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## ENHANCING CAPACITY FOR LOW EMISSION DEVELOPMENT STRATEGIES (EC-LEDS CLEAN ENERGY PROGRAM)

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# COMPETITION EVALUATION REPORT FOR GREEN BUILDING OF THE YEAR AWARD, INCLUDING MRV PLAN



August 2015

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## DISCLAIMER

The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

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The report was prepared by Levan Natadze of Green Building Council Georgia with contributions from other staff members, and was reviewed by Inga Pkhaladze and Nino Lazashvili of Winrock International Georgia.

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## ACRONYMS

Acronym	Full name
BMS	Building Management System
BREEAM	Building Research Establishment Environmental Assessment Method
CENN	Caucasus environmental NGOs Network
CO <sub>2</sub>	Carbon Dioxide
DHW	Domestic Hot Water
EBOM	Existing building operation and maintenance
EC-LEDS	Enhancing Capacities for Low Emission Development Strategies
EPA	Environmental Protection Agency (USA)
EUMM	European Union Monitoring Mission
FSC	Forest Stewardship Council
GBC	Green Building Council
GBC-Ge	Green Building Council Georgia
HVAC	Heating, ventilation, air conditioning
IR	Infrared
IT	Information technology
KW	Kilo Watt
L	Litre
LEED	Leadership in Energy and Environmental Design
LED	Light Emitting Diode
LLC	Limited Liability Company
M <sup>2</sup>	Square Meter
MRV	Monitoring, Reporting and Verification
NGO	Non-governmental organization
NTC	New Technology Center
O <sub>2</sub>	Oxygen 2
PEFS	Program for the Endorsement of Forest Certification
PV	Photovoltaic
T	Ton
VOC	Volatile organic component

## EXECUTIVE SUMMARY

Environmental matters have become a principle issue for businesses worldwide. The green building market distinguishes environmentally friendly buildings by measuring their performance and applying labels or certificates. In Georgia there are no certified or labeled green buildings yet, but some existing constructions perform quite well in this field. This report provides information on the Green Build 2015 competition, organized to stimulate the market and provide some first cases of certified green buildings.

To raise awareness on environmental issues in the building industry, the market applies green or energy-efficient building assessment systems to measure the sustainability of the facilities and their energy use. These rating systems are developed and operated nationally or internationally, and then buildings are assessed and certified according to pre-defined themes, which may vary from one country to another. Generally, certified buildings are re-assessed periodically to ensure that they still conform to the requirements of the rating systems. In order to reduce operational costs and enhance and maintain the operational efficiency of a building, monitoring the rated parameters is required. Data provided by energy labeling or green certification should be verified periodically, depending on the type of building and its systems. Verification of the initial parameters is required since subsequent changes are possible in building ownership or management, and because maintenance schemes can change for economic reasons,

This report shows how to verify results after sites have been certified. Site-specific MRVs, or Monitoring, Reporting and Verification assessments are carried out according to the requirements for a plan in the MRV Framework and Methodology Report.

## **SECTION ONE: INTRODUCTION**

Green Build awards are organized by many national GBCs to honor companies and professionals that demonstrate clear implementation of sustainable design, construction and/or operation of buildings and structures. Its main goal is to help establish a good environmental practice model for the built environment sector.

To stimulate responsible built environment business in Georgia and to motivate Georgian professionals in 2015, GBC Georgia conducted the Green Build 2015 competition to identify the best practices and help transform the green building market--which is a long-term overall objective of GBC organizations.

The GBC-Ge Awards identify, recognize and highlight organizations for their innovative and outstanding sustainable building principles and practices. The awards aim to increase understanding of how the green construction sector can contribute to sustainable development and lead to an exchange of ideas and good practices in sustainability in Georgia and the region. The program's main award identified two existing green buildings that will be certified by the BREEAM international certification scheme. In addition to recognizing the best buildings of the year, the Competition focused on types of businesses and the work of professionals in this sector.

Following on this initiative, the EC-LEDS project, in partnership with GBC Georgia, developed a framework for monitoring buildings and verifying results. The MRVs developed can show how to ensure that rated performance indicators do not decline after the buildings are certified. The MRV framework offers a strategy to ensure that once buildings are certified, they remain green and are managed in a sustainable way.

