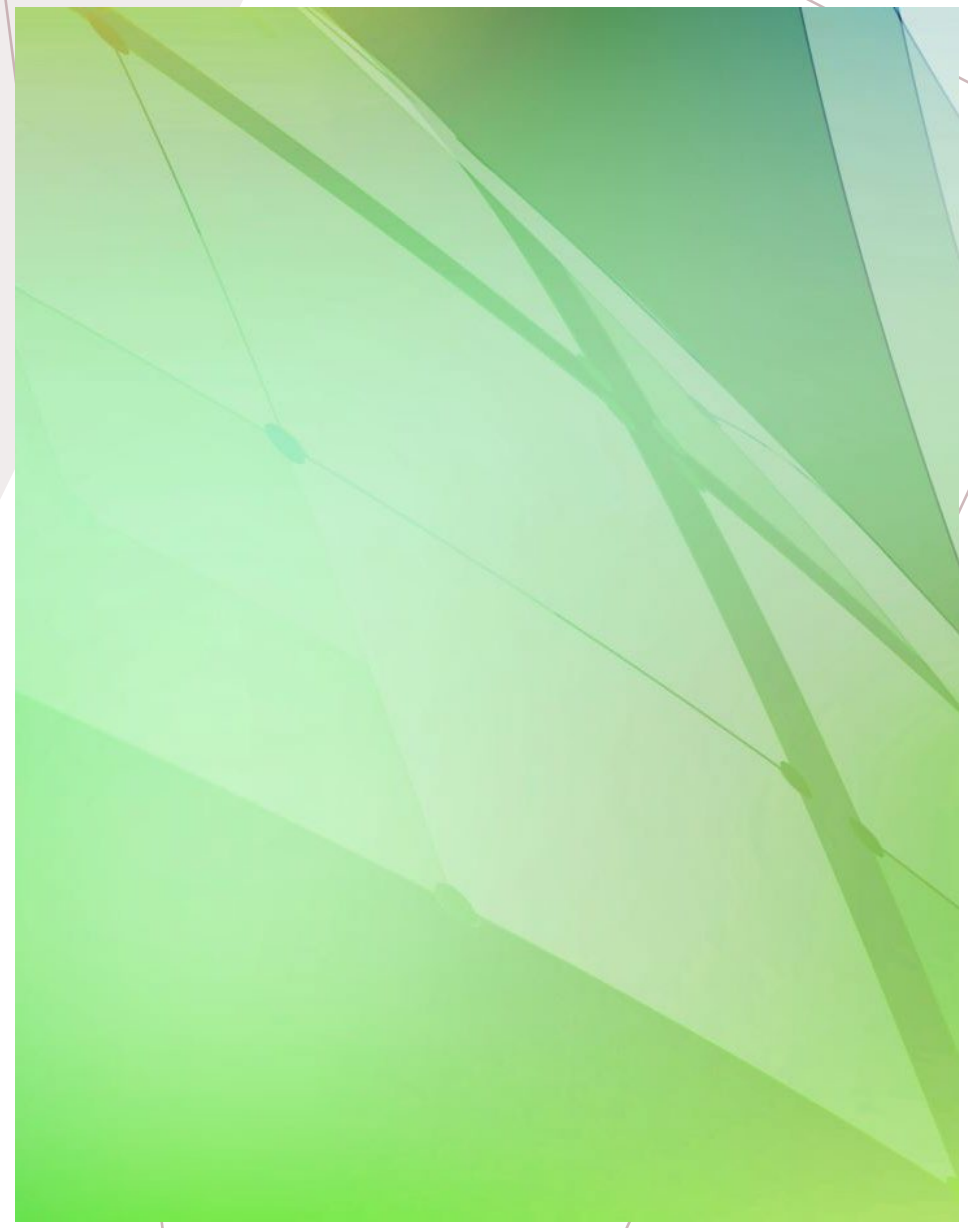
THE GREDA GREEN BUILDING CHECKLIST



Background

- The proposed green building rating tool is applicable to residential buildings and also for Design, Construction, Operation and Maintenance Phases of a residential building project.

