Prototype Airport Sustainability Rating System—Characteristics, Viability, and Implementation Options

DETAILS

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AIRPORT COOPERATIVE RESEARCH PROGRAM

ACRP REPORT 119

Prototype Airport Sustainability Rating System—Characteristics, Viability, and Implementation Options

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AIRPORT COOPERATIVE RESEARCH PROGRAM

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Carol Lurie of VHB was the Principal Investigator. Other contributors to this report were Erin Heacock, Kari Hewitt, Emmanuelle Humblet, Leo Roy, Ben Siwinski, and Autumn Ward of VHB; Kristin Lemaster, Lauren Miller, Jeff Montera, Magda Pavlak-Chiaradia, and Adam Shalapin of CDM Smith; Chris Steuer, Greg Carlock, Michael DeWit, Christine Wrublesky, Adam Klauber, and Marian Van Pelt of ICF; and Julie Pokela, Lisa Wortman, and Ingrid Stebla of Market Street Research, Inc.

FOREWORD

By Joseph D. Navarrete
Staff Officer
Transportation Research Board

ACRP Report 119: Prototype Airport Sustainability Rating System—Characteristics, Viability, and Implementation Options identifies the features of a sustainability rating system specifically developed for airports, identifies options for implementing the rating system and a certification program, and evaluates the viability of their implementation and adoption. The report provides a framework upon which a comprehensive airport-centric rating system can be built should the airport industry decide it would be beneficial for assessing its sustainability performance.

Airport sustainability encompasses a wide variety of practices that ensure protection of the environment, social progress that recognizes the needs of all stakeholders, and maintenance of high and stable levels of economic growth and employment. While many airports have begun to incorporate sustainability practices into their planning, construction, and operation, there is no established, comprehensive method for gauging airport sustainability performance. Research was needed to develop a prototype rating system and to assess the viability of industry-wide adoption of a rating system and voluntary certification program.

The research for this project, led by Vanasse Hangen Brustlin, Inc., began with a review and evaluation of sustainability practice resources, evaluation metrics, rating systems, certification programs, and guidelines that focused on their applicability to airports. Next, an initial stakeholder outreach effort was conducted to identify desired features of an airport sustainability rating system and to assess initial interest in a voluntary certification program. Using this information, the contractor developed a preliminary prototype airport sustainability rating system. The contractor then conducted a second stakeholder outreach effort to obtain industry feedback. Based on the feedback, the contractor prepared the Prototype Airport Sustainability Rating System (Prototype Rating System) and identified the desired characteristics of a voluntary certification program. The contractor then prepared a report to document their findings.

The report provides an overview of how the research was conducted, including its coordination with a related effort (ACRP Project 02-30) whose objective was to develop a list of sustainability practices and a decision tool. The report then summarizes existing sustainability resources, guidelines, metrics, and rating/certification programs. The report also describes the two stakeholder outreach efforts, including the approach used to gather industry input and the findings. The Prototype Rating System is described, including its design specifications and structural components. Finally, based on stakeholder feedback, the report assesses the viability of an airport sustainability rating system and certification/verification program.

The report notes that the key structural components of the Prototype Rating System focus on airport-wide performance (versus project-specific performance) and include sustainability activities grouped in categories, metrics to allow airports to measure and track performance, performance actions to improve sustainability, opportunity for innovation, and a scoring framework to establish a sustainability rating for airports. A chief finding of the research is that, while there may be industry support for a voluntary airport sustainability rating system, there are significant cost and governance issues that would need to be addressed.

CONTENTS

Note: Many of the photographs, figures, and tables in this report have been converted from color to grayscale for printing. The electronic version of the report (posted on the Web at www.trb.org) retains the color versions.

SUMMARY

Prototype Airport Sustainability Rating System—Characteristics, Viability, and Implementation Options

Background

ACRP developed Project 02-28, "Airport Sustainability Practices: Tools for Evaluating, Measuring, and Implementing," in an effort to assist airports in making decisions regarding sustainability. The intended outcomes of ACRP Project 02-28 were a **Prototype Airport Sustainability Rating System** (Prototype Rating System) that gauges airport sustainability performance and an industry-accepted **Decision Tool** that assists airports in evaluating and selecting best practices for airport sustainability. *ACRP Report 119* includes a summary of the research (Chapter 2) and stakeholder outreach (Chapter 3) completed to inform the development of the Prototype Rating System, presents the functional components of the Prototype Rating System (Chapter 4), and explains how they were derived. The sources consulted in developing the Prototype Rating System are included in Appendix A, and the stakeholder outreach process is documented in Appendix B. The completed Prototype Rating System includes an annotated outline of the Rating System User Guide (Appendix C), five excerpts of Sustainability Activity Sheets (Appendix D), and definitions of the 50 sustainability activities that compose the Prototype Rating System (Appendix E). A Potential Work Plan also was developed to detail the tasks for subsequent phases of the project (Appendix F).

ACRP Report 119 also reports on the status of the Decision Tool, which will be published as part of the enhanced Sustainable Aviation Guidance Alliance (SAGA) website on completion of ACRP Project 02-30, "Enhancing the Airport-Industry SAGA Website."

Prototype Airport Sustainability Rating System

This section highlights the proposed Prototype Rating System that was developed as part of ACRP Project 02-28. The proposed Prototype Rating System meets the industry need as defined by an extensive stakeholder outreach process and includes a full set of sustainability activities and performance metrics, a scoring framework, an annotated User Guide outline, and example User Guide excerpts.

Airport Stakeholder Input on Prototype Rating System

The Prototype Rating System is based on the following design specifications gleaned from the stakeholder process and from the research team's collective expertise:

1. Incorporate elements of existing rating systems to the extent possible.
2. Include a points-based scoring framework.

3. Adhere to the EONS (**E**conomic Performance, **O**perational Efficiency, **N**atural Resource Conservation, and **S**ocial Responsibility) sustainability framework. (ACI–NA has defined airport sustainability as a "holistic approach to managing an airport so as to ensure the integrity of the Economic viability, Operational efficiency, Natural resource conservation, and Social responsibility (EONS) of the airport.")
4. Recognize airport-wide sustainability performance (as opposed to individual focus on airport projects).
5. Emphasize flexibility to accommodate all airport types.

The Prototype Rating System reflects the research team's effort to respond to and incorporate the design specifications; wherein, the Prototype Rating System's key structural components were developed to meet design specifications. Sustainability performance spans airport-wide practices including new construction, existing infrastructure, and daily operations. Additionally, features of both the Prototype Rating System and the scoring framework were designed to address the final design specification—flexibility. The Prototype Rating System is designed to initially allow individual airports to assess and track their sustainability performance internally, but the framework can also support ratings and comparisons between airports in the future, if desired by the airport community.

An annotated outline of the Rating System User Guide is provided in Appendix C, which demonstrates how the structural components and content of the rating system would come together.

Key Structural Components of Prototype Rating System

The Prototype Rating System meets the design specifications provided by airport stakeholders by incorporating structural components that collectively provide a rating system framework. These components include:

- **Sustainability Activities.** High-level undertakings that have a strong potential to improve the sustainability of an airport. Sustainability activities were developed using information from existing rating systems.
- **Sustainability Categories.** Broad organizational levels that group sustainability activities of a similar sustainability theme. Sustainability categories were developed using information from existing rating systems.
- **Performance Metrics.** Indicators of performance within a sustainability activity that allows the airport to measure and track performance over time. Performance metrics were developed using information from existing rating or reporting systems and support a scoring framework.
- **Performance Actions.** Efforts taken to improve sustainability that, when evaluated alongside other performance actions, serve as good indicators of sustainability performance. Performance actions span airport infrastructure, operations, and management functions. They were developed using information from existing rating systems and support a scoring framework.
- **EONS Icons.** Four symbols—one for each aspect of the EONS framework—assigned to each sustainability category and accompanied by a discussion section for each aspect that demonstrates how the Prototype Rating System applies and embodies the holistic approach of EONS.
- **Innovation.** The opportunity for additional points based on exemplary performance.
- **Scoring Framework.** A mechanism to establish a sustainability rating for airports.

A set of 50 sustainability activities, grouped into the 8 sustainability categories shown in Figure S-1, provide the framework of the Prototype Rating System. The revision of the

Energy & Climate

EC 1	Terminal Building Energy Use
EC 2	Overall Airport Energy Use
EC 3	Renewable Energy Use
EC 4	Terminal Building GHG Emission Reductions
EC 5	Overall Airport GHG Emission Reductions
EC 6	Other Indirect GHG Emission Reductions
EC 7	Climate Change Adaptation

Transportation

TR 1	Fleet Vehicle Fuel Economy
TR 2	Airside Equipment Fuel Use
TR 3	Alternative Vehicle Fuels
TR 4	Alternative Passenger Transportation
TR 5	Alternative Employee Commute

Economic Performance

EP 1	Socially Responsible Financial Investments
EP 2	Airport Financial Viability
EP 3	Risk Management
EP 4	Regional Economic Contributions

Design & Materials

DM 1	Sustainable Design & Operation
DM 2	Material Selection
DM 3	Construction Waste Diversion
DM 4	Construction Impacts Mitigation
DM 5	Sustainable Site Selection
DM 6	Local Sourcing
DM 7	Recycled & Bio-based Content
DM 8	Low-Toxicity Materials
DM 9	Environmentally Preferable Purchasing

Engagement & Leadership

EL 1	Airport-Wide Stakeholder Engagement
EL 2	Public Outreach
EL 3	Community Stewardship
EL 4	Integrated Sustainability Management
EL 5	Airport User Engagement & Outreach
EL 6	Tenant & Vendor Sustainability

Water & Waste

WW 1	Potable Water Conservation
WW 2	Waste Reduction
WW 3	Waste Diversion

Natural Resources

NR 1	Landscape & Grounds
NR 2	Wildlife & Habitat Protection
NR 3	Pervious Surface
NR 4	Airside Stormwater Quality
NR 5	Wildlife Hazard Management
NR 6	Heat Island Reduction

Human Well-being

HW 1	Airport Noise Compatibility
HW 2	Workplace Air Quality
HW 3	Light Pollution
HW 4	Chemicals & Hazardous Materials
HW 5	Passenger Experience
HW 6	Employee Development
HW 7	Labor Relations
HW 8	Diversity & Equal Opportunity
HW 9	Occupational Health & Safety
HW 10	Universal Design

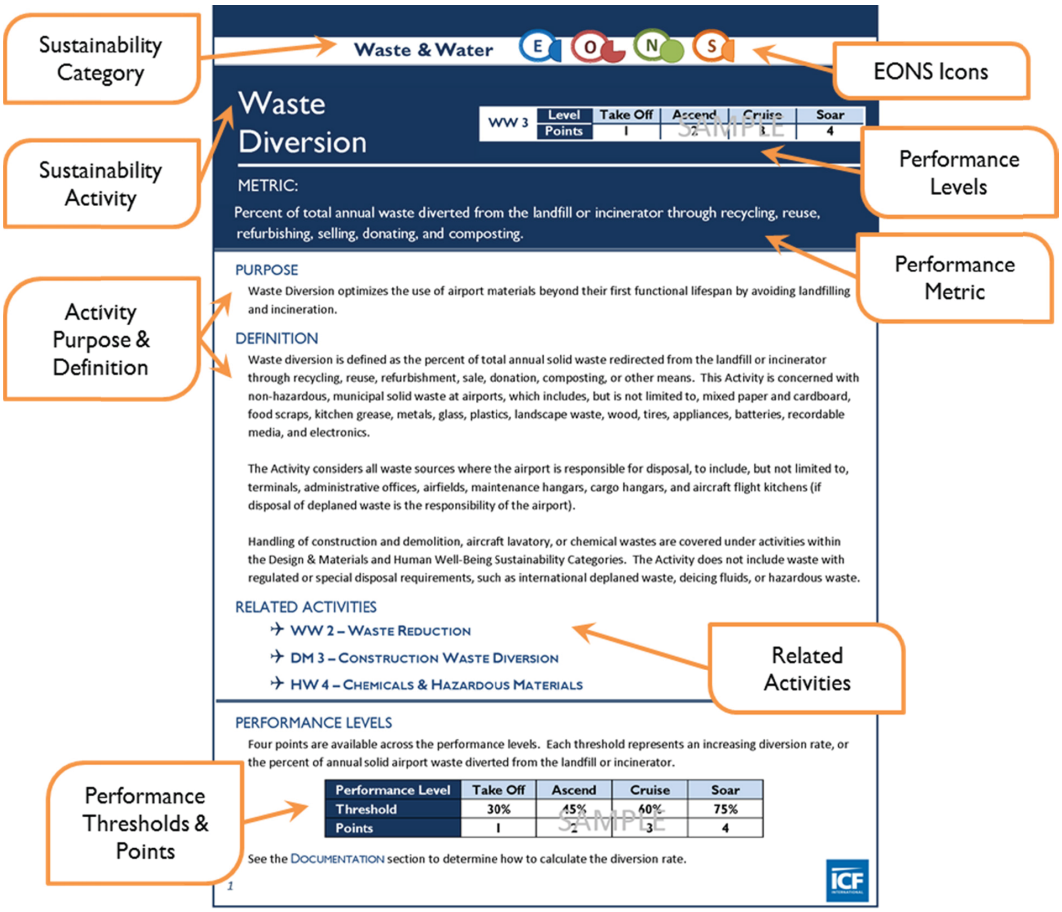
Source: ICF, 2013

Figure S-1. Prototype sustainability categories (8 categories) and sustainability activities (50 activities).

SAGA database, completed as part of ACRP Project 02-30, aligned the categories of sustainability practices with these sustainability activities to enhance the utility of the SAGA database when using the rating system. Appendix E of this report presents the definitions of each of the 50 sustainability activities that compose the Prototype Rating System. The performance metrics and actions, EONS icons, and the scoring framework provide the remaining substance of the Prototype Rating System.

The components come together to form the Prototype Rating System, which is illustrated through example User Guide excerpts. The research team prepared five User Guide excerpts to illustrate the structure of the Prototype Rating System. The excerpts are attached as Appendix D to this final report. Figure S-2 shows an example User Guide excerpt for the Waste Diversion sustainability activity and Figure S-3 provides a full-size view of the first page. These User Guide excerpts illustrate the structure of a sustainability activity and the type of content that will be presented in the Rating System User Guide. Appendix C, the annotated

Figure S-2. Example User Guide excerpt.



Source: ICF, 2013

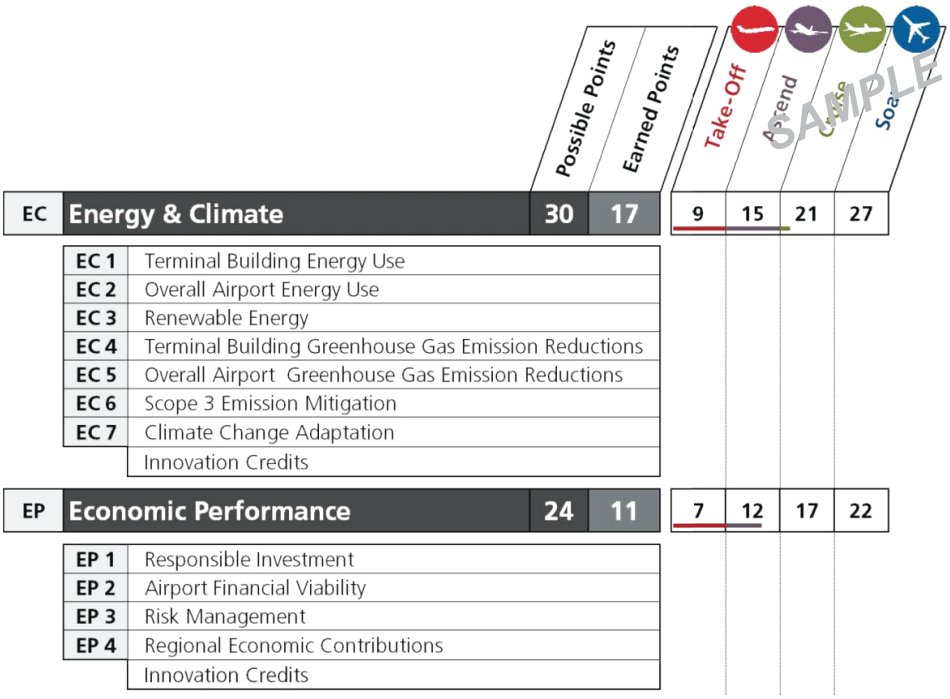
Figure S-3. Structure of a sustainability activity excerpt from the User Guide.

outline for the preliminary User Guide, includes the description of a User Guide section that will define all 50 sustainability activities, each of which will look similar to the five sample excerpts included in Appendix D.

The Prototype Rating System provides a **proof of concept** and is sufficiently complete to help the airport community determine whether to proceed with developing a full Draft Airport Sustainability Rating System (Draft Rating System).

A **scoring framework** supports the rating system by providing a mechanism for establishing a rating (see Figure S-4). The basic construct of the scoring framework is simple: airports score points for achieving levels of performance within each sustainability activity. Points can be earned and summed for all sustainability activities to gauge airport-wide performance across the entire Prototype Rating System, within each category to gauge performance in sectors such as energy and climate or human well-being, or for a single sustainability activity to target performance in one area. This framework can be used to evaluate internal sustainability performance and scaled to accommodate more robust certification and verification or optional external comparisons over time.

The Prototype Rating System provides participating airports the flexibility to use the system in the way that best suits their needs and resources without requiring high performance across all activities. Because performance is scored and tracked at the activity, category,



Note: Example scores are for illustration purposes only
Source: ICF, 2013

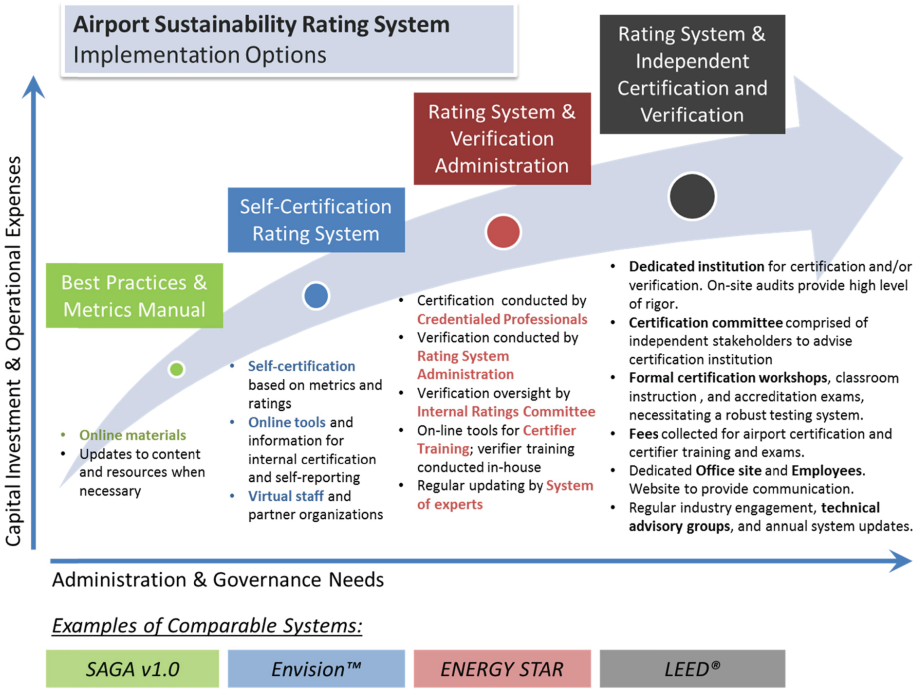
Figure S-4. Example scoring framework.

and overall rating system levels, airports can gauge their performance at whichever level of adoption makes them most comfortable, and then progress easily toward a fuller adoption over time. This flexibility allows selective prioritization of the activities and categories, as airports can choose which activities resonate most with their stakeholders and adopt activities on a case-by-case basis, or pursue a more comprehensive approach—implementing a complete set of activities within a category or even the entire Prototype Rating System. The airports can gauge their progress based on a performance baseline before they adopt the rating system. Eventually, with a mature governance structure in place, airports may be able to compare their performance with other airports.

Rating System Viability and Implementation Options

This report also discusses the viability of the Prototype Rating System—including a discussion of certification and verification—as well as options for implementing the rating system. The conclusion of the research team is that an airport sustainability rating system complete with certification and verification program could be viable, but that the costs of administration and governance would vary based on the robustness of the certification and verification program. The implementation options for a certification and verification program could range from releasing the rating system as a Best Practices & Metrics Manual that airports can use to evaluate sustainability performance internally, to coupling the rating system with a robust independent certification and verification program that involves external certification and verification parties and procedures (see Figure S-5).

Provided that the airport community can find a partner organization or the funds to support maintaining the governance and related certification services, the eventual hosting institution is likely the best candidate to make decisions about the certification and



Source: ICF, 2013
Note: Institute for Sustainable Infrastructure Envision system is in the process of establishing a certification process to be performed by credentialed professionals.

Figure S-5. Airport sustainability rating system implementation options.

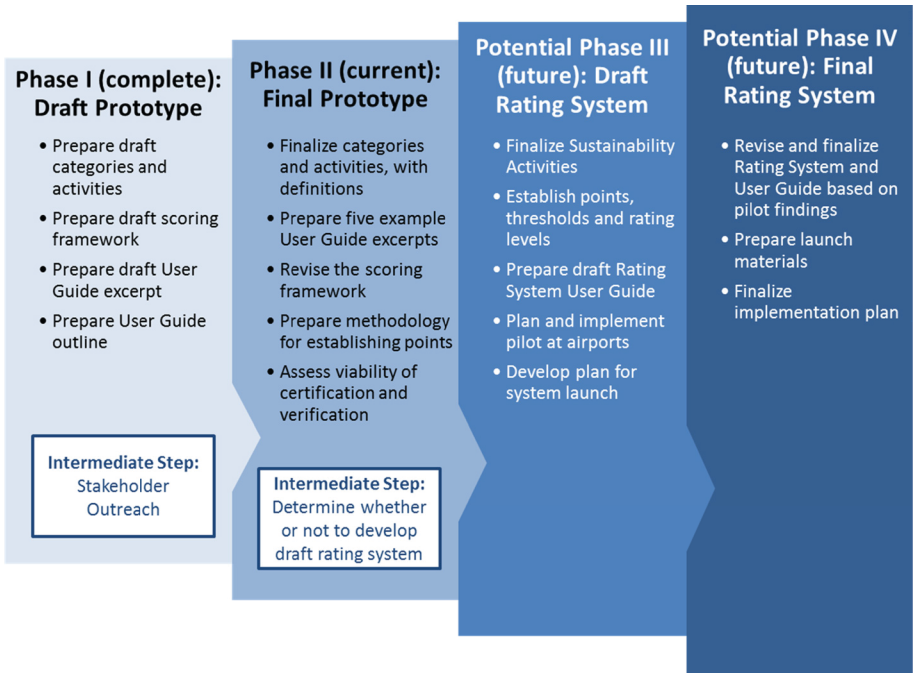
verification program. In the interim, however, if the airport community determines that the goal of the rating system should be to serve as universal resource to as many airports as possible, then a self-certification rating system may be better suited to focus on the universal benefits to all airports through a functional and flexible self-rating system. Adopting this option will establish the framework for ongoing rating system maintenance and provide the ability for airports to self-certify.

The Prototype Rating System is designed to allow internal reviews of sustainability by airports at first, but the framework could also support external comparisons in the future, if desired by the airport community. A large, critical mass of participant airports of each type would then be necessary to overcome the likely functional and financial challenges to a more extensive level of implementation.

Rating System Next Steps

This report concludes Phase II of the development process that is covered by the current ACRP Project 02-28 scope of work and includes preparing a Prototype Rating System. Future phases, as depicted in Figure S-6, would depend on whether the airport community believes it is appropriate to move forward with preparing a full Draft Rating System. A summary of the work phases follows.

- **Phase I and Phase II (Prototype Rating System Development).** These phases involved preparing draft and final versions of the Prototype Rating System. These phases are now complete.
- **Phase III (Draft Rating System and Pilot).** This potential phase would consist of preparing a functional Draft Rating System that would include a draft User Guide and scoring



Source: ICF, 2013

Figure S-6. Rating system development phases.

framework and would assign draft points to each of the activities. At the conclusion of Phase III, the rating system could be piloted at a select set of airports.

- **Phase IV (Finalize Rating System and Release).** Once the lessons learned from the pilots in Phase III were captured, the Draft Rating System could be revised into a fully formed, final airport sustainability rating system. Finalizing the rating system would likely require revising the scope of some activities, perhaps adding activities that were identified through the pilot, and likely recalibrating weighted point scores assigned to each activity, based on feedback from the rating system pilot. The development costs associated with finalizing the rating system would vary depending on the scope of the final product, but would likely be within a range of approximately $500,000 to $2 million—though they could rise to as much as $5 million if the final product were coupled with an advanced independent certification and verification program. Once complete, the rating system would require a hosting organization that would be responsible for ongoing maintenance of the system. (See Section 4.4, "Viability of the Rating System," for more detail on implementation options, governance, and funding requirements.)

Decision Tool and Enhanced SAGA Website

ACRP Project 02-28 included a component to build a Decision Tool to help users identify, evaluate, prioritize, and select sustainability practices that are most appropriate for a particular airport. As originally planned, the Decision Tool would not have a technical database associated with it, but instead would rely on users to populate the tool with information. Contemporaneously, ACRP Project 02-30, "Enhancing the Airport-Industry SAGA Website," focused on improving the SAGA website that had been developed in 2009 with the intent of providing the airport industry with one central location for airport sustainability information and updating the technical information in the website's searchable database of almost 1,000 sustainability practices.

At the start of both ACRP Projects 02-28 and 02-30, it was recognized that the projects involved overlapping efforts to create a useful tool and website. In February 2012, both panels came to a consensus to join the projects to produce one tool for the industry. A conceptual design for the tool and website was submitted to the panels for review in 2012, and following an interim meeting, an execution plan was agreed upon and the development of the joint tool and website began. Accordingly, the Decision Tool component of ACRP Project 02-28 will be incorporated into the enhanced SAGA website. Preliminary details about the content of the tool and website are outlined in this section. The final Decision Tool and website will be published upon completion of ACRP Project 02-30.

Collaboration with ACRP Project 02-30

Both ACRP Project 02-28 and ACRP Project 02-30 kicked off with extensive user research and stakeholder outreach activities. These efforts yielded similar recommendations from the industry regarding what they are looking for in a sustainability resource. After reviewing the goals of the projects and the user research and stakeholder outreach results, a plan for collaboration was developed by the research teams and presented to both project panels. In particular, it was determined that by eliminating the overlap that existed between the tasks of the two projects, a more substantial sustainability resource could be developed through collaboration. In February 2012, both project panels reached a consensus that the projects would collaborate with the goal of incorporating an online Decision Tool into the enhanced SAGA website.

Several benefits to ACRP Project 02-28 will be realized through this collaboration with ACRP Project 02-30. Specifically:

- A technical database will be developed for the Decision Tool, which was not a component of the original scope of work for the ACRP Project 02-28 Decision Tool. The original plan provided for detailed data on 10 sustainability practices to test the Decision Tool. Using the collaborative approach, detailed data for 100 sustainability practices will be available to test the Decision Tool and seed the database so that it is immediately useful when it is introduced to the industry. The framework of the Decision Tool is designed so that the users can populate the majority of the data that supports the features.
- Combining the two projects will allow for a web-based tool to be developed using an interactive concept that allows users to edit existing practices, add new practices, comment on practices, share lessons learned and case studies, share contact information, and upload documents. The Decision Tool is designed to be a self-sustaining information resource that allows users to add data (for public or private use) with minimal external support and administration and provide planning space for users to record their findings and to prepare reports that can assist with decision making.
- By combining the projects and developing one web-based Decision Tool, there will be less confusion for the airport industry and the projects will give the users a sophisticated, meaningful tool for evaluating and selecting sustainability practices for their airports.

Description of the Decision Tool

The goal of the Decision Tool is to help airports identify, evaluate, prioritize, and select sustainability practices for airport capital projects, programs, and operations. The Decision Tool was envisioned to be self-sustaining by allowing users to input data on new practices and to update technical data for existing practices over time. Another goal of the Decision Tool is to customize each user's experience by allowing them to input characteristics about

their airport and prioritize according to their most important criteria (e.g., capital cost, payback period, social benefits). The Decision Tool is intended to provide a planning space for users to record their findings and prepare plans that can assist in decision making.

To achieve these goals, the research team has built a Decision Tool that has specific functionality. The foundation of the Decision Tool is a data set of over 950 sustainability practices, with information provided about each practice to assist in decision-making activities. In addition, a "Roadmap" is provided on the homepage of the Decision Tool and web page to assist in overall integration of sustainability into an airport operator's business practices.

Functionality of the Decision Tool

The results of the stakeholder outreach results for ACRP Project 02-28 and the user research for ACRP 02-30 served as the main resource for developing the functionality of the Decision Tool and the enhanced SAGA website. Comments from both of the project panels also shaped the design. The stakeholder and project panel recommendations were combined to develop a list of seven functionalities for the Decision Tool, as follows:

1. **Search.** Users can conduct simple and complex searches for sustainability practices by entering search terms or selecting airport characteristics (e.g., geographic location), category (e.g., energy), or decision criteria (e.g., cost). The Decision Tool will look for the search terms in all of the attribute data (e.g., practice title and description, case studies, comments, and designated keywords).
2. **Edit Existing Practices.** Users can suggest edits to the detailed data for an existing practice for public use through a moderated process. Users also can edit the detailed data for their private use without approval by a moderator.
3. **Add New Practice.** Users can add a practice to the database for public use through a moderated process and using a template provided as part of the Decision Tool. Users can also add practices for their private use without approval by a moderator.
4. **Customize.** Users can specify characteristics about an individual airport (e.g., airport type) in the Decision Tool to identify applicable sustainability practices to a specific airport.
5. **Prioritize.** Users can apply custom *weights* or *importance factors* to the decision criteria. The weights and rating values for the decision criteria are used to generate a numerical score for each practice to assist in prioritizing the practices based on the users' individual preferences.
6. **My Plans.** Users can create plans that group selected sustainability practices and track other information through the addition of notes for their private use. The plans can be used to support decision-making processes within an organization. The plans also can be uploaded to the SAGA website for other users to view.
7. **Export and Print.** Users can print search results, attribute data, and plans, or they can export the data from the site for use in external programs such as Microsoft Excel and Word and Adobe Acrobat.

Data Set

The data set that underlies the Decision Tool includes information for over 950 sustainability practices. Based on the stakeholder recommendations and input from the project panels, the following information is to be included in the Decision Tool for the sustainability practices.

1. **Airport Characteristics.** This information is intended to allow users to identify sustainability practices' specific characteristics related to the types of operations and their geography. During the research, it was determined that the major drivers of determining whether a

sustainability practice can be applied at a certain airport are the level of passenger service and the geographic features. Airport characteristics include:

a. Airport Type: Scheduled passenger service, general aviation (GA) airport and military/cargo airport. Users can select more than one airport type to identify sustainability practices. For example, airports that have both military/cargo and scheduled passenger service can select both of these options to identify practices.
b. Climate and Geography: Primarily hot, primarily cold, mixed hot and cold, and located on a major water body. Users can select "located on a major water body" in combination with one of the climate characteristics.

2. **Detailed Data.** These data include detailed technical information about the sustainability practices. The detailed data include:
   a. Practice Title: The detailed title of the practice.
   b. Practice Description: A more detailed, 1- to 3-sentence description of the practice that highlights why the practice may be beneficial.
   c. Decision Criteria: Nine stakeholder-identified decision criteria, quantified for each practice: capital cost, payback period, annual operations and maintenance (O&M) cost, staffing requirements, reportability of metrics, maturity of the practice, energy use impacts, environmental benefits, and social benefits.
   d. Related Documents: Documents that may assist users in evaluating, selecting, and implementing a practice.
   e. Links: A list of any appropriate links for more information on the sustainable practice and its potential benefits/challenges.
   f. Case Studies: Descriptions of experience implementing the practice.
   g. Applicability to LEED: Whether the practice contributes to achievement of LEED credits.
3. **Keywords.** These are words identified as the most relevant words related to the practice that will enhance the search function of the Decision Tool.
4. **Categories.** Each practice will be associated with a primary category so that practices can be identified based on a general area of interest. The categories are the same as those used for the rating system (energy and climate, transportation, economic performance, design and materials, engagement and leadership, water and waste, natural resources, and human well-being).

The Decision Tool is designed to be a self-sustaining information resource that allows users to add attribute data for private and public use. The research team will provide information for airport characteristics, categories, and keywords for all of the practices. Detailed data will also be provided for 100 sustainability practices to test the Decision Tool and seed the database so that the Decision Tool will be immediately usable when it is introduced to the industry. The remainder of the attribute data will be collected by users over time.

To assist in prioritization, each user can apply a weight by assigning a value of 1 through 10 to each of the decision criteria included in the detailed data. The weights are used to calculate a numerical score for each sustainability practice; the scores can be used to compare the practices to determine which ones meet a user's preferences.

Roadmap

The opening page of the Decision Tool and web page is a framework to engage stakeholders of various backgrounds and provide guidance on how to transform day-to-day operations and business processes to be more sustainable. The Roadmap guides users beyond implementing a set of initiatives to begin making decisions that apply sustainability principles across all activities, departments, and partnerships at the airport. The Roadmap leads various kinds

of users (i.e., novices to sustainability, staff from various departments, and leaders with diverse objectives) through a process to understand basic sustainability principles, learn how sustainability can enhance an organization, and determine how best to use the information in the SAGA website to set and meet sustainability goals.

Airport Sustainability Best Practices

The SAGA website includes a searchable database of close to 950 sustainability practices. The ACRP Project 02-30 research team updated the technical data in the database by:

- Reviewing the existing database content to reduce duplicates and consolidate existing practices.
- Identifying new practices for potential inclusion in the database.
- Creating fact sheets with detailed attribute information for a subset (100) of the airport sustainability best practices included in the refined SAGA database.

The technical content of the existing SAGA database was completed in late summer 2009. Since then, both in the United States and internationally, airports have rapidly accelerated the consideration and use of sustainable practices. These airports have prepared new or modified sustainability guidance documents, have established metrics and thresholds to evaluate practices, and have started to report on their experiences. Additionally, substantial sustainability-related research has been or is being conducted through various organizations, including TRB (e.g., *ACRP Report 42: Sustainable Airport Construction Practices*). ACRP Project 02-30 will update the practices included in the SAGA database to include advancements completed since 2009.

Although the SAGA database collected and reviewed over 100 resources from more than 30 individual airport sustainability policies, plans, and reports, individual practices were common to multiple sources. Yet, because each airport is unique, slightly different attributes of similar practices may be emphasized when one compares implementation of similar practices at different airports. The result is that some measures overlap and appear redundant. Working with the project panel, the research team determined whether to simplify and generalize a practice or to retain its unique attributes in the database.

The refined list of airport sustainability best practices is included in Appendix G to this report and will be available as part of the enhanced SAGA website. Of the close to 950 airport sustainability best practices in the original SAGA database, over 400 practices were revised, over 250 practices were either deleted or combined with other practices, and over 200 new practices were identified based on new industry research and activities. In total, 23 percent of the sustainability practices in the refined SAGA database are new practices.

CHAPTER 1

Introduction

1.1 Background

The Airport Cooperative Research Program (ACRP) initiated Project 02-28, "Airport Sustainability Practices: Tools for Evaluating, Measuring, and Implementing," in an effort to assist airports in making decisions regarding sustainability. The intended outcomes of the ACRP Project 02-28 were a **Prototype Airport Sustainability Rating System** (Prototype Rating System) that gauges airport sustainability performance, and an industry-accepted **Decision Tool** that assists airports in evaluating and selecting best practices for airport sustainability. *ACRP Report 119* includes a summary of the research (Chapter 2) and stakeholder outreach (Chapter 3) completed to inform the development of the Prototype Rating System, presents the functional components of the Prototype Rating System (Chapter 4), and explains how they were derived. The completed Prototype Rating System also includes an annotated outline of the Rating System User Guide (Appendix C), five excerpts of Sustainability Activity Sheets (Appendix D), and definitions of the 50 sustainability activities that compose the Prototype Rating System (Appendix E). In addition, a Potential Work Plan (Appendix F) was submitted that details the tasks for potential future phases of the project.

ACRP Report 119 also reports on the status of the Decision Tool, which will be published as part of the enhanced Sustainable Aviation Guidance Alliance (SAGA) website on completion of ACRP Project 02-30, "Enhancing the Airport-Industry SAGA Website."

1.2 Problem Statement

The problem statement for ACRP Project 02-28 reads as follows:

> Airport sustainability encompasses a wide variety of practices that ensure protection of the environment, including conservation of natural resources; social progress that recognizes the needs of all stakeholders; and maintenance of high and stable levels of economic growth and employment. Many airports have begun to incorporate sustainability practices into their planning, construction, and daily operations because of their tangible benefits to them and their community or to respond to regulation and policy.
>
> Many airports, however, have also found barriers to implementing sustainability practices, including limited resources, lack of sustainability evaluation tools, staffing challenges, and lack of understanding and/or awareness. While there have been many efforts to define sustainability and to identify airport sustainability practices, there is no broad, industry-adopted approach to evaluate and select best practices, nor is there a rating system to gauge airport sustainability performance. Research is needed to develop a tool to help airports evaluate and select sustainability best practices, develop a rating system to gauge airport sustainability performance, and to assess the viability of industry-wide adoption of a rating system and voluntary certification program.

1.3 Objectives

Three objectives were defined for ACRP Project 02-28 related to tools that would assist airports in evaluating, measuring, and implementing sustainability practices. The three objectives were:

1. To develop a Decision Tool for airports to identify, evaluate, prioritize, and select sustainability practices.
2. To develop a Prototype Airport Sustainability Rating System to help airports and their stakeholders gauge sustainability performance.
3. To evaluate the viability of implementing the Rating System and an associated voluntary airport sustainability certification system.

The research tasks that were developed based on these objectives are described in the next section, "Project Scope."

1.4 Project Scope

ACRP Project 02-28 consisted of nine distinct tasks completed in two phases. Phase I included the research and stakeholder outreach tasks, as well as the initial development of a Prototype Airport Sustainability Rating System (Prototype Rating System) and a conceptual Decision Tool.

After completion of Phase I and following a coordination conference call with the ACRP Project 02-28 panel, the determination was made to collaborate closely with ACRP Project 02-30, "Enhancing the Airport-Industry SAGA Website," and to coordinate development of the Decision Tool to integrate with and access the SAGA website and database. A coordinated approach would allow for better use of research resources and help prevent industry confusion regarding the products of two ACRP projects on airport sustainability, while meeting the objectives of both ACRP Project 02-28 and ACRP 2-30. As a result of this consolidation, the final report documentation for the Decision Tool will be included in the Final Report of ACRP Project 02-30.

Phase II included tasks to progress the development of the Decision Tool and the Prototype Rating System. Stakeholder feedback was solicited on the Prototype Rating System; the Prototype Rating System was then revised based on this feedback. Chapter 4 of this report provides an overview of the completed Prototype Rating System and a description of the functional elements that constitute the rating system. In Section 4.4, "Viability of the Rating System," the desired characteristics of a voluntary certification system and a discussion of the future viability of the rating system also are presented. The Decision Tool is being fully developed and integrated into the enhanced SAGA website in collaboration with ACRP Project 02-30. In addition, a Potential Work Plan (not part of this original project) was developed outlining possible future tasks (see Appendix F).

CHAPTER 2

Review of Existing Resources, Guidelines, Metrics, and Rating and Certification Programs

2.1 Background

A literature review was conducted to support the development of the Prototype Rating System and the Decision Tool, and to ensure that existing pertinent work was incorporated into ACRP Project 02-28. The research team reviewed and evaluated current sustainability practice resources, sustainability development guidelines, sustainability performance metrics, and sustainability rating systems and certification programs used by airports and airport-industry organizations and by non-airport-industry organizations.

The research team compiled and evaluated three distinct types of sustainability resources:

- Sustainability practice resources and sustainability development guidelines, to understand the variables associated with sustainability practices that could inform the stakeholder outreach and the development of a Decision Tool to select sustainability practices.
- Sustainability performance metrics, to inform the development of the Prototype Rating System.
- Sustainability rating systems and certification programs, to identify characteristics of rating and certification systems for potential inclusion in the Prototype Rating System and in a voluntary certification and verification system for airports.

2.2 Research Approach

This section describes the research approach used for each of the three types of sustainability resources.

Sustainability Practice Resources

The research team conducted a web-based literature search and evaluated sustainability practices resources found in the airport industry and other industries such as construction, higher education, and municipalities, with characteristics or features similar to airports. Over 20 airport and 13 non-airport-industry resources were reviewed as part the research for this task (See Appendix A for the list of sustainability practice resources evaluated as part of this research). The following evaluation criteria were used to categorize the sustainability resources:

- Type of resource.
- Applicability to airport practices.
- Sustainability category.
- Range of topics covered.
- Availability of information.

In addition, consideration was given to the applicability of the resources to airports of different sizes, roles, and geographic location.

Sustainability Performance Metrics

The research team identified schemes of sustainability metrics and evaluated each metric scheme according to the following criteria:

- Category.
- Description.
- Industry.
- Availability of guidance on boundary setting.
- Number of metrics available.
- Availability of guidance on how to measure metrics.
- Metrics set up for comparison.
- Availability of data/level of effort.
- Level of effort required to collect data for metrics.
- Airport size applicability.
- Comments/other notes.

The web-based literature review focused on selecting a representative sample to serve the primary purpose of assisting in the development of the Prototype Rating System. (See Appendix A for the list of schemes of sustainability metrics that were evaluated as part of this research.)

Sustainability Rating Systems and Certification Programs

The research team identified sustainability rating and certification systems in use in the airport industry and other industries, and evaluated each system based on a variety of criteria. (See Appendix A for the list of sustainability guidelines and systems that were included in this evaluation.)

Each identified sustainability rating and certification system was evaluated to describe:

- System features of rating and certification systems.
- Applicability (what the areas the rating and certification system applies to in each organization).
- Technical content.

2.3 Findings and Applications

In addition to informing development of the Prototype Rating System and the Decision Tool elements, this initial research provides a resource of valuable information to the airport industry.

This section describes the findings from the review of the three types of sustainability resources.

Sustainability Practice Resources and Sustainability Development Guidelines

The following patterns were observed across both airport-related and non-airport-related sustainability practice resources:

- Practices that relate to planning and design and day-to-day operations were found the most frequently in both airport and non-airport resources. Practices related to construction, maintenance, and administration and finance practices were less prevalent in the resources evaluated. The type of resource defines the practice focus; for example, design guidelines primarily addressed planning and design issues and focused less on maintenance and community outreach.

- Practices that addressed community outreach were the least covered in the resources evaluated.
- In terms of general sustainability topics, the social dimension of sustainability was the least addressed of the EONS concept of sustainability. When social issues were addressed, they often related to off-site community impacts, and less often related to social issues within the organization such as wages, or workforce diversity.
- The amount and depth of information varied:
  - For both airport-industry and non-airport-industry resources, the focus tended to be on descriptions with minimal information on level of effort. The exception to this pattern was resources that included case studies.
  - Costs of the sustainability practices were addressed primarily in the form of "return on investment," with less detail provided on specific capital and operational costs.

Among the airport-industry resources evaluated, the economic component of sustainability was well covered, although many resources focused on the financial feasibility associated with environmental issues, and fewer resources focused on other aspects of economic sustainability (e.g., revenue diversification).

TRB resources associated with the airport industry (ACRP publications) were the most valuable with regard to implementation of practices. Many resources focused on training efforts associated with implementing sustainable practices, which is critical for the success of a program. Non-airport-industry resources were most applicable to airports for practices related to planning and design, maintenance, and day-to-day operations. Administration and finance and construction practices from the non-airport-industry resources were less applicable to airports.

Sustainability Performance Metrics

The following observations were made regarding both airport-industry and non-airport-industry metric schemes for evaluating airport performance. Of the airport performance and sustainability metric schemes evaluated:

- The Global Reporting Initiative's (GRI's) Airport Operators Sector Supplement (AOSS) and *ACRP Report 19A: Resource Guide to Airport Performance Indicators* resources are most applicable and valuable to a wide range of airports.
- *ACRP Report 19A: Resource Guide to Airport Performance Indicators* provides the most extensive collection of airport performance metrics.
- Most non-airport-industry metric schemes include performance metrics that are adaptable to airports of all sizes.
- Most performance metrics require a minimum to moderate time commitment/level of effort to collect appropriate data.
- Most performance metrics are designed for comparison to other airports/organizations.
- Economic/financial performance metrics are covered most extensively in the resources that were evaluated.

This identification of these metrics' schemes was instrumental to informing the development of the Prototype Rating System described in Chapter 4.

Sustainability Rating Systems and Certification Programs

The findings of the evaluation of the sustainability rating systems and certification programs were used to inform the initial development of the Prototype Rating System by identifying:

- Key inputs and features of a prototype rating system.
- Sustainability areas for inclusion in the Prototype Rating System.

The following characteristics were observed across both airport-related and non-airport-related rating and certification systems:

- Administration of the Certification Program (who oversees the program):
  - Airports: Certification tended to be undertaken internally by the airport entity itself, often by staff persons that had other primary responsibilities.
  - Non-airports: Certification typically was administered by a dedicated organization/institute whose sole focus was sustainability reporting, or an industry volunteer panel/advisory board.
- Certification Process (who verifies the program):
  - Airport and non-airport-industry resources were both fairly evenly split between self-verified versus third-party verification of the certification processes used for rating and certification systems.
- Categories (two main types):
  - Point-based systems (e.g., U.S. Green Building Council's [USGBC] Leadership in Energy and Environmental Design [LEED]), which tend to have a prescriptive approach.
  - Framework systems (e.g., sustainability design guidelines), which tend to offer more descriptive guidance.
- Additional Observations:
  - Buildings and terminals were most widely covered, whereas evaluation of infrastructure was limited.
  - Social and economic sustainability were mostly not addressed or were partially addressed by the airport-industry resources; the non-airport-industry resources addressed these topics more thoroughly.
  - Climate change adaptation was almost entirely unaddressed in all airport-industry systems.
  - Those systems that were most comprehensive in rating all aspects of the organization (operations and maintenance, capital programming, administration/decision making, and planning) were International Organization for Standardization (ISO) 14001, ISO 2600, Sustainability Tools for Assessing and Rating (STAR) Community Index, and the Institute for Sustainable Infrastructure (ISI) Envision™.

The common approach to rating systems at airports is to customize and build on the USGBC's LEED points-based rating system framework (by adding additional requirements, categories, and/or points) because it is the most widely used green building standard in the United States. The most notable examples of this approach include the following:

- The Chicago Department of Aviation (CDA) – Sustainable Airport Manual (SAM).
- The Los Angeles World Airport (LAWA) – Sustainable Airport Planning, Design and Construction Guidelines (LSAG).
- The Port Authority of New York and New Jersey (PANYNJ) – Sustainable Design Project Manual.

2.4 Conclusions

The research conducted as part of ACRP Project 02-28 informed subsequent tasks, specifically the development of the Prototype Rating System and a Decision Tool for selecting sustainability practices. Appendix A includes the detailed documentation of the literature research findings.

CHAPTER 3

Phase I and Phase II Stakeholder Outreach

3.1 Background

A key task of ACRP Project 02-28 was to conduct an extensive stakeholder outreach effort to solicit initial input (Phase I) and then more targeted input (Phase II) from airport industry representatives and interested parties.

Phase I stakeholder outreach process sought input on:

- Challenges airports face in evaluating, adopting, implementing, tracking, and reporting sustainability practices, and the features of a Decision Tool that could help airports evaluate and select sustainability practices.
- Interest in and desired features of an airport sustainability rating system and perspectives on an associated voluntary certification program.

Phase II stakeholder outreach sought input on:

- The Prototype Rating System developed by the research team.
- The feasibility/viability of certification and verification of a sustainability rating effort for airports.

In contrast to the Phase I stakeholder outreach, which focused on obtaining opinions from a wide range of airport stakeholders, Phase II stakeholder outreach focused on obtaining targeted feedback on the Prototype Rating System from stakeholders who would be implementing and using the rating system.

Phase I stakeholder outreach involved surveying of over 400 individuals and over 100 airports broadly representing the airport industry. The Phase I outreach was conducted through a variety of outreach instruments. Phase II stakeholder outreach used in-depth interviews, facilitated group webinars, and a large-group presentation/discussion to obtain targeted feedback from approximately 130 industry representatives.

3.2 Research Approach

The goal of both phases of stakeholder outreach was to solicit opinions from a range of airport industry representatives through a variety of outreach instruments (see Figure 3-1). Opinions were obtained from airport management and staff; from airport tenants, vendors, and users; from airlines, airport industry group representatives, consultants, and academics; and from other interested parties. The findings from this broad-reaching outreach process, combined with the project team's expertise, informed the development of the Prototype Rating System and Decision Tool.

Source: VHB, 2014

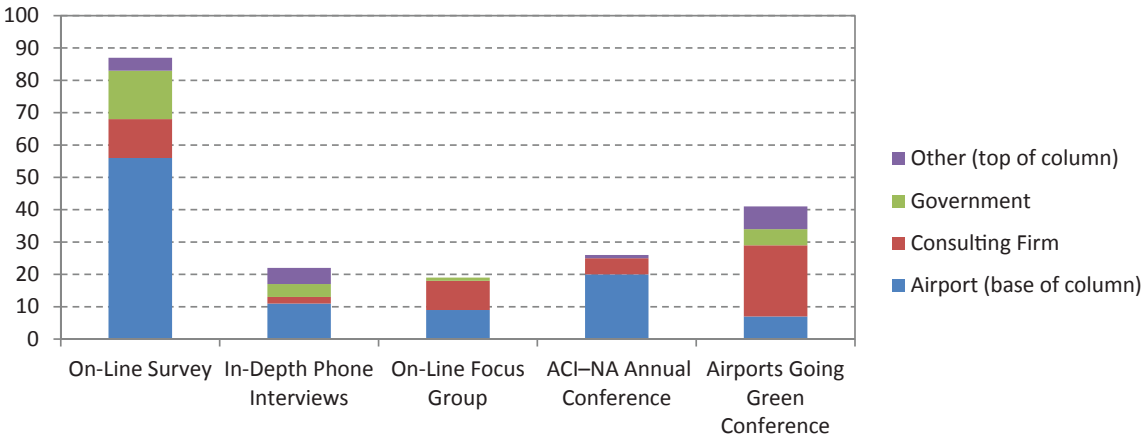
Figure 3-1. Phase I and Phase II stakeholder outreach instruments.

Stakeholder Participants in Outreach Effort

The number of airport industry representatives participating in this research varied depending on the outreach phase.

Phase I Outreach Participants

Phase I stakeholder outreach sought participation from a large number of representatives and reached a total of 195 airport industry representatives, including participants who work for airports, consulting firms, government agencies, and other types of employers (Figure 3-2). Just over half of the representatives (103 individuals) identified their employer as an airport or airport system. One-quarter of the representatives (50 individuals) contacted were employed by consulting firms. Twenty-five of the representatives contacted were employed by government agencies, and the remaining representatives (17 individuals) identified their employer as an



Source: VHB, 2012

Figure 3-2. Number and representation of Phase I outreach participants.

industry group, an airport tenant, vendor, or university. Some individuals declined to identify their employer or chose to remain anonymous.

More than 100 airports are represented by the individuals who participated in the Phase I stakeholder outreach effort. The respondents primarily represent larger passenger airports (those with 200 or more full-time equivalent employees), although they also include representatives of general aviation and other types of airports, and small- to medium-sized airports as well. The geographic location of the airports is broad and includes all of the FAA regions.

Phase II Outreach Participants

Phase II stakeholder outreach was more targeted in the selection of individuals to ensure meaningful input on the draft Prototype Rating System and its format, structure, and use. Phase II outreach also was designed to involve a range of stakeholder organizations and roles (Figure 3-3).

- **In-Depth Interviews.** The research team conducted 12 in-depth interviews, including four panel members, with the remainder of participants from the broader airport community. Key individuals were identified whose insights were expected to be valuable to the study and who represented a broad range of viewpoints and airports of different sizes.
- **Facilitated Group Webinars.** The research team conducted 11 live facilitated webinars, with three to six participants per session, capturing the input of 52 stakeholders. The major advantage of a live web-discussion format over a face-to-face focus group was that the research team was able to recruit participants from all over the country to participate in the discussion. The live web discussions also allowed the moderator to interact directly with the participants, clarifying questions where necessary or probing for more in-depth responses.
- **Large-Group Workshop.** The large-group discussion was held at an ACI–NA annual conference. The session was hosted at a joint session of ACI–NA's Environmental and Technical Committees; members of other committees were also invited to attend. The workshop was attended by over 65 individuals, including several FAA and airport industry organization representatives. Over 20 different U.S. and Canadian airports were represented by the individuals who participated in the workshop.

3.3 Findings and Applications

The following sections provide the key findings of the stakeholder outreach effort and outline how this stakeholder input shaped the recommended approach to the Prototype Rating System and Decision Tool.

Prototype Rating System Input

Phase I stakeholder outreach solicited input by focusing on industry perspectives on:

- Interest in and format of a Prototype Rating System to gauge airport sustainability performance.
- The viability of industry-wide adoption of an airport sustainability rating system and voluntary certification program.
- Structure and design of such a rating system, and how it would best meet their needs.

Phase II stakeholder outreach informed the Prototype Rating System by soliciting input on:

- The proposed Prototype Rating System developed by the research team.
- The feasibility/viability of certification and verification of a sustainability rating effort for airports.

Large Airports

- Director of Planning and Environmental
- Assistant Director of Capital Programs and Environmental Management
- Technical Advisor on Capital Projects
- Aviation Department (specializing in developing sustainability programs)
- Assistant Director of Planning and Environmental
- Environmental Specialist
- Environmental Affairs

Medium Airports

- Airport Director
- Assistant Director of Aviation
- Assistant Manager for Environmental Compliance
- Environmental Director
- Sustainability Program Coordinator
- Environmental Coordinator
- Environmental Compliance
- Environmental Scientist

Small/General Aviation Airports

- Director of Aviation
- Director of Operations
- Director of Strategy Management
- Executive Director
- Facilities Management Director
- Deputy Airport Director
- Environmental Compliance
- Assistant Manager
- Executive Director

Concessionaires, Vendors, Airlines

- Commercial Airline Representatives
- Dedicated Cargo Representative
- Janitorial Services and Support to Airports and Airlines

Consultants

- Geotechnical/Engineering
- Airport Planning
- Environmental
- Engineering
- Architectural and Interior

FAA

- Airport Environmental Planner
- Environmental Specialist
- Environmental Protection Specialist
- Airport Planner

Airport Industry Group

- Environmental Affairs Regulatory Manager
- Environmental Committee and Small Airports Committee Representatives
- Environmental Committee Member

Figure 3-3. Range of organizations and roles of Phase II stakeholders.

Phase I Stakeholder Outreach

The opinions of airport representatives track very closely with the opinions of other airport industry stakeholders throughout the variety of stakeholder outreach instruments. This was especially evident in the on-line survey. Major findings from the on-line survey revealed that airports:

- Believe that an airport-specific sustainability rating system is valid.
- Consider having a standardized method for measuring airport sustainability performance important or very important.
- Are split with regard to interest in having sustainability performance of the airport formally verified and certified.
- Favor having sustainability performance verified and certified (either self-verified or third-party verified).
- Agree or strongly agree that an airport-specific rating system could draw on experience from other industry sectors.
- Are split with regard to whether an airport sustainability rating system should focus on individual airport buildings, projects, or entire airports.
- Think that airport sustainability performance improvements should be measured against internal goals.
- Think that systems that best address airport sustainability efforts could be developed from scratch or could be adapted from an existing system.

Other key findings were gleaned from the in-depth interviews, which specifically asked airport representatives detailed questions about the rating system. These findings include the following:

- Almost all airport representatives believe that a rating system should not apply equally to airports of different sizes, geographies, and functions.
- Most airport representatives believe that the number of passengers and role of the airport are the best indicators of airport size and complexity. Most believe that the number of operations and geographic location are good indicators as well.
- The vast majority of airport representatives believe that existing ratings systems or elements of these systems should be incorporated into a rating system for airports.
- Airport representatives recommend that the ratings system should acknowledge improvement over time, and that it should give credit for already-completed sustainability actions.
- Most airport representatives prefer a rating system that scores or ranks an airport's performance, as opposed to a binary pass/fail system.
- Airport representatives are more likely to prefer that improvement in sustainability performance be measured internally rather than against an industry standard.

Respondents representing airports who participated in the outreach effort appear to support an airport sustainability rating and verification system, with the caveat that such a system be designed to support the efforts of a diverse industry of unique airports in a meaningful way while enhancing their image with the public.

Phase II Stakeholder Input

Overall, the Phase II stakeholder outreach found tentative support for the rating system concept among airport industry representatives. Larger airports with established sustainability programs or initiatives would be less likely to use the system. These larger airports thought it would be an additional burden to track and use the system. Medium and smaller airports voiced more interest in using the rating system; however, use would primarily serve as guidance for developing and

implementing a sustainability program rather than rating airport sustainability performance. Airport representatives did indicate interest in having the option to compare to other similar airports; motivations expressed for doing so were primarily to learn from and benchmark against other airports rather than to make competitive comparisons.

Many stakeholders were supportive of the concepts included in the Prototype Rating System and provided suggestions for further streamlining and modifying the rating system to better meet their specific needs. Many stakeholders raised questions about the intent and final structure and format of the rating system, which would determine their likely future use of the tool. Potential costs are a key barrier to use.

This section summarizes major findings emerging from this research. (See Appendix B for additional information on the findings for each component of the rating system.)

Design Specifications

The following design specifications for the Prototype Rating System were developed as a result of stakeholder input from Phase I. Five design specifications were identified:

1. Incorporate elements of existing rating systems to the extent possible.
2. Include a **points-based** scoring and rating framework.
3. Adhere to the **EONS** sustainability framework.
4. Recognize **airport-wide** sustainability performance (as opposed to individual focus on airport projects).
5. Emphasize **flexibility** to accommodate all airport types.

Stakeholder Input. Some stakeholders found the five design specifications confusing at first. Stakeholders suggested the Prototype Rating System could be enhanced by clarifying and simplifying terminology, explaining the use of the EONS framework, streamlining the activity categories, and expanding the sustainability activities. Customization and flexibility was a concern expressed throughout. Some stakeholders wanted to see more information upfront about how the rating system could be customized to meet the unique needs of different airports, as the sustainability challenges facing a small airport in a wet, tropical climate, for example, are likely to be different from those facing a very large airport in a Northeast urban area or an airport in an area with a high average annual snowfall.

Activity Categories and Sustainability Activities

The activity categories and sustainability activities provide the substance of the Prototype Rating System. The categories group the specific sustainability actions and metrics included in the rating system. The draft Prototype Rating System included 13 activity categories and 47 sustainability activities as shown in Figure 3-4.

Stakeholder Input. Stakeholders overall thought that the 13 activity categories and 47 sustainability activities formed a solid basis for an airport sustainability rating system, but the specific categories and activities could be further refined. To simplify the system, some suggested that the activity categories should be streamlined or condensed to a smaller, broader number of topics. At the same time, stakeholders thought that the number of sustainability activities should be expanded within each category to provide more specificity to airport-related functions. Many stakeholders thought there was an overemphasis on environmental considerations and believed the rating system should place more emphasis on the cost benefits and return on investment (ROI) of sustainability activities. The ACRP Project 02-28 panel also suggested that the Prototype Rating System categories be consistent with the SAGA categories for sustainability practices, which are being revised as part of ACRP Project 02-30.

Activity Category	Sustainability Activity
Climate Change	Terminal Building Greenhouse Gas Emission Reductions
	Overall Airport Greenhouse Gas Emission Reductions
	Scope 3 Emission Mitigation
	Climate Change Adaptation
Community Engagement	Stakeholder Engagement
	Public Outreach
	Community Service
Design & Construction	Sustainable Design
	Material Selection
	Construction Waste Diversion
	Construction Pollution
	Sustainable Site Selection
Economic Benefits	Conscience Investment
	Economic Impact
Energy Mgmt.	Terminal Building Energy Use
	Overall Airport Energy Use
	Renewable Energy

Activity Category	Sustainability Activity
Human Environments	Noise
	Workplace Air Quality
	Light Pollution
	Chemicals & Hazardous Materials
	Heat Island Reduction
	Passenger Experience
Human Resources	Employee Development
	Labor Relations
	Diversity & Opportunity
	Occupational Health & Safety
	Local Workforce
Landscape & Grounds	Impervious Surface
	Landside Sustainable Landscaping
	Airside Stormwater Quality
	Wildlife and Habitat Protection
Leadership in Sustainability	Integrated Sustainability Management
	Customer Engagement & Outreach
	Vendor & Concession Engagement

Activity Category	Sustainability Activity
Sustainable Procurement	Local Sourcing
	Recycled & Bio-based Content
	Low-Toxicity Materials
	Environmentally Preferable Purchasing
Transportation	Alternative Fuels
	Fleet Vehicles
	Airside Equipment Fuel Use
	Alternative Employee Commute
	Alternative Passenger Transportation
Waste Mgmt.	Waste Diversion
	Waste Reduction
Water Mgmt.	Potable Water Use
TBD	TBD
TBD	TBD

Figure 3-4. Preliminary activity categories and sustainability activities.

Performance Metrics and Actions

The Prototype Rating System evaluates sustainability performance using both performance metrics and performance actions. Figure 3-5 presents examples of each evaluation type, both of which promote flexibility by allowing airports of all types, sizes, and locations to choose how best to improve sustainability. The Prototype Rating System is flexible in that it also uses performance actions to evaluate sustainability for activities that do not lend themselves to a single overarching performance metric. As the sustainability field advances, performance metrics may become available for a wider set of sustainability activities.

Two Sustainability Activity evaluation types:

Performance Metrics *are single, broad performance indicators that allow the airport to measure and track performance over time*

Performance Actions *are sets of actions that collectively serve as indicators of sustainability performance*

Evaluation Type 1:

Performance Metric
Percent of total annual waste diverted from the landfill or incinerator through recycling, reuse, refurbishing, selling, donating, and composting.

Evaluation Type 2:

Performance Actions
- Install physical noise barriers between the airport property and adjacent properties, such as berms and walls.
- Sound insulate eligible noise-impacted residences near the airport.

Figure 3-5. Sustainability activity evaluation types.

Stakeholder Input. Stakeholders support the use of both metrics and actions, although they give particular weight to performance metrics, which they value as offering an objective, outcomes-based measurement of how successful an airport has been toward achieving a goal. Some stakeholders suggested that the metrics outlined in the GRI's AOSS should be further considered.

EONS Framework

Within the EONS framework, aviation sustainability is considered "a business strategy that promotes the core benefits of **E**conomic performance, **O**perational efficiency, **N**atural resource conservation, and **S**ocial responsibility." It is an expansion of the triple bottom line concept (people, planet, and profit) that incorporates operational considerations at airports. The Prototype Rating System recognizes the holistic nature of EONS and employs EONS icons to indicate whether a sustainability activity contributes to one or many aspects of the EONS framework.

Stakeholder Input. Airport industry representatives were of the opinion that the EONS framework formed a familiar basis for organizing the rating system. The visual aspects of the EONS Framework and its acknowledgment of the holistic impact of sustainability initiatives were appealing to stakeholders. Some stakeholders suggested that weighting the individual sustainability activities according to their greatest contribution to the EONS framework would be beneficial. For example, if a sustainability activity provided benefits for water conservation, it would be weighted more heavily to the natural resources conservation aspect of EONS. Others suggested that visuals should be more symbolic, connecting more directly to the ideas being presented, rather than to the EONS acronym. For example, a green dollar sign might connect to "economic performance" more intuitively than the "E" in EONS.

Infrastructure, Operations, or Management (IOM) Classification

Many activities from across an airport can support each sustainability activity. Demonstrating that all airport activities contribute to improving sustainability helps to make sustainability part of an airport's culture.

To highlight the airport-wide nature of sustainability, the Prototype Rating System classified all performance actions and recommendations as being associated with airport **Infrastructure**, **Operations**, or **Management (IOM).** Under this classification scheme:

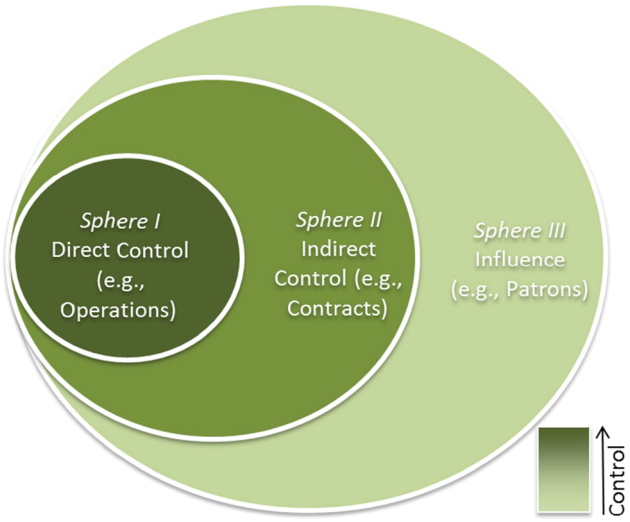
- **Infrastructure** includes all of the assets within the scope of the prototype, such as terminals, runways, control towers, parking lots, hangars, vehicles, utilities, and so forth.
- **Operations** describe the implementation of management direction and how infrastructure is used to enhance sustainability.
- **Management** describes how an airport is administered at a high level. It directs and connects sustainability across both infrastructure and operations.

Stakeholder Input. Stakeholders found the IOM classification added complexity without adding apparent value to the system. In addition, stakeholders were not clear how the EONS framework and the IOM classification related to each other and operated together.

Spheres of Influence

When considering the application of sustainability airport-wide, it is important to recognize that airport management exercises varying degrees of control within the airport's boundaries and beyond. These degrees of control can be characterized as spheres of influence, as shown in Figure 3-6:

- **Sphere 1** encompasses those activities that the airport can directly control (e.g., infrastructure at the airport, the operations that the airport controls, and the airport management).



Source: ICF, 2013

Figure 3-6. Spheres of influence.

- **Sphere 2** encompasses those activities that the airport indirectly controls (e.g., contracts held by the airport, the requirements that the airport imposes on tenants as a condition of use).
- **Sphere 3** encompasses those activities that the airport influences (e.g., tenant and passenger education).

The Prototype Rating System focused on activities that the airport could directly control (Sphere 1) as well as on a limited number of high-priority indirect activities (Sphere 2).

Stakeholder Input. Across the board, stakeholders thought it makes sense for Sphere 1 activities to be the focus of the rating system. Larger airports supported the inclusion of Sphere 2 and Sphere 3 in the rating system, acknowledging the important role these activities can play within the larger "city" of an airport. Stakeholders suggested that, ideally, airports could begin using the rating system with a preliminary focus on Sphere 1 activities, and gradually begin to incorporate activities from Sphere 2 and Sphere 3 to count as extra credit toward the airport's total rating.

Certification and Verification

Although airports will be able to evaluate their sustainability performance and certify their scores, the next step for the Prototype Rating System would be to institute a more structured governance process whereby airports would elect to voluntarily have their measurements and scores verified for accuracy and completeness, lending more credibility and comparison. Doing so would require a certification and verification system that would support the long-term use of the airport sustainability rating system. An airport can certify and verify its sustainability rating in one of several ways:

- **First-Party Certification.** This is an internal determination that the airport meets the requirements of a rating level made by the same airport staff that is responsible for compiling the data and documentation use to determine the rating level. For example, an airport may task a sustainability team with determining the airport's rating level by collecting and documenting the data and how the data determined the rating.
- **Second-Party Verification.** Using this process, the verification of the rating determination for the airport (which confirms that the data and documentation used to determine the rating level are accurate and complete and the resulting rating is appropriate) is made by individuals

at least one step removed from the development of the data and the determination of the rating. The second party may be another individual or group within the same airport. For example, after conducting a first-party certification, the airport may assign a separate, independent team of individuals within the airport to review the data and documentation to verify its accuracy. The combination of a first-party certification and a second-party verification may be sufficient for an airport to feel confident in establishing its sustainability rating.

- **Third-Party Verification.** Using this process, the verification of the rating determination for the airport (which confirms that the data and documentation used to determine the rating level are accurate and complete and the resulting rating is appropriate) is made by an independent organization that is not affiliated with the airport and is free from real or potential conflict of interest in making its verification.

Stakeholder Input. Airport industry representatives were split as to whether the intent of the rating system is for airports' internal decision-making purposes or for an external use, such as public relations. Many stakeholders prefer the idea of using the rating system as an internal guide and believe first-party certification and verification would be appropriate for these purposes. Most FAA representatives, as well as representatives of most large airports and small airports, as well as approximately half of the representatives of medium airports in this research tend to favor internal use of the tool, whereas representatives of airport industry groups, most vendors, some small airport representatives, and approximately half of the medium airport representatives in this research see value in external use of the tool. If the scoring is intended for external use, stakeholders believe third-party verification should be required for credibility, but they are concerned that the verification process could be cost-prohibitive.

Scoring Framework

To measure progress over time, the rating system employs a simple two-level scoring mechanism:

1. At the **sustainability activity** level.
2. At the **airport-wide overall sustainability rating** level.

The Prototype Rating System proposed evaluating airport sustainability performance by allocating a certain number of points for performance in each sustainability activity (e.g., waste diversion, impervious surface). Both evaluation types—metrics and actions—are scored and used to assign one of four performance levels—Basic, Improved, Enhanced, or Superior—based on points. In both evaluation types, increasing performance leads to greater points (Table 3-1).

An airport-wide **overall score** is a percentage, obtained by dividing the total number sustainability activity points earned by the total points possible for all sustainability activities (Figure 3-7) and multiplying the result by 100.

The overall score would be used to determine the airport-wide **overall sustainability rating level**, which is a distinction based on an airport's level of performance. The rating-level distinctions

Table 3-1. Example performance evaluation at the sustainability activity level.