## **SECTION TWO: COMPETITION DETAILS AND AWARD CATEGORIES**

The Competition was announced on March 03, 2015 and applications were received by April 15, 2014. Competition categories included:

- Main award (Prize--possible LEED or BREEAM certification): Green Building of the year.  
The most sustainable building constructed in or before 2014.
- Other awards (prizes – certificates):
  - Planned green project of the year  
The most sustainable and ambitious designed and ongoing Project

- Best municipal practice  
For a municipal project, a municipality or municipal servants for sustainable municipal policies and planning
- Best corporate management practice  
Operation and maintenance of corporate facilities / premises (includes all aspects of Existing Building Operation and Management -EBOM)
- Best Development Practices  
Best development practices for separate buildings and district developments
- Green Building Systems  
Best practices in design and installation of HVAC, power supply, lighting and other building systems
- Best Construction Practices  
Best practices of a construction company
- Production of green materials  
Best practices by producers of construction materials
- Re-use and recycling  
Good practices in re-using building materials
- Sustainable waste management  
Good practices in on-site waste management
- Green building professionals – architects  
Individuals – best architectural practices
- Green building professionals – engineers  
Individuals – best engineering practices
- Water management  
Best practices in water management technologies
- Sustainable lighting  
Best practices in lighting and daylight applications
- Indoor environment  
Best practices in creating a green indoor environment
- Green building professionals – education  
Achievements by professionals in the design, installation and management of green technologies
- Other innovations and research in green building  
Any other innovations or good practices

## SECTION THREE: EVALUATION CRITERIA

The following criteria were applied to identify the green building of the year:

### **Sustainable Site Use:**

- Sustainable land use preferably on previously developed or cleared lands, as opposed to green lands.
- Degree to which the soil is conserved and protected against erosion; how local ecological disturbance is minimized; how trees are protected or saved; and whether new ecological niches for animals are generated, e.g. by green roofs.

(Maximum grade 15 points)

### **Water Efficiency:**

- The degree to which the project makes good use of water resources in all respects.
- Water use for water provided from the city, drinking water imported to the office, rain water and surface water. (Is building equipped with low-flow fixtures and water-efficient restrooms? Have efforts been made to reduce waste and energy consumption with respect to bottled drinking water? Have efforts been made to make use of rain water or increase retention on site and aquifer recharge?).

(Maximum grade 10 points)

### **Energy Efficiency:**

- This category refers to both active and passive energy efficiency. Passive efficiency includes insulation, effective solar design and shading, natural ventilation, etc. Active efficiency includes smart lighting systems, fuel-efficient furnaces and chillers, renewable energy sources and power generation.

(Maximum grade 30 points)

### **Sustainable use of Materials:**

- This category includes construction materials. (Are a significant portion of the materials recycled or reused from post-consumer products? Are the materials manufactured with low-impact processes in terms of pollution generated and energy consumed? Has onsite construction waste been minimized? Do the materials come from local sources?)

(Maximum grade 10 points)

### **Sustainable Indoor Environmental Quality / Health and Well-being:**

- Focus of the project on the health of the occupants and the creation of an environment that promotes health lifestyle.

- Good air quality through low VOC- emitting materials, good ventilation, good exhaust, filtering, indoor plants and air quality monitoring.

-Other aspects that promote health and well-being like bicycle parking spaces and changing rooms; vegetated terraces for eating and working should also be considered.

(Maximum grade 10 points)

### **Innovative Design:**

Has this project employed elements that draw attention to green building and the project through their aesthetic appeal and innovative solutions to problems?

(Maximum grade 15 points)

### **Impact:**

How successful was the impact the project had on meeting the GBC-Ge's stated goal of greening the construction industry? (Media coverage, iconic landmark etc).

(Maximum grade 10 points)

## **PLANNED GREEN PROJECT OF THE YEAR**

The same criteria as for the Green Building of the Year.

### **BEST MUNICIPAL PRACTICES:**

- Planning and development of green sites.
- Activities in sustainable municipal infrastructure development.
- Sustainable urban transportation activities, including public transport, cycling network.
- Implementation of municipal energy efficiency or other green building-related projects in the housing sector.

### **BEST CORPORATE MANAGEMENT PRACTICES:**

- Monitoring building systems and building construction performance.
- Energy efficient building operation practices.
- Supply and use of environmentally friendly maintenance materials, for example for cleaning.
- Indoor environmental management, including but not limited to thermal comfort, lighting comfort, CO2 levels, tobacco smoke control.
- Use of non-toxic materials and furniture.
- Staff education and training in sustainable building management.
- Commissioning of the building systems.

### **BEST DEVELOPMENT PRACTICES:**

- Green management of the project sites developed by companies.

#### GREEN BUILDING SYSTEMS:

- Production supply or operation of environmentally friendly building systems including, but not limited to HVAC, water supply, sewage, power supply, low voltage installations, etc.

#### BEST CONSTRUCTION PRACTICES:

- Responsible contractors' practices.
- Environmentally friendly construction site management including, but not limited to, site ecology, storm water management, dust and pollutant management.

#### PRODUCTION OF GREEN CONSTRUCTION MATERIALS:

- Production and supply of environmentally friendly building materials.
- Creation of the capacity to produce green building materials in Georgia.

#### REUSE AND RECYCLING

- Recycling building materials and supplies to the construction market.
- Good practices in reusing construction materials.
- Any innovations in the reused and recycled construction materials market in Georgia.

