

LOTUS Buildings in Operation V1

Technical Manual



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VGBC Members

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Preface

VGBC Background Information

The Vietnam Green Building Council (VGBC) is a project of the Green Cities Fund, Inc. (GCF), an international non-profit organization based in Oakland, California, USA. The VGBC's aim is to be the focal point for academia, government and the private sector in order to promote a more sustainable and adaptive built environment in the context of climate change.

The VGBC has been officially recognized by the Ministry of Construction of the Socialist Republic of Vietnam (March 2009) and also took part in the establishment of the WGBC Asia Pacific Network (September 2009).

The VGBC has set the following objectives:

- Raise awareness and advocate for the development of green buildings:
 - Enhance awareness of green building practice through workshops and online resources
 - Support the government in defining green building development policies and codes
 - Strengthen ties with academia, government and private sector partners
- Build capacity:
 - Develop and implement training curricula for academia and government
 - Define and implement an official Green Consultant training and examination program (LOTUS Accredited Professional)
- Define green building metrics for Vietnam:
 - Develop a set of green building rating systems (LOTUS)
 - Create a Green Database (products and services)
 - Continue long-term research on climate change resilience for the built environment

LOTUS General Information

LOTUS Certification System is a set of market-based green building rating systems developed by the Vietnam Green Building Council specifically for the Vietnamese built environment.

LOTUS Rating Systems share the same goal with existing international green building rating systems (LEED, Green Star, BREEAM, GBI, Green Mark, BEAM Plus, etc.) and aim at establishing standards and benchmarks to guide the local construction industry towards more efficient use of natural resources and more environmentally friendly practices.

LOTUS Rating Systems have been developed through long-term research, with the expert advice of specialists giving particular consideration to Vietnam's economic and natural characteristics and existing Vietnamese standards and policy.

LOTUS Rating Systems currently include:

- LOTUS New Construction V3 (LOTUS NC)
- LOTUS Buildings in Operation V1 (LOTUS BIO)
- LOTUS Homes V1
- LOTUS Small Buildings V1 (LOTUS SB)
- LOTUS Interiors V1
- LOTUS Small Interiors V1 (LOTUS SI)

LOTUS Accreditation for Professional Practitioners

One of the key roles of VGBC is to educate and update practitioners about “green building” design and implementation issues. The core of VGBC's educational offering is the LOTUS Accredited Professional Training Course which allows candidates to undertake an exam in order to achieve the qualification of LOTUS Accredited Professional (LOTUS AP).

LOTUS APs are practitioners within the construction industry who have comprehensive knowledge of the LOTUS Rating System philosophy, structure and practical application within the lifecycle of a building project. LOTUS APs are listed on the VGBC website.

LOTUS BIO Rating System

LOTUS BIO Scope

LOTUS BIO is intended to be used for all building types covered by LOTUS for New Constructions (LOTUS NC), including the following building types:

- Cultural buildings (library, cinema, museum, theatre, club, radio station, television station, exhibition center, community house)
- Educational buildings (nursery, elementary school, secondary and tertiary school, university, vocational school, college)
- Health care buildings (clinic, general hospital, specialist federal and local hospital, nursing home and temporary health care facility)
- Retail buildings (market, shop, shopping center, supermarket, restaurant, kiosk)
- Office buildings
- Hotels and guesthouse buildings
- Transport service buildings (train station, bus station, bus stop, information service center, post office)
- Communication station and towers
- Stadia and sports centers
- Residential buildings
- Factories and industrial buildings

LOTUS BIO Eligibility

In order for a building to be eligible for LOTUS BIO, the following criteria need to be fulfilled:

1. Whole distinct building

For a project to be eligible for LOTUS BIO assessment, it must be a whole distinct building or a group of whole distinct buildings.

Exception: In a mixed-use building combining some Non-Residential (NR) Commercial and Residential components (mixed-use Residential/NR building), if the residential components are clearly separated from the other building components, the residential portion and the NR portion may be eligible for separate assessment under guidance from the VGBC.

2. Building Age

Newly completed buildings that have not been certified under LOTUS are eligible to follow LOTUS BIO. However, the building must have already been operational with at least 50% occupancy for a minimum of 1 year at the time of Provisional Certification and 2 years at the time of Full Certification.

3. Alterations and Additions

Alterations and additions are significant to LOTUS BIO Certification as they are common in the life cycle of a building, have the potential to affect the operations and performance of a building and could change a building significantly such that it can no longer be considered a “building in operation”.

As such the following eligibility requirements must be complied with to be eligible for assessment under LOTUS BIO:

- An alteration shall not affect more than 50% of the Gross Floor Area (GFA) of the building at any one time during the Performance Period
- An alteration shall not disrupt the operations or relocate more than 50% of the building occupants during the Performance Period
- An addition shall not increase the GFA of the building by more than 30% during the Performance Period

In the case where alterations and/or additions exceed the above limits, the project should consider applying for LOTUS NR or LOTUS MFR certification.

LOTUS BIO Categories

LOTUS BIO is composed of 9 categories (plus “Innovation”), each containing a varying number of credits. Against each credit, specific criteria have been set carrying individual scoring points.

It is important to note that prerequisite criteria have been set for few credits. All of these prerequisites are mandatory requirements and must be achieved in order to obtain LOTUS accreditation.

Energy (E) - To monitor, manage and reduce the energy consumption of a building through use of energy efficient equipment, renewable energy and energy management systems.

Water (W) - To reduce the water consumption of a building through the use of water-efficient fixtures, water harvesting, water reuse/recycling and effective monitoring and management of water consumption.

Sustainable Purchasing (SP) - To encourage the use of greener, healthier, and more sustainable products.

Ecology (Eco) - To protect the ecology of the building site and surrounding area, through management of the landscape and maximizing biodiversity.

Waste and Pollution (WP) - To reduce the pollution and waste produced during the operations of the building, as well as encourage extensive recycling practices.

Health and Comfort (H) - To ensure high indoor environmental quality, through maximizing daylight, external views and the monitoring and improvement of indoor air quality and occupant satisfaction.

Adaptation and Mitigation (A) - To ensure that the building reduces its impact on not only climate change itself, but also on the surrounding buildings and environment, while also being prepared for natural disasters and climate change related events.

Community (CY) - To promote the social integration of a building within its neighborhood through public awareness campaign and occupant behavior, and to facilitate access for persons with disabilities.

Management (Man) - To ensure that green targets are set and systems are in place so that occupants are aware of and can achieve these targets, as well as optimize the operation of the building to maximize efficiency.

Innovation (Inn) - To reward exceptional performance or initiatives which are above or not specifically addressed by LOTUS. This category carries additional “bonus” points.

LOTUS BIO Prerequisites

Table 1 summarizes the 9 prerequisites included in LOTUS BIO. Each prerequisite, whether stand-alone or included inside a credit, must be carried out as a minimum requirement for all projects applying for LOTUS BIO.

In a building project with unique constraints or certain building typologies, the VGBC recognizes that some prerequisites may not be attainable. Where it can be demonstrated that all reasonable strategies have been considered and a building is still not able to meet these prerequisites, or alternately that the prerequisite is patently unsuitable for that building, the VGBC reserves the right to waive those requirements. Such decisions will only be made through careful consideration by the VGBC.

Table 1: LOTUS BIO Prerequisites

Prerequisite	Criteria
E-PR-1 Energy Audit	Perform a preliminary energy audit of the building
Eco-PR-1 Environment	Conduct a vegetation survey for the building site
WP-PR-1 Waste Management	Conduct a solid waste stream audit
H-PR-1 Occupant Comfort	Conduct building occupant survey and develop an action plan based on the responses
H-PR-2 Indoor Smoking	Prohibit smoking in the building in accordance with Decision 1315/QĐ-TTg
A-PR-1 Green Transport	Provide building occupants with information on the different collective transportation means available for travel to and from the site
CY-PR-1 Occupant Behavior	Provide a building user's guide to building occupants
Man-PR-1 Facility Audit	Perform a facility audit of the building
Man-PR-2 Maintenance	Produce a building operation and maintenance manual

LOTUS BIO Credits

LOTUS is a point-based system where projects obtain points for complying with criteria set in the LOTUS credits. Credits are built on the following structure: Intent, Requirements, Overview, Approach & Implementation, Calculations (optional) and Submissions. For a project to be compliant with a credit, the intent of the credit has to be met, the requirements have to be achieved and the required submission documents have to be provided.