Waste Diversion Performance Level	Basic	Improved	Enhanced	Superior
Waste Diversion Performance Threshold	20%	40%	60%	80%
Points	1	2	3	4

Note: Threshold percentage is theoretical and is included for example purposes only.

$$Overall\ Score = \frac{Total\ Points\ Earned}{Total\ Points\ Possible} = \frac{135}{180} \times 100 = 75\%$$

Figure 3-7. Example overall score formula.

serve as an incentive to drive an airport toward greater levels of performance so that it may advertise (internally or externally) its accomplishment in achieving a high degree of sustainability.

Stakeholder Input. Although the scoring framework was generally perceived as clear, some stakeholders had concerns about the value of having an overall airport score and believed that individual scores for departments or activity categories might be more useful. (Notice that this opinion is somewhat in conflict with the previous recommendation to simplify the number of activity categories.) Materiality (i.e., local applicability) was a clear concern, and some stakeholders believed overall scores would lack value for external use. Many stakeholders thought it would be meaningless to compare overall scores for airports that may well be dramatically different in terms of the size and scale of their operations, and their unique environmental and local challenges.

Stakeholders believed that recognition levels (such as Gold, Silver, and Platinum) would not add value for internal decision making, but would add value if the scores were used externally, as they would be easier for the public to understand. Rating recognition levels similar to the LEED system were seen as confusing. The majority of stakeholders preferred to see the rating system operate as a process so that there was no end point at which sustainability could be considered attained; rather, they approached sustainability as a continuum of ongoing improvement.

Decision Tool Input

Only Phase I solicited input on the Decision Tool. It focused on industry perspectives on:

- The need for a Decision Tool.
- Desired features of a Decision Tool to help airports evaluate and select sustainability best practices.

Consistent across all phases of this research, there is a strong level of interest in a computer-based Decision Tool that would allow airport industry representatives to select the sustainability practices most appropriate for them tailored to the characteristics of a specific airport. Across all of the outreach instruments, airport stakeholders expressed a strong preference for the Decision Tool to be:

- A web-based tool, rather than a desktop program, including one that is based in Microsoft Excel; and
- Customizable for individual airports to reflect the unique characteristics of the airport, such as its size, aviation role, geographical setting, or operational characteristics.

Airport stakeholders voiced a preference for additional information to be provided for each sustainability practice as a method for selecting the most appropriate practice and to be able to provide a rationale behind selecting that practice. In general, stakeholders want additional detailed information relating to energy use reduction, operational costs, and capital costs. Other detailed information of interest includes staff requirements, environmental benefits, and issues specific to a particular region.

Like other stakeholders, many airport stakeholders would like the Decision Tool to enable users to:

- Search, sort, and browse a database of sustainability practices.
- Sort and rank sustainability practices based on user preferences.

- Provide the rationale behind the selection of certain practices.
- Rank and compare practices.
- Prioritize or weight screening criteria.
- Add new sustainability initiatives to the database.
- Submit additional information for each practice in the database, such as lessons learned or contact information.

Airport stakeholders would like the tool to offer them a variety of output formats, including fact sheets, spreadsheets, and checklists. Established software formats (such as Excel, Word or PDF) are preferred over less well-known formats.

3.4 Conclusions

Stakeholders provided critical input throughout the study to inform the development of the Prototype Rating System as well as the Decision Tool.

Prototype Rating System

Input from Phase I stakeholder outreach was often mixed. At times, therefore, the research team made informed decisions about how to evolve the rating system based on professional judgment and experience. Phase I stakeholder outreach resulted in the following components of the Prototype Rating System:

- Single, points-based rating system.
- Sustainability categories based on the EONS sustainability framework.
- Encouragement of airport-wide sustainability performance, as opposed to encouragement of sustainability on individual airport projects. (Although there was no consensus among the stakeholders on this issue, the project team felt strongly that a rating system should address activities across the airport, from airport management to operations, to physical infrastructure. In addition, a project-specific rating system would limit the system's ability to address EONS, as it would not address overall economic, operational, environmental, and social considerations resulting from airport-wide activities.)
- Initial focus on rating activities and performance under the airport's direct control as well as a limited number of high-priority indirect activities, such as tenant contracts.
- Flexibility to be applicable to all airport types.
- Elements of existing rating systems incorporated to the extent possible.
- A clearly defined rating system structure that includes:
  - Approximately 10 to 15 **activity categories** (e.g., energy management, economic performance).
  - A preliminary set of **sustainability activities** (e.g., recycle, identify locally based suppliers) that will support sustainability performance within each activity category.
  - A preliminary set of **performance metrics** (e.g., percentage of waste diverted, percentage of employees trained) to support performance evaluation at the activity category level.
  - **A scoring** framework based on a preliminary set of performance thresholds (e.g., 20 percent reduction, 40 percent reduction) to support an **internal airport verification process.**
  - A preliminary **companion protocol that standardizes** use of the rating system.

Additional sustainability activities, performance metrics, and performance thresholds beyond the preliminary sets, as well as a final companion protocol, could be developed as part of future research.

Phase II stakeholder outreach resulted in the following changes to the Prototype Rating System:

- Simplification of the activity categories and inclusion of additional social and economic categories.

- Expansion of the range of airport activities covered in the rating system.
- Full descriptions of all 60 sustainability activities.
- Clarification of the use and applicability of EONS icons.
- Simplification of the rating system by de-emphasizing use of IOM classification.
- Focus on areas under airport control, encouraging performance improvement for areas under influence and indirect control of the airport.
- Simplification of the scoring framework to allow for scoring of areas under influence and indirect control of airport.
- Consideration of contractor activities revisited.
- Revision of the scoring framework to allow for rating of activity categories.
- Revision of the scoring framework to recognize innovation.
- Focus on internal certification and verification.

Decision Tool

The Phase I stakeholder outreach and ACRP Project 02-28 panel input resulted in:

- ACRP Project 02-28 working collaboratively with ACRP Project 02-30 to further develop the SAGA database, making it relevant for incorporation into ACRP Project 02-28.
- Recognition of the importance of allowing users to add information relevant to their airport to the updated SAGA database.
- Discussion regarding the final hosting and governance of the Decision Tool.

The Phase II stakeholder outreach focused on the Prototype Rating System. Also in Phase II, the research team received guidance from the project panel regarding collaboration with the ACRP Project 02-30 research team to produce a single Decision Tool for the industry. An execution plan was agreed upon, and development of the joint tool and website began. Accordingly, the Decision Tool component of ACRP Project 02-28 will be incorporated into the enhanced SAGA website. Preliminary details about the content of the tool and website are outlined in the Summary section of this report. The final Decision Tool and website will be published on completion of ACRP Project 02-30.

CHAPTER 4

Development of Prototype Rating System

4.1 Background

Although many efforts have been made to define sustainability and to identify airport sustainability practices, no broad, industry-adopted system exists to rate airport sustainability performance. The ACRP Project 02-28 research team developed a Prototype Airport Sustainability Rating System (Prototype Rating System) that incorporates both stakeholder and project panel feedback.

The research team developed the Prototype Airport Sustainability Rating System (Prototype Rating System) to adhere to design specifications identified through the Phase I stakeholder outreach (see Chapter 3). The research team then solicited feedback on the Prototype Rating System from the project panel and conducted a second phase of stakeholder outreach to obtain input on design and content before finalizing the Prototype Rating System.

The Prototype Rating System described in this chapter provides a **proof of concept** that the airport community can use to assess the viability of an airport sustainability rating system and to determine whether to move forward with the development of a Draft Airport Sustainability Rating System. Such a rating system would help airports evaluate continued sustainability performance; set sustainability goals, objectives, and targets; improve internal and external relations; increase their competitive advantage; and help justify sustainability management. The Prototype Rating System is designed to allow, initially, individual airports to assess and track their sustainability performance internally; however, if desired by the airport community, the framework could also support ratings and comparisons between airports in the future. Finalization of the Draft Airport Sustainability Rating System is beyond the scope of the research work plan for ACRP Project 02-28.

Design Specifications and Structural Components

To identify stakeholder needs, the research team conducted an extensive survey of airport stakeholders and held formal interviews and informal discussions. As discussed in Chapter 3 of this report, stakeholder input in Phases I and II yielded some general consensus and some lack of agreement across key areas; however, general support for a rating system was apparent. Based on stakeholder input and the research team's collective expertise, the primary design specifications for the Prototype Rating System were identified. The Prototype Rating System would

1. Incorporate elements of existing rating systems to the extent possible.
2. Include a points-based scoring and rating framework.
3. Adhere to the EONS sustainability framework.
4. Recognize airport-wide sustainability performance (as opposed to individual focus on airport projects).
5. Emphasize flexibility to accommodate all airport types.

The Prototype Rating System reflects the research team's effort to respond to and incorporate the design specifications: The system's key structural components were developed to meet design specifications. Additionally, features of the Prototype Rating System and its scoring framework were designed to address the final design specification—flexibility.

Several key structural components were developed specifically to meet, and cut across, the first four design specifications. These structural components are defined below and described in detail in Section 4.3 of this report.

- **Sustainability Activities.** High-level undertakings that have a strong potential to improve the sustainability of an airport.
- **Sustainability Categories.** Broad organizational levels that group sustainability activities of a similar sustainability theme, such as natural resource protection, water and waste management, or economic performance.
- **Performance Metrics.** Indicators of performance within a sustainability activity that allow an airport to measure and track performance over time.
- **Performance Actions.** Efforts taken to improve sustainability that, when evaluated alongside other performance actions, serve as good indicators of sustainability performance.
- **EONS Icons.** Symbols that identify which aspects of the EONS framework apply to a sustainability category, accompanied by a discussion section for each aspect.
- **Innovation.** The opportunity for additional points from exemplary performance.

The fifth design specification—flexibility—influenced features of the Prototype Rating System and its scoring framework. This flexibility allows airports to rate their sustainability performance in a numerical manner (based on a performance metric) or on the status of performance actions if no metrics are appropriate. As a result, flexibility is interwoven into several Prototype Rating System features, such as:

- Performance metrics, which are designed to be overarching indicators of sustainability. Using metrics to rank an airport's performance promotes actual progress toward sustainability by focusing on outcomes. This is in contrast to some existing rating systems that only assess progress by tallying up the implementation of various sustainability projects as a proxy for sustainability performance improvement. The performance metric-based approach offers flexibility by allowing an airport to choose its own path toward improved sustainability performance rather than prescribing a set of specific actions that must be completed. In situations where metric-based performance evaluation is not available or practical, consideration is given to sustainability performance actions.
- The scoring framework, which allows airports to evaluate performance—and determine a rating—at the category level. Use of the scoring framework provides airports with the flexibility to use the rating system to evaluate performance for categories that are priorities for the airport leadership and that are appropriate given the scope of their sustainability efforts.

Section 4.2 of this chapter describes the research approach used to develop the Prototype Rating System and scoring framework as well as the overall system design. Section 4.3 provides a detailed description of the Prototype Rating System and addresses the specific methodology used to develop each of the structural design components of the rating system. Section 4.4 presents the rating system's purpose, potential users, and management options, coupled with discussions of the certification and verification options. Section 4.5 lays out potential next steps for rating system development, recognizing that the airport community will need to determine if it is appropriate to move forward with developing a full rating system to be tested by the airport industry.

4.2 Research Approach

This section presents the research approach used to prepare the Prototype Rating System.

Feedback from the Phase I stakeholder outreach indicated that the stakeholders felt the rating system should be informed by existing rating systems. Therefore, the research approach began with a review of existing rating systems to identify elements—such as categories, activities, and metrics—that should be considered for the Prototype Rating System. Figure 4-1 presents the approach used to review existing rating systems and to identify elements that should be considered for the Prototype Rating System.

As shown in Figure 4-1, the research team reviewed existing sustainability rating systems and generated lists of structural elements, such as categories, activities, and metrics. The research team also made note of other features used by these rating systems. Sustainability subject matter experts identified and filled any gaps in these lists. The research team then evaluated each element using evaluation criteria that closely mirrored the design specifications (e.g., flexibility and ability to recognize performance airport-wide). The evaluation criteria are discussed in more detail in Section 4.3. Finally, elements were adapted as necessary to cater to the structural components of the Prototype Rating System (such as to develop sustainability categories, sustainability activities, performance metrics, and performance actions) and to inform the scoring framework (discussed in a subsection titled "Establishing a Rating" in Section 4.3).

Drawing from Existing Rating Systems to Develop Categories, Activities, Metrics and Actions

More than 20 existing rating systems were assessed. A summary of the research findings is given in Chapter 2 of this report. Of the systems examined, the following seven sustainability reporting or rating systems were selected for detailed review because they are prominent in the sustainability field, they address airport-relevant activities, and they cover sufficient breadth and depth of technical content:

- Global Reporting Initiative (GRI): Sustainability Reporting Guidelines 3.1 and the AOSS (Version 3.1/AOSS Final Version).
- LEED: 2009 Guidelines for Existing Buildings and Operations Maintenance.
- LAWA: Sustainable Airport Planning, Design and Construction Guidelines, Version 5.0 (LSAG).
- Sustainable Design Manual, 2003; Sustainable Airport Manual 2009–2011 (Current Version 2.1, CDA).
- PANYNJ: Sustainable Infrastructure Guidelines (Part 2).
- Sustainability Tracking Assessment & Rating System (STARS) (Version 1.2 Technical Manual).
- Institute for Sustainable Infrastructure (ISI): "A Rating system for Sustainable Infrastructure." Envision™ Sustainability Rating System (Version 2.0).

Four of the systems are specifically focused on airports—GRI, LSAG, SAM, and PANYNJ—the others have cross-sector applicability with relevance for airports. (Note: Green Globes is an assessment and rating system for existing building sustainability that grew in prominence

Source: ICF, 2013

Figure 4-1. Research approach to develop Prototype Rating System components.

Sustainability Rating System Information Performance Metric	Element Ty	Sustainability Activity	Sustainability Category	System Group or Category	Source
GRI Sustainability Reporting & Airport Supplement					
Total direct and indirect greenhouse gas emissions by weight.	Metric		Emissions, Effluent, and Waste	Environmental	GRI Sustain
Other relevant indirect greenhouse gas emissions by weight.	Metric		Emissions, Effluent, and Waste	Environmental	GRI Sustain
Initiatives to reduce greenhouse gas emissions and reductions achieved.	Metric		Emissions, Effluent, and Waste	Environmental	GRI Sustain
Emissions of ozone-depleting substances by weight.	Metric		Emissions, Effluent, and Waste	Environmental	GRI Sustain
NO, SO, and other significant air emissions by type and weight.	Metric		Emissions, Effluent, and Waste	Environmental	GRI Sustain
Ambient air quality levels according to pollutant concentrations in microgram per cubic meter (ig/m3) or parts per million (ppm) by regulatory regime.	Metric		Emissions, Effluent, and Waste	Environmental	GRI Airport S
Los Angeles Work Airports – Sustainable Airport Planning, Design and Construction Guidelines (LSAG)					
Acquire and analyze available regional climate model data outputs specific to California to determine projected temperature changes. Coordinate with the LAWA project manager to determine if the most recent data is currently being used by LAWA as part of another project or initiative and, if so, coordinate analysis of the data	Action	Increased Temperature	Climate Change Adaptation Planning	Sustainable Planning & Design	LSAG
Using the regional climate model data, evaluate the likelihood of impacts specific to the airport	Action	Increased Temperature	Climate Change Adaptation Planning	Sustainable Planning &	LSAG
Plan and/or design infrastructure to minimize impacts on airport operations and infrastructure resulting from increased temperature.	Action	Increased Temperature	Climate Change Adaptation Planning	Sustainable Planning &	LSAG
Acquire and analyze available regional climate model data outputs specific to California to determine projected changes to severe weather patterns. Coordinate with the LAWA project manager to determine if the most recent data is currently being used by LAWA as part of another project or initiative and, if so, coordinate analysis of the data	Action	Severe Weather	Climate Change Adaptation Planning	Sustainable Planning & Design	LSAG
Using the regional climate model data, evaluate the likelihood of impacts specific to the airport	Action	Severe Weather	Climate Change Adaptation Planning	Sustainable Planning &	LSAG
Plan and/or design infrastructure to minimize impact on airport operations and infrastructure from severe weather.	Action	Severe Weather	Climate Change Adaptation Planning	Sustainable Planning &	LSAG
Acquire and analyze available regional climate model data outputs specific to California and sea level rise projections to determine expected magnitude of sea level rise and storm surge. Coordinate with the LAWA project manager to determine if the most recent data is currently being used by LAWA as part of another project or initiative and, if so, coordinate analysis of the data	Action	Sea Level Rise and Storm Surge	Climate Change Adaptation Planning	Sustainable Planning & Design	LSAG

Source: ICF, 2013

Figure 4.2. Existing rating system evaluation matrix (screenshot).

following this phase of the research. The federal government now recognizes Green Globes as an accepted system for evaluating sustainable building performance.)

The research team utilized a spreadsheet-based organizational matrix to compile, sort, and filter categories, activities, metrics, and over 800 activities from these seven rating systems (Figure 4-2). The research team used the matrix to organize, associate, consolidate, and evaluate these elements to select suitable sustainability categories, sustainability activities, performance metrics, and actions for the Prototype Rating System.

Draft and Final Prototype Rating System Development

After reviewing existing rating systems to evaluate their content and features and developing a list of the content and features that aligned with the design specifications for the draft Prototype Rating System, the research team developed a conceptual framework and materials that illustrated the Prototype Rating System, including example pages for a Rating System User Guide and a preliminary list of sustainability categories and activities.

After obtaining review comments from the ACRP project panel on the draft Prototype Rating System, the research team conducted a second stakeholder outreach effort to obtain their feedback on the Prototype Rating System. As described in Chapter 3, the panel discussion and Phase II stakeholder outreach effort led to several revisions, ultimately resulting in the final Prototype Rating System that is included in this report.

4.3 Proposed Prototype Rating System Design

This section provides an overview of the structure of the Prototype Rating System and the proposed framework for establishing a rating.

Preliminary User Guide

The Prototype Rating System comes in the form of a User Guide that includes all of the necessary background and implementation information required for an airport user to pilot, and eventually adopt, the rating system. For ACRP Project 02-28, the research team prepared an annotated outline of the Preliminary User Guide that includes the following key sections:

- **Table of Contents.**
- **Introduction.** This section describes the purpose, development and benefits of a sustainability rating system.
- **Rating System Structure.** This section defines and explains the structural components of the rating system.
- **Rating System Use.** This section explores the use of the rating system through the activities, scoring mechanism, overall rating, and certification and verification.
- **Sustainability Activities.** This section makes up the largest section of the User Guide. It defines each of the 50 activities and describes how to achieve performance (and points) under each activity through performance metrics.
- **Appendices.** The appendices present additional useful information.

The complete Preliminary User Guide Annotated Outline appears in Appendix C of this report.

The Prototype Rating System's structural components were developed through the research approach (see Section 4.2). In response to the design specifications developed through stakeholder outreach, these structural components were refined based on discussions with the ACRP panel and a stakeholder review of the Prototype Rating System. The following structural components of the rating system are described in detail in this section, along with examples and a description of the methodology used to develop them:

- Sustainability categories.
- Sustainability activities.
- Performance metrics.
- Performance actions.
- EONS icons.
- Innovation.

Figure 4-3 shows a sample User Guide excerpt for the waste diversion sustainability activity. Figure 4-4 provides a full-size view of the first page of the excerpt. The User Guide excerpt provides an example of the structure of a sustainability activity and the type of content that will be presented in the Rating System User Guide. The research team prepared five User Guide excerpts to illustrate the Prototype Rating System (see Appendix D). Snapshots of User Guide excerpts are presented throughout this section to illustrate the structure of a sustainability activity as well as to show the type of content that is presented in the Rating System User Guide. The excerpts highlight how the structural components and other features are incorporated throughout the Prototype Rating System.

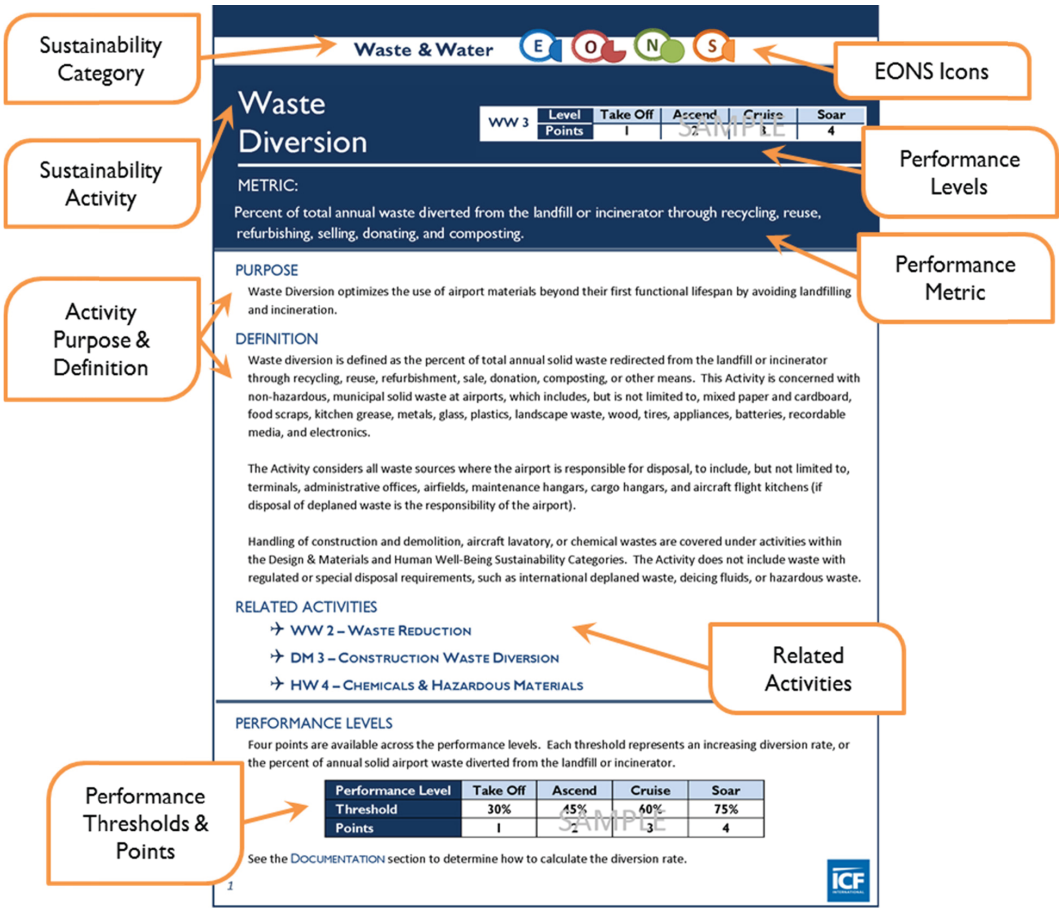
Identifying Existing Rating System Elements to Inform Prototype Rating System Structural Components

The research team assessed the applicability of existing rating system elements for use in the Prototype Rating System using the evaluation criteria. Evaluation criteria that stemmed from the stakeholder outreach process and are mostly objective were categorized as *primary*; those that are mostly subjective were categorized as *secondary*.

- Primary evaluation criteria:
  - Support airport-wide applicability across infrastructure, operations, and management.
  - Accommodate airports of varying type, size, and location.

Source ICF, 2013
Note: See Appendix D for all five User Guide excerpts.

Figure 4-3. Example User Guide excerpt.



Source: ICF, 2013

Figure 4-4. Structure of a sustainability activity excerpt from the Proposed Rating System User Guide.

  - Consider performance that would be within the direct control of the airport.
  - Provide flexibility so that airports can choose how best to pursue sustainability.
  - Support existing airport activities.
  - Recognize performance to date.
  - Facilitate documentation.
- Secondary evaluation criteria:
  - Are brand-neutral and technology-agnostic
  - Provide a broad indication of performance across EONS
  - Clearly link sustainability activities, performance metrics, and overall sustainability performance
  - Support reasonable data management expectations
  - Require a reasonable level of effort to implement

The research team used the primary and secondary evaluation criteria to identify existing rating system elements that could inform the Prototype Rating System's categories, activities, metrics, and actions.

Structural Component 1: Sustainability Categories

Sustainability categories are broad organizational levels that group sustainability activities of a similar theme. The categories highlight the high-level elements of performance and bind the

Table 4-1. Prototype sustainability categories.

Sustainability Categories	
Energy & Climate	Engagement & Leadership
Transportation	Water & Waste
Economic Performance	Natural Resources
Design & Materials	Human Well-Being

Source: ICF, 2013

broad spectrum of activities into manageable groups with similar objectives so an airport can focus its efforts. Sustainability categories are not, however, intended to overlook the important synergistic nature of sustainability or disaggregate sustainability into independent realms. Rooted in the EONS framework, the categories work to link sustainability across all aspects of an airport.

The Prototype Rating System includes eight sustainability categories based on research of existing rating systems and the elements of sustainability applicable to an airport (Table 4-1).

Methodology. The research team developed sustainability categories by reviewing existing reporting and rating systems, identifying and combining like categories, and identifying gaps to generate a preliminary list. The research team then evaluated and refined the list based on the evaluation criteria and their relevance to airport activities.

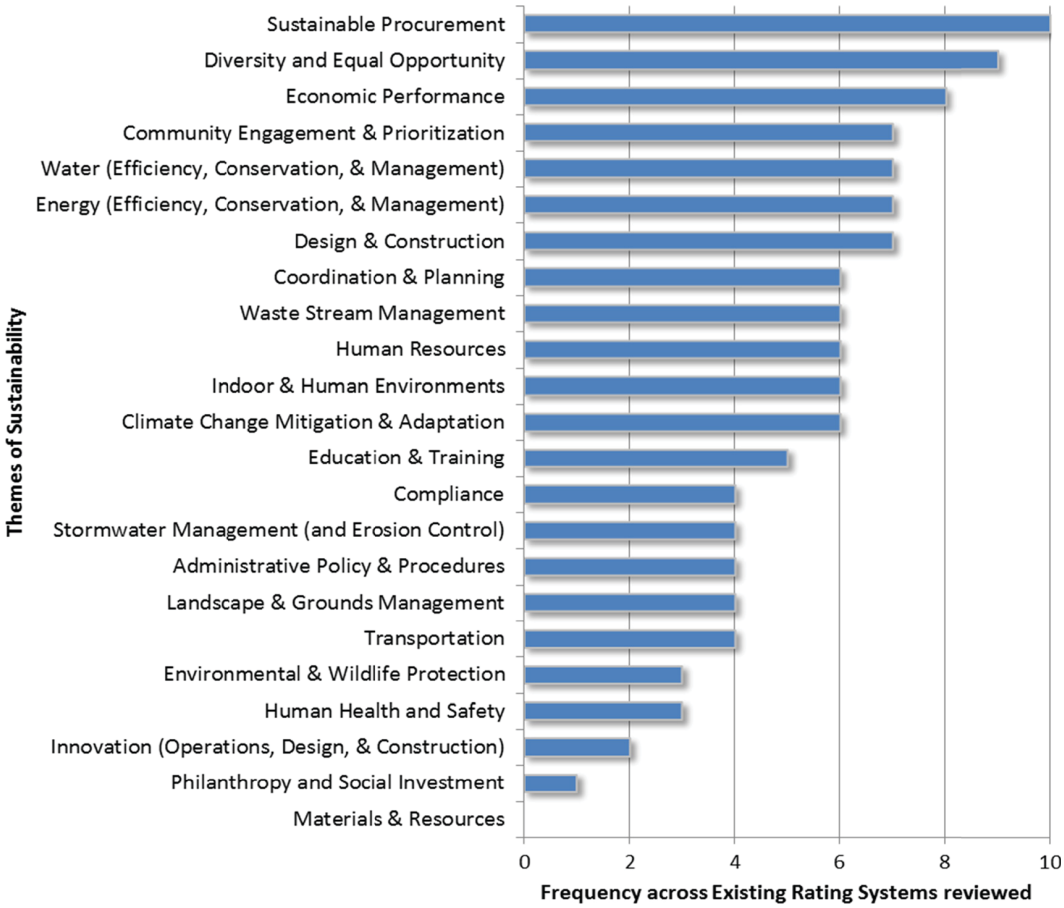
To identify and incorporate unique topics of sustainability currently covered in existing rating systems, all categories used in existing systems were combined into a single list. The number of categories ranged from 6 categories in LEED to 35 categories in the GRI Sustainability Reporting Guidelines. The resulting list of 96 categories was organized based on similar sustainability topics, such as energy, water, labor, and indoor environments. Broader categories that included multiple sustainability topics—such as sustainable sites in LEED, which addresses design and construction, alternative transportation, stormwater, and other topics—were disaggregated. Redundant topics were condensed, and unique topics were added if not already reflected in the list.

Figure 4-5 illustrates how the research team tallied similar categories across all rating systems to find commonalities.

The research team reviewed the category list for gaps, applying subject matter expertise to identify topics not covered in the list and to identify similar categories that could be combined into logical groupings. The research team cross-referenced the categories against the evaluation criteria to ensure that each category demonstrated applicability across airport functions, allowed flexibility for different airport types, and could contain a broad range of activities that would allow an airport to pursue multiple options and pick the ones that best fit their unique situation while progressing toward the goal of improved sustainability. The list was also evaluated for its comprehensiveness across the spectrum of sustainability and across the EONS framework. This effort produced a draft list of 13 sustainability categories. Based on stakeholder and panel member recommendations, the draft list was further consolidated to 8 categories to simplify integration into the SAGA database. Stakeholders had suggested that a more manageable category set would support alignment with and ease integration into the SAGA database and increase the likelihood of adoption of the rating system.

Structural Component 2: Sustainability Activities

Ultimately, the goal of the airport sustainability rating system is to recognize and encourage airport management to conduct activities in a sustainable manner on a daily basis. For example, airport staff use **alternative fuels** in vehicles and equipment; they **divert waste** from landfills by



Source: ICF, 2013

Figure 4-5. Frequency of similar sustainability categories across existing rating systems.

providing recycling bins; and they encourage **employee development** by offering staff trainings. The Prototype Rating System recognizes and represents each of these activities as a sustainability activity because they support the overall sustainability of the airport. Sustainability activities are high-level undertakings that have a strong potential to improve the sustainability performance of an airport. A design specification identified through stakeholder outreach was the desire to rank an airport's performance, rather than tally up the completion of various sustainability projects. As such, sustainability activities, and their associated performance metrics and performance actions, promote actual progress toward sustainability by focusing on the *outcome* rather than the *process or projects completed.* This facilitates flexibility, allowing an airport to choose how best to achieve a high level of sustainability performance.

Across the 8 sustainability categories, 50 distinct sustainability activities provide the framework of the Prototype Rating System (Figure 4-6). The research team sourced most of the sustainability activities used in the Prototype Rating System from existing rating systems, taking airport applicability and the evaluation criteria into account. Figure 4-7 illustrates the number of sustainability activities that were informed by each of the existing rating systems. In many cases, an activity was informed by more than one existing rating system. The STARS rating system, in particular, contributed to the development of a majority of the prototype sustainability activities, because STARS focuses heavily on overall performance through metrics. These metrics helped to inform and often transferred well into the Prototype Rating System.

Energy & Climate

EC 1	Terminal Building Energy Use
EC 2	Overall Airport Energy Use
EC 3	Renewable Energy Use
EC 4	Terminal Building GHG Emission Reductions
EC 5	Overall Airport GHG Emission Reductions
EC 6	Other Indirect GHG Emission Reductions
EC 7	Climate Change Adaptation

Transportation

TR 1	Fleet Vehicle Fuel Economy
TR 2	Airside Equipment Fuel Use
TR 3	Alternative Vehicle Fuels
TR 4	Alternative Passenger Transportation
TR 5	Alternative Employee Commute

Economic Performance

EP 1	Socially Responsible Financial Investments
EP 2	Airport Financial Viability
EP 3	Risk Management
EP 4	Regional Economic Contributions

Design & Materials

DM 1	Sustainable Design & Operation
DM 2	Material Selection
DM 3	Construction Waste Diversion
DM 4	Construction Impacts Mitigation
DM 5	Sustainable Site Selection
DM 6	Local Sourcing
DM 7	Recycled & Bio-based Content
DM 8	Low-Toxicity Materials
DM 9	Environmentally Preferable Purchasing

Engagement & Leadership

EL 1	Airport-Wide Stakeholder Engagement
EL 2	Public Outreach
EL 3	Community Stewardship
EL 4	Integrated Sustainability Management
EL 5	Airport User Engagement & Outreach
EL 6	Tenant & Vendor Sustainability

Water & Waste

WW 1	Potable Water Conservation
WW 2	Waste Reduction
WW 3	Waste Diversion

Natural Resources

NR 1	Landscape & Grounds
NR 2	Wildlife & Habitat Protection
NR 3	Pervious Surface
NR 4	Airside Stormwater Quality
NR 5	Wildlife Hazard Management
NR 6	Heat Island Reduction

Human Well-being

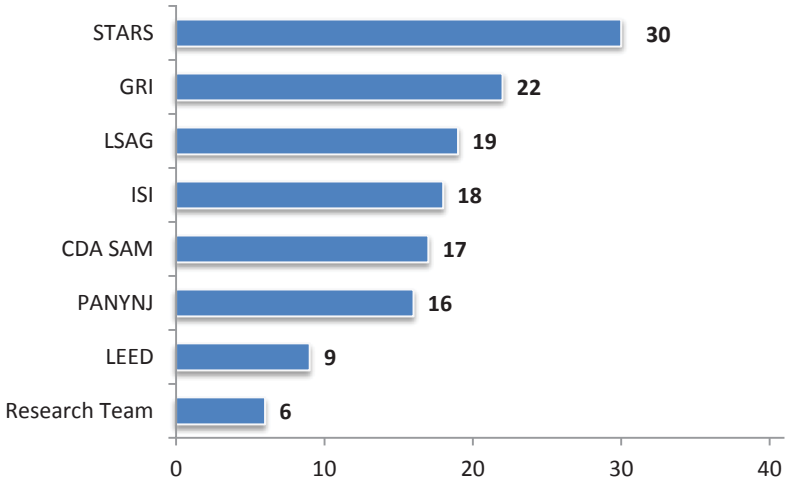
HW 1	Airport Noise Compatibility
HW 2	Workplace Air Quality
HW 3	Light Pollution
HW 4	Chemicals & Hazardous Materials
HW 5	Passenger Experience
HW 6	Employee Development
HW 7	Labor Relations
HW 8	Diversity & Equal Opportunity
HW 9	Occupational Health & Safety
HW 10	Universal Design

Source: ICF, 2013

Figure 4-6. Prototype sustainability categories (8 categories) and sustainability activities (50 activities).

Each sustainability category may contain few or many sustainability activities, depending on how well the activities cover the breadth of performance under each sustainability category. Within the *Water & Waste* sustainability category, for example, the only water-related sustainability activity is *Potable Water Conservation*, because it captures the high-level sustainability objective, which is to reduce the amount of potable water consumed at an airport. The human well-being category, on the other hand, includes multiple activities, such as employee development, labor relations, and diversity and equal opportunity, because no one activity can capture all of the most important elements of human resources and employee well-being.

Methodology. The research team reviewed existing rating systems and assessed how they address each sustainability category. For any given category, such as Energy & Climate, each category, activity, project, or metric included in the existing rating systems was compiled in a list for review. The review revealed that each rating system evaluated performance and awarded points differently. For example, the CDA Sustainable Airport Manual (CDA SAM) awards points for individual *actions* or processes. Alternatively, STARS focus on outcomes and often



Source: ICF, 2013

GRI: Global Reporting Initiative

STARS: Sustainability Tracking, Assessment & Rating System

ISI: Institute for Sustainable Infrastructure Envision™

PANYNJ: Port Authority of New York and New Jersey

LEED: Leadership in Energy and Environmental Design

CDA SAM: Chicago Department of Aviation Sustainable Design Manual (2003)/ Sustainable Airport Manual (2009)—2011, Version 2.1

LSAG: Los Angeles World Airports: Sustainable Airport Planning, Design and Construction Guidelines Sustainable Airport Manual (2009)—2011, Version 2.1

Notes: Each of the 50 sustainability activities evaluated can be informed by more than one rating system. "Research Team" indicates sustainability activities that were informed by the research team's collective expertise to supplement existing rating systems.

Figure 4-7. Number of sustainability activities informed by each existing rating system.

uses quantifiable performance *metrics* to award points. The information from existing rating systems was sorted on whether it reflected individual actions or quantifiable metrics.

This step helped the research team develop the performance metrics and actions discussed in Structural Component 3: Performance Metrics and Actions. This work occurred jointly with the choice of sustainability activities because knowing how performance would be evaluated (i.e., using metrics and actions) helped to delineate each activity. The diverse collection of metrics from existing rating systems were analyzed to determine their ultimate sustainability objective (e.g., "to reduce energy use," "to reduce greenhouse gas emissions," or "to improve labor relations"). Objectives were compiled, organized by topic, and evaluated using the evaluation criteria to identify and select the prototype sustainability activities.

Sustainability activities that target a broader range of sustainability considerations, address sustainability airport-wide, and promote flexible strategies were preferred over those that prescribe a specific avenue to success, because they offer more flexibility and are likely to accommodate evolving techniques and technologies. For example, an activity common to several existing rating systems is increasing the use of energy-efficient lighting. While increasing energy-efficient lighting is important, it represents a narrower, prescriptive activity that supports the broader objective of reducing building energy use. The research team grouped similar, narrow activities to prepare a consolidated set of sustainability activities. This approach will increase flexibility by allowing airports to choose sustainability strategies that are tailored to their organizations, while preserving a high-level objective that they can use to evaluate performance. This approach also recognizes that a wealth of guidance material is available to airports to help them execute individual sustainability projects. It also recognizes that sustainability techniques and technologies are constantly

advancing; rather than replicate guidance or endorse technologies, the Prototype Rating System establishes a high-level objective to serve as a goal for sustainability performance.

This process was repeated for each of the eight sustainability categories, whereby metrics and projects were extracted from the existing rating systems and assessed for their ultimate sustainability objectives to develop sustainability activities. Subject matter experts analyzed each category for gaps, ensuring that the breadth of activities covered the scope of that category. The research team prepared an initial set of 47 sustainability activities. Based on stakeholder recommendations and panel concurrence, 3 additional activities were added to prepare a final set of 50 sustainability activities. (The complete set of sustainability activities is listed in Table 4-2, which appears in a later section of this chapter.).

Structural Component 3: Performance Metrics and Actions

To evaluate, or rate, sustainability performance for each sustainability activity, airports need performance metrics. A performance metric is an indicator of performance within a sustainability activity that allows the airport to measure and track performance over time. The performance metric is a critical component of the Prototype Rating System because it forms the basis of the scoring framework—meeting the design specification that the rating system should allow the airport to rate its performance (see "Establishing a Rating" in this chapter). As with the sustainability activities, performance metrics allow an airport to measure performance without being overly specific about how the airport should operate. This supports a design specification preference toward scoring an airport's measured performance with respect to a specific activity. A strong metric is clearly linked to performance (i.e., it gets as close as possible to measuring actual progress rather than serving as a proxy). It acknowledges improvement over time, and it aligns with actions airports are likely to measure or already measure. In general, metrics are based on percentages, incorporate normalized intensities, and can involve baseline comparisons.

For many, but not all, sustainability activities, performance can be evaluated using a single performance metric. For some activities, however, it is more appropriate to evaluate performance using *actions*, either because the field is evolving and adequate metrics have not yet been developed or because the activity does not lend itself to measurement. In these cases, performance actions are used to evaluate sustainability. As a result, in the Prototype Rating System, sustainability activities are evaluated using one of two evaluation types: a performance metric (Evaluation Type 1) or a set of performance actions (Evaluation Type 2).

Evaluation Type 1: Performance Metric. Sustainability activities are associated with a performance metric chosen as the best measure of progress in each category. For example, under the waste diversion sustainability activity, the preferred performance metric is:

> "Percent of total solid waste diverted from a landfill or incinerator annually."

This metric captures the objective of the sustainability activity, which is to increase the amount of waste diverted from a landfill or incinerator, thereby reducing the environmental impact of disposing of solid waste in landfills or incinerating solid waste. The metric does not prescribe a specific path to performance, which allows airports the flexibility to choose their own strategies. It presents a clear link to performance and sets the stage for comparison among airports (if that option is ultimately pursued) despite differences in size, type, or location. Performance metrics are supported by a set of performance recommendations, which are used for informational purposes and recommended—not required—for an airport to take to improve sustainability performance for that activity.

Evaluation Type 2: Performance Actions. Performance actions are efforts taken to improve sustainability that, when evaluated alongside other performance actions, serve as good indicators

of sustainability performance. For each sustainability activity, a set of approximately 10–12 performance actions that serve collectively as a good indicator of sustainability performance can be used to evaluate performance. Each set will contain more actions than are required for the highest level of performance. Thus, the set of performance actions would serve as a menu from which airports can choose the most practical options given their situation, granting them flexibility.

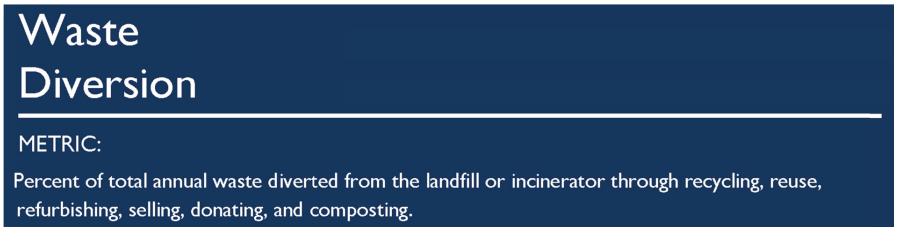
Additional research is necessary to determine the exact number of performance actions that will be appropriate to gauge performance adequately for each sustainability activity in a complete rating system. Under the climate change adaptation activity, for example, research of existing rating systems and other sources yielded no consistent or industry-accepted measurement or metric of an airport's ability to respond and adapt to the impacts of climate change. Instead, a set of performance actions were selected that reflect milestones along an adaptive management pathway. For the climate change adaptation activity, a menu of performance actions ranging from preparing vulnerability assessments to hardening structures is therefore used to evaluate performance.

Depending on the sustainability activity, the Prototype Rating System applies either a performance metric (Evaluation Type 1—see Figure 4-8) or a set of performance actions (Evaluation Type 2—see Figure 4-9). Where appropriate, both performance metrics and performance actions will direct the user to existing rating systems for project- or type-specific ratings. For example, one performance metric is "percent of total building space that achieves a recognized sustainable performance certification (e.g., LEED, Green Globes)." As discussed in the description of Evaluation Type 1, activities that utilize performance metrics also include a set of suggested actions (called performance recommendations) that are not required to achieve points under the activity but can serve as a starting point for airports to improve performance under the metric.

Many airport initiatives and projects can support each sustainability activity. As an example, an airport may have a no-idling policy that is instituted by management, enforced through staff operations, and supported by an infrastructure resource such as a cell phone waiting lot. Collectively, these airport activities contribute to less idling, which reduces the airport's indirect greenhouse gas emissions (a sustainability activity). Demonstrating that all airport activities contribute to improving sustainability helps to fold sustainability into an airport's culture. To support an airport-wide focus rather than a focus on the benefits of individual, unconnected projects, performance actions and performance recommendations are organized under airport infrastructure, operations, or management. Under this organization scheme:

- *Infrastructure* includes all of the structures and assets within the airport's boundaries, such as terminals, runways, control towers, parking lots, hangars, vehicles, utilities, and so forth.
- *Operations* describes the implementation of management direction and how infrastructure is used to enhance sustainability.
- *Management* describes how an airport is administered at a high level. It directs and connects the sustainability of both infrastructure and operations.

As seen in Figure 4-9, grouping the sustainability actions in this manner highlights the importance and necessity of connecting sustainability across the airport, rather than focusing on one



Source: ICF, 2013

Figure 4-8. Example performance metric from User Guide excerpt.

Infrastructure	Operations	Management
✈ Increase the availability of collection bins for the sorting of waste – landfill, paper, recyclables, and compost – in all areas with human presence, including terminals, office space, airfield maintenance hangars, cargo hangars, etc. ✈ Install proper signage to inform customers about waste sorting. ✈ Co-locate recycling receptacles with trash receptacles. ✈ Identify collection and staging areas for useable materials available for reuse, sale, or donation. 	✈ Incorporate waste diversion in all levels of employee training. ✈ Maintain a waste reduction, reuse, and recycling program for durable goods, including office equipment, appliances, audiovisual equipment, and furniture. ✈ Implement an inventory system to facilitate the reuse or redistribution of chemicals, cleaning supplies, paint, or other supplies. ✈ Identify and procure materials for composting or other means of organics management. ✈ Work with a local non-profit or government agency to facilitate the reuse of furniture, office supplies, and other materials. ✈ Work with vendor to create an electronics reuse program that can generate revenue for airport and extend life of computers, monitors and related equipment. ✈ Conduct a waste audit to determine the percentage of potentially recyclable waste that is going to a landfill/incinerator.	✈ Explore, implement, and expand recycling and composting pick-up options with local waste management vendors. ✈ Work with the waste hauler or service provider to collect and analyze information on the amounts and types of waste generated to understand better waste production patterns. ✈ Establish a Waste Diversion Plan to outline airport-wide goals and strategies. ✈ Analyze the economic benefits on the local community—in terms of employment, sales, and tax revenue—due to increased recycling when assessing various waste diversion options. ✈ Negotiate with waste disposal contractors and tenants with the aim of encouraging recovery of separated waste materials by having cost reflect the degree of separation at the tenant source.

Figure 4-9. Example set of performance actions organized by infrastructure, operations, and management for waste diversion.

narrow aspect. For example, an airport may wish to reduce airside equipment fuel use under the transportation sustainability category, but may lack the resources or capacity to upgrade infrastructure or equipment in the short term. The airport still has options to improve its performance from an operational or management perspective, however, such as implementing a no-idling policy, right-sizing equipment per trip, or improving maintenance and repair schedules.

Methodology. The approach the research team used to select performance metrics and performance actions is also discussed in the section, "Structural Component 2: Sustainability Activities" because the research was closely linked to developing sustainability activities. Performance metrics and performance actions from existing rating systems were grouped and compared against the evaluation criteria and then selected based on how well they meet the criteria and measure progress given the overall objective of the sustainability activity they supported. Additionally, each performance metric and performance action was assessed for its capacity to promote actions across airport activities (infrastructure, operations, and management), across EONS, and within an airport's direct control. Performance metrics and actions were chosen that touched on a greater range of these elements and if they were objective and verifiable to support documentation, self-verification, and/or third-party certification.

The research team also recognized the value of percentages, intensities, and baselines when identifying or adapting performance metrics. The scoring framework (discussed in the section titled "Establishing a Rating") is based on levels of increasing performance that have been standardized to percentage thresholds (often compared to baseline of performance) rather than absolute values. In this sense, airports of various sizes can be compared based on their own relative percentages, whereas absolute values might favor smaller or larger airports, depending on the metric. For example, an absolute energy use intensity target (e.g., British thermal units (Btu)/square foot) might favor an airport with a smaller square footage, because a larger airport would have to reduce its overall energy use by a much larger amount to meet the same absolute target. In contrast, a percent reduction from a baseline would not favor one size over another. As such, the metric chosen from existing rating systems needed to cater to the percentage threshold structure. In addition, the use of normalized intensities (e.g., percent reduction of building energy use intensity) was often preferable to absolute volumes (e.g., total energy reduction) because the latter does not cater well to changes in operations or infrastructure. Also, normalizing metrics using intensities would support comparison of airports of different types, sizes, and locations should the rating system be adapted to serve that purpose.

Finally, a secondary design specification was that the rating system should acknowledge improvement over time, as well as give credit for progress already made. The research team addressed this need by incorporating baselines, rather than benchmarks, where appropriate. Baselines are specific to each airport; whether an airport establishes its baseline this year or 10 years ago, any reductions made since the baseline can be claimed as progress. In addition, benchmarks do not adapt easily to the diversity of airport types, sizes, and locations, requiring a longer list of airport-specific benchmarks and leaving little ability to compare performance among airports. Performance metrics and performance actions selected from existing rating systems were modified where appropriate to accommodate the needs of the Prototype Rating System, such as allowing for improvements over time, being intensity-based, and including baseline comparisons. Ultimately, just over half of the sustainability activities identified for the Prototype Rating System use performance metrics; the remaining sustainability activities use performance actions. Additionally, the Prototype Rating System only includes sustainability activities that go beyond regulatory compliance. Compliance is assumed to be a base standard that all airports should achieve, and it is therefore not an indicator of sustainability in areas such as water quality, stormwater quality, air quality, occupational health and safety, environmental assessment, and fair labor practices.

As part of the evaluation criteria, the research team also considered whether sustainability activities and their related performance metrics and actions took into account and evaluated only performance that was within the control of the airport, while still encouraging improvement in areas outside of the airport. With regard to performance metrics (Evaluation Type 1), the final metrics were designed to capture only performance over which the airport has control. For example, the terminal building energy use activity omits energy consumption and performance of tenants and vendors, as the airport may not have influence over their energy use. The rating system would not penalize the airport in these cases. The research team considered this sphere of control with regard to all activities and metrics.

On the other hand, the research team recognized the importance of encouraging airports to engage in sustainability beyond their operational borders and control, where the benefits of sustainability occur outside the footprint of the airport, such as within the community or partner organizations. Several sustainability activities that evaluate performance through a menu of performance actions (Evaluation Type 2) include actions that encourage airports to pursue sustainability in areas beyond their direct control, such as with tenants and other airport users. For example, the engagement and leadership category includes several activities that promote airports to engage with airport-related stakeholders, local communities, public groups, tenant, and vendors in environmental sustainability, social, and economic areas. In these instances, airports

are evaluated based on the extent to which they engage others outside their control, rather than on quantitative improvements in sustainability that are outside the airport's areas of control.

Table 4-2 presents the final 50 sustainability activities identified for the Prototype Rating System by sustainability category. Performance metrics and indications of performance actions are also provided and the main sources (i.e., existing rating systems) that were referenced to develop the final metric are identified.

(*Text continues on page 53.*)

Table 4-2. Sustainability activity list, including performance metrics and sources (existing rating systems).

Sustainability Activity	Performance Metric	Sources
Energy and Climate (EC)		
EC 1 Terminal Building Energy Use	Percent reduction of building energy use intensity per square foot (Btu/ft^2) from a baseline. Building total square feet is derived from gross area, which is the net usable square feet plus structural square feet. (Airports without terminals will still evaluate administrative building energy use intensity.)	• GRI: Environment Indicator EN5-7 • STARS: Operations Credit 7: Building Energy Consumption • ISI RA2.1: Reduce Energy Consumption • Adapted by ACRP research team
EC 2 Overall Airport Energy Use	Percent reduction of total airport energy use intensity from a baseline. The energy intensity unit of output metric may be designated from one of the following: number of airport customers/employees, number of aircraft movements, tonnage of cargo handled, or another appropriate metric.	• GRI: Environment Indicator EN5-7 • STARS: Operations Credit 7: Building Energy Consumption • ISI RA2.1: Reduce Energy Consumption • Adapted by ACRP research team
EC 3 Renewable Energy Use	Percent of total airport energy consumed annually, including electricity and other fuels derived from renewable sources.	• GRI: Environment Indicator EN6 • STARS: Operations Credit 8: Clean and Renewable Energy • ISI RA2.2: Use Renewable Energy • PANYNJ: Energy IE-4 • Adapted by ACRP research team
EC 4 Terminal Building Greenhouse Gas (GHG) Emission Reductions	Percent reduction of Scope 1 and Scope 2[1,2] GHG emission intensity per gross square foot from a baseline. Building total square feet is derived from gross area, which is the net usable square feet plus structural square feet. (Airports without terminals will still evaluate administrative building GHG intensity.)	• GRI: Environment Indicators EN16-18 • STARS: Operations Credit 5: GHG Reductions • ISI CR1.1: Reduce Greenhouse Gas Emissions • Adapted by ACRP research team
EC 5 Overall Airport Greenhouse Gas Emission Reductions	Percent reduction of Scope 1 and Scope 2 GHG emission intensity from a baseline. The emission intensity metric may be one of the following: number of airport passengers/employees, number of aircraft movements, tonnage of cargo handled, or another appropriate metric.	• GRI: Environment Indicators EN16-18 • STARS: Operations Credit 5: GHG Reductions • ISI CR1.1: Reduce Greenhouse Gas Emissions • Adapted by ACRP research team
EC 6 Other Indirect Greenhouse Gas Emission Reductions	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, preferential procurement policies that consider lifecycle emissions, reduced business travel, waste management improvements, and employee single occupancy vehicle (SOV) commute reduction, among others.	• GRI: Environment Indicators EN16-18 • STARS: Climate Credits • PANYNJ: Multiple Credits • ACRP Report 11
EC 7 Climate Change Adaptation	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, conducting vulnerability assessments, siting plans, hardening and protecting critical infrastructure, and adaptive management procedures.	• LSAG: Climate Change Adaptation Planning • ISI CR2.1: Assess Climate Threat • Adapted by ACRP research team

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Table 4-2. (Continued).

Sustainability Activity	Performance Metric	Sources
Water and Waste (WW)		
WW 1 Potable Water Conservation	Percent reduction of potable water use intensity from a baseline. The intensity indicator can reflect overall potable water consumption divided by indoor square footage, number of airport customers/employees per period, number of aircraft movements per period, or another appropriate metric such as tonnage of cargo handled. The airport should determine which intensity metric best reflects potable water used based on its unique operations.	• GRI: Environment Indicators EN8-10 • CDA SAM: Water Use Reduction • STARS: Operations Credit 22: Water Consumption • ISI RA3.2: Reduce Potable Water Consumption • Adapted by ACRP research team
WW 2 Waste Reduction	Percent reduction of solid waste production from baseline intensity. The intensity metric may be airport produced ton/cubic yard of waste divided by indoor square footage, number of airport passengers/employees per period, number of aircraft movements per period, tonnage of cargo handled per period, or another appropriate metric.	• GRI: Environment Indicator EN21 • STARS: Operations Credit 17: Waste Reduction • Adapted by ACRP research team
WW 3 Waste Diversion	Percent of total solid waste diverted from a landfill or incinerator annually. Alternative disposal methods include recycling, composting, reusing, refurbishing, selling, and donating.	• STARS Technical Manual: Operation Credit 18: Waste Diversion • ISI RA1.5: Divert Waste from Landfills • Supported by CDA SAM: Waste Stream Management & LEED Sustainable Sites
Transportation (TR)		
TR 1 Fleet Vehicle Fuel Economy	Percent increase in fuel economy from a baseline, measured as vehicle miles traveled per gallon of fuel consumed.	• ACRP research team
TR 2 Airside Equipment Energy Use	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, vehicle idling, high-efficiency equipment procurement, maintenance and repair schedules, and right-sized vehicle planning, among others.	• ARCP research team • GRI: AOSS
TR 3 Alternative Vehicle Fuels	Percent of total fleet fuel energy purchased annually derived from alternative sources (as a portion of total cost, or energy content of fuel/electricity purchased). Energy content can be converted to British thermal units (Btu). Purchased fuel/electricity is assumed to be consumed in that same year. Electric vehicle charging requires dedicated metering.	• LSAG: Support Alternative Fuel Vehicles • CDA SAM: Alternative Transportation • STARS: Operations Credit 18: Campus Fleet • Adapted by ACRP research team
TR 4 Alternative Passenger Transportation	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, parking incentives and infrastructure for alternative, HOV, low-emitting, and pedestrian forms of passenger transportation.	• LSAG: Support Alternative Fuel Vehicles • CDA SAM: Alternative Transportation • STARS: Transportation Credits • ISI QL2.5: Alternative Transportation • PANYNJ: Site Section IS-16-21
TR 5 Alternative Employee Commute	Percent of employee alternative commutes versus total commutes by all full- and part-time employees.	• STARS: Operations Credit 16: Employee Commute Modal Split • LEED: Existing Building O&M SSc4: Alternative Commuting Transportation
Natural Resources (NR)		
NR 1 Landscape & Grounds	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, improved xeriscaping and vegetation selection, runoff and soil assessments, erosion control planning, on-site composting systems, rainwater harvesting, and irrigation efficiency measures, among others.	• LSAG: Landscape Design, Stormwater Management • LEED: Sustainable Sites • CDA SAM: Landscape, Erosion Control • STARS: Water Credits • ISI NW1.6, NW2.2, NW3.2 • PANYNJ: Site Section

Table 4-2. (Continued).

Sustainability Activity	Performance Metric	Sources
NR 2 Wildlife and Habitat Protection	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, identifying, monitoring, restoring, and protecting ecologically sensitive areas and endangered species habitat; Integrated Vegetation and Pest Management Plan; mitigating sensitive land off-site.	• LSAG: Site Protection & Restoration • GRI • STARS: Wildlife Habitat • ISI NW1.1: Preserve Prime Habitat
NR 3 Pervious Surface	Percent of total airport landside surface area covered by permeable materials.	• LSAG: Minimize Impervious Surfaces • CDA SAM: Stormwater Management • PANYNJ: Site Section IS-7 • Adapted by ACRP research team
NR 4 Airside Stormwater Quality	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, deicing fluid management, designated deicing and vehicle washing areas, water filtration systems, biological treatment, and runoff capture, among others beyond compliance standards.	• CDA SAM: Stormwater Design, Stormwater Management • LSAG: Stormwater Management
NR 5 Wildlife Hazard Management	A percent decrease in total annual number of wildlife strikes per 10,000 aircraft movements relative to a baseline.	• GRI: AOSS
NR 6 Heat Island Reduction	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, low solar reflectance and high albedo building and paving materials, increased vegetation and green roofing, and increased shade and covering.	• LSAG: Heat Island Reduction • LEED: Heat Island Reduction • CDA SAM: Landscape and Exterior Design to Reduce Heat Islands • ISI CR2.5: Manage Heat Island Effects • PANYNJ: Site IS-14
Economic Performance (EP)		
EP 1 Socially Responsible Financial Investment	Percent of total significant investment agreements and contracts that include social and environmental stipulations or that have undergone social and environmental screening.	• GRI – Airport Supplement • STARS: Investment • Adapted by ACRP research team
EP 2 Airport Financial Viability	Operating cost vs. operational performance unit. For commercial airports performance is measured per enplanement. Cargo airports measure costs per cargo ton; and general aviation airports track change in operating cost over performance period. This metric excludes non-operating costs such as debt service and depreciation.	• FAA Form 127 • *ACRP Report 19A:* Airport Key Performance Indicators: Financial
EP 3 Risk Management	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, risk assessment procedures and risk management planning for a variety of airport projects and operations, transactional safeguards to minimize corruption, crisis preparedness and response planning, and enhanced risk training, among others.	• GRI – 1.2 • ISI: Climate & Risk • ACRP research team
EP 4 Regional Economic Contributions	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, assessing the impact of sustainability initiatives; community needs assessment; low-income areas, evaluating benefits and impacts on the region; local jobs and recruiting, payroll disclosure, and economic activity.	• GRI • ACRP research team

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Table 4-2. (Continued).

Sustainability Activity	Performance Metric	Sources
Human Well-Being (HW)		
HW 1 Airport Noise Compatibility	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, noise exposure mapping, incompatible land use areas, landside planning for non-aircraft noise, construction noise abatement plans, and local area complaint mechanism.	• LSAG: Noise Pollution Reduction, Exterior Noise & Acoustical Control • CDA SAM: Noise Transmission, Construction Noise & Acoustical Quality
HW 2 Workplace Air Quality	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, achieving ASHRAE standards, complaint mechanisms, air quality studies, and contracting sustainability certified custodial service providers, among others.	• LSAG: Indoor Environmental Quality • LEED: Indoor Environmental Quality • CDA SAM: Indoor Environmental Quality • STARS: Indoor Air Quality • GRI: AOSS
HW 3 Light Pollution	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, light level assessments, light pollution planning, siting and design considerations, and light shielding, among others.	• LEED: Light Pollution Reduction • CDA SAM: Light Pollution Reduction • ISI QL2.3: Minimize Light Pollution • PANYNJ: Site IS-15
HW 4 Chemicals & Hazardous Materials	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, chemical storage and labeling protocols, chemical inventories, enhanced employee education, spill protocols, and Environmental Management Systems for tracking and reporting.	• LSAG: Indoor Chemical & Pollutant Source Control • LEED: Green Cleaning • CDA SAM: Sustainable Sites • STARS: Hazardous Waste
HW 5 Passenger Experience	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, natural lighting, effective signage and maps, satisfaction surveys, concession options, proximity to drinking water, and aesthetic enhancements, among others.	• GRI: Product and Service Labeling • LSAG: Social Responsibility • LEED: Indoor Environmental Quality • CDA SAM: Indoor Environmental Quality
HW 6 Employee Development	Percent of airport employees who receive XX or more documented hours of elective training (Internal, External [on-site], External [off-site], and On-Line) per year by labor category.	• GRI • STARS: Human Resources • Adapted by ACRP research team
HW 7 Labor Relations	Average percent annual employee retention rate across all labor categories.	• GRI • STARS: Human Resources
HW 8 Diversity & Equal Opportunity	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, mentoring, counseling, peer support, affinity programs to support under-represented employees, equal pay programs, diversity recruitment, partnerships with local/regional workforce development organizations. Performance metrics could include minority employment percentage relative to regional minority employment percentage, among others.	• GRI • STARS: Diversity & Affordability
HW 9 Occupational Health & Safety	Percent of total workforce represented in formal joint management–worker health and safety committees that help monitor and advise on occupational health and safety programs: mechanism to alert airport leadership regarding health and safety risks.	• GRI

Table 4-2. (Continued).

Sustainability Activity	Performance Metric	Sources
HW 10 Universal Design	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, universal design elements and passenger/employee safety in new construction and retrofit projects, opportunity assessments for design upgrades, and enhanced safety and accessibility features, among others.	• LEED for Neighborhood Development: Visitability and Universal Design • Greenroads: Access & Equity AE1 Safety Audit • ACRP research team
Design & Materials (DM)		
DM 1 Sustainable Design & Operation	Percent of total building space that achieves a self or 3rd party verified green certification – e.g., LEED®, Green Globes, ENERGY STAR, etc.	• LSAG: Innovation in Planning & Design • CDA SAM: LEED Certified Project • STARS: Building Operations & Maintenance
DM 2 Material Selection	Percent of total materials (as a portion of total material cost) sourced for any retrofit or expansion project consisting of environmentally preferable construction materials (i.e., recycled content, bio-based content, durable, local, rapidly renewable content, low embodied energy content, energy efficient, water efficient, green certified, reused on-site).	• ISI RA1.3: Use Recycled Materials • PANYNJ: Material Multiple Credits • LEED: Materials & Resources
DM 3 Construction Waste Diversion	Percent of total construction & demolition waste diverted from a landfill or incinerator, in tons or cubic yards.	• STARS: C&D Waste Diversion • PANYNJ: Construction IC-6 • FAA Recycling, Reuse and Waste Reduction at Airports
DM 4 Construction Impacts Mitigation	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, construction stormwater and air pollution control planning, inspection and maintenance planning, erosion and sediment control, dust suppression, vehicle washing, and equipment idling, among others.	• PANYNJ: Construction IC-1 • CDA SAM: Construction Activity Pollution Prevention
DM 5 Sustainable Site Selection	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, siting assessments and mapping, siting action plans, rehabilitation and use of contaminated sites, and wetland maintenance, among others.	• PANYNJ: Site Multiple Credits • LSAG: General Planning • LEED: Sustainable Sites • CDA SAM: Brown Field Redevelopment
DM 6 Local Sourcing	Percent of annual procurement contracts that include stipulations prioritizing the acquisition of products, materials, and services from businesses located within a certain distance from the airport.	• STARS: Operations Credit 6: Purchasing • ISI RA1.4: Use Regional Materials • PANYNJ: Material Section: IM-2 • Adapted by ACRP research team
DM 7 Recycled & Bio-based Content	Percent of applicable products and materials purchased made at least partially from recycled or bio-based content, as a portion of total annual (or project) cost. Excludes fuels and electricity. Higher points may be available for sustainability harvested/generated products (e.g., Forest Stewardship Council (FSC) certified paper).	• GRI: Environment Indicator EN2 • CDA SAM: Recycled Content • LSAG: Recycled Content • STARS: Purchasing • ISI RA1.3: Use Recycled Materials • PANYNJ: Material Section IM-1 • Adapted by ACRP research team
DM 8 Low-Toxicity Materials	Percent of applicable products and materials purchased that are third-party certified as low-toxicity, (e.g., EPEAT or Green Seal) as a portion of total annual (or project) cost.	• LSAG: Low-Emitting Materials • STARS: Multiple Credits • PANYNJ: Part 2: Material Section IM-6 • Adapted by ACRP research team

(continued on next page)

Table 4-2. (Continued).

Sustainability Activity	Performance Metric	Sources
DM 9 Environmentally Preferable Purchasing	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, procurement requirements, product certification, contract tracking, and employee training, among others.	• GRI: Product Responsibility • LEED: Material & Resources • LSAG: Materials & Resources • STARS: Purchasing: Multiple Credits • ISI RA1.2: Sustainable Procurement
Engagement & Leadership (EL)		
EL 1 Airport-wide Stakeholder Engagement	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, formal partnerships and standing committees with internal stakeholders.	• STARS: Public Engagement • PANYNJ: Site IS-1 • LSAG: Sustainability Planning and Progress Meetings • CDA SAM: Planning
EL 2 Public Outreach	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, community outreach and informational programs, internships, etc.	• STARS: Public Engagement
EL 3 Community Stewardship	Percent of airport employees that partake in 1 or more airport-sponsored community service projects or events per year; Tracking total hours of community service relative to total workforce hours.	• STARS: Community Service • Adapted by ACRP research team
EL 4 Integrated Sustainability Management	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, integrating all sustainability plans (waste, water, energy, etc.) into airport Master Plan, incorporating sustainability into planning procedures and general reporting, appointing a sustainability coordinator, formal public reporting of sustainability, including sustainability metrics within environmental management system tools, and establishing a series of sustainability guidelines across airport functions.	• STARS: Coordination & Planning • PANYNJ: Site IS-1 • LSAG: Sustainability Planning and Progress Meetings • CDA SAM: Planning
EL 5 Airport User Engagement & Outreach	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, communication, marketing, and education campaigns for sustainability at the airport, at home, and in the community.	• GRI • LSAG: Community Education • STARS
EL 6 Tenant & Vendor Sustainability	Percent of vendor, concession, and tenant contracts that include clauses that address sustainability, social, and/or environmental concerns.	• GRI

Source: ICF, 2013

GRI: Global Reporting Initiative

STARS: Sustainability Tracking, Assessment & Rating System

ISI: Institute for Sustainable Infrastructure Envision™

PANYNJ: Port Authority of New York and New Jersey

LEED: Leadership in Energy and Environmental Design

CDA SAM: Chicago Department of Aviation Sustainable Airport Manual

LSAG: Los Angeles World Airports: Sustainable Airport Planning, Design and Construction Guidelines

[1] Scope 1 GHG emissions are emissions that occur from sources owned and controlled by the airport, such as airport fleet vehicles. Scope 2 GHG emissions are emissions that occur from purchased electricity and steam.

[2] Scope 3 GHG emissions are emissions that occur as a result of the activities of the airport, but occur at sources owned or controlled by another organization (excluding purchased electricity and steam, which are Scope 2 GHG emissions). An example of Scope 3 emissions is emissions from landfilled waste. The emissions occur due to the decomposition of waste generated by the airport at a landfill, but the airport does not own the landfill.

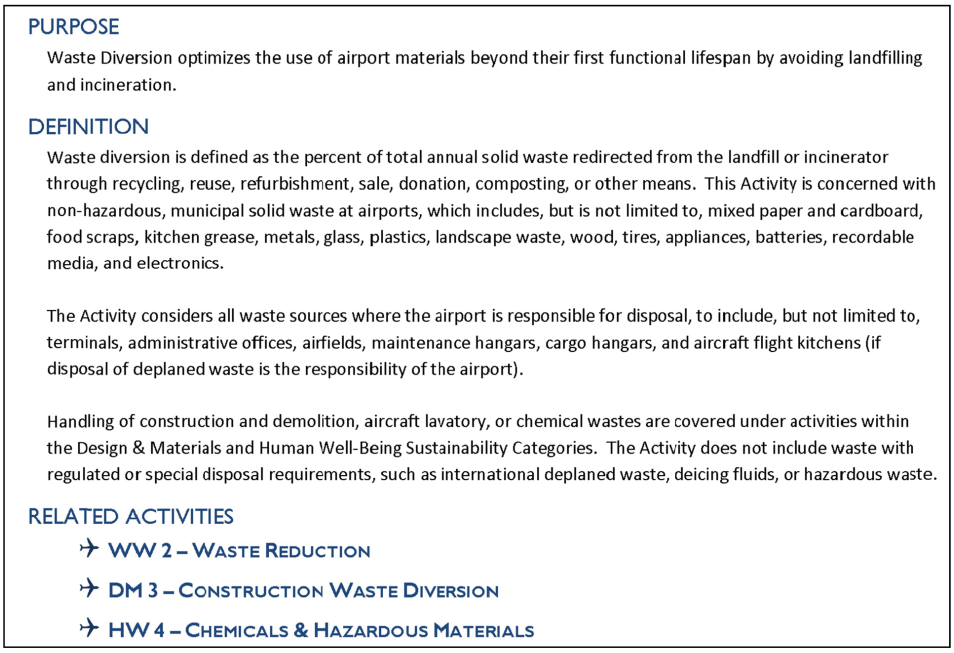
The research team prepared definitions for each of the 50 sustainability activities to articulate the scope and extent of each. The definitions include:

- A purpose statement that explains each activity's value and provides a rationale for why the activity was included in the Prototype Rating System.
- A definition that presents a general description of each sustainability activity, defines key terms, and outlines the type of airport functions that fall within the scope of the activity.
- A description of primary related activities that describes how the sustainability activity is related to others and describes areas of overlap or shared themes.
- A description of the performance metric (also included in Table 4-2)
- Examples of supporting initiatives to provide examples of actions from the SAGA database and other sources that could lead to improved performance within the sustainability activity.

The definitions provide the basic information needed to develop sustainability activity content for the Rating System User Guide. As an example, Figure 4-10 shows the purpose, definition, and related activities taken from the Waste Diversion User Guide Excerpt (see Figure 4-4). These definitions complement the User Guide excerpts, which provide examples of the full User Guide content for five example activities (see Appendix D). Definitions for all 50 sustainability activities are provided in Appendix E.