#### SUSTAINABLE WASTE MANAGEMENT

- General good practices in providing infrastructures for waste management, including separate waste collection, diversion of construction waste during construction.
- Responsible management of hazardous waste in buildings like batteries, chemicals, ozone depleting substances etc.

#### GREEN BUILDING PROFESSIONALS - ARCHITECTS

- Received local or international green design awards or participated as an architect in award-winning green projects.
- Best practice in design of green buildings.

#### GREEN BUILDING PROFESSIONALS - ENGINEERS

- Received local or international green design awards or participated as an engineer in award-winning green projects.
- Best practices in designing engineering systems for green buildings.

#### WATER MANAGEMENT

- Best practices in sustainable water management in buildings (including water efficiency, rainwater harvesting, water treatment etc.).

#### SUSTAINABLE LIGHTING

- Good practices in design, installation of interior and exterior lighting for green buildings.

- Good practices in preventing light pollution.

## INDOOR ENVIRONMENT

- Focus of the project on the health of the occupants.
- Creation of an environment that promotes healthy lifestyles.
- Good air quality through low VOC-emitting materials.
- Good ventilation, good exhaust, filtering, indoor plants and air quality monitoring.
- Other aspects that promote health and wellbeing like bicycle parking spaces and changing rooms, vegetated terraces for eating and working.

## GREEN BUILDING PROFESSIONAL EDUCATION

Contribution to the education of professionals in the green building sector. This may cover but not be limited to:

- Management of green development projects
- Design of green buildings
- Operation and maintenance of green buildings
- Production of green materials and recycling / reuse practices for the green construction sector

## OTHER INNOVATIONS AND RESEARCH IN GREEN BUILDING

- Elements used that draw attention to green building and the project through their aesthetic appeal.
- Innovative solutions to problems.

## SECTION FOUR: APPLICATIONS SUBMITTED

Applications were submitted in most of the categories announced, however none were received for building services or engineering-related categories or for the production of sustainable building materials. The tables below, followed by explanations, show the content of applications received:

### MAIN CATEGORY – GREEN BUILDING OF THE YEAR

**Table 1. Submitted application – main award**

Sub Category	Sustainable Architecture and Green Engineering Technologies Centre (Eco Tour)
Site Description	The site is located in Bazaleti, beside a lake, in a recreational district. Total building area – 1800 sq. meters.
Sustainable Site Use	Issues: <ul style="list-style-type: none"> <li>- green roof – 400 sq. meters</li> <li>- landscape integrated design</li> <li>- decorative edible fruit and vegetable gardens</li> <li>- constructed wetland</li> <li>- organic waste composting area, with organic fertilizer</li> <li>- construction waste minimization by reuse of construction materials</li> </ul>

Water Efficiency	<p>Issues:</p> <ul style="list-style-type: none"> <li>- Water treatment system: artificial treatment reservoir for water purification.</li> <li>- constructed wetland</li> <li>- water storage for irrigation</li> </ul>
Energy Efficiency	<p>Issues:</p> <ul style="list-style-type: none"> <li>- building insulation and ventilated facades</li> <li>- Energy-efficient sandwich panels envelope</li> </ul> <p>Renewable and alternative energy:</p> <ul style="list-style-type: none"> <li>- silos for storage of biomass – recuperating ventilation system</li> <li>- biogas separation, boosting and storage aggregate</li> <li>- combustion chamber for biomass received from fruit processing (seeds, pellets etc) and hot water boiler of 84 kW</li> <li>- hot water buffer station with capacity of 3 tons</li> <li>- photovoltaic systems for generation of electricity of 10 kW</li> </ul> <p>Issues:</p> <ul style="list-style-type: none"> <li>- hot water vacuum collector of 20 m2</li> <li>- hot water parabolic collector of 1 kW</li> <li>- biogas cogeneration station with 40 kW capacity (20 kW electricity and 20 kW hot water)</li> <li>- reservoir for treated waste water (with 20 m3 of volume) for irrigation purposes</li> <li>- drained water reservoir with 10 m3 of volume</li> <li>- wind generator for electricity of 1 kW and pumping of drinking water from well</li> <li>- water heat pump with 15 kW capacity</li> </ul>
Sustainable Environmental Quality / Health and Wellbeing	Views to outside, natural ventilation
Sustainable use of Materials	<p>Issues:</p> <ul style="list-style-type: none"> <li>- green construction materials used, wood PEFC- and FSC- certified</li> <li>- reuse of construction materials at construction stage</li> </ul>
Innovative Design	<p>Issues:</p> <ul style="list-style-type: none"> <li>- alternative energy generation</li> <li>- storage and distribution plant constructed</li> </ul>
Impact	<p>Wide impact on the community and others than those who use the building:</p> <ul style="list-style-type: none"> <li>- water pumping station also serves for educational purposes</li> <li>- demonstrational greenhouses for organic farming</li> </ul>
<b>Sub Category</b>	<b>Office and Conference facility, NTC</b>
Description of the site	The site is located near the western entrance to Tbilisi on the main highway, is 3000 m2 building area: office , showroom, sky bar (5 storeys).
Sustainable Site Use	<p>Issues:</p> <ul style="list-style-type: none"> <li>- green roofs</li> <li>- no waste generated, all materials recycled</li> <li>- compost facility.</li> </ul>
Water Efficiency	<p>Issues:</p> <ul style="list-style-type: none"> <li>- rain water collection system and treatment of waste water</li> <li>- no water sourced from the Municipality</li> <li>- 40 T water reservoir</li> </ul>
Energy Efficiency	<ul style="list-style-type: none"> <li>- wind generators</li> <li>- solar tubes</li> <li>- solar energy collectors</li> <li>- insulated building envelope</li> <li>- ventilated facades</li> <li>- recuperation system</li> </ul>
Sustainable environmental quality / health and wellbeing	<p>Issues:</p> <ul style="list-style-type: none"> <li>- natural ventilation and solar illumination are maximally used</li> <li>- sun, daylight and glare control</li> </ul>
Sustainable use of Materials	Re-use of building materials – sandwich panels from used concrete molds
Innovative Design	Use of structure that involves combination of reinforced concrete with timber frame
Impact	Building serves as a conference facility, making wider dissemination of the green building concept.
<b>Sub Category</b>	<b>TDS (Dog shelter in Lisi Lake area)</b>

