Briefing on Life-Cycle Assessment for Procurement

A Guidance Document for Procuring Entities under Republic Act No. 12009

Section 1: Introduction: Why Life-Cycle Assessment Matters for Philippine Procurement

The New Paradigm of Public Spending

The enactment of Republic Act No. 12009, the New Government Procurement Act (NGPA), marks a fundamental and transformative shift in the landscape of public procurement in the Philippines. This new law elevates the function of procurement from a purely transactional, cost-minimizing activity to a strategic instrument for national development.[1] Central to this new paradigm is the formal establishment of "Sustainability" as one of the eight governing principles of government procurement.[3] This principle is not merely a suggestion but a legal imperative that redefines the responsibilities of every Procuring Entity (PE) in the country. It mandates a holistic view that considers not only the immediate cost and function of a purchase but also its long-term consequences for the economy, society, and the environment.

This shift requires a new set of tools and a new way of thinking. The traditional focus on the lowest calculated bid is no longer sufficient to meet the law's requirements. Instead, PEs are now tasked with pursuing a more sophisticated and comprehensive understanding of value. This guidance document is designed to introduce and operationalize the primary analytical tool that gives substance to this principle: the Life-Cycle Assessment (LCA).

LCA as the Key to Unlocking Sustainability

Life-Cycle Assessment is the systematic methodology that allows PEs to look beyond the initial purchase price and understand the full, often hidden, environmental and social impacts associated with a good, service, or infrastructure project throughout its entire existence. By applying LCA, PEs can move from a narrow focus on acquisition cost to a comprehensive evaluation of a procurement's "cradle-to-grave" journey. This approach is the key to achieving genuine "Value for Money," as defined under the NGPA, which emphasizes the optimum combination of quality and cost over the whole life of an asset.[3]

The NGPA's mandate for LCA is not just about environmentalism; it is a strategic imperative for risk management and economic resilience in a country as climate-vulnerable as the Philippines. The nation is consistently identified as being at high risk from climate impacts such as increasingly intense typhoons, sea-level rise, and extreme rainfall.[1] These climate events inflict widespread and recurring damage on public infrastructure, leading to massive economic losses and disrupting the delivery of essential public services.[5] A procurement system focused solely on the lowest initial cost can inadvertently perpetuate this vulnerability by selecting materials and designs that are not built to withstand these intensifying climate stresses. This creates a debilitating cycle of damage and repair, draining public funds that could otherwise be invested in development.[7]

LCA, particularly when integrated with a climate resilience lens, provides a powerful antidote to this cycle. It allows PEs to move beyond a static analysis of a product's manufacturing impact and instead evaluate its long-term performance, durability, and reliability under projected future climate scenarios.[8] By assessing how a road surface will perform under higher temperatures or how a coastal structure will withstand stronger storm surges over a 30- to 50-year lifespan, LCA becomes a proactive tool for de-risking public investments. It enables the selection of more durable, resilient options that are less likely to fail, thereby reducing future liabilities, ensuring the continuity of public services, and safeguarding the national budget. In this context, LCA transforms procurement from a short-term spending activity into a long-term investment in national resilience.

Alignment with National Priorities

The application of LCA in public procurement is not an isolated requirement but a direct and powerful mechanism for implementing the nation's highest-level development goals. The Philippine Development Plan (PDP) 2023-2028 explicitly identifies the need to "accelerate climate action and strengthen disaster resilience" and to enable a "low carbon economy transition".[1] The PDP recognizes Green Public Procurement (GPP), a practice underpinned by life-cycle thinking, as a key tool to expand market opportunities for low-carbon technologies and products.[2]

When a PE uses LCA to select energy-efficient vehicles, procure sustainable building materials, or contract for services that minimize waste, it is directly contributing to these national priorities. Each procurement decision becomes an opportunity to reduce the country's carbon footprint, conserve natural resources, and build infrastructure that can withstand the challenges of a changing climate. LCA provides the evidence-based framework to ensure these contributions are real, measurable, and significant.

Purpose of this Guidance

This guidance document has been developed to equip every Filipino procurement professional with the foundational knowledge and practical tools necessary to integrate life-cycle thinking into their daily work. It is designed to demystify the concept of LCA, clarify its legal basis under the NGPA and its Implementing Rules and Regulations (IRR), and provide a clear, step-by-step framework for its application. The objective is to empower PEs to confidently fulfill their new mandate, moving beyond compliance to become strategic agents of sustainable development. This document will guide you on what LCA is, why it is legally required, how to apply it proportionally, and when to seek expert assistance, ensuring that every peso of public funds is spent in a manner that is resilient, responsible, and beneficial for the long-term prosperity of the nation.

Section 2: Understanding the Fundamentals of Life-Cycle Assessment (LCA)

A Plain-Language Guide: What is LCA?

At its core, a Life-Cycle Assessment is a scientific method for evaluating the environmental impacts of a product, service, or process throughout its entire life span. It is often described as a "cradle-to-grave" analysis.[10] This means the assessment begins with the extraction of raw materials from the earth (the "cradle"), follows them through manufacturing, transportation, and the product's useful life, and ends with its final disposal, recycling, or reuse (the "grave"). This comprehensive scope prevents "burden shifting," where solving an environmental problem in one stage of the life cycle inadvertently creates a new, potentially worse, problem in another stage.