For some credits, requirements can encompass different options or strategies. A project can only select one of the proposed options to comply with a credit, but it can implement any of the proposed strategies and cumulate points for the credit (while being restricted by the maximum number of points available for the credit).

Codes and Standards Referenced in LOTUS BIO

LOTUS BIO references 13 Vietnamese and 5 International Codes and Standards. These references are included in LOTUS BIO for their relevance to green building operation. VGBC recognizes that it has a responsibility to ensure that LOTUS certified buildings meet these mandatory minimum requirements as well as raise awareness of such codes in Vietnam. LOTUS achieves this by including many codes in prerequisite criteria, meaning evidence of compliance must be provided for a building to be LOTUS certified.

Where a Vietnamese standard exists, LOTUS references or uses it as part of credit criteria, however, buildings in Vietnam often rely on international standards as well. VGBC has consciously prioritized the use and awareness of local standards wherever possible.

This list is intended to highlight the different codes and standards that LOTUS expects applicants to consider as a minimum. This is by no means a comprehensive list of all codes and standards to be applied to buildings in Vietnam. As such, VGBC does not intend this list to be used as a checklist for projects. While every care has been taken to provide the most current codes and standards at the time of publishing, it is the responsibility of the applicant to source the most current codes and standards for their project. Where a code or standard becomes outdated in LOTUS, the applicant will be expected to apply the most current version.

Table 2: Codes and Standards Referenced in LOTUS BIO

Category	Vietnamese/ International	Legislation or Standard
General	Vietnamese	QCVN 02:2009/BXD - Vietnam Building Code Natural Physical & Climatic Data for Construction
Energy	Vietnamese	QCVN 09:2013/BXD - Vietnam Building Energy Efficiency Code (VBEEC)
Water	Vietnamese	TCVN 6773: 2000 Water quality - Water quality guidelines for irrigation
		QCVN 02:2009/BYT - National technical regulation on domestic water quality
	International	NSF/ANSI Standard 350: On-site Residential and Commercial Water Reuse Treatment Systems (National Sanitary Foundation – USA)
Waste and Pollution	Vietnamese	QCVN 14:2008/BTNMT National Technical Regulation On Domestic Wastewater
		QCVN 10:2008/BTNMT National Technical Regulation On Coastal Water Quality
		QCVN 09-MT:2015/BTNMT National technical regulation on ground water quality
		QCVN 40:2011/BTNMT National technical regulation on Industrial Wastewater
		QCVN 28:2010/BTNMT National technical regulation on Health Care Wastewater
		TCVN 6980:2001 Water Quality - Standards For Industrial Effluents Discharged Into Rivers Using For Domestic Water Supply
		QCVN 13:2008/BTNMT National Technical Regulation On Effluent Of Textile Industry
Health and Comfort	Vietnamese	TCVN 5687:2010 - Ventilation - Air Conditioning, Design Standards
	International	CIBSE Guide B - Heating, Ventilating, Air conditioning and Refrigerant
		CIBSE Lighting Guide 7 Office Lighting
		ASHRAE Standard 62.1 (2007, 2010 & 2013) Ventilation for Acceptable Indoor Air Quality
		Australian Standard, AS 1668.
Community	Vietnamese	QCVN 10:2014/BXD - National Technical Regulation on Construction for Disabled Access to Buildings and Facilities

LOTUS BIO Weighting

Weighting of LOTUS BIO categories has been carefully considered through analysis of other green building rating systems and in response to environmental issues specific to building management practices and the changing climate of Vietnam. The number of points available per credit and per category (summarized in Table 3) has been set up to reflect this weighting.

Table 3: LOTUS BIO Weighting

Category	Maximum Points
Energy	33
Water	10
Sustainable Purchasing	4
Ecology	6
Waste & Pollution	8
Health & Comfort	13
Adaptation & Mitigation	10
Community	6
Management	10
Total	100

LOTUS BIO Certification Levels

There are 100 points available in LOTUS BIO, plus up to 8 bonus points available within the Innovation category. The first certification level for LOTUS BIO has been benchmarked at 40% (LOTUS Certified) of the total amount of points. This value reflects a good first level of performance and the minimum required for certification. The following thresholds correspond to 55% (LOTUS Silver), 65% (LOTUS Gold) and 75% (LOTUS Platinum) of the total number of points as shown in Figure 1.

0-39 points Uncertified	40-54 points Certified	55-64 points Silver	65-74 points Gold	75-108 points Platinum
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Figure 1: LOTUS BIO Certification levels

LOTUS BIO for Multi-tenant Buildings

As specified in Eligibility criteria 1, LOTUS BIO applies to whole buildings. To achieve a LOTUS BIO Certification, Multi-tenant buildings (buildings that contain floor area under the ownership or tenancy of more than one entity) may require the commitment and cooperation of the tenants in the building, i.e. tenants to provide information on the equipment/systems they installed, tenants to follow management plans/policies, etc.

All the necessary information for multi-tenant projects is provided in the different prerequisites and credits. In general, 4 different cases can be described:

1. For compliance with prerequisite H-PR-2 Indoor Smoking, the whole building (100% of the GFA) must meet the requirements of the prerequisite.
2. For compliance with the following prerequisites and credits, cooperation from tenants is not necessary:
 - All the prerequisites, at the exception of H-PR-2 Indoor Smoking
 - All the credits considering permanent features of the building and site. Such credits include: Eco-1 Vegetation, A-2 Heat Island Effect, CY-1 Public Space, Man-1 LOTUS Certified Building, etc.
 - All the credits considering systems, services and areas under the control of the facilities management team. Such credits include: W-4 Sustainable Water Use Solutions, Eco-2 Sustainable Landscape Management, WP-1 Wastewater Treatment, etc.
 - Credit E-2 Energy Use Intensity. Only the total energy use of the building is considered, so tenant cooperation is not necessary though it is advised to encourage and help tenants to lower their energy consumption.
3. For compliance with credits SP-1, SP-2, H-7 and Man-5, cooperation from big tenants (tenancies that have a GFA of 10% or more of the total building GFA) is necessary. Other tenants are not required to follow the requirements of these credits. However, the facilities management team will have to provide them with tenant guidelines and training sessions.
4. For compliance with all the other credits, the involvement and cooperation of all the tenants is necessary. Such credits include: E-1 Energy Audit, E-4 Artificial Lighting, W-2 Water

Efficient Fixtures, etc. Generally, tenants will only need to disclose information on the systems they installed or, at least, allow for audits to be performed in their tenancies.

In the situation where full cooperation cannot be achieved, the project should involve a minimum of 90% of the occupied GFA in order to be considered compliant with a credit requiring involvement of the tenants. In this case, data and evidence will only need to be provided for those tenancies in cooperation for LOTUS BIO assessment.

LOTUS BIO for Multi-Residential Buildings

Multi-family Residential buildings are residential building with multiple separate dwelling units individually owned by different owners. As it is not reasonable to require the commitment and cooperation of the residents in the building, the scope of credits and prerequisites for Multi-family Residential projects is limited to all the parts owned by the building owner and/or managed by the facilities management team.

All the necessary information for Multi-family Residential projects is provided in the different prerequisites and credits

LOTUS BIO Certification Process

Introduction

LOTUS BIO Certification is a formal process to independently validate that a project has achieved the environmental performance specified in LOTUS BIO Rating System. Documentation-based submissions are provided to the Assessment Organization as evidence of this achievement.

