



# NAC Executive Insights

## Sustainability Utilizing a Program Management Approach

### Key Points

- Financial, social, and environmental outcomes define the three elements of sustainability.
- Large programs, comprised of multiple inter-related projects, present new challenges and opportunities from a sustainability perspective.
- Elements of sustainability are increasingly a fundamental requirement to undertake large capital construction programs.
- Owner's and program manager's focus must shift to a more comprehensive life-cycle perspective.
- Sustainability is lacking an obvious and measurable common "currency" (monetary or non-monetary) for expressing the magnitude of all the good and bad produced.
- In many industries, securing this "social license to operate" is key to a program's success.
- Social sustainability issues are program-wide and not geographically bounded.

### Introduction

Large, complex engineering and construction programs may be found in all industry sectors. Such projects range from extractive industries such as oil, gas, and mining to infrastructure programs for transportation, water, and power. Common to all of these is the potential to influence financial, social, and environmental performance of the implementing organizations, as well as the communities and stakeholders they touch, either positively or negatively.

Together, financial, social and environmental outcomes define the three elements of sustainability or a program's "triple bottom line." The triple bottom line is a phrase coined by John Elkington in 1994 and introduced in his 1999 book, *Cannibals with Forks*.



An owner or program manager has many reasons to practice sustainability including:

- Reduced costs and waste.
- Reduced liability, emissions, and environmental hazards.
- Efficient and effective management and disposal of materials.
- Enhanced image in communities and a role model for others.
- Short-term and long-term corporate responsibility as it safeguards the interests of society and the environment.

Large programs, comprised of multiple inter-related projects, present challenges and opportunities from a sustainability perspective driven by scale, complexity, and the opportunity for leverage of the efforts over the collective.

The life-cycle focus encouraged by good sustainability practice reinforces the approach discussed below.

In this Executive Insight, some of the challenges and opportunities programs present are examined, as well as a look at a framework for application of sustainability principles in a program management approach.

## **Developing a Sustainability Framework in Context with the Triple Bottom Line of People, Profit, and the Planet**

Management of sustainability from a program perspective must be built on:

- Recognizing the major elements of sustainability are increasingly a fundamental requirement to the successful undertaking of large capital construction programs. Sustainability drivers include not only the owner’s and program manager’s commitment to sustainability, but also legal, regulatory, or referenced standards requirements. In some industries these considerations in effect comprise the “social license to operate.”
- Recognition that the owner’s and program manager’s focus must go well beyond a first-cost or first-delivery perspective, shifting to a more comprehensive life-cycle perspective. This broader life-cycle framework increasingly lends itself to owner–program manager relationships more akin to alliancing or framework agreements.
- Understanding there is “no single solution to the equation,” but rather that a set of balanced solutions exist. This is the “sweet spot,” labeled as “sustainability” in the preceding figure.
- Changing to management and execution approaches, which reinforce many of the best practices found in well-executed programs. The changed approach rests squarely on the adoption of a systems perspective. The approach is more holistic with project and issues clearly defined and increased, broad stakeholder engagement.
- Applying this sustainability framework in all program and project phases. Phases begin with the establishment of strategic business outcomes (SBOs), then extend through strategy development, project selection, and project definition. Of course, the framework also is present in project delivery including study, pre-feasibility, design, procurement, construction, and commissioning. Ultimately it goes into operations, maintenance, and eventual decommissioning.

<b>Sustainability Framework for Large Engineering &amp; Construction Programs</b>
<b>Major elements of sustainability are a fundamental requirement.</b>
<b>Focus goes beyond first cost to a comprehensive life-cycle perspective.</b>
<b>Set of balanced solutions exist.</b>
<b>Management and execution approach is based on systems approach.</b>
<b>Sustainability framework exists in all program and project phases.</b>

### **Economic Bottom Line**

The financial benefits that can accrue to the owner in a large program derive from the opportunities of leverage and include:

- Allocation or virtualization of portions of project labor to lower cost locales.
- Acceleration or schedule modification of engineering and other program activities through workshare approaches that act to expand the available labor pool.
- Standardization to reduce overall supply chain size and spare part inventories.
- Maximization of preassembly and modularization efforts by treating as client-furnished materials (CFM) to multiple projects.
- Craft training of the shared labor pool, elevating overall safety awareness and consistency while improving productivity for the program's benefit in ways that may not be justified on a project-by-project basis.
- Design efforts better focused on project execution and life-cycle cost reduction.
- Capturing and sharing lessons learned and best practices on a programmatic basis for the benefit of all program contractors.
- Risk consolidation opportunities, including commodity hedges, exchange rate risk retention and hedging, and contractor or owner provided insurance wrap-ups across the supply chain.
- Facilitating smaller supply chain activity with augmented supplier quality assurance assistance.
- Early input gathering on the eventual operations & maintenance (O&M) requirements on a programmatic basis.
- Early strategic supplier involvement in the overall design process to allow for better life-cycle optimization.
- A facilitated comprehensive life-cycle analysis for design and construction.

## Thinking with Sustainability in Mind

A manufacturer's plant utilized a liquid circulated through a standard pumping loop. A top company designed this standard pumping loop with pumps requiring 95 horsepower. A life-cycle, systems-based approach was used to reduce power requirements to 7 horsepower. A life-cycle based systems approach reduced first cost and life-cycle power costs by 92 percent. How was this accomplished?

- **Larger pipes reduced friction and pumping energy**

Larger pipes cost more, which is a traditional tradeoff. However, smaller pumps cost less from a total systems perspective. The first cost is less, and the life cycle cost is also reduced.

- **Make pipes short and straight in first layout and then position equipment**

Less piping and fittings causes less friction, allows for smaller pumps and easier to insulate.

With a linkage between economic and social perspectives, the program can bring direct benefits to affected communities through:

- Procurement of local goods such as local construction materials and tools adds income in immediate areas of the project, thereby contributing to the local tax base through sales tax.
- Creation of a local service base of personnel to support the facility during O&M phases of the facility.
- Anti-corruption measures of the program support the societal needs of integrity and abidance to the law.
- Close ties to social opportunities and benefits of the program result in the areas of human advancement, stable business environments, and support for community service.

## Social Bottom Line

Standards exist that identify indicators of social performance as well as methodologies for measuring and auditing performance along these indicators. These include standards such as Global Reporting Initiative (GRI), SA 8000 from Social Accountability International, AA 1000 from Accountability, and parts of various ISO standards.

What is lacking is an obvious and measurable common “currency,” either monetary or non-monetary, for expressing the magnitude of all the good and bad produced by a firm’s operations and the affected individuals in various stakeholder groups. This lack of a singular metric makes it harder for a program manager to “sum” the social impacts and benefits across a program. Ultimately, it makes it difficult to drive the tracking and monitoring of a multiplicity of metrics indicative of broader program performance in the social dimension. Sample social metrics are reflected in the following table.

Social Metrics	
<b>Diversity</b>	Existence of equal opportunity policies or programs
	Percentage of senior executives who are women
	Percentage of staff who are members of visible minorities; sexual orientation percentage
	Percentage of staff with disabilities
<b>Industrial Relations</b>	Percentage of employees represented by independent trade union organizations or other bona fide employee representatives
	Percentage of employees covered by collective bargaining agreements
	Number of grievances from employees
<b>Child Labor</b>	Whether contractors are screened (or percentage screened) for use of child labor
<b>Community</b>	Earnings donated to the community
	Use of local contractors and suppliers
	Involvement in projects with value to the greater community

The program manager’s social responsibility program must be guided by an overarching set of principles based on values and purpose, accountability, transparency, ethics, respect for stakeholders, the rule of law, and respect for the norms of behavior and human rights.

While many of these will be the subject of local, national, and international law, the program manager together with the owner must establish a practice above reproach and ensure its adoption and implementation by all contractors involved in the program. Aberrant behavior by one contractor can undermine all of the good work undertaken to demonstrate social responsibility.

Increasingly in many industries, securing this “social license to operate” is key to a program’s success.

Social Responsibility Principles
Values and purpose
Accountability
Transparency
Ethics
Respect for stakeholders
Rule of law
Norms of behavior
Human rights

**“You don’t get your social license by going to a government ministry and making an application or simply paying a fee. It requires far more than money to truly become part of the communities in which you operate.”**

*— Pierre Lassonde, President, Newmont Mining Corporation*

ISO 26000 – Social Responsibility lays out a number of areas requiring the program manager’s attention. Among these is involvement in and development of the communities affected by the program. It is important for the program manager to recognize these may all not be at the final project locations, but could also include major manufacturing, logistics, or module assembly sites far away from the final project location. Much like risks and opportunities, social sustainability issues are program wide and not geographically bounded.