LCA is not an arbitrary process but a rigorous, standardized methodology governed by internationally recognized standards, primarily ISO 14040 and ISO 14044.[12] These standards ensure that LCAs are conducted in a consistent, transparent, and verifiable manner, making their results credible and comparable across different studies and products. The process is typically broken down into four distinct but interrelated phases [13]:

1. **Goal and Scope Definition:** This initial phase is crucial as it defines the purpose of the study, the product or system to be analyzed, the boundaries of the assessment (e.g., cradle-to-gate or cradle-to-grave), and the functional unit—a measure of performance that allows for fair comparison (e.g., "providing illumination of 800 lumens for 50,000 hours" instead of just "one light bulb").[10]
2. **Life Cycle Inventory (LCI):** This is the data-intensive phase where all relevant inputs and outputs for the product system are collected and quantified. Inputs include raw

materials, energy, and water, while outputs include emissions to air, water, and soil, as well as waste products.[15]

3. **Life Cycle Impact Assessment (LCIA):** In this phase, the data from the LCI is translated into potential environmental impacts. The inventory flows are classified into specific impact categories (like climate change or water depletion) and then characterized to determine their potential severity.[13]
4. **Interpretation:** The final phase involves analyzing the results from the LCI and LCIA to draw conclusions, identify significant environmental "hotspots," evaluate the study's limitations, and provide recommendations that can inform decision-making, such as in a procurement context.[10]

What LCA Measures: Key Impact Categories

An LCA makes the abstract concept of "environmental impact" tangible by quantifying a product's contribution to a range of specific environmental problems. For a procurement officer, understanding these categories helps in identifying which aspects are most relevant to a particular purchase. Key impact categories include:

- **Climate Change (or Global Warming Potential):** Measures the emissions of greenhouse gases, such as carbon dioxide (CO2) and methane (CH4), which contribute to global warming. This is often referred to as the product's "carbon footprint".[11]
- **Resource Depletion:** Assesses the consumption of non-renewable resources, including fossil fuels (oil, natural gas), minerals, and metals.[15]
- **Water Consumption (or Water Scarcity Footprint):** Quantifies the total volume of fresh water used throughout the life cycle, which is particularly important in water-stressed regions.[15]
- **Eutrophication:** Measures the emission of nutrients like nitrogen and phosphorus into water bodies, which can lead to algal blooms and oxygen depletion, harming aquatic ecosystems.[11]
- **Acidification:** Assesses emissions of substances like sulfur dioxide (SO2) and nitrogen oxides (NOx), which contribute to acid rain and can damage forests, soils, and buildings.[11]
- **Waste Generation:** Quantifies the amount of solid waste produced at the end of a product's life that is destined for landfill.[11]

Expanding the Lens: Social LCA (S-LCA)

While traditional LCA focuses on environmental impacts, the methodology can be expanded to assess social and socio-economic aspects. This is known as Social

Life-Cycle Assessment (S-LCA).[16] S-LCA evaluates the potential positive and negative social impacts of a product on various stakeholders, including workers, local communities, consumers, and society at large. This aligns directly with the NGPA's mandate for an "Inclusive Procurement Program," which considers factors like fair labor practices, gender equity, and community benefits.[3] By incorporating S-LCA principles, PEs can use the life-cycle framework to assess whether a procurement contributes to decent work, respects human rights, and promotes equitable development, thereby fulfilling the broader goals of the government's Sustainable Public Procurement (SPP) Program.

Distinguishing LCA from Life-Cycle Cost Analysis (LCCA)

It is critically important for PEs to understand the distinction between Life-Cycle Assessment (LCA) and Life-Cycle Cost Analysis (LCCA), as both are mandated by Section 13 of the NGPA IRR and serve complementary purposes.[2]

- **Life-Cycle Assessment (LCA)** evaluates **environmental and social impacts**. Its "currency" is physical units, such as kilograms of CO2-equivalent, liters of water consumed, or hours of labor under fair conditions. It answers the question: "What is the environmental and social footprint of this choice?"
- **Life-Cycle Cost Analysis (LCCA)** evaluates the **total cost of ownership** over an asset's entire life. Its "currency" is financial, measured in Philippine Pesos (PHP). LCCA includes not only the initial purchase price but also all subsequent costs, such as energy and water consumption, routine maintenance, repairs, and final disposal or resale value.[3] It answers the question: "What is the total financial cost of this choice over its lifetime?"

These two tools work hand-in-hand. An LCA might reveal that an energy-efficient air conditioner has a much lower carbon footprint over its lifetime. An LCCA would then demonstrate that, despite a potentially higher initial purchase price, this same air conditioner will result in significant cost savings for the government through lower electricity bills, making it the most economically advantageous option in the long run. Together, LCA and LCCA provide a comprehensive picture of sustainability, enabling PEs to make decisions that are both environmentally responsible and fiscally prudent.