LOTUS BIO Certification happens in three steps:

- LOTUS BIO Provisional Certification (optional)
- LOTUS BIO Full Certification
- LOTUS BIO Certification Renewal (required to maintain the LOTUS BIO certification)

LOTUS BIO Provisional Certification is an optional stage awarded after the completion of the Provisional Submission. Provisional Certification allows the Applicant to only make a guarantee that changes will be made in order to meet the requirements of some credits. If the building already has all necessary procedures and operations in place, the Applicant may wish to go directly to Full Certification. LOTUS BIO Provisional Certification is valid for 18 months.

LOTUS BIO Full Certification assesses the performance of the building in operation during the **Performance Period**. This assessment is similar to the Provisional Certification except that it requires all necessary operational procedures to be carried out and all strategies to be implemented during the whole Performance Period. Full Certification can also assess improvements from the historical performance of the building. LOTUS BIO Full Certification is valid for 5 years. During the 5-year validity period the Applicant will be required to submit **operational data**.

LOTUS BIO Certification Renewal assesses the performance of the building in operation during the period following LOTUS BIO Full Certification. This assessment is similar to the Full Certification except that it only requires projects to demonstrate that the performance has been maintained and that the operational procedures are still carried out. At the Certification Renewal stage, it is possible for projects to earn more points and reach a higher certification level by targeting more credits or by improving their performance further. It is also possible that projects earn less points and maybe lose the LOTUS BIO Certification if the performance of the building has decreased. The LOTUS BIO Certification Renewal is valid for 5 years and there is no limit in the number of renewals a project can get.

Performance Period

Initial Performance Period

The Initial Performance Period (that is referred to as Performance Period throughout the Technical Manual) is a continuous 12-month period that is used to assess the performance of the building at the Full Certification stage. All evidence supplied at the Full Certification stage must be relevant to the Performance Period, with the exception of historical data required for comparative purposes.

It is up to the applicant to specify the exact dates chosen for their Performance Period and provide evidence that data in all submissions for Full Certification was produced within this period.

The Performance Period should immediately precede the Full Certification submission.

Renewal Performance Period

The Renewal Performance Period is the whole period between the date on which previous LOTUS Certification (Full Certification or previous Certification Renewal) was awarded and the submission for the new Certification Renewal.

All evidence supplied at the Certification Renewal stage must be relevant to the Renewal Performance Period. Evidence should show that the performance of the building was maintained during the whole Renewal Performance Period and that the strategies implemented for previous LOTUS Certification have been kept in place.

LOTUS BIO Timeline

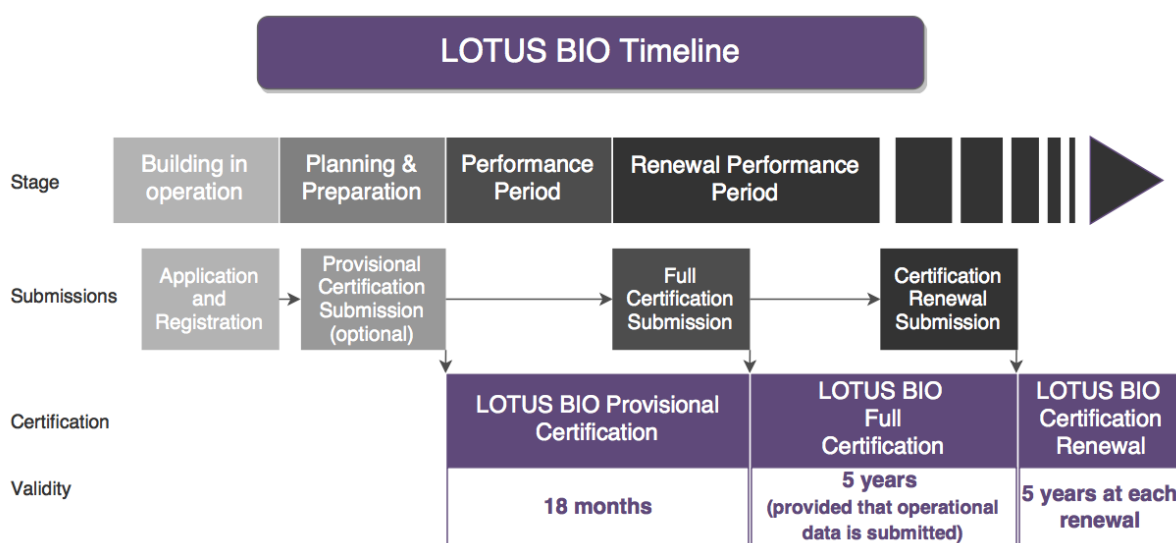


Figure 2: LOTUS BIO Timeline

The first step to gain LOTUS BIO certification is to apply and register the project. Ideally, this should be done before the project starts planning and preparing the implementation of “green” strategies to comply with LOTUS BIO, as once registered the project will receive support documents and resources.

During the planning and preparation stage, the **Applicant** may prepare the Provisional Certification Submission (optional), which should be submitted when the targets for certification have been set and the strategies to implement have been selected.

Based on the results of the assessment of the Provisional Certification Submission, a LOTUS BIO Provisional Certificate will be issued with a validity period of 18 months.

At the end of the Performance Period of 12 months, the Applicant should make a Full Certification Submission which aims to demonstrate the performance of the building during the Performance Period. Based on the results of the assessment of the Full Certification Submission, a LOTUS BIO Full Certificate will be issued with a validity period of 5 years.

In order to extend the validity of the LOTUS BIO Certification at the end of the 5-year period, the Applicant should make a Certification Renewal Submission which aims to demonstrate that the performance of the building has been maintained. Based on the results of the assessment of the Certification Renewal Submission, a LOTUS BIO Certificate Renewal will be issued with a validity period of 5 years.

LOTUS BIO Credit List

Credit	Title	Points
ENERGY		33 points
E-PR-1	Energy Audit	Energy Prerequisite 1
E-1	Energy Audit	2
E-2	Energy Use Intensity	15
E-3	Natural Ventilation and Air-conditioning	5
E-4	Artificial Lighting	4
E-5	Energy Monitoring and Management	3
E-6	Sustainable Energy Solutions	4
WATER		10 points
W-1	Water Audit	1
W-2	Water Efficient Fixtures	3
W-3	Water Metering and Leak Prevention	2
W-4	Sustainable Water Solutions	4
SUSTAINABLE PURCHASING		4 points
SP-1	Low-carbon purchasing	2
SP-2	Healthy purchasing	2
ECOLOGY		6 points
Eco-PR-1	Vegetation	Ecology Prerequisite 1
Eco-1	Vegetation	3
Eco-2	Sustainable Landscape Management	2
Eco-3	Pest Management	1
WASTE & POLLUTION		8 points
WP-1	Wastewater Treatment	2
WP-PR-1	Solid Waste Management	W&P Prerequisite 1
WP-2	Solid Waste Management	3
WP-3	Refrigerants	2
WP-4	Light Pollution Minimization	1

HEALTH & COMFORT		13 points
H-PR-1	Occupant Comfort	H&C Prerequisite 1
H-1	Occupant Comfort	3
H-PR-2	Indoor Smoking	H&C Prerequisite 2
H-2	Indoor Smoking	1
H-3	Fresh Air Supply	2
H-4	CO ₂ monitoring	1
H-5	IAQ Testing	1
H-6	Daylighting	2
H-7	External Views	2
H-8	Green Cleaning	1
ADAPTATION & MITIGATION		10 points
A-1	Disaster Resilience	2
A-2	Storm Water Runoff	2
A-3	Heat Island Effect	2
A-PR-1	Green Transportation	A&M Prerequisite 1
A-4	Green Transportation	4
COMMUNITY		6 points
CY-1	Access for People with Disabilities	2
CY-PR-1	Occupant Behavior	CY Prerequisite 1
CY-2	Occupant Behavior	2
CY-3	Public Awareness Campaign	2
MANAGEMENT		10 points
Man-PR-1	Facility Audit	Man Prerequisite 1
Man-1	LOTUS Certified Building	1
Man-2	LOTUS AP	1
Man-3	Commissioning	4
Man-PR-2	Maintenance	Man Prerequisite 2
Man-4	Maintenance	2
Man-5	Green Management	2
INNOVATION		8 bonus points
Inn-1	Exceptional Performance Enhancement	8
Inn-2	Innovative techniques/initiative	

Energy

As urbanization is accelerating all over the world, buildings have been described as a hidden culprit, responsible for more than 35% of global final energy use and nearly 40% of energy-related CO₂ emissions (c.f. Global status report 2017 coordinated by United Nations Environment Programme).

