Pathway towards an efficient
use of local natural resource

This project is funded
by the European Union

EUROPEAN UNION IPA II CROSS-BORDER COOPERATION PROGRAMME
ALBANIA – KOSOVO (2014 – 2020)

Project "Pathway to the efficient use of local natural resources"

Public Building Audit Strategy
Municipality of Kurbin

Authors:

Blendi Bushati
Teuta Thimjo

September 2024

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1. Purpose & Goals

This document establishes a municipal-level strategic framework for conducting energy efficiency audits across publicly owned buildings. The core intent is to guide municipal staff in deploying structured, policy-aligned, and cost-effective audit methodologies in coordination with qualified external contractors. The strategy prioritizes outcome-oriented audits that can inform retrofitting, capital budgeting, and carbon mitigation targets while enabling grant eligibility and improved lifecycle asset management.

In addition, this Strategy is created in the context of the already existing "Action plan for Energy Efficiency at local level for Kurbin" of 2023.

The Action Plan focuses on the mid and long-term transformations of power systems within cities and provides measurable goals for reduction of energy consumption and emissions of CO_2. This long-term vision shows how over the next twenty years, the introduction of carbon neutral and low-energy buildings, improvements in information technology and the development of a low-carbon transport system will help a city to reduce CO_2 emission. The Plan defines the measures and activities in the building, transport, and public lighting sectors.

The Action Plan in all its segments must be in line with the institutional and legal frameworks of the EU, national and local levels. In principle, it is anticipated that most SEAPs will include actions in the following areas:

- Construction environment, including new buildings and refurbishment/reconstruction of existing buildings.
- Municipal infrastructure (district heating, public lighting, smart grids, etc.)
- Decentralized renewable energy sources
- Public and private transport policies and urban mobility
- Citizen and, in general, civil society participation

- Intelligent energy behavior by citizens and businesses Energy efficiency measures, renewable energy projects and other energy-related actions can be introduced in various activity areas of local and regional governance.

Sustainable Energy Action Plans are elaborated with the active contribution to the civil society. SEAPs with a high degree of citizen participation are the most likely to get continuity in the long-term and to succeed in attaining their objectives.

1.1 Operational Cost Reduction

Energy expenditures constitute a significant and often under-optimized component of municipal operating budgets. Audits will systematically assess utility consumption patterns, system inefficiencies, and operational waste. By aligning audit protocols with audit standards, the municipality will be equipped to identify and rank actionable cost-saving measures—such as lighting retrofits, HVAC upgrades, and energy management systems (EMS)—based on return on investment (ROI), simple payback, and net present value (NPV) metrics.

1.2 Greenhouse Gas Emissions Mitigation

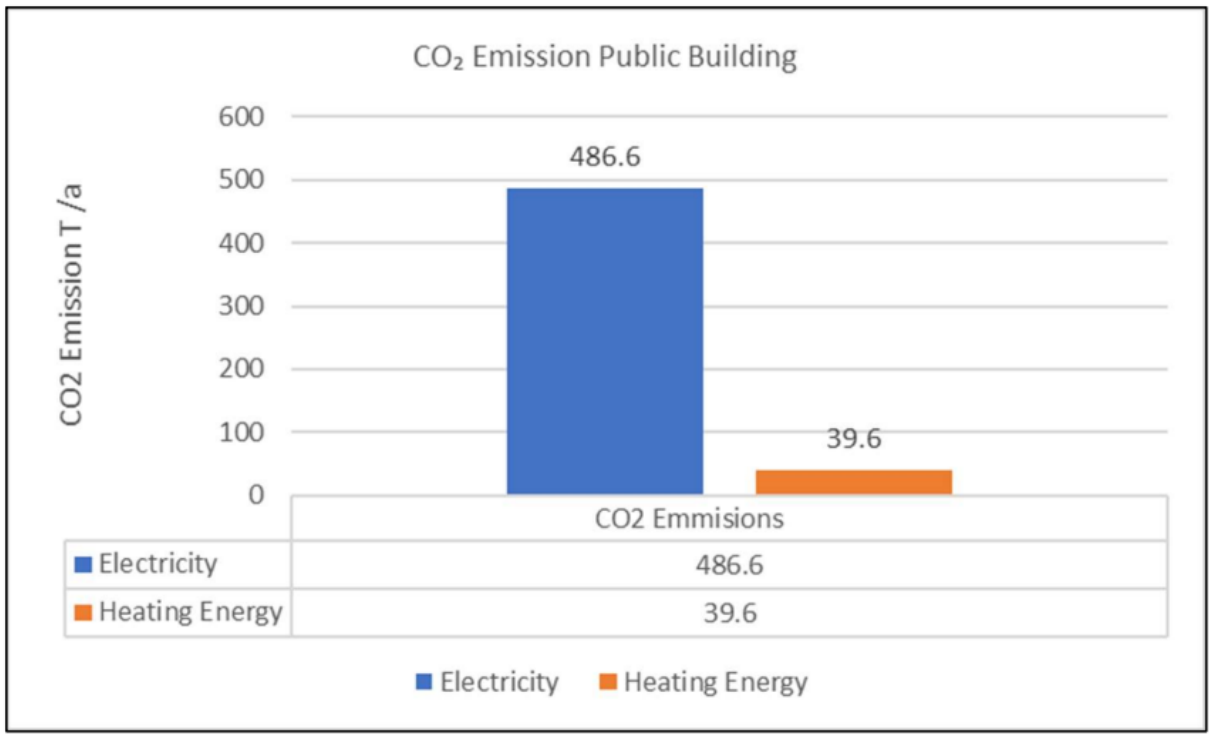
The built environment is a primary contributor to municipal emissions. This strategy supports compliance with national and subnational climate action frameworks—such as Local Climate Action Plans (CAPs), the EU Covenant of Mayors—by mapping energy consumption to carbon output using emissions factors by utility type (e.g., electricity, natural gas, heating oil). The audit process shall inform a GHG baseline per building and feed into the broader municipal decarbonization roadmap.