Section 3: The Legal Mandate: Applying LCA under the NGPA Framework

Decoding Section 13 of the IRR: "Where Appropriate"

Section 13 of the NGPA's IRR states that PEs "shall apply Lifecycle Assessment (LCA) and Lifecycle Cost Analysis (LCCA), where appropriate".[3] This phrase is not an optional

clause but a directive to apply the

Principle of Proportionality, a concept explicitly mentioned in the IRR.[3] This principle ensures that the effort and resources dedicated to an assessment are commensurate with the procurement's significance. A multi-billion peso infrastructure project demands a far more rigorous analysis than a routine purchase of office furniture.

Determining what is "appropriate" involves a reasoned judgment by the PE based on several key factors:

1. **Value and Scale:** High-value, large-scale, and long-term contracts have a greater potential for significant life-cycle impacts and thus warrant a more detailed assessment.
2. **Potential Environmental and Social Impact:** Procurements in sectors known for high environmental footprints—such as construction, energy, transportation, and ICT—are primary candidates for LCA. The greater the potential impact, the more appropriate an LCA becomes.
3. **Strategic Importance:** When a procurement is central to achieving national policy goals, such as climate resilience targets under the PDP or the transition to a circular economy, applying a life-cycle perspective is strategically essential.[1]
4. **Availability of Data and Tools:** The feasibility of conducting an assessment also plays a role. For common product categories, simplified tools and existing data may make an assessment highly appropriate and straightforward.[18]

The consistent application of LCA in public procurement, as mandated by the NGPA, will also serve as a powerful catalyst for market transformation. By signaling a clear and predictable demand for products and services with superior life-cycle performance, the government creates a strong incentive for the private sector. Suppliers who can provide LCA data or meet performance standards based on life-cycle impacts will gain a significant competitive advantage in the substantial government market. This will, in turn, encourage businesses to invest in cleaner technologies, more efficient manufacturing processes, and the technical expertise required to conduct their own LCAs. This dynamic directly supports the NGPA's goal under Section 74 to foster the "Development of a Green Local Market," building a domestic ecosystem of sustainable suppliers and enhancing the overall competitiveness of Philippine industry.[3]

LCA's Role Across the Procurement Cycle

LCA is not a separate, isolated step but a tool that should be integrated throughout the

existing public procurement process. Its insights can inform and strengthen decision-making at several critical stages, ensuring that sustainability is embedded from conception to completion.

Strategic Procurement Planning (NGPA IRR, Section 7)

The procurement process begins with planning, and this is where LCA can have its greatest impact. The NGPA IRR requires that the planning stage considers the "whole lifecycle of a procurement project, including its environmental impact".[3] LCA provides the analytical framework to fulfill this requirement during the preparation of the Project Procurement Management Plan (PPMP).

At this early stage, LCA helps PEs to:

- **Challenge the Need:** It encourages a fundamental rethinking of whether a new purchase is necessary at all, prompting consideration of alternatives like sharing resources, refurbishing existing assets, or leasing instead of buying.[3]
- **Compare Alternatives:** It allows for an evidence-based comparison of fundamentally different solutions to meet a need. For example, an LCA can compare the total environmental impact of constructing a new building versus conducting a major energy-efficiency retrofit on an existing one.
- **Inform Market Scoping:** Insights from a preliminary LCA can help shape the questions asked during market scoping (NGPA IRR, Section 10), allowing PEs to gauge the market's capacity to provide innovative, low-impact solutions.[3]

Developing Specifications (NGPA IRR, Section 11)

Once a procurement need is confirmed, LCA results are invaluable for crafting technical specifications that drive sustainability outcomes. The NGPA IRR encourages the use of **performance or functionality requirements**, and LCA is perfectly suited to define these.[3]

Instead of prescribing a specific technology (e.g., "the vehicle must have a 1.5-liter engine"), a specification informed by LCA might state, "the vehicle must not exceed a lifetime operational emission of X grams of CO2 per kilometer, based on a standardized driving cycle".[18] This approach opens the door for suppliers to offer a range of innovative solutions—including hybrid, electric, or highly efficient conventional vehicles—and fosters competition based on environmental performance.

Evaluating Bids (NGPA IRR, Section 61)

The NGPA introduces the **Most Economically Advantageous and Responsive Bid (MEARB)** as a key award criterion, allowing PEs to consider quality alongside price.[3] The IRR explicitly lists "social, environmental, economic, and innovative characteristics" as

permissible criteria within the quality component.[3]

LCA data provides a credible, quantifiable basis for scoring these environmental characteristics. The IRR further mandates that "sustainability of products, materials, or structures with green specifications shall be given greater weight in the evaluation of bids".[3] A PE can therefore design its bid evaluation to award significant points to bidders who can demonstrate superior life-cycle performance, for example, by providing a third-party verified Environmental Product Declaration (EPD) or a detailed LCA report for their proposed solution. This directly translates the principle of sustainability into a tangible competitive advantage in the bidding process.