While fast economic growth and urbanization rates are improving living conditions in Vietnam, they are also leading to an increasing energy demand and worsening of climate change. According to the Vietnam Energy Outlook Report 2017 developed by Ministry of Industry and Trade (MOIT) in collaboration with the Danish Energy Agency (DEA), it is expected that electricity demand will grow by 8% annually on average until 2035 and that almost half of the new power generation capacity needed will be coal fired.

However, since buildings, consume the majority of the energy produced annually in Vietnam, there is potential for mitigating climate change and energy insecurity through integrating energy efficiency measures into buildings. With energy efficient designs and operations, buildings can potentially reduce their energy consumption by up to 50% compared to a typical building, significantly reducing GHG emissions.

With this target in mind, LOTUS BIO rewards efforts taken to reduce a building's energy consumption through improving the efficiency of the existing systems, adding new green design features and ensuring a good management of the building.

Energy		33 points
Item	Criteria	Points
E-1	Energy Audit	2 points
	Perform a preliminary energy audit of the building	Energy Prerequisite 1
	Perform a general energy audit of the building	1
	Perform a detailed investment-grade energy audit of the building	2
E-2	Energy Use Intensity	15 points
	Strategy A: Benchmarking	
	1 point for energy use intensity lower than the benchmark and 1 point for every additional 2.5% of energy use intensity reduction compared to the benchmark	15
	Strategy B: Self-improvement	
	Reduce the energy use intensity of the building in comparison to the historical performance (up to 5 points)	5
E-3	Natural Ventilation and Air-conditioning	5 points
	Strategy A: Natural Ventilation	
	10 % of occupied areas are naturally ventilated	1
	1 point for every additional 20% of occupied areas that are naturally ventilated (up to 90%)	5
	Strategy B: COP of air-conditioning system	
	COP values of air-conditioning systems surpass VBEEC requirements	1
	1 point for every 10% improvement of COP for direct electric air-conditioners AND 5% improvement of COP for water-chilling systems in comparison to VBEEC requirements	5
	Strategy C: Variable speed controls	
	Use variable speed controls on all the air-conditioning systems	1
	Strategy D: Optimization of HVAC systems	
	1 point for every 2 measures effectively implemented to reduce energy consumption of the HVAC systems	2

E-4	Artificial Lighting 4 points	
	Strategy A: Reduction of Light Power Density	
	Lighting Power Density surpasses EEBC requirements by 15%	1
	1 additional point for every further 15% of reduction of the installed LPD compared to VBEEC requirements (up to 45%)	3
	Strategy B: Lighting controls for building spaces	
	Install lighting control devices for the building spaces	1
	Strategy C: Lighting controls for daylit areas	
	Install lighting control devices for the lighting fixtures located in potentially daylit areas.	1
E-5	Energy Monitoring and Management 3 points	
	Power sub-meters measure all the major energy uses	1
	A Power Monitoring System monitors all the major energy uses	2
	A Building Management System monitors and controls the building's electrical and mechanical equipment	3
E-6	Sustainable energy solutions 4 points	
	Strategy A: Renewable Energy	
	For 1 point, 0.5% of the total energy used in the building is produced on-site from a renewable source	1
	1 point for every further 1% of the total energy used in the building that is produced on-site from a renewable source (up to 2.5%)	3
	Strategy B: Peak Electricity Demand	
	Reduce the percentage of energy consumed during the peak periods by 10% compared to the baseline	1
	Reduce the percentage of energy consumed during the peak periods by 20% compared to the baseline	2
	Strategy C: Service Water Heating	
	Heat recovery or solar thermal system or heat pump water heater contributes to at least 50% of the total hot water demand	1
	Heat recovery or solar thermal system or heat pump water heater contributes to 100% of the total hot water demand	2

E-PR-1 and E-1 Energy Audit

Intent

To identify and evaluate opportunities to optimize the energy use of the building.

Requirements

Criteria	2 Points
Perform a preliminary energy audit of the building	Energy Prerequisite 1
Perform a general energy audit of the building	1
Perform a detailed investment-grade energy audit of the building	2

Multi-family Residential buildings

Only the building energy systems owned by the project owner and/or managed by the facilities management team should be considered in this prerequisite and credit.

E-2 Energy Use Intensity

Intent

To encourage buildings in operation to minimize their energy consumption.

Requirements

Criteria		15 Points
Strategy A: Benchmarking		
1 point for energy use intensity lower than the benchmark and 1 point for every additional 1.5% of energy use intensity reduction compared to the benchmark		15
Strategy B: Self-improvement		
Reduce the energy use intensity of the building in comparison to the historical performance		5

E-3 Natural Ventilation and Air-conditioning

Intent

To reduce the need for cooling and encourage the use of energy efficient HVAC systems.

Requirements

Criteria	5 points
Strategy A: Natural Ventilation	
10% of occupied areas are naturally ventilated	1
1 point for every additional 20% of occupied areas that are naturally ventilated (up to 90%)	5
Strategy B: COP of air-conditioning system	
COP values of air-conditioning systems surpass VBEEC requirements	1
1 point for every 10% improvement of COP for direct electric air-conditioners AND 5% improvement of COP for water-chilling systems in comparison to VBEEC requirements	5
Strategy C: Variable controls	
Use variable controls on all suitable HVAC systems	1
Strategy D: Optimization of HVAC systems	
1 point for every 2 measures effectively implemented to reduce energy consumption of the HVAC systems	2

Multi-tenant buildings

A minimum of 90% of the total building GFA should be covered in Strategies B, C and D.

If this limit cannot be reached due to lack of cooperation from tenants, then these strategies are not applicable for the project and no points can be earned in these strategies.

The percentage of GFA not covered (that should not be higher than 10% of the total building GFA) should be calculated separately for each strategy following 2 cases:

1. If no information on the air-conditioning systems a tenant may or may not have installed is available, the whole GFA occupied by the tenant should be used.
2. If some air-conditioning systems installed in the tenant space are not compliant with the requirements of the strategy, the air-conditioned area served by these systems should be used.

Multi-family Residential buildings

Only the HVAC systems owned by the project owner and/or managed by the facilities management team should be considered in Strategies B, C and D.

E-4 Artificial Lighting

Intent

To reduce energy consumption associated with the use of artificial lighting systems.

Requirements

Criteria		4 Points
Strategy A: Reduction of Lighting Power Density		
Installed Lighting Power Density (LPD) surpasses VBEEC requirements by 15%		1
1 additional point for every further 15% of reduction of the installed LPD compared to VBEEC requirements (up to 45%)		3
Strategy B: Space lighting controls		
Install lighting control devices for the building spaces		1
Strategy C: Daylighting controls		
Install lighting control devices for the lighting fixtures located in potentially daylit areas		1

Multi-tenant buildings

A minimum of 90% of the total building GFA should be covered in Strategies A, B and C.

If this limit cannot be reached due to lack of cooperation from tenants, then these strategies are not applicable for the project and no points can be earned in these strategies.

The percentage of GFA not covered (that should not be higher than 10% of the total building GFA) should be calculated separately for each strategy following 2 cases:

1. If no information on the artificial lighting systems a tenant may or may not have installed is available, the whole GFA occupied by the tenant should be used.
2. If some artificial lighting systems installed in the tenant space are not compliant with the requirements of the strategy, the floor area served by these systems should be used.

Multi-family Residential buildings

Only the lighting systems owned by the project owner and/or managed by the facilities management team should be considered in this credit.