Description of the site	Small scale development near Tbilisi for Dog shelter
Sustainable Site Use	Wetland integrated in the landscape design
Water Efficiency	Issues: - no grid connection, - well used for water supply - constructed wetland - waste water filtration
Energy Efficiency	Issues: - no grid connection - PVs used - solar water heating
Sustainable Environmental Quality / Health and Wellbeing	n/a
Sustainable use of Materials	Used materials with low embodied energy - wood
Innovative Design	n/a
Impact	n/a

## OTHER CATEGORIES: PLANNED GREEN BUILDING OF THE YEAR

### Proposal 1 - JI (Your House on Jikia Street)

The site is located in Tbilisi. Emphasis is made on yard landscaping. Re-used bricks are applied for facade finishing. The construction company has launched reinforced bars acquisition scheme by bar sizes against traditional standard scheme where the bars are cut on site, and has reduced steel waste.

### Proposal 2 - Lisi Lake (Residential Development)

The site is located in Tbilisi, in recreational area. The main emphasis is on the promotion of a healthy living environment. This is also a marketing tool for the developer. The site has designed a maximum available landscape, using energy efficient envelopes. Waste collection and recycling schemes are planned.

### Proposal 3 - Marneuli Sports Hall (applicant Inex Pro, with participation of Marneuli Municipality and Shida Kartli Governor's Administration)

The site is located in Marneuli, Georgia, developed on the former sports facility site. Issues: maximum existing vegetation retention, partial green roof - terrace, bicycle facilities, 10-ton rain water collection reservoir, 3000 lt. capacity solar hot water heating, efficient envelope, daylight and solar strategy considered, ground heat pump, LED lighting supplied from PVs and batteries, enhanced air filtering.

## CATEGORY – GREEN BUILDING PROFESSIONALS - ARCHITECTS

### Proposal 1 – Mr. Aleksandre Ramishvili

Several designs (implemented projects) of home and public buildings. The features of the buildings are insulated envelope, green roofs and sustainable land use, water efficient systems, maximum use of timber structures, natural light for most rooms. Six sites:

- New Technology Center-. Dighomi, Tbilisi, Georgia.
- Archaeological Site Center- Dighomi, Tbilisi. Georgia
- Passive Solar House – Zemo Vedzisi, Tbilisi, Georgia
- Kolkheti National Park Visitor Center Headquarters – Poti, Georgia.
- Bird Ringing Station – Anaklia, Churia River Delta, Georgia
- Family House – Kiketi, Georgia.

Green features: ventilated facades, efficient envelopes, maximum landscape protection, sustainable materials, maximum use of passive technologies, water resource management, green roofs, and constructed wetlands.

#### Proposal 2 – Mr. Revaz Avalishvili

Design of typical homes in Gudauri ski resort. Modular timber structures that can be constructed in different shapes to provide a wide range of homes. The design is approved by municipal authorities as a typical one.

Green features: Reusability of the modular structures, adaptation to non-flat surfaces (in mountainous regions), maximum retention of existing landscape. The design includes solar panels, thermal controls, rain water and waste water management system, geothermal heating/cooling.

### CATEGORY – BEST CORPORATE MANAGEMENT PRACTICES

#### Proposal 1 - European Union Monitoring Mission in Georgia (EUMM)

Utilities monitoring and tracking system in Tbilisi and field offices, facilities management problem reporting and response system throughout Georgia, problematic areas identification (energy waste, leak detection).