Structural Component 4: EONS Icons

The design specifications called for the rating system to adhere to the EONS framework. Implementing sustainability activities supports EONS. For example, consuming less energy supports natural resource conservation by lessening the environmental impact of fossil fuel extraction and combustion. However, a sustainability activity's support of EONS is not necessarily exclusive to a single aspect of the EONS framework. Consuming less energy also supports economic performance because fewer dollars are spent purchasing energy from a supplier. To accommodate the possibility that an activity may support more than one aspect of EONS, the



PURPOSE

Waste Diversion optimizes the use of airport materials beyond their first functional lifespan by avoiding landfilling and incineration.

DEFINITION

Waste diversion is defined as the percent of total annual solid waste redirected from the landfill or incinerator through recycling, reuse, refurbishment, sale, donation, composting, or other means. This Activity is concerned with non-hazardous, municipal solid waste at airports, which includes, but is not limited to, mixed paper and cardboard, food scraps, kitchen grease, metals, glass, plastics, landscape waste, wood, tires, appliances, batteries, recordable media, and electronics.

The Activity considers all waste sources where the airport is responsible for disposal, to include, but not limited to, terminals, administrative offices, airfields, maintenance hangars, cargo hangars, and aircraft flight kitchens (if disposal of deplaned waste is the responsibility of the airport).

Handling of construction and demolition, aircraft lavatory, or chemical wastes are covered under activities within the Design & Materials and Human Well-Being Sustainability Categories. The Activity does not include waste with regulated or special disposal requirements, such as international deplaned waste, deicing fluids, or hazardous waste.

RELATED ACTIVITIES

- WW 2 – Waste Reduction
- DM 3 – Construction Waste Diversion
- HW 4 – Chemicals & Hazardous Materials

Figure 4-10. Example sustainability activity definition from the waste diversion User Guide excerpt.

Prototype Rating System incorporates EONS *icons*, which are symbols that identify the major aspects of the EONS framework that apply to an entire sustainability category (i.e., a set of activities supporting a similar sustainability theme).

The EONS icons incorporate Harvey Balls that indicate the relative impacts of the category on each aspect of EONS. Harvey Balls are round ideograms used for visual communication of qualitative information. Commonly used in comparison tables to indicate the degree to which a particular item meets a particular criterion, Harvey Balls typically appear as follows:

In the waste and water sustainability category, for example, the EONS icons for "O" and "N" are more complete than the icons for "E" or "S," which indicates that while waste-reducing activities are important economically and socially, they are going to be most relevant to both operational efficiency and natural resource conservation (Figure 4-11). The symbols are intended to provide a comparison among the four aspects of EONS and do not represent a truly quantitative or measurable difference. They are designed to convey the crosscutting nature of EONS with the categories and help airports ensure they are diversifying their efforts across the EONS spectrum by pursuing activities from multiple categories.

Within the User Guide, each sustainability category section will begin with a discussion of how each aspect of EONS pertains to that category. (See Appendix C for an annotated outline of the User Guide.) Using the human well-being category as an example, there would be a discussion about how pursing sustainability performance across the activities within the category could impact positively the economic viability and operational efficiency of the airport as well as embody natural resource conservation and social responsibility.

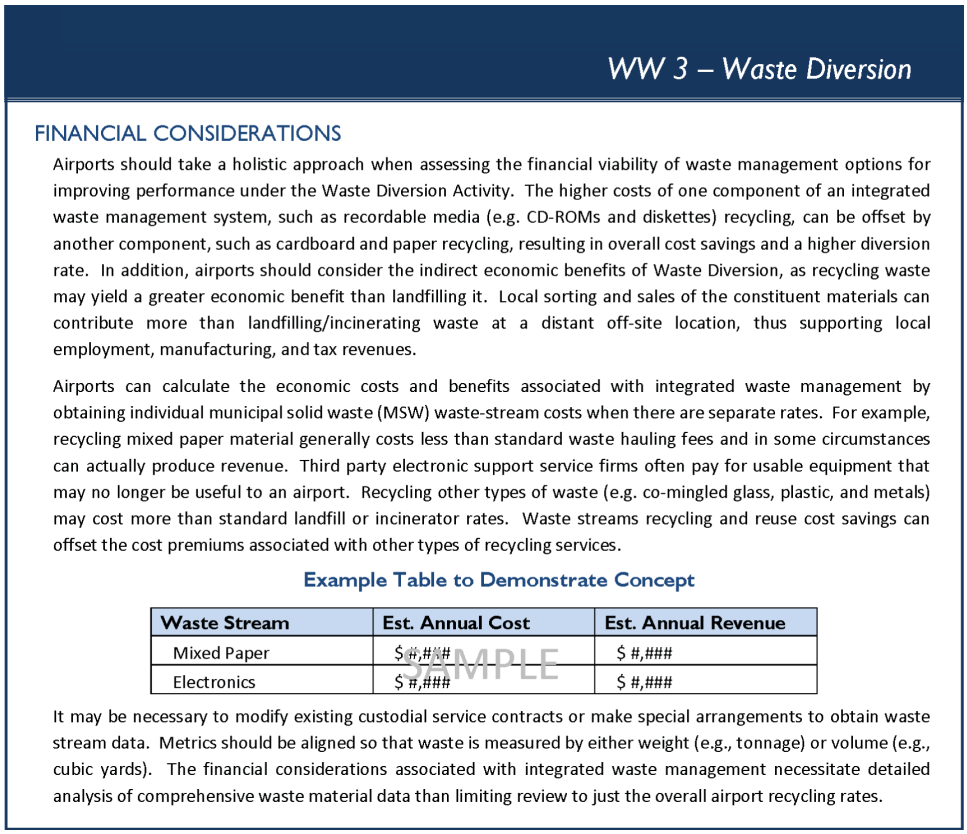
A Focus on Financial Considerations. Stakeholder outreach and discussions with the ACRP panel emphasized that economic considerations are particularly likely to span across all sustainability activities. Recognizing this need, the research team recommends incorporating financial considerations discussions into the body of the sustainability activity sections of the User Guide (see Figure 4-12). The financial considerations discussions focus on important financial concepts that airports should consider when pursuing each activity.

Structural Component 5: Innovation

The research team recognized that the Prototype Rating System could not capture every way in which an airport could demonstrate sustainability performance, and that the state of the sustainability field advances faster than the rating system could be updated. The performance action evaluation type (Evaluation Type 2), for example, may present some limitations on airport scoring because it does rely on a preset list of actions. These actions are high-level and designed to incorporate many smaller action types; however, because technologies and best practices evolve constantly, they may not capture the latest approaches toward achieving sustainability.

Source: ICF, 2013

Figure 4-11. Example EONS icons.



WW 3 – Waste Diversion

FINANCIAL CONSIDERATIONS

Airports should take a holistic approach when assessing the financial viability of waste management options for improving performance under the Waste Diversion Activity. The higher costs of one component of an integrated waste management system, such as recordable media (e.g. CD-ROMs and diskettes) recycling, can be offset by another component, such as cardboard and paper recycling, resulting in overall cost savings and a higher diversion rate. In addition, airports should consider the indirect economic benefits of Waste Diversion, as recycling waste may yield a greater economic benefit than landfilling it. Local sorting and sales of the constituent materials can contribute more than landfilling/incinerating waste at a distant off-site location, thus supporting local employment, manufacturing, and tax revenues.

Airports can calculate the economic costs and benefits associated with integrated waste management by obtaining individual municipal solid waste (MSW) waste-stream costs when there are separate rates. For example, recycling mixed paper material generally costs less than standard waste hauling fees and in some circumstances can actually produce revenue. Third party electronic support service firms often pay for usable equipment that may no longer be useful to an airport. Recycling other types of waste (e.g. co-mingled glass, plastic, and metals) may cost more than standard landfill or incinerator rates. Waste streams recycling and reuse cost savings can offset the cost premiums associated with other types of recycling services.

Example Table to Demonstrate Concept

Waste Stream	Est. Annual Cost	Est. Annual Revenue
Mixed Paper	$#,###	$ #,###
Electronics	$ #,###	$ #,###

SAMPLE

It may be necessary to modify existing custodial service contracts or make special arrangements to obtain waste stream data. Metrics should be aligned so that waste is measured by either weight (e.g., tonnage) or volume (e.g., cubic yards). The financial considerations associated with integrated waste management necessitate detailed analysis of comprehensive waste material data than limiting review to just the overall airport recycling rates.

Figure 4-12. Example financial considerations discussion from User Guide excerpt.

To account for this, the research team recommends including an *innovation mechanism* similar to LEED that would allow airports to claim credit for new, innovative, or under-represented practices that still fulfill the objective of the sustainability activity. The rating system should award airports for exemplary performance that goes beyond what is included in the rating system. Within the scoring framework, airports can achieve up to a certain number of innovation points per innovative practice in each sustainability category added to the category score. The research team recommends including a documentation requirement in the rating system such that airports have to demonstrate that an innovation point was awarded for one of the following criteria:

1. The airport achieves significant, measurable environmental performance that exceeds the highest threshold of an existing credit.
2. The airport implements new, extraordinary, unique, groundbreaking, or uncommon outcomes, policies, and practices not addressed in the existing system.
3. The airport overcomes significant problems, barriers, or limitations to achieving sustainability.
4. The airport deploys sustainable solutions that are scalable and/or transferable across sectors, opening up new opportunities.

Methodology. The research team reviewed how existing rating systems consider and incorporate innovation. The existing systems award innovation points for airports that either (1) achieve significant, measurable environmental performance that exceeds the highest threshold of an existing credit (LEED, STARS, ISI, LSAG, CDA SAM, PANYNJ) or (2) implement new, extraordinary, unique, groundbreaking, or uncommon outcomes, policies, and practices not

addressed in the existing system (LEED, STARS, ISI, CDA SAM). Across these systems, points are added at either the category level or at the system level (i.e., added to the overall score), and points may be limited to a certain number (e.g., six points) or a percentage (e.g., up to 5 percent of the total category points). The research team recommends incorporating a mix of the innovation requirements from each of the rating systems, as described above.

Establishing a Rating

The research team also developed a scoring framework to provide a mechanism for establishing a rating. The basic construct of the scoring framework is simple. Airports would score points for achieving levels of performance within each sustainability activity. Points earned across all sustainability activities would be summed, divided by the total points possible across all sustainability activities, and multiplied by 100 to determine a percent-based overall score.

For example, if an airport earns 135 points out of 180 total possible points across all sustainability activities, then its overall score is 75 percent, as follows:

$$\text{Overall Score} = \frac{\text{Total Points Earned}}{\text{Total Points Possible}} = \frac{135}{180} = 0.75, \text{ or } 75\%.$$

To develop this scoring framework, the research team reviewed existing rating systems and assessed how each awarded points for activities and how those points would sum to an overall sustainability rating. (For a list of ratings systems reviewed, see the section "Drawing from Existing Rating Systems to Develop Categories, Activities, Metrics and Actions" in this chapter.) The details of how points are earned, how and why the total points possible can change from airport to airport, and the rating levels assigned to scores are described in the sections titled "Sustainability Activity Scoring," "Applicability, Materiality, and the Scoring Framework," and "Rating Levels," respectively.

Sustainability Activity Scoring

Many existing rating systems score their activities using one or both of the following scoring frameworks:

- An increasing number of points are awarded as performance increases relative to a metric (usually using percentage-based measures).
- Single points (or small sets of points) are awarded for completing a specific action (binary scoring framework).

The scoring framework used with the Prototype Rating System incorporates both of these scoring approaches: The percentage-based scoring framework applies to performance metrics (Evaluation Type 1), while the binary scoring framework applies to performance actions (Evaluation Type 2). **Please note: The Prototype Rating System offers a scoring framework only. Determining appropriate performance thresholds, assigning points to threshold levels, and determining the appropriate number of points available for each sustainability activity would occur under future work.**

Under Evaluation Type 1, airports measure performance relative to a single, broad performance metric such as percent solid waste diverted. Percent-based thresholds (e.g., 10 percent or 20 percent) indicate increasing levels of performance for the performance metric, and points are associated with each performance threshold. Higher performance thresholds demonstrate increasingly improved performance and are worth more points (Table 4-3).

Table 4-3. Evaluation Type 1 (performance metric) point allocation example.

Performance Level	Take-Off	Ascend	Cruise	Soar
Threshold	10%	20%	30%	40%
Points	1	2	3	4

Source: ICF, 2013
Note: Performance-level titles and values are illustrative only.

Under Evaluation Type 2, airports measure performance by completing actions from a menu of performance actions. Performance actions are measures the airport could take to improve performance within the sustainability activity (e.g., "prepare a vulnerability assessment" for the sustainability activity climate change adaptation). These actions are binary in nature, meaning an airport either has or has not taken the action. Points are earned by performing a greater number of actions within a sustainability activity. Higher performance thresholds reflect a greater number of actions the airport must fulfill to receive points (Table 4-4).

Tables similar to those presented in Tables 4-3 and 4-4 would be provided for each sustainability activity to indicate the number of points earned for achieving levels of sustainability performance (see Figures 4-10 and 4-11). A maximum of four performance levels would be provided within each sustainability activity, but not all sustainability activities would have four performance levels. The number of levels would depend on the nature of the activity. Points would be awarded by level, with the highest points awarded for superior performance. For illustration purposes, performance levels could include "Take-Off," "Ascend," "Cruise," or "Soar," which mirror the category and overall rating levels (see the section titled "Rating Levels").

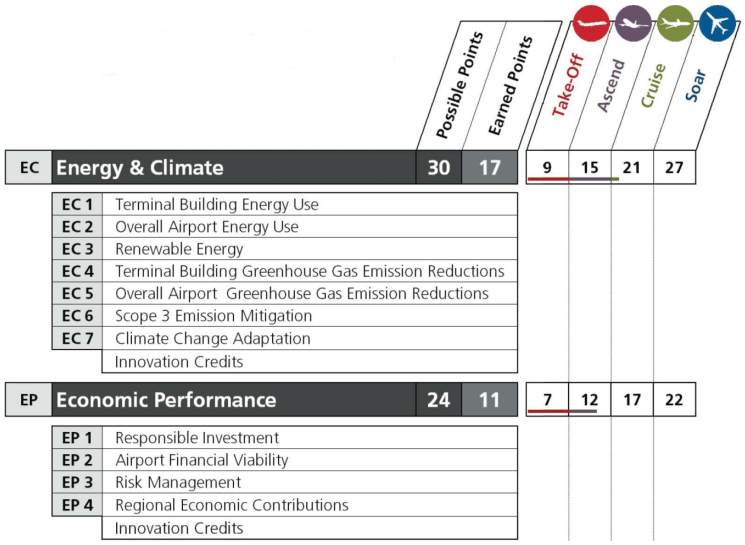
Prerequisites. In some cases, performance actions or performance metrics might be deemed to be strategic or necessary for any truly sustainable airport activity. Therefore, these actions or metrics would be considered *prerequisites*, and be required to achieve any points for that sustainability activity. In many cases, prerequisites would likely fall at the performance threshold of the Take-Off performance level. Prerequisites preserve the integrity of the rating system by requiring that minimal levels of performance be met where appropriate.

Prerequisites would likely be incorporated primarily into Evaluation Type II, wherein an action would be required to achieve a performance threshold and would be identified as such in the list of performance actions. For example, a prerequisite for the Take-Off performance level for the airport noise compatibility sustainability activity might be to "develop a noise exposure map." Thus, to meet the performance threshold to achieve the Take-Off performance level for this sustainability activity, an airport would need to develop a noise exposure map and complete two performance actions. Similarly, prerequisites could be developed and applied where appropriate to the thresholds for the Ascend, Cruise, and Soar performance levels (see Figure 4-13 for an example). The determination of prerequisites would be detailed in future efforts.

Table 4-4. Evaluation Type 2 (performance actions) point allocation example.

Performance Level	Take-Off	Ascend	Cruise	Soar
Threshold	2 Actions	4 Actions	6 Actions	8 Actions
Points	1	2	3	4

Source: ICF, 2013
Note: Performance-level titles and values are illustrative only.



Source: ICF, 2013
Note: Example scores are for illustration purposes only.

Figure 4-13. Example category-level scoring.

Category-Level Scoring

Based on feedback from stakeholder outreach to the airport industry, medium and smaller airports are also likely to use the rating system primarily as guidance for starting, improving, or expanding a sustainability program rather than for rating overall performance. The flexibility that this offers is a distinguishing feature of the Prototype Rating System. Stakeholders also recommended that the rating system allow for scoring at the category level in addition to the activity and system level so that airports could gauge their performance at various levels of adoption and progress smoothly toward a fuller adoption of the system over time.

Figure 4-13 demonstrates how the points across all activities within a category could be summed and given a rating similar to the activity performance levels (see "Sustainability Activity Scoring") and overall rating levels (see "Rating Levels"). A possible number of points is defined for each category and thresholds are given for obtaining a particular rating at the category level.

Applicability, Materiality, and the Scoring Framework

A key finding in the stakeholder outreach process was that the rating system needed to accommodate differences in airport characteristics. Not all sustainability activities will be applicable or material to all airports. Materiality is used to describe whether a sustainability activity is sufficiently applicable that it should be included within an airport's rating. As an example, the construction waste diversion sustainability activity would not be material to an airport if no construction occurred during the year when the rating was applied. Another example is passenger experience sustainability activity, which would not be material to airports that are not geared toward passengers, such as cargo airports. Generally, the broad nature of sustainability activities in the Prototype Rating System would accommodate most airports, lessening the need for applying a materiality judgment to an activity.

The scoring framework incorporates materiality by indicating that airports should identify those sustainability activities that are material to their infrastructure, operations, and management when preparing a rating. If sustainability activities are not material, they should be excluded from the rating and the points associated with that sustainability activity should be deducted from the total points possible.

Table 4-5. Example rating levels and tiers.

Rating Level	Tier Threshold *
Soar	85%
Cruise	65%
Ascend	45%
Take-Off	25%

Source: ICF, 2013
Notes: Rating level terms and tier values are illustrative only.
*Percentage of total possible points.

If, for example, the total points possible across the entire rating system is 180 points and several sustainability activities totaling to 30 points are deemed immaterial to an airport, those 30 points would be subtracted from the total points possible, yielding a *revised* total possible points of 150. In this example, if the airport earns 135 points, its overall score would be 90 percent (135/150 = 0.90, or 90 percent).

Incorporating materiality makes the Prototype Rating System more flexible and able to accommodate different airport types, roles, and sizes, because airports select those sustainability activities that are material to their operations to include in the rating. Materiality should be an objective determination based entirely on whether an activity actually occurs at the airport. For those airports that self-determine their ratings, the determination of materiality would be left entirely to the airport. This is not a concern if the airport uses the rating system primarily for internal evaluation and improvement; however, if airports choose to compare their ratings with other airports, those airports that self-determine their ratings should be encouraged to share the total points considered in determining their overall score so that exceptions made due to materiality considerations are transparently presented. Doing so would lessen concerns that airports may improperly apply materiality to determine more favorable ratings while maintaining a rating system that does not require third-party certification or verification. Stakeholder feedback indicates that many airports may likely use the rating system for internal evaluation purposes only and that interest in external certification and verification may grow in time. These concepts are explored further in the section titled "Viability of the Rating System."

Rating Levels

Once an overall score is established, it can be used to determine a rating level. As discussed in the previous sections, the overall score is calculated as a percentage of total points earned out of total points possible across all sustainability activities. An airport's overall score value can be used to determine a rating using a rating scheme similar to that presented in Table 4-5, wherein the overall score falls within a rating tier that indicates the minimum number of points required to reach a rating level. For example, using the information provided in Table 4-5, an airport that earns a score of 75 percent would receive a "Cruise" rating. **Please note: The rating names—"Soar," "Cruise," "Ascend," and "Take-Off"—and the tier levels are included for illustrative purposes only in this Prototype Rating System. The rating levels and tiers would need further development in future work.**

4.4 Viability of the Rating System

Introduction

The research team also assessed the viability of industry-wide adoption of a completed draft Airport Sustainability Rating System and voluntary certification program. To do so, the research team considered the implementation options available for the rating system, likely users of the

rating system, what entity might be responsible for implementing and maintaining the rating system, and the functions and costs needed for implementation and maintenance.

The remainder of this chapter discusses the following points:

- Purpose and likely use of an airport sustainability rating system.
- Rating system development and implementation options—including certification and verification options.
- Rating system viability.
- Summary of viability conclusions.

Purpose and Likely Uses of an Airport Sustainability Rating System

A sustainability rating system is a tool for evaluating and driving sustainability performance through a system of best practices and recognition. Well-designed rating systems can facilitate meaningful comparisons over time via a common set of measurements; incentivize continual improvement through recognition and scoring; and encourage the identification and sharing of best practices. In the context of ACRP Project 02-28, the purpose of the airport sustainability rating system would be to encourage airports to pursue sustainability, measure and track their internal performance across standardized metrics, and possibly to benchmark their progress against other airports in the United States in the future.

A collection of standard, accepted guidance, the rating system would serve as a resource with state-of-the-art sustainability best practices and a mechanism for evaluating performance. The rating system would also enable airports to improve relations with the community and customers by communicating sustainability successes both nationally and to local stakeholders (e.g., travelers, employees, airlines, and community members), educating stakeholders, and justifying and highlighting the importance of sustainability management. Tracking performance more closely could also help facilitate enhanced environmental compliance processes.

The Prototype Rating System would provide a framework for internal sustainability performance evaluation and tracking through a common set of activities, metrics, and actions, plus a scoring framework to support optional external comparisons. Similar airports that opt to make external comparisons could do so for both competitive purposes and to learn from and benchmark against other airports. The rating system would provide participating airports the flexibility to use it in the way that best suits their needs and resources without requiring high performance across all activities. Because performance could be scored and tracked at the activity and category levels, in addition to the system (i.e., airport-wide) level, airports could gauge their performance at whichever level of adoption is most appropriate for them, then progress easily toward a fuller adoption over time.

The flexibility built into the rating system also could allow selective prioritization of the activities and categories. Airports could choose which activities and categories most resonate with their stakeholders and adopt activities on a case-by-case basis, or pursue a more comprehensive approach (i.e., implementing a complete set of activities within a category or the entire rating system). The airports could gauge their progress based on a performance baseline before they adopt the rating system. Eventually, with a mature governance structure in place, airports could potentially compare their performance with other airports.

Potential Users

Possible users of an airport sustainability rating system include commercial service, cargo service, reliever, and general aviation airports; however, use of the rating system would likely vary among large, medium, and small airports. Based on stakeholder feedback, larger airports with

full-time dedicated environmental staff have more available resources to pursue sustainability ratings. The larger airports could use the rating system to track performance internally and gauge performance against other, similarly large airports. Alternatively, airports may wish to supplement their existing programs using guidance from specific sustainability categories, then track and compare performance, if desired, given that the rating system allows for scoring at the sustainability category level. For example, a large airport that has a well-established environmental program may choose to focus on its performance in categories such as human well-being or economic performance in order to pursue other less-developed components of sustainability. As a group, larger airports are more likely and capable of pursuing a greater number of sustainability categories within the rating system, which may translate to several categories or the entire system as a whole. However, some of the larger airports have indicated that they would likely first use their own independently developed ratings systems, and a few airports expressed concerns about additional performance tracking.

Based on feedback from stakeholder outreach to the airport industry, medium and smaller airports are also likely to use the rating system; however, they may use it primarily as guidance for starting, improving, or expanding a sustainability program rather than rating overall performance. Such airports could take advantage of the rating system's best practices and metrics. The rating system could help these airports evaluate and prioritize sustainability activities as it relates to their planning, construction, and daily operations. For example, smaller airports may target certain sustainability activities relevant to their operations, and then expand their efforts to other activities in the same category. Because performance can be scored and tracked at the activity, category, and rating system (i.e., airport-wide) levels, airports could gauge their performance at various levels of adoption and progress smoothly toward a fuller adoption of the system over time.

Although stakeholders and the airport community remain divided on whether an airport sustainability rating system should be used for internal purposes only or for external use and comparison, the effect this decision will have on certification and verification options is clear (Table 4-6). Those who favor internal use of the tool are likely to advocate for a rating system that functions primarily as a best practices manual or guidance, while those who favor external use are likely to favor more rigorous certification and verification procedures. Many stakeholders favor internal use and believe that this lower-cost option will keep the rating system accessible to all airports and drive adoption of the tool. Those who favor external use believe a more formal certification and verification process—with associated administration and governance—is critical for credibility.

Rating System Development and Implementation Options

This section presents the steps that would be needed to develop draft and final versions of the airport sustainability rating system as well as potential implementation options.

Rating System Implementation Options

ACRP Report 119 concludes Phase II of the development process for the Prototype Rating System, which covers the scope of work for ACRP Project 02-28. The next steps would be for the airport community to determine whether to move forward with preparing a full draft rating system and pilot the draft rating system at airports. Following pilot projects and any revisions that would come out of the pilot effort, when the rating system is ready for release to the airport industry there would be a need for a permanent governance organization. The governance organization would be responsible for the release, administration, and governance of the rating system. The level of administration and governance required would depend on the robustness

Table 4-6. Certification and verification options—definitions.

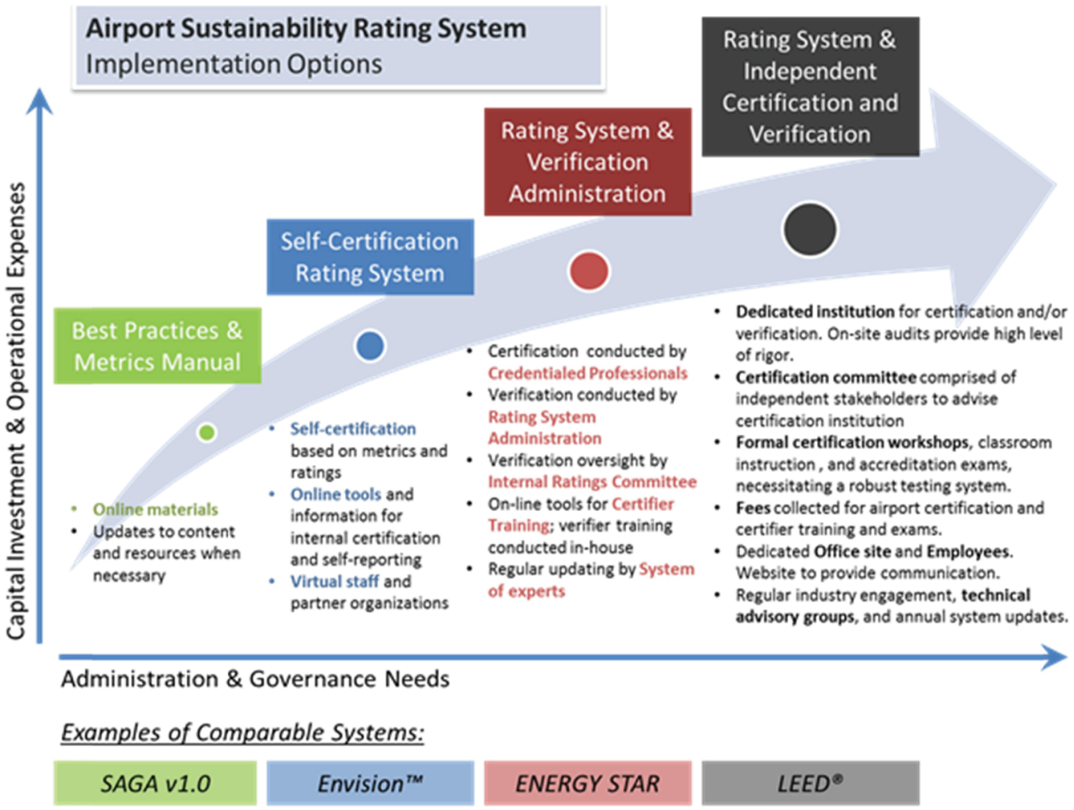
Certification & Verification Options	
First-party certification	Often referred to as self-certification or self-determination: internal determination that the airport meets the requirements of a rating level made by the same airport staff that is responsible for compiling the data and documentation use to determine the rating level.
Second-party certification	A determination of the rating level made by at least partially independent staff with an appropriate understanding of rating system requirements. If made by internal staff, they are other than those who are responsible for compiling the data and documentation used in support of the rating level (i.e., at least one step removed from developing the data that supports the rating). Second-party certification also can be conducted by a peer organization, for example, by staff with appropriate expertise from another airport or even within a network of airports.
Second-party verification	Verification of the rating determination for the airport confirming that the data and documentation used to determine the rating level are accurate and complete and that the resulting rating is appropriate and made by individuals at least one step removed from the development of the data and the determination of the rating.
Third-party certification	External determination of the rating level made by an organization that is not affiliated with the airport.
Third-party verification	Verification of the determination of the rating for the airport confirming that the data and documentation used to determine the rating level are accurate and complete, and that the resulting rating is appropriate and made by an independent organization that is not affiliated with the airport and is free from real or potential conflict of interest in its determination.

of certification and verification procedures that would accompany the rating system. Potential administrative and governance functions include:

- **Administrative Oversight.** Provide staffing, site, and ongoing program support functions.
- **Rating System Advisory Committees.** Obtain expert stakeholder input on a regular basis to maintain relevancy, optimize usage, and connect with the broader airport community.
- **Formal Rating System, Certification, and Verification Training.** Provide users with detailed information on scoring and certification requirements, and empower professionals by credentialing certifiers and verifiers.
- **Stakeholder Communication.** Identify, inform, and engage willing airport-industry participants.
- **Rating System Updates.** Solicit user feedback and stay ahead of changes in industry best practices and standards.

At a minimum, the governance organization would need to have a method to communicate with users and stakeholders, receive and respond to their suggestions, and issue updated versions of the rating system, most likely through an on-line platform. More active and well-resourced administration and governance could include trainings, professional credentialing to issue certifications, stakeholder working groups, procedures for verifying certifications, and collection of airport performance data to support benchmarking.

Assessing the viability of a rating system requires understanding the options for certifying and verifying a sustainability rating and thus the amount of administration and governance that would be required. Consideration would also need to be given to the current context for sustainability planning and the airport industry. More robust certification and verification procedures would require more administration and governance. Figure 4-14 presents four implementation options that fall along a spectrum of increasing system administration and governance needs,



Source: ICF, 2013

Note: The ISI Envision™ system is in the process of establishing a certification process to be performed by credentialed professionals.

Figure 4-14. Airport Sustainability Rating System implementation options.

as well as increasing capital investment and operational expenses. The options are described in detail after Figure 4-14. Each demonstrates a possible viable deployment option of the rating system, along with their respective certification and verification requirements. These should serve only as examples, and it is up to the industry to determine which option, or variation thereof, is most viable and appropriate.

Best Practices and Metrics Manual. The basic level of implementation would involve the distribution of the rating system as a sustainability guidance document that contains best practices, useful metrics, and evaluation techniques. Airports would utilize the manual to start, improve, or expand upon an internal sustainability program by pursuing as many performance actions and sustainability activities as feasible given the airports' needs and resources. This option involves minimal investment and operational expenses beyond the initial development and piloting of the rating system. The rating system material would need to be available for distribution on-line, either through a dedicated website or through a partner entity sponsoring the system. Updates would occur as necessary. The SAGA website is a stand-alone tool and a comparable example of this level of governance; it only requires a host website and periodic updates to perform its useful function.

Self-Certification Rating System. The second-tier option would be a self-certification rating system in which airports would evaluate and certify their own performance based on the activities and metrics in the rating system, along with support from on-line resources for internal certification and self-reporting. Effectively, volunteers or shared employees from an airport

association would serve as a "virtual staff" to provide a minimal level of engagement or regular oversight functions, necessitating a minimal resource commitment as necessary to execute basic functions. To minimize related administrative cost, this option might leverage an existing organization's or association's expert committee skills to serve as an advisor group. Web-based educational resources with pre-recorded workshop and informational webinars from experts could teach airports how to utilize the rating system, and web-based forms and worksheets could be provided for airports to track their own sustainability progress. Communication could be done on a sustainability rating system website with announcements and updates on at least an annual basis, complemented by live updates at relevant conferences.

Limiting revisions to the ratings system to when they are necessary (once a year at most) would limit the need for labor and funding. Additionally, the advisory committee could potentially lead the effort, and they could serve as the conduit to incorporate broader stakeholder input. Envision™ and the LEED "alternative compliance pathway" for non–United States projects are examples for this level of governance. LEED alternative compliance paths provide additional options to LEED credits that address unique project needs and advancements in technology, specifically for projects outside the United States. For more information, see www.usgbc.org. It is acknowledged that Envision™ also is moving toward higher levels of governance. Both systems provide users a framework, and the implementers are responsible for establishing a performance level.

Rating System and Verification Administration. The third option provides a more rigorous mechanism to evaluate and verify airport performance and to benchmark against other airports. Certification is required by independently credentialed professionals (e.g., certified energy managers) to bring credibility to the rating. Self-ratings would be managed by internal airport review committees and submitted to the rating system administration entity for a formal verification of documentation. On-line tools and formal training would also be more necessary to standardize certifier and verifier knowledge and requirements.

Dedicated staff with a moderate level of engagement could maintain regular communication with stakeholders, liaison with an advisory committee, and maintain a website and data resources for airport participants. Such a system would require regular meetings of a dedicated advisory committee (or topic-specific committees) with a singular focus on improving the sustainability rating system. On-line training would be augmented by live classroom instruction and scheduled workshops on the sustainability ratings system. Live training could occur at conferences, airport venues, or at college and university campuses. Workshop curricula could be designed in advance and reviewed by the advisory committee. A monthly (or quarterly) listserv message would also be beneficial, and system updates could follow a formal cycle, soliciting feedback actively on the website or at conferences. The existing version of the rating system could incorporate these revisions without having to conduct an open, public review of the material. This option would provide for a durable program that could implement changes on a faster basis to refine the early rating system and to promote it.

The ENERGY STAR program is a comparable example of this level of governance. The rating system requires that an independent professional submit the certification package to ENERGY STAR for review. ENERGY STAR requires that the submitting individual have a specific set of credentials (e.g., be a registered architect or a professional engineer), but does not create unique credentialing or oversight of the training credentials.

Rating System and Independent Certification and Verification. The fourth option is the most intensive approach and would establish two fully independent organizations: one to administer the rating system, and one to administer the certification and verification duties. With the highest level of engagement, both dedicated staff and dedicated office space would be necessary to provide active responses to airport inquiries, host trainings and web meetings, and perform the administrative

duties required of the system. The staff and office would require sizable resources and substantial funding would be necessary for both the initial and ongoing operating costs.

In addition to all the considerations listed in the third option, this option might require multiple technical advisory groups that specialize in each of the eight categories and can provide more rigorous and informed guidance for updating the rating system and responding to stakeholder needs.

Such a system could have professionally accredited professionals who attend live workshops, study rating system content, and take proctored exams to assess their understanding. Additional costs for the testing could be covered by participant fees.

To achieve a higher level of recognition and participation, dedicated conference events at an existing conference (e.g., Airports Going Green) or a new annual conference could serve as a venue for industry to showcase new products and services as well as involve other green building affinity groups. At the highest level, a formal cycle could include complete version overhauls of the rating system every 3 years or so. Draft documents could be made available to airport stakeholders for their review, with comments tracked and recorded.

The USGBC's LEED system and the independently established Green Building Certification Institute (GBCI) are examples at the most resource intensive level of governance. USGBC maintains the sustainability rating system for buildings and the related guidance duties. GBCI runs the credentialing of professionals and the certification of the buildings themselves. This double-entity approach allows LEED to have a tailored system of professional knowledge via USGBC, plus the third-party validated testing for professionals and the buildings.

Rating System Viability

An airport sustainability rating system requires a thoughtfully planned and well-executed implementation approach. Airport adoption depends on stakeholder interest, on functional benefits gained by participation, and on existing alternative methods to rate sustainability performance. Governance also plays a key role. A permanent hosting organization would be needed for the rating system once it had completed the design phases. The market for these services would need to be assessed before making additional sizable investments to a rating system. This section covers these critical aspects of governance and their impact on viability by reviewing the governance requirements, providing implementation case studies from other rating systems, and assessing the demand for a rating system and certification/verification program.

Governance Responsibility

Once the rating system was ready for release to the airport industry, a need would arise for a permanent governance organization. The governance organization would be responsible for executing the administrative tasks described in the section titled "Rating System Development and Implementation Options," including the release, administration, and governance of the rating system. Given its research mission, it is assumed that ACRP would not be the ideal organization to assume the governance role. Existing airport trade associations may be potential candidates to host the system.

Governance Staffing and Costs

Each implementation option described in the "Rating System Development and Implementation Options" section is a viable approach for releasing the rating system and for providing certification and verification procedures. Funding would be necessary for ongoing administration and governance regardless of the option that is chosen; however, the costs associated with an

independent certification and verification process (the most intensive approach) would likely far exceed the costs of a Best Practices and Metrics Manual (the least intensive approach).

Table 4-7 provides an estimate of the costs associated with rating system governance and certification and verification procedures by function. For the purpose of this evaluation, the costs are broken into *capital investment* (what airports commonly refer to as capital expense or Capex) and *operational expenses* (also called Opex) for each of the implementation options. Capital

Table 4-7. Governance and certification/verification estimated capital expense and operational expense costs by component.

Governance/ Certification Function		Best Practices & Metrics Manual		Self-Certification Rating System		Rating System & Verification Administration		Rating System & Independent Certification and Verification	
		CE	OE	CE	OE	CE	OE	CE	OE
Governance	Administrative oversight	$25–50K	$5–15K	$25–75K	$5–15K	$50–150K	$250–750K	$250–750K	$250–750K
	Rating system advisory committee	$5–15K	$5–15K	$5–15K	$5–15K	$50–150K	$5–15K	$50–150K	$50–150K
	Practitioner rating system training	$150–300K	$5–15K	$250–750K	$5–15K	$250–750K	$50–150K	$0.5–1.5M	$50–150K
	Stakeholder communication	$25–75K	$5–15K	$25–75K	$5–15K	$50–150K	$50–150K	$250–750K	$250–750K
	Rating system updates	$50–150K	$5–20K	$50–150K	$5–20K	N/A	$50–150K	N/A	$50–150K
Certification & Verification	Certification/ verification process design	N/A	N/A	N/A	N/A	$250–750K	$250–750K	$0.5–1.5M	$250–750K
	Certification/ verification advisory committee	N/A	N/A	N/A	N/A	$50–150K	$50–150K	$50–150K	$50–150K
	Certifier/verifier training	N/A	N/A	N/A	N/A	$250–750K	$50–150K	$0.5–1.5M	$250–750K
	Certification administration and communication	N/A	N/A	N/A	N/A	N/A	N/A	$250–750K	$0.5–1.5M
	Verifier administration and communication	N/A	N/A	N/A	N/A	$5–15K	$5–15K	$250–750K	$250–750K
	TOTAL COSTS (average)	***$420K*** ***Investment***	***$52K*** ***Annually***	***$710K*** ***Investment***	***$52K*** ***Annually***	***$1.91M*** ***Investment***	***$1.52M*** ***Annually***	***$5.20M*** ***Investment***	***$3.90M*** ***Annually***

Note: Capital expense (CE) is a one-time expense, and operational expense (OE) is an annual funding requirement. Table costs were estimated given the assumed labor-hours (and hired staff) required to perform each of the functions. Labor-hours were estimated using a basic project management tool. N/A denotes that the function is not applicable to the implementation option.

expenses include first costs associated with starting a new program service and are not commonly recurring expenses. For example, designing and deploying a new website would initially be a capital investment. Maintaining that same website in the second year would be an operational expense.

The hosting organization that assumes responsibilities for implementation of the rating system may consider adopting the related functions down the entire set of a single engagement level or, alternatively, selecting functions from multiple levels to create a blended approach.

Existing Sustainability Rating and Reporting Systems—Case Studies

To assist with evaluating the available options for implementing the rating system, the research team reviewed the implementation approach used by other sustainability rating systems. The case studies in this section provide an overview of the implementation approach used by five similar sustainability rating systems. Four of these systems involved major organizations and required over 5 years to produce and at least $2 million of capital investment. The individual airport sustainability rating systems could be generated for much lower investments, but likely have limited ability for practical use at secondary locations by outside stakeholders.

Case Study 1: Leadership in Energy and Environmental Design (LEED)

Governing Body. U.S. Green Building Council (USGBC)

Resources to Implement. USGBC relied on significant volunteer time to implement LEED. USGBC estimates that it required 200,000 volunteer labor-hours, equivalent to 100 full-time employees for 1-year. Assuming that the labor was worth an average of approximately $50 per hour fully loaded, the cost to implement LEED was at least $10 million. USGBC secured revenue sources from the Greenbuild annual conference, membership fees, professional accreditation programs from greater than 10,000 individuals, publications (including the reference manual for the system itself), and, in the beginning, certification fees from the candidate building teams under consideration. By 2008, annual revenue from these sources exceeded $10 million. In 2008 the GBCI spun off from USGBC to create independent oversight of the building certification and professional credential programs.

Structure. LEED is a project-focused sustainability rating system that provides weighted point scoring for sustainability performance measurements and actions for buildings (primarily new construction). The rating system's purpose is to promote environmentally sustainable design, construction, and operation of buildings. USGBC maintains the current rating system and issues regular updates with input from advisory committees and external stakeholders. In addition, USGBC maintains the credentialing training for professionals to assist building design teams. The independent GBCI oversees actual credential testing and renewals. The accredited professionals are not mandatory for certification. Building certification is also conducted by GBCI.

Sustainability Scope. LEED's most common product is the rating system focused on new construction and major renovation projects. Operationally, the existing building operations and maintenance (EBOM) program covers the building and adjacent grounds for conventional buildings. There is no coverage for airport-specific operations or spaces.

Airport Applicability. LEED has strong recognition across airports and among airport stakeholders. Multiple airports have LEED-certified terminal buildings or control towers. A number of larger hub airports and airport authorities have based their own airport-specific sustainability guidance on LEED principles and categorization. LEED does not currently address horizontal infrastructure such as runways, ground support equipment (GSE), ground access

vehicles (GAV), and other airport airside-related assets. It should be noted that airports have pursued two LEED product options: building design and construction (BD&C) and EBOM. Although dozens of airport BD&C-certified new construction projects exist, there are no airport EBOM-certified projects, even though there are over a dozen airports that have initiated the LEED process and registered for existing buildings. This may suggest that LEED is more appropriate for new construction and retrofits at airports, and the operations-focused option for existing infrastructure may not be well tailored for airports.

Timeline to Implement. the USGBC was formed in 1993 and released its first green building rating system in 2000—seven years later. As the rating system has matured, it has added specific type of building certifications (e.g., schools and hospitals), components of buildings (e.g., commercial interiors and core & shell), groups of buildings (e.g., campus and neighborhood development), and existing buildings (e.g., existing building operation & maintenance, covered in the previous paragraph).

Case Study 2: Individual Airport or Airport Authority-Tailored Systems

Governing Bodies. Airports/Airport Authorities, including CDA, LAWA, and PANYNJ.

Resources to Implement. Many of the airports' individual sustainability rating systems were modeled after the LEED system and thus saved resources. Other airports hired consultants to design their systems, issuing requests for proposals with costs under $1 million and a requirement of less than 2 years to design. It is unknown how much funding is allocated to update the systems.

Structure. Airports with the interest and resources have created their own rating systems for sustainability, borrowing from other systems (such as LEED). The purpose of the independent airport-authored systems is to provide a method to cover buildings and operations that goes beyond the scope of LEED and helps to advance sustainability principles above the standard airport conventions. Individual airports decide how and when they want to apply their own system and provide their own verification. These systems tend to be project-focused.

Sustainability Scope. Airports' self-created sustainability rating systems range in scope from airport to airport. Most systems address new construction projects and some extend coverage to operations.

Airport Applicability. Each independent airport-designed system is designed to support the scale and functions of the unique airport it serves and therefore may have limited applicability to the medium and small airports that might benefit from borrowing the approach.

Timeline to Implement. The research team estimates that airports' individual rating systems required approximately 2 years to develop and begin implementation.

Case Study 3: Envision™

Governing Body. ISI

Resources to Implement. ISI formed in 2008 as a partnership between the American Council of Engineering Companies (ACEC), American Public Works Association (APWA), and the American Society of Civil Engineers (ASCE). As with LEED, many thousands of volunteer hours were required for ISI to produce a first-draft of the rating system. Anecdotally, the actual costs for ISI have been at least $3 million to date. In addition, before partnering with ISI to collaboratively release the Envision™ rating system in 2012, the Harvard Graduate School of Design (GSD) had spent approximately 3 years with paid academic researchers and volunteer

collaborators creating the Zofnass Sustainable Infrastructure system. The associated costs of the Zofnass Program are unknown, and funding to establish the program came from a single external benefactor. ISI generates revenue from membership fees and professional credentialing.

Structure. The Envision™ system was created to address the system sustainability aspects of infrastructure not covered in the LEED system (e.g., roads, water treatment plants, etc.). Envision™ also goes beyond the physical properties and performance of structures to cover social and economic concerns, such as project-relative contributions to the local economy. ISI maintains the Envision™ system and the professional credentialing program. Participants can currently adopt the system and then self-certify. Envision™ is project-focused. ISI is setting up Envision™ for certification by a third-party provider.

Sustainability Scope. Envision™ can cover all airport functions.

Airport Applicability. Airports are gaining familiarity with this system, although it is likely that a small informed group has knowledge at present. ACI-NA hosted a webinar on Envision™ and has formed a committee—the Sustainable Airport Workgroup (SAW)—to explore adapting the Envision™ System for airports.

Implication for Viability. Envision™ may be the strongest alternative to the Prototype Rating System. At the very least it is recommended to explore coordination and collaboration between the two systems.

Timeline to Implement. Envision™ required about 3 years for the first pilots and another year before the first system was released. At the time of ACRP Project 02-28, the only Envision™ airport project moving toward certification was San Diego's new terminal.

Case Study 4: AOSS

Governing Body. GRI

Resources to Implement. GRI was started in 1997 by the non-profit organizations Ceres and Tellus Institute with the support of the United National Environmental Program (UNEP). It became an independent institution in 2000 and is on the fourth version of its disclosure protocols, which include the Airport Operators Sector Supplement (AOSS). The total annual budget for GRI is over $8 million and it obtains it revenue from donations and user fees.

Structure. GRI was established to promote transparent sustainability accountability for private firms and other organizations. An organization or firm must track metrics that it might not have focused on without GRI, and publication of the report provides incentive to improve performance. The GRI's systems and supplements, such as the AOSS for the airport sector, do not rate achievement levels. GRI manages its system of sustainability metrics for benchmarking various industry sectors and provides periodic updates. GRI's intent is to promote transparency and tracking; it is a reporting system, not a rating system. Organizations that utilize GRI report on a broad number of metrics and, presumably, they are inclined to show progress on these measures. Individual participants pay fees to register with GRI and then conduct their own measurements and reporting based on sector-defined common metrics. There are two options, (1) no certification, and (2) the elective and more rigorous "+" designation, which requires the annual report to be independently verified by a third party. GRI's airport sector supplement addresses airport-wide performance and is not project-level focused.

Sustainability Scope. GRI's AOSS covers all airport functions. AOSS indicators span environmental performance, social/employment indicators, and financial/economic measures. The GRI is a system of reporting metrics but does not include a rating component.

Airport Applicability. A few airports have published GRI reports (e.g., Dallas/Fort Worth International Airport and Toronto Pearson International Airport) and airport environmental leaders are aware of the system. It is likely that, outside the core of environmental technical staff at large airports and involved airport-industry participants, GRI knowledge is limited.

Timeline to Implement. GRI required 3 years to form is own organization and offered pilot programs shortly after that time. Approximately 3 years was required for GRI to develop the AOSS.

Case Study 5: ENERGY STAR

Governing Body. EPA

Resources to Implement. ENERGY STAR is a federal partnership between EPA and DOE. Started in 1992, its current annual budget is in excess of $50 million, covered by the EPA. ENERGY STAR has multiple components, including Portfolio Manager, which relies on building industry data gathered by the Energy Information Agency (EIA) Commercial Building Energy Consumption Survey (CBECS). The program includes an on-line tool for registering and assessing buildings, a mechanism to review certification submissions, and plaques for buildings that achieve an ENERGY STAR certification rating (75 percent or above).

Structure. EPA and DOE created the ENERGY STAR program as a voluntary approach to achieving environmental and energy improvement without additional regulations. By recognizing superior equipment and building performance, EPA believes that consumers will value the option to purchase products with lower operating costs and manufacturers and building operators will be incentivized by the branding benefits. ENERGY STAR maintains the benchmarking tool and stores the building energy performance information. Baseline data is obtained from the external EIA via its irregularly scheduled building censuses. Verification/validation is performed by third-party general professionals with either engineer or architecture credentials. The third party compiles and submits the application. Building candidates are responsible for verification/validation costs for the third party. Awards are issued by ENERGY STAR. Administrative costs are born by the federal government. Facility applicants do not pay EPA or ENERGY STAR to apply. EPA believes its significant budget allocation is justified given the large efficiency benefit the program has helped to catalyze, estimated at $14 billion in consumer energy costs annually in 2006 alone.

Sustainability Scope. ENERGY STAR only covers buildings and energy consumption. There is no current specified airport building profile within ENERGY STAR (e.g., terminals, hangars).

Airport Applicability. High, as the program has strong recognition among building engineers as the authoritative benchmark for building energy performance; however, it is only applicable to buildings.

Timeline to Implement. ENERGY STAR started with other programs, such as appliances, before it created the Portfolio Manager. It is estimated that it took over 5 years to implement the building rating system.

Airport Market Assessment

An understanding of the demand for a rating system may help determine next steps for research. It may also provide background for a possible future rating system governance organization to determine an appropriate certification and verification program. Although a robust market assessment was outside the scope of ACRP Project 02-28, this section provides some initial perspective based on the results of the stakeholder outreach efforts and feedback from the airport community during Phases I and II of this study.

The Phase I stakeholder outreach resulted in five design specifications that were used to develop the Prototype Rating System. These design specifications encompassed the need for an airport sustainability rating system. Whether the Prototype Rating System would be viable if finalized and released to the airport industry may, in part, be evaluated by considering whether the rating system is likely to meet the design specifications. Table 4-8 compares the design specifications against the scope of the Prototype Rating System as well as other existing rating systems.

During the Phase II stakeholder outreach, airport-industry representatives were asked whether their airport or airport client(s) would be likely to use the Prototype Rating System. They were also asked (1) if the rating system should be used for internal use only or for comparison to other airports as well and (2) about the need for a certification and verification program.

Overall, airport representatives indicated moderate interest in using the rating system, with many saying that their interest depends on how the rating system is to be used and how well it addresses their existing questions and concerns. Several airport representatives said that their likely use would depend on whether the rating system is launched for internal or external purposes. Airport representatives were fairly divided in this respect; some liked the idea of comparing with or benchmarking against other airports, while others strongly preferred that the tool be used for internal purposes.

The stakeholder outreach effort also directly engaged stakeholders on the topic of certification and verification. The research team found that, as with the rating system as a whole, the responses differed based on whether the airport representatives believed the rating system would be used for internal decision-making purposes or for external uses such as public relations. Many preferred the idea of using the rating system as an internal guide and believed that first-party certification and verification would be appropriate for these purposes. If the scoring were intended for external use, however, they believed third-party verification should be required for credibility, and anticipated that this could be cost-prohibitive. A few airport representatives expressed interest in ways to gain the credibility of third-party verification without incurring prohibitive costs, such

Table 4-8. Comparison of representative rating systems against design specifications.

	A. Incorporate Elements of Existing Rating Systems	B. Include a Points-Based Scoring Framework	C. Adhere to the EONS Sustainability Framework	D. Recognize Airport-Wide Sustainability Performance	E. Flexible for Airports of Different Sizes & Geographies
Prototype Rating System	Yes	Yes	Yes	Yes	Yes
Envision™	Yes	Yes	Yes	No	Yes (Focus on utilities/ infrastructure)
LEED	No	Yes	Main focus on Environmental	No	Yes (Focus on buildings)
CDI SAM	Yes	Yes	Yes	No	Yes (Focus on projects)
ENERGY STAR	No	Yes	No	No	Yes (Focus on buildings)

as having verification funded through external organizations or requiring verification updates infrequently (e.g., every few years rather than annually).

Summary of Viability Conclusions

The conclusion of the research team is that an airport sustainability rating system, complete with a certification and verification program, is viable in that (1) a defined user group exists and (2) the Prototype Rating System addresses the stakeholder's design specifications whereas other existing rating systems do not address all design specifications. The costs of administration and governance would vary, however, based on the robustness of the certification and verification program. The implementation options for a certification and verification program could range from simply releasing the rating system as a Best Practices and Metrics Manual that airports could use internally to evaluate sustainability performance, to coupling the rating system with a robust independent certification and verification program that involves external certification and verification parties and procedures.

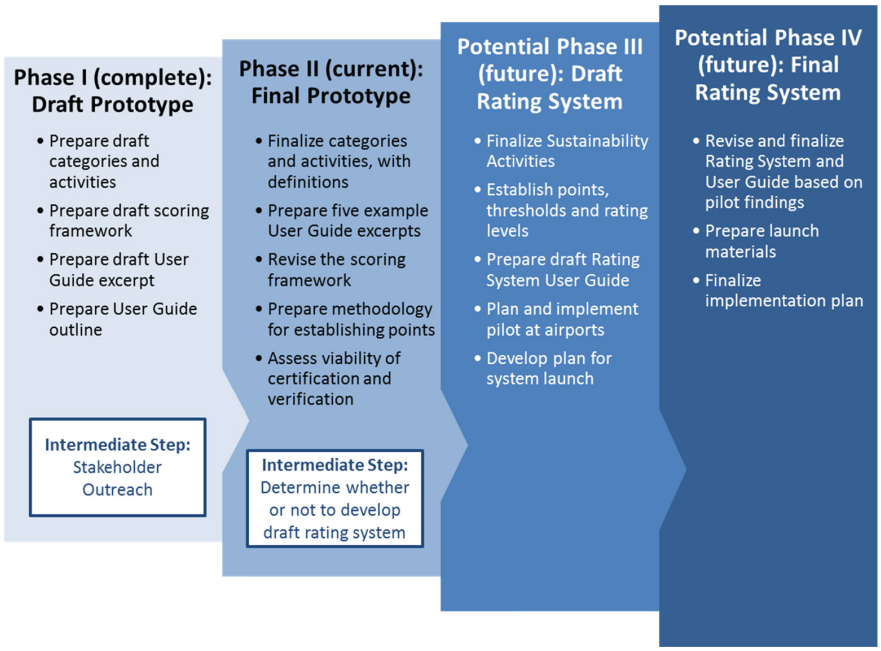
Provided that a partner organization and the funds to support maintaining the governance and related certification services can be found, the eventual hosting institution would likely be the best candidate to make decisions about the certification and verification program.

In the interim, however, if the industry determines that the goal of the rating system should be to serve as a universal resource to as many airports as possible, then a self-certification rating system may be better suited to focus on the universal benefits to all airports through a functional and flexible self-rating system. Adopting this option would establish the framework for ongoing rating system maintenance and provide the ability for airports to self-certify. The initial administration and governance costs would likely be under $0.5 million without dedicated employees, office resources, or independent third-party certification. Ongoing operational costs could be below $100,000 per year.

Beyond self-certification, the ability to benchmark performance against other airports would become secondary, and a robust certification and verification system is less critical, if not entirely unnecessary. The cost and level of effort to establish the benchmarking capability along with independent certification and verification institutions might not be warranted given a limited ability to compare across airports of different sizes, types, and locations, and given the likelihood of a broad spectrum of airports adopting the system. At this juncture, the effort may be best served initially by developing a self-certification approach, pending industry concurrence. A large, critical mass of participant airports of each type would then be necessary to overcome the likely functional and financial challenges to obtain the more extensive level of implementation. The Prototype Rating System would allow internal reviews of sustainability by airports at first, but the framework could also support external comparisons in the future, if desired by the airport community.

4.5 Potential Next Steps for the Airport Sustainability Rating System

Figure 4-15 presents the development phases for completion of a functional draft Airport Sustainability Rating System (Draft Airport Sustainability Rating System). *ACRP Report 119* concludes Phase II of the development process covered by the scope of work for ACRP Project 02-28, including the preparation of a Prototype Rating System. **Any progress beyond Phase II would be conducted only after the airport community determines whether it is appropriate to continue developing the Airport Sustainability Rating System.**



Source: ICF 2013

Figure 4-15. Airport Sustainability Rating System development phases.

Phases I & II (Prototype Rating System Development). These now-completed phases involved preparing draft and final versions of the Prototype Rating System. Before moving ahead, the airport community will need to determine if it is appropriate to prepare a functional Draft Airport Sustainability Rating System (Draft Rating System) for testing through a pilot study featuring a diverse range of U.S. airports.

Potential Phase III (Draft Rating System and Pilot). This potential phase would consist of preparing a functional Draft Rating System that would include a Draft User Guide and scoring framework and would assign proposed points to each of the activities. At the conclusion of this future work, the Draft Rating System could be piloted at a select set of airports. A potential work plan for Phase III appears in Appendix F.

Potential Phase IV (Finalize and Release Airport Sustainability Rating System). Once the lessons learned from the pilot programs are captured, the Draft Rating System could be revised to create a fully formed, final rating system. Finalizing the rating system would likely require revising the scope of some activities, perhaps by adding activities identified through the pilot and likely by recalibrating the proposed weighted point scores assigned to each activity. The completed rating system would require a hosting organization and sizable funding resources. Perhaps the most likely candidate for assuming governance responsibilities would be an airport trade association. An airport-industry organization could adopt and govern the final Airport Sustainability Rating System, hiring staff as needed to support the release and ongoing management of the system. This hosting group would need to establish advisory committees and mechanisms to both communicate and receive feedback from airport stakeholders. (More details on possible administration and implementation are in the "Rating System Development and Implementation Options" section of this chapter.)

Continued stakeholder involvement during the development of the Draft Rating System would help the airport community make a determination as to whether the rating system is

primarily for internal or external use. Successful ratings systems often first deploy a beta test by recruiting willing participants to test the system and identify the attributes that work and places where improvements are necessary. Once these pilot efforts have been assessed, the initial rating system is refined and rolled out to the broader industry. A pilot implementation of the Draft Rating System conducted at airports between potential Phases III and IV (see Figure 4-15) would serve as this beta test and would help determine the manner in which the final rating system should be deployed, allowing the industry to determine:

- If the rating system is best used internally or for external comparison, which will drive decisions regarding the robustness of the certification and verification program.
- If sufficient interest exists among U.S. airports to use the rating system.
- If an organization exists that is willing to adopt the rating system and provide for ongoing administration and governance.

4.6 Conclusions

This chapter presented a Prototype Rating System—or proof of concept—for the potential development of a Draft Airport Sustainability Rating System. The Prototype Rating System consists of the rating system structural components, illustrations of how they collectively support a rating system framework, a scoring framework, and a set of 50 sustainability activities grouped into 8 sustainability categories.

The components and rating system structure are further illustrated by five sustainability activity descriptions that accompany this chapter and an annotated User Guide outline. Future potential work could include completion of descriptions for the remaining sustainability activities and incorporate these, as well as other guidance, into a final User Guide.

When complete, the Airport Sustainability Rating System could assess airport-wide sustainability; provide airports with a resource for setting goals, objectives, and targets; and enable airports to evaluate continued sustainability performance over time. It would provide airports with a framework for categorizing and evaluating sustainability activities as well as insight into the operations, management activities, and infrastructure that support sustainability. The completed rating system could also give airports a mechanism to take a snapshot of sustainability performance against which future performance can be evaluated. Through emphasis on documentation, the rating system would also aid airports in continuing measurement, support internal verification, and set the stage for third-party verification if and when airports choose to pursue it independently or it is incorporated as a rating system requirement. Additionally, the rating system would provide a common language for airports to describe, evaluate, and promote sustainability performance, internally and with the public.

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Abbreviations and Acronyms

AASHE	Association for the Advancement of Sustainability in Higher Education
ACC	Airport Consultants Council
ACEC	American Council of Engineering Companies
ADD40	TRB's Standing Committee on Transportation and Sustainability
AOSS	GRI's Airport Operators Sector Supplement
APU	Auxiliary Power Unit
APWA	American Public Works Association
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
BD&C	Building Design and Construction
Btu	British Thermal Unit
CBECS	Commercial Building Energy Consumption Survey
CDA	Chicago Department of Aviation
CE	Capital Expense
CRAA	Columbus Regional Airport Authority
EBOM	Existing Building Operations and Maintenance
EIA	Energy Information Agency
EONS	Economic Viability, Operational Efficiency, Natural Resource Conservation, and Social Responsibility
EV	Electric Vehicle
FSC	Forest Stewardship Council
GA	General Aviation
GAV	Ground Access Vehicles
GBCI	Green Building Certification Institute
GCIF	Global Cities Indicator Facility
GHG	Greenhouse Gas Emissions
GRI	Global Reporting Initiative
GSD	Graduate School of Design
GSE	Ground Support Equipment
LEED	Leadership in Energy and Environmental Design
IATA	International Air Transport Association
IFMA	International Facility Management Association
IOM	Infrastructure, Operations, or Management
ISI	Institute for Sustainable Infrastructure
ISO	International Organization for Standardization
IT	Information Technology
LAWA	Los Angeles World Airports
LSAG	Los Angeles World Airports: Sustainable Airport Planning, Design, and Construction Guidelines

Massport	Massachusetts Port Authority
MCDA	Multi-Criteria Decision Analysis
NPIAS	National Plan of Integrated Airport System
O&M	Operations and Maintenance
OE	Operational Expense
PANYNJ	Port Authority of New York and New Jersey
PCA	Pre-conditioned Air
QOL	Quality of Life
ROI	Return on Investment
SAGA	Sustainable Aviation Guidance Alliance
SAM	Sustainable Design Manual, 2003; Sustainable Airport Manual 2009–2013; Current Version 3.1, Chicago Department of Aviation
SAW	Sustainable Airport Workgroup
SME	Subject Matter Expert
SOV	Single Occupancy Vehicle
SQA	Software Quality Assurance
STAR	Sustainability Tools for Assessing and Rating (STAR Community Index)
STARS	Sustainability Tracking, Assessment & Rating System™
TDD	Test-Driven Development
UNEP	United National Environmental Program
USGBC	U.S. Green Building Council

Glossary

General

EONS An abbreviation for ***E****conomic Viability*, ***O****perational Efficiency*, ***N****atural Resource Conservation, and* ***S****ocial Responsibility*, the four functional parts needed for holistic airport management crafted by the Environmental Committee of ACI–NA. EONS looks at operational efficiency factors in addition to the traditional economic, ecological, and social factors.

SAGA An abbreviation for ***S****ustainable* ***A****viation* ***G****uidance* ***A****lliance.* The SAGA website consolidates existing guidelines and practices into a comprehensive, searchable resource that can be tailored to the unique requirements of individual airports of all sizes and in different climates/regions in the United States. The website and database are being updated under ACRP Project 02-30.

Sustainability For purposes of ACRP Project 02-28, the ACI–NA Environmental Committee definition of sustainability has been adopted, which states, "A holistic approach to managing an airport so as to ensure the integrity of the EONS of the airport."

Practices Sustainability measures that could be implemented at an airport.

Stakeholder Research

On-Line Survey A survey that was administered online.

In-Depth Interviews One-on-one, semi-structured telephone interviews that were recorded.

Instrument The method by which opinions where gathered from participants.

Focus Group A moderated discussion during which participants provide their perspectives on a topic. Can be held in person or online.

Stakeholder Outreach An activity included in the user research for ACRP Project 02-28. Stakeholder outreach focused on collecting information about preferences for sustainability resources and was included in an online survey, in-depth telephone interviews, an online focus group, and industry briefings.

TurningPoint™ A software program that allows the user to collect instant, anonymous data from participants who provide responses using of a programmed remote control.

Prototype Rating System

Benchmark A point of reference used to track performance and recognize performance improvements over time.

Certification For purposes of ACRP Project 02-28, certification refers to the process during which sustainability performance is reviewed and assessed, and a rating is identified. Certification is typically issued by a third party.

EONS Icon A symbol that identifies which aspects of the EONS framework apply to a sustainability category, accompanied by a discussion section for each aspect. EONS icons are used to apply the EONS framework to the Prototype Rating System.

EONS Framework A four-component framework of sustainability defined by the Environmental Committee of ACI–NA as consisting of **E**conomic viability, **O**perational efficiency, **N**atural resource conservation, and **S**ocial responsibility.

Innovation The opportunity to add additional points for exemplary performance whereby the airport (a) achieves significant, measurable environmental performance that exceeds the highest threshold of an existing credit; (b) implements new, extraordinary, unique, groundbreaking, or uncommon outcomes, policies, and practices not addressed in the existing system; (c) overcomes significant problems, barriers, or limitations to achieving sustainability; or (d) deploys sustainable solutions that are scalable and/or transferable across sectors, opening up new opportunities.

Governance How the rating system is managed and maintained over time.

Materiality An element of the scoring framework that recognizes that not all sustainability activities will be relevant to all airports while rewarding airports for objectively considering the relevance of their activities. Materiality indicates the level at which an airport activity becomes sufficiently important that it should be included in the airport's rating. Incorporating materiality makes the rating system more flexible and able to accommodate different airport types because airports select those activities that are material to their operations to include in the rating.

Performance Action An effort taken to improve sustainability that, when evaluated alongside other Performance Actions, serves as a good indicator of sustainability performance. Performance Actions were developed using information from existing rating systems and support a scoring framework.

Performance Level A performance target (or threshold) under each sustainability activity that reflects a greater demonstration of sustainability given the objective of the activity, and thus earns an increased number of points. Sustainability activities may have up to four performance levels; depends on the nature of the activity.

Performance Metric An indicator of performance within a sustainability activity that allows the airport to measure and track performance over time. Performance Metrics were developed using information from existing rating systems and support a scoring framework.

Performance Threshold A dividing limit between Performance Levels that is denoted by a percentage (when associated with Performance Metrics) or by a specific number of Performance Actions. The percentages and number of actions will vary depending on the sustainability activity.

Points The individual units of measure used to calculate the overall score of an airport under the Prototype Rating System. Points earned are divided by total points possible to establish a score.

Points-Based Rating System A type of rating system that awards points based on level of performance.

Rating Levels The tiers used to denote the overall score of an airport (e.g., Platinum, Gold, or Silver, as with LEED). Rating levels are associated with a range of points and serve as the sustainability rating that an airport will report and can use to compare itself against other airports and/or market to the public.

Scoring Framework The framework that determines how airports achieve/collect points to obtain a rating level.

Structural Components The components of the Prototype Rating System that collectively provide a rating system framework. The Prototype Rating System structural components include sustainability activities, sustainability category, performance metrics, performance actions, EONS icons, innovation, and the scoring framework.

Sustainability Activity High-level undertakings that have a strong potential to improve the sustainability of an airport. Sustainability activities were identified using information from existing rating systems.

Sustainability Categories Broad organizational levels that group sustainability activities of a similar sustainability theme. Sustainability categories were developed using information from existing rating systems.

Threshold A level or value that marks significant progress or improvement toward a sustainability goal.

Verification For the purposes of ACRP Project 02-28, verification refers to the process during which a sustainability rating is reviewed, assessed, and confirmed through either self-verification, peer verification, or third-party verification.

Weighting Applying a weight to the points received for a sustainability activity that emphasizes the contribution of the sustainability activity in the overall score received.

APPENDIX A

Sources Consulted for the Review of Existing Resources, Guidelines, Metrics, and Rating & Certification Programs

The following sources were compiled to support the research conducted for this project. Additional resources may have been made available since this research was completed. All references listed were current as of the time of this research (2011–2013). Note that urls may also have changed since publication of this report.

