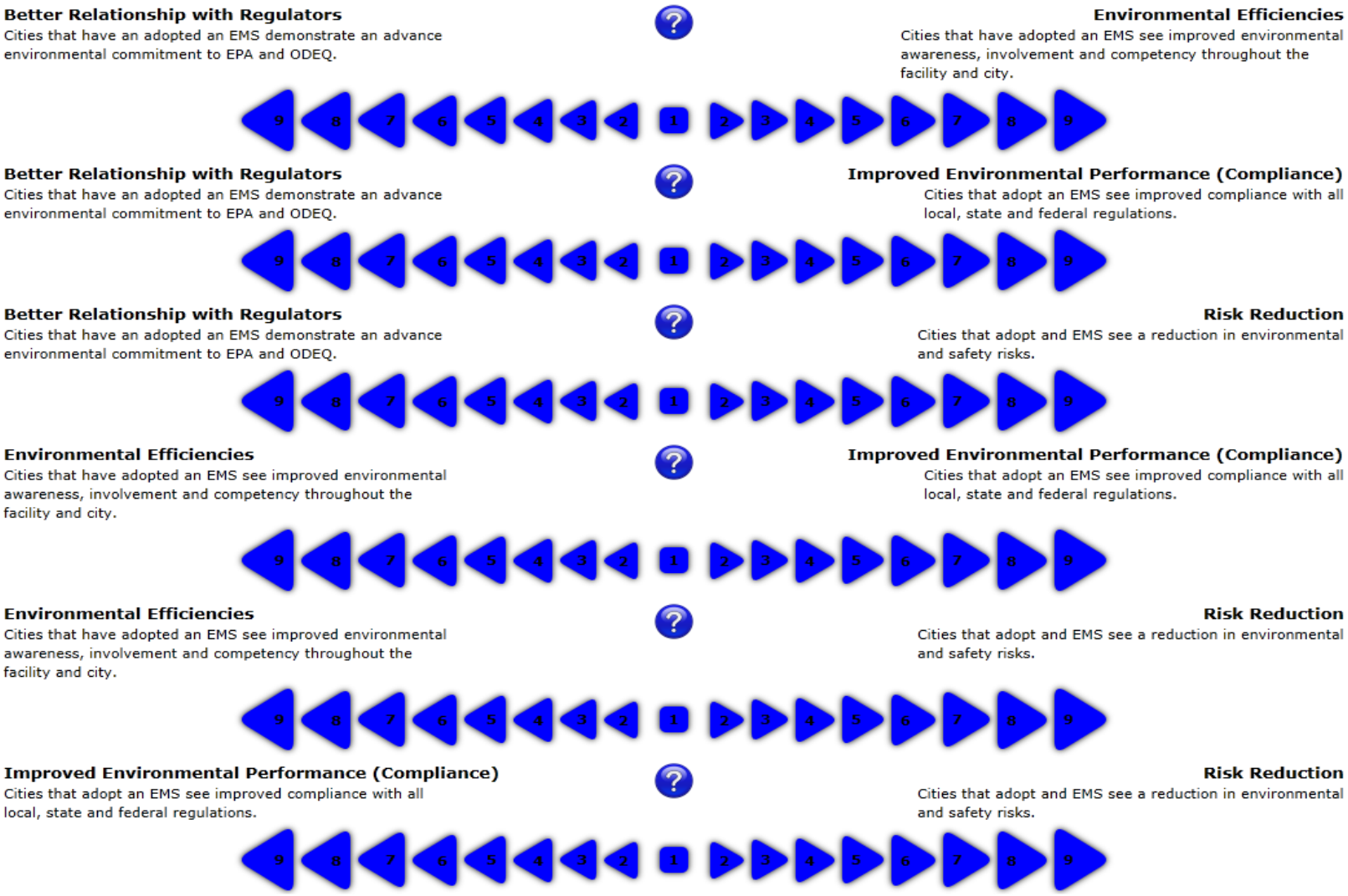
# BENEFIT AHP ECONOMIC BENEFITS SUBCRITERIA (MakeitRational© Software)



# BENEFIT AHP ALTERNATIVE SELECTION IMPROVED BOND RATING

## (MakeitRational© Software)

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# BENEFIT AHP ALTERNATIVE SELECTION REDUCED COSTS

## (MakeitRational© Software)

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# BENEFIT AHP ALTERNATIVE SELECTION REDUCED INSURANCE PREMIUMS

## (MakeitRational© Software)

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# Strategy Survey

## Core strategy for EMS implementation

Your city will be provided with the following:

- Dedicated funding for EMS implementation for a single entity (department, operation, or facility).
- Top managers will be provided with EMS training that will include drivers for implementation (benefit/cost, pay back, etc).
- EMS program director and other key individuals will receive in depth EMS training and certification (as needed).
- A basic program design for your individual city and entity will be provided. This program will stress improved environmental performance (compliance) and reducing costs

## Additional strategies for EMS implementation

Please read and rate the following additional strategies for EMS implementation.