- The Certification tool is focused on seven (7) main criteria, namely: Site and Transport; Water Efficiency; Energy Efficiency and Carbon emission management; Indoor Environmental Quality; Materials and Resources; Waste and Pollution; Innovation.

- The review of existing well-known rating tools globally resulted in the above-mentioned criteria and its related indicators as being in the position to adequately measure the sustainability of buildings in Ghana.

GREDA GREEN BUILDING CHECKLIST (GREDA-GBC) CERTIFICATION TOOL

Applicable to Residential Buildings and for the Design, Construction, Operation and Maintenance Phases

About the (GREDA-GBC) Certification Tool

- The total credit for a Criteria is the sum of all the indicator points while the possible points for an indicator is based on the level of sustainability of the indicator.
- The total possible accrued points is one hundred and thirty (130) and a minimum accrued point for a certification is forty-five (45).
- Any residential building is therefore required to earn a minimum point to attain a certification. Buildings earning higher scores will be rewarded with different certification levels depending on the specific thresholds they reach.
- The proposed GREDA-GBC will have four certification levels which include: Two (2) Star (45-59 points), Three (3) Star (60-79 points), Four (4) Star (80 -105 points), and Diamond (106 – 130 points)

R/NO.	CRITERIA/ INDICATORS	CREDITS	REMARKS
ST	**Site and Transport (ST)**	**20**	
ST1	Protect or restore habitat	6	
ST2	Heat Island reduction	4	
ST3	Landscaping and planters	4	
ST4	Access to Public Transport	3	
ST5	Facilities for cycling or walking	3	
WE	**Water Efficiency (WE)**	**16**	
WE1	Water quality	1	
WE2	High Efficiency Water fixtures	3	
WE3	Rain water management	2	
WE4	Outdoor water use reduction	2	
WE5	Surface water run off/ Stormwater mgt	1	
WE6	Water recycling	2	
WE7	Metering and leakage detection system	2	
WE8	Water efficient irrigation	2	
WE9	Water conservation and management plan	1	

EEMR	**Energy Efficiency and Carbon emission mgt (EEMR)**	**34**	
EEMR1	Greenhouse gas emission reduction	4	
EEMR2	Energy efficient equipments	4	
EEMR3	Renewable energy use	4	
EEMR4	Energy metering and monitoring	2	
EEMR5	Low and zero carbon technologies	4	
EEMR6	Energy effiecient cold storage	2	
EEMR7	Efficient ventilation and a/c equipment	2	
EEMR8	Alternative passive design	4	
EEMR9	Embodied energy in building elements	3	
EEMR10	Eco-friendly refrigerants	2	
IEQ	**Indoor Environmental Quality (IEQ)**	**20**	
IEQ1	Low Emitting toxic Materials	3	
IEQ2	Optimum Interior Lighting	2	
IEQ3	Daylighting	2	
IEQ4	Quality Views	2	
IEQ5	Acoustic performance	2	
IEQ6	Indoor Air Quality	2	
IEQ7	Noise Attenuation	2	
IEQ8	Indoor planters	2	
IEQ9	Rooms within 10m natural lighting source	2	

MR	**Material & Resources (MR)**	**18**	
MR1	Life Cycle Impact Reduction	2	
MR2	Environmental Product Declaration	2	
MR3	Responsible sourcing of raw materials	2	
MR4	Sustainable/ Green Products	2	
MR5	Materials with Recycled Content	2	
MR6	Materials with low embodied energy	2	
MR7	Reused Materials	2	
MR8	Locally sourced materials	2	
MR9	Materials with third-party certification/ verifications	2	
WP	**Waste and Pollution (WP)**	**14**	
WP1	Construction waste managmenet	4	
WP2	Operational waste	3	
WP3	Public transport access	2	
WP4	Waste disposal facilities	3	
WP5	Low emmitting vehicles	2	

IN	**Innovation (IN)**	**8**	
IN1	Innovative Technologies	2	
IN2	Innovative materials and products	2	
IN3	Innovative design	4	
	Total Credit	**130**	

Comparisons with other Standard Certification Tools

The GREDA-GBC Certification is compared with other tools with on the following:

- Credit Criteria of Green rating tools
- Scores for key Credit Criteria for each rating tool.
- Assessment criteria of green building rating tools

Credit Criteria of Green Rating Tools

GREDA -GBC (GREDA Green Building Checklist-130 credit points)	LEED (Building and Design and construction- 115 credit points)	BREEM (BREEAM New Construction- international- 130 credit points)	Green Star (Design and As Built- 100 credit points)	Green Mark (Non-Residential New Buildings version 4.1- 183 credit points)	IGBC Rating (IGBC Green New Building- 96 credit points)
Site and Transport (20)	Location and transport (20)	Management (23)	Management (14)	Energy efficiency (116)	Sustainable architecture and design (5)
Water efficiency (16)	Sustainable sites (10)	Health and wellbeing (17)	Indoor environment quality (17)	Water efficiency (17)	Site Selection and planning (14)
Energy efficiency and Carbon emission mgt (EEMR) (34)	Water efficiency (12)	Energy (27)	Energy (22)	Environmental protection (42)	Water conservation (18)
Indoor environmental quality (20)	Energy and atmosphere (35)	Transport (12)	Transport (10)	Indoor Environmental quality (8)	Energy efficiency (28)
Material and resources (18)	Material and resources (14)	Water (9)	Water (12)	Other green features (7)	Building material and resources (16)
Water and Pollution (14)	Indoor environmental quality (18)	Material (11)	Material (14)		Indoor environmental quality (12)
Innovation (8)	Regional priority (4)	Waste (6)	Land use and ecology (6)		Innovation and development (7)
	Integrative process (1)	Land use and ecology (12)	Emissions (5)		
	Accredited professional (1)	Pollution (13)	Innovation		
	Innovation (5)	Innovation (10)			

Green Building Index (Non-Residential- 94 credit points)	BEAM Plus (BEAM Plus New Building version 1.2-140 credits points)	CASBEE (CASBEE for new construction)
Energy efficiency (35)	Site aspects (24)	Indoor environment (Q)
Indoor environmental quality (21)	Material aspects (23)	Quality of services (Q)
Sustainable site planning and management (16)	Energy use (48)	Outdoor environment (Q)
Material and resources (11)	Water use (10)	Energy (L)
Water efficiency (10)	Indoor environmental quality (35)	Resources and materials (L)
Innovation (7)	Innovation and additions (5)	Off- site environment (L)

Scores for Key Credit Criteria for each Rating Tool.

		Site	Energy	Water	IEQ	Material	Waste and pollution	Management	Other	Total
GREDA-GBC	Score	20	34	16	20	18	14	0	8	130
	%	15.38	26.15	12.31	15.38	13.85	10.77	0	6.15	100.00
LEED	Score	17	35	15	18	12	12	1	5	115
	%	14.78	30.43	13.04	15.65	10.43	10.43	0.87	4.35	100.00
BREEAM	Score	14	30	15	15	13	18	23	2	130
	%	10.77	23.08	11.54	11.54	10.00	13.85	17.69	1.54	100.00
Green Star	Score	7	24	14	17	14	11	12	1	100
	%	7.00	24.00	14.00	17.00	14.00	11.00	12.00	1.00	100.00
Green Mark	Score	8	91	20	35	18	4	7	0	183
	%	4.37	49.73	10.93	19.13	9.84	2.19	3.83	0.00	100.00
GBI	Score	9	37	11	21	6	6	3	1	94
	%	9.57	39.36	11.70	22.34	6.38	6.38	3.19	1.06	100.00
BEAM plus	Score	13	48	10	32	19	12	1	5	140
	%	9.29	34.29	7.14	22.86	13.57	8.57	0.71	3.57	100.00
IGBC	Score	11	28	19	12	13	5	2	6	96
	%	11.46	29.17	19.79	12.50	13.54	5.21	2.08	6.25	100.00
CASBEE	Score	6	7	6	21	10	4	2	27	83
	%	7.23	8.43	7.23	25.30	12.05	4.82	2.41	32.53	100.00