E-5 Energy Monitoring and Management

Intent

To ensure continuous monitoring and control of all energy consuming building systems.

Requirements

Criteria	3 Points
Power sub-meters measure all the major energy uses	1
A Power Monitoring System monitors all the major energy uses	2
A Building Management System monitors and controls the building's electrical and mechanical equipment	3

E-6 Sustainable energy solutions

Intent

To implement sustainable energy solutions in order to generate energy from renewable sources, reduce electricity consumption during peak hours and reduce energy consumption for service water heating.

Requirements

Criteria	4 Points
Strategy A: Renewable Energy	
For 1 point, 0.5% of the total energy used in the building is produced on-site from a renewable source	1
1 point for every further 1% of the total energy used in the building that is produced on-site from a renewable source (up to 2.5%)	3
Strategy B: Peak Electricity Demand	
Reduce the percentage of energy consumed during the peak periods by 10% compared to the baseline	1
Reduce the percentage of energy consumed during the peak periods by 20% compared to the baseline	2
Strategy C: Service water heating	
Heat recovery or solar thermal system or heat pump water heater contributes to at least 50% of the total hot water demand	1
Heat recovery or solar thermal system or heat pump water heater contributes to 100% of the total hot water demand	2

Water

Water scarcity - including poor availability and quality - is a growing risk threatening both the food and energy security of many countries in Southeast Asia. Several river basins in Vietnam are expected to face acute stress or shortage by 2025, and groundwater sources are rapidly declining.

In Vietnam, even though the country was considered to have high water availability with intensive river systems, the government has recently announced that Vietnam is a country with poor clean water resources, which has only enough water to provide 4000 m³/year/person, compared to the global average of 7000 m³/year/person. Moreover, seasonal shortages have already worsened, especially around major metropolitan areas such as the Red River delta or big rice-producing areas like the Mekong Delta due to high demand, water pollution and climate change impacts. Since these two river deltas are the country's premier rice-growing regions, water shortages threaten the nation's food security.

As clean water becomes less readily available within Vietnam, the cost of domestic water supply is bound to increase in the near future. Therefore, a water-efficient building not only ensures consistency in operation and production but also saves building owners money in operational costs. Furthermore, such building improvements will also help reduce the load on many of the antiquated sewerage systems in urban areas of Vietnam.

Understanding the circumstances, LOTUS prioritizes the reduction of water consumption and emphasizes this in the requirements of the Water category. Credits within this category encourage strict monitoring of water consumption, water-efficient fixtures, water reuse/recycling, rainwater collection and water efficient landscaping.

Water		10 Points
Item	Criteria	Points
W-1	Water Audit	1 point
	Perform a water audit of the building	1
W-2	Water Efficient Fixtures	3 points
	Reduce water consumption through fixtures by 10% in comparison to a baseline model	1
	1 point for every additional 10% reduction of water consumption through fixtures (up to 30%) in comparison to a baseline model	3
W-3	Water Metering and Leak Prevention	2 points
	Strategy A: Water metering	
	Install permanent water meters for all major water uses	1
	Strategy B: Water Leak Prevention	
	Develop and implement a water leak prevention plan	1
W-4	Sustainable Water Use Solutions	4 points
	Strategy A: Water recycling/reuse/harvest	
	Recycled water, reused water or harvested rainwater contributes 5% of the building's total water consumption	1
	1 point for every 5% of the building's total water consumption covered with recycled water, reused water or harvested rainwater (up to 15%)	3
	Strategy B: Water Efficient Landscaping	
	Reduce domestic water used for landscaping by 50% compared to benchmark consumption	1
	Reduce domestic water used for landscaping by 80% compared to benchmark consumption	2
	Strategy C: Cooling Tower Water Use	
	The cooling tower operates at a minimum of 6 cycles of concentration	1
	The cooling tower operates at a minimum of 8 cycles of concentration	2

W-1 Water Audit

Intent

To identify and evaluate opportunities to optimize the building's water use.

Requirements

Criteria	1 Point
Perform a water audit of the building	1

Multi-family Residential buildings

Only the water equipment owned by the project owner and/or managed by the facilities management team should be considered in this credit.

W-2 Water Efficient Fixtures

Intent

To reduce the consumption of water in buildings through water fixtures.

Requirements

Criteria	3 Points
Reduce water consumption through fixtures by 10% in comparison to the baseline	1
1 point for every additional 10% reduction of water consumption through fixtures (up to 30%) in comparison to the baseline	3

Multi-tenant buildings

A minimum of 90% of the total building GFA should be covered in the credit.

If this limit cannot be reached due to lack of cooperation from tenants, then this credit is not applicable for the project and no points can be earned.

The percentage of GFA not covered (that should not be higher than 10% of the total building GFA) should be calculated as follows. For each tenant for which no information on the water fixtures that may or may not have been installed is available, the whole GFA occupied by the tenant should be used.

Multi-family Residential buildings

Only the water fixtures owned by the project owner and/or managed by the facilities management team should be considered in this credit.

W-3 Water Metering and Leak Prevention

Intent

To monitor water uses so that water consumption can be regulated and water leaks can be detected.

Requirements

Criteria		2 Points
Strategy A: Water metering		
Install permanent water meters for all major water uses		1
Strategy B: Water Leak Prevention		
Develop and implement a water leak prevention plan		1

W-4 Sustainable Water Use Solutions

Intent

To encourage water recycling, reuse and water harvesting, to limit the use of water for irrigation and to reduce the water consumption for heat rejection in cooling towers.

Requirements

Criteria		4 Points
Strategy A: Water recycling/reuse/harvest		
Recycled water, reused water or harvested water contributes 5% of the building's total water consumption		1
1 point for every 5% of the building's total water consumption covered with recycled water, reused water or harvested water (up to 15%)		3
Strategy B: Water Efficient Landscaping (Only sites with a landscaped area which is greater than 100 m ² are eligible for this strategy)		
Reduce domestic water used for landscaping by 50% compared to benchmark consumption		1
Reduce domestic water used for landscaping by 80% compared to benchmark consumption		2
Strategy C: Cooling Tower Water Use		
The cooling tower system operates at a minimum of 6 cycles of concentration		1
The cooling tower system operates at a minimum of 8 cycles of concentration		2

Sustainable Purchasing

Sustainable purchasing is an effort to buy greener, healthier, and more sustainable products. It is based on the simple concept that every single purchase has hidden human health, environmental, and social impacts and that it is possible to reduce adverse impacts by buying better products.

The Sustainable Purchasing Category of LOTUS BIO includes two main goals which are to increase the use of materials and products associated with a low-carbon footprint (low energy use, low use of virgin natural resources used, recyclable, etc.) and to increase the use of healthier materials and products (low-VOC, low-formaldehyde, chlorine free, etc.).

Sustainable Purchasing		4 points
Item	Criteria	Points
SP-1	Low-carbon purchasing	2 points
	Adopt a Low-carbon Purchasing Policy including procurement of at least 2 types of low-carbon products	1
	Adopt a Low-carbon Purchasing Policy including procurement of at least 4 types of low-carbon products	2
SP-2	Healthy purchasing	2 points
	Adopt a Healthy Purchasing Policy including procurement of at least 2 types of healthy products	1
	Adopt a Green Purchasing Policy including procurement of at least 4 types of healthy products	2

SP-1 Low-carbon purchasing

Intent

To encourage the purchase of low-carbon products that have less environmental impacts during the operations of the building.

Requirements

Criteria	2 Points
Adopt a Low-carbon Purchasing Policy including procurement of at least 2 types of low-carbon products	1
Adopt a Low-carbon Purchasing Policy including procurement of at least 4 types of low-carbon products	2

Multi-tenant buildings

Points in this credit can be awarded only if:

- the FM team implements the Low-carbon Purchasing Policy in common areas and owner-occupied spaces (if any),
- the big tenants implement the Low-carbon Purchasing Policy in their private areas, and
- tenant guidelines and training sessions are provided to other tenants to guide and encourage them to purchase low-carbon products

Multi-family Residential buildings

Only products procured by the project owner and/or the facilities management team should be considered in this credit.