From the Energy Efficiency Action Plan of Kubin : CO_2 Emission from public buildings

Based on our collected delta and information for Kurbin public buildings that are managed under Kurbin Municipality the CO_2 emission impact will be calculated as follow:

	Building No.	Electricity Consumptin	Fuel Type (Ton)	CO2 Emmisions
		Kwh	Wood/pellet	(t CO2/a)
Electricity	38	1,569,737.0		486.6
Heating Energy	20	127,000.0	24	39.6
Total		**1,696,737.0**	**24**	**526.2**

Heating in Kubin Municipality building is done through electricity and wood/pellet fuel type. From total number of 38 buildings managed by Kurbin Municipality, 20 of these buildings have a heating system with old technology with high impact of CO_2 emissions.



1.3 Strategic Capital Planning Integration

Energy audits generate essential data for capital investment prioritization. Audit findings will be integrated into multi-year capital plans, lifecycle cost analyses (LCCA), and deferred maintenance schedules. The strategy promotes coupling energy efficiency investments with scheduled capital upgrades (e.g., roof replacement + insulation retrofit) to minimize marginal cost increases while maximizing operational and resilience benefits.

1.4 Infrastructure Lifecycle Optimization

Mechanical systems operating below optimal efficiency contribute to premature equipment degradation. This strategy positions energy audits as a proactive asset management tool, enabling data-driven preventive maintenance planning and infrastructure renewal. Prioritizing buildings with aging HVAC systems, envelope degradation, and unmanaged plug loads can materially extend equipment lifespans and reduce unplanned capital expenditures.

1.5 Grant and Incentive Alignment

Many national and regional energy funding programs require pre-audit documentation or pre-approval based on verified energy usage data. This strategy ensures that audit outputs are formatted to meet requirements for funding eligibility under national and international donor programs such as the EU structural funds for energy efficiency. Municipal staff will be equipped to package audit findings into compelling applications, accelerating access to third-party financing and performance-based incentives.

2. Building Categorization Framework

A standardized approach to categorizing public buildings is essential for efficient resource allocation, meaningful comparisons, and structured audit planning. This framework allows the municipality to rank buildings not only by size or usage but also by strategic retrofit potential and policy relevance.

2.1 Core Categorization Dimensions

Each of the following dimensions forms a critical layer in determining a building's audit urgency, potential return on investment, and compatibility with retrofit programs. Municipal staff should document each factor as part of a **pre-audit inventory**.

a) Functional Type

Understanding building function is foundational, as it determines energy usage profiles, regulatory constraints, and operational flexibility.

- **Administrative Buildings**
  Typically used during standard business hours (e.g., 8 a.m.–6 p.m.). Energy consumption is driven by lighting, HVAC, and plug loads (computers, printers, etc.). These buildings often present retrofit opportunities with minimal disruption to services.
- **Educational Facilities**
  Schools, adult learning centers, and training institutes have fixed occupancy hours and predictable seasonal schedules. Opportunities include behavioral energy programs, demand-based HVAC zoning, and lighting controls. Additional constraints may arise from school board policies or union agreements.
- **Recreational Facilities**
  Arenas, pools, and gymnasiums have highly variable loads and extended operational hours, especially in winter. Pools and ice rinks require careful audit of dehumidification, heat recovery, and system balancing. These buildings often provide high-ROI opportunities, but may require specialized audits.
- **Emergency Services**
  Fire and police stations operate continuously and require reliable, redundant systems. Audit recommendations must consider mission-critical backup power systems, strict indoor air quality standards, and minimal downtime for retrofits.
- **Cultural & Civic Spaces**
  Museums, libraries, and community centers often have aesthetic or heritage constraints that limit retrofit options (e.g., window replacements, solar PV). Lighting upgrades and subtle envelope improvements may be prioritized. Their high public visibility makes them ideal for demonstrating climate leadership.
- **Storage, Utility & Support Buildings**
  Typically unconditioned or minimally used. While low energy users, these may be grouped for portfolio-level lighting retrofits or considered for passive envelope improvements if they exhibit heat loss that affects nearby facilities.

b) Gross Floor Area (GFA)

Floor area reflects a building's size and typically correlates with both energy consumption and upgrade cost.

- **Large Facilities (>2,000 m² / ~21,500 ft²)**
  These buildings warrant detailed audits due to scale efficiencies in retrofit measures and higher absolute savings. Larger buildings may have zoned HVAC systems, submetering opportunities, and sophisticated controls that require detailed analysis.
- **Mid-Sized Facilities (500–2,000 m²)**
  These are ideal for standardized audit packages. They offer meaningful savings while maintaining manageable audit scopes.
- **Small Facilities (<500 m²)**
  Typically not prioritized unless housing critical operations. For small structures, only cost-effective upgrades with simple paybacks (<5 years) should be considered.

c) Energy Use Intensity (EUI)

EUI is a core benchmarking metric and a leading indicator of inefficiency. It accounts for both scale and performance.

- **Calculation**:
  EUI=Annual Energy Consumption (kWh or GJ)Gross Floor Area (m²)\text{EUI} = \frac{\text{Annual Energy Consumption (kWh or GJ)}}{\text{Gross Floor Area (m²)}}EUI=Gross Floor Area (m²)Annual Energy Consumption (kWh or GJ)
- **Use**:
  Compare each building's EUI to national benchmarks.
- **High EUI Buildings**:
  Often result from legacy HVAC equipment, envelope leakage, or poor control systems. These buildings should be audited early.
- **Low EUI Buildings**:
  May still be inefficient if EUI is low due to under-utilization or seasonal shutdowns—context matters.

d) Building Age and Systems Vintage

Older buildings may present both more opportunities and more complexity.

- **Pre-1990 Construction**
  Often lacks insulation standards, uses outdated boilers and chillers, and has minimal automation or zoning. These buildings are rarely code-compliant and may qualify for significant funding.
- **1990–2000**
  Systems may include early-generation DDC controls, compact fluorescents, and oversized HVAC. These are good candidates for optimization and moderate retrofits.
- **Post-2000**
  Likely compliant with baseline efficiency codes, but may still benefit from fine-tuning, control integration, or LED conversion.