Sustainability Practice Resources

Airport-Specific Sustainability Practice Resources

Sustainable Aviation Guidance Alliance (SAGA)

- Resource Guide
  http://www.airportsustainability.org/sites/default/files/SAGA%20Final2.pdf
- SAGA Database
  http://www.airportsustainability.org/database

ACRP Publications

- ACRP Report 43: Guidebook on Improving Environmental Performance at Small Airports
  http://onlinepubs.trb.org/onlinepubs/acrp/acrp_rpt_043.pdf
- *ACRP Report 45: Optimizing the Use of Aircraft De/Anti-Icing Fluids* (2009)
  http://onlinepubs.trb.org/onlinepubs/acrp/acrp_rpt_045.pdf
- *ACRP Report 42: Sustainable Airport Construction Practices*
  http://onlinepubs.trb.org/onlinepubs/acrp/acrp_rpt_042.pdf
- ACRP Synthesis 21: Airport Energy Efficiency and Cost Reduction
  http://onlinepubs.trb.org/onlinepubs/acrp/acrp_syn_021.pdf
- *ACRP Synthesis 10: Airport Sustainability Practices*
  http://onlinepubs.trb.org/onlinepubs/acrp/acrp_syn_010.pdf
- ACRP Report 14: Deicing Planning Guidelines and Practices for Stormwater Management Systems (2009)
  http://onlinepubs.trb.org/onlinepubs/acrp/acrp_rpt_014.pdf
- ACRP Fact sheets: Deicing Practices (2009)
  http://onlinepubs.trb.org/onlinepubs/acrp/acrp_rpt_014_factsheets.pdf
- ACRP Report 11: Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories (January 2009)
  http://onlinepubs.trb.org/onlinepubs/acrp/acrp_rpt_011.pdf
- ACRP Report 46: Handbook for Analyzing the Costs and Benefits of Alternative Aviation Turbine Engine Fuels at Airports
  http://onlinepubs.trb.org/onlinepubs/acrp/acrp_rpt_046.pdf

Other Airports[1]

- Albuquerque International Sunport Sustainability Policy Statement
  http://www.cabq.gov/airport/sustainability-at-sunport
- Columbus Regional Airport Authority Capital Program Sustainable Design Guidance Manual
  http://www.columbusairports.com/construction/CRAA-Capital-Program-Guidance-Manual.pdf
- Dallas/Fort Worth International Airport Sustainability Initiative
  http://www.dfwairport.com/sustainability/index.php
- Denver International Airport 2009 Sustainability Summary
  http://business.flydenver.com/community/enviro/documents/2009summary.pdf
- Fort Lauderdale-Hollywood International Airport Guidance Manual for Sustainable Operations & Green Practices
  http://www.broward.org/Airport/Community/Documents/ManualGreenpractices.pdf
- Honolulu International Airport Sustainable High Performance Guidelines
  http://hawaii.gov/dot/airports/doing-business/sustainability/Sustainable%20High%20Performance%20Guidelines.pdf/at_download/file
- Los Angeles World Airports (LAWA)
  - LAWA Sustainable Airport Planning, Design and Construction Guidelines
    http://www.lawa.org/uploadedFiles/LAWA/pdf/LSAG%20Version%205.0%20021510.pdf
  - LAWA Sustainability Report Los Angeles World Airport's Sustainability Plan
    http://www.lawa.org/uploadedFiles/LAWA/pdf/Sustainability%20Plan%20%28Final%29.pdf
  - LAWA Sustainability Vision and Principles
    http://www.lawa.org/uploadedFiles/LAWA/pdf/Sustainability%20Visions%20and%20Principles%20%28Final%29.pdf
- Massport – Logan International Airport 2009 Environmental Data Report
  http://www.massport.com/environment/environmental_reporting/Documents/EDR/2009EDR_Part_1_Main.pdf
- Chicago Department of Aviation – Sustainable Airport Manual
  http://www.airportsgoinggreen.org/SAM
- Philadelphia International Airport Environmental Stewardship Program
  http://www.phl.org/enviro_intro.html
- Port of Oakland
  - Oakland International Airport Port of Oakland Sustainability Program
    http://www.portofoakland.com/pdf/sustaina.pdf
  - 2003 Oakland International Airport's Environmental Management Program
    http://www.oaklandairport.com/noise/environmental.shtml
- Port of Portland – Portland International Airport Environmental Initiatives
  http://www.flypdx.com/Env_Home.aspx
- Salt Lake City International Airport Sustainability Program Assessment
  http://www.slcairport.com/cmsdocuments/sustainability.pdf
- San Diego County Regional Airport Authority
  - San Diego County Regional Airport Authority's Sustainability Program
    http://www.san.org/sdcraa/airport_initiatives/environmental/sustainability.aspx
  - San Diego County Regional Airport Authority's Sustainability Policy
    http://www.san.org/documents/corp_serv/Policies/Article%208/Policy%208.31%20Sustainability.pdf
- San Francisco International Airport Environmental Sustainability Reports
  http://www.flysfo.com/web/export/sites/default/download/about/reports/pdf/ESReport.pdf
- Seattle Tacoma International Airport Environmental Strategy Plan 2009
  http://www.portseattle.org/downloads/community/environment/airport-envirostrategy.pdf
- Greater Toronto Airports Authority (GTAA) Corporate Social Responsibility Report
  http://gtaa.com/local/files/en/Corporate/Publications/CorporateSocialResponsibilityReport2008.pdf
- Vancouver International Airport Environmental Management Plan
  http://www.yvr.ca/Libraries/ENV_Docs/YVR_EMP_2009.sflb.ashx

[1] From ACI–NA Resources http://www.aci-na.org/sustainability/sustainability-links.html.

FAA Sustainability Pilot Program Airports (those with existing programs)

- Hartsfield-Jackson Atlanta International Airport, Georgia
  http://www.atlantaga.gov/client_resources/mayorsoffice/sustainablity/gtech%20atlanta%20airport%20sustainability.pdf
- Nashville International Airport, Tennessee
  http://www.flynashville.com/info_center/FlyGreen.aspx

Other Industries

Transportation

- U.S. DOT/FTA Clearinghouse of Transit Agency Sustainable Practices
  http://www.fta.dot.gov/planning/planning_environment_8524.html
- GreenRoads
  http://www.greenroads.us/files/235.pdf
- Transportation Research Board (TRB)
  http://pubsindex.trb.org/index.aspx

Institutions of Higher Education

- Campus Sustainability Best Practices. A Resource for Colleges and Universities (August 2008)
  http://www.mass.gov/Eoeea/docs/eea/lbe/lbe_campus-sustain-practices.pdf
- Association for the Advancement of Sustainability in Higher Education (AASHE) – Creating a Campus Sustainability Revolving Loan Fund: A Guide for Students
  http://www.aashe.org/resources/pdf/CERF.pdf
- Campus Carbon Calculator
  http://www.cleanair-coolplanet.org/toolkit/calculator/v5.xls
- EPA – College and Universities in New England
  http://www.epa.gov/region01/assistance/univ/
- Guide to Developing a Sustainable Food Purchasing Policy
  http://www.aashe.org/resources/pdf/food_policy_guide.pdf
- Society for College and University Planning (SCUP) (used to find resources)
  http://www.scup.org/

Municipalities/State

- EPA Community Energy Challenge
  http://www.epa.gov/ne/eco/energy/mitigation-efforts-epane.html
- Renewable Energy and Energy Efficiency Partnership – Compendium of U.S. Best Practices
  http://www.reeep.org/16672/compendium-of-best-practices.htm
- California Air Pollution Control Officers Association – Quantifying Greenhouse Gas Mitigation Measures
  http://www.capcoa.org/wp-content/uploads/downloads/2010/09/CAPCOA-Quantification-Report-9-14-Final.pdf
- ICLEI – General Resources
  http://www.icleiusa.org/action-center/general-resources
- Sustainability Planning Toolkit (member-only access)
  http://www.icleiusa.org/action-center/planning/sustainability-planning-toolkit
- PlaNYC 2030
  http://nytelecom.vo.llnwd.net/o15/agencies/planyc2030/pdf/planyc_2011_planyc_full_report.pdf

Civil Engineering

- Sustainable Design Guidance/Actions
  http://www.asce.org/uploadedFiles/Sustainability_–_New/SustainabilityActionPlan.pdf
- Sustainable Engineering Practice: An Introduction. ASCE Committee on Sustainability, 2004.

Buildings/Facilities

- U.S. Green Building Council – Leadership in Energy and Environmental Design – New Construction & Major Renovations (Reference Guide and associated resources)
  http://www.usgbc.org/DisplayPage.aspx?CMSPageID=220
- Sustainable Facilities Tool, U.S. General Services Administration
  http://www.sftool.org/
- Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings
  http://www.fedcenter.gov/Documents/index.cfm?id=11130&pge_prg_id=28981&pge_id=1860
- U.S. Environmental Protection Agency(EPA) Green Building Website
  http://www.epa.gov/greenbuilding/

Schemes of Sustainability Performance Metrics

Aviation-Related Sustainability Performance Metrics

- Global Reporting Index (GRI) Airport Operators Sector Supplement
  https://www.globalreporting.org/resourcelibrary/AOSS-Complete.pdf
- ACRP Report 19A: Resource Guide to Airport Performance Indicators
  http://onlinepubs.trb.org/onlinepubs/acrp/acrp_rpt_019A.pdf

Non-Aviation[2]

Private

- Global 100
  http://www.global100.org/methodology/criteria-a-weights.html

Transportation

- "Developing Indicators for Comprehensive and Sustainable Transport Planning," *Transportation Research Record* 2017, TRB, 2007, pp. 10–15.
  http://www.vtpi.org/sustain/sti.pdf
- "A Holistic Assessment Framework for Urban Development and Transportation with Innovative Triple Bottom Line Sustainability Metrics," Projections, MIT Journal of Planning, MIT 2010, pp. 1–21.
  http://web.mit.edu/dusp/dusp_extension_unsec/projections/issue_9/issue_9_doust.pdf

Higher Education

- 2010 Environmental Performance Index—Yale Center for Environmental Law & Policy
  http://www.ciesin.columbia.edu/repository/epi/data/EPI_2010_report.pdf
- STARS Sustainability Tacking Assessment & Rating System—Technical Manual
  http://www.aashe.org/files/documents/STARS/stars_1.1_technical_manual_final.pdf (see page 15)

Municipalities

- Global City Indicators Facility
  http://www.cityindicators.org/
  http://www.cityindicators.org/Deliverables/Indicators%20revised%20-core%20and%20supporting_8-31-2009-1743191.pdf
- PlaNYC 2030
  http://nytelecom.vo.llnwd.net/o15/agencies/planyc2030/pdf/planyc_2011_planyc_full_report.pdf
- Boston Indicators Report
  http://www.bostonindicators.org/uploadedFiles/Indicators/Indicators2008/Homepage/Indicators_102309.pdf

[2] Limited to five most relevant resources, due to the vast number of non-aviation resources available.

International/Sustainable Development

- International Atomic Energy Agency: Energy Indicators for Sustainable Development
  http://www-pub.iaea.org/MTCD/publications/PDF/Pub1222_web.pdf

List of Sustainability Rating and Certification Programs

Airport Industry Rating and Certification Programs

- Los Angeles World Airports (LAWA)—Sustainable Airport Planning, Design, and Construction Guidelines (LSAG)
- Massachusetts Port Authority (Massport)—Sustainable Design Standards and Guidelines v2 (2011)
- Port Authority of New York and New Jersey: Sustainable Design Project Manual
- Airports Council International (ACI) – Europe—Airport Carbon Accreditation
- Chicago Department of Aviation (CDA)—Sustainable Airport Manual (SAM)
- Columbus Regional Airport Authority (CRAA)—Capital Program Sustainable Design Guidance Manual (2008)
- Global Reporting Initiative (GRI)—G3 Guidelines with Airport Operators Sector Supplement (AOSS)

Non-Airport Industry Rating and Certification Programs

- International Standards Organization (ISO) 14001: *Environmental Management Systems*
- ISO 2600: Guidance on Social Responsibility (2010)
- US Green Buildings Council (USGBC)—Leadership in Energy and Environmental Design (LEED) Rating Systems
- US EPA – ENERGY STAR
- ICLEI – STAR Community Index
- Illinois – Livable and Sustainable Transportation Rating System and Guide (I–LAST)
- Association for the Advancement of Sustainability in Higher Education (AASHE) – *Sustainability Tracking and Rating System (STARS) 1.0*
- Greenroads Foundation – GreenRoads Rating System v1.5
- Institute for Sustainable Infrastructure (ISI) – Envision™ Sustainability Rating System
- Sustainable Sites Initiative: Guidelines and Performance Benchmarks 2009

APPENDIX B

Stakeholder Outreach Process and Detailed Findings

This appendix describes the two-phased stakeholder outreach process for the ACRP Project 02-28, "Sustainability Practices: Tools for Evaluating, Measuring, and Implementing," and outlines how this stakeholder input shaped the recommended approach to the Decision Tool and Prototype Airport Sustainability Rating System (Prototype Rating System).

A key task of ACRP Project 02-28 was to conduct an extensive stakeholder outreach effort in order to solicit initial (Phase I) and then more targeted (Phase II) input from airport industry representatives and interested parties.

The Phase I stakeholder outreach sought input on:

- Challenges airports face in evaluating, adopting, implementing, tracking, and reporting sustainability practices and the features of a decision tool that could help airports evaluate and select sustainability practices.
- The interest in and desired features of an airport sustainability rating system and perspectives on an associated voluntary certification program.

The Phase II stakeholder outreach sought input on:

- The proposed draft Prototype Airport Sustainability Rating system developed by the research team.
- The feasibility/viability of certification and verification of a sustainability rating effort for airports.

Phase I Stakeholder Outreach

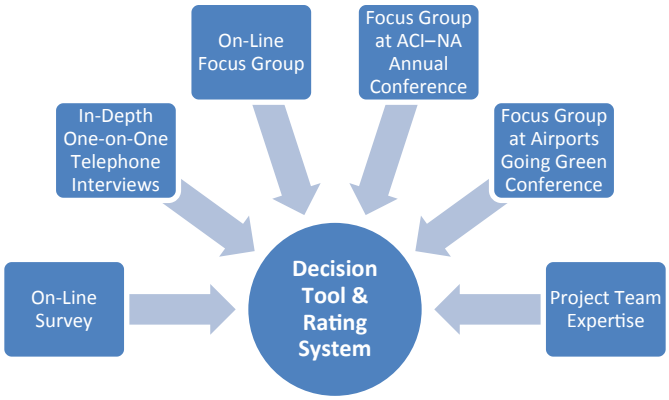
Over 400 people, broadly representing the airport industry, were involved in the first phase of stakeholder outreach effort through an on-line survey, in-depth interviews, an on-line facilitated focus group, as well as an in-person facilitated focus group and a paper survey (Figure B-1). Opinions were solicited from airport management and staff, from airport tenants, vendors and users; from airlines, consultants, and academics, and other interested parties. The findings from this broad-reaching outreach process provided the basis for the research team's suggestions for next steps for the project. The following sections document the Phase I stakeholder outreach process, characteristics of participating stakeholders, and the findings from the Phase I outreach efforts.

Phase I Outreach: Input on Decision Tool

Consistent across all phases of this outreach, there was a strong level of interest in a computer-based Decision Tool that would allow airport industry representatives to select the sustainability practices most appropriate for them tailored to the characteristics of a specific airport. Stakeholders provided input that will guide the development of a decision tool. The following sections present:

1. **What the airport industry wants**—a summary of stakeholder feedback.
2. The research team's **proposed concept** for the Decision Tool, based on stakeholder preferences.

The research found strong support for a decision tool to assist airports in making sustainability decisions. The research team will develop a conceptual Decision Tool for panel review and approval; followed by developing the full Decision Tool.



Source: VHB, 2014

Figure B-1. Sources of input to the Decision Tool and rating system (Phase 1 outreach).

Decision Tool: What the Airport Industry Wants

Stakeholders expressed a strong preference for the Decision Tool to be:

- Web-based tool—Consistent in both phases in which this question was asked, representatives have a strong preference for a web-based Decision Tool over a desktop program, including one that is based in Microsoft Excel.
- Customized for individual airports—Consistent across all phases of this research, the most important feature for the Decision Tool to have is that it is able to be customized for the unique characteristics of the airport, such as its size, aviation role, geographical setting, or operational characteristics.
- Stakeholders voiced a preference for additional information to be provided for each sustainability practice as a method for selecting the most appropriate practice and to be able to provide a rationale behind selecting those practices. In general, stakeholders want additional detailed information relating to energy use reduction, operational costs, and capital costs. Other detailed information of interest includes staff requirements, environmental benefits and issues specific to a particular region.
- In addition to the overarching need for customization, many would like the Decision Tool to enable users to:
  - Search, sort and browse a database of sustainability practices.
  - Sort and rank sustainability practices based on user preferences.
  - Provide the rationale behind why certain practices were selected.
  - Rank and compare practices.
  - Prioritize or weight screening criteria.
  - Add new sustainability initiatives to the database.
  - Submit additional information for each practice in the database such as lessons learned or contact information.
- Stakeholders would like the tool to offer them a variety of output formats, including fact sheets, spreadsheets, and checklists. Established software formats (such as Excel, Word or PDF) are preferred over proprietary formats.

Decision Tool: Addressing Stakeholder Comments

Based on the stakeholder preferences described above, the research team suggested that a Decision Tool be developed with the following format, features, technical content and structure:

- Format: A web-based tool that is linked to a technical database of sustainability practices.
- Features: Decision Tool that will be able to reach into a database of sustainability measures and extract meaningful answers and information for the user. Based on the results of stakeholder outreach, there are four categories of the Decision Tool features that would be developed:
  - **Informational Features:** The informational features would include a "Getting Started" page as the introductory page of the decision model.
  - **Search Features:** The search features would allow the user to process the technical data for each sustainability strategy in a database based on the specific interests of the airport user.
    - The "**Search**" feature would allow the user to type keywords and search the database for all strategies will the specified keyword.

  - The "**Sort**" feature would allow the user to easily sort the strategies based on the criteria results and ranking scores. For example, the user could sort the strategies based on which have the shortest payback period and/or which have the most environmental benefits. In addition, the user could sort the strategies based on the overall ranking score.
  - The "**Browse**" feature would allow the user to look through the entire list of strategies in the database or only through these that have already been deemed applicable to the airport based on the airport characteristics.
  - The "**Prioritize**" feature would allow users to rank the strategies based on which of the evaluation criteria are most important. This feature will function by applying weights to the evaluation criteria.
  - The "**Customize**" feature would lead the users to input their airport's characteristics such as size (general aviation, small-hub, medium-hub, large-hub, or non-hub), geography, and type of operation (commercial, general aviation, or cargo). These characteristics will eliminate from view any sustainability strategies in the database that are not applicable to those airport characteristics.
  - The "**Refine**" feature would allow users to have their own accounts where they can use this feature to change the scores for the evaluation criteria, add supplemental information or add sustainability practices without impacting the master database or other users.
- **Report Feature:** The report feature would allow the user to export their search data to Excel, Word or Adobe PDF.
- **External Use Feature:** Through downloads to Excel and Word, users could add new sustainability strategies that are not found in the database and further manipulate the strategies to better reflect the needs of the specific airport.

- Technical Data Needs: Additional information on each sustainability practice would serve as inputs to the Decision Tool. Users would be able to base their decision-making on evaluation criteria and supplemental information.
  - **Evaluation Criteria:** Nine evaluation criteria would be included in three categories
    - Financial considerations—Estimated Capital Costs, Estimated Annual Operations and Maintenance Costs, Estimated Payback Period
    - Implementation considerations—Staffing Requirements, Reportability of Metrics and Maturity of Practice
    - Benefits—Energy Reduction, Environmental Benefits, Social Benefits. The evaluation criteria would provide ranking scores for each practice. The scores for each **criterion** would be added to develop one numerical score for each strategy such that those strategies with a higher overall numerical score would be the most desirable for implementation. The users may use the features of the system to weight each evaluation criterion, which would modify the numerical score and overall ranking, as well as sort the practices based on ranking scores for a specific criterion (e.g., sort on the capital cost criterion to show those that are least expensive).
  - **Supplemental Information:** Information that users could use to enhance their decision-making include: airport size, airport geography, type of airport operation (e.g., commercial, general aviation or cargo).
- Structure: A critical element of the Decision Tool is the overall structure of the technical data. Based on the stakeholder feedback on the types of information desired and the categories of technical data desired, the structure of the Decision Tool would need to be of a format that captures the following:
  - Sustainability Practice Index
  - Sustainability Practice Name
  - Description of Sustainability Practice
  - Evaluation Criteria
  - Applicability to Airport Size
  - Applicability to Type of Airport Operation
  - Applicability to Geography
  - Lessons Learned/Case Studies
  - Additional Links

Phase I Outreach: Input on Prototype Rating System

Stakeholders provided input that guided the preliminary development of a Prototype Rating System. The following sections provide:

1. A summary of stakeholder preferences.
2. Preliminary concept based on stakeholder preferences.

Sustainability Rating System: What the Airport Industry Wants

Generally, feedback from the stakeholders was mixed on questions pertaining to the airport sustainability rating system.

- Standardization: Stakeholders have somewhat divided opinions about whether or not it is important for airports to have a standardized method for measuring sustainability performance that is recognized by the airport industry, or if the industry should utilize a common rating system. About half the stakeholders believe an objective set of standards would be useful in ensuring industry-wide consistency and helping airports to set goals and justify sustainability initiatives. Others believe it would be too much of a challenge to create a workable standardized system, given how different individual airports are from each other.
- Evaluation: What matters most to stakeholders is that the system enables airports to be judged within the context of each airport's unique considerations, and that it lends credibility to their efforts. Stakeholders do not want the process to result in competitive "point chasing" among airports or meaningless efforts.
- Verification: In general, stakeholders believed there should be some process for verifying the success of their sustainability efforts. They believe a sustainability rating system and certification program for U.S. airports could confer an advantage in the form of enhancing airports' image and improving public relations. There is no strong consensus about what that process should look like, however. Some express a preference for an informal, internal, or peer-review process, while others express a preference for third-party certification.

Airport industry stakeholders were queried about how such a rating system could be structured and designed and how it would best meet their needs. On some points, representatives tend to be in agreement, whereas other aspects of the rating system garnered more fragmented perceptions. First, in terms of the points that tended to generate the most agreement:

- Consensus on the Rating System Structure
  - Incorporate existing ratings systems or elements of these systems into a rating system for airports (such as LEED, Chicago's Sustainable Airport Manual (SAM) or Global Reporting Initiative [GRI]).
  - Acknowledge improvement over time and give credit for sustainability actions the airport has already completed.
  - Most prefer a system that score or ranks an airport's performance, rather than a binary pass/fail system.
- Rating System Structure Open Issues
  - Stakeholders had divided opinions about whether the system should allow airports to compare or benchmark performance against each other, or monitor internal performance only. While some thought benchmarking and comparison could be useful, others felt airports are too different for such comparison to be meaningful.
  - Stakeholders also had somewhat divided opinions about whether the rating system should address management's approach or not.
  - There was no consensus about whether a rating system should apply airport-wide or to specific projects or activities.

There was cautious support for an airport sustainability rating and verification system, with the caveat that such a system be designed to support the efforts of a diverse industry of unique airports in a meaningful way while enhancing their image with the public.

Prototype Rating System: Addressing Stakeholder Comments

In response to this stakeholder input, the research team developed a preliminary prototype of an airport-specific sustainability rating system. The prototype rating system would have the following characteristics:

- Single, points-based rating system.
- Sustainability categories considered would be based on the EONS (Economic, Operational, Natural Resource Conservation, and Social Responsibility) sustainability framework.
- Encourages sustainability performance airport-wide (as opposed to individual airport projects). Although there was no consensus among the stakeholders on this issue, the Project team feels strongly that a rating system should address activities across the airport, from airport management to operations, to physical infrastructure. In addition, a project-specific rating system would limit the system's ability to address EONS, as it would not address overall economic, operational, environmental, and social considerations resulting from airport-wide activities.

- Initially focuses on rating activities and performance under the airport's direct control as well as a limited number of high-priority indirect activities, such as tenant contracts.
- Emphasizes flexibility to be applicable to all airport types (primarily by invoking the concept of materiality[1] as well as normalized metrics).
- Incorporates elements of existing rating systems to the extent possible.

The prototype rating system would have a clear, defined structure that includes:

- Approximately 10 to 15 activity categories (e.g., Energy Management, Economic Performance).
- Preliminary set of sustainability activities—such as recycle and identify locally-based suppliers—that will support sustainability performance within each activity category.
- Preliminary set of performance metrics (e.g., percent waste diverted, percent employees trained) to support performance evaluation at the activity category level.
- Scoring framework based on a preliminary set of performance thresholds (e.g., 20 percent reduction, 40 percent reduction) to support an internal airport verification process.
- Preliminary companion protocol that standardizes use of the rating system.[2]

Sustainability Rating System: Additional Considerations

A number of questions arose from the stakeholder outreach process. The research team compiled these and proposed an approach to resolve these issues as presented below.

- **Governance**
  A number of characteristics of the rating system requested from stakeholders and essential to the overall viability of the rating system relate to the issue of governance. This aspect of the rating system will not be fully resolved as part of the ACRP 02-28, but establishing a governance process will be important to address during future efforts. The research team recommends adding a section on "governance concerns" as part of the Task 6 Outreach on the rating system in order to obtain feedback from stakeholders on potential ideas and concerns.

  Specifically, the issue of governance addresses the following concerns:

- **Verification**
  Stakeholders indicated that they would like a process for verifying sustainability performance; however, many believed this should be done informally rather than instituting a required third-party verification process.
  The research team recommended that for the Prototype Rating System, airports internally determine ratings. Third-party verification initially would be an optional component, with some recognition of the added effort (e.g. GRI awards a "+" to the letter grade of those entities who opt for third-party verification). Note that the research team only considered internal verification in the prototype, but future efforts may involve developing an oversight entity (governance process) and a system for third-party verification.
- **Rating System Improvements Over Time**
  Some stakeholders expressed interest in a system that would be designed to grow over time by including industry standard targets for certain metrics that could be replaced with actual industry performance values as the system matures and such data are available. As an example, electricity intensity could begin as an industry standard and then later be measured against the 5th percentile energy intensity of participating airports.
  The research team recommended considering this capability as a longer term strategy with the understanding that implementation of the Prototype Rating System would be outside the parameters of ACRP Project 02-28, but rather as the Prototype Rating System is operated and continually improved in the future as a part of long-term viability.

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[1] **Materiality** indicates the level at which an activity becomes sufficiently important that it should be included within the airport's rating. Another way to understand materiality is that it indicates whether operations, management approaches, or infrastructure occur or exist at an airport to a degree that they are required for the airport to function. Material items will vary across airports. As an example, if there is no terminal, or there is no local public transit system to access, then activities associated with these types of infrastructure would not be a required consideration in the determination of the rating. Allowing users to indicate which activities are material to their airport increases the rating system's flexibility by accommodating airports of varying types and sizes.

[2] Additional sustainability activities, performance metrics, and performance thresholds—beyond the preliminary set—and a final companion protocol will be developed in later tasks after receiving panel approval on the preliminary versions.

- **Rating System Maintenance**
  For the system to be viable in the long term, it will need to be reviewed periodically (i.e., maintained)—particularly because the community of practice in sustainability is evolving rapidly.

  The research team recommended that at some point in the work process (possibly Phase III) an approach will need to be considered/developed for periodic updates to the rating system, either by an oversight entity or another third party.

- **Flexibility/Customization**
  Stakeholders were concerned about being able to tailor a rating system to their particular airports' characteristics such as role, location, staffing or local priorities.
  As described above, the research team recommended that airports define whether aspects of the system are material to their operations or not, and would provide normalized metrics where possible.
- **Benchmarks (or "Thresholds")**
  Stakeholders did not have strong opinions about how benchmarks to provide goals toward which airports could strive or to compare airports' performance should be determined.
  For the prototype, the research team recommended that thresholds not be based on industry benchmarks or standards (as for many metrics these are not well developed for airports); although the system could evolve toward developing benchmarks in the future as performance data becomes more robust.

Phase I Stakeholder Outreach Process

The research team undertook an extensive stakeholder outreach process and sought to solicit input from a wide range of airport industry professionals. The research team initiated stakeholder registration that included airport industry representatives from airports, consultants, airport tenants, the FAA, other regulatory entities, academia and aviation associations. The stakeholder outreach process was a partially combined effort between this ACRP Project 02-28, and ACRP Project 02-30, "Enhancing the Airport Industry SAGA Website." The following sections describe the efforts taken by the research team to encourage stakeholder interest in the project and participation in the outreach in addition to the registration process.

Stakeholder Solicitation

Early research was completed to identify airport industry groups and aviation associations that would be provided the registration information and requested to provide to their membership. The VHB Team identified airport industry groups, regional airport organizations, tenant organizations, other specific airport user groups, and government agencies, and worked with these parties to send out an email describing the two projects and opportunities for stakeholder input. Those organizations included:

- Airport Industry Groups
- Airport Council International (ACI)
- Airport Consultants Council (ACC)
- American Association of Airport Executives (AAAE)
- Air Transport Association (ATA)
- Aircraft Owners and Pilots Association (AOPA)
- National Business Aviation Association (NBAA)
- National Air Transportation Association (NATA)
- National Air Carriers Association
- Regional Airline Association
- Regional Airport Organizations from all 50 states
- Aviation Associations and Councils
- Airport Managers and Operators Associations
- Pilot Associations
- Airport Tenants
- Independent Fixed Base Operators Association
- Cargo Airline Association
- Airport Ground Transportation Association
- Regional Air Cargo Carriers Association
- Other Specific Airport User Groups
- Army Aviation Association of America
- Women in Aviation
- Air Traffic Control Association
- Government Agencies
- Federal Aviation Administration
- Transportation Security Administration
- Immigrant and Customs Enforcement

The research team requested that an email be sent to membership lists or colleagues to coincide with the launch of the registration website. The research team also provided a short press release that could be used if the airport industry group released a newsletter during the registration period.

Upon review of the demographics of the registered participants, the research teams found it necessary to conduct additional outreach to strive to achieve broad representation in the participant groups. Thus additional individualized invitations for registration were sent out to airport industry professionals particularly in the areas of cargo, concessions and tenants, legal, as well as to smaller airports. A reminder email was sent out during the registration period, with additional outreach to the Airports Council International (ACI) Environmental Committee and ACI's broader membership, Airport Consultants Council (ACC) membership, American Association of Airport Executives (AAAE) membership, and FAA. This additional outreach yielded an additional 41 individuals resulting in a total of 152 people who registered to participate in the outreach process.

For each outreach instrument, the research teams then identified appropriate candidates to participate in the outreach efforts for both ACRP projects. In some cases, participants were selected to participate in both of the ACRP projects.

From the list of registered interested parties, augmented by the research teams' knowledge of airports around the country, the research teams developed a list of airport executive and staff participants that are representative of a range of airports, as well as airport industry representatives, private industry airport consultants and other stakeholders. Consideration was given to airports that are implementing sustainability initiatives as well as airports with emerging sustainability programs and airports not yet participating in sustainability programs. The following stakeholders were identified:

- Airport owners and operators
- Airport tenants (including airlines, concessionaires, and governmental agencies)
- Airport industry organizations
- Airport industry consultants

In addition to the participants who registered as described above, for each of the outreach instruments, the research teams found it necessary to further augment stakeholders who were invited to participate, since the registrants were either not diverse enough, or were not of sufficient number to ensure a representative groups of respondents. Table B-1 lists the additional outreach solicitation efforts.

Table B-1. Additional stakeholder outreach solicitation.

Outreach Instrument	Additional Outreach Solicitation	Number of Participants
On-line Survey	Identified preliminary list of 82 potential respondents from registration. Augmented list with 324 individuals from membership roster of AAAE	Invited Participants: 406 Responses: 87
In-depth Interviews (conducted by phone)	Identified preliminary list of 20 potential respondents from registration. Augmented list for in-depth interviews through publicizing the project at industry conferences (National Aviation Conference and ACI–NA Annual Conference) and through direct calling of the research teams' contacts	Invited Interviewees: 27 Conducted Industry Interviews: 15 Panel Interviews: 7 Total Interviews: 22
On-Line Focus Group	Identified preliminary list of 10 potential respondents from registration. Augmented list through publicizing at industry conferences (ACI–NA Annual Conference and Airports Going Green) and through direct calling of the research teams' contacts	Invited Focus Group participants: 34 Actual participants: 19 participants completed 50 percent or more
Briefings at Conferences	ACI–NA Annual Conference – Briefing and paper survey Extensive notification to conference attendees and emails	Received 26 paper surveys Committee meetings attendance: Information Technology (~60), Finance (~45), joint Environmental/Ops Technical (~75), Commissioners (~30), and Small Airports (~45)
	Airports Going Green – Briefing and input solicited through instant feedback technology (TurningPoint)	Attendees: 41

Source: VHB, 2014

Phase I Stakeholder Outreach Instruments and Methodologies

To achieve the ACRP Project 02-28 research objectives, the research team conducted a five-phase project involving an on-line survey, in-depth interviews, on-line focus group, a paper survey at the ACI–NA Annual Conference, and an in-person facilitated workshop at the Airports Going Green Conference. The following sections describe the stakeholder outreach instruments and methodologies.

On-Line Survey

The goal of the on-line survey was to gain input from a representative sample of participants on sustainability best practices, parameters of a Decision Tool, and features of a rating system. The survey was self-administered on-line, and required about 30 minutes to complete. The survey contained approximately 60 questions in total, and included a mix of open-ended and closed-ended questions. During the 2-week data-collection period, the research team sent two reminder emails to respondents who had not yet completed the survey in order to enhance the response rate.

The research team prepared and administered the on-line survey. The process for the on-line survey was as follows:

- Developed the questionnaire using market research techniques to assure objective responses.
- The survey was tested by 4 individuals: an ACRP Project 02-28 panel member, a consultant, a FAA representative, and an airport staff person.
- An email was sent to selected survey participants (406 individuals) notifying them of the survey and providing a link to the survey.
- At the close of the survey, 87 responses were completed representing a 21 percent response rate.

The goal of the on-line survey was to secure a representative sample of completed surveys from airport staff responsible for planning and implementing airport development projects, as well as those staff involved with operations and maintenance activities.

The on-line surveys were self-administered via RDD Field Services' on-line survey service. All surveys were completed from September 29, 2011, through October 13, 2011. The response rate (the proportion of eligible respondents contacted who completed an on-line questionnaire) for the survey was 21 percent. The remaining potential respondents either chose to not complete the survey or were unavailable during the data collection period.

All sample surveys involve a margin of error. The percentages of the total population surveyed for this study (87 interviews) are accurate by a margin of plus or minus 6.3 to 10.6 percentage points at the 95 percent confidence level (Table B-2). In general, sampling tolerances will vary depending on the size of the subgroup analyzed as well as the percentage of respondents giving a particular response. The following table indicates the sampling tolerances for the total sample and for subgroups of various sizes at different percentages. These tolerances reflect error due to sampling error, and do not reflect error due to other factors. Margin of error is used for scientific samples, and while the margin of error information is included, this should be interpreted cautiously because the sample for the on-line survey is a convenience sample.

To determine if the differences between subgroups were statistically significant and not due to random sampling error, the research team conducted difference of proportion tests on all comparisons between groups. In this report, differences are reported

Table B-2. Margin of error.

Sample Size	Percentages								
	10%	20%	30%	40%	50%	60%	70%	80%	90%
87	6.3	8.5	9.7	10.4	10.6	10.4	9.7	8.5	6.3
75	6.8	9.0	10.4	11.1	11.3	11.1	10.4	9.0	6.8
50	8.3	11.1	12.7	13.6	13.9	13.6	12.7	11.1	8.3

Source: Market Street Research, 2013

as significant if the difference of proportion tests conducted indicate that there is a 95 percent or greater chance that the difference is real and not due to sampling error. Findings reported as somewhat different indicate that there is a 90 percent to 94 percent chance the difference is real. Differences are discussed only if the number of respondents giving each response is at least 20. Differences not discussed in the text should be interpreted cautiously. These differences may not be statistically significant and may reflect sampling error rather than actual differences between groups.

In-Depth Interviews

The VHB Team held in-depth interviews with ACRP Project 02-28 panel members and airport industry decision makers. Twenty-seven interviewees were contacted via email and phone, and times were scheduled for the interviews. The research team conducted a total of 22 interviews, which included 15 interviews with stakeholders and 7 interviews with panel members. On the phone call, the introduction to the session was made by Principal Investigator. To ensure unbiased feedback and reporting, the specific questions were posed and recorded by representatives from the market research firm on the research team. Feedback from in-depth interviews was recorded on an in-house program developed by the market research firm, which was then used to sort data by respondents and by question to analyze and report on the findings.

The in-depth interviews allowed for a semi-structured discussion on the key issues. In preparation for the interviews the research team developed an interview guide that included questions regarding topics of importance including:

- Successful sustainability best practices.
- Barriers to implementation.
- Interest and desire for a sustainability Decision Tool.
- Desire for and features of a sustainability performance rating system.
- Interest in a voluntary certification system and its structure.

Interviews were conducted at times convenient for respondents. Upon completion of data collection, interview responses were analyzed by the market research firm analysts and used to inform the development of the moderator's guide for the on-line focus group phase of the study.

Results presented in this report should be interpreted cautiously, as a small number of airport industry representatives were interviewed (22) and the sample for the study is a non-random or convenience sample. For these reasons, the results may not fully reflect the characteristics of all airport industry representatives, and readers should keep this in mind when interpreting results.

In addition, it is important to note that differences between airport industry representatives presented for this phase are observational and not statistically significant. Readers should interpret any differences across groups of representatives with caution.

On-Line Focus Group

For this outreach effort, the research engaged airport industry representatives in directed, moderated discussions to understand their perspectives specifically on a sustainability Decision Tool and the feasibility of an airport-specific sustainability rating/certification system. Invitees were identified based on those who indicated an interest during the registration process and through additional solicitation for participants at industry conferences. The research team sent invitations to 34 potential participants, and 19 individuals completed 50 percent or more of the questions posed during the course of the focus group. The remaining potential respondents either did not complete a significant number of questions; or logged into the bulletin board but completed no questions; or never logged on.

The on-line bulletin board-style focus group was hosted by iTracks on-line focus group service. Facilitation was conducted using an on-line moderated/hosted bulletin board-style focus group application. Each participant was asked to develop a simple profile with information about their roles and areas of responsibility and the characteristics of airport where they are employed.

The results of the previously completed on-line survey and in-depth interviews informed the questions posed to the on-line focus group. A moderator's guide was also developed for the on-line focus group. Participants replied to the preprogrammed

sets of questions and the live moderator, who monitors the session, asked follow-up questions where appropriate to probe for more information. Focus groups are an appropriate method for obtaining in-depth information about respondents' attitudes. By definition, however, focus groups are qualitative; that is, they involve relatively small numbers of participants. The results may therefore not be representative of all people who are involved in the airport industry. The information presented in this report should be interpreted in general terms only, and not in terms of percentages.

Paper Survey at ACI–NA Annual Conference

The research team provided project briefings at an ACI–NA Annual Conference. The research team gave a formal presentation to a joint Environmental and Technical/Operations committee meeting and briefings to the Information Technology, Financial, Small Airports, and Commissioners committees over the course of the conference. The presentation included an overview of the goals of ACRP Project 02-28. A paper survey was distributed to attendees of the presentation and briefing on the same topics of interest covered in the other outreach instruments.

The paper survey was designed so that an individual would be able to complete it within five minutes. It included 20 questions focused only on the Decision Tool and rating system and many of the questions were taken verbatim from the on-line survey.

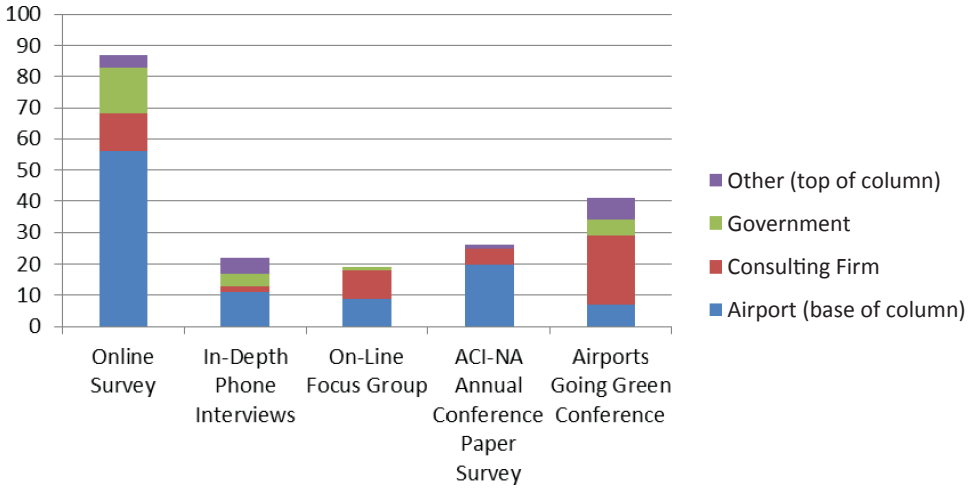
In-Person Facilitated Workshop

The Principal Investigator made a presentation on ACRP Project 02-28 to a workshop attended by 65 individuals at the Airports Going Green Conference. The presentation included general information regarding the goals of the ACRP Project 02-28 and the research questions as well as directed questions regarding preferences for the Decision Tool and rating system. Answers to the questions were gathered using an instant feedback technique through voting using remotes (TurningPoint software).

TurningPoint integrates with Microsoft PowerPoint to allow participants to provide instant feedback. The TurningPoint software allows the moderator to use Microsoft PowerPoint to pose questions to the audience and post the results graphically within PowerPoint once polling has ended. The participants use hand held remote devices where buttons are keyed to certain responses presented in PowerPoint. The responses are stored within the TurningPoint software for downloading and analysis after the presentation has ended.

Characteristics of Phase I Stakeholder Participants

A total of 195 airport industry representatives participated in this research, including those who work for airports, consulting firms, government agencies, and other types of employers (Figure B-2). Just over half of the representatives (103 individuals)



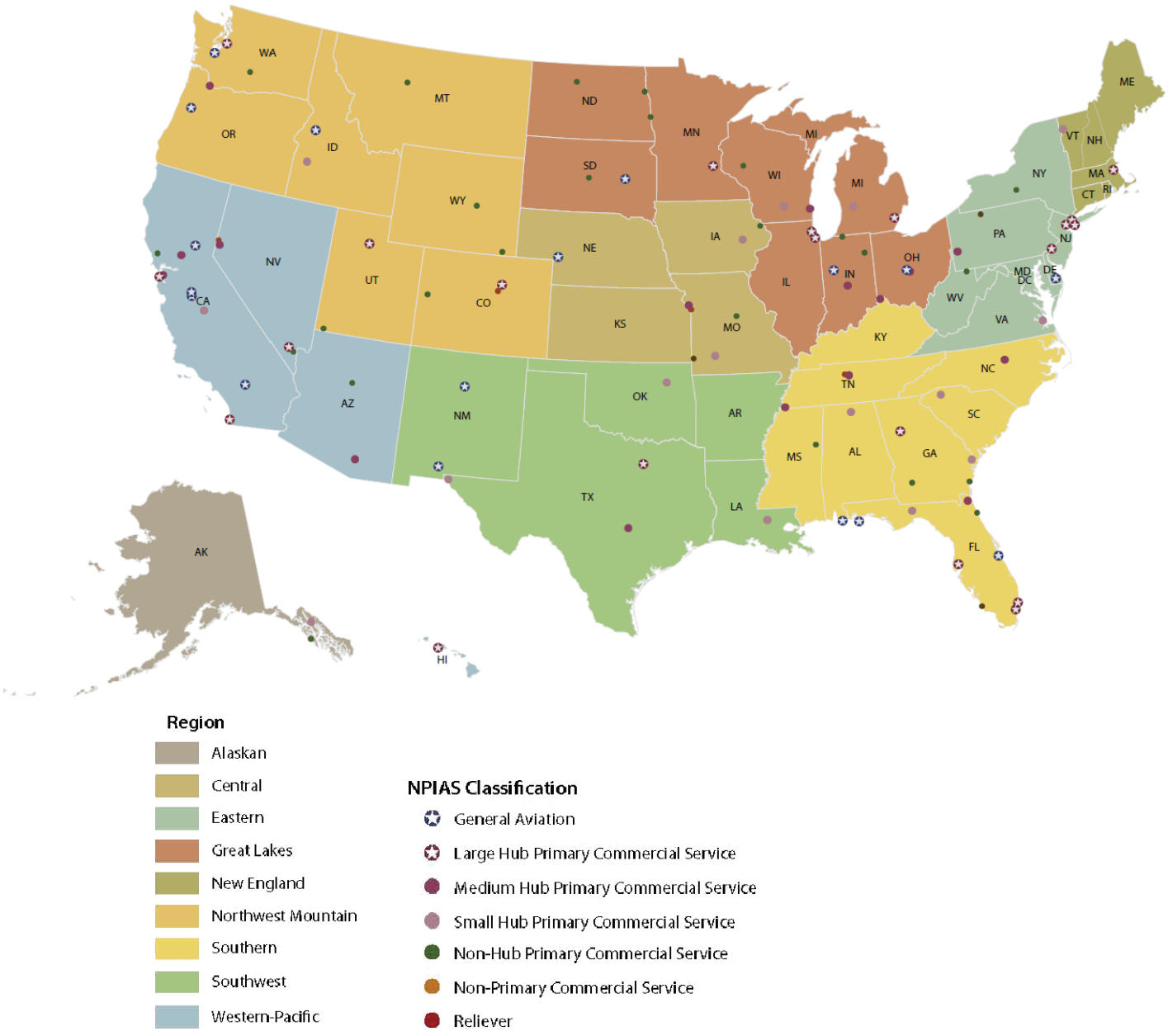
Source: VHB, 2014

Figure B-2. Number of participants across outreach instruments.

identify their employer as an airport or airport system. One-quarter of the representatives (50 individuals) contacted are employed by a consulting firm. Twenty-five of the representatives contacted are employed by the government, and the remaining representatives (17 individuals) identified their employer as an industry group, an airport tenant, vendor, or university faculty member. Note that some individuals declined to identify their employer or chose to remain anonymous.

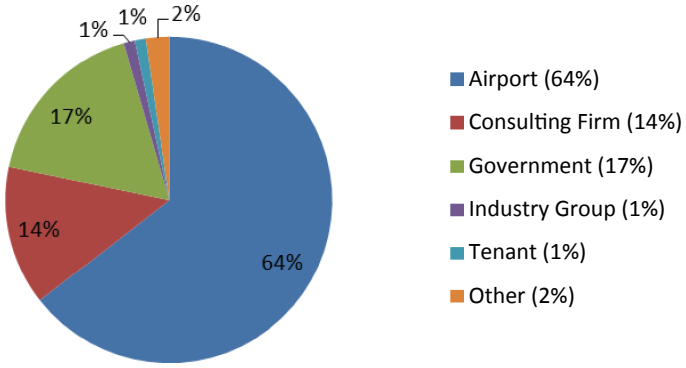
Over 100 airports are represented by the individuals who participated in the stakeholder outreach. The respondents primarily represent larger passenger airports (those with 200 or more full time equivalent employees), although the findings include representatives of general aviation and other types of airports, and small to medium-sized airports as well. The geographic location of the airports is broad and includes all of the FAA regions (Figure B-3).

The following sections describe the characteristics of the participants in each of the five outreach instruments. Across all five outreach instruments, airports represented the largest group of individuals. Consulting firms were also well represented in each



Source: VHB, 2014

Figure B-3. Locations of airports represented in stakeholder outreach.



Source: Market Street Research, 2013

Figure B-4. On-line survey—participants.

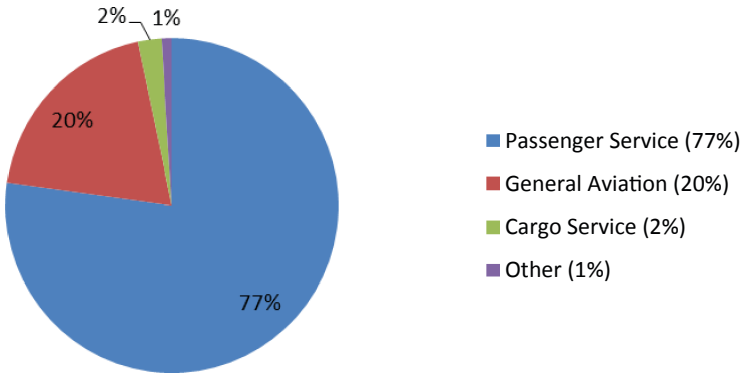
of the survey instruments. A number of government officials, either Federal Aviation Administration employees or other government entity or agency employee, airport tenants, industry group representatives, and university facility members participated in the outreach instruments.

On-Line Survey

A total of 406 individuals were identified to participate in the on-line survey. Eighty-seven individuals of the invited 406 individuals participated in the on-line survey representing a 21 percent response rate. Of the 87 individuals, 64 percent are employed by an airport operator, 14 percent are employed by a consulting firm, 17 percent are employed by a government entity or agency, and the remaining 4 percent are employed by an airport industry group, an airport tenant, or did not identify themselves as employed by one of these categories (Figure B-4).

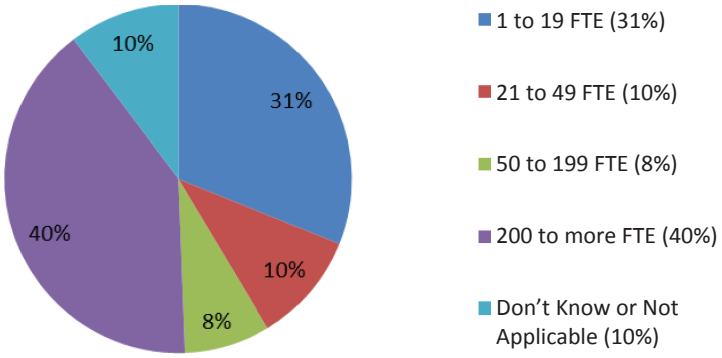
The participants who are employed by airports are most likely to work in either the Finance/Administration or Environmental departments. The government participants work in municipal government positions and most of the remainder work for the Federal Aviation Administration. Smaller numbers of individuals hold other positions. The consulting firm participants primarily work in Engineering, Environmental, or Planning divisions.

Of the airports represented, approximately 77 percent of them provide passenger service (i.e., commercial airline service), 20 percent mainly provide general aviation service, 2 percent mainly provide cargo service, and 1 percent mainly provide a different type of service (Figure B-5).



Source: Market Street Research, 2013

Figure B-5. On-line survey—types of airports represented.



Source: Market Street Research, 2013

Figure B-6. On-line survey—number of employees at airports represented.

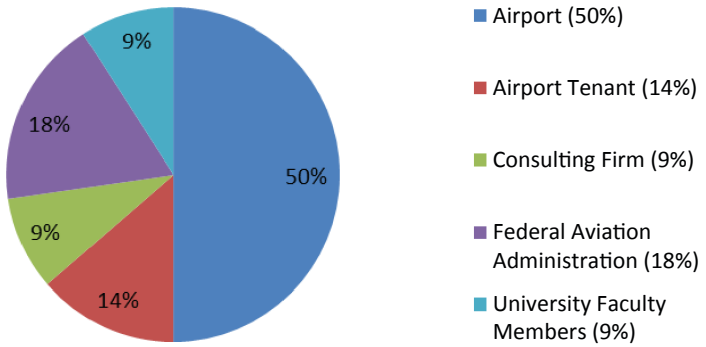
About two-fifths (40 percent) of the airports in this research have 200 or more Full Time Equivalent (FTE) Airport staff, excluding contract employees and tenants. Most airports in this research are smaller, which includes nearly one-third (31 percent) with fewer than 20 FTE staff. For the purposes of this analysis, this document refers to airports with 200 or more FTE as large; those with between 20 and 199 FTE as medium; and those with fewer than 20 FTE as small airports (Figure B-6).

In-Depth Interviews

Twenty-eight individuals were invited to participate in the in-depth interviews. The individuals identified to participate were drawn from the registration pool for the two concurrent ACRP Projects and were supplemented by the VHB Team's industry contacts and represented a range of stakeholders. Fifteen of the 28 individuals invited agreed to participate in the in-depth interviews. Additionally, seven members of the ACRP Project 02-28 panel agreed to be interviewed. Therefore, 22 individuals were included in the in-depth interviews. The 22 participants included employees of airport operators (50 percent), FAA employees (18 percent), representatives who work for airport tenants (14 percent), representatives of consulting firms (9 percent), and university faculty members (9 percent), as shown on Figure B-7.

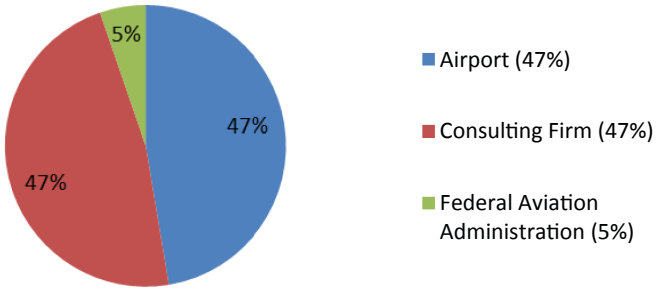
The airport industry representatives who work for airports have such job titles as Airport Manager; Airport Director; Executive Director; Director of Aviation, Planning, and Environmental; Assistant Airport Director for Planning and Development; Vice President of Planning, Engineering, and Environmental Management; Assistant Vice President for Construction and Environmental; Executive Vice President of Operations; and Director of Operations.

These respondents represent such departments as Civil and Environmental Engineering; Planning, Engineering, and Environmental; Operations; Planning, Design, and Construction; Planning and Development; Administration; and Aviation Technology.



Source: Market Street Research, 2013

Figure B-7. In-depth interviews—participants.



Source: Market Street Research, 2013

Figure B-8. On-line focus group—participants.

The VHB Team also interviewed airport industry representatives who work for organizations other than airports, including those who work for tenants at airports; firms that consult with airports; the FAA, a federal government agency; and university faculty members. These individuals have such job titles as Vice President of Business Development; Civil Engineer; Professor/Director of the Center for Excellence for Airport Technology; Associate Professor; Vice President of Corporate Real Estate; Senior Program Manager of Aviation; Program Manager; Environmental Program Manager; Project Manager and Engineer; and Airport Planner.

Nearly one-half of the representatives in this research have worked in the industry for 21 years or more, and about three-fifths have worked with two or more airports within the past twelve months.

Representatives who work for organizations other than airports were more likely than those who work for airports to have worked with two or more airports in the past twelve months.

On-Line Focus Group

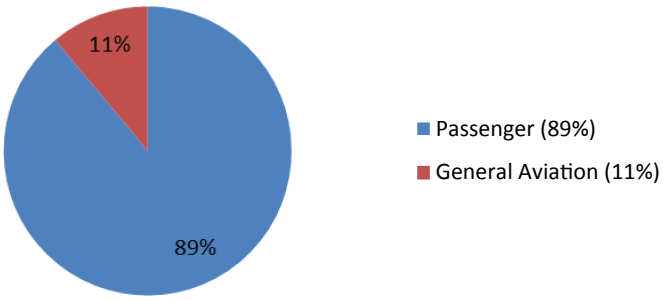
Nineteen individuals responded to 50 percent or more of the questions posed to the focus group. The participants represented airports (47 percent), consulting firms (47 percent), and the FAA (5 percent), as shown on Figure B-8.

The airport participants overwhelmingly represented passenger service airports (89 percent). Eleven percent of the airport participants represented general aviation airports (Figure B-9).

Paper Survey at ACI–NA Annual Conference

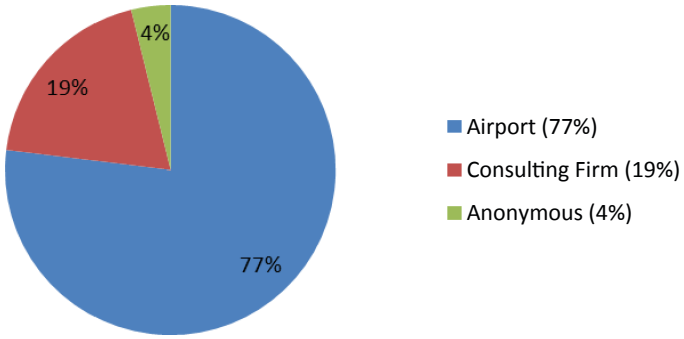
All of the recipients of the paper survey were in attendance at the ACI–NA committee meetings during the Annual Conference. Twenty-six individuals completed and returned the paper survey. The respondents were either employed by an airport operator (77 percent) or were employed by a consulting firm (19 percent). One individual choose to remain anonymous (Figure B-10).

All of the airports represented by survey respondents are passenger airports. None of the airports were served general aviation.



Source: Market Street Research, 2013

Figure B-9. On-line focus group—types of airports represented.



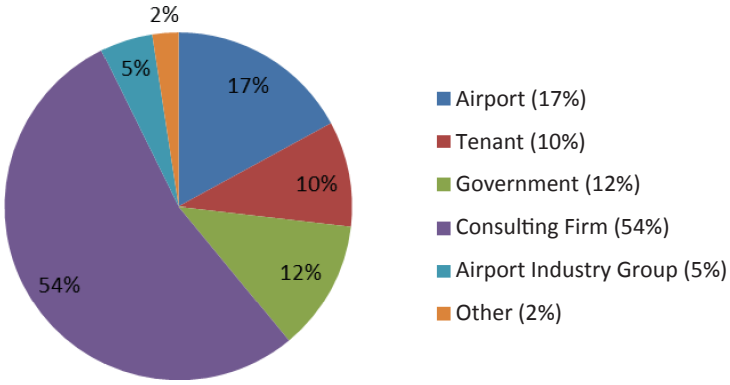
Source: Market Street Research, 2013

Figure B-10. Paper survey—respondents.

In-Person Facilitated Workshop

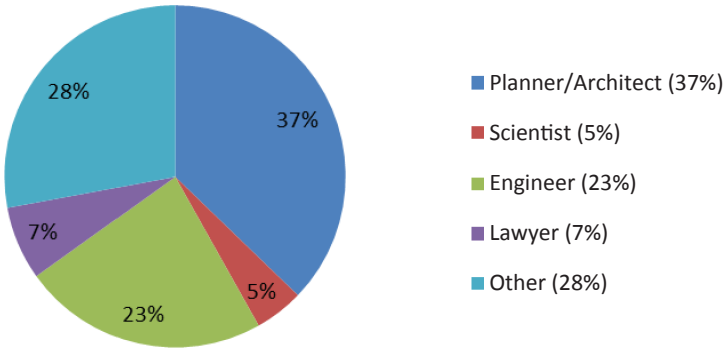
There were 41 individuals who actively participated in the workshop at the Airports Going Green Conference. The majority of participants at the Airports Going Green workshop were employed by consulting firms (54 percent). Also well represented were airports (17 percent), federal and/or state government officials (12 percent), and airport tenants (9 percent). Airport industry groups were also represented at the workshop (5 percent), as shown on Figure B-11.

Most of the workshop participants identified themselves as a planner or architect (37 percent). Other professions included scientist (5 percent), engineer (23 percent), and lawyer (7 percent), as shown in Figure B-12.



Source: Market Street Research, 2013

Figure B-11. In-person facilitated workshop—participants.



Source: Market Street Research, 2013

Figure B-12. In-person facilitated workshop—participants' professions.

Phase II Stakeholder Outreach

The intent of the Phase II stakeholder outreach process for ACRP Project 02-28: Sustainability Practices: Tools for Evaluating, Measuring, and Implementing was to solicit feedback from airports on a proposed prototype airport sustainability rating system developed by the Research team and to determine the feasibility/viability of certification and verification of a sustainability rating effort for airports. In contrast to the Phase I stakeholder outreach that focused on obtaining opinions from a wide-range of airport stakeholders, Phase II stakeholder outreach was focused on obtaining targeted feedback from stakeholders who would be implementing and using the rating system. The purpose of the stakeholder outreach in this task was to confirm and validate panel guidance and solicit airport industry opinion on the components of the Prototype Rating System, including:

- Applicability and feasibility of proposed activity categories and sustainability activities.
- Feedback on the completeness of the list of Activity Categories and Sustainability Activities. Identify gaps and propose additional Activity Categories and Sustainability Activities if necessary.
- Feedback on the appropriateness of Performance Metrics and Performance Actions as high-level indicators of airport-wide sustainability.
- Whether the incorporation of materiality addresses concerns of rating system applicability to airports of all sizes and geographies.
- Appropriateness of allowing airports to select their own metric (e.g., building size, passengers, aircraft movements) to determine an intensity value for some Performance Metrics rather than requiring use of a specific metric.
- Complexity of the certification program for presenting the trade-offs between costs of the program, ease of understanding, and ability to drive performance improvement of participation.
- Suggestions on Rating Level names to improve upon the Platinum, Gold, Silver, Bronze format presented in the Prototype.

Phase II Outreach: Input on the Prototype Rating System

Overall, this study found tentative support for the Rating System concept among airport industry representatives. Larger airports with established sustainability programs or initiatives would be less likely to use the system. These larger airports thought it would be an additional burden to track and use the system. Medium and smaller airports voiced more interest in using the Rating System; however, use would primarily serve as guidance for developing and implementing a sustainability program, rather than rating airport sustainability performance. There was interest across airports for having the option to compare to other similar airports, although motivations were primarily for learning from and benchmarking against other airports rather than for competitive comparative purposes.

Many stakeholders were supportive of the concepts included in the prototype Rating System, and provided suggestions for further streamlining and modifying the Rating System to better meet their specific needs. Many raised questions about the intent and final structure/format of the Rating System, which would determine their likely future use of the tool. Potential costs are a key barrier to use.

This section summarizes major findings emerging from this research.

Design Specifications. Some stakeholders found the five Design Specifications confusing at first. Stakeholders suggested the Rating System could be enhanced by clarifying and simplifying terminology, explaining the use of the EONS[3] (Economic performance, Operational efficiency, Natural resource conservation, and Social responsibility) Framework, and streamlining the Activity Categories and expanding the Sustainability Activities. Customization and flexibility was a concern expressed throughout. Some wanted to see more information upfront about how the Rating System could be customized to meet the unique needs of different airports, as the sustainability challenges facing a small airport in a wet, tropical climate, for example, are likely to be different from those facing a very large airport in a Northeast urban area or an airport in an area with a high average annual snowfall.

Activity Categories and Sustainability Activities. Stakeholders overall thought that the 13 Activity Categories and 47 Sustainability Activities formed a solid basis for an airport sustainability rating system, but the specific categories and activities

[3]Airport Council International-North America's Environmental Committee defines Airport Sustainability as a holistic approach to managing an airport so as to ensure the integrity of the Economic viability, Operational efficiency, Natural Resource Conservation and Social responsibility (EONS) of the airport.

could be further refined. To simplify system, some suggested that the Activity Categories should be streamlined or condensed to a smaller, broader number of topics. At the same time, stakeholders though that the number of Sustainability Activities should be expanded within each Category to provide more specificity to airport-related functions. Many stakeholders thought there was an over emphasis on environmental considerations and believed the Rating System should place more emphasis on the cost benefits and return on investment (ROI) of sustainability activities. More specific suggestions related to the Categories and Sustainability Activities, are provided in Section 3.3, *Findings and Applications*, of this report.

Performance Metrics and Actions. Stakeholders support the use of both Metrics and Actions, although they give particular weight to Performance Metrics, which they value as offering an objective outcomes-based measurement of how successful an airport has been toward achieving a goal. Some suggested that the Metrics outlined in the Global Reporting Initiative (GRI) Airport Sector Supplement should be further considered.

EONS Framework. Airport industry representatives were of the opinion that the EONS framework formed a familiar basis for organizing the rating system. The visual "badges" aspect of the EONS Framework and its acknowledgement of the holistic impact of sustainability initiatives were appealing to stakeholders. Some stakeholders suggested that weighting the individual Sustainability Activities according to their greatest contribution to the EONS aspects would be beneficial. For example, if a Sustainability Activity provided benefits for water conservation, it would be weighted more heavily to the Natural resources conservation aspect of EONS. Others suggested that visuals to be more symbolic, connecting more directly to the ideas being presented, rather than the EONS acronym. For example, a green dollar sign might connect to "economic performance" more intuitively than the "E" in EONS.

Infrastructure, Operations, and Management (IOM) Classification. Stakeholders found the IOM Classification added complexity without adding apparent value to the System. In additional, stakeholders were not clear how the EONS framework and the IOM related to each other and operated together.

Spheres of Influence. Across the board, stakeholders thought it makes sense for Sphere 1 activities to be the focus of the System. Larger airports supported the inclusion of Spheres 2 and 3 in the Rating System, acknowledging the important role they can play as sustainability leaders within the larger "city" of an airport. Stakeholders suggested that, ideally airports could begin using the Rating System with a preliminary focus on Sphere 1 activities, and gradually begin to incorporate Spheres 2 and 3 activities to count as "extra credit" toward the airport's total rating.

Certification and Verification. Airport industry representatives were split as to whether the intent of the Rating System is for airports' internal decision-making purposes, or external use, such as public relations. Many prefer the idea of using the Rating System as an internal guide and believe first-party certification and verification would be appropriate for these purposes. Most Federal Aviation Administration (FAA) representatives, large airports, most small airports, and approximately half of the medium airports in this research tend to favor internal use of the tool, while representatives of airport industry groups, most vendors, some small airports, and approximately half of the medium airports in this research see value in external use of the tool. If the scoring is intended for external use, stakeholders believe third-party verification should be required for credibility, but are concerned that the verification process could be cost-prohibitive.

Scoring Framework. Overall, while the scoring framework was clear, some had concerns about the value of having an overall airport score and believed that individual scores for departments or Activity Categories might be more useful. (Note, this opinion is somewhat in conflict with the previous recommendation to simplify the number of Activity Categories). Materiality (i.e., local applicability) was a clear concern, and some believed overall scores would lack value for external use. Many stakeholders thought it would be meaningless to compare overall scores for airports that may well be dramatically different in terms of the size and scale of their operations, and their unique environmental and local challenges.

The stakeholders believed recognition levels (such as Gold, Silver and Platinum) would not add value for internal decision-making, but would if the scores were used externally, as they would be easier for the public to understand. Rating recognition levels similar to the LEED system was seen to be confusing. The majority of stakeholders preferred to see the Rating System operate as a process so that there was no "end" point at which sustainability has been attained, but rather approached sustainability as a continuum of ongoing improvement. Table B-3 summarizes some of the key recommended changes or suggestions for each component part of the prototype Rating System.

Table B-3. Summary of stakeholder suggestions.

Component	Stakeholder Suggestions
Design Specifications	Communicate overarching goal of System more clearly from onset Clarify and simplify terminology Clarify customization options from onset Key areas to simplify and clarify: EONS, Categories, and Activities (see below)
Activity Categories; Sustainability Activities	Condense into fewer, broader Categories Expand Sustainability Activities and add definitions for each activity Add a glossary or descriptions Expand focus on cost benefits/Return on Investment Add sense of priority to Activities Expand Activities to include negative and neutral impacts Reframe Activities as verbs; clearly differentiate goals from strategies to accomplish goals Add Safety and Security; Operations, Social, Economic
Performance Metrics and Actions	Clarify customization options from onset Define actions to be specific and results-oriented Consider adding broad Goals Consider ability to measure progress both from an initial starting point and annual progress
EONS and IOM	Include information about how the four elements will be weighted Consider connecting visuals to ideas rather than acronym Simplify IOM so as not to add complexity without value
Spheres of Influence	Consider and clarify how Sphere 2 and 3 activities will be weighted Consider framing Sphere 2 and 3 activities as “extra credit” Clarify customization options from onset Address concerns from concessionaires, vendors, etc.
Scoring framework	Clearly incorporate local applicability (materiality) from onset Consider ability to break out scores for sustainability categories; not just overall airport score Consider alternative recognition labels that will neither cause confusion with LEED terminology nor imply an end point Frame scoring to assess performance as an ongoing effort, rather than an end goal, to be ended once achieved
Certification and Verification	Clarify and communicate whether goal of Rating System is for internal or external use Address concerns about costs associated with third-party verification, including exploring funding

Phase II Stakeholder Outreach Process

The stakeholder outreach process included three outreach instruments: in-depth interviews, webinars, and a workshop at an industry conference. This section outlines the steps taken to encourage stakeholder participation, the methodology deployed for each instrument

The research team undertook a wide reaching stakeholder outreach process and sought to solicit feedback from a wide range of airport industry representatives on the preliminary prototype sustainability rating system and its viability. The following sections describe the efforts taken by the research team to encourage stakeholder interest in the project and participation in the feedback instruments.

Stakeholder Solicitation

The research team employed several methods for soliciting stakeholder participation in the research effort.

In-Depth Interview and Webinars. The Phase II stakeholder outreach built on the efforts undertaken during the Phase I outreach process. The Phase I process included a broad registration process where over 150 people signed up to participate in the stakeholder feedback effort. During the Phase I process, e-mails were sent to membership lists or colleagues of airport industry

groups, encouraging their participation in the stakeholder outreach. Interested participants were able to register on-line, and a list was created of these individuals and their associated demographics. This list was the basis for developing the Phase II stakeholder outreach roster of potential participants, and was further augmented through the following efforts:

- Participants who had expressed interest in the effort since Phase I through e-mails and enquiries received by the research team.
- Individuals who participated in the stakeholder efforts for ACRP Project 02-30, "Enhancing the Airport Industry SAGA Website" (including an on-line survey, usability testing, and presentations at industry conferences).
- Conference attendees from an American Association of Airport Executive (AAAE) Airports Going Green conference.
- Outreach to members of the International Facility Management Association (IFMA), Airport Facilities Council (AFC) through an e-mail distributed by an IFMA representative.
- Outreach to members of Airlines for America (A4A) also through an email distributed by an A4A representative.

In combination with the Phase I Stakeholder roster and the additional efforts described above, a total of 302 potential stakeholders were compiled for the Phase II outreach. Participants from the Phase II list were organized into eleven categories based upon airport size, employer category, region, and level of leadership. This variety in categories was aimed to achieve broad representation for the participant groups in order to gain valuable feedback from different levels of interest groups that likely would have an opinion on the feasibility and specific details of an airport-specific sustainability rating system. The categories included:

- Leadership and staff from large, medium and small airports.
- Airport staff and consultants specifically focused on operations and maintenance (O&M) activities.
- Representatives of airlines, concessionaires and vendors.
- Consultants.
- The Federal Aviation Administration (FAA).
- Representatives from Airport Industry Organizations.

Upon review of the sorted list of participants, the research team found it necessary to further augment the roster in order to provide broad range of participants within each of the eleven categories. Participants were identified from the following additional sources:

- Airport Council International–North America (ACI–NA) membership directory including airport members as well as the technical committees.
- AAAE membership directory including airport members and technical committees.
- Airport Consultants Council membership directory including members and technical committees.
- FAA staff listed on the FAA's website.

It is of importance to note that many of the participants included on the list may not be knowledgeable of the concept of sustainability rating systems and may not work with airport sustainability directly, but the intent of their participation was to offer more variety in obtaining valuable feedback for the development of the preliminary prototype sustainability rating system for airports across the country.

Large-Group Presentation and Discussion. The large-group discussion was held at an ACI–NA annual conference. The session was hosted at a joint session of ACI–NA's Environmental and Technical Committees. Prior to the conference, the research team contacted the ACI committee liaisons who sent out notifications of the session to members of their committees. In addition, flyers notifying conference attendees of the session were widely distributed.

Phase II Stakeholder Outreach Instruments and Methodologies

To achieve the second phase of the stakeholder outreach for ACRP Project 02-28, the research team used three outreach efforts:

- In-depth interviews.
- Facilitated group webinars.
- Feedback at the ACI–NA World and Annual Conference in Calgary, Canada.

The following sections describe the stakeholder outreach methodologies and instruments.

In-Depth Interviews

The research team conducted in-depth interviews with participants that are likely to be users or reviewers of the airport sustainability rating system including airport employees, airport industry organization representatives, consultants, and ACRP Project 02-28 panel members.

Interview Participant Selection. The research team conducted a total of 12 in-depth interviews including four panel members with the remainder of participants from the broader airport community. Key individuals were identified whose insights were expected to be valuable to the study and who represent a broad range of viewpoints and airports of different sizes.