SP-2 Healthy purchasing

Intent

To encourage the purchase of healthy products that have less harmful impacts to occupants during the operations of the building.

Requirements

Criteria	2 Points
Adopt a Healthy Purchasing Policy including procurement of at least 2 types of healthy products	1
Adopt a Green Purchasing Policy including procurement of at least 4 types of healthy products	2

Multi-tenant buildings

Points in this credit can be awarded only if:

- the FM team implements the Healthy Purchasing Policy in common areas and owner-occupied spaces (if any),
- the big tenants implement the Healthy Purchasing Policy in their private areas, and
- tenant guidelines and training sessions are provided to other tenants to guide and encourage them to purchase healthy products

Multi-family Residential buildings

Only products procured by the project owner and/or the facilities management team should be considered in this credit.

Ecology

In the 21st century, the world has witnessed the boom of large cities with populations of over 10 million across Asia. Following this trend, Vietnam's urbanization rate is rapidly increasing together with a rise in the country's GDP. While this raises the general standard of living, the difficult to manage urbanization rate poses a threat to the existence of various ecosystems.

Sites of buildings in operation consume the majority of space within urban areas, this means that at some stage they have displaced native plant and animal species. By including vegetated areas populated by native species on the sites of buildings in operation these negative impacts can be mitigated. This is achieved by improving the general biodiversity of the urban area, providing a better living environment for human and co-habiting species. It is important that landscaped areas are managed in a sustainable way to prevent any negative environmental impacts caused by excessive irrigation, chemical fertilizer and pesticide use.

Recognizing the importance of vegetation within urban areas, the Ecology category of LOTUS BIO awards points to buildings that have vegetation on a significant portion of their site. LOTUS BIO also recognizes that an important first step is to understand the characteristics of the landscape and rewards the sustainable management of these areas.

Ecology		6 points
Item	Criteria	Points
Eco-1	Vegetation	3 points
	Conduct a vegetation survey for the building site	Ecology Prerequisite 1
	Strategy A: Vegetated Area	
	10% of the total site area is vegetated	1
	1 point for every additional 10% of the total site area that is vegetated (up to 30%)	3
	Strategy B: Quality of the Vegetation	
	Improve the quality of the vegetation on site	1
Eco-2	Sustainable Landscape Management	2 points
	Implement a landscape management plan	2
Eco-3	Pest Management	1 point

	Implement an Integrated pest management system	1
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Eco-PR-1 and Eco-1 Vegetation

Intent

To maximize the amount of vegetation on site and ensure facility managers are familiar with the vegetation and its needs.

Requirements

Only sites with a landscaped area which is greater than 100 m² are eligible for credit Eco-1.

Criteria	3 Points
Conduct a vegetation survey for the building site	Ecology Prerequisite 1
Strategy A: Vegetated Area	
10% of the total site area is vegetated	1
1 point for every additional 10% of the total site area that is vegetated (up to 30%)	3
Strategy B: Quality of the Vegetation	
Improve the quality of the vegetation on site	1

Eco-2 Sustainable Landscape Management

Intent

To preserve ecological integrity, protect the environment and promote non-toxic landscaping.

Requirements

Criteria	2 Points
Implement a landscape management plan	2

Eco-3 Pest Management

Intent

To manage pests in a responsible way and minimize the use of chemical pesticides.

Requirements

Criteria	1 Point
Implement an Integrated pest management system	1

Waste & Pollution

A building and its occupants produce various forms of waste and pollution. These include solid waste, sewer discharge, water pollution, light pollution, ozone depleting chemicals and greenhouse gases. Reducing these emissions should be a key aim of any green building.

In Vietnam the three largest cities have a combined domestic waste water discharge of 1.9 million m³ per day, of which less than 10% is treated. This is due to outdated and undersized sewerage infrastructure and urban treatment plants. The release of this untreated domestic and industrial wastewater is a major concern which is causing Vietnam's waterways and natural aquifers to become increasingly polluted. As such it is vitally important that sewage discharged from a building meets minimum quality requirements in order to reduce the damage to downstream ecosystems.

Vietnam's urban areas generate over 8 million tonnes of solid waste per year, of which only about 70% is collected and treated. This means almost 2.5 million tonnes of untreated solid waste is released into the environment each year.

Mitigating these trends is extremely important, as pollution prevention is always preferable to remediation, which is costly and inefficient. The credits within the Waste & Pollution category of LOTUS BIO encourage strategies and technologies which minimize the generation, and hence minimize the negative effects of a wide range of waste and pollutants. Proper equipment and specification for building systems, as well as good management procedures throughout the lifespan of the building, can reduce the overall waste and pollution generated by the built environment. In addition to reducing waste generation, systematic reuse and recycling programs can also significantly reduce the quantity of waste and pollution discharged from a building site.

Waste & Pollution		8 points
Item	Criteria	Points
WP-1	Wastewater Treatment	2 points
	Building complies with all relevant wastewater regulations and standards	2
WP-2	Solid Waste Management	3 points
	Conduct a solid waste stream audit	W&P Prerequisite 1
	Strategy A: Environmentally friendly solid waste management system	
	Implement an environmentally friendly solid waste management system	1
	Strategy B: Dedicated recycling storage area	
	Provide a dedicated recycling storage area for use by all building occupants	1
	Strategy C: Waste diversion performance	
	50% of the solid waste generated by the building is diverted from landfill	1
WP-3	Refrigerants	2 points
	Strategy A: Refrigerant Atmospheric Impact of Air-conditioning systems	
	Average Refrigerant Atmospheric Impact of all the air-conditioning systems installed in the building is below 13	1
	Average Refrigerant Atmospheric Impact of all the air-conditioning systems installed in the building is below 11	2
	Strategy B: Refrigerant management	
	Implement measures to reduce annual leakage of refrigerants	1
WP-4	Light Pollution Minimization	1 point
	Option A: Automatic lighting shutoff	
	Implement automatic lighting shutoff strategies for exterior lighting fixtures and interior lighting fixtures with a direct line of sight to any openings in the envelope	1
	Option B: Cutoff exterior lighting fixtures	
	All exterior lighting fixtures are either full cutoff, cutoff or semi-cutoff	1

WP-1 Wastewater Treatment

Intent

To encourage appropriate treatment of wastewater prior to discharge from the site

Requirements

Criteria	2 Points
Building complies with all relevant wastewater regulations and standards	2

WP-PR-1 and WP-2 Solid Waste Management

Intent

To understand the quantity and type of waste produced by the building and implement environmentally friendly solid waste management systems.

Requirements

Criteria	3 Points
Conduct a solid waste stream audit	WP Prerequisite 1
Strategy A: Environmentally friendly solid waste management system	
Develop and implement an environmentally friendly solid waste management system	1
Strategy B: Dedicated recycling storage area	
Provide a dedicated recycling storage area for use by all building occupants	1
Strategy C: Waste diversion performance	
50% of the solid waste generated by the building is diverted from landfill	1

WP-3 Refrigerants

Intent

To encourage the selection and use of refrigerants that do not increase global warming or damage the ozone layer.

Requirements

Criteria	2 Points
Strategy A: Refrigerant Atmospheric Impact of Air-conditioning systems	
Average Refrigerant Atmospheric Impact of all the air-conditioning systems installed in the building is below 13	1
Average Refrigerant Atmospheric Impact of all the air-conditioning systems installed in the building is below 11	2
Strategy B: Refrigerant management	
Implement measures to reduce annual leakage of refrigerants	1

Multi-tenant buildings

A minimum of 90% of the total building GFA should be covered in both Strategies.

If this limit cannot be reached due to lack of cooperation from tenants, then these strategies are not applicable for the project and no points can be earned in these strategies.

The percentage of GFA not covered (that should not be higher than 10% of the total building GFA) should be calculated separately for each strategy following 2 cases:

1. If no information on the air-conditioning systems a tenant may or may not have installed is available, the whole GFA occupied by the tenant should be used.
2. If some air-conditioning systems installed in the tenant space are not compliant with the requirements of the strategy, the air-conditioned area served by these systems should be used.