- **System-Specific Mapping**
  Create a schedule identifying the install year of lighting systems, HVAC units, windows/doors, roof insulation, etc. This supports lifecycle-based retrofit planning and bundling of upgrades.

e) Occupancy Patterns

Operational hours and occupant behavior dramatically influence energy profiles.

- **24/7 Occupancy**
  Requires continuous HVAC and lighting systems. Opportunities include improved zoning, demand ventilation, and occupancy sensors. Downtime for retrofits must be negotiated carefully.
- **Business Hours (e.g., 8–6, M–F)**
  These buildings can benefit from night setbacks, automated shutdowns, and passive daylighting strategies.
- **Intermittent Use**
  Community halls or storage areas may exhibit energy "leakage" (e.g., heating during unoccupied times). Simple programmable thermostats can yield outsized results.
- **Peak Load Management**
  Understanding when energy demand spikes (e.g., recreation centers on weekends) can inform load shifting, battery storage, or demand-response participation.

f) Capital Planning Status

Audit timing should align with scheduled infrastructure upgrades for cost efficiency.

- **Capital Project Alignment**
  Energy audits should be performed 12–24 months ahead of major renovations to ensure findings inform project scopes.
- **Deferred Maintenance Context**
  Buildings with backlogged maintenance (e.g., leaking roofs, failing chillers) are ideal for "deep retrofit" bundling: combining maintenance with performance upgrades.
- **Resilience Funding Opportunities**
  In areas with climate risks (e.g., flooding, heat waves), capital planning should account for energy resilience and backup power options, guided by audit findings.

2.2 Recommended Building Tiers

To manage auditing workloads, maximize energy savings, and control costs, municipal buildings should be segmented into three strategic audit tiers. Each tier defines not just audit **urgency**, but also **audit depth**, **expected return**, and **implementation sequencing**.

This triage ensures that limited audit and retrofit resources are first applied where they will generate the greatest operational and environmental value.

Tier 1 – High-Impact Buildings

Definition:
Facilities with high energy consumption, large size, critical public function, aging infrastructure, or high greenhouse gas output. These buildings present the greatest opportunity for substantial utility cost reductions and emissions mitigation.

Typical Examples:

- City/municipal halls
- Central libraries
- Indoor aquatic facilities and ice rinks
- Multi-purpose civic centers
- High-occupancy recreation complexes
- Hospitals or long-term care (if municipally owned)

Criteria:

- Gross Floor Area > 2,000 m^2
- EUI ≥ 300 kWh/m^2/year
- HVAC, lighting, or control systems > 20 years old
- Operate > 60 hours/week or 24/7
- Unsubmetered or exhibiting unexplained high utility costs

Recommended Audit Approach:

- **Detailed Audit**
  - Full energy breakdown by end use
  - Engineering-grade analysis of energy conservation measures (ECMs)
  - Installation of temporary submetering/loggers for granular insights
  - Financial modeling (NPV, IRR, lifecycle cost)
  - Retrofit bundling roadmap + implementation plan
  - GHG emissions profiling

Strategic Considerations:

- Prioritized for early implementation to build momentum and secure early wins
- Often qualify for significant retrofit grants or performance-based financing (e.g., energy performance contracts)
- Public-facing upgrades serve a **communications and leadership** role

Tier 2 – Medium-Priority Buildings

Definition:
Buildings with moderate energy use or smaller size, often well-maintained but still operating with legacy systems. These facilities offer modest but still worthwhile savings opportunities.

Typical Examples:

- Branch libraries
- Fire stations
- Medium-sized community centers
- Daycare or administrative satellites
- Older but well-maintained educational facilities

Criteria:

- Gross Floor Area between 500–2,000 m²
- EUI between 150–300 kWh/m²/year
- Systems between 10–20 years old
- Operating hours between 40–60 hours/week
- No major capital work planned within 12 months

Recommended Audit Approach:

- **Hybrid Audit**
  - Walkthrough and system inventory
  - Basic utility bill analysis (1–3 years)
  - Identification of low/medium-cost ECMs
  - Spot-checking of control systems and equipment scheduling
  - Optional: portable logging for high-load systems (e.g., rooftop HVAC, lighting panels)

Strategic Considerations:

- Often suitable for **grouped or batch audits** by facility type
- Ideal for **municipal staff walk-throughs** supported by external advisors
- Retrofits can be bundled for procurement efficiency and tied to mid-term capital upgrades

Tier 3 – Low-Priority / Specialized Buildings

Definition:
Buildings with low energy consumption, intermittent use, or specialized purposes that limit retrofit feasibility. These facilities have limited energy or GHG reduction impact relative to audit effort.

Typical Examples:

- Storage units and garages
- Sheds and auxiliary outbuildings
- Heritage buildings under preservation restrictions
- Public toilets, shelters, and kiosks
- Seasonal-use buildings (e.g., summer-only facilities)

Criteria:

- Gross Floor Area < 500 m²
- EUI < 150 kWh/m²/year
- Very limited occupancy
- Already upgraded or recently built (post-2010)
- Ineligible for current capital upgrades or funding

Recommended Audit Approach:

- **Basic Walkthrough or Desktop Audit**
  - Visual inspection or review of basic consumption data
  - Verification of lighting type, thermostats, insulation presence
  - Documented for compliance or long-term tracking
  - No in-depth diagnostics unless repurposing or major issue arises

Strategic Considerations:

- Audits may be deferred until a change of use, capital project, or grant opportunity arises
- May be assessed as part of ISO 50001 or energy benchmarking programs for completeness
- Some buildings (e.g., heritage sites) may need **special retrofit strategies** involving minimal disruption

This tiered approach allows the municipality to:

- Front-load high-ROI audits
- Avoid over-investment in low-return facilities
- Justify resource allocation using technical and financial criteria
- Maintain audit momentum over multiple budget cycles

Below Is a list of all public buildings in Kurbin Municipality.