#### Proposal 2 – CENN Caucasus Environmental NGOs' Network

Operation of CENN Bulachauri Green Center, Village Bulachauri, Georgia. The site also acts as demo facility for green education.

Efficient envelope, effective heating system, permeable landscape, shaded surfaces, soil erosion and sedimentation control, adapted vegetation, compost production, all staff employed from the walking distance, environmentally friendly exterior lighting, reusing of rain water, utilities expenditure monitored, waste separation and recycling, sustainable purchasing, daylight, lighting controls, low VOC materials, safe cleaning products storage.

### CATEGORY – BEST DEVELOPMENT PRACTICES

#### Lisi Lake Residential Development

The site is located in Tbilisi, in a recreational area. The main emphasis is on promotion of a healthy living environment. This is also marketing tool for the developer. Maximum available landscape, using energy efficient envelopes, with planned waste collection and recycling scheme.

## CATEGORY – OTHER INNOVATIONS AND RESEARCH IN GREEN BUILDING

Mr. Revaz Avalishvili

Typical design of the homes in Gudauri ski resort. These are modular timber structures which can be used in different shapes to provide wide range of homes. The design is approved by municipal authorities as typical one.

Green features: Reusability of the modular structures, adaptation to non-flat surfaces (in mountainous regions), maximum retention of existing landscape. The design includes solar panels, thermal controls, rain water and waste water management systems, geothermal heating/cooling.

## CATEGORY – SUSTAINABLE WASTE MANAGEMENT

European Union Monitoring Mission in Georgia (EUMM)

Waste separation: plastic, glass, paper, steel, general waste, also hazardous waste like batteries, cartridges, light bulbs; recycling of the materials or sending for safe disposal. Location - Tbilisi and field offices.

## SECTION FIVE: AWARDS

The Jury consisted of representatives from Winrock International (Nino Lazashvili), GBC Georgia (Levan Natadze), Ministry of Energy (Margarita Arabidze), and Ministry of Economy and Sustainable Development (David Gigineishvili). Also International Expert Ms. Duygu Erten participated in evaluation.

For the main award, the winner was identified by scoring as shown on the following table:

**Table 2. Scoring**

Name	Eco Tour (Sustainable Architecture and Green Engineering Technologies Centre)	NTC (Office and Conference facility)	TDS (Dog shelter)
Ms Duygu Erten	71	62	13
Ms. Nino Lazashvili	92	66	15
Mr. Levan Natadze	69	59	21
Mr. David Gigineishvili	68	63	14

Ms. Marita Arabidze	70	64	14
TOTAL:	370	314	77
Ranking	1	2	3

The winners were awarded as follows:

Main award: Green Building of the Year:

**Site 1: Demonstration and Training Center for Sustainable Architecture and Engineering, Bazaleti Lake, Dusheti Municipality**

Distinction: Showing exemplary environmental, social and economic performance in the spheres listed in the award description. The site is located in Bazaleti, on the side of the lake, in a recreational district. Total building area – 1800 sq. meters.

Distinctions, in more details:

*Sustainable Site Use:* Green roof – 400 sq. meters; landscape integrated design; decorative, edible fruit, and vegetable gardens; constructed wetland; organic waste composting area, with organic fertilizer; construction waste minimization by reuse of construction materials.

*Water Efficiency:* Water treatment system: artificial treatment reservoir for water purification; constructed wetland; water storage for irrigation.

*Energy Use :* Building insulation and ventilated facades; energy-efficient sandwich panels envelope; silos for storage of biomass; recuperating ventilation system; biogas separation, boosting and storage aggregate; combustion chamber for biomass received from fruit processing (seeds, pellets etc) and hot water boiler of 84 kW; hot water buffer station with capacity of 3 tons; photovoltaic systems for generation of electricity of 10 kW; hot water vacuum collector of 20 sq. m. area; hot water parabolic collector of 1 kW; biogas cogeneration station with 40 kW capacity (20 kW electricity and 20 kW hot water); reservoir for treated waste water used for irrigation (20 m3); rain water collection reservoir (10 m3); wind generator for electricity of 1 kW and for pumping drinking water from well; water-water heat pump with 15 kW capacity.

*Sustainable Environmental Quality / Health and Wellbeing:* Views to outside, natural ventilation

*Sustainable use of Materials:* Green construction materials used, wood PEFC- and FSC-certified; at construction stage re-use of construction materials

*Innovative Design:* Alternative energy generation; storage and distribution plant constructed.

*Impact:* Wide impact on non-users of the building: (a) water pumping station also serves for educational purposes; (b) demonstration greenhouses used for organic farming.

**Site 2 New Technology Center, Agmashenebeli Highway, Didi Dighomi, Tbilisi Municipality**

Distinction: Showing exemplary environmental, social and economic performance in the spheres listed in the award description.