Participant Briefing Package. The research team prepared a summary briefing package that was provided to interview and webinar participants in advance of the sessions. This 12-page document summarized the key features of the prototype rating system and provided examples of what the prototype may look like. Prior to the interviews and webinars, participants were e-mailed the participant briefing package and were requested to review the materials before the interviews and webinars. The need for advance preparation was made clear in the participant solicitation and selection process.

Interview Logistics. Prior to the conduct of the in-depth interviews, the research team developed a draft interview guide for use by the interviewer. The interview guide was tested with a member of the research team and revised prior to conducting the interviews. The guide included descriptions and questions regarding key topics of importance. During the course of the interviews, questions were added regarding any unanticipated topics that had risen. This was one of the benefits of an in-depth interview methodology: the research process is responsive to direct feedback.

A trained, experienced interviewer from Market Street Research (MSR) conducted the in-depth interviews via telephone during the scheduled appointments. Each interview took approximately 45 minutes to an hour to complete. Each interview began with an introduction to the project, in most cases given by Principal Investigator (PI), Carol Lurie. After the introduction, the PI signed-off from the call to allow for candid discussion. Participants were given the option to follow up with the PI after the call. None of the interviewees followed up.

Webinars

The research team conducted a total of 11 live facilitated webinars, with three to six participants per session. The major advantage of a live web discussion format over a face-to-face focus group was that the research team was able to recruit participants from all over the country to participate in the discussion. The live web discussions allowed the moderator to interact directly with the participants. This was essential in gaining feedback on the rating system since participants' questions were answered, areas of confusion were clarified, and the moderator was able to probe for more in-depth responses from participants.

Webinar Participant Selection. From the Phase II stakeholder outreach participant list, 20 to 30 individuals from each of 11 categories were randomly selected. A group email was sent out to all of the selected individuals requesting their participation in one of the scheduled webinars. Follow-up phone calls were made to those individuals who did not respond to the first email, in order to answer questions the individuals may have had and gauge whether or not they would like to be involved in a webinar. Research was conducted throughout this process in order to fill in gaps related to contact information of individuals or to further augment the stakeholder list to get a sufficient number of participants. Those individuals who expressed interest in the webinar participation via email or phone were sent a webinar invitation for their scheduled sessions, along with the participant briefing package.

The 11 webinars, allowed the research team to obtain input from 52 stakeholders. The groups were organized so that the participants in each individual group were relatively homogenous in terms of criteria such as size of airport, type of airport, and role in the airport industry (e.g., airport consultant vs. airport employee). The research team strove to have participants that reflected a cross-section of airports of different sizes and geographies. Between three and six stakeholders participated in each of the following 11 live web discussion groups:

- Airport Directors/Executive Leadership from:
  - Small-Hub/general aviation (GA) Airports.
  - Medium-Hub Airports.
  - Large-Hub Airports.

- Airport Staff from:
  - Small-Hub/GA Airports.
  - Medium-Hub Airports.
  - Large-Hub Airports.
- Airport Industry Organizations (ACI–NA, AAAE, A4A).
- Federal Aviation Administration Staff (Headquarters and Regional Offices).
- Tenants (Airlines, Concessionaires, Vendors).
- Airport staff and consultants with a particular focus on airport operations and maintenance.
- Airport Consultants with a knowledge of sustainability issues.

Webinar Logistics. Prior to the webinars, the research team prepared a moderator's guide, which outlined information about the prototype rating system, the questions to be asked, and the materials displayed during the web discussions. As with the interviews, in advance of each web discussion, participants were e-mailed the participant briefing package and were asked to prepare their thoughts. This was made clear in the participant solicitation and selection process.

Each web discussion lasted one and one-half hours. Participants called into a conference call line (or were contacted directly) along with the moderator, subject matter expert, and observers. The webinars were moderated by staff from InsideOut Insights, a private market research firm based in Pennsylvania and specializing in on-line and teleconference focus groups. The trained and experienced moderator's role was to lead the discussion and ask the relevant questions. The subject matter expert's role was to provide an overview of the prototype rating system and to answer participants' technical questions about the rating system.

During the live web discussion, the moderator made available discussion materials via WebEx, as well as on a website, for those who could not access WebEx. As with the interviews, for most of the webinars, the Principal Investigator provided an overview of the project, but with the webinars, the PI was an observer for the duration of the webinar.

Large-Group Presentation and Discussion

The goal of the large-group discussion at a conference was to solicit input from participants on the prototype sustainability rating system in relation to the following:

- Applicability to airports of different roles and geography.
- Activity categories and sustainability activities included in the rating system.
- Ease of use.
- Appeal of the rating system and if it is compelling enough to attract participants.

Large-Group Presentation and Discussion Logistics. The large-group discussion was held at an ACI–NA annual conference. The session was hosted at a joint session of ACI–NA's Environmental and Technical Committees; members of other committees were also invited to attend.

The meeting facilitator opened the meeting and the PI made a presentation on the features of the prototype airport sustainability rating system. The PI led participants through a question session, followed by a structured but open-ended discussion period. A key component of the meetings was to solicit feedback in the form of anonymous voting. The PI utilized TurningPoint™, an interactive audience participation tool that can be used to collect comments, concerns and observations at meetings. The mechanism was very successful in the Phase I, as well as the Phase II outreach process. As soon as a survey session was complete, the graphed results were viewed by the workshop participants as part of the presentation, providing instant feedback. The findings were also saved in a spreadsheet format for later analysis.

Characteristics of Phase II Stakeholder Participants

The stakeholders included in this research effort represent a range of airport sizes and locations across the United States and Canada; as well as airport industry organizations, the FAA and consultants. Stakeholders hold a variety of **positions and roles** at the airports.

The airports represented fall along a broad spectrum in terms of their own formal sustainability management plans. Larger airports are more likely to have had formal sustainability management plans in place for a number of years, while small airports are more likely to be engaged in the process of creating programs now, or looking at individual initiatives rather than a full program.

In-Depth Interview Respondents. *Stakeholders* who participated in an in-depth interview represent: San Diego International Airport; Dallas/Fort Worth International Airport; Dane County Regional Airport; Austin-Bergstrom International Airport; Big Bear City Airport; Ithaca Tompkins Regional Airport; and Portland International Airport. These representatives work in a variety of departments, including, Environmental Affairs, Operations, Management and Operations and Public Safety, and in a variety of roles, including Director, Chief Operating Officer, Executive Vice President of Operations, General Manager, and Airport Manager.

The *consultants* who participated in this research have worked for the following airports in the last 12 months: Buffalo Niagara International Airport; Lambert–St. Louis International Airport; Chicago O'Hare International Airport; Boston Logan International Airport; New Delhi Indira Gandhi International Airport; Raleigh-Durham International Airport; LaGuardia Airport; Honolulu International Airport; Doha International Airport; Abu Dhabi International Airport; San Diego International Airport; Los Angeles International Airport; Dallas/Fort Worth International Airport; Chicago O'Hare International Airport. The representatives from the **FAA** who participated in an in-depth interview work in the FAA's Eastern and Northwest Mountain regions.

Webinar Respondents. *Airport industry representatives* included stakeholders in leadership positions as well as staff in various departments. Airport industry representatives who participated in the webinars represent: The Port Authority of New York and New Jersey; Hartsfield-Jackson Atlanta International Airport; Salt Lake City International Airport; Seattle–Tacoma International Airport; Los Angeles World Airports; Buffalo Niagara International Airport; Nashville International Airport; Indianapolis International Airport; Albuquerque International Sunport; Jacksonville Aviation Authority; Elmira Corning Regional Airport; Eastern Iowa Airport; Detroit Metropolitan Wayne County Airport; Sioux Falls Regional Airport; Raleigh-Durham International Airport; Minot International Airport; Dayton International Airport; Gerald R. Ford International Airport; Southwest Florida International Airport/Lee County Port Authority; Asheville Regional Airport Authority; Fort Lauderdale-Hollywood International Airport; Massachusetts Port Authority; Lihue Airport; and Smyrna Airport.

Table B-4 provides a bulleted list of the types of positions of the stakeholders who participated in a webinar focus group. The reader is advised that airport industry representatives described their roles in their own words; therefore, there may be some variation in responses.

Industry Conference Participants. The joint Environmental and Operations/Technical committee session was attended by over 65 individuals, 57 of which were active participants using the anonymous voting remote control units. Over half of the attendees were airport staff, with the remainder primarily representing the airport consultant community. Several FAA and airport industry organization representatives also attended the session. Over 20 different United States and Canadian airports were represented by the individuals who participated in the ACI–NA session.

Table B-4. Example positions of stakeholders.

Large Airports	Director of Planning and Environmental Assistant Director of Capital Programs and Environmental Management Technical Advisor on Capital Projects Aviation Department (specializing in developing sustainability programs) Assistant Director of Planning and Environmental Environmental Specialist Environmental Affairs
Medium Airports	Airport Director Assistant Director of Aviation Assistant Manager for Environmental Compliance Environmental Director Sustainability Program Coordinator Environmental Coordinator Environmental Compliance Environmental Scientist
Small/General Aviation Airports	Director of Aviation Director of Operations Director of Strategy Management Executive Director Facilities Management Director Deputy Airport Director Environmental Compliance Assistant Manager Executive Director
Concessionaires, vendors, airlines	Commercial Airline Representatives Dedicated Cargo Representative Janitorial services and support to airports and airlines
Consultants	Geotechnical/Engineering Airport Planning Environmental Engineering Architectural and Interior
FAA	Airport Environmental Planner Environmental Specialist Environmental Protection Specialist Airport Planner
Airport industry group	Environmental Affairs Regulatory Manager Environmental Committee and Small Airports Committee Representatives Environmental Committee Member
Airport O&M staff	Operations Specialist Energy Engineering Technician Acting Deputy in Charge Of Facilities Senior Design/Engineering Consultant Environmental Consultant

APPENDICES C–E

Prototype Airport Sustainability Rating System

Appendices C, D, and E make up the Prototype Airport Sustainability Rating System. Appendix C presents an annotated outline for a preliminary Rating System User Guide. Appendix D provides suggested language for portions of the User Guide dealing with airport sustainability activities. Appendix E provides suggested definitions for sustainability activities and performance metrics.

APPENDIX C

Preliminary User Guide—Annotated Outline

1 Table of Contents

The User Guide will begin with a Table of Contents.

2 Introduction

Purpose of the Rating System

This section explains the purpose of the Rating System, which is ultimately to help airports pursue sustainability, measure their performance across standardized metrics, and compare their progress against other airports in the United States. Elements in this section will:

- Recognize other rating systems and explain the airport-focused, flexible, and domestic nature of this Rating System.
- Explain how this Rating System goes beyond project-based rating systems (and at times incorporates them) in order to focus on higher-level sustainability performance, thereby giving airports the flexibility to choose their own paths depending upon their particular issues.
- Discuss the importance of integrating sustainability across airport functions—i.e., management, operations, and infrastructure.
- Address the need to approach sustainability across airport spheres of influence—i.e., direct control, indirect control, and direct influence.
- Highlight the need to guide and assist airports in documentation and verification.

Rating System Development

This section will describe why the Rating System was developed, the design specifications that were considered when developing it, and a high-level overview of how the rating system fits within the greater library of rating systems, such as:

- Global Reporting Initiative (GRI) – Sustainability Reporting Guidelines 3.1.
- GRI Airport Operator Supplement.
- Leadership in Energy and Environmental Design (LEED) – 2009 Guidelines for Existing Buildings and Operations Maintenance.
- Los Angeles World Airports – Sustainable Airport Planning, Design, and Construction Guidelines 5.0 (LSAG).
- Chicago Department of Aviation, Sustainable Design Manual, 2003; Sustainable Airport Manual 2009–2011, Current Version 2.1, (SAM).
- Sustainability Tracking Assessment & Rating System 1.2 (STARS).
- Institute for Sustainable Infrastructure (ISI) Envision Sustainability Rating System.
- Port Authority of New York & New Jersey (PANYNJ) – Sustainable Infrastructure Guidelines.

EONS and Sustainability

This section explains the EONS framework, presents a definition of sustainability, and discusses how both can apply to functions across airports for the purposes of this Rating System. The EONS framework augments conventional environmental

definition of sustainability and incorporates operational, administrative, economic, and social concerns. This section also discusses how the Rating System considers sustainability airport-wide by considering airport infrastructure, operations, and management.

Benefits of Pursuing Sustainability

This section discusses the benefit of pursing sustainability and how this Rating System can help meet goals, track progress, and communicate success toward sustainability. The benefits discussed may include:

- Reduce energy and resource consumption and decrease emissions.
- Measure and track performance across standardized metrics.
- Communicate environmental successes nationally and to local stakeholders—travelers, employees, airlines, community members, etc.
- Educate stakeholders.
- Compare progress against industry standards as well as other airports in the U.S.
- Improve relations with the community and customers.
- Facilitate environmental permitting.
- Justify and communicate importance of sustainability to management.

3 Rating System Structure

This section will describe the Rating System components, their purpose, and how they relate to each other to form a functional rating system. It will provide the reader with an introduction and overview of the system. After describing each component the section will close with a one- or two-page sample Sustainability Activity Description that summarizes the components and their purpose along with examples of each.

Sustainability Categories and Sustainability Activities

This section will provide a definition, purpose, and examples of Sustainability Categories and Sustainability Activities as well as a summary table of the Sustainability Categories and Sustainability Activities included in the Rating System.

- **Sustainability Activities** – High-level undertakings that have a strong potential to improve the sustainability of an airport.
- **Sustainability Category** – Broad organizational levels that group Sustainability Activities of a similar sustainability theme.

Performance Metrics and Actions

This section will provide a definition, purpose, and examples of Performance Metrics and Actions. It will also discuss how recommended performance actions encompass airport infrastructure, operations, and management.

- **Performance Metric** – An indicator of performance within a Sustainability Activity that allows the airport to measure and track performance over time.
- **Performance Action** – Efforts taken to improve sustainability that, when evaluated alongside other Performance Actions, serve as good indicators of sustainability performance.

EONS Icons

This section will provide a definition of EONS Icons along with its purpose, application in the Rating System, and examples.

- **EONS Icon** – A symbol that identifies which aspects of the EONS framework apply to a sustainability activity.

Innovation

This section discusses what innovation credits are, how they can be earned, and what documentation is required.

4 Rating System Use

This section provides the user with instructions for using the Rating System. Including instructions for using the scoring framework, how to establish an initial rating, how and when to reevaluate sustainability and update the rating. The section will also include recommendations for internal verification, documentation, and management of rating system procedures.

Overall Airport Rating

This section explains the structure of the scoring framework and its basis on thresholds and points. It also discusses how the accumulation of points leads to an overall rating.

Sustainability Activity and Category Scoring

This section explains how points can be earned to measure the level of performance for an activity as well as the process for summing points to achieve a category score and an overall score. It includes descriptions of the two evaluation types (metrics and actions). Topics such as prerequisites and innovation are also included.

Rating Levels

This section will introduce how to determine a Rating Level from the Category score and Overall score and will also discuss the process for updating the rating over time.

Certification, Verification, Management, and Documentation

This section will describe procedures for certification and verification (if applicable) as well as high-level best practices used to ensure openness, balance, and applicability for every airport in the country. The section will also provide guidance for documenting information for internal use and to support third party-verification if and when the Rating System requires it.

Initially, the expectation is that airports will be allowed full flexibility to evaluate their sustainability performance and to establish and verify a rating using the Rating System. Over time a more structured governance process may be put in place based on demand. This section of the User Guide will provide guidance on how to conduct certification and verification. If this is done internally, the User Guide will provide guidance for first and second party certification as well as second party verification—each is defined below:

First-Party Certification – often referred to as self-certification or self-determination: internal determination that the airport meets the requirements of a rating level made by the same airport staff who are responsible for compiling the data and documentation use to determine the rating level.

Second-Party Certification – a determination of the rating level made by at least partially independent staff with an appropriate understanding of rating system requirements. If internal staff, they are other than those who are responsible for compiling the data and documentation used in support of the rating level—i.e., at least "one step removed" from the developing the data that supports the rating. This can also be conducted by a peer organization, for example appropriate expertise from another airport even within a network of airports.

Second-Party Verification – verification of the rating determination for the airport confirming that the data and documentation used to determine the rating level are accurate and complete and the resulting rating appropriate made by individuals at least "one step removed" from the development of the data and the determination of the rating.

Over time, the airport industry may transition to conducting third party certification and verification. This section would then provide recommendations and guidance for achieving third party certification and verification, which are defined as follows:

Third-Party Certification – external determination of the rating level made by an organization that is not affiliated with the airport.

Third-Party Verification – verification of the determination of the rating for the airport confirming that the data and documentation used to determine the rating level are accurate and complete and the resulting rating appropriate made by an

independent organization that is not affiliated with the airport and which is free from real or potential conflict of interest in its determination.

The section will also provide recommendations for managing the use of the Rating System and data that supports it—such as establishing a team to oversee the rating, ensuring that the team is multidisciplinary, data tracking mechanisms and procedures, etc.

Documentation details will be provided by Sustainability Activity in Section 5 of the User Guide.

5 Sustainability Activities

This section will be the majority of the User Guide. A Sustainability Activity Description will be provided for each of the 50 Sustainability Activities included in the Rating System, organized by the Sustainability Category. Each category chapter will be preceded by a discussion of EONS and how the activities within the respective category can support each aspect of EONS (economic viability, operational efficiency, natural resource conservation, and social responsibility).

Each Sustainability Activity Description will provide the associated:

- Sustainability Category.
- EONS Icons.
- Performance Metric or Performance Actions.
- Performance Levels and Thresholds.
- Financial Considerations.
- Recommended (or required) procedures for Documentation.

6 Appendices

Appendices will include supplementary information that directly relates to the use of the Airport Sustainability Rating System, such as:

- **Additional Guidance and Resource Materials** – Additional information and references that will supplement the information provided throughout the Rating System.
- **Glossary** – Definitions of important terms and concepts presented throughout the Rating System.
- **Acronyms** – Expansions of all acronyms presented throughout the Rating System.
- **Activity Scoring Worksheet/Checklist** – A summary list of all Sustainability Activities and points associated with each, organized by Category, to help visualize the content of the Rating System and help tally points to establishing a Rating.

APPENDIX D

Airport Sustainability Activities—User Guide Excerpts

Waste & Water

Waste Diversion

WW 3	Level	Take Off	Ascend	Cruise	Soar
	Points	1	2	3	4

METRIC:

Percent of total annual waste diverted from the landfill or incinerator through recycling, reuse, refurbishing, selling, donating, and composting.

PURPOSE

Waste Diversion optimizes the use of airport materials beyond their first functional lifespan by avoiding landfilling and incineration.

DEFINITION

Waste diversion is defined as the percent of total annual solid waste redirected from the landfill or incinerator through recycling, reuse, refurbishment, sale, donation, composting, or other means. This Activity is concerned with non-hazardous, municipal solid waste at airports, which includes, but is not limited to, mixed paper and cardboard, food scraps, kitchen grease, metals, glass, plastics, landscape waste, wood, tires, appliances, batteries, recordable media, and electronics.

The Activity considers all waste sources where the airport is responsible for disposal, to include, but not limited to, terminals, administrative offices, airfields, maintenance hangars, cargo hangars, and aircraft flight kitchens (if disposal of deplaned waste is the responsibility of the airport).

Handling of construction and demolition, aircraft lavatory, or chemical wastes are covered under activities within the Design & Materials and Human Well-Being Sustainability Categories. The Activity does not include waste with regulated or special disposal requirements, such as international deplaned waste, deicing fluids, or hazardous waste.

RELATED ACTIVITIES

- **WW 2 – Waste Reduction**
- **DM 3 – Construction Waste Diversion**
- **HW 4 – Chemicals & Hazardous Materials**
- **EC 6 – Other Indirect GHG Emission Reductions**

PERFORMANCE LEVELS

Four points are available across the performance levels. Each threshold represents an increasing diversion rate, or the percent of annual solid airport waste diverted from the landfill or incinerator.

Performance Level	Take Off	Ascend	Cruise	Soar
Threshold	30%	45%	60%	75%
Points	1	2	3	4

See the Documentation section to determine how to calculate the diversion rate.

WW 3 – Waste Diversion

PERFORMANCE RECOMMENDATIONS

The table below includes recommended actions from across airport infrastructure, operations, and management that can assist in improving waste diversion and achieving higher performance thresholds. The list is suggestive and not exhaustive, and airports have the flexibility to determine how they will achieve performance through these activities and others.

Infrastructure	Operations	Management
✈ Increase the availability of collection bins for the sorting of waste – landfill, paper, recyclables, and compost – in all areas with human presence, including terminals, office space, airfield maintenance hangars, cargo hangars, etc. ✈ Install proper signage to inform customers about waste sorting. ✈ Co-locate recycling receptacles with trash receptacles. ✈ Identify collection and staging areas for useable materials available for reuse, sale, or donation. 	✈ Incorporate waste diversion in all levels of employee training. ✈ Maintain a waste reduction, reuse, and recycling program for durable goods, including office equipment, appliances, audiovisual equipment, and furniture. ✈ Implement an inventory system to facilitate the reuse or redistribution of chemicals, cleaning supplies, paint, or other supplies. ✈ Identify and procure materials for composting or other means of organics management. ✈ Work with a local non-profit or government agency to facilitate the reuse of furniture, office supplies, and other materials. ✈ Work with vendor to create an electronics reuse program that can generate revenue for airport and extend life of computers, monitors and related equipment. ✈ Conduct a waste audit to determine the percentage of potentially recyclable waste that is going to a landfill/incinerator.	✈ Explore, implement, and expand recycling and composting pick-up options with local waste management vendors. ✈ Work with the waste hauler or service provider to collect and analyze information on the amounts and types of waste generated to understand better waste production patterns. ✈ Establish a Waste Diversion Plan to outline airport-wide goals and strategies. ✈ Analyze the economic benefits on the local community—in terms of employment, sales, and tax revenue—due to increased recycling when assessing various waste diversion options. ✈ Negotiate with waste disposal contractors and tenants with the aim of encouraging recovery of separated waste materials by having cost reflect the degree of separation at the tenant source.

WW 3 – Waste Diversion

DOCUMENTATION

Tracking waste diversion requires regular audits to assess the waste stream across the airport. It is important to capture as many disposal means as possible, including the landfill, incinerator, recycling, reuse, refurbishment, donation, resale, and composting.

The following calculation should be used to determine the percent of total annual waste diverted from the landfill or incinerator through alternative disposal methods

$$\textit{Percent of Total Annual Waste Diverted} = \frac{A}{B} x\ 100$$

Where:

A = Total amount of waste diverted (tons) in the performance year—most recent year for which data are available.

$$\textit{Recycling} + \textit{Rescue} + \textit{Refurbishment} + \textit{Resale} + \textit{Donation} + \textit{Composting}$$

B = Total waste generation (tons) in the performance year—most recent year for which data are available.

$$\textit{Landfill} + \textit{Incinerator} + \textit{Recycling} + \textit{Rescue} + \textit{Refurbishment} + \textit{Resale} + \textit{Donation} + \textit{Composting}$$

The following weight data in tons is required for the performance year:

- ❑ Materials sent to landfill
- ❑ Materials incinerated
- ❑ Materials recycled
- ❑ Materials reused
- ❑ Materials refurbished
- ❑ Materials resold
- ❑ Materials donated
- ❑ Materials composted

Volume measurements can be converted to weight using the conversion factors provided in the Appendix.

Additional documentation should be collected for internal and external verification, if applicable, including:

- ❑ A summary narrative outlining the types of waste and volumes diverted.
- ❑ A brief description of the factors that contributed to the diversion rate (e.g., programs, policies, etc.)
- ❑ Copies of contract with vendor or other documentation of collection service.

References that may assist in documenting, measuring, or estimating waste diversion include:

- ✈ U.S. EPA's guide to Developing and Implement and Airport Recycling Program: http://www.epa.gov/wastes/conserve/tools/rogo/documents/airport-recycling-guide.pdf.
- ✈ FAA Synthesis Document on Recycling, Reuse, and Waste Reduction at Airports: http://www.faa.gov/airports/resources/publications/reports/environmental/media/RecyclingSynthesis2013.pdf

3

WW 3 – Waste Diversion

FINANCIAL CONSIDERATIONS

Airports should take a holistic approach when assessing the financial viability of waste management options for improving performance under the Waste Diversion Activity. The higher costs of one component of an integrated waste management system, such as recordable media (e.g. CD-ROMs and diskettes) recycling, can be offset by another component, such as cardboard and paper recycling, resulting in overall cost savings and a higher diversion rate. In addition, airports should consider the indirect economic benefits of Waste Diversion, as recycling waste may yield a greater economic benefit than landfilling it. Local sorting and sales of the constituent materials can contribute more than landfilling/incinerating waste at a distant off-site location, thus supporting local employment, manufacturing, and tax revenues.

Airports can calculate the economic costs and benefits associated with integrated waste management by obtaining individual municipal solid waste (MSW) waste-stream costs when there are separate rates. For example, recycling mixed paper material generally costs less than standard waste hauling fees and in some circumstances can actually produce revenue. Third party electronic support service firms often pay for usable equipment that may no longer be useful to an airport. Recycling other types of waste (e.g. co-mingled glass, plastic, and metals) may cost more than standard landfill or incinerator rates. Waste streams recycling and reuse cost savings can offset the cost premiums associated with other types of recycling services.

Example Table to Demonstrate Concept

Waste Stream	Est. Annual Cost	Est. Annual Revenue
Mixed Paper	$ #,###	$ #,###
Electronics	$ #,###	$ #,###

It may be necessary to modify existing custodial service contracts or make special arrangements to obtain waste stream data. Metrics should be aligned so that waste is measured by either weight (e.g., tonnage) or volume (e.g., cubic yards). The financial considerations associated with integrated waste management necessitate detailed analysis of comprehensive waste material data than limiting review to just the overall airport recycling rates.

Energy & Climate

Climate Change Adaptation

EC 7	Level	Take Off	Ascend	Cruise	Soar
	Points	1	2	3	4

METRIC:

Performance is gauged by the number of Performance Actions achieved

PURPOSE

Climate Change Adaptation promotes an airport's long-term viability by increasing the resiliency of airport operations and infrastructure to climate change impacts.

DEFINITION

Climate Change Adaptation increases an airport's resiliency to episodic events and longer term meteorological and environmental shifts, thereby avoiding service interruptions in air service and ground transportation. Depending on the location of the airport, climate change impacts may include changes in temperature, precipitation levels, storm frequency, and storm severity; thawing permafrost; sea level rise; habitat impacts; and changes in wildlife.

Performance is evaluated by the degree to which an airport has developed and implemented a plan to assess climate vulnerability and increase resiliency. This Activity includes all infrastructure and assets within the airport site including, but not limited to, terminal and administrative buildings; parking lots and structures; HVAC systems; energy and water provision for buildings; roadways and transportation infrastructure; storm water management systems; airfield and navigational aid infrastructure; runways, taxiways, and aprons; turf areas; wetlands; wildlife areas; and shorelines.

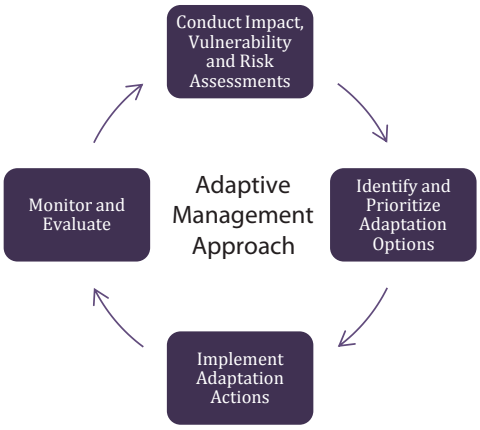
RELATED ACTIVITIES

- EC 4 – Terminal Building Greenhouse Gas Emission Reductions
- EC 5 – Overall Airport Greenhouse Gas Emission Reductions
- EC 6 – Other Indirect Greenhouse Gas Emission Reductions
- WW 1 – Potable Water Conservation
- EP 2 – Airport Financial Viability
- EP 3 – Risk Management
- EL 4 – Integrated Sustainability Management
- NR 1 – Landscape & Grounds
- NR 2 – Wildlife & Habitat Protection
- NR 3 – Pervious Surface
- NR 4 – Airside Stormwater Quality
- NR 6 – Heat Island Reduction
- DM 1 – Sustainable Design & Operation

EC 7 – Climate Change Adaptation

PERFORMANCE LEVELS

Four points are available based on the level of performance assessed by the number of Performance Actions taken by the airport. The Actions indicate the degree to which the airport has developed and implemented a plan for climate vulnerability assessment and adaptation. This approach can be integrated into the airport's existing operations by incorporating climate factors into ongoing planning, design, and management decisions through an adaptive management approach.



Performance Levels reflect steps within the adaptive management approach, with the Soar Performance Level indicating that the airport has a fully deployed adaptive management approach, is implementing assessment and adaptation actions, and is monitoring their performance. Therefore, credit for each level must be earned before a higher tier can be achieved—i.e., Ascend, Cruise, and Soar levels requires that the previous Performance Level has also been achieved. As an example, Ascend Performance requires that all requirements for the Take-Off Performance Level have also been achieved.

Performance Level	Take Off	Ascend	Cruise	Soar
Threshold	2 Assess Actions	2 Prioritize Actions	3 Implement Actions	1 Monitor and Evaluate Action
Points	1	2	3	4

See the DOCUMENTATION section to determine what information should be recorded to address climate change adaptation.

EC 7 – Climate Change Adaptation

PERFORMANCE RECOMMENDATIONS

The table below includes recommended actions from across airport infrastructure, operations, and management that support climate change adaptation and achieving higher performance thresholds. The list is suggestive and not exhaustive, and airports have the flexibility to determine how they achieve performance through these activities and others.

Assess	*Management*
	❑ Inventory infrastructure and identify critical assets (existing and planned) that may be vulnerable to climate change stressors. ❑ Inventory airport operations and services and identify activities (existing and planned) that may be vulnerable to climate change stressors. ❑ Determine potential climate impacts under local or regional climate change scenarios. ❑ Assess vulnerability of assets, operations, and services under climate change scenarios. ❑ Assess the direct and indirect economic impacts due to climate change on the airport and local community as part of a Climate Change Impact Assessment.
Prioritize	*Management*
	❑ Prioritize vulnerable assets that require adaptation measures. ❑ Prioritize vulnerable operations and services that require adaptation measures. ❑ Develop a Climate Change Adaptation Plan that identifies vulnerable assets, operations, and services; articulate adaptation priorities; and define organizational roles and responsibilities for implementation. ❑ Engage in a regional Climate Change Adaptation Plan with state agencies, municipalities, and institutions. ❑ Develop protocols and procedures for increased incidence of severe weather events, such as what to do in the event of a flood for airports vulnerable to such events.
Implement	*Infrastructure*
	❑ Protect and harden structures through design and construction to reduce exposure (e.g., levee construction) or increase the resilience of infrastructure (e.g., reinforcing traffic control towers; elevating roadways). ❑ Relocate assets to less vulnerable locations.
	Operations
	❑ Increase frequency of maintenance and repair and operational improvements to accommodate growing climate stresses. ❑ Review and reinforce operation of access roads, inter-modal on-ground connectivity, and communications infrastructure with regard to climate vulnerability. ❑ Increase redundancy by developing alternative ways to maintain service in the event of disruption (e.g., back-up runways and access roads, alternative power sources).
Monitor and Evaluate	*Management*
	❑ Develop and implement a system for ongoing monitoring and evaluation of airport-specific impacts based on regional climate model predictions. ❑ Evaluate airport resilience and the effectiveness of current adaptation actions on annual basis. ❑ Incorporate findings from monitoring into the climate adaptation planning. ❑ Develop a plan for business continuity after a disruption due to climate-related impacts

EC 7 – Climate Change Adaptation

FINANCIAL CONSIDERATIONS

Airports are likely to realize economic benefits by increasing the resilience of their operations and infrastructure to climate change—though the benefits may vary by location and may depend on the airport's vulnerabilities to climate change. The economic benefits of climate adaptation investments are not always immediate and they may vary by location depending on the airport's likelihood of experiencing short-term hazards—such as a severe weather event—or long-term changes in conditions—such as more frequent seasonal flooding or rising sea levels. Airports that have improved their resilience to climate change impacts are more likely to avoid or mitigate damages to infrastructure and will incur fewer repair and reconstruction costs. Additionally, airports that have operational practices in place to respond to events are more likely to avoid loss of revenue caused by service disruptions.

Airports can estimate the economic impacts resulting from climate adaptation with cost-benefit analysis (CBA) techniques. CBA methodologies specific to adaptation have been derived and proven to be effective decision-support tools for the planning and development of organizations. Steps in a climate adaptation CBA include identifying potential adaptation options, establishing a baseline of events, and quantifying the aggregate costs and benefits over specific time periods.

Example Table to Demonstrate Concept

	Status Quo	Minimum Action	Do Something - Managed Adaptively			
			Level of Effort (1%)	Level of Effort (2%)	Level of Effort (3%)	Level of Effort (4%)
Total present value of costs	$,#,###	$,#,###	$,#,###	$,#,###	$,#,###	$,#,###
Total present value of benefits	$,#,###	$,#,###	$,#,###	$,#,###	$,#,###	$,#,###
NPV	$,#,###	$,#,###	$,#,###	$,#,###	$,#,###	$,#,###
Benefit-cost Ratio	#	#	#	#	#	#

CBA for adaptation strategies allow for comparison of many different categories of benefits or costs into a single, monetized value. However, airports should consider the social, nontangible benefits that arise from climate adaptation strategies which may not be measured or expressed in monetary terms in the CBA. Additionally, the costs and benefits need to be discounted to properly calculate their present value.

EC 7 – Climate Change Adaptation

DOCUMENTATION

Airports should fully document all actions taken to address climate change adaptation and be able to provide descriptions for the following:

- ❑ Regional and local climate scenarios
- ❑ Inventories of airport operations, services, and assets
- ❑ Vulnerability assessment reports and maps of airport operations, services, and assets
- ❑ Infrastructure upgrades
- ❑ Operational adaptation measures
- ❑ Written policies
- ❑ Updated planning documents

References that may assist in addressing climate change adaptation and planning include:

- ✈ The U.S. Department of Transportation FHWA Climate Change Vulnerability Assessment Pilot Program: http://www.fhwa.dot.gov/environment/climate_change/adaptation/ongoing_and_current_research/vulnerability_assessment_pilots/index.cfm
- ✈ The ACRP Synthesis S11-02-06, Airport Climate Change Adaptation and Preparedness
- ✈ The ACRP Report 02-40 (*pending*), Climate Change Risk Assessment and Adaptation Planning at Airports

5

Energy & Climate

Terminal Building Energy Use

EC 1	Level	Take Off	Ascend	Cruise	Soar
	Points	2	4	7	10

METRIC:

Percent reduction of building energy use intensity per square foot (BTU/ft^2) from a baseline.

PURPOSE

Terminal Building Energy Use promotes the efficient use of energy in terminal and administrative building spaces to reduce operating expenses and minimize resource consumption without impacting airport critical functions.

DEFINITION

Terminal buildings are defined as airport space for passenger support, baggage processing and pick-up, concession retail and restaurants, and administration functions. Energy use intensity is defined as total annual building energy consumption per square foot of building space. Efficiency performance is evaluated as a percent reduction from an airport-determined baseline energy intensity. Building energy includes direct consumption of fuels, e.g., for water heating and space conditioning, as well as energy consumption generated offsite—such as purchased electricity and steam.

This activity includes total energy consumption within all terminal and administrative building spaces that support airport ground operations. Energy end-uses include, but are not limited to: lighting; refrigeration; equipment use (e.g., service counters, baggage systems, checkpoints); boilers; steam generation; heating, ventilation, and air conditioning (HVAC); people movers, data centers, jet bridges, building controls; and backup energy supply systems.

The energy and building area footprint omits airside functions and infrastructure, which are covered by Activity EC 2 – Overall Airport Energy Use. Mobile energy associated with ground access vehicles and airport fleet is addressed by Activity TR 1 – Fleet Vehicle Fuel Economy.

RELATED ACTIVITIES

- **EC 2 – Overall Airport Energy Use**
- **EC 4 – Terminal Building Greenhouse Gas Emission Reductions**
- **EC 5 – Overall Airport Greenhouse Gas Emission Reductions**
- **TR 1 – Fleet Vehicles**

PERFORMANCE LEVELS

Ten points are available based on the level of performance.

Performance Level	Take Off	Ascend	Cruise	Soar
Threshold	30%	45%	60%	75%
Points	2	4	7	10

See the DOCUMENTATION section to determine how to calculate the percent reduction of building energy use intensity.

1

EC 1 – Terminal Building Energy Use

PERFORMANCE RECOMMENDATIONS

The table below includes recommended actions from across airport infrastructure, operations, and management that can assist in decreasing terminal building energy use and achieving higher performance thresholds. The list is suggestive and not exhaustive, and airports have the flexibility to determine how they will achieve performance through these activities and others.

Infrastructure	Operations	Management
✈ Design and upgrade buildings with energy efficient features, including lighting and HVAC systems. ✈ Take greater advantage of daylight in terminal design and upgrading. ✈ Install more efficient or alternative sources of energy, such as combined heat and power, ground-source heat pumps, or solar thermal. ✈ Utilize thermal energy storage systems to optimize energy use of air conditioning systems. ✈ Purchase and install ENERGY STAR rated appliances and computers. ✈ Enhance escalators with energy efficient technology. ✈ Install, upgrade, or improve building automation systems. ✈ Optimize thermal performance of data center spaces with cold/hot air containment.	✈ Prioritize use of energy-efficient equipment within procurement policy. ✈ Use aggressive temperature setbacks, lighting controls, and building automation. Optimize occupancy and use of buildings and equipment. ✈ Perform energy audit to identify and evaluate “energy hot spots”. ✈ Commission existing buildings to improve their operations and maintenance for optimal performance. ✈ Provide “real-time” building energy performance dashboards to promote occupant behavioral changes. 	✈ Implement an Energy Management Plan to outline airport-wide goals and strategies for reducing energy consumption. ✈ Develop an employee education campaign for energy and electricity efficiency. ✈ Incorporate lifecycle energy consumption and cost analyses into asset management, construction, and operations decision-making, in addition to infrastructure upgrades. ✈ Utilize alternative financing options for large-scale energy upgrades—e.g., Energy Savings Performance Contract (ESPC) and Utility Energy Service Contracts (UESC). ✈ Designate a dedicated Energy Manager responsible for managing airport energy projects and tracking performance.

EC 1 – Terminal Building Energy Use

DOCUMENTATION

Calculating total terminal building energy use intensity requires both the total quantity of electricity consumed and the total quantity of purchased building fuels. Establishing an appropriate baseline requires a least one full year of consecutive energy consumption data and the gross square footage of all terminal and administrative building space for that year. Energy consumption from other airport features—such as runway lights, hangar facilities, and traffic control towers—are not included in this calculation. An airport should choose a year in which it is confident in the energy and square footage data in order to compare energy efficiency measures. Airports already employing significant energy reduction strategies may use a recent past year to recognize previous achievement from their respective baseline.

The most basic method of collecting energy data is through electricity utility and building fuel invoices that track purchases of energy. However, utility meters that measure electricity consumption and may often cover large and non-uniform areas, capturing consumption of more than (or less than) the target terminal building space. If this is the case, a correction calculation must be used to estimate the fraction of electricity consumption that can be assigned to just terminal or administrative building space. To avoid such estimation, a better approach is to sub-meter individual buildings and spaces to get a more accurate measurement of electricity consumption. Building fuel energy—e.g., fuel oil, natural gas, diesel—can also be estimated through the purchasing invoices, under the assumption that all fuel purchased in a given year was consumed.

Consumption data must be converted to the common unit of British Thermal Units (Btu, which can be done using the table of conversion factors in million Btu (MMBtu) below for both electricity and building fuels. The associated energy content of different types of building fuels can be found in Appendix XX.

Energy Unit	MMBtu Equivalent
1 kWh	0.003412
1 MWh	3.412
1 Therm	0.1
1 kBtu	0.001
1 ton-hour	0.012
1 MJ	0.000948

The following calculation should be used to determine the percent change in terminal building energy use intensity from the baseline year.

$$\frac{\left(Baseline\ Year \frac{MMBtu}{ft^2}\right) - \left(Performance\ Year\ \frac{MMBtu}{ft^2}\right)}{\left(Baseline\ Year\ \frac{MMBtu}{ft^2}\right)} x\ 100 = \ Energy\ Intensity\ Reduction$$

Where:

Baseline energy intensity value = the baseline energy consumption value divided by the square footage from the baseline year.

Compare the calculated percent reduction to the thresholds in the Performance Target sections. Points are earned for the highest level where the calculated reduction exceeds the percentage threshold.

3

EC 1 – Terminal Building Energy Use

FINANCIAL CONSIDERATIONS

Energy conservation and efficiency practices in existing buildings provide airports with low/no-cost options for reducing the energy use intensity of airport buildings. Energy conservation—such as turning lights off in favor of natural lighting—is the most cost-effective means for reducing energy consumption because the action typically requires no capital cost. Energy efficiency measures—such as using more efficient lighting or heating, ventilation, and air-conditioning (HVAC) equipment—typically pay for themselves as the dollars saved through reduced energy consumption offset the capital and maintenance costs associated with installing and maintain the equipment. The payback period for energy efficiency measures may vary from a few months to several years depending on the capital costs of purchasing the equipment as well as the labor and material costs associated with its maintenance and upkeep. Reducing energy use intensity has also shown to produce less tangible benefits, such as improved worker performance and reduced environmental pollution, as energy efficiency drives emission and pollution reductions that reduce an airport's environmental impacts footprint.

Estimating payback periods of an energy efficiency project is a simple way airports can evaluate and prioritize implementation of projects. The payback period—the length of time required for an investment to recover its costs in terms of profits or savings—can be calculated by the initial cost of the project and resulting net savings per year. Efficiency measures have varying payback periods and lifetime savings, making them cost-effective in the short and medium term.

Example Table to Demonstrate Concept

EE Practice	Initial Investment	Est. Net Annual Savings	Est. Payback	Est. Lifetime Savings
HVAC Systems	$#,###	$#,###	## Years	$#,###
Building Automation	$#,###	$#,###	## Years	$#,###
Employee Campaign	$#,###	$#,###	## Years	$#,###

Human Well-Being

Airport Noise Compatibility

HW 1	Level	Take Off	Ascend	Cruise	Soar
	Points	1	2	3	4

METRIC:

Performance is gauged by the number of Performance Actions achieved

PURPOSE

Airport Noise Compatibility promotes compatibility between airports and surrounding communities by minimizing noise from aircraft operations and construction activities.

DEFINITION

Airport Noise Compatibility is defined as airport noise exposure on surrounding communities and the effort to reduce noise exposure on incompatible land uses. Thresholds for noise compatibility around airports have been defined by the FAR Part 150 Airport Noise Compatibility Planning Program. For example, the FAA currently defines Day Night Average Sound Level (DNL) 65 dB as the threshold of noise incompatibility with residential land uses.

Airport-related noise is typically a great concern to surrounding communities. It largely derives from aircraft operations, but it can also come from non-aircraft sources, such as airport construction.

This activity includes the development of acoustical control measures to reduce ambient noise levels for nearby affected communities. Through FAR Part 150, the FAA provides financial assistance to airports that develop noise exposure maps and noise compatibility programs. This documentation is submitted to the FAA for review and approval. Financial assistance supports the assessment of noise impacts as well as the implementation of noise-reduction measures. For landside development, including construction-related noise, acoustical controls should be planned for in the early phases of project development. These measures are typically outlined in construction noise abatement plans.

This activity also includes noise monitoring, which generally involves the installation of listening stations at sensitive sites and a mechanism to log, track, and respond to community noise complaints. Data acquired through a noise-monitoring program allows an airport to better understand how its aircraft operations are affecting surrounding communities.

RELATED ACTIVITIES

✈ **EL 2 – Public Outreach**

PERFORMANCE LEVELS

A total of 4 points are available based on the number of Performance Actions taken to address the sustainability activity objective. The actions are designed to help airports meet FAA requirements for land use compatibility and encourage best practices implementation to address common community concerns.

Performance Level	Basic	Improved	Enhanced	Superior
Threshold	2 Actions	4 Actions	6 Actions	8 Actions
Points	1	2	3	4

See the Documentation section to determine how to document actions related to airport noise.

1

HW 1 – Airport Noise Compatibility

PERFORMANCE RECOMMENDATIONS

The table below includes recommended actions from across airport infrastructure, operations, and management that can assist in improving airport noise and achieving higher performance thresholds. The list is suggestive and not exhaustive, and airports have the flexibility to determine how they will achieve performance through these activities and others.

Infrastructure	Operations	Management
❑ Install physical noise barriers between the airport property and adjacent properties, such as berms and walls. ❑ Install run-up areas to shield start-up ground noise from aircraft. ❑ Utilize noise soundproofing and building design features for existing eligible residential properties and provide new construction design recommendations for new developments. ❑ Evaluate noise impacts in the planning for airside infrastructure, including runway adjustments, taxing lanes, hangars, etc.	❑ Develop a noise exposure map and identify incompatible land use areas, and publish maps available on public website. **(Basic Prerequisite)** ❑ Identify and utilize flight paths during off-peak hours, and over landscape features, to minimize noise impacts. ❑ Adapt landside planning to evaluate noise impacts for the design, construction, and operation of landside (non-aircraft) mobile and stationary sources. 	❑ Implement a noise abatement plan that includes best practices for lowering noise levels such as a “Fly Quiet” program. ❑ Establish a noise complaint resolution process that actively engages neighboring properties and airport visitors, tracks reported complaints with airport responses, and provide this info publically. ❑ Establish a noise working group that includes airlines and meets at least on quarterly basis. ❑ Regularly review and update noise maps and plans at least every 5 years (Superior Prerequisite). ❑ Implement a rebate incentive program for low-sound-classified Stage 4 designated aircraft and usage of alternatives to aircraft engine powered taxing. ❑ Assess the indirect economic impacts due to airport noise from, for example, residential and commercial displacement.

2

HW 1 – Airport Noise Compatibility

FINANCIAL CONSIDERATIONS

Reducing airport-related noise impacts can enhance the quality of life for airport patrons and nearby residents, and increase community receptivity to future airport projects. Certain noise abatement practices for aircraft can reduce fuel burn and related emissions, shorten flight durations, and improve ground management of aircraft. However, variation in flight paths may increase noise complaints with operational changes. Changes in airspace management with air traffic control modernization may exacerbate community relations in the short run as residents see aircraft over different areas with increased traffic volumes.

In addition, airports should consider the capital investments required for changes to aircraft operations and the related runway usages changes or noise abatement infrastructure necessary.

DOCUMENTATION

Airports should fully document all actions taken to address airport noise compatibility and be able to provide descriptions for the following:

- ❑ Assessment reports and maps
- ❑ Infrastructure upgrades
- ❑ Written policies
- ❑ Updated planning documents
- ❑ Web resources for communities and other stakeholders

References to adopt best practices for airport noise compatibility include:

- ✈ The Federal Code of Regulations Title 14: Aeronautics and Space, Part 150: Airport Noise Compatibility Planning provides guidance on the proper method for developing and submitting a noise exposure map, identifying incompatible land use areas, and planning to reduce the effects of noise.
- ✈ The Los Angeles World Airports- Sustainable Airport Planning, Design, and Construction Guidelines 5.0 and the Chicago Department of Aviation Sustainable Airport Manual 2.1 provide guidance on suitable noise levels for different areas of the airport terminal and property .
- ✈ The Los Angeles World Airports- Sustainable Airport Planning, Design, and Construction Guidelines 5.0 and the Chicago Department of Aviation Sustainable Airport Manual 2.1 suggest infrastructure improvements for addressing airport noise.
- ✈ The San Francisco International Airport Fly Quiet Program http://flysfo.proofic.net.s3.amazonaws.com/pdf/about/SFOFlyQuietProgram.pdf
- ✈ NoiseQuest Project guidance sponsored by the FAA, NASA and Transport Canada http://www.noisequest.psu.edu/

Human Well-Being

Labor Relations

HW 7	Level	Take Off	Ascend	Cruise	Soar
	Points	1	2	3	4

METRIC:

Average percent annual employee retention rate across all labor categories.

PURPOSE

Labor Relations promotes the retention of airport personnel through reasonable compensation and benefits, along with their fair treatment.

DEFINITION

Labor Relations is defined as the constructive interaction between airport management and personnel that establishes mutually agreed upon productivity goals while maintaining a reasonable quality of life for workers. Reasonable compensation includes the provision of fair/living wages. Fair/living wages allow employees to maintain a decent standard of living that meets the basic needs of themselves and their families. Fair/living wages exceed national legislated requirements, such as the minimum wage and worker's comp.

Benefits are compensations an organization provides to its employees that are in addition to normal wages. Benefits include regular contributions (e.g., retirement funding, health insurance) or other forms of support (e.g., daycare, wellness programs, transportation assistance, onsite amenities). Fair treatment of employees includes the incorporation of anti-discrimination and equal opportunity policies. It also includes the open and transparent interaction between airport management and personnel for the purposes of inclusivity and accountability.

This activity increases the likelihood of employee retention and minimizes the risk of labor unrest that can disrupt airport operations and threaten airport security. Employee retention protects the investments an airport has made in the collective knowledge base and skill sets of its employees.

RELATED ACTIVITIES

- **EP 1 – Socially Responsible Financial Investment**
- **HW 6 – Employee Development**
- **HW 8 – Diversity & Opportunity**
- **HW 9 – Occupational Health & Safety**
- **EL 1 – Airport-Wide Stakeholder Engagement**

PERFORMANCE LEVELS

Four points are available based on the level of performance.

Performance Level	Take Off	Ascend	Cruise	Soar
Threshold	30%	45%	60%	75%
Points	1	2	3	4

See the DOCUMENTATION section to determine how to calculate average percent annual employee retention rate.

HW 7 – Labor Relations

PERFORMANCE RECOMMENDATIONS

The table below includes recommended actions from across airport infrastructure, operations, and management that can enhance labor relations and achieve higher performance thresholds. The list is suggestive and not exhaustive, and airports have the flexibility to determine how they achieve performance through these activities and others.

Infrastructure	✈ Provide an on-site child care facility for employees, partner with a local facility, and/or provide subsidies or financial support to help meet the child care needs of employees. ✈ Support transportation assistance programs for commuting employees such as airport sponsored vanpools. ✈ Establish on-site private nursing and pumping spaces for mothers of infants and toddlers. ✈ Create a plan to maximize employee and tenant access to daylight and day-lit spaces.
Operations	✈ Establish an airport volunteer "green team" with an annual budget and official standing. ✈ Maintain a publically available and updated list of chemicals utilized at the airport, locations of usage, and their material safety data sheets (MSDS) information. ✈ Establish an airport stakeholder written policy on the usage of products with volatile organic compounds including paints, perfumes, colognes and other potential impact sources for chemically sensitive individuals. ✈ Offer employees the opportunity to donate their home materials to a local non-profit, school or government agency.
Management	✈ Guarantee a living wage across all labor categories based on local costs of living, in addition to a meaningful raise system. ✈ Provide health insurance for some portion of employees who work less than the state or federal threshold whereby insurance is mandatory, or provide live support for individuals to navigate new healthcare exchange options. ✈ Conduct regular employee satisfaction surveys and implement a mechanism to resolve prevalent or severe issues raised by the evaluation. ✈ Facilitate collective bargaining representation for all unionized airport employees aimed at reaching agreements on labor issues—e.g., benefits, wages, hours, training, health and safety, overtime, and grievances. ✈ Provide an employee assistance or wellness program that offers counseling, referral, well-being and financial services to employees. ✈ Coordinate with programs linking welfare-to-work recipients and unemployed and underemployed city residents to airport jobs. ✈ Assess the economic return (resulting from fewer days of sick leave, less truancy and turn-over) of employee benefits and engagement programs, such as alternative work schedules, leave transfer programs, on-site child care, educational program, etc.

HW 7 – Labor Relations

DOCUMENTATION

Tracking Airport Employee Retention Rate requires a yearly audit across all labor categories of the percent of airport employees that remain employed with the airport.

The following calculation should be used to determine the airport employee retention rate for the performance year.

$$Employee\ Rentetion\ Rate = \frac{A - B}{A}\ x\ 100$$

Where:

A = Total number of airport employees at the beginning of the performance year.

B = Number of employees that leave employment during the performance year.

The following data is required for the performance year:

- ❑ Total number of airport employees across all labor categories
- ❑ Number of employees that leave employment, either through employ er or self-termination.

Additional documentation should be collected for internal and external verification, if applicable, including:

- ❑ A summary narrative outlining the employee retention rate.
- ❑ A brief description programs and policies in place to address employee retention.
- ❑ Copies of employee contracts or other documentation of collective bargaining, promotion and wage schedules, benefit packages, and other employee incentives.

HW 7 – Labor Relations

FINANCIAL CONSIDERATIONS

Airports should evaluate the risks and benefits of providing tools and resources for increasing employee engagement. Studies find disengaged employees take more sick days, produce lower quality work, are less productive, and generate poor sales. Moreover, disengaged employees are more likely to quit, causing the airport to incur costs from recruiting, hiring, training, loss of company knowledge, disruption of customer service, lost sales, and negative company-wide morale. All impacts combined, it may cost up to 40-50% of the salary for each employee lost. Investing in employee engagement tools can mitigate these negative impacts by enhancing quality of life during and outside of work. Studies find firms with high employee satisfaction also exhibit greater levels of productivity and efficiency. Companies with satisfied, engaged employees can often yield 10% higher productivity rate than those who are disengaged. In addition, optimizing labor relations enables airports to attract and recruit talented candidates.

Understanding how much turnover costs can help an airport decide how much to invest into programs that reduce turnover. Airports can estimate these costs by tracking the annual turnover rate of employees (by labor class and average salary) while considering an average cost of turnover as a percent of salary (e.g. 40%).

Example Table to Demonstrate Concept

Labor Class	# of Employees	Average Salary	Annual Turnover Rate	Turnover Cost as a percent of salary	Total Cost of Turnover
1	###	$#,###	##%	##%	$#,###
2	###	$#,###	##%	##%	$#,###

Estimating the cost of turnover, and in turn the savings from reduced turnover, can help an airport gauge the return of investment of various employee benefit and engagement programs. Fair and responsible compensation also creates an indirect regional economic benefit by increasing money available to spend on the regional economy.

APPENDIX E

Sustainability Activity Definitions and Performance Metrics

The Airport Sustainability Rating System is composed of 50 Sustainability Activities across 8 categories (Figure E-1). In the ensuing tables, each Sustainability Activity is further clarified using the following sub-headings:

- Purpose. This section explains each activity's value and provides a rationale for why the activity was included in the Rating System. For example, the purpose of the Renewable Energy Use Activity is to conserve resources and increase airport resiliency by limiting dependence on fossil fuels.
- Definition. This section presents a general description of each Sustainability Activity, defines key terms, and outlines the type of airport functions that fall within the scope of the activity. For example, "Terminal Building" and "Energy Use Intensity" are defined for the Terminal Building Energy Use Activity, and the related airport energy uses are listed. The definition of each activity focuses generally on performance within the airport's direct control. However, engagement with other entities outside the airport's control (e.g., tenants, passengers, general public) is encouraged, where appropriate.
- Primary Related Activities. This section shows how each Sustainability Activity is related to others (e.g., where there is an overlap or a common theme). For example, Overall Airport Energy Use is related to the Overall Airport Greenhouse Gas Emission Reductions Activity.
- Performance Metric. An indicator of performance within a Sustainability Activity that allows the airport to measure and track performance over time. Performance Metrics were developed using information from existing rating systems and support a scoring framework.
- Example Supporting Initiatives. This section lists example airport projects or policies that could lead to improved performance under the sustainability activity and performance metric of that activity. These are not exhaustive, and individual airports will identify their own different initiatives and achieve differing results. The main source referenced in this section is the Sustainable Aviation Guidance Alliance (SAGA) database (2009). The SAGA reference number is in parentheses after each initiatives sourced from SAGA, e.g., (432).
- Source. This section lists sources that were references to develop the performance metric and definition. The main sources referenced include, among others:
  - Global Reporting Initiative (GRI) Airport Operators Sector Supplement
  - Leadership in Energy and Environmental Design (LEED)—2009 Guidelines for Existing Buildings and Operations Maintenance
  - AASHE, Sustainability Tracking and Rating System (STARS)
  - Sustainable Design Manual, 2003; Sustainable Airport Manual 2009–2011, Current Version 2.1, Chicago Department of Aviation; Los Angeles World Airports (LAWA): Sustainable Airport Planning, Design, and Construction Guidelines (LSAG)
  - Port Authority of New York and New Jersey (PANYNJ): Sustainable Design Project Manual
  - Institute for Sustainable Infrastructure (ISI) Envision™ Sustainability Rating System

Energy & Climate – EC		Engagement & Leadership – EL	
EC 1	Terminal Building Energy Use	EL 1	Airport-Wide Stakeholder Engagement
EC 2	Overall Airport Energy Use	EL 2	Public Outreach
EC 3	Renewable Energy Use	EL 3	Community Stewardship
EC 4	Terminal Building Greenhouse Gas Emission Reductions	EL 4	Integrated Sustainability Management
EC 5	Overall Airport Greenhouse Gas Emission Reductions	EL 5	Airport User Engagement & Outreach
EC 6	Other Indirect Greenhouse Gas Emission Reductions	EL 6	Tenant & Vendor Sustainability
EC 7	Climate Change Adaptation	**Water & Waste – WW**	
Transportation – TR		WW 1	Potable Water Conservation
TR 1	Fleet Vehicle Fuel Economy	WW 2	Waste Reduction
TR 2	Airside Equipment Fuel Use	WW 3	Waste Diversion
TR 3	Alternative Vehicle Fuels	**Natural Resources – NR**	
TR 4	Alternative Passenger Transportation	NR 1	Landscape & Grounds
TR 5	Alternative Employee Commute	NR 2	Wildlife & Habitat Protection
Economic Performance – EP		NR 3	Pervious Surface
EP 1	Socially Responsible Financial Investment	NR 4	Airside Stormwater Quality
EP 2	Airport Financial Viability	NR 5	Wildlife Hazard Management
EP 3	Risk Management	NR 6	Heat Island Reduction
EP 4	Regional Economic Contributions	**Human Well-Being – HW**	
Design & Material – DM		HW 1	Airport Noise Compatibility
DM 1	Sustainable Design & Operation	HW 2	Workplace Air Quality
DM 2	Material Selection	HW 3	Light Pollution
DM 3	Construction Waste Diversion	HW 4	Chemicals & Hazardous Materials
DM 4	Construction Impacts Mitigation	HW 5	Passenger Experience
DM 5	Sustainable Site Selection	HW 6	Employee Development
DM 6	Local Sourcing	HW 7	Labor Relations
DM 7	Recycled & Bio-based Content	HW 8	Diversity & Equal Opportunity
DM 8	Low-Toxicity Materials	HW 9	Occupational Health & Safety
DM 9	Environmentally Preferable Purchasing	HW 10	Universal Design

Figure E-1. Airport sustainability rating system—overview of sustainability categories and activities.

ENERGY & CLIMATE

Sustainability Activity	Definition	Performance Metric	Sources
EC 1 Terminal Building Energy Use	***Purpose*** Terminal Building Energy Use promotes the efficient use of energy in terminal and administrative building spaces to reduce operating expenses and minimize resource consumption without impacting airport critical functions. ***Definition*** Terminal buildings are defined as airport space for passenger support, baggage processing and pick-up, concession retail and restaurants, and administration functions. Energy use intensity is defined as total annual building energy consumption per square foot of building space. Efficiency performance is evaluated as a percent reduction from an airport-determined baseline energy intensity. Building energy includes direct consumption of fuels, e.g., for water heating and space conditioning, as well as energy consumption generated offsite—such as purchased electricity and steam. This activity includes total energy consumption within all terminal and administrative building spaces that support airport ground operations. Energy end-uses include, but are not limited to: lighting; refrigeration; equipment use (e.g., service counters, baggage systems, checkpoints); boilers; steam generation; heating, ventilation, and air conditioning (HVAC); people movers, data centers, jet bridges, building controls; and backup energy supply systems. The energy and building area footprint omits airside functions and infrastructure, which are covered by Activity *EC 2 – Overall Airport Energy Use*. Mobile energy associated with ground access vehicles and airport fleet are addressed by Activity *TR 1 – Fleet Vehicle Fuel Economy*. ***Primary Related Activities*** EC 2 – Overall Airport Energy Use EC 4 – Terminal Building Greenhouse Gas Emission Reduction EC 5 – Overall Airport Greenhouse Gas Emission Reductions TR 1 – Fleet Vehicles	Percent reduction of building energy use intensity per square foot (BTU/ft^2) from a baseline. Building total square feet is derived from gross area, which is the net usable square feet plus structural square feet (Airports without terminals will still evaluate administrative building energy use intensity). **Example Supporting Initiatives** • Install building energy management control systems that optimize all systems in real time (328) • Install high-efficiency motors and energy systems (334) • Require building staff participation during commissioning and equipment testing (429)	• GRI: Environment Indicator EN5-7 • STARS: Operations Credit 7: Building Energy Consumption • ISI RA2.1: Reduce Energy Consumption • Adapted by ACRP Research Team

Sustainability Activity	Definition	Performance Metric	Sources
EC 2 Overall Airport Energy Use	***Purpose*** Overall Airport Energy Use advances optimal energy performance across all airport operations to reduce operating expenses and minimize resource consumption without impacting airport critical functions. ***Definition*** Overall airport energy use intensity is defined as total annual airport energy use per designated unit of output. Efficiency performance is evaluated as an energy intensity reduction from an airport-determined baseline energy intensity. This activity covers both airside and landside energy use that occurs airport-wide as part of its operation. This includes energy use associated with, but not limited to: boilers; steam generation; heating, ventilation, and air conditioning (HVAC); lighting; data centers, building controls; backup energy supply systems; baggage handling; people movers; runway, taxiway, apron lighting; firefighting training; perimeter lighting; air traffic control towers; emergency facilities; cargo and maintenance hangars; auxiliary power units (APUs), jet bridges, and ground support equipment (GSE). The performance metric covers all airport energy end-uses, including Terminal Building Energy Use addressed in *EC 1*, except mobile energy associated with ground access vehicles. All fleet energy is included in *TR 1 – Fleet Vehicle Fuel Economy*. ***Primary Related Activities*** EC 1 – Terminal Building Energy Use EC 4 – Terminal Building Greenhouse Gas Emission Reduction EC 5 – Overall Airport Greenhouse Gas Emission Reductions TR 1 – Fleet Vehicle Fuel Economy	Percent reduction of total airport energy use intensity from a baseline. The energy intensity unit of output metric may be designated from one of the following: number of airport customers/employees, number of aircraft movements, tonnage of cargo handled, or another appropriate metric. **Example Supporting Initiatives** • Establish and follow systems commission requirements for runway lighting and illuminated signage, runway NAVAIDS, runway site lighting systems, traffic signals, pump stations, and oil/water separators. (312) • Convert conventional airfield lighting to LED • Develop an Energy Master Plan for the organization's facilities (383) • Conduct investment grade energy audit across airport operated assets • Install variable speed fans for HVAC systems	• GRI: Environment Indicator EN5-7 • STARS: Operations Credit 7: Building Energy Consumption, • ISI RA2.1: Reduce Energy Consumption • Adapted by ACRP Research Team

Sustainability Activity	Definition	Performance Metric	Sources
EC 3 Renewable Energy Use	***Purpose*** Renewable Energy Use conserves resources and increases airport resiliency by limiting dependence on fossil fuels. ***Definition*** Renewable energy is sustainably generated energy from non-fossil fuel sources including, but not limited to, solar photovoltaic generation, solar thermal, hydroelectric, wind turbine systems, biomass, and geothermal energy. Renewable Energy Use is measured as the percent of total airport energy consumption that is derived from renewable sources. The activity includes on-site renewably generated electricity, consumed bio-fuels, and purchased renewable electricity generated off-site. This Activity is concerned with renewable energy supplied to power terminal and building operations, perimeter and street lighting, cargo and maintenance hangars, parking structures, and other infrastructure and operations both landside and airside. Renewable energy use associated with ground access and airport fleet vehicles are covered under TR 3 – *Alternative Vehicle Fuels.* ***Primary Related Activities*** TR 3 – Alternative Vehicle Fuels	Percent of total airport energy consumed annually, including electricity and other fuels derived from renewable sources. **Example Supporting Initiatives** • Install solar powered water heaters (404) • Purchase Renewable Energy Certificates (415) • Identify energy tax credits, rebates, and grants by local utilities or federal, state or local agencies (413) • Develop public-private partnerships for renewable energy development	• GRI: Environment Indicator EN6 • STARS: Operations Credit 8: Clean and Renewable Energy • ISI RA2.2: Use Renewable Energy • PANYNJ: Energy IE-4 • Adapted by ACRP Research Team

Sustainability Activity	Definition	Performance Metric	Sources
EC 4 Terminal Building Greenhouse Gas Emission Reduction	***Purpose*** Terminal Building Greenhouse Gas (GHG) Emission Reduction promotes actions that mitigate aviation's contribution to atmospheric GHG concentrations from airport terminal and administrative building activities. ***Definition*** Terminal Building GHG Emission Reductions is defined as total annual building scope 1 and scope 2 GHG emissions per square foot of terminal and administrative building space. Performance is evaluated as a percent reduction from an airport selected baseline emissions intensity. Scope 1 GHG emissions are direct emissions from sources that are owned or controlled by the airport, including stationary combustion and fugitive emission sources. Scope 2 GHG emissions are indirect emissions that result from airport direct energy consumption from energy generated off-site (e.g., electricity and steam). GHGs considered under this Activity include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). This Activity includes all scope 1 and scope 2 emissions that result from activities occurring within all terminal and administrative building spaces—including but not limited to: lighting; refrigeration; equipment use (e.g., service counters, baggage systems, checkpoints); boilers; construction; firefighting training; steam generation; heating, ventilation, and air conditioning (HVAC); and other building sources. Airports without terminal buildings should consider GHG emissions from administrative buildings only. Scope 1 and 2 GHG emissions from spaces operated by airport tenants are encouraged to be included within this activity with the acknowledgement that obtaining required data and influencing reductions are more difficult. This activity includes clearly documenting such cases where data may be less detailed or unavailable.[1] GHG emissions from mobile energy sources and airside functions and infrastructure are covered in *EC 5 – Overall Airport Greenhouse Gas Emission Reductions*. Scope 3 emissions, which are all other indirect and optionally considered emissions from sources not owned or controlled by the airport, are considered under EC 6 – *Other Indirect Greenhouse Gas Emission Reduction*. ***Primary Related Activities*** EC 1 – Terminal Building Energy Use EC 2 – Overall Airport Energy Use EC 3 – Renewable Energy Use EC 5 – Overall Airport Greenhouse Gas Emission Reductions EC 6 – Other Indirect GHG Emission Reduction	Percent reduction of Scope 1 and Scope 2 GHG emission intensity per gross square foot from a baseline. Building total square feet is derived from gross area, which is the net usable square feet plus structural square feet (Airports without terminals will still evaluate administrative building GHG intensity). **Example Supporting Initiatives** • Develop sustainable design guidelines for upgrades or new construction of terminal and administrative buildings (2) • Install large revolving doors to create an air lock and reduce heat transfer (340) • Implement routine retro-commissioning of airport terminals and administrative buildings	• GRI: Environment Indicators EN16-18 • STARS: Operations Credit 5: GHG Reductions • ISI CR1.1: Reduce Greenhouse Gas Emissions • Adapted by ACRP Research Team

[1] *ACRP Report 11: Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories* can be used to prepare an airport-specific inventory of greenhouse gas emissions: http://onlinepubs.trb.org/onlinepubs/acrp/acrp_rpt_011.pdf.

Sustainability Activity	Definition	Performance Metric	Sources
EC 5 Overall Airport Greenhouse Gas Emission Reductions	***Purpose*** Overall Airport Greenhouse Gas Emission Reductions promotes actions that mitigate an airport's contribution to atmospheric GHG concentrations. ***Definition*** Overall airport GHG emission intensity is defined as total annual airport scope 1 and scope 2 GHG emissions per designated unit of output. Performance is evaluated as a percent reduction from an airport-determined baseline GHG emissions intensity measurement. The intensity indicator can reflect overall scope 1 and 2 GHG emissions per number of airport passengers/employees, number of aircraft movements, tonnage of cargo handled, or another appropriate metric. Scope 1 GHG emissions are direct emissions from sources that are owned or controlled by the airport, including stationary combustion and fugitive emissions associated with refrigerants, radar, and fire suppressants. Scope 2 GHG emissions are indirect emissions that result from airport direct energy consumption from energy generated off-site (e.g., electricity and steam). GHGs considered under this Activity include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). This Activity includes all scope 1 and scope 2 emissions associated with EC 4 – Terminal Building GHG Emission Reductions, in addition to mobile emissions from airport leased, owned, and/or operated vehicles and equipment, plus all non-terminal emission sources. These sources may include, but are not limited to, runway, taxiway, apron lighting; firefighting training; perimeter lighting; air traffic control towers; emergency facilities; cargo and maintenance hangars; auxiliary power units (APUs), jet bridges, airport operated ground access vehicles (GAV), and ground support equipment (GSE). Scope 1 and 2 GHG emissions from spaces operated by airport tenants are encouraged to be included within this activity with the acknowledgement that obtaining required data and influencing reductions are more difficult. [2] Scope 3 emissions, which are all the other indirect and optionally considered emissions from sources not owned or controlled by the airport, are considered under EC 6 – *Other Indirect Greenhouse Gas Emission Reduction.* ***Primary Related Activities*** EC 1 – Terminal Building Energy Use EC 2 – Overall Airport Energy Use EC 3 – Renewable Energy Use EC 4 – Terminal Building Greenhouse Gas Emission Reductions EC 6 – Other Indirect Greenhouse Gas Emission Reductions	Percent reduction of Scope 1 and Scope 2 GHG emission intensity from a baseline. The emission intensity metric may be one of the following: Number of airport passengers/employees, number of aircraft movements, tonnage of cargo handled, or another appropriate metric. **Example Supporting Initiatives** • Prepare an airport-wide GHG emissions inventory that is publicly available • Promote purchasing products with low-GWP refrigerants • Assess feasibility of including GHG reduction measures in the project design, specifically energy consumption reduction, reuse, or alternatives such as solar energy generation	• GRI: Environment Indicators EN16-18 • STARS: Operations Credit 5: GHG Reductions • ISI CR1.1: Reduce Greenhouse Gas Emissions • Adapted by ACRP Research Tam

[2] *ACRP Report 11: Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories* can be used to prepare an airport-specific inventory of greenhouse gas emissions: http://onlinepubs.trb.org/onlinepubs/acrp/acrp_rpt_011.pdf.