Category 1: School Total surface of schools is 36,671 sqm. Which make used area of approx. of 31,000 sqm. Total yearly energy consumption for these buildings is 1,162,430 Kwh /annual. From the calculation and the usage of school facilities for max 10 months we have: 31.7kwh a / sqm (31,700 wh a/sqm)

Category 2: Kindergarten Total surface of schools is 4,646 sqm. Which make used area of approx. of 3,949 sqm. Total yearly energy consumption for these buildings is 137,718 Kwh /annual. From the calculation and the usage of kindergarten facilities for max 10 months we have: 34.87kwh a / sqm (34,870 wh a/sqm)

Category 3: Other Total surface of schools is 6,175 sqm. Which make used area of approx. of 5,248 sqm. Total yearly energy consumption for these buildings is 409,765 Kwh /annual. From the calculation and the usage of other category public facilities we have: 67 kwh a / sqm (76,000 wh a/sqm)

Nr.	Institution Name	Administrative Unit	Surface (m^2)	Electricity Consumption (Kwh/annual)	Usage hours (8/16/24)	Investment in last 5 years
	Shkolla					
1	Shk. 9 vjecare Mal Bardh "Cub Capani" 2kt	Milot	Stot = 893 m2		8 ore	YES
2	Shk. 9 vjecare Skuraj	Milot	Stot=180 m2		8 ore	NO
3	Shk. 9 vjecare Malesia e Kurbinit	Milot	Stot=240 m2		8 ore	NO
4	Shk. 9 vjecare Lester	Milot	Stot=240 m2		8 ore	NO
5	Shk. 9 vjecare Gorre "Nik Tom Prela" 2kt	Fushe-Kuqe	Stot=986.62 m2		8 ore	YES
6	Shk. 9 vjecare"28 Nentori" Fushe Milot 2kt + kopesht	Milot	Stot=1434.76 m2		8 ore	YES
7	Shk. E mesme Milot 3kt	Milot	Stot=1387 m2		8 ore	YES
8	Shk. 9 vjecare Koder-Shullaz	Milot	Stot=520 m2		8 ore	NO
9	Shk. 9 vjecare Shkopet	Milot	Stot=220 m2		8 ore	NO
10	Shk. 9 vjecare Milot 3kt	Milot	Stot=2237 m2		8 ore	YES
11	Shk. 9 vjecare Fushe-Mamurras	Mamurras	Stot=1916 m2		8 ore	NO
12	Shk. E mesme Mamurras "Arif Halil Sulaj" 3kt+bodrum	Mamurras	Stot=3314 m2	1,162,430	8 ore	YES
13	Shk. 9-vjecare" Demokracia" 2kt	Mamurras	Stot=995 m2		8 ore	YES
14	Shk. 9 vjecare Migjeni	Mamurras	Stot=1550 m2		8 ore	YES
15	Shkolla 9 vjecare Zhej	Mamurras	Stot=334 m2		8 ore	NO
16	Shk. 9 vjecare "Dan Bajrami " 2kt	Mamurras	Stot=3265 m2		8 ore	YES
17	Shk. 9 vjecare Nr.2 Gjin Pjetri	Lac	Stot=1800 m2		8 ore	NO
18	Shk. 9 vjecare "Gjok Elezi" Sanxhak 2kt	Lac	Stot=3334 m2		8 ore	YES
19	Shk. 9 vjecare "Mark Trokthi"	Lac	Stot=1832 m2		8 ore	YES
20	Shk. E mesme " At Shtjefën Gjecovi"	Lac	Stot=2900 m2		8 ore	NO
21	Shk. Gjon Gjonaj 2kt	Lac	Stot=3309 m2		8 ore	YES
22	Shk. 9 vjecare nr.3 - pas gjykates	Lac	Stot=699 m2		8 ore	YES
23	Shk.Nr.1 "Besnik Sylja "Mamurras	Mamurras	Stot=1237 m2		8 ore	YES
24	Shk. 9 vjecare Gurez	Fushe-Kuqe	Stot=520 m2		8 ore	NO
25	Shk. 9 vjecare Adriatik	Fushe-Kuqe	Stot=460 m2		8 ore	NO
26	Shk. E mesme "At Shtjefen Kurti "Gorre 2kt	Fushe-Kuqe	Stot=867.8 m2		8 ore	YES
	KOPSHTE					
27	Kopshti nr 2 Lac (pas gjykates)	Lac	Stot=1144 m2		8 ore	YES
28	Cerdhe nr.2	Lac	Stot=1000 m2		8 ore	YES
29	Kopshti nr.1 lagje 2	Lac	Stot=760 m2	137,718	8 ore	YES
30	Kopshti nr.3 (parafabrikat)	Lac	Stot=1060 m2		8 ore	YES
31	Kopshti nr.1	Mamurras	Stot=600 m2		8 ore	YES
32	Kopshti nr.2	Mamurras	Stot=82 m2		-	NO
	AMBIENTE					
33	Komuna Fushe-Kuqe	Fushe-Kuqe	Stot=220m2		8 ore	NO
34	Pallati I Kultures Lac	Lac	Stot=1682 m2		8 ore	NO
35	Bashkia Lac	Lac	Stot=3005 m2	409,765	-	YES
36	Zjarrefikset Lac	Lac				NO
37	Bashkia Mamurras	Mamurras	Stot=1140m2		8 ore	NO
38	Komuna Milot	Milot	Stot=135 m2		8 ore	NO

3. Pre-Audit Data Collection

Robust pre-audit data collection reduces the cost, time, and ambiguity associated with third-party audits. It ensures auditors can focus on high-value diagnostics rather than foundational discovery, and it also creates an internal dataset the municipality can retain, use, and update regardless of external vendors.

This section outlines each required data category and offers collection methods, formats, and tips to ensure completeness and consistency.

3.1 Utility Data (Energy & Water)

Utility consumption data provides the quantitative foundation for audit analysis. It is critical for establishing baselines, calculating Energy Use Intensity (EUI), benchmarking performance, and verifying post-retrofit savings.