Section 4: A Practical Framework for Applying LCA

To operationalize the NGPA's mandate, PEs can adopt a practical, tiered framework. This approach allows for the proportional application of LCA, ensuring that the level of effort is appropriate for the procurement at hand. It empowers PEs to take immediate, meaningful action on the majority of their procurements using simplified methods, while providing clear guidance on when a more formal, expert-led assessment is required.

Step 1: Triage - When to Consider an LCA?

The first step is to determine which procurements are most relevant for a life-cycle review. Not every purchase requires an LCA. PEs should prioritize their efforts where the potential for environmental and social impact is greatest. A simple triage process can guide this decision:

- **High Priority (Strongly Recommended for LCA):** These are procurements with high value, long-term implications, and significant known environmental impacts.
    - **Examples:** Major infrastructure projects (roads, bridges, government buildings), fleet vehicle procurement, large-scale ICT equipment purchases (desktops, servers), long-term energy supply contracts, and waste management services.
- **Medium Priority (Consider for Simplified LCA):** These are recurring procurements with moderate but cumulative impacts. Applying a simplified LCA can identify significant opportunities for improvement.
    - **Examples:** Catering and event services, office furniture, staff uniforms, cleaning services and supplies, and paints.
- **Low Priority (LCA Generally Not Required):** These are typically low-value, non-recurring purchases where the administrative effort of an LCA would outweigh the potential benefits.
    - **Examples:** Small-value procurement of general office supplies. (Note: If these items are procured under a large, multi-year framework agreement, a simplified

LCA of the product category would be appropriate).

Step 2: The Simplified LCA - Identifying "Hotspots" without an Expert

For the vast majority of medium-priority procurements, a full, ISO-compliant LCA is not necessary. Instead, PEs and end-user units can conduct a **Simplified LCA** using a standardized questionnaire. This qualitative tool is designed to help non-experts think through the life-cycle stages of a product or service and identify the most significant areas of environmental impact, often called "hotspots." This process fulfills the legal requirement to consider life-cycle impacts in a proportional manner.

The following questionnaire, adapted from best practices, provides a structured approach [18]:

Simplified Life-Cycle Assessment Questionnaire

Life-Cycle Stage	Guiding Questions for Procurers
Supplier Capacity	Does the bidder have a documented environmental policy or certification (e.g., ISO 14001)? Can they provide data on their environmental performance?
Raw Materials & Manufacturing	Are the primary materials made from recycled, renewable, or biodegradable content? Are materials sourced from certified sustainable sources (e.g., FSC for wood)? Are hazardous or toxic substances avoided in the manufacturing process?
Transportation & Logistics	Can packaging be minimized, eliminated, or made from recycled/recyclable materials? Can delivery schedules be optimized to reduce fuel consumption (e.g., bulk deliveries)?
Use Phase	Does the product consume significant energy during operation? (Look for energy efficiency labels). Does it consume significant water? Does it require consumables (e.g., ink cartridges, filters)? What is its expected lifespan? Is it durable and designed for longevity?
Maintenance & Repair	Is the product easily repairable? Are spare parts readily available? Does the supplier offer an extended warranty or maintenance service?
End-of-Life	Can the product be easily disassembled for recycling? Is the product or its components recyclable in local facilities? Does the supplier offer a take-back or recycling program at the end of its life?
Service-Based	Could the need be met by procuring a service instead of a product (e.g., leasing

Alternatives	equipment, contracting a managed print service)? This often incentivizes the supplier to maximize durability and efficiency.

By working through these questions, a PE can create a profile of a product's life-cycle impacts and identify 2-3 key areas where procurement specifications can drive the most significant environmental improvements.

Step 3: From Insights to Action - Integrating LCA into Tender Documents

The insights gained from the simplified LCA must be translated into concrete requirements in the bidding documents. This is how life-cycle thinking influences the market and leads to better outcomes.

Example: Procurement of Air Conditioning Units

- **Simplified LCA Hotspots:** The questionnaire quickly identifies that for air conditioners, the most significant life-cycle impact is **energy consumption during the use phase**. Durability and end-of-life management are also important.
- **Translating to Specifications (Before vs. After):**
  - **Before (Prescriptive):** "Supply and install one (1) 1.5 horsepower window-type air conditioning unit."
  - After (Performance-based, LCA-informed): "Supply and install a window-type air conditioning unit that meets the following minimum requirements:
    a) Must have a minimum Energy Efficiency Ratio (EER) as prescribed by the Department of Energy's Minimum Energy Performance Standards (MEPS).
    b) The supplier must offer a minimum 5-year warranty on the compressor.
    c) The supplier must provide a list of accredited service centers within the region for repairs."
- **Translating to MEARB Award Criteria:**
  - To reward bidders who go beyond the minimum, the PE could add the following rated criteria to the quality component:
    - **Energy Efficiency (15 points):** "Additional points will be awarded for every 0.5 increment the EER exceeds the minimum MEPS requirement, up to a maximum of 15 points."
    - **Supplier Take-Back (10 points):** "10 points will be awarded to bidders who can provide a formal commitment to take back the unit at the end of its useful life for proper disposal and recycling."