Multi-family Residential buildings

Only the HVAC systems owned by the project owner and/or managed by the facilities management team should be considered in this credit.

WP-4 Light Pollution Minimization

Intent

To minimize light pollution into the night sky.

Requirements

Criteria	1 Point
Option A: Automatic lighting shutoff	
Implement automatic lighting shutoff strategies for exterior lighting fixtures and interior lighting fixtures with a direct line of sight to any openings in the envelope	1
Option B: Cutoff exterior lighting fixtures	
All exterior lighting fixtures are either full cutoff, cutoff or semi-cutoff	1

Health & Comfort

The World Health Organization reported in its Air Quality Guidelines (2nd Edition) that most of an individual's exposure to air pollutants comes from inhalation of indoor air. Besides air quality, noise and light pollution can also affect occupants and surrounding communities. As the population of Vietnam becomes increasingly urbanized, it is estimated by the Ministry of Construction that the urban population will increase by 45% within the next 20 years. This urban migration results in more people spending more time within the built environment. As a result, the quality of life of building occupants depends greatly on the Indoor Environmental Quality (IEQ).

Improving IEQ results in reduced cases of asthma, allergies, respiratory disease and other occupant ailments described as “sick building syndrome”. In office buildings good IEQ has been linked with increased worker productivity and reduced absenteeism which translates into reduced costs and increased savings for building owners, operators and tenants. Good IEQ also increases a building's resale value.

Credits within the Health & Comfort category of LOTUS BIO measure the quality of the overall indoor environment in buildings. The credits consider four different aspects of the indoor environment. The first and most important aspect is the quality of indoor air; the building must ensure fresh, clean air free of toxic chemicals and dust for occupants. Moreover, a healthy indoor environment in a building should be comfortable visually, acoustically and thermally for building occupants.

Health & Comfort		12 Points
Item	Criteria	Points
H-1	Occupant Comfort	3 points
	Conduct a building occupant survey and develop an action plan based on the responses	H&C Prerequisite 1
	Occupants' average overall satisfaction score from the building occupant survey is 3.5 out of 5	1
	1 point for every 0.5 point increase in the occupants' average overall satisfaction score of 3 (Up to 4.5)	3
H-2	Indoor Smoking	1 point
	Prohibit smoking in the building in accordance with Decision 1315/QĐ-TTg	H&C Prerequisite 2
	Provide outdoor designated smoking areas	1
H-3	Fresh Air Supply	2 points
	Provide sufficient fresh air supply to a minimum of 90% of the net occupied area of the building	2
H-4	CO ₂ Monitoring	1 point
	Conduct CO ₂ monitoring in high density occupied areas of the building	1
H-5	IAQ Testing	1 point
		1
H-6	Daylighting	2 points
	40% of the net occupied area has average daylight factor between 1.5% and 3.5%	1
	70% of the net occupied area has average daylight factor between 1.5% and 3.5%	2
H-7	External Views	2 points
	50% of the net occupied area has a direct line of sight to the outdoor environment	1
	65% of the net occupied area has a direct line of sight to the outdoor environment	2
H-8	Green Cleaning	1 point
	Develop and implement a green cleaning program	1

H-PR-1 and H-1 Occupant Comfort

Intent

To improve occupant satisfaction and workplace productivity.

Requirements

Criteria	3 Points
Conduct a building occupant survey and develop an action plan based on the responses	Health & Comfort Prerequisite 1
Occupants' average overall satisfaction score from the building occupant survey is higher than 3.5 out of 5	1
1 point for every 0.5 point increase in the occupants' average overall satisfaction score (Up to 4.5)	3

H-PR-2 and H-2 Indoor Smoking

Intent

To minimize the effect of passive smoking on building occupants.

Requirements

Criteria	1 Point
Prohibit smoking in the building in accordance with Decision 1315/QĐ-TTg	Health & Comfort Prerequisite 2
Provide outdoor designated smoking areas	1

Multi-family Residential buildings

Smoking should be banned inside the whole building at the exception of the dwelling-units.

H-3 Fresh Air Supply

Intent

To ensure the provision of enough fresh air to maintain good indoor air quality during occupancy.

Requirements

Criteria	2 Points
Provide sufficient fresh air supply to a minimum of 90% of the net occupied area of the building	2

H-4 CO₂ Monitoring

Intent

To regulate indoor air quality via CO₂ monitoring.

Requirements

Criteria	1 Point
Conduct CO ₂ monitoring in high-density occupied areas of the building	1

Multi-family Residential buildings

Only high-density occupied spaces in common areas and owner-occupied areas should be considered in this credit.

H-5 IAQ Testing

Intent

To test and determine the indoor air quality (IAQ) of the building.

Requirements

Criteria	1 Point
Perform IAQ measurements in the occupied spaces of the building	1

H-6 Daylighting

Intent

To provide building occupants with access to natural light.

Requirements

Criteria	2 Points
40% of the net occupied area has an average daylight factor between 1.5% and 3.5%	1
70% of the net occupied area has an average daylight factor between 1.5% and 3.5%	2

H-7 External Views

Intent

To increase occupants' connection to the outdoors by ensuring a direct line of sight outside.

Requirements

Criteria	2 Points
50% of the net occupied area has a direct line of sight to the outdoor environment	1
65% of the net occupied area has a direct line of sight to the outdoor environment	2

H-8 Green Cleaning

Intent

To promote the use of safer cleaning products and practices to protect building occupants from the adverse impacts of cleaning chemicals and toxic substances.

Requirements

Criteria	1 Point
Develop and implement a green cleaning program	1

Multi-tenant buildings

Points in this credit can be awarded only if:

- the FM team implements the Green Cleaning Program in common areas and owner-occupied spaces (if any),
- the big tenants implement the Green Cleaning Program in their private areas, and
- tenant guidelines and training sessions are provided to other tenants to guide and encourage them to follow green cleaning procedures

Multi-family Residential buildings

The green cleaning program only needs to be implemented by the FM team in common areas and owner-occupied spaces (if any).

Adaptation & Mitigation

Climate change is widely accepted as being among the greatest challenges to face mankind this century. Today, the term climate change is usually used with regard to changes in global climate, which result from human activities. From the industrial revolution until today, we have become increasingly reliant on fossil fuels as our main source of energy. The process of burning fossil fuels for energy has resulted in the release of large amounts of Greenhouse Gases (GHG) into the atmosphere. The increasing concentration of GHGs in the atmosphere changes the radiation balance of the earth, increasing the greenhouse effect and leading to global warming. The impacts of climate change can now be seen in the form of stronger and more frequent storms, flooding and drought, sea level rise and other extreme weather phenomena.

Although developed countries are responsible for 40% of emissions globally, it is the poorer developing countries which will face the most severe climate change impacts. In the first part of the century it has been predicted that Vietnam will be one of the five countries most affected by climate change. In Vietnam these impacts will include flooding to more than 1 million residents who currently live below 1 m above sea level due to predicted sea level rise and increased frequency and intensity of extreme rainfall events and droughts.

In response to the severity of the situation, the government has issued guidance to all related sectors, instructing immediate preparation in response to climate change. However, existing Vietnamese buildings built with conventional construction practices are susceptible to damage from flooding, storms and earthquakes. Therefore, it is crucial for facility managers to identify any measures they can take to improve the resilience of buildings against natural disasters. This will protect the occupants of a building in the event of a natural disaster and maximize the building's life span.

Credits within the Adaptation & Mitigation category of LOTUS BIO target the building's resistance towards natural disasters and the reduction of the building's transport related GHG emissions. A green building must account for all possible disasters such as flooding, typhoon and fire and comprehensive strategies must be prepared to ensure the safety of occupants. At the same time, it should alleviate its own impacts on climate change by increasing the perviousness of the site and reducing the amount of paved surfaces that contribute to the heat island effect. It should also reduce the consumption of fossil fuels required for transport by occupants during the operation of the building.