Recommended Data Types:

- **Electricity:**
  - Monthly consumption (kWh)
  - Demand charges (kW), if applicable
  - Time-of-use (TOU) or interval data (if available)
  - Total cost and rate structure (fixed vs. variable, demand tiers)
- **Natural Gas or Heating Fuel:**
  - Monthly volume (m^3 or liters), energy content (GJ or kWh)
  - Weather normalization (HDD-based)
  - Commodity and delivery charges
- **District Energy or Steam:**
  - Consumption (kg of steam, GJ)
  - Peak demand and control points
- **Water:**
  - Monthly usage (m^3), total cost
  - Peak use patterns (for pools, landscaping, domestic hot water)

How to Collect:

- Request 24–36 months of billing history from utility providers
- Use utility portals or automated data access agreements
- Store in centralized spreadsheet or data management platform

Pro Tip: If budget allows, implement interval data loggers or work with utilities to access smart meter feeds for buildings with suspected peak load issues.

3.2 Building Documentation

Building plans and system documentation allow auditors to understand the physical layout, infrastructure vintage, and existing energy systems. Missing or outdated documents are common—municipal staff may need to contact archives, architects, or maintenance contractors.

Key Documents to Collect:

- Architectural floor plans (with measurements, space use labels)
- Mechanical and electrical (M&E) drawings (including HVAC zoning)
- Lighting schedules and control diagrams
- BAS screenshots or export logs
- Specifications for major retrofits (roof replacements, window upgrades)
- Permit records and occupancy classifications

Format:

- Preferably digital (PDFs, DWGs, BIM models if available)

- Use file naming conventions and a shared drive

Gap Strategy:

- If floor plans are missing, request auditors to perform an initial field survey
- Consider mobile scanning apps or laser measurement tools for small buildings

3.3 Occupancy and Operational Profiles

Understanding **how** buildings are used is essential to determine whether systems are oversized, poorly controlled, or mismatched to real demand.

What to Record:

- Daily operating hours (e.g. Mon–Fri, 8 a.m. – 6 p.m.)
- Seasonal adjustments (e.g. summer closure, holiday use)
- Estimated occupant count by space type (staff, visitors, students)
- Special occupancy: events, kitchen use, IT/server rooms, workshops
- Facility use trends (e.g. reduced use due to remote work or COVID-19)

Collection Methods:

- Interview facility managers or department heads
- Review booking systems for community centers
- Analyze security/badge swipe data (if available)
- Log building access patterns via BAS or motion sensors

Usage Matters Because:

- HVAC schedules can be optimized to match real use
- Lighting controls can be adjusted by occupancy zone
- Plug loads and process loads vary widely by function

3.4 Equipment Inventory

This helps define retrofit feasibility, capital timing, and baseline efficiency. Even a partial inventory can help auditors assess what technologies are currently in place.

Inventory Components:

- **HVAC Systems:**
  - Boiler/chiller/furnace type, model, capacity, age
  - Air handling units (AHUs), heat pumps, rooftop units
  - Control strategy (thermostats, sensors, BAS integration)
- **Lighting Systems:**
  - Fixture types (e.g. T12, T8, LED)
  - Control method (switch, timer, occupancy sensor, daylight sensor)

- **Domestic Hot Water:**
  - Heater type (tank, tankless), fuel source, insulation
- **Motors, Pumps, and Fans:**
  - Horsepower ratings, control method (constant vs. variable speed)
- **On-Site Generation:**
  - Solar PV array size and production history (if applicable)
  - Backup generators and their load share

Format:

- Spreadsheet with columns for Equipment ID, System Type, Location, Model, Year Installed, Condition, Maintenance History
- Photos and serial numbers helpful if future verification is needed

Tools:

- Use digital inventory tools like Asset Essentials or FacilityDude if already implemented
- Basic Excel template for smaller teams

3.5 Policies, Projects & Constraints

This non-technical layer is often overlooked but critically shapes the feasibility of retrofit implementation and audit scope.

Relevant Inputs:

- **Scheduled Projects:**
  - Any approved or planned renovations (roofing, HVAC, etc.)
  - Facilities scheduled for repurposing, sale, or decommissioning
- **Designations or Constraints:**
  - Heritage buildings with aesthetic preservation requirements
  - Zoning constraints, seismic upgrades, or asbestos presence
- **Strategic Plans and Targets:**
  - Climate action plans with emissions targets
  - Fleet electrification plans that may require EV charging infrastructure
- **Procurement Policies:**
  - Requirements for competitive bidding or union labor
  - Sustainability guidelines (e.g., LEED Silver for new builds)
- **Funding Context:**
  - Previous or pending grant applications
  - Budget lines for maintenance vs. energy capital

4. Working with Contractors

Because the municipality relies on external providers to conduct audits, this section provides a structured approach for:

- Selecting qualified audit contractors

- Defining clear scopes of work
- Managing quality assurance
- Aligning with procurement and compliance requirements
- Coordinating multi-site audit logistics

4.1 Contractor Pre-Qualification

To ensure technical competency, municipalities should either:

- **Develop a pre-qualified vendor list**
  OR
- **Use existing regional/state-approved vendor lists** (e.g., cooperative procurement networks, public-sector energy efficiency frameworks)

Minimum Qualifications to Require:

- Demonstrated experience conducting audits
- Engineers on staff with relevant licenses (P.Eng, PE, or equivalent)
- Experience with public sector clients and reporting formats
- Familiarity with applicable codes (e.g, national building/energy code)
- Insurance, bonding, and liability coverage (per municipal requirements)

Optional But Preferred:

- Certified Energy Auditor (CEA) or Certified Energy Manager (CEM) on staff
- Measurement & verification (M&V) experience
- Energy modeling capabilities
- References from completed multi-building portfolios

4.2 Defining the Scope of Work (SOW)

To control costs and ensure audit outputs are actionable, the Scope of Work must be:

- **Tailored to each building tier** (see Section 2.2)
- **Aligned with municipal retrofit goals** (cost reduction, emissions, grants)
- **Standardized** across vendors for consistency and comparability

Core SOW Elements:

- Site walkthroughs and system inspections
- Utility data analysis and benchmarking
- ECM identification (including capital cost, savings estimate, payback)
- GHG emission impact per ECM
- Photographic documentation
- Building-level summary reports and portfolio-wide summary
- Digital data delivery (Excel + editable audit reports)

Optional Add-ons:

- Energy modeling or simulation for Tier 1 buildings
- Audits for investment-grade retrofits
- Support with grant application documentation
- Development of Measurement & Verification (M&V) plans

4.3 Procurement Models

Choose a procurement model that balances speed, compliance, and control:

- **Individual RFQs/RFPs** per building or tier
  - More control, but time-intensive
- **Master Services Agreement (MSA)**
  - Pre-qualify vendors, then assign work orders per phase
- **Piggyback on Regional/State Procurement Contracts**
  - Fast-track procurement using existing contracts (subject to rules)

Tip: Include language in RFQs that allows for phased or conditional award based on performance and funding availability.