Step 4: Knowing Your Limits - When to Call a Professional

While the simplified LCA is a powerful tool, certain procurements require the rigor and

defensibility of a full, ISO 14040/14044-compliant LCA conducted by a certified practitioner. PEs should recognize the following clear triggers for engaging external expertise:

- **Trigger 1: High Value and High Risk:** For any major infrastructure project (e.g., new government building, transport system, power plant) or any procurement exceeding a significant budget threshold (e.g., PHP 1 Billion), a full LCA should be considered a standard part of the feasibility and design stage.
- **Trigger 2: Complex System Comparisons:** When the procurement involves comparing fundamentally different and complex systems where the environmental trade-offs are not obvious. For example, deciding between a centralized versus a decentralized wastewater treatment system for a community.
- **Trigger 3: Public-Facing Environmental Claims:** If the PE or the government intends to make a strong public claim based on the procurement (e.g., "This is a carbon-neutral building," "This project is powered by 100% renewable energy"), the claim must be substantiated by a formal, third-party verified LCA to ensure credibility and protect against accusations of "greenwashing."
- **Trigger 4: Development of New Standards:** When a PE is looking to establish a new environmental standard or specification for a product category that will be used in future procurements across government, a full LCA is necessary to ensure the standard is science-based and effective.

Table 1: Simplified vs. Full LCA: A Comparative Guide for Procurers

This table provides a quick-reference guide to help PEs understand the key differences between the two approaches to LCA and to justify their choice of method in accordance with the principle of proportionality.

Feature	Simplified LCA (Screening)	Full LCA (ISO 14040/14044 Compliant)
Primary Goal	To qualitatively identify the main environmental "hotspots" and opportunities for improvement in a product's life cycle.	To provide a comprehensive, quantitative, and verifiable assessment of environmental impacts, allowing for robust comparison between different products or systems.
Methodology	Primarily qualitative, using a structured questionnaire, checklists, and readily available data (e.g., ecolabels, energy ratings).	Highly quantitative, involving detailed data collection, process modeling using specialized software, and calculation of specific impact category indicators (e.g., kg CO2-eq).

Who Conducts It	Can be conducted internally by the Procurement Officer, the BAC, or the End-User Unit with basic training.	Must be conducted by a certified LCA practitioner or a specialized consulting firm with expertise in LCA methodology and software.
Typical Application	Most common goods and services, recurring procurements, and as a preliminary screening for larger projects. (e.g., IT equipment, furniture, catering, vehicles).	Major infrastructure projects, procurement of new or innovative technologies, development of public-facing environmental claims, and setting new government-wide standards.
Output	A summary report or checklist identifying key risks and opportunities, which directly informs the technical specifications and award criteria.	A detailed technical report, often peer-reviewed, with precise quantitative data on all impact categories. This can be used for detailed bid evaluation and public reporting.
NGPA Alignment	Fulfills the mandate of Section 13 by applying the **Principle of Proportionality** for the majority of government procurements.	Fulfills the mandate of Section 13 for high-value, high-impact, and strategically critical procurements where a higher level of scrutiny is required.

Section 5: A Critical Lens: Integrating Climate Resilience into LCA

Beyond Standard Analysis: The Philippine Imperative

For the Philippines, conducting a standard LCA that only quantifies past and present environmental impacts is insufficient. The nation's profound vulnerability to the escalating effects of climate change—including more powerful typhoons, rising sea levels, and extreme heat—demands a forward-looking approach.[1] Therefore, PEs must adapt the LCA framework to serve as a critical tool for **climate adaptation and resilience**. This means moving beyond mitigation (reducing greenhouse gas emissions) to ensure that the goods, services, and infrastructure procured today are designed and built to withstand the climate of tomorrow. A procurement decision that looks good from a carbon footprint perspective but fails physically in the face of a super-typhoon is not a sustainable or responsible use of public funds.

Assessing Climate Risks Across the Life Cycle

Integrating a climate resilience lens requires PEs to ask a different set of questions at each stage of the life cycle, shifting the analysis from a static snapshot to a dynamic,

future-oriented assessment.

- **Materials and Manufacturing:** The resilience of the supply chain itself becomes a key consideration. Are critical raw materials sourced from regions prone to climate-related disruptions like droughts or floods? Are key manufacturing facilities located in coastal, flood-prone areas, posing a risk to the continuity of supply for government projects? A resilient procurement strategy considers diversifying suppliers to mitigate these risks.
- **Use Phase (The Critical Stage):** This is where the integration of climate resilience is most crucial. The analysis must evaluate the performance and durability of a product or infrastructure over its entire intended lifespan under projected future climate conditions for its specific location.[8] This involves assessing its vulnerability to:
    - **Increased Heat and UV Radiation:** Will building materials, road surfaces, or outdoor equipment degrade faster under higher average temperatures and more intense sun exposure?
    - **Intensified Rainfall and Flooding:** Will drainage systems for roads and buildings be able to handle higher volumes of water? Are electronic components in outdoor infrastructure adequately protected against water ingress?
    - **Increased Typhoon Intensity:** Has the structural design of buildings and bridges been calculated to withstand higher wind speeds than historical norms?
    - **Sea-Level Rise and Storm Surge:** For coastal infrastructure, has the design accounted for projected sea-level rise and the increased reach of storm surges over its operational life?
- **End-of-Life:** Climate resilience also extends to post-disaster scenarios. Can materials from damaged infrastructure be easily salvaged, reused, or recycled for reconstruction efforts? Designing for disassembly and using standardized components can enhance the resilience of the recovery process itself.

