The Intersection of Sustainability and Resiliency;

What Does it Mean and How Can You Leverage the Interest?
RESILIENCY AND SUSTAINABILITY
Leveraging the Intersection

1. COMMON TERMS
Common language leads to consistent understanding and outcomes.

2. THE INTERSECTION
Resiliency at its core is a risk based approach to airport operation and maintenance. Does an increase in Sustainability Improve Resiliency?

3. INTEGRATED OUTCOMES
Developing an integrated decision framework enhances priorities and outcomes

4. TOOLS AND REFERENCES
References and Tools to Facilitate the Discussion
MISTAKES

It Could Be that the Purpose of Your Life Is Only to Serve as a Warning to Others.
Resiliency
- Organizational Resilience is “the ability of an organization to anticipate, prepare for, respond and adapt to incremental change and sudden disruptions in order to survive and prosper”.

Sustainability
- Sustainability focuses on “meeting the needs of the present without compromising the ability of future generations to meet their need”.

Maintainability
- The probability that a system or system element can be repaired in a defined environment within a specified period of time. Increased maintainability implies shorter repair times or availability.

Availability
- The probability that an item is operational at a given point in time under a given set of environmental conditions. Availability depends on reliability and maintainability.

Risk
- A probability or threat of damage, injury, liability, loss, or any other negative occurrence that is caused by external or internal vulnerabilities, and that may be avoided through preemptive action.
Pop Quiz

• How many Airports in the United States have a **Backup Water Supply** on Airport?

• What is the **difference** between **redundancy** and **diversity** (Can you have one without the other)?

• How many airports have **dual electrical feeds** from diverse sources?

• What is the target operational window for a **domestic military installation** to be off-grid?

• What is the target operational window for a **US Embassy** to be off-grid?

• Does **ACARS** work on the ground?
The business was growing so quickly it was getting new customers faster.

**Availability**

The business was growing so quickly it was getting new customers faster.

**Sustainability**

The business was growing so quickly it was getting new customers faster.

**Resiliency**

The business was growing so quickly it was getting new customers faster.

**Maintainability**

The business was growing so quickly it was getting new customers faster.
# Examples

<table>
<thead>
<tr>
<th>Investment</th>
<th>Resiliency</th>
<th>Sustainability</th>
<th>Maintainability</th>
<th>Availability</th>
<th>Risk Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add On-Site Solar</td>
<td>Bad</td>
<td>Good</td>
<td>Bad</td>
<td>Bad</td>
<td>Bad</td>
</tr>
<tr>
<td>Develop Diverse Utility Sources</td>
<td>Good</td>
<td>Bad</td>
<td>Bad</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Install a Micro-Grid</td>
<td>Good</td>
<td>Good</td>
<td>Bad</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>SCADA Controls for all Vertical Transportation</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Natural Lighting (Lots of Windows)</td>
<td>Neutral</td>
<td>Good</td>
<td>Bad</td>
<td>Neutral</td>
<td>Neutral</td>
</tr>
<tr>
<td>IoT Sensors for all Electrical and Mechanical</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Store 500 5-Gallon Buckets</td>
<td>Good</td>
<td>Bad</td>
<td>Neutral</td>
<td>Good</td>
<td>Good</td>
</tr>
</tbody>
</table>
Performance Metrics and KPIs

(at Facility, Site or Portfolio Level)

**Near Term Indicators**

- Mission Availability
  - Facility Operational Availability (His Actual vs His Planned)
    - Critical System Maintenance Complete
    - Critical AM Personnel Available
  - Site Operational Availability (His Actual vs His Planned)
    - Critical Site Personnel Available
    - Critical System Maintenance Complete

- Standards Compliance
  - Public Sector Requirements
  - DOS Performance Requirements
    - FAM/FAM/DS Requirements Met
    - Minimum Required Data Elements

- Occupant Satisfaction
  - Occupant Survey Results
  - Occupant Trouble Calls

- Economic Efficiency
  - Investment Costs / GSF Hrs Use
    - Initial Cost / GSF Hrs Use
    - Ongoing Cost / GSF Hrs Use
  - Operations Costs / GSF Hrs Use
    - Utility Cost / GSF Hrs Use
    - Site Cost / GSF Hrs Use
  - Maintenance Costs / GSF Hrs Use
    - Planned Cost / GSF Hrs Use
    - Unplanned Cost / GSF Hrs Use

**Long Term Indicators**

- Total Cost of Ownership (TCO/GSF by Facility Type)
  - (Derived from Economic Efficiency x Years of Use)
- Effective Useful Life
  - Actual versus Planned Useful Life
  - Effective Useful Life by System
  - Effective Useful Life by Equipment
Facility Management Demystification

What my friends think we do

What my Mom thinks we do

What society thinks we do

What airports think we do

What I think we do

What we really do !!!
Risk Informed Resiliency

Choices

- Do Nothing
- Redundancy
- Hardening
- Contingency

Consequence

Probability

Low

High

Do Nothing

Redundancy

Hardening

Contingency
### Resiliency Benefit Cost Ratios

<table>
<thead>
<tr>
<th>National Benefit-Cost Ratio Per Peril</th>
<th>Exceed common code requirements</th>
<th>Meet common code requirements</th>
<th>Utilities and transportation</th>
<th>Federally funded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Hazard Benefit-Cost Ratio</td>
<td>4:1</td>
<td>11:1</td>
<td>4:1</td>
<td>6:1</td>
</tr>
<tr>
<td>Riverine Flood</td>
<td>5:1</td>
<td>6:1</td>
<td>8:1</td>
<td>7:1</td>
</tr>
<tr>
<td>Hurricane Surge</td>
<td>7:1</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td>Too few grants</td>
</tr>
<tr>
<td>Wind</td>
<td>5:1</td>
<td>10:1</td>
<td>7:1</td>
<td>5:1</td>
</tr>
<tr>
<td>Earthquake</td>
<td>4:1</td>
<td>12:1</td>
<td>3:1</td>
<td>3:1</td>
</tr>
<tr>
<td>Wildland-Urban Interface Fire</td>
<td>4:1</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td>3:1</td>
</tr>
</tbody>
</table>
Resiliency Benefit Cost Ratios

- San Francisco, California 24:1
- Los Angeles, California 23:1
- Seattle, Washington 7:1
- Salt Lake City, Utah 7:1
- Portland, Oregon 3:1

**Benefit: $7 billion**

- 43% – Property: $3
- 29% – Additional living expenses and direct business interruption: $2
- 14% – Deaths, injuries, and post-traumatic stress disorder: $1
- 14% – Indirect business interruption: $1
- 0.3% – Urban search and rescue: $0.02

Billions 2018 USD

**Cost: $0.6 billion**

*Figure 2-24. Sources of savings from I-Code adoption for earthquake.*
Best Practices – Resiliency Strategy
References/Additional Information

- National Institute of Building Sciences (NIBS)
  https://www.nibs.org/
- Federal Emergency Management Agency (FEMA)
  https://www.fema.gov/resilience
- Environmental Protection Agency (EPA)
  https://www.epa.gov/waterfinancecenter
- Airports Council International (ACI)