4.4 Audit Timeline and Coordination

Efficient coordination of audits—especially across multiple facilities—requires detailed planning to avoid scheduling conflicts, ensure access to data, and maintain audit quality. Municipal staff act as **project coordinators**, bridging external contractors with internal building stakeholders.

A) Audit Scheduling Strategy

Audit rollouts should be phased based on:

- **Building Tier Priority**
  (Start with Tier 1 buildings—high-impact facilities—then cascade into Tiers 2 and 3)
- **Seasonal Conditions**
  Some audits (especially HVAC or envelope diagnostics) are more effective when heating/cooling loads are active. Consider:
  - Heating-dominated buildings → audit in winter
  - Cooling-dominated → audit in summer
- **Geographic Clustering**
  Group buildings by location to minimize auditor travel time and enable daily scheduling across nearby sites.
- **Available Staff Support**
  Align audits with availability of facility managers, operations staff, or security personnel who will provide access and answer operational questions.

B) Pre-Audit Preparation Checklist

Municipal staff should prepare the following for each building:

- Confirm building access protocols, keyholders, and after-hours availability if needed
- Assemble utility bills and building documents (see Section 3)
- Identify and brief a facility liaison at each building
- Alert IT, security, and mechanical staff (if relevant)
- Communicate audit scope and expected activities to staff and building users

C) Coordination Tools & Communication

- Use a shared **audit tracking spreadsheet** or project management tool (e.g., Trello, Asana) to assign tasks and track progress
- Schedule **weekly check-ins** with contractors for status updates and issue resolution
- Require auditors to **submit an audit schedule** in advance for review and approval

4.5 Quality Assurance & Oversight

Energy audits vary widely in quality, depending on contractor diligence, methodology, and how well they understand local context. The municipality must take an **active quality oversight role** to ensure the results are technically sound, usable, and consistent.

A) Standardized Reporting Templates

To enable comparison across buildings and contractors, all audit reports should use a standard structure and format, including:

- Executive summary with building info and audit level
- Summary table of ECMs with estimated cost, savings, payback, and emissions reduction
- Utility analysis and energy breakdown
- ECM descriptions with supporting calculations and photos
- Equipment inventory
- Appendices for raw data, logs, and assumptions

Tip: Provide a municipal-branded template as part of the audit contract to reduce formatting variability.

B) Reviewing Audit Deliverables

Each audit report should be reviewed by municipal staff or a third-party consultant for:

- **Accuracy of baseline data** (cross-check with utility bills)
- **Plausibility of savings estimates** (e.g., 80% lighting savings is unrealistic unless full LED conversion is proposed)
- **Appropriateness of recommended ECMs** for building type and use
- **Completeness**: All systems covered, clear next steps, no placeholder language

Use a **technical review checklist** to standardize internal reviews and track approval.

C) Cross-Site Consistency

In portfolio-wide audits, apply quality control through:

- **Calibration audits**: Have a secondary engineer re-audit a subset of buildings to compare results
- **Measure benchmarking**: Compare cost/savings for ECMs across similar building types (e.g., LED retrofits across libraries)
- **Feedback loops**: Municipal staff or facility managers provide feedback on audit reports to improve future accuracy

D) Dispute Resolution

Include a clause in contracts requiring auditors to:

- Correct errors at no additional cost within a defined timeline (e.g., 15 business days)
- Attend a review meeting for each Tier 1 building to clarify assumptions
- Submit editable versions of reports and calculations (not just PDFs)

This ensures transparency, usability, and municipal ownership of audit outputs.

5. Cost Estimation & Budgeting

Municipalities often struggle to estimate costs without detailed audit results. This section provides a **methodology for pre-audit financial planning** that:

- Informs RFP scoping and funding requests
- Enables phased budgeting over multiple years
- Aligns retrofit investments with capital planning cycles
- Positions the municipality for grant-readiness

Budget planning is split into two stages:

- **5.1 Audit Costs** – What it will cost to assess each building
- **5.2 Retrofit Implementation Budgets** – Forecasting the likely investment range per building type and audit tier

5.1 Estimating Audit Costs

A) Key Cost Drivers:

- Complexity of HVAC and controls
- Accessibility and security requirements
- Travel time between buildings
- Documentation availability (less = more time = higher cost)
- Required deliverables (e.g., financial modeling, energy simulations)

B) Cost Management Strategies:

- Batch similar buildings into a single procurement to reduce per-building cost
- Set a standard pricing model in RFPs (e.g., cost/ft²)
- Provide complete pre-audit data packages (see Section 3) to reduce auditor hours
- Use flat-rate walkthroughs for Tier 3 facilities

5.2 Estimating Retrofit Implementation Budgets

While exact costs come post-audit, municipalities can use **order-of-magnitude planning ranges** to prepare preliminary budgets and funding proposals.

A) Retrofit Cost Ranges by Measure:

Measure Type	Estimated Installed Cost (per unit or ft²)
LED Lighting Retrofit	$3–$8/m²
HVAC System Replacement	$20–$40/m²
BAS Upgrade	$2–$5/m²
Envelope Improvements	$10–$30/m²
Heat Pump Conversion	$30–$60/m²
Rooftop Solar PV	$2.50–$3.50/watt installed

Note: Costs vary by region, procurement scale, and construction complexity.