Assessment Criteria of Green Building Rating Tools

GREDA-GBC	Green Star	LEED	BREEAM	Green Mark	Green Building Index	BEAM Plus	IGBC Rating
			Sites				
Protect or restore habitat. Heat Island reduction Landscaping and planters Access to Public Transport Facilities for cycling or walking.	Ecological Value Sustainable Sites Heat Island Effect Light Pollution	Sensitive land protection High priority sites Surrounding density and diverse use. Site assessment Protect or restore habitat. Open space Heat island reduction	Proximity to amenities Site selection Ecological value of site and protection Enhancing site ecology long term impact on biodiversity. Building footprint	Greenery provision	Site selection Brownfield redevelopment Development density Environment Management Earthworks Greenery & roof	Contaminated land Neighborhood amenities Ecological impact Cultural heritage Landscaping and planters Microclimate around the building	Site Preservation Basic amenities Proximity to building transport Natural topography and vegetation. Preservation or transplantation of trees Heat island reduction, Non-roof Heat Island effect
			Energy				
Greenhouse gas emission reduction. Energy efficient equipment. Renewable energy use. Energy metering and monitoring. Low and zero carbon technologies. Energy efficient cold storage Efficient ventilation and a/c equipment Alternative passive design Embodied energy in building elements Eco-friendly refrigerants	Greenhouse Gas Emissions Peak Electricity Demand Reduction Refrigerant Impacts Metering and Monitoring	Enhanced commissioning green power and carbon offsets Enhanced refrigerant management Renewable energy Demand response Advanced energy metering. Optimized energy performance	Energy efficiency Energy monitoring External lighting Low and zero carbon technologies. Energy efficient cold storage Energy efficient transport Energy efficient equipment Impact of refrigerants	Building envelope Efficient ventilation Lifts and escalators Energy efficient practices Renewable energy Refrigerants	Minimum energy efficiency (EE) Performance Lighting zoning Electrical sub-metering Renewable Energy Advanced EE performance Enhanced commissioning Post occupancy commissioning EE Verification Sustainable maintenance (Energy related systems) Refrigerants and clean agents	Reduction of CO_2 emissions/ alternative passive design Peak electricity demand reduction Embodied energy in building structural elements. Ventilation system in carparks (EE) Lighting system in carparks (EE) Renewable energy system Air conditioning units Testing and commissioning Energy efficient appliances Operation and maintenance Metering and monitoring Energy efficient layout	Eco-friendly refrigerants Enhanced energy efficiency On-site renewable energy Off-site Renewable energy. Commissioning Post-installation of equipment & systems Energy Metering and Management

Water							
Water quality High Efficiency Water fixtures Rainwater management Outdoor water uses reduction. Surface water run off/ Stormwater mgt. Water recycling Metering and leakage detection system Water efficient irrigation Water conservation and management plan	Potable Water Stormwater	Rainwater management Outdoor water use reduction. Indoor water uses reduction. Cooling tower water use Water metering	Water quality Water consumption Water monitoring Water leak detection and prevention Water efficient equipment Surface water runoff	Water efficient fittings Water usage and leakage detection Irrigation system and landscaping Water consumption of cooling towers Stormwater	Rainwater harvesting Water recycling. Water efficient irrigation Water efficient fittings metering and leak detection system Stormwater design	Annual water uses Monitoring and control Water efficient irrigation Water recycling. Water efficient appliances Effluent discharge to foul sewers	Landscape design Management of irrigation system Rainwater harvesting roof non roof Water efficient plumbing fixtures Wastewater treatment reuse Water Metering Wastewater during construction