The site is at the western Tbilisi city limit, 3000 m2 building area: office, showroom sky bar (five storeys).

Distinctions, in more details:

*Sustainable Site Use:* Green roofs; no waste generated, all materials are recycled; compost facility.

*Water Efficiency:* Rainwater collection system; treatment of waste water; no water is provided from the municipality; 40 T water reservoir.

*Energy Use:* Wind generators; solar tubes; solar energy collectors; insulated building envelope; ventilated facades; recuperation system

*Sustainable Environmental Quality / Health and Well-being:* Natural ventilation and solar illumination are maximally used; solar; daylight and glare control.

*Sustainable use of Materials:* Re-use of building materials – sandwich panels from used concrete molds.

*Innovative Design:* Use of structure that involves combination of reinforced concrete with timber frame.

*Impact :* The building serves as a conference facility, which spreads the ideas of the green building concepts.

**Table 3. Other awards**

<b>Award Category</b>	<b>Awarded</b>	<b>Distinction</b>
Best Corporate Management Practices	Caucasus Environmental NGO Network - CENN	Sustainable Operation and Management of CENN Bulachauri Green Center, Village Bulachauri, Georgia. The site also acts as demo facility for green education.
Distinctions, in more detail:  Efficient envelope, effective heating system, permeable landscape, shaded surfaces, soil erosion and sedimentation control, adapted vegetation, compost production, all staff employed within walking distance, environmentally friendly exterior lighting, reuse of rain water, utilities expenditures monitored, waste separation and recycling, sustainable purchasing, daylight, lighting controls, low VOC materials, safe cleaning products storage.		
<b>Award Category</b>	<b>Awarded</b>	<b>Distinction</b>
Best Development Practices	Lisi Lake Development LLC	Environmental approach to the district development.  The site is located in upper Tbilisi, in recreational area around Lisi Lake.
Distinctions, in more detail: The main emphasis is on promoting a healthy living environment. This is also marketing tool for the developer. The site has designed maximum available landscape, using energy efficient envelopes, also is planned waste collection and recycling scheme.		
<b>Award Category</b>	<b>Awarded</b>	<b>Distinction</b>
Sustainable waste management	EUMM – European Union Monitoring Mission in Georgia	Showing exemplary practice in waste primary collection, storing and separation.  Location - Tbilisi and Field Offices.
Distinctions, in more detail: Waste separation: plastic, glass, paper, steel, general waste, also hazardous waste like		

batteries, cartridges, light bulbs, recycling of the materials or sending for safe disposal. , Location - Tbilisi and Field Offices.		
Award Category	Awarded	Distinction
Green building professionals - Architects	Mr. Aleksandre Ramishvili	Several designs (implemented projects) of home and public buildings. The sites are located in different locations in Georgia.
<p>Distinctions, in more detail: The features of the buildings are insulated envelope, green roofs and sustainable land use, water efficient systems, maximum use of timber structures, natural light for most rooms.</p> <p>6 sites:</p> <ul style="list-style-type: none"> <li>- New Technology Center- Georgia. Tbilisi, Georgia</li> <li>- Archaeological site center-Georgia. Tbilisi, Georgia</li> <li>- Passive Solar House – Zemo Vedzisi. Tbilisi, Georgia</li> <li>- Kolkheti National Park Visitor Center Headquarters – Poti, Georgia.</li> <li>- Bird Ringing Station – Georgia. Anaklia, Churia river delta, Georgia.</li> <li>- Home building – Kiketi, Georgia</li> </ul> <p>Green features: ventilated facades, efficient envelopes, maximum landscape protection, sustainable materials, maximum use of passive technologies, water resources management, green roofs, constructed wetlands.</p>		
Award Category	Awarded	Distinction
Planned green project of the year	Jl LLC	Multi story residential block on Jikia Street, with yard landscaping and re-use of materials.
<p>Distinctions, in more details: The emphasis is made on yard landscaping. Also re-used bricks are applied for facade finishing. The construction company has launched reinforced bars acquisition scheme by bar sizes against traditional standard scheme (where the bars are cut on site) and reduced steel waste.</p>		
Award Category	Awarded	Distinction
Best Municipal Practice – Planned green municipal project of the year	Inex Pro LLC (design contractor)  Marneuli Municipality and Kvemo Kartli Governor’s Office (project management)	Marneuli Sports Hall designed site is located in Marneuli, Georgia, developed on the former sports facility. The design is conducted taking into account the best environmental and energy performance practice
<p>Distinctions, in more detail: Maximum existing vegetation retention, partial green roof - terrace, bicycle facilities, 10- ton rain water collection reservoir, 3000 lt. capacity solar hot water heating, efficient envelope, daylight and insolation strategy considered, ground heat pumping, LED lighting supplied from PVs and batteries, enhanced air filtering.</p>		
Award Category	Awarded	Distinction
Other - innovations and research in green building	Mr. Revaz Avalishvili	Innovative design proposal for modular type sustainable buildings construction providing maximum retention of the top soil on the sloped sites.
<p>Distinctions, in more detail: Proposal for typical design of homes in Gudauri ski resort. These are modular timber structures which can be used in different shapes to provide wide range of homes. The design is approved as ‘typical housing’ by municipal authorities.</p> <p>The green features are: Reusability of the modular structures, adaptation to non-flat surfaces (in mountainous regions),</p>		

maximum retention of the existing landscape. The design includes solar panels, thermal controls, rain water and waste water management system, geothermal heating/cooling.