B) Budgeting by Building Tier:

Tier	Audit Cost Estimate	Retrofit Budget Planning Range
Tier 1	$10,000–$100,000	$250,000–$3M
Tier 2	$2,000–$25,000	$50,000–$500,000
Tier 3	$500–$5,000	$0–$50,000 (if retrofitted at all)

C) Funding and Phasing Strategy:

- Phase retrofit rollouts over 3–5 years to align with capital budgets
- Bundle ECMs with <5-year paybacks for early wins
- Defer complex retrofits (e.g., HVAC overhaul) until aligned with major renovations
- Reserve 5–10% of retrofit budget for measurement, verification, and change orders

D) Total Portfolio Planning: To develop a multi-year budget:

1. Calculate total GFA by tier
2. Apply average audit and retrofit costs per ft²
3. Build low/high scenario ranges
4. Adjust annually based on audit findings, inflation, and funding

6. Timeline Scenarios

The choice of timeline is not just a scheduling question—it determines how quickly the municipality achieves cost savings, how grant-eligible it remains, and how audit fatigue and vendor capacity are managed. This section presents **three timeline models** for implementing the audit and retrofit strategy.

Each scenario includes:

- Strategic rationale
- Audit and retrofit pace
- Organizational demands
- Key implementation tips
- Trade-offs and risks

6.1 Scenario A: Accelerated Rollout (1–2 Years)

Strategic Rationale:
This timeline is optimal when the municipality faces an external driver—such as limited-time funding, new climate legislation, or a political directive to show rapid impact. It emphasizes immediate action over long-term integration.

Implementation Plan:

- **Year 1:**
  - Conduct audits for all Tier 1 buildings (simultaneous batches)
  - Launch RFP for bundled retrofit projects before audits even conclude
  - Begin Tier 2 audits in parallel, using streamlined templates
- **Year 2:**
  - Complete all Tier 2 audits and implement highest-ROI Tier 2 retrofits
  - Perform desktop or walkthrough audits on Tier 3 buildings (as needed)

Staffing & Governance Needs:

- Assign dedicated project manager or hire an external program manager
- Weekly coordination with auditors and facility managers
- Executive-level visibility and approvals to move quickly

Key Tips:

- Reduce procurement delays
- Pair this scenario with **performance-based contracting (e.g., ESCO)** to fast-track retrofits
- Develop a public communication strategy to highlight visible wins

Trade-Offs & Risks:

- **High short-term cost exposure**
- Risk of **contractor capacity issues**
- Staff bandwidth stretched across buildings
- Long-term planning may be sacrificed for short-term gains

Best for:
Stimulus periods, carbon neutrality deadlines, or political cycles with strong sustainability mandates

6.2 Scenario B: Balanced & Phased Rollout (3–5 Years)

Strategic Rationale:
This is the most common and recommended approach for municipalities seeking a manageable pace that aligns with annual budgeting, minimizes disruption, and builds internal capacity over time.

Implementation Plan:

- **Year 1–2:**
  - Audit and retrofit all Tier 1 buildings
  - Start with "low-hanging fruit" ECMs with <5-year paybacks
- **Year 3–4:**
  - Complete Tier 2 audits
  - Retrofit medium-priority buildings, phased by complexity and cost
- **Year 5:**
  - Conduct final Tier 3 assessments (if needed)
  - Integrate results into future capital planning documents

Staffing & Governance Needs:

- Energy lead or facilities director serves as strategy owner
- Monthly coordination meetings with internal stakeholders
- Departmental budget alignment required each fiscal year

Key Tips:

- Bundle audits and retrofits by **building type** (e.g., all libraries or fire stations) for procurement and process efficiency
- Integrate audits into **Asset Management Plans** to secure long-term capital funding
- Track savings to reinvest into future energy projects (“revolving energy fund” model)

Trade-Offs & Risks:

- Slower emissions and cost savings realization
- Risk of **grant eligibility gaps** if applications aren’t well-timed
- Requires careful documentation and institutional memory

Best for:
Municipalities with moderate budgets, high internal coordination capacity, and a long-term climate plan

6.3 Scenario C: Extended & Opportunistic Rollout (5–10 Years)

Strategic Rationale:
This low-disruption, capital-synergized approach is designed for municipalities with constrained budgets, minimal staff, or a strong emphasis on facility lifecycle integration over fast-track emissions reduction.

Implementation Plan:

- Only audit buildings when aligned with other capital upgrades (e.g., HVAC or envelope replacement)
- Tier 3 audits may be postponed indefinitely unless triggered by use change or funding availability
- Gradually build audit dataset across a decade, with updates triggered by major asset decisions

Staffing & Governance Needs:

- Facilities and asset management teams lead; energy management may be passive
- Annual project integration with capital planning committees
- Focus on **strategic timing**, not volume of activity

Key Tips:

- Maintain a "**building readiness matrix**" to flag when each site is eligible for audit
- Use this strategy to build toward **net-zero retrofit** targets by aligning timing, budget, and technology
- Supplement with **low-cost measures** and behavioral initiatives while audits are pending

Trade-Offs & Risks:

- **Long lag time** to generate savings or reduce emissions
- May struggle to qualify for fast-moving grants
- Lack of portfolio-wide visibility unless well-tracked
- Staff turnover can disrupt continuity

Best for:
Municipalities integrating energy into **long-range asset strategies**, or facing budget and political uncertainty

6.4 Visual Comparison

Element	Accelerated (1–2 yrs)	Balanced (3–5 yrs)	Extended (5–10 yrs)
Cost Savings Speed	Fast	Medium	Slow
Emissions Reduction	High impact, quick	Moderate	Long-term only
Capital Demand	High upfront	Moderate yearly	Low, incremental
Staff Load	Intense	Balanced	Minimal
Planning Integration	Low	Moderate to high	High

Grant Readiness	Excellent	Good	Limited	

7. Expected Outcomes & Next Steps

This section ensures the strategy doesn't stay on paper—it becomes a living, measurable initiative. It lays out:

- What outcomes the municipality should expect
- How to track them
- How to move from planning to execution
- How to embed the process into long-term operations