GREDA-GBC	Green Star	LEED	BREEAM	Green Mark	Green Building Index	BEAM Plus	IGBC Rating
IEQ							
Low Emitting toxic Materials Optimum Interior Lighting Daylighting Quality Views Acoustic performance Indoor Air Quality Noise Attenuation Indoor planters Rooms within 10m natural lighting source	Indoor Air Quality Acoustic Comfort Lighting Comfort Visual Comfort Indoor Pollutants Thermal Comfort	Enhanced indoor air quality strategies. Low emitting material Construction IAQ Management plan Indoor air quality assessment Thermal comfort Interior lighting Daylight Quality views Acoustic performance	Visual comfort Indoor air quality Thermal comfort Acoustic performance Noise attenuation	Daylighting Artificial lighting Ventilation in carparks Ventilation in common areas Thermal comfort Noise level Indoor air pollutants IAQ Management High frequency ballast	Minimum IAQ performance Environmental Tobacco Smoke Control Carbon dioxide monitoring and control Indoor Air pollutants Mold prevention Thermal comfort. Air change effectiveness Daylighting Daylight glare control Electric lighting levels High frequency ballast External views Internal noise levels IAQ before and during occupancy Post occupancy comfort survey	Security Plumbing and drainage biological contamination Construction IAQ Management Outdoor sources of air pollution Indoor sources of air pollution IAQ in carparks increased ventilation Background ventilation Localized ventilation in common areas Thermal comfort in AC premises Thermal comfort in naturally ventilated spaces Natural lighting Interior lighting in areas normally occupied. Interior lighting in areas not normally occupied. Room acoustics Noise isolation Background noise Indoor vibration Access for persons with disability	CO_2 Monitoring Daylighting Minimum indoor and outdoor pollutants Outdoor views Low emitting material IAQ testing. Occupant wellbeing facilities IAQ Management during construction

Materials							
Life Cycle Impact Reduction Environmental Product Declaration Responsible sourcing of raw materials Sustainable/ Green Products Materials with Recycled Content Materials with low embodied energy Reused Materials Locally sourced materials Materials with third-party certification/ verifications	Life Cycle Impacts Responsible Building Materials Sustainable Products Construction and Demolition Waste	Building life cycle impact reduction Environmental product declaration Sourcing of raw material Material ingredients	Life Cycle Impacts Insulation Responsible sourcing of material Designing for robustness Recycled aggregates Speculative floor and ceiling finishes	Sustainable products Sustainable construction	Material reuse and selection Recycled content material regional material Sustainable timber	Building re-use Modular and standardized Design Prefabrication Adaptability and deconstruction Rapidly renewable material Sustainable Forest product Recycled material Ozone depleting substances Regionally manufactured material	Sustainable building materials Use of certified green building material

GREDA-GBC	Green Star	LEED	BREEAM	Green Mark	Green Building Index	BEAM Plus	IGBC Rating
Management							
None	Green Star Accredited Professional Commissioning and Tuning Adaptation and Resilience Building Information Commitment to Performance Construction Environmental Management	LEED accredited professional	Sustainable procurement Stakeholder participation LCC and service life planning Responsible. construction practices Construction site impacts	Environmental Management Practice	Building user manual Accredited facilitator	Environmental Management Plan	Accredited professional Green building guidelines
Waste & pollution							
Construction waste management Operational waste Public transport access Waste disposal facilities Low emitting vehicles	Sustainable Transport Operational Waste	Construction and Demolition Waste Access to quality transit Bicycle facilities Reduced parking footprint. Green vehicles Light pollution	Construction waste management Operational waste public transport accessibility Alternative modes of transport Maximum car parking capacity Travel plan NO_x emission Reduce light pollution	Green transport	Storage and collection of recyclables Construction waste management Public transport access green vehicle priority Parking capacity	Local transport Air pollution during construction Noise during construction Water pollution during construction Light pollution Construction waste reduction Demolition waste reduction Waste disposal facilities	Low emitting vehicles Outdoor light pollution reduction Organize waste Management, post occupancy. Handling of waste materials During construction

Other							
Innovative Technologies Innovative materials and products Innovative design	Microbial Control	Integrative process regional priority	Safe access Hazards		Workers' site amenities	Site design appraisal Neighborhood daylight access Amenity features	Integrated Design approach Passive architecture Optimization in structural design basic facilities for construction workers Universal design

GREDA-GBC Certification Levels

Rating	Score
Five (5) – Star	106 - 130
Four (4) - Star	80 - 105
Three (3) - Star	60 - 79
Two (2) - Star	45 - 59

Proposed GREDA - GBC Certification Process

REGISTRATION DOCUMENTATION SUBMISSION ASSESSMENT CERTIFICATION

Thank You