Of these additional strategies pick 3 as high (those that your city would need), 3 as medium (those that would be nice to have) and 3 as low (those your city would not need).

*Strategy A - Team*

Your city will be provided with additional help in forming and operating the implementation team.

*Strategy B - Political*

Your city will be provided with training tailored for the city council (and other interested parties such as businesses or public as needed).

*Strategy C - Communications*

Your city will be provided with additional help for communications within the city. Training and personnel will be available as needed. Your program will be designed to enhance communications inside and outside of the city.

*Strategy D - Employee*

Your city will be provided with additional help in employee training and to gain employee buy-in.

*Strategy E – Operations*

Your program will be designed to stress operational efficiency and consistency for all operations (this includes operations outside of environmental).

*Strategy F – Risk*

Your program will be designed to specifically reduce risk for all operations and areas included in the EMS.

*Strategy G – Regulators*

Your program will be designed to develop better relationships with regulators. It will strive to make your city environmentally proactive.

*Strategy H – Environmental Efficiency*

Your program will be designed for environmental efficiency for all operations and areas included in the EMS.

*Strategy I – Labor*

Your program will be designed for better labor relationships with management and easier employee succession.

| Additional EMS Strategies | | | | |
|---|---|---|---|---|
| Strategy | Name | High | Medium | Low |
| A | Team | | | |
| B | Political | | | |
| C | Communications | | | |
| D | Employee | | | |
| E | Operations | | | |
| F | Risk | | | |
| G | Regulators | | | |
| H | Environmental Efficiency | | | |
| I | Labor | | | |

Only select 3 as High, 3 as Medium, and 3 as low

## Questions about Strategy Selections

The following questions may be asked to respondents depending on their selections and time available.

1. Does the core meet your city's needs?
2. What does your city consider as a good payback time?
3. What is the minimum amount of resources that the city would like to implement a program? ¼? ½? ¾? Or all?
4. Which do you feel is more important? A facilitator to make things happen or person power to do things?
5. How much outside involvement in city programs is your city comfortable with? Very little? Some? Or a lot?
6. Do you feel that a central clearing house for environmental information and EMS program help would be beneficial to Oklahoma?
7. Do you think your city would like to participate in an EMS pilot program?
8. Why do you feel that your city is not environmental proactive?
9. What kind of incentives do you feel ODEQ should offer to cities that implement an EMS?
10. What do you feel the ideal time frame for program implementation would be? 6 months? 9 months? 1 year? 1.5 years? 2 years?

**Oklahoma State University Institutional Review Board**

| | |
|---|---|
| Date: | Wednesday, February 15, 2012 |
| IRB Application No | GU124 |
| Proposal Title: | How Can We Encourage Cities to Successfully Implement an Environmental Management System? |
| Reviewed and Processed as: | Exempt |

**Status Recommended by Reviewer(s): Approved Protocol Expires: 2/14/2013**

Principal Investigator(s):

Matt Albright
18139 S. 129th W. Ave.
Sapulpa, OK 74106

William J Fuchl
226 Murray
Stillwater, OK 74078

---

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

☒ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Beth McTernan in 219 Cordell North (phone: 405-744-5700, beth.mcternan@okstate.edu).

Sincerely,

Shelia M. Kennison

Shelia Kennison, Chair
Institutional Review Board

## Oklahoma State University Institutional Review Board

| | | | |
|---|---|---|---|
| Date | Tuesday, April 03, 2012 | Protocol Expires: | 2/14/2013 |
| IRB Application No: | GJ12I | | |
| Proposal Title: | How Can We Encourage Cities to Successfully Implement an Environmental Management System? | | |
| Reviewed and Processed as: | Exempt<br>**Modification** | | |

Status Recommended by Reviewer(s) **Approved**

Principal Investigator(s):

Matt Albright
18139 S 129th W. Ave.
Sapulpa, OK 74066

William J Focht
225 Murray
Stillwater, OK 74078

---

The requested modification to this IRB protocol has been approved. Please note that the original expiration date of the protocol has not changed. The IRB office MUST be notified in writing when a project is complete. All approved projects are subject to monitoring by the IRB.