Sustainability Activity	Definition	Performance Metric	Sources
EC 6 Other Indirect Greenhouse Gas Emission Reductions	***Purpose*** Other Indirect Greenhouse Gas Emission Reductions focuses on reducing or managing GHG emissions from sources that are not owned or controlled by the airport. ***Definition*** Other Indirect Greenhouse Gas Emission Reductions is defined as measures and strategies undertaken by the airport to reduce scope 3 GHG emissions, which are GHG emissions from sources outside the airport's direct control—excluding emissions from purchased energy (e.g., electricity and steam). Examples of scope 3 emissions include employee commuting, passenger vehicle transportation to and from the airport, airport employee business travel, waste disposal, emissions associated with the production and transport of procured materials, emissions from certain airline and tenant activities, and building spaces not owned and controlled by the airport. GHG inventory protocols assume that organizations may have some ability to influence scope 3 emissions even if they are not under direct control of an airport. This Activity does not include scope 1 and 2 emissions from stationary combustion, purchased energy, mobile, or fugitive sources, which are covered in the EC 4 and EC 5 in the Energy & Climate Category. ***Primary Related Activities*** EC 4 – Terminal Building Greenhouse Gas Emission Reductions EC 5 – Overall Airport Greenhouse Gas Emission Reductions TR 4 – Alternative Passenger Transportation TR 5 – Alternative Employee Commute WW 3 – Waste Diversion	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, preferential procurement policies that consider lifecycle emissions, reduced business travel, waste management improvements, and employee single occupancy vehicle (SOV) commute reduction, among others. **Example Supporting Initiatives** • Establish preferential procurement procedures that consider lifecycle GHG emissions • Provide alternative meeting options to reduce business travel • Improve waste management services for tenants • Provide incentives to reduce employee commute in single occupancy vehicles (SOV)	• GRI: Environment Indicators EN16-18 • STARS: Climate Credits • PANYNJ: Multiple Credits • ACRP Report 11

Sustainability Activity	Definition	Performance Metric	Sources
EC 7 Climate Change Adaptation	***Purpose*** Climate Change Adaptation promotes an airport's long-term viability by increasing the resiliency of airport operations and infrastructure to climate change impacts. ***Definition*** Climate Change Adaptation increases an airport's resiliency to episodic events and longer term meteorological and environmental shifts, thereby avoiding service interruptions in air service and ground transportation. Depending on the location of the airport, climate change impacts may include changes in temperature, precipitation levels, storm frequency, and storm severity; thawing permafrost; sea level rise; habitat impacts; and changes in wildlife. Performance is evaluated by the degree to which an airport has developed and implemented a plan to assess climate vulnerability and increase resiliency. This Activity includes all infrastructure and assets within the airport site including, but not limited to, terminal and administrative buildings; parking lots and structures; HVAC systems; energy and water provision for buildings; roadways and transportation infrastructure; storm water management systems; airfield and navigational aid infrastructure; runways, taxiways, and aprons; turf areas; wetlands; wildlife areas; and shorelines. ***Primary Related Activities*** EC 4 – Terminal Building Greenhouse Gas Emission Reductions EC 5 – Overall Airport Greenhouse Gas Emission Reductions EC 6 – Other Indirect Greenhouse Gas Emission Reductions WW 1 – Potable Water Conservation EP 2 – Airport Financial Viability EP 3 – Risk Management EL 4 – Integrated Sustainability Management NR 1 – Landscape & Grounds NR 2 – Wildlife & Habitat Protection NR 3 – Pervious Surface NR 4 – Airside Stormwater Quality NR 6 – Heat Island Reduction DM1 – Sustainable Design & Operation	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, vulnerability assessments; updated siting, planning, and design; hardening and protecting critical infrastructure; and adaptive management procedures. **Example Supporting Initiatives** • Perform vulnerability assessments of land and buildings within the boundary • Incorporate sustainable development guidelines into existing siting, planning, and design plans • Implement hardening and protection techniques for areas with low shorelines and adaptive management procedures for vulnerable sites	• LSAG: Climate Change Adaptation Planning • ISI CR2.1: Assess Climate Threat • Adapted by ACRP Research Team

WATER & WASTE

Sustainability Activity	Description	Performance Metric	Sources
WW 1 Potable Water Conservation	***Purpose*** Potable Water Conservation promotes the efficient use of treated water and the recovery/reuse of wastewater, where feasible, to minimize potable water consumption. ***Definition*** Potable water is defined as water suitable for human consumption. Airports can conserve potable water by using other non-treated water sources where appropriate and deploying water conserving practices and equipment. Potable water consumption intensity is defined as total annual airport potable water use per designated unit of output. Efficiency performance is evaluated as a potable water intensity reduction from an airport-determined baseline potable water intensity. This activity covers both airside and landside potable water consumption that occurs airport-wide as part of its operation. This includes potable water consumption associated with, but not limited to: drinking water fountains, faucets, sprayers, concession retail and restaurant cooking, plumbing, showers, toilet flushing, cooling tower evaporation, landscape irrigation, building and vehicle washing, de-icing, fire fighting, and sanitation. The performance metric covers all airport potable water end-uses, including Landscape and Grounds addressed in *NR 1*. ***Primary Related Activities*** NR 1 – Landscape & Grounds NR 4 – Airside Stormwater Quality DM 1 – Sustainable Design & Operation	Percent reduction of potable water use intensity from a baseline. The intensity indicator can reflect overall potable water consumption divided by indoor square footage, number of airport customers/employees per period, number of aircraft movements per period, or another appropriate metric such as tonnage of cargo handled. The airport should determine which intensity metric best reflects potable water used based on its unique operations. **Example Supporting Initiatives** • Provide education materials to maintenance staff and building occupants that convey best practices and strategies for water reduction (162) • Install high-efficiency products certified by the US EPA WaterSense Program (178) • Install metering networks to facilitate accurate measurement of water use (182)	• GRI: Environment Indicators EN8-10 • CDA SAM: Water Use Reduction • STARS: Operations Credit 22: Water Consumption • ISI RA3.2: Reduce Potable Water Consumption • Adapted by ACRP Research Team

Sustainability Activity	Definition	Performance Metric	Sources
WW 2 Waste Reduction	***Purpose*** Waste Reduction promotes minimizing the amount of materials that enter the solid waste stream over time. ***Definition*** Waste reduction is realized by preventing materials generated throughout all airport operations from entering the solid waste stream through a collective set of airport actions. Performance is evaluated as a reduction in solid waste production from an airport-determined baseline intensity. This Activity is concerned with non-hazardous, municipal solid waste at airports, which includes, but is not limited to, mixed paper and cardboard, food scraps, kitchen grease, metals, glass, plastics, landscape biomass, wooden pallets, tires, appliances, batteries, recordable media, and electronics. The Activity considers all waste sources where the airport is responsible for disposal, including, but not limited to, terminals, administrative offices, airfields, maintenance hangars, cargo hangars, and aircraft flight kitchens (if disposal of deplaned waste is the responsibility of the airport). Handling of construction and demolition, aircraft lavatory, or chemical wastes are covered under activities within the *Design & Materials* and *Human Well-Being* Sustainability Categories. The Activity does not include waste with regulated or special disposal requirements, such as international deplaned waste, deicing fluids, or hazardous waste. ***Primary Related Activities*** WW 3 – Waste Diversion DM 3 – Construction Waste Diversion HW 4 – Chemicals & Hazardous Materials	Percent reduction of solid waste production from an baseline intensity. The intensity metric may be airport produced ton/cubic yard of waste divided by indoor square footage, number of airport passengers/employees per period, number of aircraft movements per period, tonnage of cargo handled per period, or another appropriate metric. The waste production intensity metric includes all non-hazardous, municipal solid waste disposed of through landfilling, incinerating, recycling, composting, selling, and donating. **Example Supporting Initiatives** • Separate food waste from normal waste to utilize for composting, biofuels, livestock feed, and other uses off-site (e.g., divert biomass waste to local biomass facility) (637) • Provide recycling containers in airport parking lots (674) • Contract an electronics reseller service provider to earn revenue for retired computers, monitors and printers	• GRI: Environment Indicator EN21 • STARS: Operations Credit 17: Waste Reduction • Adapted by ACRP Research Team

Sustainability Activity	Definition	Performance Metric	Sources
WW 3 Waste Diversion	**Purpose** Waste Diversion optimizes the use of airport materials beyond their first functional lifespan by avoiding landfilling and incineration. **Definition** Waste diversion is defined as the percent of total annual solid waste redirected from the landfill or incinerator through recycling, reuse, refurbishment, sale, donation, composting, or other means. This Activity is concerned with non-hazardous, municipal solid waste at airports, which includes, but is not limited to, mixed paper and cardboard, food scraps, kitchen grease, metals, glass, plastics, landscape waste, wood, tires, appliances, batteries, recordable media, and electronics. The Activity considers all waste sources where the airport is responsible for disposal, to include, but not limited to, terminals, administrative offices, airfields, maintenance hangars, cargo hangars, and aircraft flight kitchens (if disposal of deplaned waste is the responsibility of the airport). Handling of construction and demolition, aircraft lavatory, or chemical wastes are covered under activities within the *Design & Materials* and *Human Well-Being* Sustainability Categories. The Activity does not include waste with regulated or special disposal requirements, such as international deplaned waste, deicing fluids, or hazardous waste. **Primary Related Activities** WW 2 – Waste Reduction DM 3 – Construction Waste Diversion HW 4 – Chemicals & Hazardous Materials	Percent of total solid waste diverted from a landfill or incinerator annually. Alternative disposal methods include recycling, composting, reusing, refurbishing, selling, and donating. **Example Supporting Initiatives** • Audit waste streams to determine the waste baseline (639) • Provide education training on waste reduction for the involved employees (636) • Incentivize concessionaries to minimize packaging (646)	• STARS Technical Manual: Operation Credit 18: Waste Diversion • ISI RA1.5: Divert Waste from Landfills • Supported by CDA SAM: Waste Stream Management & LEED Sustainable Sites

TRANSPORTATION

Sustainability Activity	Description	Performance Metric	Sources
TR 1 Fleet Vehicle Fuel Economy	**Purpose** The Fleet Vehicle Fuel Economy Activity promotes fuel savings and all associated benefits via the use of fuel-efficient fleet vehicles. **Definition** Fleet Vehicle Fuel Economy is defined as the annual fuel consumed per mile traveled by all airport fleet vehicles. Performance is evaluated as a percent increase in fuel economy from a baseline. Tracking fuel consumption by vehicle type promotes selecting high usage vehicles with high fuel economy and driving these more efficient vehicles whenever possible. This Activity applies to any landside and airside roadway vehicles leased, owned, and/or operated by the airport including, but not limited to, passenger transit vehicles, taxies, buses, limousines, vans, maintenance trucks, and cargo trucks. Airport ground access vehicles (GAV) are covered. This activity omits the fuel economy of all ground support equipment, fixed rail, emergency response vehicles, snow removal vehicles, and airport-owned aircraft. **Primary Related Activities** TR 2 – Airside Equipment Fuel Use TR 3 – Alternative Vehicle Fuels	Percent increase in fuel economy from a baseline, measured as vehicle miles traveled per gallon of fuel consumed. **Example Supporting Initiatives** • Enforce procurement of motorized vehicles with fuel economies higher than existing values • Assess vehicle type and annual mileage when prioritizing vehicles to be replaced • Participate in the FAA's Voluntary Airport Low Emissions Vehicle Program (213)	• ACRP Research Team

Sustainability Activity	Definition	Performance Metric	Sources
TR 2 Airside Equipment Energy Use	**Purpose** The Airside Equipment Energy Use Activity promotes efficiency by identifying excessive or unnecessary uses of fuel and electricity consumed by airport airside equipment. **Definition** Airside Equipment Fuel Use promotes best practices to reduce energy consumption by airside ground support equipment leased, owned, and/or operated by the airport. This equipment includes, but is not limited to, tugs and tractors, container loaders, lifts, transporters, conveyor belt loaders, passenger boarding stairs, air starters, potable water trucks, lavatory service vehicles, catering vehicles, ground power units, refuelers, de-icing vehicles, emergency response vehicles, and snow removal vehicles. Fuel consumption of roadway and passenger vehicles is covered under Activity *TR 1 – Fleet Vehicle Fuel Economy*. **Primary Related Activities** TR 1 – Fleet Vehicle Fuel Economy TR 3 – Alternative Vehicle Fuels EC 2 – Overall Airport Energy Use	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, vehicle idling, high-efficiency equipment procurement, maintenance and repair schedules, and right-sized vehicle planning, among others. **Example Supporting Initiatives** • Institute a “No-idling” policy for all motorized vehicles • Purchase EPA SmartWay Elite certified vehicles for airport groundside operations • Implement maintenance and repair activities to maintain optimal fuel efficiency levels	• ARCP Research Team • GRI – Airport Supplement

Sustainability Activity	Definition	Performance Metric	Sources
TR 3 Alternative Vehicle Fuels	**Purpose** The Alternative Vehicle Fuels Activity promotes the use of sustainably sourced energy for airport fleet vehicles and equipment in order to reduce emissions and decrease dependence on fossil fuels. **Definition** Alternative Vehicles Fuels gauges performance as the percent of total fleet non-conventional energy purchased annually derived from alternative sources (as a portion of total cost, or energy content of fuel/electricity of energy purchased). Alternative Fuels used among airport fleet vehicles or equipment include, but are not limited to, ethanol-gasoline blends, biodiesel, compressed natural gas, propane, other low-/no-carbon fuels, electric energy, and hybrid technology. This Activity applies to airside and landside fleet vehicles and equipment owned, leased, and/or operated by the airport, excluding aircraft. This includes all vehicle and equipment types covered by *TR 1 – Fleet Vehicle Fuel Economy* and *TR 2 – Airside Equipment Fuel Use*, in addition to fire and rescue equipment and snow removal equipment, as feasible. **Primary Related Activities** TR 1 – Fleet Vehicle Fuel Economy TR 2 – Airside Equipment Fuel Use	Percent of total fleet fuel energy purchased annually derived from alternative sources (as a portion of total cost, or energy content of fuel/electricity purchased. Energy content can be converted to British Thermal Units (BTUs). Purchased fuel/electricity is assumed to be consumed in that same year. Electric vehicle charging requires dedicated metering. **Example Supporting Initiatives** • Use alternatively fueled and electric Ground Support Equipment and shuttle buses (212) • Provide preferred parking incentives for alternative fuel vehicles (218) • Install alternative fuel refueling stations (i.e., biodiesel, compressed natural gas, and electric) at the airport for public and private use (224)	• LSAG: Support Alternative Fuel Vehicles • CDA SAM: Alternative Transportation • STARS: Operations Credit 18: Campus Fleet • Adapted by ACRP Research Team

Sustainability Activity	Definition	Performance Metric	Sources
TR 4 Alternative Passenger Transportation	**Purpose** Alternative Passenger Transportation promotes the use of high occupancy vehicles and alternative forms of transportation by airport visitors to protect air quality and minimize traffic congestion. **Definition** This Activity promotes alternative passenger transportation to decrease passenger travel to and from an airport site by conventional fuel, single-occupancy vehicles. This Activity relates to any infrastructure upgrades or organizational policies targeting the increase of Alternative Passenger Transportation. Infrastructure upgrades supporting alternative transportation to, from, and within an airport site include, but are not limited to, parking lots and structures, walkways and roads for non-motorized vehicles, pedestrian amenities, secure/covered bicycle parking, sky trains, high fuel economy priority parking, and electric vehicle charging stations. Policies include Transportation Demand Management (TDM) options including: car-share partnerships, ride-matching programs, and shower access for pedestrians and bicyclists. Alternative employee transportation performance is covered under *TR 5 – Alternative Employee Commute*. **Primary Related Activities** EC 6 – Other Indirect Greenhouse Gas Emission Reduction TR 5 – Alternative Employee Commute	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, parking incentives and infrastructure for alternative, HOV, low-emitting, and pedestrian forms of passenger transportation. **Example Supporting Initiatives** • Provide parking incentives for alternative or low-emitting vehicles • Install Electric Vehicle charging stations for public use • Offer Transportation Demand Management options such as ride matching programs	• LSAG: Support Alternative Fuel Vehicles • CDA SAM: Alternative Transportation • STARS: Transportation Credits • ISI QL2.5: Alternative Transportation • PANYNJ: Site Section IS-16-21

Sustainability Activity	Definition	Performance Metric	Sources
TR 5 Alternative Employee Commute	**Purpose** The Alternative Employee Commute Activity supports options and incentives that enable employees to get to work faster, at lower cost, while reducing emissions and traffic congestion. **Definition** Alternative Employee Commute is defined as the movement of airport employees to and from their duty station by means other than a conventional, employee- owned single-occupancy vehicle. Options may include carpools, walking, biking, car-share, public transit, or hybrid and fully electric vehicles. Performance is evaluated as the percent of total full- and part-time employee commutes by means other than a conventional, single-occupancy vehicle. This activity includes all commuters employed at the airport, whether employed by the airport, tenants, concession, or airlines that commute to their duty station on a daily or weekly basis. Airports may adopt Transportation Demand Management (TDM) measures to promote employee alternative commutes. TDM actions can include airport facilities vanpools, ride-matching programs, subsidized transit fares, incentivizing alternative commutes, preferred parking for carpools, and preferred parking for high fuel economy vehicles. Policies, programs, and infrastructure regarding alternative employee commute options will also relate to EC 6 – *Other Indirect Greenhouse Gas Emission Reduction* and HW 7 – *Labor Relations.* **Primary Related Activities** EC 6 – Other Indirect Greenhouse Gas Emission Reduction TR 4 – Alternative Passenger Transportation HW 7 – Labor Relations	Percent of employee alternative commutes verses total commutes by all full and part-time employees. **Example Supporting Initiatives** • Subsidize employees public transportation passes (239) • Design easily accessible, covered waiting areas for transit stops and stations at the airport (192) • Install safe bicycle lanes and paths for access to and from the airport (198) • Provide ride matching services for airport employees • Provide guaranteed ride home services for employees with alternative transportation types	• STARS: Operations Credit 16: Employee Commute Modal Split. • LEED: Existing Building O&M SSc4: Alternative Commuting Transportation

ECONOMIC PERFORMANCE

Sustainability Activity	Description	Performance Metric	Sources
EP 1 Socially Responsible Financial Investment	**Purpose** The Responsible Investment Activity recognizes intentional investment decisions with secondary beneficial sustainability and stewardship contributions beyond the airport. **Definition** Responsible Investments are defined as financial agreements or contracts considered socially principled, environmentally beneficial, ethical, and/or mission-related. Performance is evaluated as the total monetary value of investment agreements and contracts that include social or environmental performance requirements, or have undergone social or environmental screening, as a percent of total investments. Criteria for responsible investments include, but are not limited to, direct investments in socially responsible investment funds as well as investments that support socially and environmentally ethical practices, that promote the development of new sustainable products and services, that support sustainable industries (e.g., renewable energy, sustainable forestry), and that prioritize businesses that are certified (e.g. ISO 26000 and SA 8000) and/or recognized for exemplary sustainability performance, or contribute to socially responsible investment funds. This activity does not promote airport revenue diversion. **Primary Related Activities** EP 4 – Regional Economic Contribution	Percent of total significant investment agreements and contracts that include social and environmental stipulations or that have undergone social and environmental screening. **Example Supporting Initiatives** • Invest in recognized socially responsible mutual funds or exchange-traded funds	• GRI – Airport Supplement • STARS: Investment • Adapted by ACRP Research Team

Sustainability Activity	Definition	Performance Metric	Sources
EP 2 Airport Financial Viability	***Purpose*** Airport Financial Viability promotes efficiencies in capital costs, operation, and maintenance to optimize the financial performance of an airport and to ensure its long-term financial viability. ***Definition*** An airport's financial viability is the ability of an airport to finance its capital needs and to cover its annual cost of operations to meet existing as well as future demand. This activity includes an airport's operating revenues and expenses, as well as funding capital projects. Non-operating costs such as debt service and depreciation are not included. Commercial service airports are already required to file annual financial reports with the FAA, which are made available for public viewing on FAA's website. Financial performance influences economic decisions, including an airport's long-term risks and opportunities. This activity goes beyond reporting and promotes a positive, incremental change in an airport's financial status. Financial performance measures are used to track all aspects of an airport's financial performance, including revenues for the airport in total and its various departments and functions. Airline cost per enplanement (CPE), a widely used financial indicator, is the average of what airlines pay per enplanement to the airport for use of the airfield (i.e., landing fees and ramp/apron fees) and terminal space (i.e., space rentals net of any credits and reimbursements, plus gate charges). This activity does not include the economic importance of an airport to surrounding communities and regions. Regional economic impacts are addressed in Activity EP 5 – *Regional Economic Contributions*. ***Primary Related Activities*** EC 1 – Terminal Building Energy Use EC 2 – Overall Airport Energy Use EP 5 – Regional Economic Contributions	Operating cost vs. operational performance unit. For commercial airports performance is measured per enplanement. Cargo airports measure costs per cargo ton; and general aviation airports track change in operating cost over performance period. This metric excludes non-operating costs such as debt service and depreciation. **Example Supporting Initiatives** • Measure the cost difference between reusing materials on-site and the disposal, hauling, and purchasing of new items. • Review engineering standards for building systems equipment subject to period maintenance or replacement (air handler motors and belts, pumps and valves, luminaries, switches, etc.) to identify potential durability upgrades that would measurably reduce life cycle maintenance costs.	• FAA Form 127 • ACRP Report 19A Airport Key Performance Indicators: Financial

Sustainability Activity	Definition	Performance Metric	Sources
EP 3 Risk Management	**Purpose** The Risk Management Activity promotes airport resilience and continual operating efficiency by optimizing the ability to identify, mitigate, and respond to hazards and crises. **Definition** Risks are defined as effects of uncertain magnitude and probability that can negatively influence the ability of the airport to sustain air service operations. Risk Management is defined as the identification, assessment, and prioritization of risks followed by coordinated steps to minimize, monitor, and control the magnitude and probability of risk. Airport risk types include, but are not limited to, economic, financial, health, infrastructural, operational, climate, natural disaster, environmental, political, corruption, crime, and terrorism. **Primary Related Activities** EC 7 – Climate Chang Adaptation EP 2 – Airport Financial Viability	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, risk assessment procedures and risk management planning for a variety of airport projects and operations, transactional safeguards to minimize corruption, crisis preparedness and response planning, and enhanced risk training, among others. **Example Supporting Initiatives** • Develop a comprehensive Risk Management Plan and risk assessment procedures for projects • Implement periodic random reviews of contracts and procurement card bills to increase acquisition accountability • Conduct enhanced risk identification and management training for employees	• GRI: 1.2 • ISI: Climate & Risk • ACRP Research Team

Sustainability Activity	Definition	Performance Metric	Sources
EP 4 Regional Economic Contributions	***Purpose*** Regional Economic Contributions encourages airports to produce beneficial economic impacts for local and regional economies. ***Definition*** Regional Economic Contributions is both the quantification and qualification of the direct and indirect economic impacts of an airport that benefit local and regional economies. Economic benefits generally include improvements in economic conditions through increases in business output, gross regional product, property values, wages, or jobs. These measures are indicators of improvement in the economic well-being of residents in a given area. Economic benefits also include state and local tax payments. This activity includes an airport's net economic impact, including direct and indirect contributions, to its regional economic system. Airports generate direct regional economic benefits through its own business operations, including its workforce (and associated wages) and state and local tax payments. Indirect regional economic benefits include local business support through local (within 500 miles) purchases and procurement, increased connectivity, and encouraging trade and tourism. This activity does not include an airport's financial performance and long-term prospects. Activity EP 2 – *Airport Financial Viability* addresses this concern. ***Primary Related Activities*** EP 2 – Airport Financial Viability EL 1 – Airport-Wide Stakeholder Engagement EL 2 – Public Outreach EL 6 – Tenant & Vendor Sustainability	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, assessing the impact of sustainability initiatives; community needs assessment; low-income areas, evaluating benefits and impacts on the region; local jobs and recruiting, payroll disclosure, and economic activity. **Example Supporting Initiatives** • Encourage the use of local vendors/suppliers. • Actively work with local community leaders to attract new clean businesses and educational institutions to the community. Provide incentives and/or establish foreign trade zones.	• GRI • ACRP Research Team

NATURAL RESOURCES

Sustainability Activity	Description	Performance Metric	Sources
NR 1 Landscape & Grounds	**Purpose** Landscape and Grounds promotes the sustainable planning, use and maintenance of the airport grounds in order to conserve resources, protect airport infrastructure, and increase resilience to changing environmental conditions. **Definition** Landscape and Grounds refers to the sustainable operations and management of irrigation systems, vegetation, soil erosion and sedimentation, fertilization, stormwater, precipitation (non-potable water) conservation, and run-off, as they relate to landscape and associated hardscapes features. These features can include, but are not limited to, roadways, turf areas, perimeter fences, courtyards and seating areas, planting beds, berms, trellises, stone or paved pathways, and retaining walls. Actions addressing heat island effect, impervious surfaces, and wildlife hazards or protection are covered under other activities within the *Natural Resources* Sustainability Category. This Activity is concerned with the maintained grounds on both the airside and landside of an airport, which can include, but is not limited to, roadways; terminals; air traffic control towers; cargo and hangar facilities; maintenance facilities and yards; parking facilities and structures; roadways, medians, and airfield turf adjacent to runways, taxiways, and perimeter fences. **Primary Related Activities** WW 1 – Potable Water Conservation NR 2 – Wildlife & Habitat Protection NR 3 – Pervious Surfaces NR 4 – Airside Stormwater Quality NR 5 – Wildlife Hazard Management	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, improved xeriscaping and vegetation selection, run-off and soil assessments, erosion control planning, on-site composting systems, rainwater harvesting, and irrigation efficiency measures, among others. **Example Supporting Initiatives** • Implement xeriscaping methods throughout the site • Develop and maintain a Soil Erosion and Sedimentation Control plan • Provide or increase quantity of signage for “No-dumping” near drain sites • Use native plant species on airport grounds	• LSAG: Landscape Design, Stormwater Mgmt. • LEED: Sustainable Sites • CDA SAM: Landscape, Erosion Control • STARS: Water Credits • ISI NW1.6, NW2.2, NW3.2 • PANYNJ: Site Section

Sustainability Activity	Definition	Performance Metric	Sources
NR 2 Wildlife & Habitat Protection	***Purpose*** Wildlife and Habitat Protection promotes the preservation, creation, and restoration of ecologically sensitive lands and biodiversity, particularly species of concern, on airport-owned property, in accordance with FAA standards and guidelines. ***Definition*** Wildlife and Habitat Protection is the set of actions optimizing airport plant and animal conditions without jeopardizing human safety. Ecologically sensitive lands include habitat areas, such as upland grassland (mowed and unmowed), upland woodland, wetlands, and waterways. Species of concern include animal species listed as endangered, threatened, or under consideration for official listing under the Endangered Species Act, and state-protected species. This activity addresses all activities at an airport that involve ecologically sensitive areas, such as the operation and maintenance of airport land and airport capital projects. Operation and maintenance of airport land includes stand-alone projects that identify, monitor, and restore ecologically sensitive areas or the broader implementation of an Integrated Vegetation and Pest Management Plan. Airport capital projects, commonly outlined in Airport Capital Improvement Plans, may include siting and construction activities that have the potential to adversely affect ecologically sensitive lands and biodiversity. This activity encourages the innovative and creative implementation of Best Management Practices (BMPs) to avoid the loss, degradation, or conversion of ecologically sensitive areas as well as the loss of biodiversity and individual species of concern. This category does not include the management of wildlife on airport-owned land and in surrounding areas. Activity NR 5 – Wildlife Hazard Management addresses this concern. ***Primary Related Activities*** NR 1 – Landscape & Grounds NR 3 – Pervious Surface NR 5 – Wildlife Hazard Management DM 5 – Sustainable Site Selection	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, identifying, monitoring, restoring, and protecting ecologically sensitive areas and endangered species habitat; Integrated Vegetation and Pest Management Plan; mitigating sensitive land off-site. **Example Supporting Initiatives** • Where practical, control invasive species, noxious weeds, and keep vegetation low by using local farm animals such as goats and cattle, or other biological means such as beetles. • Partner with local environmental or conservation groups to fund restoration of nearby areas.	• LSAG: Site Protection & Restoration • GRI • STARS: Wildlife Habitat • ISI NW1.1: Preserve Prime Habitat

Sustainability Activity	Definition	Performance Metric	Sources
NR 3 Pervious Surfaces	**Purpose** Pervious surfaces decrease rainwater runoff and increase groundwater recharge, improving water quality, while reducing soil erosion and sedimentation. **Definition** Pervious surface is defined as penetrable material, such as soil, sand, stones, porous construction mixes and pavers (concrete, asphalt, brick), and green roofs, which allow water to infiltrate the ground. It is measured as the land surface area covered by these materials, as compared to the entire land area of a site. Emerging technology is increasing the functional applications for constructed porous materials and eventually roads and runways may have viable alternatives to conventional impermeable options. This activity does not address airside run-off management, which is covered under NR 4 – *Airside Stormwater Quality*. This Activity is concerned with all airport landside sites covered with pervious surfaces, which include but are not limited to open fields, lawns, flowerbeds, sidewalks, building roofs, parking areas, roadway shoulders, and other paved areas. **Primary Related Activities** NR 2 – Landscape & Grounds NR 4 – Airside Stormwater Quality	Percent of total airport landside surface area covered by permeable materials. **Example Supporting Initiatives** • Locate parking areas below the building's footprint (underground) to reduce impervious area (114) • Utilize pervious pavement for roadways, shoulders, non-traffic pavements, maintenance roads, utility yards, airside and landside parking facilities (115) • Use natural fiber geotextiles (permeable fabrics) that are biodegradable (117)	• LSAG: Minimize Impervious Surfaces & • CDA SAM: Stormwater Management • PANYNJ: Site Section IS-7 • Adapted by ACRP Research Team

Sustainability Activity	Definition	Performance Metric	Sources
NR 4 Airside Stormwater Quality	**Purpose** The Airside Stormwater Quality Activity recognizes airport outstanding performance to exceed minimum requirements related to water quality while maintaining operational priorities. **Definition** Airside Stormwater Quality considers the management and pollution prevention of airside stormwater and chemical run-off through best practices that include, but are not limited to, de-icing fluid collection, environmentally preferred runway ice-melt treatments, aircraft cleaning, water filtration, biological treatment, and fuel runoff capture. Performance is expected to go beyond basic pollution prevention required by regulation with regard to stormwater quality and chemical pollution. This Activity applies to all airport airside infrastructure where the capture and treatment of run-off is necessary, and may include runways, taxiways, aprons, roadways, building rooftops, general service areas, and other impervious surfaces. Landside stormwater issues are included in NR 2 – *Landscape and Grounds* and NR 3 – *Pervious Surfaces* **Primary Related Activities** NR 2 – Landscape & Grounds NR 3 – Pervious Surfaces	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, de-icing fluid management, designated de-icing and vehicle washing areas , water filtration systems, biological treatment, and runoff capture, among others. **Example Supporting Initiatives** • Isolate and collect aircraft de-icing fluid runoff • Design and use water filtration systems • Train on-site personnel in pollution prevention procedures and provide the Stormwater Pollution Prevention Plan available at the construction site for review	• CDA SAM: Stormwater Design, Stormwater Management • LSAG: Stormwater Management

Sustainability Activity	Definition	Performance Metric	Sources
NR 5 Wildlife Hazard Management	***Purpose*** Wildlife Hazard Management encourages the identification and control of wildlife and wildlife habitat on airport-owned property and surrounding areas in compliance with FAA standards. ***Definition*** Wildlife Hazard Management is the identification of the number and locations of birds and other wildlife whose presence has the potential to cause strikes with aircraft, and the actions required to track and reduce such strikes. Wildlife commonly associated with aircraft collisions include birds (e.g., vultures, Canada geese), mammals (e.g., white-tailed deer), and reptiles (e.g., eastern box turtle). Wildlife habitat includes natural areas that provide wildlife attractants, such as food sources and water. Wildlife strikes occur in an airport's approach/departure airspace or air operations area, and may result in damage to aircraft and air traffic delays. Wildlife strikes also pose a serious threat to human safety. This activity includes coordination with the FAA on the development of Wildlife Hazard Assessments and Wildlife Management Plans. These documents help minimize the risks of wildlife strikes through the identification of hazards and the development, implementation, and evaluation of wildlife management techniques. This activity encourages the implementation of innovative and creative wildlife management techniques, which include human manipulation (e.g., habitat modification) and the use of natural deterrents (e.g., predators). This category does not include the preservation, creation, and restoration of wildlife and habitat. Activity NR 2 – Wildlife and Habitat Protection addresses this concern. ***Primary Related Activities*** NR 1 – Landscape & Grounds NR 2 – Wildlife & Habitat Protection EP 3 – Risk Management HW 9 – Occupational Health & Safety DM 5 – Sustainable Site Selection	Positive trends indicating decreasing total annual number of wildlife strikes per 10,000 aircraft movements. **Example Supporting Initiatives** • Avoid the creation of natural open water features on or near airfield sites that attract wildlife. • Install Kevlar bird deterrent wires or other mechanisms to prevent waterfowl from using area water bodies.	• GRI – Airport Supplement

Sustainability Activity	Definition	Performance Metric	Sources
NR 6 Heat Island Reduction	**Purpose** The Heat Island Reduction Activity encourages sustainable planning and construction of airport structures in order to reduce the heat island effect on and around the airport property. **Definition** Heat Island Effect describes a localized area that generates higher average temperatures than nearby areas due to heat-absorbing surfaces and materials on buildings, roads, and other infrastructure. Performance is evaluated through best practices that may include installing building, roofing, and paving materials with high reflectance, high albedo (reflecting visible light spectrum energy), high emissivity (emitting infrared spectrum energy); increased vegetative cover; and increased shading. This Activity covers any area within an airport site, including airside and landside that creates higher local temperatures than those on surrounding properties. Common airport site materials with a propensity for higher heat absorption relative to natural ground surfaces include, but are not limited to, building materials, concrete, asphalt, paved roads, parking lots, traffic control towers, terminals, and constructed roofing materials. **Primary Related Activities** NR 2 – Landscape & Grounds NR 3 – Pervious Surfaces DM 1 – Sustainable Design & Operation DM 2 – Materials Selection	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, high solar reflectance and high albedo building and paving materials, increased vegetation and green roofing, and increased shade and covering. **Example Supporting Initiatives** • Prioritize installation of equipment with high solar reflectance or high albedo • Install vegetation surfaces on roofing for at least 50 percent of the system area • Increase shaded and covered areas for parking lots and paved areas	• LSAG: Heat Island Reduction • LEED: Heat Island Reduction • CDA SAM: Landscape and Exterior Design to Reduce Heat Islands • ISI CR2.5: Manage Heat Island Effects • PANYNJ: Site IS-14

HUMAN WELL BEING

Sustainability Activity	Definition	Performance Metric	Sources
HW 1 Airport Noise Compatibility	***Purpose*** Airport Noise Compatibility promotes compatibility between airports and surrounding communities by minimizing noise from aircraft operations and construction activities. ***Definition*** Airport Noise Compatibility is defined as airport noise exposure on surrounding communities and the effort to reduce noise exposure on incompatible land uses. Thresholds for noise compatibility around airports have been defined by the FAR Part 150 Airport Noise Compatibility Planning Program. For example, the FAA currently defines Day Night Average Sound Level (DNL) 65 dB as the threshold of noise incompatibility with residential land uses. Airport-related noise is typically a great concern to surrounding communities. It largely derives from aircraft operations, but it can also come from non-aircraft sources, such as airport construction. This activity includes the development of acoustical control measures to reduce aircraft noise levels for nearby affected communities. Through FAR Part 150, the FAA provides financial assistance to airports that develop noise exposure maps and noise compatibility programs. This documentation is submitted to the FAA for review and approval. Financial assistance supports the assessment of noise impacts as well as the implementation of noise-reduction measures. For landside development, including construction-related noise, acoustical controls should be planned for in the early phases of project development. These measures are typically outlined in construction noise abatement plans. This activity also includes noise monitoring, which generally involves the installation of listening stations at sensitive sites and a mechanism to log, track, and respond to community noise complaints. Data acquired through a noise-monitoring program allows an airport to better understand how its aircraft operations are affecting surrounding communities. ***Primary Related Activities*** EL 2 – Public Outreach	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, noise exposure mapping, incompatible land use areas, landside planning for non-aircraft noise, construction noise abatement plans, and local area complaint mechanism. Performance metric could be annual number of individuals submitting a noise complaint. **Example Supporting Initiatives** • Proactively engage local schools to evaluate and implement noise-reduction programs for school facilities. • Conduct a noise modeling study	• LSAG: Noise Pollution Reduction, Exterior Noise & Acoustical Control • CDA SAM: Noise Transmission, Construction Noise & Acoustical Quality

Sustainability Activity	Definition	Performance Metric	Sources
HW 2 Workplace Air Quality	**Purpose** Workplace Air Quality supports the protection of occupant health, and well-being within all airport workspaces. **Definition** The Workplace Air Quality Activity considers the monitoring and management of indoor and outdoor workplace air pollutants occurring at the airport site that can impair human health and safety. Common pollutants include, but are not limited to, carbon monoxide, lead, radon, formaldehyde, exhaust, volatile organic compounds, and benzene that derive from paints, coatings, adhesives, sealants, lubricants, pesticides, wood products, carpet, fabric treatments, custodial chemicals, dust, fuels and combustion systems. This Activity applies to all indoor and outdoor airport workspaces with human occupancy, including, but not limited to, terminal and administrative buildings, baggage handling areas, tarmacs, aprons, hangars, parking structures, and maintenance areas. The Activity includes material and chemical use, vehicle and aircraft fueling, in addition to infrastructure upgrades to air handling mechanical systems, ventilation and air ducts, and airflow management systems. Performance is expected to go beyond regulated compliance requirements with regard to indoor and outdoor air quality. Handling of chemicals and hazardous materials at an airport is addressed by Activity *HW 4 – Chemical and Hazardous Materials*. **Primary Related Activities** HW 4 – Chemical & Hazardous Materials DM 1 – Sustainable Design & Operation DM 2 – Material Selection DM 4 – Construction Impact Mitigation	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, achieving ASHRAE standards, complaint mechanisms, air quality studies, and contracting sustainability certified custodial service providers, among others. **Example Supporting Initiatives** • Adhere to ASHRAE standards for indoor ventilation efficacy (i.e., air exchange and CO_2 concentrations) (445) • Create an employee feedback system to communicate any related safety and health concerns • Install air quality monitoring stations for outdoor areas such as baggage claim and tarmacs	• LSAG: Indoor Environmental Quality • LEED: Indoor Environmental Quality • CDA SAM: Indoor Environmental Quality • STARS: Indoor Air Quality • GRI – Airport Supplement AO5

Sustainability Activity	Definition	Performance Metric	Sources
HW 3 Light Pollution	**Purpose** The Light Pollution Activity promotes the efficient management of illumination at night, thereby reducing resource consumption and improving conditions at nearby residential communities. **Definition** Light Pollution is defined as excessive, misdirected, or obstructive artificial lighting primarily from exterior outdoor sources, but also within indoor spaces. This Activity considers the management of airport light pollution through design and planning best practices that may include siting and design standards, light level assessments, lighting plans, controls (e.g. motion sensors and timers) and light shielding. This Activity considers artificial lighting from all areas within an airport site that may be considered excessive, misdirected, or obstructive, including, but not limited to, indoor terminal and administrative building lighting, building exterior lighting, roadway and sidewalk lamps, and parking structure lighting. This activity omits navigation and safety lighting critical to airport safety and operations, including runway, taxiway, and apron lighting; approach lighting; perimeter lighting; tower lighting; and spot lights. Performance is expected to go beyond regulated compliance requirements with regard to excessive or obtrusive light sources. **Primary Related Activities** DM 1 – Sustainable Design & Operations DM 5 – Sustainable Site Selection	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, light level assessments, light pollution planning, siting and design considerations, and light shielding, among others. **Example Supporting Initiatives*** • Develop light shielding techniques on parking structures and roads • Conduct light level assessments within the property • Adopt light pollution plan, siting and design best practices where possible while maintaining proper illumination • Install motion activated parking lot lights **Does not include lighting vital to airport safety*	• LEED: Light Pollution Reduction • CDA SAM: Light Pollution Reduction • ISI QL2.3: Minimize Light Pollution • PANYNJ: Site IS-15

Sustainability Activity	Definition	Performance Metric	Sources
HW 4 Chemicals & Hazardous Materials	**Purpose** Chemicals & Hazardous Materials management ensures the safety and well-being of human health at the airport site while minimizing compliance costs and protecting environmental quality. **Definition** This Activity considers the proper generation, use, storage, disposal, and transportation of chemicals and hazardous materials through best practices. Common hazardous materials used at an airport are fuels (jet fuel, diesel, gasoline, and liquid propane gas), solvents, lubricants, cleaning agents, paints, compressed gases, peroxides, caustics, pesticides, herbicides, alcohol, deicing and anti-icing fluids, and foams. Chemicals and hazardous materials can also originate from building materials, such as asbestos, polychlorinated biphenyls and lead-based paints. This Activity includes chemical and hazardous materials used for activities that include, but are not limited to, aircraft and ground vehicle fueling and maintenance, building cleaning and maintenance, fuel storage, heating and cooling equipment, fire suppression, spills, de-icing, and pest abatement. Where possible, airports should obtain lower hazard alternatives if there are functionally equivalent products available (e.g., citrus based degreasers). This Activity intends to go beyond regulated compliance standards regarding the production, use, storage, transport, and disposal of chemicals and hazardous materials. Mitigating the impacts of chemicals and hazardous materials with regard to air quality pollution is covered under Activity *HW 2 – Workplace Air Quality*. The use of chemicals and hazardous materials with regard to construction and demolition is addressed under Activity *DM 2 – Materials Selection*. **Primary Related Activities** DM 1 – Sustainable Design & Operation DM 5 – Sustainable Site Selection DM 2 – Materials Selection DM 8 – Low-Toxicity Materials	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, chemical storage and labeling protocols, chemical inventories, enhanced employee education, spill protocols, and Environmental Management Systems for tracking and reporting. **Example Supporting Initiatives** • Designate specific areas for chemical storage and enforce protocols for proper labeling • Prioritize procurement of low-toxicity cleaning chemicals • Create an inventory of all chemicals and hazardous materials used on-site • Provide proper training and education to tenants and applicable staff regarding safe handling • Include provision in custodial contract that service provider must be Green Seal or ISSA CIMS certified	• LSAG: Indoor Chemical & Pollutant Source Control • LEED: Green Cleaning • CDA SAM: Sustainable Sites • STARS: Hazardous Waste

Sustainability Activity	Definition	Performance Metric	Sources
HW 5 Passenger Experience	***Purpose*** Passenger Experience promotes a comfortable and stress-minimizing airport environment for passengers. ***Definition*** Passenger experience is defined as the interaction of the passenger with airport facilities and services between the time a customer arrives at and departs from airport-owned property. The activity is focused on elements that the airport directly controls. Passenger experience includes customer comfort, i.e., how a customer feels about the space. This involves healthy indoor environments as well as aesthetic considerations. Healthy indoor environments include natural lighting, ample ventilation, drinking water, clean air (e.g., tobacco smoke control and use of low-emitting materials), and comfortable temperatures. Airport facilities that are aesthetically pleasing and feature a full-range of concession options also enhance the passenger experience. Aesthetic considerations may also include public art displays. This activity also includes the straightforward flow of passengers, either arrivals or departures, through airport facilities. Passengers should be able to navigate airport facilities with ease, which may involve wayfinding. This activity does not include airline passenger experience, which occurs after an aircraft take-off and before landing. This concern is outside the scope of this guidance. This activity also does not include overall passenger safety or facility accessibility by older people and people with disabilities. Activity HW 10 – Universal Design addresses this concern. ***Primary Related Activities*** TR 4 – Alternative Passenger Transportation HW 3 – Light Pollution HW 10 – Universal Design EL 5 – Airport User Engagement & Outreach	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, natural lighting, effective signage and maps, satisfaction surveys, concession options, proximity to drinking water, and aesthetic enhancements, among others **Example Supporting Initiatives** • Provide areas with varying indoor conditions in terminals, allowing passengers to choose an area with conditions that best match their needs. • Develop and implement a “ZipBike” or other bike sharing program for employees and passengers to travel between airport facilities.	• GRI: Product and Service Labeling • LSAG: Social Responsibility • LEED: Indoor Environmental Quality • CDA SAM: Indoor Environmental Quality

Sustainability Activity	Definition	Performance Metric	Sources
HW 6 Employee Development	***Purpose*** Employee development builds staff capacity through training and educational opportunities. ***Definition*** Employee competency is defined as the knowledge, skills, and abilities that an employee applies on the job to improve overall organizational performance. This activity includes elective training and educational opportunities that are provided by an internal airport training team as well as opportunities provided either via third parties on-site, off-site, or on-line. This activity precludes trainings required by law, such as Occupational Health and Safety (OSHA) standards. An airport's investment in employee development has the potential to improve the overall airport performance and increase employee satisfaction. Cross training employees from separate operational units will improve airport-wide collaboration and promote innovative team problem solving. This activity does not include equal opportunity in the workplace or programs to support underrepresented employees. Activity HW 8 – Diversity and Equal Opportunity addresses these concerns. ***Primary Related Activities*** HW 7 – Labor Relations HW 8 – Diversity & Equal Opportunity HW 9 – Occupational Health & Safety	Percent of airport employees who receive XX or more documented hours of elective training (Internal, External [On-Site], External [Off-site], and On-line) per year by labor category **Example Supporting Initiatives** • Provide appropriate training for the operations and maintenance of airport facilities and systems. • Provide sustainability awareness training for employees, consultants and contractors. Discuss the airport's definition of sustainability, the organization's approach to sustainability, current initiatives, and the airport's desired outcomes. Utilize these forums to capture ideas on how to further improve sustainability performance	• GRI • STARS: Human Resources • Adapted by ACRP Research Team

Sustainability Activity	Definition	Performance Metric	Sources
HW 7 Labor Relations	***Purpose*** Labor Relations promotes the retention of airport personnel through reasonable compensation and benefits, along with their fair treatment. ***Definition*** Labor Relations is defined as the constructive interaction between airport management and personnel that establishes mutually agreed upon productivity goals while maintaining a reasonable quality of life for workers. Reasonable compensation includes the provision of fair/living wages. Fair/living wages allow employees to maintain a decent standard of living that meets the basic needs of themselves and their families. Fair/living wages exceed national legislated requirements, such as the minimum wage and worker's comp. Benefits are compensations an organization provides to its employees that are in addition to normal wages. Benefits include regular contributions (e.g., retirement funding, health insurance) or other forms of support (e.g., daycare, wellness programs, transportation assistance, onsite amenities). Fair treatment of employees includes the incorporation of anti-discrimination and equal opportunity policies. It also includes the open and transparent interaction between airport management and personnel for the purposes of inclusivity and accountability. This activity increases the likelihood of employee retention and minimizes the risk of labor unrest. Employee retention protects the investments an airport has made in the collective knowledge base and skill sets of its employees. Related actions will minimize the possibility of labor unrest, which can take the form of strikes or picketing. Labor unrest can disrupt airport operations and threaten airport security. Fair and responsible compensation also creates an indirect regional economic benefit by increasing money available to spend on the regional economy. ***Primary Related Activities*** EP 1 – Socially Responsible Financial Investment HW 6 – Employee Development HW 8 – Diversity & Opportunity HW 9 – Occupational Health & Safety EL 1 – Airport-Wide Stakeholder Engagement	Average percent annual employee retention rate across all labor categories. **Example Supporting Initiatives** • Develop an employee retention and development plan consistent with the overall organizational goals. • Develop labor practice indicators consistent with the goals for employee development and maintaining a strong and viable work force. • Install a nursing/pumping station	• GRI • STARS: Human Resources

Sustainability Activity	Definition	Performance Metric	Sources
HW 8 Diversity & Equal Opportunity	***Purpose*** Diversity and Equal Opportunity encourages a mix of individuals in an airport's governance and personnel through fair treatment in hiring and remuneration. ***Definition*** Diversity refers to the equitable inclusion of individuals in the workplace regardless of race, age, gender, sexual orientation, as well as other human or cultural differences. Equal Opportunity promotes airport management action to optimize human resource decisions and support maximal workforce diversity. This activity includes the establishment and implementation of an airport's equal opportunity policy. Federal laws prohibiting job discrimination (e.g., Civil Rights Act, Age Discrimination Act, etc.) represent the baseline for this activity. The benefits of recruiting and maintaining a diverse workforce include attracting the best and brightest talent and maximizing productivity through improvements in staff capacity, team synergies, and enhanced communications. This activity also includes any airport-sponsored sensitivity training on issues of diversity as well as any mentoring/peer assistance programs designed to support underrepresented employees. Diversity and Equal Opportunity should not be confused with reasonable compensation and benefits and fair treatment for the purposes of employee retention, which is addressed in HW 7 – Labor Relations. ***Primary Related Activities*** EP 1 – Socially Responsible Financial Investment HW 6 – Employee Development HW 7 – Labor Relations	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, mentoring, counseling, peer support, affinity programs to support underrepresented employees, equal pay programs, diversity recruitment, partnerships with local/regional workforce development organizations, Performance Measures could include minority employment percentage relative to regional minority employment percentage, among others. **Example Supporting Initiatives** • Establish airport sustainability internships, stewardships, and/or public education programs (focus on low-income and diverse populations). • Promote employee work force retention through: employee training programs; training/recruiting of the local minority workforce; and traditional M/WBE programs, certification and goals.	• GRI • STARS: Diversity & Affordability

Sustainability Activity	Definition	Performance Metric	Sources
HW 9 Occupational Health & Safety	***Purpose*** Occupational Health & Safety promotes the health, safety, and general well-being of airport employees through the active elimination of workplace hazards. ***Definition*** Occupational Health and Safety is defined as the provision of a safe and healthy work environment for airport personnel. Workplace hazards are defined as any source of potential harm or adverse health effect on individuals under occupational conditions. Sources of workplace hazards generally include tasks, conditions, substances and materials, and equipment. Workplace hazards of particular concern to airports include noise exposure and exposure to airborne pollutants or other hazardous substances related to aircraft/airport operations. Other concerns include the operation of machinery by ground crew, handling of baggage by ticket counter and ramp personnel, assisting passengers with special needs by gate crew, the potential transmittal of diseases to flight crew, and typical administrative concerns (e.g., lighting and ventilation). Under the Occupational Safety and Health (OSH) Act of 1970 and the laws and regulations of the Occupational Safety and Health Administration (OSHA), employers are already obligated to provide safe and healthful working environments. In addition, the FAA provides guidance on worker protection specific to the airline industry (14 CFR 139). These standards represent the minimum baseline for this activity, and airports are encouraged to exceed them through innovative and creative practices. This activity includes actions and programs that monitor as well as mitigate such hazards, including the formation of joint management-worker health and safety committees and a mechanism by which health and safety risks can be reported. General benefits of providing a safe and healthy work environment include maintaining or improving productivity levels and reducing costs associated with workers' compensation, medical visits, conducting accident investigations, and training replacement employees. ***Primary Related Activities*** EP 3 – Risk Management HW 2 – Workplace Air Quality HW 3 – Light Pollution HW 4 – Chemicals & Hazardous Materials HE 7 – Labor Relations HW 10 – Universal Design EL 1 – Airport-Wide Stakeholder Engagement	Percent of total workforce represented in formal joint management–worker health and safety committees that help monitor and advise on occupational health and safety programs: mechanism to alert airport leadership regarding health and safety risks. **Example Supporting Initiatives** • Provide first responder life support training for employees. • Install ergonomic workstations • Ensure working areas are adequately lighted • Develop and communicate alternative routes to the nearest medical facility as part of the organization's overall health and safety program. Include this information in the Airport Disaster and Emergency Preparedness Plan. • Conduct safety observations to ensure workers are abiding by the health and safety plan.	• GRI

Sustainability Activity	Definition	Performance Metric	Sources
HW 10 Universal Design	**Purpose** The Universal Design Activity optimizes airport spaces with the well-designed safety and accessibility functionality to optimize customer and employee experiences. **Definition** Universal Design is defined as the selection and installation of products and built environments that are aesthetic and usable to the greatest extent possible by everyone, regardless of physical or cognitive ability. This activity includes all airport new construction, expansion, and retrofits associated with spaces or areas designed for human occupancy, including, but not limited to, terminal and administrative buildings, buses, shuttles, trains, parking lots and structures, and roadways. Airports are encouraged to incorporate universal design elements related to lighting and visibility; walking surfaces, doorways, stairs, escalators, restrooms, concession spaces, people movers, and elevators; audio, visual, and written media and signage; and other enhanced safety and accessibility features. This activity is focused on practices that exceed minimum regulatory compliance standards related to safety and accessibility. **Primary Related Activities** HW 5 – Passenger Experience HW 9 – Occupational Health & Safety DM 1 – Sustainable Design & Operation	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, universal design elements and passenger/employee safety in new construction and retrofit projects, opportunity assessments for design upgrades, and enhanced safety and accessibility features, among others. **Example Supporting Initiatives** • Incorporate universal design elements and passenger/employee safety in new construction projects • Assess all airport areas for opportunities to incorporate universal design related to lighting and visibility; walking surfaces, stairs, escalators, people movers, and elevators; audio, visual, and written media and literature; and other enhanced safety upgrades • Conduct road safety audits for all major pedestrian crossings	• LEED for Neighborhood Development: Visitability and Universal Design • Greenroads: Access & Equity AE1 Safety Audit • ACRP Research Team

DESIGN & MATERIALS

Sustainability Activity	Description	Performance Metric	Sources
DM 1 Sustainable Design & Operation	**Purpose** Sustainable Design and Operation recognizes airport spaces that are intentionally conceived and operated based on integrated sustainability approaches. **Definition** This Activity considers the design and operation of eligible building spaces that either achieve a third-party verified certification—e.g., LEED, Green Globes, Envision™—or would meet sustainable design, operation, and maintenance guidelines and policies that cover: minimized impacts to the surrounding site, energy consumption, use of environmentally preferable materials, optimized indoor environmental quality, and water conservation. The key success factor is integrating the systemic sustainability considerations with the full planning, design, construction and operation process. Airports may use externally established sustainability design and operation systems or utilize guidelines that they have generated themselves. This Activity covers the sustainable design and operation of spaces to include, but not limited to, terminals, administrative buildings, air traffic control towers, ground transportation areas, cargo and maintenances, and other buildings and spaces intended for human occupancy. **Primary Related Activities:** DM 2 – Material Selection DM 5 – Sustainable Site Selection DM 9 – Environmentally Preferable Purchasing WW 1 – Potable Water Conservation EC 1 – Terminal Building Energy Use HW 2 – Workplace Air Quality	Two tier starting with the lower points: 1) Percent of total building space that achieves a self or 2nd party verified sustainable performance guidelines, and 2) Percent of total building space achieving 3rd party verified green certification – e.g., LEED, Green Globes, Envision™, etc. **Example Supporting Initiatives** • Apply for U.S. Green Building Council LEED Certification for new construction projects or upgrades to existing buildings, as applicable (8) • Require a LEED building standard and green operating commitment from non-airport controlled buildings that are on/near the airport, such as hotels and restaurants (18) • Involve (require) LEED® Accredited Professionals at all levels of planning and design (46)	• LSAG: Innovation in Planning & Design • CDA SAM: LEED Certified Project • STARS: Building Operations & Maintenance

Sustainability Activity	Definition	Performance Metric	Sources
DM 2 Material Selection	**Purpose** The Material Selection Activity promotes the selection of sustainable products for construction and retrofit projects that reduce waste and conserve production-and-distribution related resources and energy. **Definition** Sustainable materials are products characterized as containing recycled content, containing bio-based or rapidly renewable content, containing low embodied energy, sustainably harvested, durable, locally sourced, energy-efficient, water efficient, reused, or low toxicity. Materials that have achieved these characteristics through third-party certification or an independent assessment are considered preferable. This activity includes materials used in all airport new construction, expansion, and retrofit projects associated with, but not limited to, terminal and administrative buildings; roadways; parking lots and structures; runways, taxiways, and aprons; cargo and maintenance hangars; and turf areas. This activity does not include materials procured and used for routine airport operational consumption, which are addressed by multiple other activities within the *Design & Materials* Category. **Primary Related Activities** DM 6 – Local Sourcing DM 7 – Recycled & Bio-based Content DM 8 – Low-Toxicity Materials DM 9 – Environmentally Preferable Purchasing	Percent of total materials (as a portion of total material cost) sourced for any retrofit or expansion project consisting of environmentally preferable construction materials (i.e., recycled content, bio-based content, durable, local, rapidly renewable content, low embodied energy content, energy-efficient, water efficient, green certified, reused on-site). The full activity excerpt would include a list of accepted certifying organizations. Exemplary performance credit can be achieved for percent of total materials (% of total cost) with environmental product declarations. **Example Supporting Initiatives** • Reduce the requirements for preservative-treated wood (742) • Develop a plan identifying airport construction components that can utilize reused materials onsite (e.g., runway concrete as fill or secondary surface use) • Establish a Forest Stewardship Council certified wood products goal and identify suppliers (737) • Track material costs and quantifies for environmentally preferable construction materials	• ISI RA1.3: Use Recycled Materials • PANYNJ: Material Multiple Credits • LEED: Materials & Resources

Sustainability Activity	Definition	Performance Metric	Sources
DM 3 Construction Waste Diversion	**Purpose** The Construction Waste Diversion Activity promotes building materials stewardship by diverting waste from the landfill or incinerator. **Definition** Construction waste diversion is defined as the percent of total annual construction and demolition waste diverted from the landfill or incinerator through recycling, reuse, refurbishment, sale, donation, composting, or other means. This Activity is concerned with waste associated with construction and demolition projects under the responsibility of the airport, or where the airport is responsible for the disposal of the waste. It is defined to include waste associated with land clearing, excavation, and/or the construction, demolition, renovation or repair of structures, roads, and utilities. Both excess new construction materials and the pre-existing replaced building materials are waste sources. This commonly includes concrete, wood, metals, drywall, ceiling tiles, wiring, carpet, plastic, pipe, plumbing fixtures, major kitchen appliances, land-clearing debris, cardboard, and salvaged building components. Handling of other municipal solid or chemical wastes not associated with construction and demolition are covered under activities within the *Waste & Water* and *Human Well-Being* Categories. The Activity does not include waste with regulated or special disposal requirements, such as tar-impregnated roofing materials, lamps/switches/thermostats with mercury, or asbestos materials. **Primary Related Activities** WW 3 – Waste Diversion DM 4 – Construction Impacts Mitigation	Percent of total construction & demolition waste diverted from a landfill or incinerator, in tons or cubic yards. **Example Supporting Initiatives** • Develop and implement a Construction Waste Management Plan (699) • Adopt requirement for contractors to track recycling for construction materials • Develop an inventory of topsoil for potential re-use (701) • Re-use project waste as a resource to another project, which may include concrete, asphalt, land and clearing debris, and building components (703)	• STARS: C&D Waste Diversion • PANYNJ: Construction IC-6 • FAA Recycling, Reuse and Waste Reduction at Airports

Sustainability Activity	Definition	Performance Metric	Sources
DM 4 Construction Impacts Mitigation	**Purpose** The Construction Impacts Activity promotes the mitigation of construction and demolition pollution from airport projects by implementing best practices. **Definition** Construction and demolition pollution is defined as all ground, air, and water pollution and materials waste associated with construction and demolitions projects. This Activity covers stormwater pollution prevention, dust mitigation, indoor air quality protection, construction heavy equipment emissions, erosion and sediment control, waste management, and environmental contamination associated with landside and airside airport construction and demolition projects. Pollution control measures should apply to all projects requiring at least one-half acre of soil disturbance. This Activity omits pollution mitigation practices necessary to meet regulated compliance requirements with regard to construction and demolition. **Primary Related Activities** DM 3 – Construction Waste Diversion HW2 – Workplace Air Quality NR 1 – Landscapes & Grounds NR 4 – Airside Stormwater Quality	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, construction stormwater and air pollution control planning, inspection and maintenance planning, erosion and sediment control, dust suppression, vehicle washing, and equipment idling, among others. **Example Supporting Initiatives** • Prepare a construction stormwater and air pollution plan • Create a site inspection procedure to be carried out within 24 hours of a rainfall • Comply with State's discharge general permit requirements • Establish and enforce maximum idling time for motorized equipment	• PANYNJ: Construction IC-1 • LEED ND – Construction Activity Pollution Prevention

Sustainability Activity	Definition	Performance Metric	Sources
DM 5 Sustainable Site Selection	**Purpose** The Sustainable Site Selection Activity promotes the preservation of undeveloped land by prioritizing and making efficient use of existing infrastructure, rehabilitating contaminated sites, and protecting land for future aeronautical use. **Definition** Sustainable Site Selection is defined as the preliminary assessment prior to project planning, design, and construction to identify suitable sites for development. Site selection should prioritize the use of already developed land, rehabilitating contaminated sites (e.g., brownfields), and maintaining wetlands and wildlife habitat. This activity includes all airport new construction, expansion, and retrofits associated with, but not limited to, terminal and administrative buildings; roadways; parking lots and structures; runways, taxiways, and aprons; cargo and maintenance hangars; and turf areas. **Primary Related Activities** NR 1 – Landscape & Grounds NR 2 – Wildlife & Habitat Protection	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, siting assessments and mapping, siting action plans, rehabilitation and use of contaminated sites, and wetland maintenance, among others. **Example Supporting Initiatives** • Perform a site assessment • Build on previously developed sites, or one close to existing infrastructure (553) • Maximize use of contaminated or Brownfield sites to reduce pressure on undeveloped land (563) • Develop a balanced earthwork plan and retain the maximal excavated earth on-site (700)	• PANYNJ: Site Multiple Credits

Sustainability Activity	Definition	Performance Metric	Sources
DM 6 Local Sourcing	**Purpose** The Local Sourcing Activity optimizes the economic impact and efficiency of procuring goods and services from local businesses. **Definition** Local Sourcing is defined as prioritizing the acquisition of products, materials, and services from businesses located within a certain distance from the airport. Performance is evaluated as a percent of annual procurement contracts that include stipulations prioritizing local sourcing. This activity covers goods and services procured directly by the airport, including, but not limited to, office supplies, cleaning supplies, electronics, food, fuel, electricity, landscaping materials, plants, and repair and technical services. This activity omits electrical, mechanical, and plumbing equipment, as the most efficient equipment should be utilized regardless of transportation distance. Materials purchased locally for construction are addressed under DM 2- Materials Selection. **Primary Related Activities** DM 2 – Material Selection DM 9 – Environmentally Preferable Purchasing EC 2 – Renewable Energy Use	Percent of annual procurement contracts that include stipulations prioritizing the acquisition of products, materials, and services from businesses located within a certain distance from the airport. **Example Supporting Initiatives** • Purchase reused office furniture from local organizations (551) • Establish a management goal for the minimum percentage of local/regional materials and products that are manufactured regionally within a certain distance from the airport (725) • Allow longer lead times for local companies to supply regional materials (729) • Prioritize the use of the following locally/regionally available materials: concrete, asphalt, structural steel, masonry, post-industrial recycled gypsum wallboard, storm system concrete pipes of all sizes, manholes and handholes, electrical duct banks, cable, gas and water piping, rail tracks, rail ties, rail ballast, landscape material and seed (724)	• STARS: Operations Credit 6: Purchasing • ISI RA1.4: Use Regional Materials • PANYNJ: Material Section: IM-2 • GRI – EC 6 Locally-based Suppliers • Adapted by ACRP Research Team

Sustainability Activity	Definition	Performance Metric	Sources
DM 7 Recycled & Bio-based Content	**Purpose** The Recycled & Bio-based Content Activity reduces the demand for virgin resources by promoting recycled or renewable materials. **Definition** Recycled content is defined as the portion of materials used in a product that was diverted from a waste stream and would have constituted virgin materials. Recycled material can be either post-industrial (production generated) or post-consumer (discarded after intended usage). Bio-based Content products are defined as any product, other than food, with a portion composed of biological products, sustainably-harvested forestry materials, or agricultural sourced materials, which includes plant, animal, and microbial materials. Performance is evaluated by the percent of applicable products and materials purchased made at least partially from recycled or bio-based content, as a portion of total cost. Applicable products used at an airport include, but are not limited to, office supplies, paper and paper products, carpet, office furniture, toner cartridges, utensils and serving ware, plastics, lubricants, road/runway ice-melt applications, recycled de-icing glycol, landscaping products, and packaging materials. Fuels, electricity, and other forms of purchased energy derived from renewable or bio-based materials are covered under Activity *EC 3 – Renewable Energy Use* and *TR 3 – Alternative Vehicle Fuels*. Sustainable purchase decisions regarding construction and building retrofits are covered under Activity *DM 2 – Material Selection*. **Primary Related Activities** DM 2 – Material Selection DM 9 – Environmentally Preferable Purchasing	Percent of applicable products and materials purchased made at least partially from recycled or bio-based content, as a portion of total annual (or project) cost. Excludes fuels and electricity. Higher points may be available for sustainability harvested/generated products (e.g., Forest Stewardship Council (FSC) certified paper). **Example Supporting Initiatives** • Develop acquisitions policy for furniture and building fixtures with high recycled material content • Use bio-based transformer fluids; these fluids can also improve equipment efficiency (718) • Provide a fact sheet to designers that includes available recycled content materials and the organization's target for each material (723) • Establish project goals for recycled content materials and identify material suppliers that can achieve this goal (714)	• GRI: Environment Indicator EN2 • CDA SAM: Recycled Content • LSAG: Recycled Content • STARS: Purchasing • ISI RA1.3: Use Recycled Materials • PANYNJ: Material Section IM-1 • Adapted by ACRP Research Team

Sustainability Activity	Definition	Performance Metric	Sources
DM 8 Low-Toxicity Materials	**Purpose** The Low-Toxicity Materials Activity prioritizes the use of low-toxicity products to decrease exposure to harmful pollutants and optimize water and air quality. **Definition** Low-Toxicity Materials are defined as certifiable alternatives to chemicals that may be considered odorous, irritating, and harmful to humans. Performance is evaluated by the percent of applicable products and materials purchased that are certified as low toxicity (e.g., EPEAT or Green Seal certified), as a portion of total cost. This Activity applies to all materials purchased and utilized by an airport, and applicable materials include, but are not limited to, paint, office furniture, carpets, wood products, fluorescent lamps, lubricants, solvents, cleaners, herbicides, pesticides, fertilizers, and deicing fluids. This Activity excludes fuel products. Mitigating the impacts of toxic materials with regard to air quality pollution is covered under Activity *HW 2 – Workplace Air Quality*. The use of low-toxicity materials with regard to construction and demolition is addressed under Activity *DM 2 – Materials Selection*. **Primary Related Activities** HW 2 – Workplace Air Quality HW 4 – Chemical & Hazardous Materials DM 2 – Material Selection DM 9 – Environmentally Preferable Purchasing	Percent of applicable products and materials purchased that are 3rd party certified as low toxicity, (e.g., EPEAT or Green Seal) as a portion of total annual (or project) cost. **Example Supporting Initiatives** • Review maintenance and janitorial programs to eliminate toxic agents in favor of more environmentally friendly choices (539) • Avoid installing vinyl flooring with high polyvinyl chloride (PVC) content (464)	• LSAG: Low-Emitting Materials • STARS: Multiple Credits • PANYNJ: Part 2: Material Section IM-6 • Adapted by ACRP Research Team

Sustainability Activity	Definition	Performance Metric	Sources
DM 9 Environmentally Preferable Purchasing	**Purpose** Environmentally Preferable Purchasing promotes the creation of markets for products that take into consideration resource conservation and human and environmental well-being. **Definition** Environmentally Preferable Purchasing considers management and procurement policies and programs that prioritize products or services with certified environmental attributes. These attributes include, but are not limited to, low-toxicity, durability, energy-efficient, water efficient, low embodied energy, bio-based content, recycled content, and non-ozone-depleting, in addition to price, performance, and availability. This Activity applies to airport-wide policies for purchasing products and services for daily airport operations and construction projects, including, but not limited to, office and administrative operations, new construction and retrofits, building maintenance and custodial services, electronic equipment and appliances, vehicle maintenance, food services, and landscaping. **Primary Related Activities** DM 1 – Material Selection DM 7 – Recycled & Bio-based Content DM 8 – Low-Toxicity Materials DM 9 – Environmentally Preferable Purchasing	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, procurement requirements, product certification, contract tracking, and employee training, among others. **Example Supporting Initiatives** • Establish procurement requirements for energy-efficient, water-efficient, bio-based, recycled content, low-toxicity, and non-ozone-depleting products and services • Develop a list of prioritized/preferred high durability materials • Design a sustainable purchasing program covering select items available at a lower cost per unit	• GRI: Product Responsibility • LEED: Material & Resources • LSAG: Materials & Resources • STARS: Purchasing: Multiple Credits • ISI RA1.2: Sustainable Procurement

ENGAGEMENT & LEADERSHIP

Sustainability Activity	Definition	Performance Metric	Sources
EL 1 Airport-wide Stakeholder Engagement	***Purpose*** Stakeholder Engagement enables any internal entity with a vested interest in airport development or operations to contribute to airport improvements. ***Definition*** Stakeholder Engagement is defined as the process through which an airport acquires useful input from internal persons or groups that are affected by airport activities. Stakeholders include representation from an airport's various departments and committees/commissions, including directors and support staff. They also include an airport's tenants and their employees. Regulatory agencies, such as the Federal Aviation Administration, can also be stakeholders under certain conditions. This activity includes the formation and maintenance of partnerships that encourage open participation from a broad set of interests. Collaboration within these partnerships represents an opportunity to collect valuable input that can generate innovative contributions to overall airport performance as well as avoid potential conflicts or pitfalls. In the long-term, this activity is about sustaining constructive internal relationships to ensure future airport viability. In a project setting, this activity encourages early engagement with stakeholders and the maintenance of such engagement throughout the lifetime of a project. This activity does not include external outreach programs that include the open exchange of information between airports and the communities in which they operate. This concern is addressed under Activity EL 2 – Public Outreach. Employee communication is also covered by Activity HW7 – Labor Relations. ***Primary Related Activities*** HW 7 – Labor Relations EL 2 – Public Outreach EL 3 – Community Service EL 5 – Airport User Engagement & Outreach EL 6 – Tenant & Vendor Sustainability	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, formal partnerships and standing committees with internal stakeholders. **Example Supporting Initiatives** • Develop an internal communication plan to report on sustainability performance. • Hold regular meetings with established standing committees.	• STARS: Public Engagement • PANYNJ: Site IS-1 • LSAG: Sustainability Planning and Progress Meetings • CDA SAM: Planning

Sustainability Activity	Definition	Performance Metric	Sources
EL 2 Public Outreach	***Purpose*** Public Outreach promotes the open and transparent exchange of information between airports and the communities in which it operates to acquire and maintain community support. ***Definition*** Public outreach is a proactive process in which an airport engages in two-way communications with surrounding communities and regions. Community support is imperative to the long-term viability of an airport, as community opposition to airport development and/or operations can result in project delays or cancelations, unanticipated costs, and/or litigation. This activity includes educational initiatives through which an airport disseminates information to the public on its development and operations as well as a forum that provides for public feedback. Direct communication with the public allows an airport to avoid miscommunication. A result of this collaborative process is the mutual understanding and trust between an airport and surrounding communities and regions. This process balances the needs of the airport with the interests of the public. This activity does not include engaging stakeholders through the formation of partnerships or standing committees related to the development of specific projects or overall airport operations. This concern is addressed under Activity EL 1 – Airport-Wide Stakeholder Engagement. ***Primary Related Activities*** EP 1 – Socially Responsible Financial Investment EP 4 – Regional Economic Contributions HW 1 – Airport Noise Compatibility EL 1 – Airport-Wide Stakeholder Engagement EL 3 – Community Stewardship EL 5 – Airport User Engagement & Outreach	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, community outreach and informational programs. **Example Supporting Initiatives** • Host a meeting or panel discussion during airport projects as an opportunity for questions and education about a project (separate from the required public hearing). • Develop/use airport and local municipality websites to detail current and anticipated sustainability practices and provide an opportunity for community input.	• STARS: Public Engagement

Sustainability Activity	Definition	Performance Metric	Sources
EL 3 Community Stewardship	***Purpose*** Community Stewardship fosters good will through airport-sponsored community support programs and the provision of services to local populations where such services are needed. ***Definition*** Community Stewardship is defined as leadership through dedication and contribution to the development, encouragement, and preservation of a community. This activity includes the formation and implementation of community support programs that address the needs and deficits as well as support the strengths and assets of the communities and regions in which airports operate. The good will generated from such programs would help to strengthen the relationship between airports and surrounding communities and regions. This activity does not include local economic impacts of job creation and other forms of economic development. This concern is addressed under Activity EP 4 - Regional Economic Contributions. ***Primary Related Activities*** EP 1 – Socially Responsible Financial Investment EP 4 – Regional Economic Contributions HW 8 – Diversity & Equal Opportunity EL 1 – Airport-Wide Stakeholder Engagement EL 2 – Public Outreach	Percent of airport employees that partake in 1 or more airport-sponsored community service projects or events per year; Tracking total hours of community service relative to total workforce hours. **Example Supporting Initiatives** • Encourage the use of local vendors/suppliers. • Actively work with local community leaders to attract new clean businesses and educational institutions to the community.	• STARS: Community Service • Adapted by ACRP Research Team

Sustainability Activity	Definition	Performance Metric	Sources
EL 4 Integrated Sustainability Management	***Purpose*** Integrated Sustainability Management promotes the institutionalization of sustainability throughout all airport functions. ***Definition*** Integrated Sustainability Management is defined as the integration of sustainability principles and practices into airport governance, including individual project development. Airport governance is the decision-making processes that contribute to the management, operation, and development of an airport. This activity includes incorporating sustainability (e.g., waste, water, energy) into an airport's planning documents, such as an airport master plan. Such documents establish an airport's priorities and influence financial forecasting and decision-making. At the project level, this activity encourages consideration of sustainability at the earliest stages of project planning and design and throughout its life cycle. It also encourages an integrated team approach, which includes broad participation by professionals in various disciplines as well as all applicable stakeholders. The benefits of these actions include maximizing the use of resources, including natural resources and human capital. This activity also includes methods by which an airport can track sustainability performance, whether it is through an environmental management system (EMS) or some other mechanism. This includes tracking individual contributions to ensure that sustainability is implemented within an individual's own functions and duties. ***Primary Related Activities*** DM 1 – Sustainable Design & Operation DM 9 – Environmentally Preferable Purchasing EL 1 – Airport-Wide Stakeholder Engagement EL 2 – Public Outreach EL 5 – Airport User Engagement & Outreach EL 6 – Tenant & Vendor Sustainability	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, integrating all sustainability plans (waste, water, energy, etc.) into airport Master Plan, incorporating sustainability into planning procedures and general reporting, appointing a Sustainability Coordinator, formal public reporting of sustainability, including sustainability metrics within EMS tools, and establishing a series of sustainability guidelines across airport functions. **Example Supporting Initiatives** • Establish and follow a process for tying sustainability goals and objectives into the operations and maintenance and capital improvement program budget process; this helps ensure that life cycle costs, impacts on other divisions, and specific sustainability goals for projects are addressed. • Require regular sustainability progress reports during design for construction projects (quarterly or at project conception (PDD), 30%, 60%, 90%, and 100% milestones). • Establish a sustainability liaison to the airport sponsor (for all design, construction, operations, maintenance, tenants).	• STARS: Coordination & Planning, • PANYNJ: Site IS-1 • LSAG: Sustainability Planning and Progress Meetings • CDA SAM: Planning

Sustainability Activity	Definition	Performance Metric	Sources
EL 5 Airport User Engagement & Outreach	***Purpose*** Airport User Engagement and Outreach encourages the promotion of an airport's sustainability initiatives to provide airport users with an understanding of the initiatives as well as the overall concept of sustainability. ***Definition*** Airport User Engagement and Outreach is defined as the communication, marketing, and education of an airport's sustainability initiatives to its users. Airport users are defined as airline passengers, pilots/crew, and any other individuals or groups utilizing airport facilities. This activity includes the dissemination of information pertaining to airport sustainability activities by an airport to its users. Such actions increase awareness of airport development and operations, and the decision-making that was involved. This activity can be demonstrated through physical means (e.g., educational installations in the terminal) or through on-line engagement (e.g., the airport's website, social media). This activity presents airport users with the means to support sustainability initiatives at the airport as well as emulate them in their own homes and in their communities. ***Primary Related Activities*** HW 5 – Passenger Experience EL 2 – Public Outreach	Performance is evaluated and points are awarded based on the number of performance actions pursued that address, for example, communication, marketing, and education campaigns for sustainability at the airport, at home, and in the community. **Example Supporting Initiatives** • Create an interactive multimedia display (i.e. video, website, etc.) that would engage and educate visitors about the sustainable aspects of completed projects or airport operations. • Showcase the airport as a demonstration and commercialization launch pad for alternative energy technologies and products through marketing and press relations	• GRI • LSAG: Community Education • STARS

Sustainability Activity	Definition	Performance Metric	Sources
EL 6 Tenant and Vendor Sustainability	***Purpose*** Vendor and Concession Engagement promotes the integration of airport sustainability principles and practices into tenant and vendor operations. ***Definition*** Tenant and Vendor Sustainability is defined as the adoption of airport-supported sustainability principles and practices by airport tenants and vendors. Tenants include airlines, fixed-based operators, and concessionaires. Vendors include any entity from which an airport procures goods or services. This activity includes the determination of minimum expectations of performance thresholds pertaining to social and environmental concerns, and encouraging adoption of those standards by airport tenants and vendors. Adoption may be suggested or may be required as part of tenant/vendor contracts. In an effort to establish a common understanding of sustainability and how it should be incorporated throughout all airport functions, airports are encouraged to provide guidance to its tenants and vendors (e.g., sustainability guidelines or informational meetings). Airports can foster a culture of sustainability by establishing working groups, providing public recognition for tenant elective actions, or providing incentives. ***Primary Related Activities*** EC 1 – Terminal Building Energy Use WW 1 – Potable Water Conservation WW 2 – Waste Reduction WW 3 – Waste Diversion EP 1 – Socially Responsible Financial Investment EL 1 – Airport-Wide Stakeholder Engagement	Percent of vendor, concession, and tenant contracts that include clauses that address sustainability, social, and/or environmental concerns. **Example Supporting Initiatives** • Require that all developers, contractors, and tenants establish a corporate sustainability policy. • Grant concessions to tenants that have the lowest average fleet emissions.	• GRI

APPENDIX F

Potential Work Plan for Phases III and IV

The following work plan was developed by the project team to offer a detailed description of the work and associated level of effort would be needed for Phases III and IV to continue development of the Airport Sustainability Rating System.