## SECTION SIX: MRV PLANS

The MRV Plan is based on the Framework developed by EC-LEDS program. Roles and responsibilities during MRV implementation are as follows:

Building owner:

- (a) collect site baseline documentation
- (b) feedback

Program partner (may be GBC-Ge or other partners):

- Review of site documentation (certified or labeled)
- Data collection and verification (including on-site works)
- Findings and recommendations developed, sent to EC-LEDS

The suggested time frame for the tasks is as follows:

Stage 1 - identify target/the baseline – one week.

Stage 2 - conduct survey – 1-2 working days for each site, additional days may be needed for testing, if major deviations revealed.

Stage 3 - compare results, monitor variations – one week.

Stage 4 – identify findings – 2 working days.

Stage 4 – produce recommendations – 1 working day.

Stage 5 - distribute among stakeholders – 1 working day.

Stage 6 - review feedback – 2 working days.

Stage 7 - take follow-up action – depending on recommendations issued after site findings.

The Table below shows administrative issues that need to be clarified periodically.

**Table 4. Scope of administrative issues**

Issue	What to look for	Comment	NTC Tbilisi site	Sustainable Architecture and Engineering Center Bazaleti site
Site ownership	Does the site have the same owner? If rented site, does the tenancy / lease / rent agreement cover the whole period of MRV?	If the renting period is less, then the landlord can assure the responsible site management after rent agreement ends.	YES	YES
Site boundaries	Has the site boundary remained the same?		YES	YES
Site surroundings	Have any construction or planning permits been issued	To look at Tbilisi municipal web page, in	YES	YES

	near the site?	regions – to be checked with each municipality separately.		
Building alterations	Are there any alterations, renovations, reconstructions or renovations planned?	If yes, then how it will affect site sustainability?	YES	YES
Responsibility for site maintenance	Is the responsibility for site green maintenance clearly defined? Are the responsible parties known?	The responsible parties should be aware of their duties and responsibilities.	YES	YES

The table below shows technical issues which need to be clarified periodically.

**Table 5. Scope of technical issues**

Issue	What to look for	Comment	NTC Tbilisi site	Sustainable Architecture and Engineering Center Bazaleti site
Building envelope - door and window openings	Are the items in the same physical condition? Do the openings provide the same level of pressurization?	If needed, conduct Standard Door Blower's Test and compare actual and claimed results	YES	YES
Building envelope - daylight	Is the building envelope modified? Are voids' glass surfaces cleaned regularly to maintain transparency?	Check daylight factor, external factors, voids parameters, window to floor ratio	YES	YES
Building envelope - insulation	Are external walls in the same good condition? Can they provide thermal and moisture insulation as initially planned?		YES	YES
Temperature (air and surface)	Do the building systems provide designed temperature in peak periods (summer, winter)		YES	YES
Energy Performance indexes	Is there conducted any energy performance labeling, e.g. Display?		YES	YES
Off-site renewables	Does the site supply green energy from the grid or other sources as claimed or planned?		YES	YES
On-site renewables	Does the site maintain claimed on-site renewable energy items? Do they produce energy as planned or claimed?	Condition of Solar Heating and DHW Photovoltaic plants Unconventional Heating System (Geothermal), wind turbines, biogas. Look for verified performance, e.g. metered data	YES	YES
Real Energy and Water Consumptions	What is the total energy use of the building? What is the net energy use of the separate zones or facilities? What is the energy consumption for each end use?		YES	YES
Heat island effect	Are the roof and pavement materials in the same condition? Is there altered color or texture?	If renovations have taken place, then re-assess for heat island effect issues.	YES	YES
Shading	Are the shading devices operational? Are there trees and do they still provide the same shading for parking,		YES	YES