Practical Questions for a Climate-Resilient LCA

To embed this forward-looking perspective into the procurement process, PEs should integrate the following questions into their simplified or full LCA frameworks. These questions prompt a conscious consideration of climate adaptation.

- **For Infrastructure Projects:**
    - "Has the project's design explicitly used the latest climate projection data (e.g., from PAGASA) for rainfall, temperature, and sea-level rise for the specific project location over its planned 50-year lifespan?"
    - "Have nature-based solutions—such as mangrove restoration for coastal defense or green roofs for urban cooling and stormwater management—been

evaluated as alternatives or complements to purely 'grey' infrastructure?".[7]
    - "Does the design incorporate redundancy or fail-safe mechanisms to ensure the continuity of essential services during and after an extreme weather event?"
- **For Procurement of Goods:**
    - "What is the certified operational temperature and humidity range for this electronic equipment, and does it align with the projected increase in extreme heat days for its intended location?"
    - "Is the product's warranty voided by exposure to flooding or extreme humidity, conditions that are increasingly common in many parts of the country?"
    - "For outdoor equipment, what is its certified wind-load rating, and has it been tested against typhoon-level conditions?"
- **For Procurement of Services:**
    - "What are the service provider's detailed business continuity and disaster recovery plans in the event of a major typhoon or flood? How do they guarantee service uptime?"
    - "Does the provider's own infrastructure (e.g., data centers, logistics hubs) have certified resilience against climate and seismic hazards?"
    - "For critical services, does the provider have backup power generation that is not solely reliant on a fossil fuel supply chain that could be disrupted during a disaster?"

By systematically asking these questions, PEs can ensure that their application of LCA is not only compliant with the NGPA but is also a strategic contribution to building a more resilient and secure Philippines.

Section 6: LCA in Action: Case Studies for Key Procurement Categories

To illustrate the practical application of Life-Cycle Assessment in Philippine public procurement, this section presents three detailed case studies based on priority product categories identified in the government's pilot programs.[2] Each case study follows a consistent structure: defining the procurement challenge, outlining the LCA approach, summarizing the key findings with a focus on climate resilience, and providing concrete examples of how to apply these insights in tender documents.

Case Study 1: Infrastructure – Procuring Climate-Resilient Cement for Public Works

- **The Procurement Challenge:** The Department of Public Works and Highways

(DPWH) is undertaking the construction of a new coastal highway in a region frequently exposed to typhoons and saltwater spray. The procurement must not only meet structural engineering standards but also align with the NGPA's sustainability mandate and contribute to the nation's climate adaptation goals. The choice of cement, the primary binder in concrete, is a critical decision with significant long-term environmental and resilience implications.

- **The LCA Approach:** A comparative "cradle-to-gate" LCA is conducted to compare two main types of cement:
    1. **Ordinary Portland Cement (CEM I):** The traditional standard, known for its high strength but also for its high carbon footprint due to the energy-intensive production of its primary component, clinker.
    2. **Blended Cement (e.g., Portland-Limestone Cement Type IL or Portland-Slag Cement Type IS):** These modern cements replace a significant portion of the clinker with supplementary cementitious materials (SCMs) like ground limestone, fly ash (a byproduct of coal power plants), or ground granulated blast furnace slag (a byproduct of steel manufacturing).[21]
- **Key Findings & Climate Resilience Insights:**
    - **Climate Mitigation:** The LCA results show a stark difference in Global Warming Potential (GWP). The production of clinker is responsible for approximately 5% of global anthropogenic CO2 emissions.[23] By replacing a portion of this clinker with SCMs, blended cements can reduce the carbon footprint of the final product by 10% to over 50%, depending on the type and percentage of SCM used. This represents one of the most significant and readily available opportunities for decarbonizing public construction projects.[22]
    - **Climate Adaptation and Resilience:** Beyond emissions, the LCA reveals crucial performance benefits. Certain blended cements, particularly those containing slag or pozzolans, exhibit superior long-term durability in harsh environments. They create a denser concrete matrix that is more resistant to chloride and sulfate attacks, which are prevalent in coastal areas due to saltwater exposure.[21] This enhanced durability translates directly to a longer service life for the coastal highway, reducing the need for costly repairs and making the infrastructure more resilient to the compounding stresses of a marine environment and a changing climate.
- **Application in Procurement:**
    - **Technical Specification:** Instead of specifying only "Portland Cement," the tender documents should specify a performance-based requirement: "The cement used must be a Blended Hydraulic Cement, such as Type IL(MS) or Type IS(HS), conforming to relevant Philippine National Standards and demonstrating moderate/high sulfate resistance."