Potential Phase III Overview

The third phase of the ACRP Project 02-28 Airport Sustainability Prototype Rating System would take the airport sustainability rating system from a proof-of-concept prototype to a complete draft Airport Sustainability Rating System. This phase would fully detail the full set of sustainability activities, their related performance metrics and actions, and produce an airport User Guide. This phase would also include the recruiting of volunteer airports to participate in a pilot study program that would guide them through the rating system to test and learn about useful functions and to identify improvement areas. Assuming the pilot study finds that the format, functionality, and likely use of the rating system is determined viable, an implementation roadmap would be developed to guide the fourth and final phase of the rating system project.

Phase III would require approximately 24 months. The preliminary cost estimate for Phase III is $725,000 (Table F-1). More detailed descriptions of the Phase III tasks are provided below. Phase III could also be divided into three sub-phases A, B and C, as shown in the table below.

To provide a sense of the overall magnitude of the effort, this document also provides a preliminary discussion of tasks and a fee estimate for a potential Phase IV of the work, which would consist of finalizing the User Guide based on feedback from pilot study participants, developing launch materials, and finalizing an implementation/launch plan (Figure F-1). The preliminary estimate for Phase IV is provided to help inform discussions regarding the full effort associated with finalizing and releasing the rating system.

Potential Phase III Work Plan by Task

Phase III—Part A, User Guidance

Airports need to have a full set of rating system materials before the system can be piloted. Within Part A of Phase III, the draft rating system documentation and support materials would be completed. The activities will be fully detailed as the first task. External experts would contribute their input to establish rating thresholds and points associated for implementing each action or reaching a designated level of performance. Based on the content for the completed airport sustainability activities list and the selected point scoring, a User Guide would be drafted.

The Part A associated tasks are:

Task 1—Finalizing sustainability activities
Task 2—Establishing points and performance thresholds
Task 3—Developing User Guide to support airport pilots

Table F-1. Summary of potential Phase III tasks.

Task	Sub-phase	Task Description	Fee Estimate
Phase III Estimate			
Part A, Complete User Guidance			
Task 1	Prepare Draft User Guide	Finalize the sustainability activities—including performance metrics and actions.	$121,750
Task 2	Prepare Draft User Guide	Establish points, thresholds and rating levels for sustainability activities	$210,000
Task 3	Prepare Draft User Guide	Prepare a draft Rating System User Guide	$130,250
		Subtotal Part A:	**$462,000**
Part B, Pilot Rating System			
Task 4	Pilot Study Draft Rating System	Develop approach for piloting draft rating system	$15,700
Task 5	Pilot Study Draft Rating System	Develop pilot study resources and materials	$56,375
Task 6	Pilot Study Draft Rating System	Conduct pilot study and evaluate results	$105,300
		Subtotal Part B:	**$177,375**
Part C, Develop Roadmap			
Task 7	Develop Roadmap	Develop plan for system launch	$72,625
Task 8	Develop Roadmap	Prepare Phase IV Work Plan	$13,000
		Subtotal Part C:	**$85,625**
		Total Phase III	**$725,000**
Preliminary Phase IV Estimate			
Task 1		Finalize User Guide/Rating System	$150,000
Task 2		Prepare Launch Materials	$100,000
Task 3		Finalize Implementation Plan	$100,000
		Total Phase IV	**$350,000**
Total Phase III and Phase IV			**$1,075,000**

Note: The final Phase IV Cost Estimate may vary depending on the level of comments from the pilot study and decisions regarding launch plan materials.

Task 1: Finalize the Sustainability Activities—Including Performance Metrics and Actions

Purpose: Identify performance measures for all Rating System sustainability activities.

Under this task, the final performance metrics and actions for each of the Sustainability Activities identified in the prototype Rating System would be prepared. Draft performance metrics and samples of actions were prepared under Phase II of ACRP 02 28 and would be used as a starting point for actions and metrics prepared under this task.

Example Performance Metrics and Actions

Performance Metric Example:

Waste Diversion: Percent reduction of solid waste production from a baseline intensity.

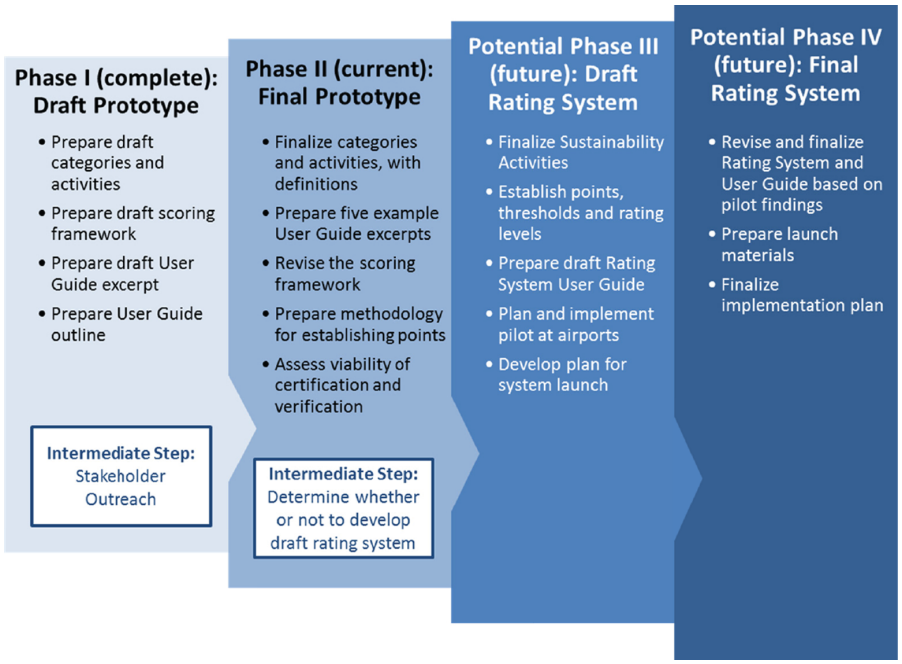
Performance Action Examples:

Climate Change Adaptation:

- Inventory infrastructure and identify critical assets that may be vulnerable to climate change stressors
- Develop a Climate Change Adaptation Plan

1.1 Update Draft Set of Performance Metrics and Actions. This task would begin by reviewing the draft set of performance metrics and actions for each activity to:

1. Identify performance metrics and actions that can be improved or replaced due to advancements in the sustainability field. The sustainability field is constantly advancing and new metrics/actions may become available that were not available when the draft set was prepared.



Source: ICF 2013

Figure F-1. Airport sustainability rating system development phases.

2. Identify activities whose list of actions should be supplemented, revised, or replaced. Under Phase II of ACRP Project 02-28 the research team identified example actions for several activities. These may need to be updated to ensure that the actions adequately address sustainability performance for that activity.

The targeted updates would then be made to the 'Evaluation Matrix'—which was prepared under Phase II of ACRP Project 02-28 and includes the entire set of draft metrics and actions developed to date—to add new metrics and actions from sources such as other rating systems (e.g., Green Globes, Envision, LEED v4), ACRP reports, and sustainability literature.

1.2 Screen New Performance Metrics and Actions. The new metrics and actions would be screened for use in the Draft Rating System using the same primary and secondary evaluation criteria used under Phase II of ACRP Project 02-28, as follows:

Primary Evaluation Criteria:

- Supports airport-wide applicability across infrastructure, operations, and management.
- Accommodates airports of varying type, size, and location.
- Considers performance that would be within the direct control of the airport.
- Provides flexibility so that airports can choose how best to pursue sustainability.
- Supports existing airport activities.
- Recognizes performance to date.
- Facilitates documentation.

Secondary Evaluation Criteria:

- Brand-neutral and technology-agnostic.
- Provides a broad indication of performance across EONS.
- Clearly links sustainability activities, performance metrics, and overall sustainability performance.
- Supports reasonable data management expectations.
- Requires a reasonable level of effort to implement.

These evaluation criteria would be used to ensure that the metrics and actions align with the Rating System design specifications (e.g., support airport-wide sustainability across infrastructure, operations, and management; allow for flexibility in achieving performance across airports of varying sizes, types, and locations; or demonstrate benefits across EONS). For example, evaluating performance based on achieving a targeted level of gallons of water per enplanement is preferred over evaluating performance over a set of actions such as the number of water-conserving fixtures installed.

1.3 Review and Refine List of Performance Metrics and Actions. A full list of metrics and actions for each Sustainability Activity would be prepared, based on the screening in Task 1.2. This list would then be provided to a specially established Review Board (described under Phase III Task 2) who would be responsible for reviewing and commenting on the metric and actions and signing off on the draft Rating System that would form the basis of the pilot study. The performance metrics and actions would then be revised based on the Review Board's feedback and recommendations, and a final set of performance metrics and actions would be prepared for the pilot study.

Once approved, the final set of performance metrics and actions would be included in the User Guide.

1.4 Document Methodology. A brief memorandum that describes how the performance metrics and actions were determined would be prepared.

Task 1 Deliverables:

- Draft and Final performance metrics and actions for all sustainability activities.
- Brief memorandum describing the development process.

Task 2: Establish Points, Thresholds and Rating Levels for Sustainability Activities

Purpose: Establish the number of points available for performance within and across sustainability activities to support establishing a sustainability rating.

2.1 Identify Technical Advisory Groups (TAGs). Under this task, teams of 3 to 5 subject matter experts (SMEs) would be identified for each sustainability category (groups of sustainability activities). The SMEs would form Technical Advisory Groups (TAGs) that would review and approve rating-level points and thresholds by activity. The TAGs and a Review Board would finalize the points and thresholds to include in the pilot study.

The TAGs would assist in the development of the draft Rating System by (1) reviewing and suggesting improvements to the performance metrics developed under Task 1 and (2) reviewing and suggesting improvements to the points and thresholds called for under this task. The TAGs would review the draft set of points and thresholds for all activities within a category. The ground rules for participating in the TAGs would be established, and a series of conversations among the TAGs would be facilitated to receive comments on the points and thresholds, make revisions, and determine the set of thresholds and point totals for the pilot study. Differences of opinion within the TAGs would be resolved to ensure equitable allocations across all activities within a category.

Under this approach, the TAGs would need to consider how to comprehensively evaluate sustainability work across an airport. This is a difficult task to accomplish, as the SMEs would need to consider which sustainability activities, within their category, warrant more weight than others. For example, would Energy Use be weighted more heavily than Labor Relations in the Rating System? These challenges are likely to result in differences of opinion among the SMEs—both within the sustainability category they represent as well as across all categories.

2.2 Convene a Review Board. This approach to use TAGs to refine performance metrics and thresholds also supports the need for a "board-level" group of SMEs or airport industry stakeholders that would review the set of thresholds and points for the pilot study and revise to ensure equitable points distribution across categories. This Review Board could be a separate entity that would make final determinations regarding the total number of points available within any one sustainability category as well as for the system overall.

The Review Board can also perform the critical role of selecting the award level naming convention and individual levels. In Phase II the research team created the following place holder levels for performance, "Take-Off," "Ascend," "Cruise," and "Soar."

Table F-2. Example points performance threshold for a sustainability activity.

Performance Level	Take-Off*	Ascend*	Cruise*	Soar*
Threshold	30%	45%	60%	75%
Points	1	2	3	4

*Naming convention for Performance Levels (e.g., Take-Off, Ascend) to be determined by TAGs and Review Board.

A Review Board would be convened, consisting of approximately five members. The TAGs would be asked to identify a representative from their groups that can participate in conversations with the Review Board to represent their TAG's perspective. The initial set of points and thresholds would be compiled based on the recommendations from the TAGs; particular attention would be given to areas of potential inequity or areas where activities may be under or over represented. A summary report and briefing slides would be submitted to Review Board and TAG representatives, and approximately three meetings would be convened to reconcile any differences and to prepare a final set of points and thresholds. Ultimately the Review Board would be responsible for resolving any differences of opinion and making determinations on the final set of points and thresholds for the pilot study.

Moving forward (once the Rating System is fully launched following Phase IV) the Review Board may become a formalized body that serves to guide and advise on long-term Rating System use and maintenance.

The Review Board would resolve questions related to the scoring framework under this task. As an example, the number of points available for 'innovation' under each category would need to be determined. Final revisions to the scoring framework provided under ACRP Project 02-28 would be made to accommodate the draft set of thresholds and points as well as to accommodate any final changes made to its structure.

2.3 Prepare Preliminary Points and Thresholds. As Table F-2 indicates, performance thresholds are dividing limits between performance levels (e.g., reduce greenhouse gases by 10%, 20%, etc.), while points indicate the value earned by achieving a given performance level. More points are awarded for greater performance. A finite number of points are available for each activity and points are summed across activities to rate performance for a sustainability category as well as for performance across all categories. In Figure F-2, four points are available across the performance levels. Each threshold represents an increasing diversion rate, or the percent of annual solid airport waste diverted from the landfill or incinerator.

Prior to engaging the TAGs, preliminary points and thresholds would be prepared for each Sustainability Activity using subject matter expertise and ground rules and parameters for establishing the rating level thresholds and points. The ground rules would include parameters such as upper and lower bounds for the number of points that can be earned for any one activity, as well as the number of points that can be earned for each threshold (i.e., Level 1, Level 2, Level 3, Level 4). These ground rules and parameters would be rolled up into a qualitative guidance document that would also be provided to the TAGs to inform their review of the rating level thresholds and points. The guidance document would also help the TAGs understand other considerations that come into play when determining points and thresholds. For example, TAGs would need to consider the estimated magnitude of sustainability performance benefit as well as the associated cost and labor requirements needed to implement actions while assigning points.

Figure F-2. Steps to establish set of points and thresholds for the pilot study.

The prototype Rating System contains eight sustainability categories; thus, eight TAGs would be needed—indicating that between 24 and 40 SMEs would need to be identified throughout the airport industry. SMEs can be identified to participate in the TAGs by referencing the stakeholder groups that participated in the Phase I and II components of the project, and from airport industry groups such as the Airports Council International–North America (ACI–NA) Environmental Affairs Committee, American Association of Airport Executives (AAAE) environmental related conferences, Airport Consultants Council, and the ACRP Aviation Environmental Impacts Committee (AV030).

TAG representatives could also provide useful guidance to ensure the Rating System is useful for airports. The TAG groups could help identify how the airport sustainability rating system could complement other existing ratings systems, and which gaps might exist with programs like the US Green Building Council's LEED products and Institute for Sustainable Infrastructure's Envision approach. Part of this task will also include coordinating with airport stakeholder associations to align with industry related initiatives.

2.4 Prepare Checklist for Piloting of Rating System. The set of thresholds and points would be compiled for the pilot study, and a series of checklists prepared that could be used by pilot study airports to determine a sustainability rating at the activity, category and system-wide level.

The draft thresholds and points established under this task would be included in the pilot study under Task 7. Feedback received would be summarized and recommendations made for finalizing the thresholds and points, prior to the launch of the pilot study.

Task 2 Deliverables:

- Preliminary set of thresholds and points for TAG review.
- Guidance for establishing thresholds and points.
- List of TAG members.
- List of review board members.
- Meeting notes for facilitated conversations with TAGs and review board.
- Draft set of thresholds and points for review board review (compiled based on TAG recommendations).
- Memorandum and slide deck identifying potential issues with initial threshold and point allocation.
- Set of draft points and thresholds by sustainability activity for pilot study.
- Checklists containing points and thresholds for use by pilot study airports.

Task 3: Prepare a Draft Rating System User Guide

Purpose: Complete the remaining Rating System activities and User Guide for Rating System participants.

Task 3 would consist of preparing a draft Rating System User Guide. To do so, each chapter contained in the User Guide Annotated Outline prepared under Phase II would be expanded. These chapters are as follows:

- **Introduction**—addresses items such as the Rating System Purpose, EONS and Sustainability, and the Benefits of Pursuing Sustainability.
- **Rating System Structure**—provides the reader with an introduction and overview of the system by describing the Rating System components, their purpose, and how they relate to each other to form a functional rating system.
- **Rating System Use**—provides the user with instructions for using the Rating System—including detailed overviews of each Sustainability Activity, instructions for how to establish a rating, and how and when to reevaluate sustainability progress and update the rating.
- **Appendices**—provides additional information that is applicable, but not necessary for the body of the User Guide.

In addition to the overview material included in the Introduction and Rating System Structure chapters, the Rating System Use chapter would include extensive descriptions for each Sustainability Activity (see Figure F-3). Five examples of these—termed "User Guide Excerpts"—were prepared under Phase II. An additional 45 activity descriptions would be prepared under this task. The descriptions would present information such as the Sustainability Activity's purpose, definition, performance metrics and actions, and recommended activities for improving performance. The "Activity Definitions" prepared under Phase II and the performance metrics, points and thresholds prepared under Tasks 2 and 3 would provide much of the draft content needed to prepare this information.

Waste & Water

Waste Diversion

WW 3	Level	Take Off	Ascend	Cruise	Soar
	Points	1	2	3	4

SAMPLE

METRIC:

Percent of total annual waste diverted from the landfill or incinerator through recycling, reuse, refurbishing, selling, donating, and composting.

PURPOSE

Waste Diversion optimizes the use of airport materials beyond their first functional lifespan by avoiding landfilling and incineration.

DEFINITION

Waste diversion is defined as the percent of total annual solid waste redirected from the landfill or incinerator through recycling, reuse, refurbishment, sale, donation, composting, or other means. This Activity is concerned with non-hazardous, municipal solid waste at airports, which includes, but is not limited to, mixed paper and cardboard, food scraps, kitchen grease, metals, glass, plastics, landscape waste, wood, tires, appliances, batteries, recordable media, and electronics.

The Activity considers all waste sources where the airport is responsible for disposal, to include, but not limited to, terminals, administrative offices, airfields, maintenance hangars, cargo hangars, and aircraft flight kitchens (if disposal of deplaned waste is the responsibility of the airport).

Handling of construction and demolition, aircraft lavatory, or chemical wastes are covered under activities within the Design & Materials and Human Well-Being Sustainability Categories. The Activity does not include waste with regulated or special disposal requirements, such as international deplaned waste, deicing fluids, or hazardous waste.

RELATED ACTIVITIES

- WW 2 – Waste Reduction
- DM 3 – Construction Waste Diversion
- HW 4 – Chemicals & Hazardous Materials

PERFORMANCE LEVELS

Four points are available across the performance levels. Each threshold represents an increasing diversion rate, or the percent of annual solid airport waste diverted from the landfill or incinerator.

Performance Level	Take Off	Ascend	Cruise	Soar
Threshold	30%	45%	60%	75%
Points	1	2	3	4

SAMPLE

See the Documentation section to determine how to calculate the diversion rate.

1

PERFORMANCE RECOMMENDATIONS

The table below includes recommended actions from across airport infrastructure, operations, and management that can assist in improving waste diversion and achieving higher performance thresholds. The list is suggestive and not exhaustive, and airports have the flexibility to determine how they will achieve performance through these activities and others.

Infrastructure	Operations	Management
✈ Increase the availability of collection bins for the sorting of waste – landfill, paper, recyclables, and compost – in all areas with human presence, including terminals, office space, airfield maintenance hangers, cargo hangars, etc. ✈ Install proper signage to inform customers about waste sorting. ✈ Co-locate recycling receptacles with trash receptacles. ✈ Identify collection and staging areas for useable materials available for reuse, sale, or donation.	✈ Incorporate waste diversion in all levels of employee training. ✈ Maintain a waste reduction, reuse, and recycling program for durable goods, including office equipment, appliances, audiovisual equipment, and furniture. ✈ Implement an inventory system to facilitate the reuse or redistribution of chemicals, cleaning supplies, paint, or other supplies. ✈ Identify and procure supplies suitable for composting. ✈ Work with a local non-profit or government agency to facilitate the reuse of furniture, office supplies, and other materials. ✈ Work with vendor to create an electronics reuse program that can generate revenue for airport and extend life of computers, monitors and related equipment. ✈ Conduct a waste audit to determine percentage of potentially recyclable waste is going to landfill/incinerator.	✈ Explore, implement, and expand recycling and composting pick-up options with local waste management vendors. ✈ Work with the waste hauler or service provider to collect and analyze information on the amounts and types of waste generated to understand better waste production patterns. ✈ Establish a Waste Diversion Plan to outline airport-wide goals and strategies. ✈ Analyze the economic benefits on the local community—in terms of employment, sales, and tax revenue—due to increased recycling when assessing various waste diversion options. ✈ Negotiate with waste disposal contractors and tenants with the aim of encouraging recovery of separated waste materials by having cost reflect the degree of separation at the tenant source.

2

DOCUMENTATION

Tracking waste diversion requires regular audits to assess the waste stream across the airport. It is important to capture as many disposal means as possible, including the landfill, incinerator, recycling, reuse, refurbishment, donation, resale, and composting.

The following calculation should be used to determine the percent of total annual waste diverted from the landfill or incinerator through alternative disposal methods

$$Percent\ of\ Total\ Annual\ Waste\ Diverted = \frac{A}{B} x\ 100$$

Where:

A = Total amount of waste diverted (tons) in the performance year—most recent year for which data are available.

$$Recycling + Resue + Refurbishment + Resale + Donation + Composting$$

B = Total waste generation (tons) in the performance year—most recent year for which data are available.

$$Landfill + Incinerator + Recycling + Resue + Refurbishment + Resale + Donation + Composting$$

The following weight data in tons is required for the performance year:

- ❑ Materials sent to landfill
- ❑ Materials incinerated
- ❑ Materials recycled
- ❑ Materials reused
- ❑ Materials refurbished
- ❑ Materials resold
- ❑ Materials donated
- ❑ Materials composted

Volume measurements can be converted to weight using the conversion factors provided in the Appendix.

Additional documentation should be collected for internal and external verification, if applicable, including:

- ❑ A summary narrative outlining the types of waste and volumes diverted.
- ❑ A brief description of the factors that contributed to the diversion rate (e.g., programs, policies, etc.)
- ❑ Copies of contract with vendor or other documentation of collection service.

References that may assist in documenting, measuring, or estimating waste diversion include:

- ✈ U.S. EPA's guide to Developing and Implement and Airport Recycling Program: http://www.epa.gov/wastes/conserve/tools/rogo/documents/airport-recycling-guide.pdf.
- ✈ FAA Synthesis Document on Recycling, Reuse, and Waste Reduction at Airports: http://www.faa.gov/airports/resources/publications/reports/environmental/media/RecyclingSynthesis2013.pdf

3

FINANCIAL CONSIDERATIONS

Airports should take a holistic approach when assessing the financial viability of waste management options for improving performance under the Waste Diversion Activity. The higher costs of one component of an integrated waste management system, such as recordable media (e.g. CD-ROMs and diskettes) recycling, can be offset by another component, such as cardboard and paper recycling, resulting in overall cost savings and a higher diversion rate. In addition, airports should consider the indirect economic benefits of Waste Diversion, as recycling waste may yield a greater economic benefit than landfilling it. Local sorting and sales of the constituent materials can contribute more than landfilling/incinerating waste at a distant off-site location, thus supporting local employment, manufacturing, and tax revenues.

Airports can calculate the economic costs and benefits associated with integrated waste management by obtaining individual municipal solid waste (MSW) waste-stream costs when there are separate rates. For example, recycling mixed paper material generally costs less than standard waste hauling fees and in some circumstances can actually produce revenue. Third party electronic support service firms often pay for usable equipment that may no longer be useful to an airport. Recycling other types of waste (e.g. co-mingled glass, plastic, and metals) may cost more than standard landfill or incinerator rates. Waste streams recycling and reuse cost savings can offset the cost premiums associated with other types of recycling services.

Example Table to Demonstrate Concept

Waste Stream	Est. Annual Cost	Est. Annual Revenue
Mixed Paper	$ #,###	$ #,###
Electronics	$ #,###	$ #,###

SAMPLE

It may be necessary to modify existing custodial service contracts or make special arrangements to obtain waste stream data. Metrics should be aligned so that waste is measured by either weight (e.g., tonnage) or volume (e.g., cubic yards). The financial considerations associated with integrated waste management necessitate detailed analysis of comprehensive waste material data than limiting review to just the overall airport recycling rates.

4

Figure F-3. Example User Guide excerpt.

The activity descriptions would also include instructions for documenting the steps airports should take to pursue the Sustainability Activity in a manner that is sufficient to support certification and verification as well as recommend relevant financial considerations and necessary resources. Calculations/algorithms needed to determine the performance metric would also be added where appropriate. As an example, airports would need uniform methodologies for estimating water conservation or greenhouse gases. The User Guide would provide these methodologies where reasonable and would point to broader guidance documents and tools where appropriate. For example, ACI's Airport Carbon and Emissions Reporting Tool (ACERT) could be used or the team may recommend using a model based on guidance from ACRP Guidebook on Preparing Greenhouse Gas Emission Inventories (Report 11).

The draft performance metrics and actions prepared under Task 1 as well as the draft thresholds and points developed under Task 2 would be included in the User Guide, together with guidance on how to use the Rating System to establish a rating.

3.1 Prepare Draft User Guide. A formatted draft User Guide would be prepared and sent to the pilot study participants under Task 7. The draft User Guide is likely to be a 150 to 200 page document (excluding appendices).

3.2 Prepare Final User Guide. The User Guide would be revised based on feedback received and a draft Final User Guide provided for airports that participate in the pilot study effort.

3.3 Prepare Interim Report. The work to date would be summarized in an interim report for review prior to initiating the pilot study.

Task 3 Deliverables:

- Draft User Guide for review.
- Draft Final User Guide.
- Interim Report of progress to date.

Phase III—Part B, Pilot Rating System

Piloting the draft rating system is essential to test it at actual airports and learn what works and what needs to be improved. During the Phase III Part B the research team will identify the ideal representation among airports, develop supporting materials for use during the pilot, and remotely facilitate the actual pilot process with participating sites. After the pilots have been conducted the lessons learned will be summarized in a report.

The Part B associated tasks are:

- Task 4—Develop an approach to pilot the rating system.
- Task 5—Develop pilot support resources and materials.
- Task 6—Conduct the pilots and evaluate results.

Task 4: Develop Approach for Piloting Draft Rating System

Purpose: Produce a method to identify and recruit representative group of airports.

4.1 Establish Recruitment Criteria for Pilot Study Airport. Prior to piloting the draft Rating System, defining airport characteristics would be defined to establish recruitment criteria for pilot study airports. The criteria are necessary to ensure coverage across a broad range of airports. These criteria would include size, region, and operation parameters to promote diversity within the pilot.

4.2 Select Pilot Study Airport Participants. A broad set of criteria would be identified for airport characteristics to include in the pilot airport candidates based on the parameters established in Task 4.1, in addition to a proposed method for recruiting them. Airport candidates may be identified and recruited based on existing sustainability progress, engagement with environmental affairs committees, conference participation, or receipt of sustainable grants, among others. Interest would be solicited among the airport community by reaching out to the list of stakeholders that were contacted in Phase 1 of ACRP Project 02-28. Interested airports will then be screened according to the established criteria.

During this phase, the pilot study airports would determine the scope of the rating they would prepare (e.g., preparing a rating for select sustainability activities, a full category, or a full rating for the entire airport). Pilot study participants would try to ensure that, collectively, the airports test a majority of the activities within the rating system. A proposed participant list (5–10 airports) and proposed evaluation process would be provided prior to executing the Pilot under Task 7.

4.3 Prepare a Pilot Study Implementation Approach. An implementation approach would be prepared that presents a timeline for completing the pilot study—including kickoff, training schedule, support call schedule, milestones for submitting draft ratings and associated materials, and deadline for airports to complete ratings.

Task 4 Deliverables:

- Pilot study participant list.
- Implementation approach.

Task 5: Develop Pilot Study Resources and Materials

Purpose: Produce the supporting materials for airport pilot study participants.

Under this task, the resources and materials needed to execute the pilot study would be prepared. Supporting materials would include:

- Webinar training materials (e.g., slide deck).
- A quick start guide that provides brief instructions for using the Rating System (a.k.a., User Guide lite).
- A User Guide (developed under Task 3).
- Frequently Asked Questions (FAQs).
- A brief instructional video for using the Rating System.
- Rating System checklists (developed under Task 2).
- A Rating System website that provides general information regarding the Rating System to raise awareness among pilot study participants and other interested parties.
- A promotional brochure to raise awareness about the Rating System.

Materials would be prepared and released to the pilot study participants.

Task 5 Deliverables:

- Webinar slide deck.
- Quick Start Guide.
- FAQs.
- Instructional video.
- Rating System checklist.
- Rating System website.
- Promotional brochure.

Task 6: Conduct Pilot Study and Evaluate Results

Purpose: Receive feedback from airports on Rating System effectiveness.

This task involves conducting a pilot study of the Rating System at the participant airports identified under Task 5. The pilot task would last for 6 months to allow for sufficient time to implement at the selected airport participant sites. Airport pilot teams would hold web meetings, regularly scheduled phone meetings, and a final survey/phone-debrief upon completion of the pilot.

6.1 Provide Materials and Information to Support Pilot Study Airports. At the beginning of the pilot study, relevant resources and materials developed under Task 6 would be provided to the pilot study airports and remote kickoff meetings would be held. Individual kickoff meetings would be held with pilot airports (remotely) and a an overview of the Rating System provided. The kick-off meetings with participating airports would cover the pilot study materials, the timeline and milestones of the pilot study, and the process for collecting feedback.

6.2 Conduct Training Sessions and Ongoing Support to Pilot Study Airports. Additionally, approximately three training sessions would be held to train pilot study participants on the use of the Rating System. The training sessions would be recorded to serve as a reference for pilot study participants. Weekly to monthly support calls would be held to assist pilot study airports and an email address provided for receiving and responding to questions from pilot airports.

6.3 Collect Rating System Feedback from Pilot Study Airports. A brief survey would be prepared and interviews conducted at the end of the pilot study to collect feedback and determine the associated challenges with the new system, as well as the successes.

A report would be prepared to summarize the feedback received from the participant airports as well as other findings and that makes recommendations for revising the Rating system before general release.

Task 6 Deliverables:

- Training materials.
- Pilot study summary report.

Phase III—Part C, Develop Roadmap

A well-conceived plan is critical to a successful launch. Phase III, Part C is focused on developing the road map for the system launch and detailing the work plan of Phase IV. The research team will complete the preparation for transition to a fully operational rating system after Phase III.

The Part C associated tasks are:

- Task 7—Develop plan for system launch.
- Task 8—Prepare Phase IV work plan for launch.

Task 7: Develop Plan for System Launch

Purpose: Prepare for broad airport sustainability rating system launch.

A launch plan would be developed for the Rating System to function as a fully operational system. The plan would include an implementation road map that discusses both the internal, administrative components and the external, promotion priorities. The roadmap would be preliminary as it would be limited to the anticipated needs in the first two years of operation, and focus on how to ramp up to a "stable" operational scale that shifts from raising awareness and encouraging use to maintaining the system.

The roadmap would include a timeline of tasks to accomplish within the first two years of implementation. Tasks would include a long-term staffing strategy, a detailed budget, funding strategies, a communication approach, rating system update administrative and functional requirements, and a capabilities assessment, among other items. The assessment would detail the requirements for an organization that has oversight duties of the rating system, including necessary functions and responsibilities. The assessment will identify the level of effort and personnel recommendations, including possible volunteer contributions, associated with the oversight organization (maintaining official volunteer advisory groups will help to leverage valuable SME knowledge and provide contributions on an on-going basis).

The implementation roadmap would include:

- A launch schedule with priority startup tasks.
- A recommended process for reevaluating and updating metrics and actions at regular intervals as necessary and as the state of the sustainability field changes.
- A communication strategy that identifies target audiences, engagement approaches (e.g., using social media), communication materials, and a timeline for attending conferences and other forums to raise awareness of the Rating System.
- A recommended training strategy that describes training content and approach.
- A detailed description of necessary resources and materials needed to launch the Rating System such as the final User Guide, website, checklists and an On-line Rating Tool.
- A potential rewards and recognition program that recognizes Rating System use and sustainability performance.
- A methodology for receiving and responding to feedback.

The draft implementation roadmap (approximately 25 to 50 pages) would be provided as part of a Final Report and would respond to one round of comments prior to delivering a Final Report.

Task 7 Deliverables:

- Draft implementation roadmap.
- Final implementation roadmap.
- Final Report.

Task 8: Prepare Phase IV Work Plan

In this task a detailed work plan would be prepared for Phase IV of the work. Presently Phase III is proposed to conclude with receiving feedback from the pilot study participants and compiling the information into recommendations for finalizing the rating system. Additionally, Task 7 under Phase III would prepare a launch plan for rolling the rating system out for wider use by the airport community.

The proposed Phase IV would consist of making any revisions to the rating system to prepare it for launch and finalizing the game plan or roadmap for launching the rating system by developing launch materials, identifying a host organization, etc.

Based on the above information, Phase IV is likely to include the following steps:

- Finalize the User Guide based on feedback from the pilot study.
- Develop the launch materials proposed under Task 7.
- Revise and finalize the implementation roadmap prepared under Task 7.

Although it is premature to predict the costs of a potential Phase IV (which are likely to vary based on the amount/detail of feedback received during the pilot study and associated revisions), a preliminary estimate of costs for Phase IV as described in this document would be approximately $350,000.

This estimate includes development of an on-line rating system that airports could use to determine a rating. The on-line rating system could take different forms, such as:

Option (1) At a minimum, the On-Line Rating System tool would replace the checklists provided under the pilot study and would have locations for the user to enter their performance level within each activity. The tool would sum points earned across all activities to provide a rating at the category and system levels.

Option (2) A more robust On-Line Rating System would accept data inputs from the airports that could be used to calculate values for performance metrics within each sustainability activity. As an example, airports could enter total terminal building energy consumption as well as total terminal building square footage to calculate their terminal building energy intensity for a current and base year. The On-Line Rating System would use these data to calculate energy intensity performance relative to the base year, which would be used to establish a rating level for the Terminal Building Energy Use sustainability activity.

The preliminary cost estimates given for Phase IV assume that the on-line rating system would follow option 1. Revised cost estimates would be prepared as part of the Phase IV work plan (prepared under the proposed Phase III, Task 8) and based on the outcome of Phase III.

Task 8 Deliverables:

- Phase IV work plan.

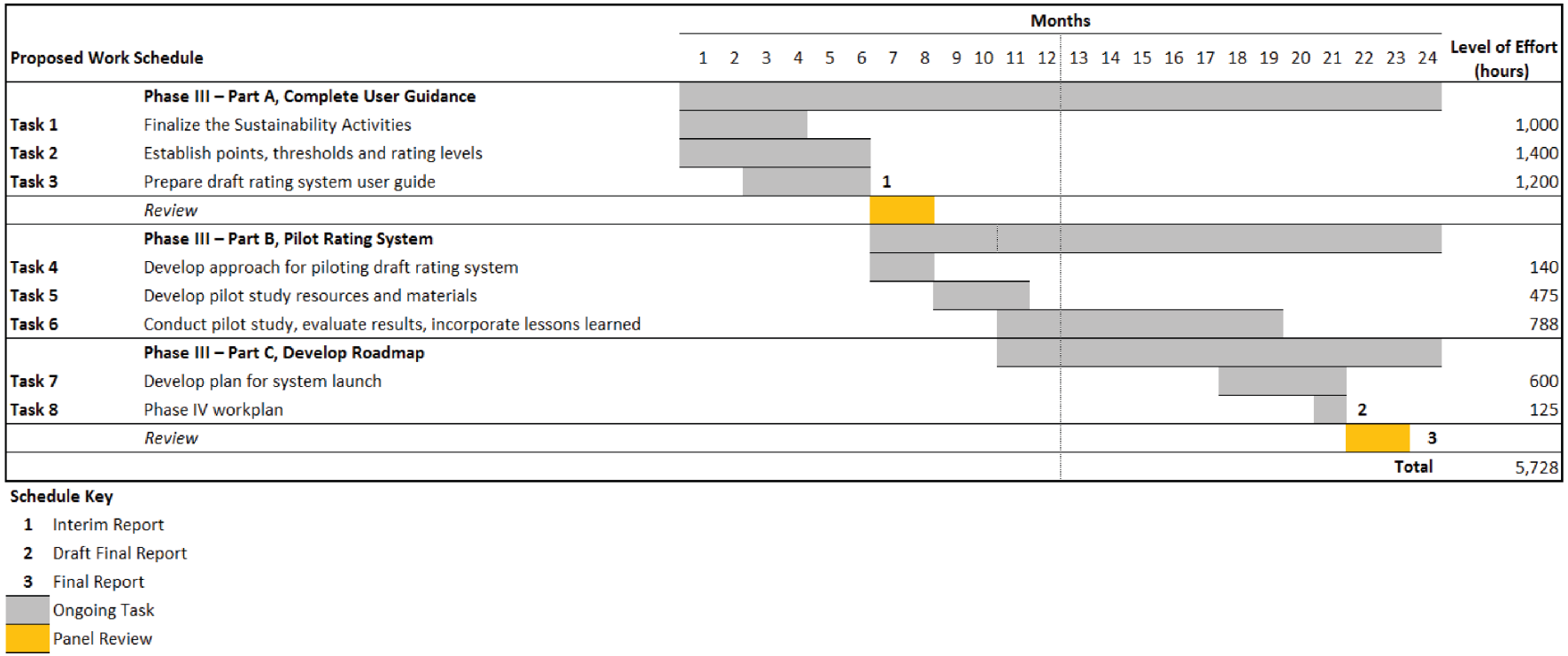
Potential Phase III Schedule and Fee

The estimated fees (Table F-3) and schedule (Figure F-4) on the following pages are provided for rough planning purposes only. The schedule includes two panel review periods and an aggressive, 8-month airport pilot study duration. Estimated labor hours are approximate.

Table F-3. Potential Phase III fee estimate.

Task	Sub-phase	Task Description	Fee Estimate
Phase III Estimate			
Part A, Complete User Guidance			
Task 1	Prepare Draft User Guide	Finalize the sustainability activities—including performance metrics and actions.	$121,750
Task 2	Prepare Draft User Guide	Establish points, thresholds and rating levels for sustainability activities	$210,000
Task 3	Prepare Draft User Guide	Prepare a draft Rating System User Guide	$130,250
		Subtotal Part A:	**$462,000**
Part B, Pilot Rating System			
Task 4	Pilot Study Draft Rating System	Develop approach for piloting draft rating system	$15,700
Task 5	Pilot Study Draft Rating System	Develop pilot study resources and materials	$56,375
Task 6	Pilot Study Draft Rating System	Conduct pilot study and evaluate results	$105,300
		Subtotal Part B:	**$177,375**
Part C, Develop Roadmap			
Task 7	Develop Roadmap	Develop plan for system launch	$72,625
Task 8	Develop Roadmap	Prepare Phase IV Work Plan	$13,000
		Subtotal Part C:	**85,625**
		Total Phase III	**$725,000**
Preliminary Phase IV Estimate			
Task 1		Finalize User Guide/Rating System	$150,000
Task 2		Prepare Launch Materials	$100,000
Task 3		Finalize Implementation Plan	$100,000
		Total Phase IV	**$350,000**
Total Phase III and Phase IV			**$1,075,000**

Note: The final Phase IV cost estimate could vary depending on the level of comments received from the pilot study and decisions regarding launch plan materials.



Proposed Work Schedule		Level of Effort (hours)
	Phase III – Part A, Complete User Guidance	
Task 1	Finalize the Sustainability Activities	1,000
Task 2	Establish points, thresholds and rating levels	1,400
Task 3	Prepare draft rating system user guide	1,200
	Review	
	Phase III – Part B, Pilot Rating System	
Task 4	Develop approach for piloting draft rating system	140
Task 5	Develop pilot study resources and materials	475
Task 6	Conduct pilot study, evaluate results, incorporate lessons learned	788
	Phase III – Part C, Develop Roadmap	
Task 7	Develop plan for system launch	600
Task 8	Phase IV workplan	125
	Review	
	Total	5,728

Schedule Key

1 Interim Report
2 Draft Final Report
3 Final Report
Ongoing Task
Panel Review

Figure F-4. Potential Phase III work schedule.

APPENDIX G

Airport Sustainability Best Practices

The following presents the 937 airport sustainability best practices included in the SAGA database that was refined as part of ACRP Project 02-30, "Enhancing the Airport-Industry SAGA Website." The following list is organized by the original SAGA categories. In the refined SAGA database, these practices will be associated with the Sustainability Categories defined by the Prototype Airport Sustainability Rating System.

Administrative

- Policies, Procedures, and Plans
  - Create and follow a sustainable vision/mission statement.
  - Require that all developers, contractors, and tenants have and follow a corporate sustainability policy.
  - Develop or adopt sustainability guidelines and metrics.
  - Brand, track, certify, manage, and market sustainable initiatives using an airport-specific sustainability logo (i.e., place on green vehicles, recycling bins, and other airport signage).
  - Develop or adopt a sustainability project rating and award recognition program.
  - Develop a sustainability recognition program for airport business partners.
  - Use standardized tracking forms and guidelines to document all sustainable construction activities.
  - Tie contractor/vendor sustainability submittals and documentation of sustainable practices to payments (e.g., tie construction contractor green equipment and fuel use logs to monthly payments).
  - Require regular sustainability progress reports at several stages throughout the design and construction process at project start-up, interim milestones, project substantial completion, and close-out.
  - Develop and implement an Environmental Management System (EMS) to track progress in improving environmental performance.
  - Develop and follow a Sustainable Management Plan or Sustainable Airport Master Plan.
  - Tie sustainability goals and objectives into the operations and maintenance and capital improvement program budget process to ensure that life cycle costs, impacts on other divisions, and specific sustainability goals for projects are addressed.
  - Include a sustainability training requirement in all bid documents.
  - Integrate sustainability language and requirements into airport contracts.
  - Clearly define sustainable design goals in requests for qualifications (RFQs), requests for proposals (RFPs), and bid review criteria.
  - Include sustainable practices in the airport's Minimum Operating Standards.
  - Urge state and local legislative authorities to adopt laws that support sustainability and remove barriers to sustainability practices.
  - Apply for national, state, and local grants to support the implementation of sustainable practices.
  - Support the development of alternative fuels for aircraft.
  - Maintain regular discourse with federal, state and local air management agencies to be aware of plans and timelines affecting the airport, including State Implementation Plan development and air emissions inventories.

  - Pursue U.S. Green Building Council LEED (Leadership in Energy and Environmental Design) Certification or equivalent (e.g., BREEAM, DGNB, GreenStar, etc.).
  - Require a U.S. Green Building Council LEED (Leadership in Energy and Environmental Design) or equivalent building standard and green operating commitment from non-airport controlled buildings that are on airport-controlled land, such as hotels and restaurants.
  - Use the Envision™ rating system to assess the sustainability performance of airport infrastructure projects and development programs.
  - Adopt the Global Reporting Initiative's Sustainability Reporting Framework, following their Airport Operations Sector Supplement.
  - Publish an internal and external airport-wide sustainability report.
  - Develop a communication plan to report on sustainability performance that includes social media posts, website information, commercial advertisement in the terminals, stakeholder presentations, etc.
  - Develop and implement an air quality improvement program.
  - Prepare an airport-wide greenhouse gas emissions inventory.
  - Conduct an emissions inventory for all projected construction activities.
  - Develop and implement an Asset or Infrastructure Management Plan.
  - Develop and implement a Pavement Management Plan.
  - Perform a pre-NEPA (National Environmental Policy Act) analysis of environmental resource categories as part of planning efforts.
  - Develop a Cultural Resources Management Plan (CRMP) to guide the treatment and identification of cultural resources.
  - Develop an Unanticipated Discovery Plan that establishes a response framework for the environmental manager in the event unanticipated finds are discovered.
  - Complete a U.S. Environmental Protection Agency Pollution Prevention Opportunity Assessment.
  - Develop and implement a Risk Management System according to International Organization for Standardization (ISO) 31000 *Risk Management—Principles and Guidelines.*
  - Use the "Total Cost Assessment" (TCA) tool to incorporate the costs and savings associated with environmental considerations as a key part of business decisions.
  - Develop a rolling (e.g., 15-year) capital expenditures (CAPEX) Roadmap that shows the annual capital demand for all capital development projects.
  - Establish a sustainability budget to fund sustainability projects.
- Sustainability Meetings, Teams, and Presentations
  - Establish a sustainability oversight committee or "Green Team" to guide, direct, and evaluate the integration of sustainability practices.
  - Create a "sustainability manager" position and/or an "office of sustainability."
  - Establish a sustainability liaison to the airport sponsor for all design, construction, operations, maintenance, and tenant activities.
  - Develop a sustainable review panel that includes designers, engineers, construction managers, and contractors to facilitate submittals and review documentation.
  - Establish a regular meeting schedule to discuss sustainability progress with construction and maintenance contractors, tenants, airlines, local regulators, and/or national civil aviation administration and national environmental protection agency representatives.
  - Plan for annual meetings at times of the year when temperatures are less extreme to reduce energy consumption due to the use of air conditioning/heat.
  - Post sustainable meeting best practices in meeting rooms and on internet and intranet sites.
  - Integrate various airport departments and functions to promote sustainability goals, including planning and design, operations and maintenance, procurement, real estate, and legal.
  - Utilize electronic visual aids instead of paper where appropriate to facilitate discussion in sustainability meetings.
  - Use zero-emission or low-emitting materials for exhibit displays.
  - Reuse display boards; utilize both front and back sides.
  - Conduct meetings outdoors when appropriate to take advantage of natural light and fresh air.
  - Create an electronic library/central depository for viewing project information to reduce paperwork.

  - Create an "environmental handbook for tenants" that includes emergency contact numbers, policies, reporting requirements, spill response, procedures for handling international waste and managing and disposing wastes such as fluorescent bulbs, etc.
  - Assign team members to obtain a U.S. Green Building Council LEED professional credential (e.g., LEED Accredited Professional (AP) with specialty or LEED Green Associate) or similar credential.
  - Encourage construction field personnel, project architects and engineers, contractors, project supervisors, and trades people to achieve American National Standards Institute accredited Green Advantage Certified Practitioner (GACP) Certification.
  - Provide training opportunities for U.S. Green Building Council LEED Accredited Professionals and American Institute of Architects (AIA) professionals to obtain continuing education hours.
  - Assign a U.S. Green Building Council LEED Accredited Professional (AP) to review sustainable concepts and practices with project team members including green building planning, design, construction, operations, and maintenance.
- Community Outreach
  - Sponsor local community projects that showcase sustainability efforts such as recycling days and tree plantings.
  - Develop working relationships/partnerships with community groups; community leadership; local businesses; and local, regional, and/or national environmental organizations.
  - Solicit feedback on a particular project from local community leaders.
  - Issue a newsletter to local residents, businesses, libraries, and the city hall that discusses construction progress, airport updates, events, facts, and/or other information.
  - Provide airport internships in administrative and technical areas (e.g., business administration, information technology (IT), car mechanic, electrician, landscaping, etc.), focusing on low-income and diverse populations.
  - Provide a "help desk"/"welcome center" information table where volunteers help answer questions, provide assistance with lost luggage, offer brochures of local attractions, pass out freebies, showcase the city, discuss sustainable practices, and provide a friendly welcome.
  - Arrange for space in public and private (i.e., tenant) areas for sustainability displays and awareness training.
  - Create an interactive multimedia display (e.g., website or kiosk) that would engage and educate visitors about the sustainable aspects of completed projects and/or airport operations.
  - Create short, easy to understand video-clips that explain various elements of airport operations and sustainability for display in terminals and/or on the internet ("Airport-TV").
  - Provide construction information kiosks at the airport.
  - Coordinate with local schools to arrange for field trips or educational presentations on airport and aviation-related issues.
  - Provide narrated tours of the airport to demonstrate sustainability achievements and specific installations (e.g., solar panels).
  - Develop and provide free, internet accessible learning material and tutorials for public schools on the topics of aviation and environment/sustainability.
  - Participate in a mentorship program with a local school where airport employees build special connections with students by reading, playing games, and sharing experiences in a supportive learning environment.
  - Partner with local conservation groups to restore native habitat.
  - Host a seminar open to the community and/or other stakeholders that provides education on the airport, aviation, and sustainability-related topics (separate from the required public hearing).
  - Develop a "Speaker's Bureau" where airport representatives report the airport's sustainability accomplishments to local communities and determine points of collaboration for future practices.
  - Serve as a guest lecturer at a university, speaking to students and faculty (live or via teleconference) about airport sustainability initiatives.
  - Partner with universities and research centers to evaluate, demonstrate, and commercialize new airport sustainability practices.
  - Administer and/or contribute to a scholarship fund that supports education, sustainability, and aviation.
  - Distribute press releases regarding specific airport projects and sustainability accomplishments.
  - Work with municipalities to prevent incompatible land uses.
  - Provide transportation to public meetings.
  - Ensure that public meetings are at varied times (day/evening) and at varied locations.
  - Provide child care during public meetings.

  - Provide a foreign language translator, a sign language translator, and/or equipment for handicapped/disadvantaged attendees during land acquisition processes, public meetings, and similar events.
  - Hold press conferences and issue press releases in conjunction with construction changes and milestones.
  - Indicate sustainability goals in all interactions with the public for all design and construction projects.
  - Produce training materials, flyers, and press releases in languages other than English that will reach local minority or ethnic groups in the community.
  - Develop and implement a 'Periodicals for Education' program, collecting magazines, newspapers, and books from international passengers and donating them to educational facilities that teach foreign languages, senior centers, nonprofit organizations, and/or military organizations.
  - Donate airplane passenger headphones, blankets and pillows to homeless shelters and/or charity organizations.
  - Provide the public with live data on the performance of airport alternative renewable energy systems.
  - Partner with community leaders to provide incentives and/or establish foreign trade zones that would attract new clean businesses and educational institutions to the community.
  - Offer a free roadway advertisement/sponsorship, or a reduced advertisement fee, for tenants or community groups who clean up an airport roadway environment.
  - Coordinate informal meetings with the mayors of neighboring cities to discuss airport projects, sustainability, and other general information.
  - Detail current and anticipated sustainability practices on airport and local municipality websites and provide an opportunity for community input.
  - Provide job experience and income by operating an on-airport apiary (beehives) to sell honey and honey-based products.
  - Use a community volunteer "airport rangers" equestrian program and/or "airport watch" aircraft plane spotting program to monitor suspicious activity, perimeter fencing, wildlife activity, and foreign object debris (FOD).
  - Establish an archery-only deer hunting program on airport property.
  - Schedule mobile food trucks to provide service in the cell phone waiting lot.
  - Provide designated public observation and photographer locations around the airport with a view to air traffic ("plane spotter locations").
  - Host a "Relay for Life" or other walking event inside the terminal (during off-peak hours) to raise funds for a charity.
  - Establish an honor flight program with an airline where veterans are paid tribute to inside the airport and fly to a national memorial free of charge.
  - Organize an "Airport Experience for Autistic Children and Adults" where people with autism can practice entering the airport, obtaining boarding passes, checking bags, being screened at the security checkpoint, boarding the aircraft, and sitting on an aircraft in preparation for a future flight.
  - Start an "Airport Explorers" program with local schools and children's groups, such as the Boy and Girl Scouts, to allow children to explore airplane related jobs and functions.
  - Establish a social organization of airport partners (i.e., an "Airport Managers Association") for communicating, networking, and recreational outings that includes managers from the airlines, Transportation Security Administration, concessions, Customs and Border Protection, and the airport authority.
  - Sign a "Sister Airport" agreement with another airport outside the country to formalize a commitment to work collaboratively to strengthen air service, trade, tourism and cultural links.
  - Send holiday care packages/goodies to airport staff serving military duty.
  - Host an international airport delegation, providing a tour of airport facilities, briefings on construction projects and sustainability practices, and technical discussions on planning, engineering and construction.
  - Deliver gifts and goodie baskets to local families who need assistance and support during the holiday season (e.g., children's educational toys, games, blankets, bicycles and gift cards).
  - Host an airplane pull/tug-of-war competition to raise money for charity.
  - Use social media to promote the airport and its sustainability accomplishments, issue alerts, travel tips, traffic information, weather updates, flight cancellations, etc.
  - Create an airport float made of recycled materials for use in parades to promote teamwork, community, and resource conservation.
- Human Resources
  - Recruit and train members of minority and women-owned businesses.
  - Link achievement of the organization's sustainability goals to performance reviews of key personnel.

  - Include sustainability responsibilities in job descriptions.
  - Include educational training on sustainability in periodic employee meetings.
  - Provide training on the airport's sustainable planning, design and construction guidelines, including their basis, the parties responsible for using the guidelines, and the sustainable rating system.
  - Incorporate objectives of Americans with Disabilities Act compliance and the accommodation of persons with special needs in the project planning phase so that any additional costs can be properly managed.
  - Provide sustainability awareness training programs, presentations, and/or meetings for employees, consultants, tenants, and contractors.
  - Conduct frequent employee performance reviews to ensure alignment of labor practice goals with business strategy.
  - Conduct periodic employee satisfaction and engagement surveys (anonymous) on topics like work and job challenges, work-life-balance, workplace health, etc.
  - Develop an employee retention and development plan consistent with the overall organizational goals.
  - Establish team-specific goals and objectives that support the airport's overall goals in an effort to keep employees engaged and committed.
  - Recognize employees for their achievements and outstanding performances through an award and recognition program that may include luncheons, team outings, and gift cards.
  - Measure and communicate changes in absenteeism of affected employees.
  - Measure and communicate user satisfaction with airport facilities.
  - Install "green" suggestion boxes to obtain airport passenger and employee input and to identify any questions or concerns regarding existing sustainable practices.
  - Develop Labor Practice and Decent Work Indicators consistent with goals for employee development and maintaining a strong and viable work force.
  - Require documented sustainability experience from contractors and subcontractors.
  - Communicate sustainability goals and requirements at pre-bid, bid, project start, update meetings, and review them at project closeout.
  - Review sustainable building requirements in specifications with each contractor and subcontractor prior to commencement of work.
  - Provide leadership training for airport sustainability staff.
  - Host a concession, airline, and/or department of aviation job opportunity fair.
  - Host an airport concessions workshop that includes an overview of the Request for Proposals (RFP) process, information on having a business at the airports, and an explanation on how to become certified as an Airport Concessions Disadvantaged Business Enterprise (if applicable).
  - Offer voluntary, free language courses for employees (e.g., English aviation terms and common tourist languages).
  - Offer voluntary, free courses on using administrative software (presentation, document, and spreadsheet software).
  - Develop a 'Take Your Child to Work Day' Program that includes a tour of the airfield, hangars, and fire stations, and presentations from airport staff, tenants, and the airlines.
  - Provide a subsidized on-site daycare facility for employee children.
- Health and Safety
  - Participate in the Occupational Safety and Health Administration's (OSHA's) Voluntary Protection Programs.
  - Develop an Airport Disaster and Emergency Preparedness Plan.
  - Provide first responder life support training for employees.
  - Install Automated External Defibrillators (AED).
  - Communicate alternative routes to the nearest medical facility as part of the overall health and safety program.
  - Participate in a full scale emergency response exercise to evaluate the capability and effectiveness of emergency responders in the event of an actual emergency.
  - Participate in an emergency exercise with a local hospital/medical center to train medical staff on how to transfer patients from an aircraft to local medical facilities in the event of a natural disaster or other emergency that forces evacuation of a hospital.
  - Conduct road safety audits for all major pedestrian crossings.
  - Offer voluntary, free physical activity programs for staff (e.g., running groups, yoga classes, softball leagues, etc.).
  - Host an airport health and wellness clinic/expo that provides health screening, seminars, health and safety exhibits, flu shots, a workout pavilion, healthy cooking demos, green living ideas, exhibitors, financial health information, and more.

  - Notify area police and fire departments of any road closures or heavy construction traffic.
  - Submit weekly reports summarizing all safety incidences as well as all events which may have resulted in an accident; include an evaluation of what steps can be taken to prevent those events in the future.
  - Measure and communicate healthcare cost impacts.
  - Provide flu shots and immunizations.
  - Train airport personnel to identify and stop human trafficking.
  - Post flyers, brochures, and/or screen public service announcements on television monitors to warn human traffickers about the harsh penalties they face and provide victims with a toll-free number to call for help and/or to report crimes.
- Airport Movement Area Safety
  - Install an automated foreign object debris (FOD) detection system on aircraft movement areas.
  - Provide airfield perimeter service roads to facilitate access to all areas of the airfield without requiring the crossing of active airfield pavement.
  - Segregate operationally diverse facilities on the airfield to minimize mixing of different operational types (e.g., GA/student and air carrier).
  - Enhance lighting, signage, and/or markings to mitigate confusion and error potential in the movement area.
  - Provide recurrent training for all movement area drivers and require a "checkout" field exam.
  - Isolate construction areas from the movement area as completely as possible (barricades, fencing, signage, etc.).
  - Ensure adequate staffing during snow removal and/or maintenance activities to ensure continuous and coordinated contact between vehicle drivers and air traffic controllers; consider use of a command vehicle manned by an airport operations representative.
  - Ensure the airport's snow removal and/or landscaping plan is coordinated with and on file with the airport traffic control tower.
  - Use guards to monitor all points of access between the construction area, contractor staging/operations area, and the movement area.
  - Include a placard in all vehicles (airport, tenant, service provider, other) that illustrates airfield markings and their meaning.
  - Ensure vehicle drivers receive appropriate training in air traffic control phraseology and intent, including airport-specific references that may be in use at a particular airport.
  - Define and communicate thresholds for airport movement area infractions and associated penalties (e.g., badge revocation).
  - Cease all construction and maintenance vehicle activities in the airport movement area during periods of low visibility.

Passenger Experience

- Terminal Amenities
  - Install an indoor hydroponic or aeroponic garden.
  - Install, increase, and/or improve wireless internet connectivity.
  - Install internet kiosks.
  - Provide an on-airport movie theater.
  - Provide in-terminal sleeping pods, napping rooms, rocking chairs, and/or transit hotels.
  - Provide an in-terminal sanctuary lounge.
  - Provide passengers with access to an on-airport pool and hot tub.
  - Provide passengers with access to showering facilities.
  - Stock bathrooms with pocket-size oral hygiene kits that contain mouthwash, dental floss, a toothbrush, and toothpaste.
  - Provide an in-terminal vanity area/powder room.
  - Provide in-line skates, bicycles, Nordic walking poles, skis, snowboards, and/or other sports equipment for rent at an airport service center.
  - Designate a wellness/walking path within the terminal complex.
  - Provide an airport fitness center and/or partner with an on-airport hotel health club to provide access for the public and/or employees.
  - Offer stationary bikes that can generate energy when pedaled for users to recharge personal electronics and get a workout in.
  - Install an ice skating rink in the terminal made of plastic artificial ice and provide ice skates for rent.

  - Provide a yoga room and/or prayer/reflection room.
  - Use therapy dogs to comfort stressed travelers.
  - Install retail touchscreen kiosks where travelers can rent or buy entertainment (via download) on the go.
  - Install an airport observation deck/spectator terrace with a view to the airside apron and tower-to-pilot radio communication available.
  - Plant/install a butterfly/sunflower/cactus garden and/or koi pond nature trail (non-wildlife attracting if open-air).
  - Welcome passengers by handing out free popcorn, a fresh-baked cookie, or other goodies.
  - Install an ice cream kiosk, popcorn machine, and/or a cookie kiosk.
  - Work with local restaurants to provide passengers with 'a taste of the city' featuring the local area's most famous cuisine.
  - Distribute flowers to passengers on Valentine's Day and on Mother's Day.
  - Offer free local phone calls year-round (or on customer appreciation days).
  - Install a multistory tube slide in the terminal.
  - Provide an in-terminal play room for children.
  - Staff child play areas/rooms with "play coordinators" that host craft activities and storytelling sessions and help parents keep an eye on their kids.
  - Provide a private baby care room with a hot water dispenser.
  - Provide an entertainment zone/deck (e.g., gaming, television, ping pong, board games) for passengers.
  - Provide sports simulators that mimic soccer, basketball, golf, boxing, skiing, car racing, etc., for passengers to enjoy in between flights.
  - Provide live music performances in the terminal.
  - Provide live holiday/seasonal entertainment (e.g., Santa, Irish dancers, Halloween parade and trick or treating, etc.).
  - Host a holiday fashion market where local fashion designers and independent retailers offer unique, one-of-a-kind holiday gifts for sale including accessories, apparel and jewelry.
  - Offer digital versions of movies for passengers to purchase and download on a flash drive that can be watched on their laptop or tablet.
  - Provide an on-airport beauty salon, barber shop, massage bar, spa, reflexology, and other services.
  - Provide an on-airport fish spa pedicure with Garra rufa fish to pamper and entertain passengers.
  - Provide an in-terminal library with work stations and reading areas.
  - Provide a golf putting green and/or mini golf inside the terminal.
  - Provide guided airport tours and/or free bus tours that passengers can take during layovers and/or delays.
  - Provide an in-terminal dental office where passengers and employees can obtain teeth cleanings, whitening, and X-rays.
  - Provide wheelchairs and strollers/baby carriages for use inside the terminal (free or rental).
  - Rent portable DVD players to passengers.
  - Provide a post office box or counter with post office services and a commemorative airport ink stamp that can be impressed on postcards and letters.
  - Provide a pharmacy, bank and other basic public services at the airport.
  - Provide in-terminal shoe and luggage repair services.
  - Provide gift wrapping services and/or provide complimentary holiday gift wrapping.
  - Provide dry cleaning services in the terminal.
  - Take care of pets while passengers are away at an on-airport pet hotel; include an adjoining veterinarian clinic and nail clipping salon.
  - Designate meeting points/rendezvous plazas in the terminal with appropriate signage.
- Art and Culture
  - Develop an airport art and culture master plan, partnering with local art districts, cultural societies, artists, educational institutions, and volunteers to identify optimal locations for exhibits, timing and display duration, and to determine appropriate media and artists.
  - Provide art and cultural programs for employees and the general public.
  - Provide a museum and/or art gallery in the terminal.
  - Install a cultural display, exhibit, garden, gallery, or museum inside the terminal.
  - Partner with a local school or university to display artwork created by the students (preferably artwork promoting conservation, use of recycled materials, and environmental awareness).