	yard and other open spaces?			
Acoustics	Reverberation time (noise attenuation)	The interior finishing materials are in original place, in good condition	YES	YES
Sound insulation between rooms	Sound transmittance	The interior insulation materials are in original place, in good condition	YES	YES
Sound insulation from traffic noise (roads, railways, airports) and service equipment	Building envelope, as well surrounding vegetation is in original condition	Check for external factors changes (outside the boundary) It can be construction of roads, e.g. in district development.	YES	No
Planned Indoor Comfort	What temperature and humidity ranges are maintained in the building as by facilities management plan? Does it fit the range specified in the certification/labeling documents?		YES	YES
Comfort issues range	Thermal comfort, natural ventilation, mechanical ventilation velocity, fresh air supply rates, oxygen levels		YES	YES
Heating efficiency	Are thermostatic valves or space thermal controllers still operational?		YES	YES
Lighting comfort	Do the building occupants actively use the lighting controls designed for them specifically? Are the controls still operational?		NA	YES
Solar radiation	Has the site maintained solar shading devices on voids, roof, landscape?		YES	YES
Lighting	Does the lighting system provide luminance of the surfaces within the claimed min and max limits?		YES	YES
Automatic Lighting Controls	Are the claimed lighting controls in place and in working condition?		YES	YES
Humidity (internal and external)	Are humidity measurements taken by owner/manager on a regular basis?		YES	YES
Indoor CO2	Does CO2 monitoring system work properly? If no system installed – does the manager have plan to manage oxygen levels with alternative methods (e.g. natural ventilation)?		YES (if the systems are applied)	YES (if the systems are applied)
Water leaking detectors	Are the claimed detectors in place and in working condition?		No	YES
Building Management System	Does the site have a BMS? Is the data properly collected and analyzed by assigned personnel? Is the personnel's qualification sufficient to manage the building using BMS?		No	YES (if BMS applied)
Air distribution strategy	Is fresh air distributed in the system as planned?		YES	YES
Waste management	Is the site managed	waste separation, delivery to	YES	YES

	according to approved waste management plan?	Brownfield's reuse and recycling practice		
Staff education - occupants	Does the owner / occupant provide regular staff trainings on how to operate the building in a sustainable way?		YES	YES
Staff education – facilities management team	Has the facilities management staff changed? Are the facilities management qualified sufficiently to manage the site in sustainably?		YES	YES
Sub- metering – heavy use areas	Are heavy-use areas sub-metered: e.g. car wash, server rooms, catering facilities. Are the meters easy to read?		YES (excl. water)	YES
Sub-metering, consumption by type of utilities	Natural gas, Electric Energy, Water		YES (excl. water)	YES
Building sustainable systems	Condition of: -Sunspaces -Sustainable insulation materials -Solar shadings -Heating System (centralized) -Floor heating system -Rain-water recovery system -Water management systems (storage, purification, collection...)		YES	YES

## SECTION SEVEN: RECOMMENDATIONS TO CONDUCT MONITORING MISSIONS

MRV plan implementation is recommended on a regular basis, or reporting at least once every two years and conducting a site survey at least once in a reporting period. If unexpected changes are observed between report submissions, a non-regular site survey must be conducted.

MRV Plan/s can be reviewed or updated once a five year, or in other period identified by MRV frame. This may concern particular tasks as well as the general scope of interest which includes:

- (1) climate;
- (2) building envelope (windows, wall, roofs, etc.);
- (3) energy-using equipment and systems (building services);
- (4) operation and maintenance of the building and its systems;
- (5) occupant behavior and activity;
- (6) requirements for the indoor environment.

The MRV scope also can be revised if there are new legal developments in the country, or at the owner's demand. It is strongly advised that if site ownership changes, the new landlord takes on the environmental responsibility to the same extent.

## **SECTION EIGHT: REPORTING**

Site-specific MRV reports are submitted at the end of each reporting period. The suggested length of reporting period is identified in a previous section. The reporting scope also can be revised or updated according to new circumstances in each reporting period. According to a current needs assessment and the suggestions of the MRV Framework, the MRV report for each site should include, at a minimum, the following information:

- Facility definition and boundaries
- Project name
- Building name (may be same as project name)
- Site address
- Site contact details (owner, facilities manager)
- Monitoring report details (persons conducting monitoring and dates)
- All Facility/Procedure Related Contacts: (Names, organization, title, contact information)
- Dates of site visits and monitoring period
- Basic building data (planning zone, land and building area, occupancy type)
- Building description (floor plan, floors, space uses, typical occupancy patterns, as built drawings)
- Principal building function(s) zone by zone: (Education, Food Sales, Food Service, Health Care, Lodging, Mercantile, Office, Public Assembly, Public Order and Safety, Religious Worship, transportation, industrial, workshop, Other Service, Warehouse and Storage, Parking, IT Centre/hub)
- Site survey limitations
- Site survey exclusions
- Data submitted by owner/manager
- Observations
- Conclusions
- Recommendations
- Blank space for feedback from the owner

## **SECTION NINE: PUBLICIZING DATA**

Possible channels for publicizing data include:

- EC-LEDS project media resources (web page, Facebook, events)
- GBC Georgia's media resources (web page, Facebook, events)
- Owner's media resources
- The site's outdoor and interior space (using posters, leaflets, outdoor advertising)

## **REFERENCES:**

MRV Framework and Methodology Report, EC-LEDS Program, August 2015