- **MEARB Award Criteria:** To further incentivize low-carbon options, the bid evaluation can include:
  - **Criterion 1 (15 points):** "Bidders are required to submit an Environmental Product Declaration (EPD) for their proposed cement. Points will be awarded based on the declared Global Warming Potential (GWP), with the lowest GWP receiving the maximum points."
  - **Criterion 2 (10 points):** "Additional points will be awarded to bidders who can provide third-party test results demonstrating superior performance in chloride permeability tests, exceeding the minimum standard."

Case Study 2: Goods – Modernizing the Government Vehicle Fleet

- **The Procurement Challenge:** A national government agency is procuring a new fleet of 50 sedans for administrative use. The agency must comply with the NGPA's sustainability principle and is exploring the feasibility of shifting from traditional gasoline-powered vehicles to electric vehicles. The decision requires a comprehensive comparison of the total environmental impact, not just tailpipe emissions.
- **The LCA Approach:** A comparative "cradle-to-grave" LCA is performed for a conventional Internal Combustion Engine Vehicle (ICEV) and a comparable Battery Electric Vehicle (BEV). The analysis must be contextualized to the Philippines, particularly by using the current national electricity generation mix to calculate the emissions from charging the BEV.[29]
- **Key Findings & Climate Resilience Insights:**
  - **Manufacturing Phase:** The BEV has a significantly higher initial carbon footprint, primarily due to the energy-intensive manufacturing of its lithium-ion battery. This can make the BEV's manufacturing emissions up to 80% higher than a comparable ICEV.[30]
  - **Use Phase:** This is the decisive stage where the BEV's advantage becomes clear. Even with the Philippines' current energy mix, which includes a substantial share of fossil fuels, the emissions from generating electricity to power the BEV are lower than the direct tailpipe emissions from burning gasoline in an ICEV. A local study for the Philippines confirmed that replacing ICEVs with PBEVs reduces greenhouse gas emissions and fossil fuel use.[29]
  - **Break-Even Point:** The LCA calculates the "emissions break-even point"—the distance a BEV must be driven before its total emissions (manufacturing + use) become lower than the ICEV's. Studies show this is typically reached within 1-2 years of average use, after which the BEV offers cumulative emissions savings for the rest of its life.[30] Crucially, as the Philippines adds more renewable energy to its grid in line with the PDP, the use-phase emissions of the BEV will continue

to decrease, making it an increasingly cleaner option over time.[29]
    - **Climate Resilience:** BEVs offer a unique resilience advantage. With the development of vehicle-to-grid (V2G) technology, a government fleet of BEVs could function as a distributed energy storage network. During a power outage following a typhoon, these vehicles could potentially provide emergency power to critical government facilities, enhancing operational continuity and national resilience.
- **Application in Procurement:**
    - **Evaluation Approach:** The PE should use a Life-Cycle Cost Analysis (LCCA) alongside the LCA. The LCCA must include the initial purchase price, projected 10-year costs for fuel (for ICEV) and electricity (for BEV), estimated maintenance costs (typically lower for BEVs), and any applicable carbon taxes or incentives.
    - **MEARB Award Criteria:**
        - **Criterion 1 (10 points):** "Points will be awarded for the length of the manufacturer's warranty on the battery pack, with a warranty of 10 years or more receiving maximum points."
        - **Criterion 2 (10 points):** "Bidders must submit a plan for the end-of-life management of the vehicle's battery. Maximum points will be awarded for plans that demonstrate a clear process for battery reuse, repurposing, or high-value material recycling."
        - **Criterion 3 (5 points):** "Points will be awarded to bidders whose vehicles are equipped with or are certified to be compatible with future V2G technology standards."

Case Study 3: Services – Contracting for Efficient Data Centers

- **The Procurement Challenge:** The Department of Budget and Management (DBM) is consolidating its IT infrastructure and needs to procure data center hosting services. This is a procurement of a service, not a physical good, but it has immense and continuous environmental impacts related to energy and water consumption. The goal is to secure reliable and secure services while minimizing this environmental footprint.
- **The LCA Approach:** For a service like data hosting, the LCA focuses primarily on the operational phase. The assessment is centered on key, internationally recognized performance metrics that serve as proxies for life-cycle efficiency.
- **Key Findings & Climate Resilience Insights:**
    - **Energy Efficiency:** The most critical metric is **Power Usage Effectiveness**

(PUE). PUE is the ratio of the data center's total energy consumption to the energy delivered to the IT equipment. A perfect PUE is 1.0. The industry average PUE in 2021 was 1.57, meaning for every 1.57 watts drawn from the grid, only 1 watt powers the IT equipment; the other 0.57 watts are lost in cooling and power distribution. Leading "hyperscale" data centers, like those run by Google, achieve PUEs as low as 1.09, demonstrating massive potential for efficiency gains.[33]

- **Water Consumption:** A parallel metric is **Water Usage Effectiveness (WUE)**, which measures the liters of water consumed per kilowatt-hour of IT equipment energy (L/kWh). This is crucial as many large data centers use evaporative cooling systems that consume millions of gallons of water, a significant concern in a country facing climate-related water stress.[36]
- **Climate Resilience:** The physical location and design of the data center are paramount. It must be located outside of flood plains and seismic zones and have structural resilience to withstand typhoons. Furthermore, its energy source is a key resilience factor. A data center powered by a diverse mix of renewable sources is less vulnerable to price volatility and supply disruptions affecting a single fossil fuel source.