7.1 Key Outcomes to Track

These are **quantitative and qualitative** outcomes that define success:

A) Energy & Emissions Reductions

- % reduction in total municipal energy consumption (kWh or GJ)
- % reduction in GHG emissions (tonnes CO_2e)
- Energy Use Intensity (EUI) improvements per building and portfolio-wide

B) Financial Returns

- Total utility cost savings ($/year)
- Average retrofit simple payback (years)
- Cost savings vs. audit and retrofit investment (ROI)

C) Audit & Retrofit Completion

- % of buildings audited by tier
- % of priority ECMs implemented
- % of buildings with energy baseline and tracking

D) Capacity & Process Development

- Audit protocol institutionalized in procurement and capital planning
- Staff trained in interpreting audit reports and coordinating retrofits
- Digital records of all audits, utility data, and equipment inventories maintained

7.2 Monitoring and Verification (M&V)

A basic M&V plan ensures credibility of savings and supports grant compliance.

Recommended Steps:

- Compare post-retrofit utility bills to weather-normalized baselines
- Use tools like ENERGY STAR Portfolio Manager or Puzzle to track changes
- Log operational changes or system upgrades that may impact energy use
- For large retrofits, consider third-party M&V using IPMVP protocols

7.3 Strategic Embedding into Municipal Operations

For lasting impact, energy audits and retrofits should be **standard municipal practice**, not one-time projects.

Actionable Tactics:

- Integrate energy audit triggers into the capital planning process (e.g., major renovation = trigger audit)
- Include audit requirements in facility maintenance policies
- Create an "Energy and Emissions" section in all future Asset Management Plans
- Formalize staff roles for energy data management and audit coordination

7.4 Immediate Next Steps (Action Checklist)

1. **Present strategy** to senior leadership and council
2. **Establish internal audit team** or point of contact
3. **Gather pre-audit data** for Tier 1 and 2 buildings
4. **Define and publish procurement documents** for audit contractors
5. **Select preferred timeline scenario** (see Section 6)
6. **Create a central tracking system** for audits, ECMs, savings

7. **Identify near-term grant opportunities** and align rollout
8. **Prepare communications plan** for staff and public messaging

8. Delivery Model Comparison: Contractors vs. In-House Staff

This section compares the **costs, capabilities, scalability, and risks** of two primary delivery models for energy audits:

- **Option A: Hiring External Contractors**
- **Option B: Developing In-House Audit Capacity**

Each has pros, cons, and suitability depending on municipal size, budget, and long-term vision.

8.1 Option A: Hiring External Contractors

Full Description:
Under this model, the municipality issues **Requests for Proposals (RFPs)** or uses **pre-qualified vendor lists** to hire external energy professionals (engineering firms, ESCOs, or certified auditors). These contractors conduct site visits, collect utility data, perform diagnostics, model energy scenarios, and deliver standardized audit reports.

Most firms bring their own tools (e.g., loggers, meters, modeling software) and are responsible for data collection, analysis, cost estimation, and GHG calculations. Contracts can be issued **per building**, **by tier**, or as part of a **master service agreement (MSA)**.

Real-World Example:
A municipality hires a consulting firm to audit 10 high-priority buildings over 3 months. The firm deploys a team of engineers who conduct audits, provide full ECM packages with cost/savings modeling, and assist with a grant application.

Ideal Use Cases:

- Rapid audit turnaround across multiple sites
- Tier 1 buildings with complex systems and high capital stakes
- Situations requiring engineering stamps, investment-grade analysis, or external validation
- Municipalities lacking internal energy management resources

8.2 Option B: Developing In-House Audit Staff

Full Description:
In this model, the municipality **builds internal energy audit capacity** by training its existing facilities or asset management staff—or by hiring new staff with technical backgrounds. Staff perform basic audits such as:

- Walkthroughs and equipment logging

- Utility analysis and energy benchmarking
- Identification of low-cost ECMs (e.g., lighting, scheduling, thermostat optimization)
- Tracking and verifying previously implemented retrofits

With sufficient experience, internal staff may oversee contractors, manage RFPs, validate audit outputs, and serve as long-term stewards of the municipal energy portfolio.

Certification & Training:

- **Certified Energy Auditor (CEA)** or **Certified Energy Manager (CEM)** via AEE
- Government or utility-sponsored training
- Internal mentorship with senior engineering staff, if applicable

Real-World Example:
A city trains its facilities team to conduct walkthrough audits for 20+ small and mid-sized buildings over 2 years, while continuing to contract external engineers for arenas and civic centers. Staff maintain a central ECM tracking tool and update GHG savings annually.

Ideal Use Cases:

- Continuous improvement and re-auditing of existing buildings
- Tier 2 and Tier 3 audits where cost savings don't justify external fees
- Building long-term institutional knowledge
- Enabling deeper collaboration with facilities staff and occupants

8.3 Comparison Table: Contractors vs. In-House Audit Delivery

Criteria	External Contractors	In-House Staff
Technical Expertise	High – licensed engineers, energy modelers, M&V experts	Moderate – staff may be trained, but not certified
Audit Scope	Full financial modeling	Level 1–2 for simpler buildings, less financial detail
Speed of Delivery	Fast – scalable deployment across many buildings	Slower – limited by staff time and availability
Upfront Cost	High per audit	Low per audit (after training)
Long-Term Cost	High for ongoing use	Lower over time; self-sufficient model
Flexibility	High – access niche skills on demand	Moderate – tied to staff workload and scope
Grant Eligibility Support	High – auditors deliver compliant reports	Medium – internal reports may lack required format/certification
Knowledge Retention	Low – knowledge resides with vendor	High – builds internal capacity and continuity
Oversight Needs	Medium – needs QA/QC, clear RFPs	High – requires training, SOPs, and supervision

Criteria	External Contractors	In-House Staff
Ideal Use	Complex, capital-intensive buildings	Routine, lower-risk, or smaller buildings
Best Fit For	Municipalities seeking fast impact or lacking capacity	Municipalities investing in long-term energy management