  - Give children free crayons and blank post-paid postcards and ask them to mail back a picture from their travels for display in an airport gallery.
- Circulation and Baggage
  - Hire a team of 'airport experience agents' to roam around the airport terminals with tablets assisting travelers with way-finding, check-in, transfers, lost luggage and other travel-related issues.
  - Offer expedited "1-Stop" customs processing for international passengers arriving without checked baggage.
  - Implement Automated Passport Control (APC) with the U.S. Customs and Border Protection (CBP) to help travelers move faster through the border clearance process by entering information at a self-service kiosk instead of filling out a declaration card.
  - Optimize the passenger baggage handling system.
  - Offer passenger check-in self-service kiosks with bag-tag printing.
  - Allow passengers to report a missing bag at a kiosk instead of waiting in line at a baggage service counter.
  - Offer bag drops where passengers can free themselves of luggage immediately upon arriving at the airport.
  - Encourage airlines to participate in the International Air Transport Association's (IATA) Baggage Improvement Program (BIP).
  - Provide baggage storage lockers (for screened baggage).
  - Offer luggage delivery services for passengers where they can hire baggage agents to retrieve their checked luggage and deliver it to a destination of their choice, freeing them of luggage and avoiding time spent at baggage claim.
  - Allow passengers to receive their boarding pass via website.
  - Support the use of paperless ticket (e-ticket) technology, including bar-coded boarding passes on mobile phones.
  - Allow passengers to scan their travel documents at kiosks for data verification and onward transmission to government agencies (e.g., automated passport control), avoiding identity checks at check-in desks or gates.
  - Enable passengers to proactively handle the re-booking for cancelled or delayed flights and obtain a new boarding pass via a self-service channel (kiosk, web, and mobile phone).
  - Develop an airport mobile application for easy access to retail and dining options and promotions, real-time flight status, emergency alerts, terminal maps, weather and city guides, airport facilities and services, and to enable mobile payments for services like wireless internet and parking, etc.
  - Participate in the Transportation Security Administration's PreCheck Program to allow low-risk travelers to experience faster, more efficient screening.
  - Provide an on-airport car wash valet service where cars are cleaned and ready for travelers upon their return to the airport.

Stormwater Management

- Erosion and Sedimentation Control
  - Design for and install detention basins, detention ditches, ditch checks, curb breaks, and/or other stormwater Best Management Practices (BMPs).
  - Install water quality swales, rain gardens, and/or constructed wetlands to control stormwater rates.
  - Install temporary sedimentation basins, diversion dikes, ditches, sediment traps, silt fences, and/or pipe slope drains during construction.
  - Achieve permanent soil stabilization in seeded areas by covering all exposed soil surfaces with vegetation (non-wildlife attracting).
  - Incorporate temporary and permanent soil stabilization techniques including hydroseeding, soil binders, composting and mulching.
  - Install rolled mats (organic, biodegradable mulch mats used to reduce erosion) and ensure that they conform to site contours.
  - Use natural fiber geotextiles (permeable fabrics) that are biodegradable.
  - Prohibit the use of chemical soil stabilizers during construction.
  - Use lime to increase the stability, impermeability, and load-bearing capacity of the subgrade.
  - Monitor construction water quality impacts by conducting sampling before and during construction, especially after significant storm events.
  - Install slurry walls during construction to prevent commingling of aquifers.

  - Locate construction vehicle entrances on stabilized, level ground and provide ample turning radii.
  - Grade construction vehicle entrances to prevent runoff.
  - Locate construction staging, lay-down areas, stockpiles, and traffic on areas that are paved or will be paved as part of the construction.
- Stormwater Management, Rate and Quantity
  - Design projects to ensure no net increase in rate and quantity of stormwater runoff (minimize the amount of impervious surface constructed).
  - Build on a previously developed site.
  - Install permeable pavement.
  - Remove and recycle existing pavement that is not required or needed for future use.
  - Reduce flow velocities in stormwater conveyance systems to encourage settling of sediments (for later removal).
  - Collect and reuse stormwater for non-potable uses such as landscape irrigation and building flush systems.
  - Design stormwater storage and conveyance systems for the 500-year storm in areas prone to flooding and those that are projected to have increased flooding due to climate change.
  - Coordinate with local or city governments to determine if other properties (e.g., parks) can be used for regional stormwater infiltration to prevent flooding.
- Stormwater Management, Treatment
  - Implement Best Management Practices outlined in the U.S. EPA's *Guidance Specifying Management for Sources of Nonpoint Pollution in Coastal Waters.*
  - Construct engineered wetlands to treat wastewater, glycol, and other chemicals and provide aesthetic benefits (off-airport and/or ensure non-wildlife attracting).
  - Install an on-airport stormwater collection and rain harvesting system to treat runoff prior to reuse or discharge.
  - Install slotted edge drains and other first flush systems connected to underground holding tanks.
  - Install bioswales (non-wildlife attracting) along roadways and parking areas to encourage groundwater infiltration of stormwater runoff.
  - Plant nitrogen-fixing vegetation in fertilized areas.
  - Install an on-airport sand filtration system to control storm water quality and runoff volumes.
  - Use water quality inlets (WQIs) to separate pollutants from the first flush of storm water (referred to as oil/grit separators or oil/water separators).
- Stormwater Pollution Prevention Plan (SWPPP)
  - Develop and Implement a Stormwater Pollution Prevention Plan (SWPPP).
  - Train on-site personnel in pollution prevention procedures and always make the Stormwater Pollution Prevention Plan (SWPPP) available at the construction site for review.
  - Prepare a hydrology report to document typical rainfall, drainage patterns, flow rates, and runoff expected during storms.
  - Prepare a soil report to document drainage characteristics, soil stability, and design constraints.
  - Prepare a grading and drainage plan (based on hydrology and soil reports) that records slopes, areas of cut and fill, areas of soil disturbance, and protection of existing vegetation.
  - Store materials and waste in areas sheltered from rain and runoff.
  - Install a closed-loop aircraft wash rack wastewater recycling system.
  - Collect and recycle, or treat and properly dispose of, water used for vehicle and aircraft washing.
  - Install a construction sewage pre-treatment plant to avoid acidification (e.g., from concrete) before discharge in the storm-water system.
- Deicing
  - Provide centralized and/or remote deicing/anti-icing facilities (e.g., deicing pads) with drainage infrastructure to capture and segregate deicing runoff.
  - Use sweeper-vacuums, glycol recovery vehicles (GRVs), and/or "mobile collection units" to remove (and potentially reuse) spent deicing/anti-icing fluid.
  - Collect excess glycol in permanent or temporary tanks for recycling, treatment, and/or disposal.
  - Use deicing materials that have a low biochemical oxygen demand (BOD).
  - Install electronic and/or hydronic heated pavement systems to control snow accumulation.
  - Install a glycol epoxy overcoat on pavement surfaces.

  - Train employees on deicing fluid storage and handling, deicing procedures, spill response and prevention, and stormwater pollution prevention.
  - Block storm drains during deicing/anti-icing operations to prevent contamination of stormwater runoff.
  - Clearly designate aircraft deicer/anti-icer storage and transfer areas.
  - Store deicing/anti-icing materials indoors or in a sheltered area away from direct traffic routes to prevent spills.
  - Keep deicing/anti-icing spill response equipment in locations easily accessible to and near areas where spills may occur.
  - Perform and document frequent inspections of storm drains, deicer application equipment, deicer runoff controls, and storage tanks; perform maintenance as required.
  - Use forced air/hybrid deicing that adds deicing fluid to the air stream to aid in breaking loose snow and ice.
  - Use infrared energy to deice aircraft.
  - Perform initial deicing using hot water at a temperature of at least 60 degrees Celsius or 140 degrees Fahrenheit; an anti-icing fluid is then applied before the water freezes.
  - Purchase and install enclosed deicing buckets on deicing vehicles (or as part of centralized deicing facilities), protecting operators from exposure to deicing fluid and encouraging deicing closer to the aircraft.
  - Install Holdover Time Determination Systems (HOTDS) to record measurements of winter conditions and calculate deicing/anti-icing fluid holdover time.
  - Track the volume of aircraft deicers and anti-icers used to identify procedures to improve, help analyze and design deicing management systems, and enhance compliance with regulatory requirements.
  - Use Tempered Steam Technology (TST) to defrost or pre-deice aircraft.
  - Clear snow accumulation from aircraft deicing areas prior to deicing operations to prevent contamination.
  - Dispose deicer-laden stormwater to publicly owned off-site treatment works that use biological processes to break down glycols and other organic constituents of deicing runoff.
  - Install an on-site biological/natural treatment system to treat deicing/anti-icing runoff to concentrations acceptable for discharge to surface waters or the sanitary sewer.
  - Use membrane filtration to separate larger deicing/anti-icing molecules from smaller water molecules, increasing the concentration of the (reject) stream and separating it from the dilute (permeate) stream.
  - Use recovered glycol as a "feedstock" for reformulated aircraft deicing fluid (after meeting SAE AMS 1424 specifications), vehicle anti-freeze, aircraft lavatory fluid, coolants, coatings, paints, and plastics.
  - Use beet juice made from the carbohydrate extract of sugar beets or molasses to deice sidewalks, parking lots, and roadways.

Water Efficiency

- Water Use Reduction
  - Educate maintenance staff, employees, passengers, and tenants on water conservation strategies.
  - Develop a baseline water consumption level and track and report on water use data and cost savings compared to the baseline.
  - Install metering networks to facilitate accurate measurement of water use.
  - Install an on-site wastewater treatment plant.
  - Install motion sensors on sink faucets.
  - Install water-conserving aerators on faucets and showerheads.
  - Install pressure-assisted toilets.
  - Install dual-flush toilets.
  - Install waterless or water-efficient urinals.
  - Install water-efficient pre-rinse spray valves (used in commercial kitchens to remove food waste from dishes prior to dishwashing).
  - Use low-volume, high pressure sprayer nozzles on water hoses used for vehicle washing.
  - Install cisterns to capture rainwater from roofs for irrigation.
  - Recycle used non-potable water for landscaping, machine washing, urinal and toilet flushing, custodial uses, etc. to the extent allowed by the Safe Drinking Water Act of 1974.
  - Incorporate reclaimed graywater collection and reuse in building design.

  - Reclaim water used during aircraft rescue and fire fighting (ARFF) training exercises for landscaping or other non-potable uses.
  - Use pulsed-power electromagnetic water treatment, ultraviolet treatment, or ozone treatment for the cooling tower water.
  - Use reverse osmosis and ultra-filtration to process waste water.
  - Use tank-less (instantaneous) hot water heaters.
  - Provide training for employees and signage for facility users instructing them on how they can reduce water use.
  - Limit steam cleaning and high pressure washing of vehicles and equipment.
- Innovative Wastewater Technologies
  - Test and repair water supply and wastewater conveyances to conserve water and stop leaks.
  - Use an external NoFoam unit/kit for aircraft rescue and fire fighting (ARFF) vehicles and for application on aircraft hangar foam-water suppression systems.

Ground Transportation

- Public Transportation
  - Provide direct, safe access to an existing or planned and funded commuter rail or subway/elevated train station.
  - Provide direct, safe access to bus stops usable by airport passengers, employees, and construction workers.
  - Financially contribute to the greening and/or expansion of the mass transit systems which serve the airport.
  - Provide subsidized train and/or bus passes to employees and construction workers.
  - Provide a transportation plan to and from the construction site.
  - Provide employees with directions to public transportation facilities.
  - Install covered and heated (if applicable) waiting areas for public transportation stops at the airport.
  - Provide public transportation information displays, schedules, and ticket vending machines in the baggage claim area.
  - Prepare a smart growth plan that considers mixed land uses, compact building design, walkable neighborhoods, a strong sense of place, preservation of open space, directing development toward existing communities, public transportation choices, and community and stakeholder collaboration.
  - Select public transportation accessible venues/hotels (with directions provided).
  - Provide a centralized, consolidated rental car facility with connection to the airport transit system.
  - Provide a Centralized Intermodal Ground Transportation Center.
  - Operate satellite 'check-in' facilities (downtown and suburban locations) to minimize congestion on terminal access roads.
  - Communicate with local and regional transit authorities to advance multiple transit connection opportunities.
  - Provide a temporary parking area for vehicles waiting to pick up passengers (such as a cell phone lot).
  - Provide a remote curb location outside of the terminal core (such as a 'Kiss-n-Fly' drop-off).
  - Use an off-site delivery consolidation center to reduce delivery traffic.
- Bicycle Access/Usage
  - Provide safe bicycle lanes and walking paths to and from the airport and to nearby commercial office, retail, and hotel zones.
  - Provide secure bicycle racks and/or storage near the building entrance and at construction staging locations.
  - Provide shower and changing facilities.
  - Install signage to ensure bikes remain visible and maintain an image of "bikes belong here."
  - Encourage transit agencies to provide bicycle friendly buses and trains.
  - Participate in a bike sharing program.
- Parking Capacity
  - Provide incentives such as rebates and/or preferred parking for staff vanpools/carpools.
  - Provide infrastructure and support programs to facilitate shared vehicle usage such as carpool drop-off areas, car-share services, ride boards, and shuttle services to mass transit.
  - Support the implementation of vanpooling services for all airport agencies and vendors.
  - Coordinate carpooling to construction sites (set up schedules and incentives based on locations).
  - Bus construction workers into the construction site from consolidated vehicle parking/staging areas to reduce security checkpoint delays and emissions from individual riders and vehicle idling.
  - Provide incentives for shared rides in taxis.

  - Increasing transit ridership among employees by implementing programs such as transit awareness day, guaranteed ride home, etc.
  - Encourage telecommuting and off-site work.
  - Support the use of flexible or non-traditional work hours by airport agencies and vendors.
- Alternative Fuel Vehicles
  - Purchase, operate and maintain alternatively fueled, electric, and hybrid vehicles.
  - Replace conventional gasoline-based equipment with alternative fuel based equipment, including biodiesel, compressed natural gas (CNG), hybrid electric, fuel cell, hydrogen, or liquid petroleum gas (LPG).
  - Use alternatively fueled and/or hybrid construction vehicles.
  - Provide airport employees with access to a hybrid and/or alternatively fueled vehicle sharing program.
  - Provide incentives for hybrid and/or alternatively fueled vehicle purchases/conversions.
  - Use alternatively fueled ground support equipment (GSE), generators, and shuttle buses.
  - Provide preferred parking and/or discounted parking rates for hybrid and/or alternatively fueled vehicles.
  - Develop preferred parking and/or lot locations for rental fleets that offer alternatively fueled rental vehicles.
  - Install biodiesel and ethanol fuel refueling stations.
  - Install electric vehicle charging stations.
  - Install compressed natural gas (CNG) refueling stations.
  - Transport visitors and passengers between parking lots and terminals using electric golf carts.
- Reduced Vehicle Idling
  - Develop a reduced vehicle idling plan.
  - Turn off vehicle engines if they will be left idle for more than three minutes (or other airport-specified time limit).
  - Issue notices or fines to vehicle operators who leave vehicles idle for excessive periods.
  - Ensure that no vehicle idling occurs within 100 feet of a sensitive receptor area, such as air intakes.
  - Post no-idling signs.
  - Install idling reduction technologies.
  - Install automatic engine start/stop technology that reduces idling but maintains engine oil temperature.
  - Provide a commercial vehicle holding area.
  - Implement an on-demand system for taxi management.
  - Purchase and install vehicle air fresheners, placards, stickers, and/or decals (non-toxic) that promote and remind vehicle operators of a "no-idling" or "engines off" campaign.
  - Provide training and post flyers to encourage eco-friendly driving habits.
- Roadway Design
  - Design roadways to meet long life pavement design criteria.
  - Use asphalt containing recycled tires and/or roofing shingles.
  - Design roadway lanes for use by high occupancy vehicles (HOVs), including appropriate turning lane dimensions.
  - Use warm-mix asphalt instead of hot mix asphalt.
  - Use at least 50 percent recycled aggregate in roadbase materials.
  - Use at least 25 percent recycled aggregate in cement or asphalt bound pavement materials.
  - Use at least 25 percent replacement of Portland cement with suitable supplementary cementitious material (SCM) in all concrete pavements, curbs and gutters, and sidewalks.
  - Specify the use of blended (ASTM C595) and/or Performance Specified (ASTM C1157) cements for all Portland cement concrete pavements, sidewalks, and curbs and gutters.
  - Reduce the total Portland cement content to a maximum of 470 pounds per cubic yard for all pavements, sidewalks, and curbs and gutters.

Landscape and Exterior Design

- Landscaping
  - Develop and implement sustainable landscaping guidelines/specifications that require plantings to be low-maintenance, drought resistant, and native species that are non-wildlife attracting.

  - Contact the local U.S. Department of Agriculture (USDA) county extension agent for suggestions on plantings to reduce water consumption, lower maintenance costs, enhance aesthetics, etc.
  - Substitute vegetated surfaces (non-wildlife attracting) for impervious surfaces.
  - Plant trees and other vegetation (non-wildlife attracting) to retain stormwater and shade dark-colored impervious surfaces.
  - Minimize disturbed landscape areas and keep pre-existing topography, terrain, trees and vegetation (non-wildlife attracting) intact whenever feasible.
  - Require the contractor(s) to develop a plan to protect existing vegetation during all construction activities.
  - Protect vegetation from damage due to run-off or spillage during mixing and placement of construction materials using temporary fencing, barricades, and guards.
  - Use clean-cut or trenchless technology when installing utility conduits to minimize surface disruption; tunnel under or around tree roots by hand digging or boring.
  - Purchase off-site, prefabricated assemblies to avoid the need for on-site fabrication equipment.
  - Require that all vegetation that has to be removed be chipped for on-site mulching or composting (if the plant or tree cannot be relocated, sold, or donated intact).
  - Collect grass clippings for composting or mulching or set the lawn mower to release (rather than bag) clippings.
  - Donate healthy plants and trees removed during construction to the community.
  - Donate money to an organization that plants trees/vegetation to offset impacts to existing vegetation.
  - Install artificial turf to reduce maintenance labor and traffic, the presence of hazardous wildlife and foreign object debris, to accommodate emergency response, and to enhance pilot recognition of non-movement areas.
  - Specify non-toxic fertilizer and maintenance materials for initial plant establishment.
  - Spot treat landscape problem areas instead of chemically treating a larger area than necessary.
  - Provide structured parking in lieu of paved surface lots to reduce stormwater runoff and the heat island effect.
  - Use pavement materials that have a high Solar Reflectance Index (at least 29).
- Water Efficient Landscaping
  - Perform a soil and climate analysis to determine the appropriate landscape strategy.
  - Install a high-efficiency slow-drip, sub-soil irrigation system (if irrigation is a necessity) that uses non-potable water and has an automated linkage to meteorological data.
  - Top-dress plant root zones and soil with mulch and compost to decrease fertilizer needs, retain moisture, and control erosion.
- Vegetation and Wildlife Management
  - Develop a wildlife hazard control plan.
  - Develop and implement an Integrated Pest Management (IPM) plan.
  - Establish a non-toxic wildlife control program.
  - Install an avian radar system to improve aviation safety, security surveillance, environmental management, weather detection, and wind measurement.
  - Use falconry to control bird activity.
  - Maintain (i.e., mow) airfield sites to prevent use by wildlife that is hazardous to aircraft.
  - Use electric lawn mowers to reduce the level of noise and air pollution generated by traditional gasoline-powered mowers.
  - Use organic or bio-based fertilizers and pesticides if landscape treatment is necessary.
  - Use non-potable hot water (heated to 210 degrees Fahrenheit/94 degrees Celsius) to kill vegetation in pavement cracks instead of herbicides.
  - Control vegetation using grazing animals.
  - Avoid the creation of natural open water features on or near airfield sites that attract wildlife.
  - Use perforated underground drains/drain pipe or dry wells to provide infiltration without creating inundated areas that may attract hazardous wildlife.
  - Install bird deterrent wires or other mechanisms to prevent waterfowl from using area water bodies.
- Heat Islands—Roofing
  - Install vegetated green roofs.
  - Install high reflectance/high albedo roofing materials with a high solar reflectance index (SRI).
  - Install a Cool Roof Rating Council (CRRC) rated roof product or an Energy Star cool roof with equivalent reluctance and emittance properties.

  - Apply high reflectance coating to the surface of a conventional roof membrane.
  - Utilize a combination of vegetated and high albedo roof surfaces.
  - Use advanced satellite imagery to create a map that identifies hot spots at the airport where urban heat island reduction strategies will have the greatest impact.
- Light Pollution Reduction
  - Model the site lighting using a computer model to establish a baseline level and evaluate benefits.
  - Meet or provide lower light levels and uniformity ratios than those recommended by the Illuminating Engineering Society of North America (IESNA) *Recommended Practice Manual: Lighting for Exterior Environments (RP-33-99).*
  - Monitor lighting systems regularly to maintain proper illumination and minimize lighting where possible (maintain light use for safety, access, and building identification).
  - Adopt strict site lighting criteria to maintain appropriate light levels while avoiding off-site lighting and night-sky pollution; update lighting criteria periodically in conjunction with seasonal daylight fluctuations.
  - Focus light toward the earth to minimize night-sky pollution.
  - Limit lighting in protected ecological areas to mitigate lighting impacts on wildlife.
  - Utilize full cutoff luminaries, low-reflectance, non-specular surfaces and low-angle spotlights for roadway and building lighting.
  - Develop greenbelts along the airport perimeter as an attractive light and noise buffer between the airport and the community.
  - Use High Pressure Sodium (HPS) lamps instead of Metal Halide (MH) lamps.
  - Install low-temperature fluorescents and/or solar powered fixtures for exterior lighting.
  - Use high frequency electronic ballasts with fluorescent 2, 4, and 8-foot Tubular lamps that do not contain mercury.
  - Install self-dimming fluorescent lamp ballasts.
  - Install recyclable lamps and provide recycling information for all luminaries.
  - Establish a schedule for when construction lighting is required and develop a policy to reduce lighting when not needed.

Energy Efficiency and Atmosphere

- Commissioning
  - Develop and utilize a systems commissioning plan.
  - Engage a commissioning team that does not include individuals directly responsible for project design or construction management to evaluate both building and site systems as part of the commissioning plan.
  - Identify an individual to lead the commissioning process early on.
  - Establish and follow commissioning requirements to ensure optimal performance of the following systems: central building automation; heating, ventilation, and air conditioning (HVAC) equipment; lighting controls and sensors; site lighting; refrigeration systems; vertical transport; building envelope; emergency power generators and automatic transfer switching; uninterruptible power supply; life safety (i.e., fire alarms); Egress pressurization; lightning protection, domestic and process water pumping and mixing; sound control; data and communications; paging; security; irrigation; and plumbing.
  - Establish and follow systems commission requirements for runway lighting and illuminated signage, runway navigational aids, runway site lighting systems, traffic signals, pump stations, and oil/water separators.
  - Incorporate commissioning requirements into construction documents.
  - Complete a systems commissioning report that contains the information required for recommissioning and provide it to the airport owner in a single manual.
  - Recommission energy systems when building energy usage deviates from the planned energy usage or as part of any building modification or addition.
  - Include airport facility operators and users in design teams to ensure installed equipment is used as intended (e.g., heating, ventilation, and air conditioning systems).
  - Acquire manufacturer documentation and guarantee of installations, projected results, and in-situ performance criteria to compare to standard performance results as part of systems commissioning.
- Energy Performance
  - Meet or exceed the local Energy Conservation Code.
  - Design buildings and site systems to comply with ASHRAE/IESNA Standard 90.1-1999.
  - Develop a Strategic Energy Management Plan using input from maintenance staff.

- Perform a baseline energy audit and conduct and implement recommendations from an energy audit periodically (e.g., every four years).
- Use a computer simulation model to assess energy performance and identify the most cost effective energy measures.
- Install a motor efficiency controller in escalators and automated people movers/moving walkways to reduce energy consumption.
- Develop and implement a Lighting System Energy Conservation Program.
- Specify energy efficiency requirements for equipment in contract agreements.
- Develop energy performance contracting partnerships.
- Utilize compact fluorescent light (CFL) bulbs in lieu of incandescent lamps.
- Organize lighting circuitry and building systems so that individual areas are separately controlled.
- Implement a "turn off your light and computer" campaign to raise awareness about unnecessary energy usage.
- Integrate occupancy sensors with heating, ventilation, and air conditioning (HVAC) operation.
- Install occupancy sensors, either infrared (heat detection), ultrasonic (movement detection), or a combination of both, to control lighting in areas that are intermittently occupied (i.e., rest rooms, storage areas, stairwells, etc.).
- Install large revolving doors to create an air lock and reduce heat transfer.
- Minimize air infiltration through all exterior openings during heating, ventilation, and air conditioning (HVAC) operation.
- Group flights in a certain part of the concourse during nonpeak hours, allowing the airport to shut off air conditioning and lighting in unused areas.
- Design aircraft gates and hold rooms for common use, requiring airlines to use the same passenger processing system, displays, baggage handling, and baggage claim system.
- Design aircraft remain overnight areas for common use (e.g., so they can serve as cargo ramps during the day and airline parking at night).
- Install large electrical cables (larger than required by the National Electric Code) to decrease the cable resistance and reduce energy loss during transmission.
- Install cogeneration or trigeneration systems.
- Install energy peak shaving units to offset higher demand periods and costs.
- Install an on-airport power generation system.
- Install an anaerobic digester.
- Install LED (light-emitting diode) lighting and signals.
- Install a building automation system (BAS).
- Install daylight harvesting control systems, optimize lighting controls, and integrate lighting systems with building automation systems.
- Install thermally efficient/high performance glazing and window systems.
- Apply thermochromic coatings on buildings.
- Improve insulation of the building envelope.
- Enhance insulation of the heating, ventilating and air conditioning (HVAC) distribution piping system.
- Convert old steam heating systems to modern hot water heating systems (preferably passive solar water heating systems).
- Evaluate and upgrade the central plant and distribution system equipment.
- Install direct-drive equipment instead of belt- or gear-driven heating, ventilation, and air conditioning (HVAC) equipment.
- Install an indirect evaporative and/or evaporative condensing direct expansion (DX) heating, ventilation, and air conditioning (HVAC) system instead of chilled water plant system.
- Establish airside lighting controls and procedures to turn off or reduce the intensity of airside lighting (runway, taxiway and apron lights and navigational aids) when not being used.
- Enable pilot controlled lighting for aircraft landing during off-peak hours so that airfield lighting can be turned off at night.
- Use light colored paints and interiors to reflect lighting.
- Install interior and exterior shading devices/strategies to filter daylight and control glare (e.g., shades, louvers, blinds, awnings/overhangs, vegetation, etc.).
- Plant coniferous trees (non-wildlife attracting) to block winter winds from entering indoor areas.
- Install centralized pre-conditioned air (PCA) and ground power systems (400 Hz) for gated aircraft.
- Include a requirement for pre-conditioned air units in all bid documents for terminal and gate design and renovation projects.

  - Develop, implement, and enforce a policy to minimize the use of auxiliary power units at gates where pre-conditioned air (PCA) and gate power are available.
  - Use infrared imaging during construction to identify issues with thermal leaks from buildings.
  - Use variable-air-volume air conditioning systems to reduce energy use during peak-use conditions.
  - Install energy-efficient chillers.
  - Integrate high performance chillers with thermal ice storage to reduce electrical demand use and costs during the cooling season.
  - Use absorption cooling which employs lower cost fuels such as steam, natural gas, or high-temperature waste heat, to drive the absorption refrigeration process.
  - Use Variable Frequency Drive (VFD) motors to control the rotational speed of an alternating current (AC) electric motor.
  - Install U.S. Environmental Protection Agency ENERGY STAR labeled products.
  - Install gas-fired (instead of electric) kitchen equipment, such as ovens, booster heaters, and grills, that ignites electronically instead of using pilot lights.
  - Connect monitors, printers, and other accessories to a power strip/surge protector. Turn off the power strip to prevent them from drawing power (even when shut off) when they are not in use.
  - Unplug cell phone chargers, fans, coffeemakers, desktop printers, radios, and other equipment that drains energy even when not in use.
  - Turn off computer monitors if they are not going to be used for more than 20 minutes (a small surge in energy occurs when a monitor starts up).
  - Turn off both the computer central processing unit and monitor if the computer is not going to be used for more than two hours (a small surge in energy occurs when a computer starts up).
  - Select a power-down or "sleep mode" feature on the computer central processing unit and monitor.
  - Do not use computer screen savers since they consume more energy than not using one and/or they may disable power-down or "sleep mode" features.
  - Purchase and use printers and fax machines that have power-down or standby features.
- Measurement and Verification
  - Develop a measurement and verification plan.
  - Track and control energy use using metering/monitoring devices and energy management control systems.
  - Install tenant energy sub-metering systems.
  - Use a maintenance log to track energy use processes, problems, and ideas.
  - Report energy savings after implementing energy reduction strategies for use as a marketing mechanism, to set/accomplish energy goals, manage strategies, etc.
  - Conduct comprehensive training of all staff that covers all aspects of building operations and maintenance.
  - Include operations and maintenance staff in building design meetings, commissioning, and testing and balancing activities to capture their perspective and ideas.
- CFC, HFC, and HCFC Reduction
  - Replace existing heating, ventilation, and air conditioning (HVAC) equipment that uses chlorofluorocarbon (CFC), hydrofluorocarbon (HFC), and hydrochlorofluorocarbon (HCFC) refrigerants.
  - Use evaporative cooling.
  - Install leak-detection systems and maintain equipment frequently to detect leaks.
- Renewable and Alternative Energy
  - Conduct an alternative renewable energy feasibility study (e.g., solar, wind, geothermal) to determine the optimal size, type, location, and the cost of installing and operating an alternative renewable energy system.
  - Use collected snow to chill the liquid used in the airport's cooling system in the summer.
  - Buy and sell Renewable Energy Certificates (RECs) or carbon credits.
  - Purchase "Green Power" from a local energy provider to fund renewable energy research, development, production, and use.
  - Enter into a public-private partnership to construct and operate a renewable energy system.
  - Install solar trash compactors along curbfonts and in remote areas.
  - Install solar photovoltaic panels on buildings and/or at ground level.
  - Install solar-thermal powered water heaters.

  - Install solar thermal storage systems (e.g., solar Trombe walls) for passive solar heating.
  - Install solar-powered roadway signs and parking lot lights.
  - Install geothermal heating and cooling systems.
  - Utilize sewer heat recovery systems.
  - Utilize wind power.
  - Utilize hydroelectric and/or tidal power.
  - Utilize coal gasification to convert low-value fuels and residuals into a synthesis gas.
  - Investigate energy tax credits, rebates, and grants by local utilities or federal, state, or local agencies.
  - Utilize fuel cells.
  - Utilize biofuels in facilities and appropriate vehicles.

Indoor Environmental Quality

- Environmental Tobacco Smoke Control
  - Develop and implement an Environmental Tobacco Smoke (ETS) control plan.
  - Prohibit smoking in the public areas of buildings.
  - Locate exterior designated smoking areas away from entries and operable windows.
  - Designate privately leased spaces (such as cargo areas) as non-smoking.
  - Prohibit smoking within structures under construction and restrict smoking on-site during construction.
  - Provide a designated exterior smoking area (protected from the elements) that is sufficiently distant from construction activities.
  - Install a designated smoking room designed to effectively contain, capture, and remove Environmental Tobacco Smoke (ETS) from the building using a separate ventilation system (if an interior smoking room is necessary).
  - Establish zero exposure of non-smokers to Environmental Tobacco Smoke (ETS).
- Carbon Dioxide (CO2) Monitoring
  - Provide for real-time control of terminal unit air flow rates and total outdoor air flow rates based on carbon dioxide levels.
  - Install a permanent carbon dioxide monitoring system that provides feedback on space ventilation performance.
  - Voluntarily install air quality monitoring stations and track and publish data.
  - Design heating, ventilation, and air conditioning (HVAC) systems with carbon dioxide monitoring sensors in each space and integrate these sensors with the building automation system (BAS).
  - Use bees and honey from an on-airport apiary to biomonitor the air quality at the airport.
- Ventilation
  - Design buildings for optimum natural ventilation.
  - Locate air intakes away from contaminants such as loading areas, exhaust fans, and cooling towers.
  - Utilize carbon or electrostatic filters, or other particulate control technologies.
  - Install air diffusers for all mechanically ventilated spaces.
  - Design building ventilation systems that result in an air change effectiveness (εac) greater than or equal to 0.9 as determined by ASHRAE 129-1997.
  - Use displacement ventilation, which introduces cool air into a zone at low velocity, to increase air change effectiveness.
  - Use low-face velocity coils and filters to reduce energy loss through air delivery system components.
  - Clean or change furnace filters once a month during the heating season.
  - Increase air movement in facilities by using ceiling fans.
  - Install trickle ventilators (small 'openers' concealed within a window or curtainwall's horizontal members) that allow fresh air to 'trickle' into the building without the need for operating windows or sliding doors.
  - Install relief vents or operable skylights in cargo and other applicable facilities to provide stack effect natural ventilation.
  - Install remote monitoring systems to detect Jet A vapors.
- Low-Emitting Materials
  - Use zero- or low-volatile organic compound (VOC) adhesives and sealants; consider using water-based sealants which contain no VOCs and can be used on porous or nonporous surfaces.
  - Do not use fluorescent, compact fluorescent, and LED (light-emitting diode) lights that contain mercury (as well as electrical switches and thermostats).

  - Use zero- or low-volatile organic compound (VOC) paints and coatings.
  - Specify low-volatile organic compound (VOC) carpet systems and/or require that VOC emissions meet or exceed the requirements of the Carpet and Rug Institute's Green Label Indoor Air Quality Test Program.
  - Require that composite wood and agrifiber carpet systems must contain no added urea-formaldehyde resins.
  - Install volatile organic compound-free natural linoleum flooring, recycled glass tile, or ceramic tile.
  - Do not install vinyl flooring with high polyvinyl chloride (PVC) content.
  - Vacuum heavily trafficked areas daily using equipment with powerful suction and a high-efficiency particulate air (HEPA) filtration bag.
  - Perform carpet extraction cleaning every 6 to 12 months, preferably with hot water or steam.
  - Ensure that all shop finished material meet volatile organic compound (VOC) emission requirements.
- Indoor Chemical and Pollutant Source Control
  - Install separate exhaust and plumbing systems in spaces that are known to use or contain chemicals and hazardous products.
  - Prohibit the indoor use of combustion engine-based devices without direct exterior exhaust and make-up air.
  - Use non-absorptive flooring and walls.
  - Install indoor toxic-absorptive vegetation (e.g., green walls).
  - Remove all equipment containing Polychlorinated Biphenyls (PCB).
  - Design buildings to minimize pollutant cross-contamination of regularly occupied areas.
  - Provide segregated areas with separate outside exhaust at a rate of at least 0.50 cubic feet per minute per square foot, no air re-circulation, and maintain a negative pressure where chemical use occurs.
  - Install drains plumbed for appropriate disposal of liquid waste in spaces where water and chemical concentrate mixing occurs.
  - Install permanent architectural entryway systems such as grills or grates (preferably over six feet long) to prevent occupant-borne contaminants from entering the building.
  - Hire a contractor to regularly clean mats that track dirt from occupants entering the building if installing a grate or grill is not practical.
  - Identify all hazardous products or processes.
  - Install air-tight electrical boxes to minimize air leakage.
  - Ensure proper ventilations, such as fume hoods, for activities that produce hazardous gasses.
  - Design central locations in terminal and office buildings for storage of concentrated cleaning chemicals and other pollutant sources.
  - Provide water and electricity utility outlets for cleaning.
  - Use biodegradable soap in aircraft and vehicle wash areas.
  - Specify environmentally friendly cleaning products and processes for installed systems and products in operation and maintenance manuals.
- Controllability
  - Install operable windows in areas that are not noise-sensitive.
  - Install task lighting or more light switching zones in offices areas.
  - Install under floor air distribution systems with individual diffusers (controllable outlets) in office areas.
  - Provide controls for each individual in office spaces for airflow, temperature and lighting of the occupied space, and for the occupants in non-perimeter, regularly occupied areas.
  - Integrate micro switches of operable windows with heating, ventilation, and air conditioning (HVAC) operation.
  - Use direct digital control systems for greater accuracy, flexibility, and operator interface compared to pneumatic systems.
- Thermal Comfort
  - Install a temperature and humidity monitoring system that provides operators with control over thermal comfort performance and humidification and/or dehumidification systems.
  - Comply with ASHRAE Standard 55-2004, *Thermal Comfort Conditions*, including humidity control within established ranges per climate zone.
  - Install air curtains at building entrances.
  - Provide areas with varying indoor conditions in terminals, allowing passengers to choose an area with conditions that best match their needs.

- Daylight and Views
  - Install natural skylights to reduce daylight lighting requirements.
  - Design the building with a shallow floor plate (more rectangular than square), aligning the east-west axis so that the southern sun will penetrate deeper into the building.
  - Coordinate daylight strategies with electrical lighting scenarios and the building automation system (BAS).
  - Install photo-integrated light sensors to dim artificial lights when daylight penetrating the building is sufficient.
  - Install window tinting film to minimize heat and air conditioning loss, reduce glare, increase privacy, protect installed materials from the sun's ultraviolet rays, and prevent injury and damage from broken glass.
  - Use a daylighting model or calculations to assess foot-candle levels and daylight factors achieved.
  - Achieve a Daylight Factor of at least 25 footcandles (excluding all direct sunlight penetration) in 75 percent of all regularly occupied areas.
  - Achieve direct line of sight to vision glazing for building occupants in 90 percent of all regularly occupied spaces.
  - Design partitioned offices in the center of floor plans with windows so that more daylighting and views can be achieved.
  - Use open workstation cubicles or cubical walls lower than four feet.

Climate Change

- Adaptation
  - Develop a strategic plan (e.g., climate action plan) for addressing climate change, addressing reduction of greenhouse gasses and adapting to projected future climate scenarios.
  - Perform a climate change vulnerability assessment of airport land and buildings.
  - Integrate sea level rise flood scenarios into the regional aviation strategic plan process.
  - Create a heat response plan, focusing on vulnerable travelers (e.g., the elderly).
  - Prepare a watershed plan with the water reclamation district that factors in projected climate changes.
  - Install backup power for sump pumps.
  - Provide an emergency inventory of portable pumps, generators, temporary flood gates, and sandbags.
  - Plan for and advertising extended concessionaire hours to accommodate stranded passengers.
  - Implement hardening and protection techniques for areas with low shorelines and adaptive management procedures for sites vulnerable to sea level rise.
  - Determine which nearby major roadways and airport access roads are prone to flooding and identify backup routes for airport/airline staff and emergency personnel to safely reach the airport.
  - Increase the airport's snow removal and deicing equipment inventory to account for an increased likelihood of winter precipitation associated with climate change (where applicable).
  - Plant foliage and trees (non-wildlife attracting) that can survive in warmer environments.
  - Educate travelers on the impact of climate change, including impacts on individual lives and how to respond, using displays, commercials, and art exhibits.

Facility Operations

- Maintenance
  - Write and follow a maintenance plan that evaluates each system component and incorporates the proper maintenance strategy to minimize unnecessary maintenance while maximizing system up-time.
  - Develop a comprehensive operation and maintenance (O&M) manual, including record logs, for all systems and operations.
  - Use a Computerized Maintenance Management System (CMMS) to streamline the management of operations and maintenance programs.
  - Determine the required maintenance procedures prior to installing or purchasing equipment, paying specific attention to disposal requirements and impacts to indoor environmental quality.
  - Perform all aircraft, vehicle, and equipment maintenance indoors, where possible.
  - Perform outdoor maintenance in a designated area paved with impervious concrete located at least 50 feet from any storm drain inlet.

  - Design drains in aircraft and vehicle maintenance areas to discharge to the sanitary sewer and not the stormwater system. Floor drains should discharge into an oil/water separator that is periodically pumped and the oil processed for recycling.
  - Maintain and locate Spill Control Kits in areas readily accessible to all maintenance areas.
  - Have the building service contractors provide a monthly log that documents the collection, storage and disposal of recyclable materials.
  - Have the building service contractors provide a monthly log of all of the materials used in Integrated Pest Management (IPM).
  - Review engineering standards for building equipment subject to periodic maintenance or replacement (air handler motors and belts, pumps and valves, luminaries, switches, etc.) to identify potential durability upgrades that would reduce life cycle maintenance costs.
  - Specify more durable, longer lasting materials and finishes to extend material life and reduce maintenance requirements.
  - Provide a full set of design and construction documentation to system operators so they can maintain the equipment as the manufacturer recommends.
  - Install heating, ventilation, and air conditioning (HVAC) and ductwork products that can be easily cleaned and that protect against dust, microbial growth, and fiber shredding.
  - Install ultraviolet-C (UVC) lights in air handling units for continuous coil cleaning.
  - Consider ease of maintenance when designing lighting systems.
- Brownfield/Contaminated Site Redevelopment
  - Develop a Brownfield Prevention Program for the airport to implement strategies that prevent pollution and minimize waste generation.
  - Develop on a site documented as contaminated by an All Appropriate Inquiry (AAI) (or an ASTM E1903-97 Phase II Environmental Site Assessment) OR classified as a Brownfield by a local state and federal government agency OR is listed as a contaminated site by local or state regulatory agencies to reduce pressure on undeveloped land.
  - Enter into the state's voluntary Site Remediation Program (if applicable) that offers a No Further Remediation (NFR) Letter.
  - Pursue tax incentives, government grants, property tax savings, and legal protections for development in a Brownfield (examples include the Expedited Remedial Action Program and Prospective Purchase Agreements).
- Exterior Air Quality
  - Participate in a climate registry to calculate, verify, and publicly report greenhouse gas emissions.
  - Purchase carbon offsets.
  - Install carbon-offset kiosks where passengers can purchase offsets for their flight and discover the environmental impact of their flight.
  - Purchase materials, goods, and equipment from local sources.
  - Apply for Federal Aviation Administration (FAA) Voluntary Airport Low Emissions Program (VALE) funding for intermodal connections, underground fuel hydrants, alternatively fueled vehicles, etc.
  - Install an intra-terminal people-mover system from remote parking lots, rental car facilities, employee parking, etc. to reduce emissions and roadway traffic.
  - Encourage rental car facilities to use 'ready/return' systems.
  - Enhance airport campus overhead signage and roadway marking/painting (e.g., terminal entrance, parking lots, rental car return).
  - Install fuel vapor recovery systems to limit the escape of gasoline vapors, reducing emissions and conserving liquid gasoline.
  - Install and provide direct access to an underground fuel hydrant system at all aircraft gates.
  - Develop a vehicle inspection program to ensure vehicles are properly maintained and pollution control devices are in place.
  - Monitor bus/commercial vehicle performance, routes, and frequencies through an Automatic Vehicle Identification (AVI) system to verify performance and fuel economy.
  - Improve the fuel efficiency of taxis by requiring lighter/smaller advertisement display boards.
  - Skew parking fees based on carbon; charge higher fees for single occupancy vehicles (SOVs) and lower fees for high occupancy vehicles (HOVs), alternatively fueled vehicles, and hybrid vehicles.
  - Install additional lanes and booths at parking structures.
  - Install 'pay on foot' parking machines.
  - Install a "smart park" system to efficiently utilize garage capacity and reduce emissions from excessive spot searching.
  - Install high-speed or rapid exit taxiways to reduce aircraft taxi distances.

  - Implement a ground management program, leveraging airport surface surveillance data and airline schedules to better manage the taxi-out process, reduce taxi times, and improve efficiency.
  - Design airfield geometry (or reposition runway and taxiway hold lines) such that aircraft idling in the departure queue and ground run-up areas are directed away from surrounding sensitive areas.
  - Encourage aircraft to taxi with less than all engines operating, where appropriate.
  - Encourage aircraft to taxi at idle power or a specified minimum power threshold.
  - Use ground support equipment (GSE) tugs to move aircraft.
  - Use an aircraft rescue and fire fighting (ARFF) training facility to conduct firefighting training exercises.
  - Use propane fuel for the aircraft rescue and fire fighting (ARFF) training center simulation burners instead of conventional gasoline (use a mobile aircraft fire fighting training device (MAFTD)).
- Noise
  - Conduct a noise modeling study.
  - Develop and implement a noise abatement plan.
  - Work with the Federal Aviation Administration (FAA) to enable continuous descent arrivals to reduce emissions and noise.
  - Use area navigation (RNAV) procedures to reduce noise on surrounding land uses.
  - Install a Noise-Monitoring System (NMS).
  - Produce a Fly Quiet Report which scores and awards airport operators.
  - Start a community noise roundtable to help respond to noise issues.
  - Track and respond to all noise complaints.
  - Track noise complaints using a geographic information system (GIS) to better identify where noise problems are occurring surrounding the airport.
  - Develop and implement a residential sound insulation program for residential units located in areas exposed to substantial aircraft noise.
  - Develop and implement a school sound insulation program if any schools are located within areas exposed to substantial aircraft noise.
  - Maintain a community noise resource website.
  - Install acoustical silencers, barriers, and earthen berms.
  - Implement a Preferential Runway Use Policy to minimize noise exposure over sensitive land uses when possible.
  - Encourage airlines to limit the use of aircraft engine reverse thrust after landing (when runway length, pilot judgment, and weather/visibility considerations are optimal).
  - Establish an aggressive land acquisition program to prevent noise-sensitive land use encroachment and preserve green spaces.
  - Work with local realtors to ensure accurate communication of noise levels to home buyers (e.g., real estate disclosures).
  - Replace noisier vehicles and equipment with quieter units.
  - Install mufflers on vehicles and construction equipment.
  - Wrap exterior heating, ventilation, and air conditioning (HVAC) duct work with sound deadening materials.
  - Install a ground run-up enclosure.
  - Designate specific areas on the airfield for aircraft engine run-up operations (pre-flight and maintenance and pre-flight engine checks).
  - Locate mechanical equipment and other sources of noise away from areas of occupancy.
  - Orient the building so that glazed surfaces are not directed toward noise.
  - Install acoustical ceiling tiles, flooring and walls.
  - Install double-pane windows.
  - Use laminated glazing to reduce noise transmission.

Materials and Resources

- Waste Reduction
  - Develop and implement an Integrated Solid Waste Management Plan.
  - Start or enhance a waste reduction or recycling program that includes employees, passengers, and concessions.

  - Develop and implement a Green Concessions Policy.
  - Provide educational training on waste reduction.
  - Participate in a "waste-to-profit" network to identify by-product synergy and material reuse opportunities.
  - Provide food waste collection bins to separate food waste from normal waste.
  - Utilize food waste for composting (off-airport only), biofuels, livestock feed, waste to energy, and other uses.
  - Donate surplus food to charity.
  - Establish mandates, incentives, and/or inspections to encourage tenants to support composting programs.
  - Design waste management to comply with ASTM E2129-05 and the U.S. Environmental Protection Agency's Green Purchasing Guidelines.
  - Conduct a waste composition study (an audit of waste streams) to identify the most common types and amount of waste collected.
  - Work with tenants and contractors to provide recycling data and to establish monitoring and reporting techniques.
  - Install Insulating Concrete Forms (ICFs) to decrease waste, optimize energy performance, and reduce impacts from construction.
  - Develop an inventory list of space allocation, infrastructure and equipment needed to facilitate waste reduction and recycling.
  - Require concessionaires to minimize packaging.
  - Require vendors to eliminate plastic from their service items and packaging.
  - Set up annual or bi-annual clean-up events to collect bulky, non-hazardous items from tenants, airlines, and airport employees for recycling, donation, or disposal.
  - Require airport businesses to use fabric/reusable bags, biodegradable bags, and/or paper bags instead of plastic bags.
  - Recycle used restaurant grease to manufacture biofuel.
  - Recycle coffee grounds as mulch.
  - Use recycled coffee grounds, flour, chili powder, cinnamon, peppermint, and/or black pepper for ant control.
  - Utilize worm boxes in kitchens to reduce leftover food waste.
  - Use reusable coffee/tea mugs, glasses, and water bottles.
  - Use biodegradable plates and cutlery.
  - Install automatic hand towel dispensers in restrooms.
  - Install efficient next-generation hand dryers instead of conventional dryers or paper towels.
  - Change soap dispensers to units that dispense soap foam instead of liquid soap.
  - Implement a toilet paper roll repurposing (re-rolling) program.
  - Switch from normal toilet paper rolls to coreless (no cardboard core) toilet paper rolls.
  - Replace conventional vehicle motor oil filters with reusable oil filters.
  - Install bypass motor oil filters.
  - Reuse or donate existing furniture.
- Office Waste Reduction
  - Minimize the use of printed materials.
  - Integrate information technology (IT) systems to maximize teamwork, transparency and information sharing, including: web directories and links; web based document sharing; web based procurement process, notices/advertisements; and electronic document processing to reduce paper needs.
  - Require electronic submittals.
  - Use electronic pay statements and accounting forms.
  - Designate a majority of printers as general purpose to be loaded with 20 pound or 22 pound weight paper with only one or two printers to be loaded with higher quality paper.
  - Use water pitchers rather than individual plastic bottles during meetings.
  - Track printing to identify errors so that print jobs are not duplicated.
  - Inscribe "printed on recycled paper" on the footers of applicable documents.
  - State "please consider the environment before printing this email" on the footer of all e-mails (and write a similar message on other electronic documents).
  - Only purchase copiers or printers that offer double-sided printing options. Set all print drivers to default to double-sided printing.

  - Recycle used computer systems. Donate or schedule and implement an auction of used computer systems.
  - Contract an electronics reseller service provider to earn revenue for retired computers, monitors, and printers.
  - Print documents in "draft mode" to reduce the use of printer ink.
  - Place recycling bins for printer/copier cartridges and for batteries in offices and terminals.
  - Implement "Paper-Free Fridays," a "Think Before You Print" campaign, and/or similar campaigns to reduce paper and/or materials consumption.
  - Utilize conference calls and web-based conferences when possible to reduce printed materials and to reduce emissions from transportation.
  - Work with waste haulers to negotiate contracts that allow for reduction in waste hauls and increases in recycling hauls in order to leverage cost savings potential that may arise from recycling programs.
  - Establish a document management system so that project files can be submitted and archived electronically.
- Recyclables
  - Recycle aluminum, glass, plastics, paper, newspapers, magazines, phone books, and corrugated cardboard.
  - Recycle gas filters, waste gasoline, motor oil, anti-freeze, scrap metal, tires, electrical wiring, electronics, grease and sludge, hazardous materials and spent solvents, pallets, and wood.
  - Recycle batteries, light bulbs, toner cartridges, and electronics.
  - Increase the number of clearly marked, distinct recycling containers available.
  - Provide liquid disposal stations at security checkpoints.
  - Install bottle refill stations, especially after security checkpoints so that passengers can refill their beverage containers after dumping out liquids to pass through security.
  - Use on-site trash compactors instead of roll-offs to reduce the trips needed to remove municipal solid waste.
  - Require airlines and cleaning companies to have onboard recycling programs.
  - Install an airside recycling center to collect and recycle deplaned waste from arriving aircraft.
  - Provide waste oil containers to pilots (particularly general aviation pilots) for the collection of waste engine oil.
  - Provide general aviation tenants with sump fuel disposal containers.
  - Recycle hot-drained or crushed nonterne-plated used oil filters.
  - Recycle all used oil cans as scrap metal.
  - Recycle aircraft tires, turbine oil, hydraulic fluid, engine oil, carpet, glass and metal from light bulbs, and batteries.
  - Collect used oil for heating purposes in approved burners.
  - Utilize cardboard balers, aluminum can crushers, recycling chutes, and other technologies to enhance recycling activities.
  - Provide cardboard compactors to assist concessionaires with recycling.
  - Strategically locate recycling receptacles and place signs directly adjacent that clearly identifies what can and cannot be recycled.
  - Develop recycling and waste reduction competitions between different departments.
  - Conduct awareness training for the janitorial staff to ensure that recyclables stay segregated from waste.
- Hazardous Materials
  - Develop and implement a hazardous waste management plan for the containment and operational use of hazardous materials.
  - Develop and implement a Spill Prevention Countermeasure and Control (SPCC) Plan.
  - Develop and implement an underground storage tank management plan.
  - Upgrade aging single-wall underground storage tanks with double-wall underground storage tanks.
  - Develop and implement an above ground storage tank management plan.
  - Establish a hazardous waste spill response chain of command with tenant and fuel supplier planners (i.e., pipeline and fuel trucking).
  - Institute solid and fluid waste containment methods and disposal protocols to support minimal or no site contamination.
  - Donate unused paint to the city's graffiti removal program.
  - Implement a centralized hazardous substance management system/library where materials could be purchased or checked out on an as needed basis.
  - Provide sophisticated monitoring for underground fuel hydrant systems.
  - Require off-peak fueling.
  - Develop and submit a Fuel and Lubricants Control Plan.

- Green Purchasing
  - Start or enhance a Green Procurement Program.
  - Participate in the U.S. Environmental Protection Agency's Environmentally Preferable Purchasing Program.
  - Participate in a statewide purchasing alliance with a focus on local procurement.
  - Purchase fair trade products (such as coffee, bags, boxes, artwork, chocolate, sugar, etc.) to build equitable and sustainable trading partnerships and create opportunities to alleviate poverty.
  - Purchase naturally raised, hormone-free and organic ingredients.
  - Purchase bleach-free and chlorine-free paper products.
  - Purchase high post-consumer recycled content paper.
  - Purchase bottles made of biodegradable materials such as ethanol instead of plastic bottles (if bottles are necessary).
  - Purchase vegetable-based inks for printing where appropriate.
  - Purchase reusable/recyclable printer cartridges.
  - Purchase reused furniture from local organizations.
  - Procure only green cleaning and hygiene products (e.g., GreenGuard, Green Seal, Ecologo, etc.).
  - Enforce procurement of motorized vehicles with fuel economies higher than existing values.

Construction

- Construction Scheduling and Sequencing
  - Expedite the completion of the building envelope to minimize moisture exposure to interior surfaces, minimizing the potential for mold.
  - Minimize the extent and duration of bare ground exposure to prevent erosion.
- Logistics
  - Purchase precut and prefabricated components when available and order materials to size in order to reduce waste and haul loads.
  - Require suppliers to make deliveries using sturdy returnable pallets and containers. Have suppliers pick up pallets and empty containers.
  - Provide concrete washout areas to collect and retain concrete washout water and solids in leak proof containers for recycling.
  - Purchase easily stackable units such as cladding systems, curtain walls, steel beams, etc. to reduce transportation costs to the site.
  - Use a raised floor system to reduce data and communication installation costs and allow for easier, more economical moves and space reconfiguration.
  - Closely coordinate deliveries of construction materials with scheduled installation times ("just in time" deliveries) to reduce staging requirements.
- Construction Waste Management
  - Develop and implement a Construction Waste Management Plan that requires and tracks recycling of (at a minimum) land-clearing debris, cardboard, metal, brick, concrete, asphalt, plastic, wood, glass, gypsum wallboard, carpet, and insulation.
  - Develop a balanced earthwork plan and keep excavated soil on-site to reduce off-site hauling.
  - Use portable concrete/asphalt crushers or operate concrete crushing/recycling plants on-site to facilitate reuse of materials in other construction projects.
  - Designate specific on-site areas for recycling construction waste materials.
  - Include in all contract documents the minimum quantities of excess materials that will be accepted for return by the vendor and the required conditions of such material.
  - Recycle non-contaminated drywall by grinding, spreading, and tilling it on open land (away from aircraft movement areas) at a rate of approximately five tons per acre if no local markets exist for recycling it.
  - Use excess asphalt paving material to fix surrounding roads, parking lots, etc.
  - Use concrete chunks, old bricks, broken block and other masonry rubble for backfill along foundation walls, parking stops, jersey barriers, etc. (where permitted).
  - Use pre-assembled rebar cages to reduce on-site rebar waste.
  - Use large panel formwork systems to reduce concrete waste generated by losses due to damaged formwork.

  - Reduce packaging waste through vendor participation using bulk packaging techniques or choose products with minimal or no packaging.
  - Encourage alternative sustainable packaging techniques (e.g., metal strapping in preference to shrink-wrap, paper packaging as opposed to plastic and shredded paper as opposed to foam).
  - Do not use temporary wood structures.
  - Use sight and sound barriers made of lightweight panels that can be easily installed, maintained, and replaced.
  - Reuse items such as electrical boxes, wire spools, breaker equipment, wall outlets and other equipment.
  - Save worn out NiCad (nickel–cadmium) batteries from portable power tools for delivery to a specialized battery-recycling site.
  - Determine the disposal cost, hauling cost, and revenue generated from reusing materials on-site and compare that with the cost of purchasing new items.
- Recycled Content
  - Establish project goals for recycled content materials and identify material suppliers that can achieve this goal.
  - Identify the value of both the post-consumer recycled content and the post-industrial content, defining recycled content materials in accordance with the Federal Trade Commission's *Guides for the Use of Environmental Marketing Claims*, 16 CFR (Code of Federal Regulations) Part 260.
  - Provide fact sheets to designers that include available recycled content materials and the target for each material.
  - Purchase concrete materials that contain recycled content, such as aggregate cast-in-place concrete, fly-ash cast-in-place concrete, and bituminous concrete pavement.
  - Purchase recycled content materials for the following major building components: unit pavers; steel reinforcement; structural steel; miscellaneous steel; steel fencing and furnishings; unit masonry; ductile iron pipe; aluminum products; railroad rails; railroad ties; railroad track base material; steel doors and frames; aluminum doors and windows.
  - Purchase recycled content materials for the following internal building components: plaster; terrazzo; acoustical ceilings; drywall; finish flooring including carpet, resilient flooring, and terrazzo; toilet and shower compartments; special furnishes; equipment; sheet metal ductwork; and site lighting.
  - Develop an acquisitions policy for furniture and building fixtures with high recycled content.
  - Use recycled/reused rubber, glass, agricultural fibers, and plastic for flooring.
  - Install carpet tiles from post-industrial nylon that are reusable and recyclable.
  - Use ceramic tile containing post-consumer or post-industrial waste.
  - Use telecommunications cabling and electrical device wall plates that have a high percentage of recycled plastic.
  - Ensure that the specified recycled content materials are installed and quantify the total percentage of recycled content materials installed.
- Local/Regional Materials
  - Use the following locally/regionally available materials: concrete, asphalt, structural steel, masonry, post-industrial recycled gypsum wallboard, storm system concrete pipes of all sizes, manholes and handholes, electrical ductbanks, cable, gas and water piping, rail tracks, rail ties, rail ballast, landscape material and seed.
  - Establish a goal for the minimum percentage of local/regional materials and products that are manufactured regionally within a radius no greater than 500 miles (designate a shorter radius where possible; e.g., 250 miles).
  - Identify materials and material suppliers that can achieve the regional materials goal.
- Rapidly Renewable Materials
  - Use the following rapidly renewable materials for both permanent and temporary construction materials: poplar oriented straw board (OSB) or "agriboard" (formwork for temporary construction and underlayment); bamboo flooring; cork; wool carpets and fabrics; cotton-batt insulation; linoleum flooring; sunflower seed board; wheat grass or straw board cabinetry and others.
  - Install clay roof tiles which are made from abundant raw materials and carry effective heat gain characteristics (for cool climates).
  - Use paper joint tape in lieu of fiberglass tape.
  - Establish a project goal for the utilization of rapidly renewable materials.
- Wood
  - Establish a Forest Stewardship Council (FSC) certified wood products goal and identify suitable suppliers.
  - Use Forest Stewardship Council (FSC) products in temporary and permanent construction materials and finished products.

  - Do not use creosote-coated lumber.
  - Do not use chromate copper arsenate (CCA) pressure-treated lumber.
  - Do not use extruded polystyrene (XPS) rigid board insulation.
  - Do not use fiberglass insulation that contains phenol-formaldehyde binders.
- Structure and Building Reuse/Salvaging
  - Reuse existing structures and/or building components.
  - Reuse existing runway pavement.
  - Plan for the reuse (and temporary storage) of equipment, facilities, and materials from one project to another; track cost savings.
  - Quantify the extent of structure and building reuse.
  - Remove elements that pose a contamination risk prior to reusing structures.
  - Advertise salvage activities prior to demolition to encourage salvaged materials reuse.
  - Use a public information website or other means to list salvaged materials to offer for sale or donation.
  - Donate project waste that cannot be reused or salvaged to a cooperating agency.
  - Conduct detailed assessments to better understand materials or equipment that are salvageable versus recyclable.
- Deconstruction, Disassembly, and Flexible Use of Space
  - Plan for deconstruction, disassembly, and flexible use of space for systems, components, and structures.
  - Design for current needs with the ability to expand into the future. Do not oversize components during the initial design phase to account for future build-out.
  - Allow adequate time for deconstruction activities.
  - Specify detailed terms of deconstruction in bid documents.
  - Evaluate the potential reuse of deconstructed mechanical, electrical, and plumbing systems.
  - Purchase ceiling tile and carpeting from companies that recycle and/or reuse deconstructed carpet and tiles.
  - Detail electrical/utility connections for disassembly and/or upgrades and ensure they are accessible; provide instructions.
  - Minimize the use of chemical (adhesive) connectors; instead use friction-based connectors.
  - Design electrical and fiber optics, other wiring, and the heating, ventilation, and air conditioning (HVAC) system in such a way that it is flexible to expand or downsize it.
  - Design air conditioner roof units so additional units may be placed if necessary in the future.
  - Design for additional temperature, electrical, sprinklers and communication zones in a large space so that future renovation work will not disrupt services.
  - Place entrances and corridors to spaces in such a way that future uses may utilize existing egresses.
  - Evaluate the structure and component life cycle prior to purchasing materials/equipment.
  - Create flexible and diverse workspaces to enable expansion.
  - Select fittings fasteners, adhesives and sealants that allow for quicker disassembly and facilitate the removal of reusable materials.
- Construction Vehicle Emissions Reduction
  - Replace aging construction equipment with new low emission models.
  - Install low emission engines into old equipment chassis.
  - Perform routine maintenance to maintain original vehicle emission levels.
  - Install particulate filters on construction vehicles.
  - Install diesel oxidation catalysts (DOC) on construction vehicles.
  - Use the best available retrofit technology as approved by the U.S. Environmental Protection Agency and/or the California Air Resources Board (CARB).
  - Develop a Tier compliant and retrofit program for construction vehicles (e.g., retrofit all pre-Tier, Tier 1 and Tier 2 construction vehicles).
  - Provide retrofit allowances for construction equipment.
  - Maintain an inventory of all installed retrofit equipment and emissions reduction devices to ensure goals or guidelines are achieved and for documentation and marketing purposes.
  - Develop a vehicle inspection program to ensure pollution control devices are in place.
- Construction Materials Conveying
  - Use an overland conveyor system to transport construction materials from stockpile areas.
  - Use biodegradable hydraulic elevator oils for conveyors.

- Construction Noise and Acoustical Quality
  - Establish construction vehicle speed limits to minimize noise and dust.
  - Require contractors to submit sound reduction construction plans to mitigate unwanted construction noise and vibration.
  - Locate mechanical equipment and other sources of noise away from noise-sensitive land uses.
  - Install noise barriers.
  - Use rubber tired equipment in lieu of track equipment to reduce noise levels.
- Foundations
  - Add polyethylene vapor retardant under the floor slab to reduce the potential for mold.
  - Install a layer of gas-permeable material under the foundation (usually four inches of gravel).
  - Provide a capillary break (dampproofing or membrane) between the footing and foundation wall or perimeter foundation for slab-on-grade.
  - Install drainage tile at foundation footings.
- Other Construction Equipment/Materials
  - Install freight elevators as early as possible and coordinate building enclosure at the elevator shafts to minimize temporary hoisting needs.
  - Use localized hot water equipment rather than centralized equipment to reduce transmission loss and improve efficiency.
  - Use a Global Positioning System-based earthmover to enable machines to get to grade with fewer passes, using less fuel, incurring less wear, improving safety, and reducing costs.
  - Install pipes with acoustic measuring devices to detect vibrations and/or sound waves in pipelines, indicating defects.
  - Require early installation of permanent electrical systems to minimize the number of temporary circuits needed for construction.
  - Use soundless demolition chemical agents (SCDA) as a substitute for explosives.
  - Install moisture resistant greenboard and mold resistant purpleboard.
  - Conduct periodic monitoring for mold and asbestos.
  - Use bio-based transformer fluids.
- Construction Equipment Maintenance
  - Use recycled oil, biodiesel-based oils and hydraulic fluid, non-toxic lubricants, and other environmentally friendly maintenance agents.
  - Require contractors to submit a pre-construction plan to recycle oil and use environmentally friendly maintenance agents during construction.
  - Maintain current Material Safety Data Sheets (MSDS) on-site.
- Construction Indoor Air Quality (IAQ)
  - Develop and implement an Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building.
  - Appoint an Indoor Air Quality (IAQ) manager who will identify problems and methods of mitigation.
  - Communicate the hazards of Indoor Air Quality (IAQ) with construction workers during health and safety meetings.
  - Meet or exceed the recommended *Design Approaches of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) Indoor Air Quality (IAQ) Guidelines for Occupied Buildings Under Construction.*
  - Sequence the installation of materials to avoid contamination of absorptive materials such as insulation, carpeting, ceiling tile, and gypsum wallboard.
  - Conduct a two-week building flush-out with 100 percent outside air after construction ends and prior to occupancy.
  - Do not operate (or impose strict limits on the operation of) air handling equipment during construction.
  - Use filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 at each return air grill if air handlers are used during construction.
  - Replace all air filter media used during construction at least two weeks prior to building occupancy, subsequent to building flush-out.
  - Install filtration media with a Minimum Efficiency Reporting Value (MERV) of 13 for media installed after construction.
  - Use ventilation systems overnight to purge the work area.
  - Use a desiccant dehumidifier to remove humidity and control moisture levels during installation of interior finishes.
- Dust Control
  - Develop and implement a Construction Dust Control Plan.
  - Cover soil stockpiles or areas under active construction during rainfall, high wind, and at night.

  - Stabilize access roads, subdivision roads, parking areas, and other on-site vehicle transportation routes immediately after grading and frequently maintain them to prevent erosion and control dust.
  - Require haulers to cover truck beds for dust suppression.
  - Alter construction scheduling to limit activity during high winds and poor air quality conditions.
  - Water down loose materials and exposed earth (with non-potable water) during construction.
  - Spray down truck wheel wells (with non-potable water) and use rumble strips before exiting the construction site.
  - Require truck beds to maintain at least two feet of freeboard for dust suppression.
  - Perform regular street sweeping during construction.
  - Use integral dust collection systems on drywall sanders, cut off saws and routers.
  - Use wet rags, damp mops, and vacuum cleaners with high-efficiency particulate absorption (HEPA) filters to clean dust.
  - Require employees and/or contractors to wear respirators and masks during certain dust/hazardous conditions.
- Minimize Site Disturbance During Construction
  - Delineate the site perimeter to prevent disturbance beyond the construction area and flag all environmentally and socially sensitive areas.
  - Brief all contractors and sub-contractors on access road and staging area locations.
  - Ensure that truck/vehicle washing is on a paved or crushed stone pad to drain into a sediment trap or basin.
  - Designate truck and vehicle cleaning areas to manage or collect wastewater.
- Construction Traffic Control
  - Coordinate with state and local transportation agencies to plan construction routes and to avoid vulnerable roadway areas.
  - Work with local radio affiliates to announce construction traffic alerts/reports on local radio stations.
  - Display construction traffic information on signage near the airport.
  - Release a construction project outlook report to local media outlets to provide advanced notice of any modifications to existing streets and intersections and provide information on truck haul routes in use.
  - Immediately repair any construction-related roadway damage.
- Construction Health and Safety
  - Appoint a health and safety manager for the construction site.
  - Develop a site-specific health and safety plan that identifies all potential hazards and steps taken to mitigate accidents.
  - Include a reference to the Occupational Safety and Health Act (OSHA) General Duty Clause (29 CFR 1903.1) in all project bid specifications.
  - Perform an environmental site assessment and industrial hygiene review prior to construction.
  - Require one or more member(s) of the construction field team to have CPR/First Aid certification.
  - Post signs reminding construction workers of the long-term health risks from exposure to particulates and the unknown toxins attached to particulates.
  - Use personal air monitoring systems during construction to sample airborne contaminants and compare them to permissible exposure limits published in health and safety standards.

Abbreviations and acronyms used without definitions in TRB publications:

A4A	Airlines for America
AAAE	American Association of Airport Executives
AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ACI–NA	Airports Council International–North America
ACRP	Airport Cooperative Research Program
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	American Trucking Associations
CTAA	Community Transportation Association of America
CTBSSP	Commercial Truck and Bus Safety Synthesis Program
DHS	Department of Homeland Security
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
HMCRP	Hazardous Materials Cooperative Research Program
IEEE	Institute of Electrical and Electronics Engineers
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
MAP-21	Moving Ahead for Progress in the 21st Century Act (2012)
NASA	National Aeronautics and Space Administration
NASAO	National Association of State Aviation Officials
NCFRP	National Cooperative Freight Research Program
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
PHMSA	Pipeline and Hazardous Materials Safety Administration
RITA	Research and Innovative Technology Administration
SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)
TCRP	Transit Cooperative Research Program
TEA-21	Transportation Equity Act for the 21st Century (1998)
TRB	Transportation Research Board
TSA	Transportation Security Administration
U.S.DOT	United States Department of Transportation