☑ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

The reviewer(s) had these comments:

The modification request to add the AHP (analytic hierarchy process) benefit and barrier clusters developed via analyses of the results from phase one of the research is approved.

Signature:

Shelia Kennison, Chair, Institutional Review Board

Tuesday, April 03, 2012
Date

## Oklahoma State University Institutional Review Board

| | | | |
|---|---|---|---|
| Date: | Friday, June 08, 2012 | Protocol Expires: | 2/14/2013 |
| IRB Application No. | SU124 | | |
| Proposal Title: | How Can We Encourage Cities to Successfully Implement an Environmental Management System? | | |
| Reviewed and Processed as: | Exempt<br>**Modification** | | |

Status Recommended by Reviewer(s) **Approved**

Principal Investigator(s)

Matt Albright
18139 S. 125th W. Ave.
Sapulpa, OK 74106

William J Fecht
228 Murray
Stillwater, OK 74078

---

The requested modification to this IRB protocol has been approved. Please note that the original expiration date of the protocol has not changed. The IRB office MUST be notified in writing when a project is complete. All approved projects are subject to monitoring by the IRB.

☒ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

The reviewer(s) had these comments:

The modification request to add the EMS strategies developed via the first two research steps and the strategy survey is approved.

Signature:

Sheila M. Kennison

Sheila Kennison, Chair, Institutional Review Board

Friday, June 08, 2012
Date

VITA

Matt Albright

Candidate for the Degree of

Doctor of Philosophy/Education

Thesis: PREFERRED STRATEGIES FOR IMPLEMENTING ENVIRONMENTAL MANAGEMENT SYSTEMS IN OKLAHOMA CITIES

Major Field: Environmental Science

Biographical:

Education:

Completed the requirements for the Doctor of Philosophy in Environmental Science at Oklahoma State University, Stillwater, Oklahoma in July, 2012.

Completed the requirements for the Master of Science in Environmental Science at Oklahoma State University, Stillwater, Oklahoma in 2002.

Completed the requirements for the Bachelor of Science in Biology at Portland State University, Portland, Oregon in 1980.

Experience:

My areas of expertise are program management and implementation. I have proficiency in a variety of qualitative and quantitative social science research techniques widely applicable to environmental decision-making and management. My knowledge expertise includes Environmental Management Systems and Environmental Management Leadership. My experience includes consulting on environmental management systems, university teaching, social sciences research, management leadership, and higher education administration and recruiting.

Name: Matt Albright Date of Degree: July, 2012

Institution: Oklahoma State University Location: Stillwater, Oklahoma

Title of Study: PREFERRED STRATEGIES FOR IMPLEMENTING ENVIRONMENTAL MANAGEMENT SYSTEMS IN OKLAHOMA CITIES

Pages in Study: 326 Candidate for the Degree of Doctor of Philosophy

Major Field: Environmental Science

Scope and Method of Study:

The study is regional in scope, exploratory, and utilized a combination of qualitative and quantitative social science methods.

Findings and Conclusions:

Cities throughout the United States are currently under pressure to deliver services and become more sustainable without raising taxes or reducing workforces. They are plagued by compliance problems, consent decrees, solid waste disposal issues, garbage problems, wastewater overflows, air pollution, and a host of other environmental issues. To make matters worse, cities face aging infrastructure, rapid urban growth, drought and water supply problems, rising fuel costs, loss of businesses, stagnant or shrinking budgets, and diminished workforces.

One possible solution to these challenges is the adoption of Environmental Management Systems (EMSs). This study extends the findings of earlier studies of local governmental EMS programs to demonstrate that preferences for EMS implementation strategies can be predicted from ratings of implementation benefits and barriers. Alternative strategies were formulated for Oklahoma cities with populations greater than 20,000. This study demonstrated that a core strategy, which gains city management support, attracts funding, provides training, improves environmental compliance, and yields cost savings can be defined that meets some of the needs of all cities. Additional strategies were defined to address the particular needs of individual cities such as dedicated implementation teams, improved political support, communications, employee buy-in and training, operational and environmental efficiencies and consistency, risk reduction, relationships with regulator and labor relations. The study's conclusions suggest that cities can be encouraged to adopt EMS programs if they are tailored to overcoming the barriers and taking advantage of the perceived benefits as perceived by municipal managers.

ADVISER'S APPROVAL: Dr. William Focht