The program may become involved in community engagement and development in a number of different ways, including through social, health, and education programs; job creation; and enhancement of community-based skills and organization building, including technology transfer to local enterprises.

<b>Community Involvement Focus Areas</b>
<b>Social development</b>
<b>Education</b>
<b>Job creation</b>
<b>Capacity development</b>
<b>Community engagement</b>
<b>Health</b>
<b>Technology transfer and organization building</b>

The program’s social responsibility efforts can include:

- Procuring local services, including employment of local specialty contractors such as a steel fabricator or an HVAC contractor, providing environmental benefit of reduced travel time resulting in reduced energy consumption, and incorporating a mentor-protégé program.

- Performing supplier prequalification surveys such as querying whether procedures exist to prevent discrimination and harassment and querying existence of certifications such as ISO 14001.
- Also, are there processes precluding child or compulsory labor, reducing work-related injuries, and reducing construction waste sent to landfill that can result in reducing truck noise in communities?
- Additionally, are there established programs for conducting craft worker training programs, providing training facilities for craft personnel, providing training for projects in remote locations, and developing owner's local staff capabilities? These projects also typically provide a huge learning environment for careers in STEM for students of all age
- Increasingly, social justice is a core focus area in society as a whole. Attention to the needs of the personnel involved with the project and community where they work and live is important.

## Capacity Building through Craft Training and Mentor-Protégé Programs

Training, technology transfer, and organizational development are not confined to the owner's staff. Recognize the broader societal objectives as well as the opportunities created through the program.

- **Craft training** – The implementation and longer term maintenance of the program's facilities will often require the local construction industry to expand its skills base to include specialized skills associated with the program. In addition, increased attention to safety is paramount in a program of scale since construction-related accidents can be a primary cause of project disruption. Craft certification programs can be used to create a permanent, local craft pool to meet operating phase requirements.
- **Mentor-protégé program** – This program will identify targeted areas with a long-term requirement for subcontracting to local contractors. These subcontract requirements, to be incorporated into the various design and construction procurement packages, would require a best efforts approach by prime contractors and participation in a formal mentor-protégé program. Key elements in the implementation of the program would be:
  - Breaking out contract work items into economically feasible units.
  - Conducting capacity surveys and targeting local business participation in pre-bid and informational meetings while also soliciting local business concerns as early in the acquisition process as practical.
  - Providing interested small businesses with adequate and timely information about the plans, specifications, and requirements for performance of the prime contract to assist them in submitting a timely offer for the subcontract.
  - Assisting interested local businesses in obtaining bonding, lines of credit, required insurance, necessary equipment, supplies, materials, or services.
  - Requiring prime contractors in targeted areas to participate in a formal mentor-protégé program with one or more local business protégés that results in developmental assistance to the protégés.

## Environmental, Health and Safety Bottom Line

Large projects require cognizance of the requirements and guidance contained in the ISO 14000 family of standards. Increasingly these standards may be directly included in project contracts. The following table identifies the standards that comprise the ISO 14000 family of standards.

ISO 14000 Family of Standards	
<b>ISO 14001</b> Environmental management systems	Requirements with guidance for use
<b>ISO 14004</b> Environmental management systems	General guidelines on principles, systems, and support techniques
<b>ISO 14015</b> Environmental assessment of sites and organizations	
<b>ISO 14020</b> series (14020 to 14025)	Environmental labels and declarations
<b>ISO 14031</b> Environmental performance evaluation	Guidelines
<b>ISO 14040</b> series (14040 to 14049), <u>LifeCycle Assessment, LCA</u>	Discusses pre-production planning and environment goal setting.
<b>ISO 14050</b>	Terms and definitions.
<b>ISO 14062</b>	Discusses making improvements to environmental impact goals.
<b>ISO 14063</b> Environmental communication	Guidelines and examples
<b>ISO 14064</b> Measuring, quantifying, and reducing <u>Greenhouse Gas</u> emissions.	
<b>ISO 19011</b>	Specifies one <u>audit protocol</u> for both 14000 and 9000 series standards together

On a portfolio of projects or programs utilizing a broad-based program management approach, the importance of attention to environmental sustainability continues to be heightened. Multiple projects managed in an uncoordinated way may cause total environmental impacts from the program to exceed threshold limits. Additionally, various emissions and discharges, while on average may be within acceptable levels, may also reach unacceptable levels if discharges by multiple projects coincide or overlap in unanticipated or unacceptable ways.