- **Application in Procurement:**
  - **Technical Specification (Minimum Requirements):**
    - "The bidder must operate a Tier III or higher certified data center."
    - "The bidder must provide their trailing twelve-month (TTM) average PUE, which must not exceed 1.5."
    - "The facility must have a documented and tested disaster recovery and business continuity plan."
  - **MEARB Award Criteria:**
    - **Criterion 1 (20 points):** "Points will be awarded for PUE values lower than the 1.5 maximum, with a PUE of 1.2 or lower receiving the maximum 20 points."
    - **Criterion 2 (10 points):** "Bidders must report their TTM average WUE. Points will be awarded for lower WUE values."
    - **Criterion 3 (15 points):** "Bidders must declare the percentage of the data center's electricity that is sourced from renewable energy, verified through contracts or certificates. A higher percentage will receive more points."

Section 7: Toolkit: Resources for Further Learning

To support Procuring Entities in their journey toward mastering and implementing Life-Cycle Assessment, this section provides a curated list of essential resources. These tools, databases, and guidance documents offer avenues for deeper learning,

practical application, and access to international best practices.

Official Philippine Government Resources

- **New Government Procurement Act (Republic Act No. 12009) and its Implementing Rules and Regulations (IRR):** The foundational legal documents that mandate the use of LCA and LCCA. All PEs should have a copy and be familiar with the key provisions cited in this guidance (Sections 3, 7, 11, 13, 61, 72, 73, 74, 75).
- **Government Procurement Policy Board (GPPB) Website:** The central repository for all official resolutions, circulars, and manuals related to public procurement in the Philippines. The forthcoming GPPB guidelines on LCA and LCCA will be published here.
  - Website: https://www.gppb.gov.ph/
- **NGPA Microsite:** A dedicated portal for updates, resources, and stakeholder feedback related to the implementation of the new procurement law.[2]
  - Website: https://ngpa.gppb.gov.ph/

LCA Software and Databases

For PEs or technical staff who wish to explore LCA methodology in more detail, several powerful tools are available.

- **openLCA:** A professional, open-source, and free Life Cycle Assessment software. It is one of the most widely used LCA tools globally by industry, consultants, and researchers. The website offers the software for download, along with extensive documentation, case studies, and video tutorials to guide new users through the process of building an LCA model.[38]
  - Website: https://www.openlca.org/
- **Life Cycle Inventory (LCI) Databases:** A full LCA relies on comprehensive databases that contain the environmental data for thousands of materials, energy sources, and industrial processes. While many are commercial, understanding their role is important. The **ELCD Database** is a notable free database from the European Commission that can be used with software like openLCA.[40]

International Best Practices and Guidance

Learning from the experience of other countries and international organizations can accelerate the adoption of LCA in the Philippines.

- **European Commission Green Public Procurement (GPP) Criteria:** This is arguably the most valuable international resource for procurers. The European Commission has developed detailed, science-based GPP criteria for over 20 common product and service groups, including computers, textiles, road transport, and food services. Each criteria set includes technical specifications and award criteria at both a "core"

(easy to apply) and "comprehensive" (more ambitious) level. PEs in the Philippines can readily adapt these criteria for their own tenders.[42]
    - Website: https://green-forum.ec.europa.eu/green-business/green-public-procurement/gpp-criteria-and-requirements_en
- **UN Environment Programme (UNEP) Sustainable Public Procurement:** UNEP is a global leader in promoting SPP. Their website offers a wealth of resources, including policy guidance, case studies from developing countries, and information on the links between SPP and the Sustainable Development Goals (SDGs).
    - Website: https://www.unep.org/explore-topics/resource-efficiency/what-we-do/sustainable-public-procurement
- **Global Center on Adaptation (GCA):** For PEs focusing on climate resilience in infrastructure, the GCA provides specialized resources, including the "Climate-Resilient Infrastructure Officer Handbook," which offers tools for integrating climate resilience into project cycles.[45]
    - Website: https://gca.org/

Finding an Expert

When a full, ISO-compliant LCA is required, PEs will need to engage a qualified external expert. To ensure the quality and credibility of the work, PEs should look for:

- **Professional Certifications:** Look for individuals or firms with recognized certifications, such as "Life Cycle Assessment Certified Professional" (LCACP) or similar credentials from reputable professional bodies.
- **Demonstrated Experience:** The consultant should have a portfolio of completed LCA studies that are compliant with ISO 14040/14044 standards, preferably in the relevant sector (e.g., construction, energy).
- **Familiarity with LCA Software and Databases:** The expert should be proficient in using professional LCA software (such as openLCA, SimaPro, or GaBi) and leading LCI databases.
- **Procurement:** PEs can procure these services through the standard modes of procurement for consulting services outlined in the NGPA. The terms of reference should clearly state that the required deliverable is an ISO 14040/14044-compliant LCA report, and if necessary, that it must undergo a third-party critical review as specified in the ISO standards.

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