Comprehensive attention to the environmental, health, and safety bottom line will not only help eliminate these unintended consequences, but can identify opportunities for performance enhancement in each of these areas on a programmatic basis.

The environmental bottom line facts associated with large engineering and construction programs include the following:

- Estimated that 25 percent of construction materials are waste.
- Estimated that 20 percent of landfill volume are due to construction waste.
- Construction consumes estimated 40 percent of extracted resources in developing countries.
- Construction consumes estimated up to 40 percent of generated energy in world.

Large programs utilizing a program management approach have an opportunity to change this paradigm by undertaking program-wide efforts that may be financially prohibitive on a project-by-project basis. Examples of some of these environmental opportunities that a program management approach may facilitate include:

- Return of unused materials to suppliers
- Return of equipment packaging to suppliers
- Use of fly ash in concrete
- Conservation of water
- Conservation of energy
- Use of recycled materials
- Recycling of waste
- Remediation projects
- Use of environmentally preferred products such as eco-labels or green certifications
- Engineer projects with sustainability in mind to lower emissions or use of recirculation for process water

Programmatic consideration of health and safety is equally important in large programs.

Anecdotal evidence from many project managers within multiple organizations holding strong safety cultures demonstrates that delivery of a safe project goes hand-in-hand with lower disruptions of project work, higher worker morale, and more efficient execution practices including managing fatigue. Documented financial improvements from reduced worker compensation claims also exist. Similarly, safety improvements in analogous industries are viewed as having positively contributed to improved productivity.

Common drivers of safety and productivity include better planning, increased focus on identifying and managing risks of all types including safety and non-safety challenges, control of the disruptive effects of unwanted changes and events, and improvements in project execution practices. Communication is an essential part of the safety culture.

On large programs, the effects of disruption behaves in nonlinear ways. Deterioration of a common safety culture and unacceptable safety practices or poor safety performance can spill over into the other projects comprising the program. It is essential for the owner and program manager to work together to create an environment of safety awareness by getting everyone involved and engaged in each other's safety, generating safety talk leading to safe work practices, and maintaining a safety incentive and reward system. Emotional well-being is important to an overall safe work environment. The safety program must have a solid foundation, starting with the top program executives from all contractors, consultants, and owner's teams.

This last point cannot be overstated. Owner commitment to safety is essential to successfully implementing a program-wide safety program. The owner cannot simply be involved, but must live the safety culture desired.

The program manager must ensure that any system, structure, or component that could jeopardize the health and safety of the work force or the general public must be able to comprehensively demonstrate that all management, quality, and safety processes have been rigorously applied. These efforts must include not just permanent structures and outcomes, but temporary ones as well.

The program manager must ensure that design responsibility for any temporary works is clarified, in particular for any temporary works benefiting multiple projects in the program. Safety staff should be engaged early in program development and safety reviews of preliminary designs conducted in parallel with constructability reviews.

Programmatic consideration of safety should include the interaction at a human and physical level between all projects, not just within the physical limits of a given project. Safety and associated environmental and health standards must be consistently applied across all projects.

Programs with phased operation of facilities must consider operational risks to the surrounding construction workforce. Safety processes must recognize that the external factors influencing the safety of a given project will evolve over time and may not be intuitive to project related safety operations. The owner and program manager should institute a comprehensive safety program for both facility operators and constructors during the construction phase.

## Conclusion

Large, complex engineering and construction programs are a major driver of the triple bottom line of financial, social, and environmental outcomes. It is essential that sustainability be a foundational consideration in every aspect of the programmatic endeavor. Reduced costs and waste, reduced liability, emissions and environmental hazards, efficient and effective management and disposal of materials, enhanced image in communities and a role model for others, along with corporate responsibility both short-term and long-term are all elemental outcomes of a sustainability program.

In reviewing the subject, it is clear that the emphasis on all three segments of sustainability are important and have become pervasive in the approach to program activity and must be planned in the process.

## References

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## About the Author

Bob Prieto was elected to the National Academy of Construction in 2011. He is a senior executive who is effective in shaping and executing business strategy and a recognized leader within the infrastructure, engineering, and construction industries.

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