Adaptation & Mitigation		11 Points
Item	Criteria	Points
A-1	Disaster Resilience	2 points
	Strategy A: Disaster response plan	
	Prepare a disaster risk report and produce a disaster response plan	1
	Strategy B: Disaster resilience	
	Prepare a disaster risk report and demonstrate that disaster resilience is incorporated within the building and site	1
A-2	Storm Water Runoff	2 points
	Strategy A: High average perviousness	
	Average perviousness of the site is at least 30%	1
	Average perviousness of the site is at least 50%	2
	Strategy B: Self-improvement	
	Average perviousness of the site at Performance Period is increased by 30% compared to the historical average perviousness of the site	1
A-3	Heat Island Effect	2 points
	30% of paved and roof areas limit the heat island effect	1
	50% of paved and roof areas limit the heat island effect	2
A-4	Green Transportation	4 points
	Provide building occupants with information on the different collective transportation means available for travel to and from the site	A&M Prerequisite 1
	Strategy A: Green transportation policy	
	Implement a green transportation policy	1
	Strategy B: Green transport Facilities	
	Provide Green transport facilities for the building occupants	1
	Strategy C: Green Commuting	
	10% of occupant trips are made by green commuting	1
	20% of occupant trips are made by green commuting	2

A-1 Disaster Resilience

Intent

To ensure buildings are well prepared for natural disasters.

Requirements

Criteria		2 Points
Strategy A: Disaster response plan		
Prepare a disaster risk report and produce a disaster response plan		1
Strategy B: Disaster resilience		
Prepare a disaster risk report and demonstrate that disaster resilience is incorporated within the building and site		1

A-2 Stormwater Runoff

Intent

To improve perviousness of site surfaces, thus reduce temporary load to municipal drainage system and improve groundwater recharge.

Requirements

Only projects that have a non-building area and/or a green roof area that make up more than 10% of the total site area or make up more than 200 m² are eligible for this credit.

Criteria		2 Points
Strategy A: High average perviousness		
Average perviousness of the site is at least 30%		1
Average perviousness of the site is at least 50%		2
Strategy B: Self-improvement		
Average perviousness of the site at Performance Period is increased by 30% compared to the historical average perviousness of the site		1

A-3 Heat Island Effect

Intent

To minimize the heat island effect and reduce the impact of the built environment on microclimates, as well as human and wildlife populations.

Requirements

Criteria	2 Points
30% of paved and roof areas limit the heat island effect	1
50% of paved and roof areas limit the heat island effect	2

A-PR-1 and A-4 Green Transportation

Intent

To raise awareness of the different collective transport means available and implement policies to ensure a significant proportion of occupant trips are made by green transport.

Requirements

Criteria	4 Points
Provide building occupants with information on the different collective transportation means available for travel to and from the site	A&M Prerequisite 1
Strategy A: Green transportation policy	
Implement a green transportation policy	1
Strategy B: Green transport facilities	
Provide Green transport facilities for the building occupants	1
Strategy C: Green Commuting	
10% of occupant trips are made by green commuting	1
20% of occupant trips are made by green commuting	2

Community

A building in operation should interact with the surrounding community in a positive way; this includes building occupants as well as residents, workers and visitors in the surrounding area. A building can enhance its interaction with the local community by ensuring building access for people with disabilities, providing training and information to occupants and by organizing public awareness campaigns.

Credits within the Community category of LOTUS BIO aim to maximize the benefits to the community and minimize the negative impacts of development on the surrounding community. This is important to ensure the built environment meshes organically with the residents of the area. Finally, it fits in with the concept of sustainable development, where the society, the economy and the environment develop in harmony.

Although existing buildings are not currently required to comply with Vietnam's legislation to provide convenient access for people with disabilities, it is strongly encouraged that standards for new buildings are met. Barrier-free design principles ensure age, physical ability or any other characteristic is not a limiting factor for use of the built environment.

Community		6 Points
Item	Criteria	Points
CY-1	Access for People with Disabilities	2 points
	Building complies with the requirements of QCVN 10:2014/BXD	2
CY-2	Occupant Behavior	2 points
	Provide a building user's guide to building occupants	Community Prerequisite 1
	Strategy A: Ongoing environmental-awareness campaign	
	Conduct an ongoing environmental-awareness campaign	1
	Strategy B: Occupant training	
	Conduct regular occupant training	1
CY-3	Public Awareness Campaign	2 points
	Perform at least two actions to promote general public awareness	1
	Perform at least four actions to promote general public awareness	2

CY-1 Access for People with Disabilities

Intent

To promote access for people with disabilities to buildings in operation.

Requirements

Criteria	2 Points
Building complies with the requirements of QCVN 10:2014/BXD	2

CY-PR-1 and CY-2 Occupant Behavior

Intent

To achieve optimal building performance by improving the interaction between building occupants and building systems.

Requirements

Criteria	2 Points
Provide a building user's guide to building occupants	Community Prerequisite 1
Strategy A: Ongoing environmental-awareness campaign	
Conduct an ongoing environmental-awareness campaign	1
Strategy B: Occupant training	
Conduct regular occupant training	1

CY-3 Public Awareness Campaign

Intent

To promote general public awareness on sustainability and green buildings.

Requirements

Criteria	2 Points
Perform at least two actions to promote general public awareness	1
Perform at least four actions to promote general public awareness	2

Management

Building/facilities management is vitally important and is highlighted by the fact that operations costs represent approximately 80% of a commercial building's total cost (encompassing design, construction and operation). The credits and requirements within the LOTUS BIO Management category ensure effective and efficient building operation. To attain the standards expected of a LOTUS BIO certified building, high levels of communication and coordination between all parties involved including; building designers, commissioners, contractors, managers and occupants is vital.

Good management will ensure that the building is operated the way that designers intended. Of particular importance is that building tenants are educated in the correct operation of technologies within the building. In this way, effective management can influence user behavior, which is a major factor in energy and water consumption.

Commissioning is a critical operation to ensure building performance meets the design specification. Retro-commissioning and recommissioning can be conducted on equipment in buildings in operation to ensure that their performance is optimized and they are meeting performance requirements.

A key part of effective building/facilities management is the implementation of a preventative maintenance plan. By conducting preventative maintenance periodically, equipment is able to operate more efficiently and needs to be replaced less frequently resulting in significant cost savings.

The behavior of building users is also vitally important in ensuring that a building is operated to its optimal capacity. This includes things as simple as turning off electrical equipment at the end of the day, minimizing water use through behavior such as taking shorter showers, notifying building staff of any maintenance requirements and operating equipment correctly. This behavior can be improved through training and an environmental awareness campaign targeted at building users.

Management		10 Points
Item	Criteria	Points
Man-PR-1	Facility Audit	PR
	Perform a facility audit of the building	Management Prerequisite 1
Man-1	LOTUS Certified Building	1 point
	The building has previously achieved LOTUS NR or LOTUS MFR Full Certification	1
Man-2	LOTUS AP	1 point
	Involve a LOTUS AP as a member of the project team	1
Man-3	Commissioning	4 points
	Strategy A: Commissioning	
	1 point for providing commissioning for each of the following systems: <ul style="list-style-type: none"> – Water-side equipment of central chiller plant – Air-side equipment of central chiller plant and/or direct air-conditioning systems – Electrical services systems – Plumbing and drainage systems 	4
	Strategy B: On-going commissioning	
	Prepare and implement an on-going commissioning plan	1
Man-4	Maintenance	2 points
	Produce a building operation and maintenance manual	Management Prerequisite 2
	Define and implement a preventative maintenance plan of the building's major services and equipment	2
Man-5	Green Management	2 points
	Strategy A: Green management system	
	Develop and implement a green management system for the building	1
	Develop and implement a green management system for the building - AND - The building is at least 50% owner-occupied	2
	Strategy B: Green leases	
	Sign green leases with 50% of the tenants	1

Man-PR-1 Facility Audit

Intent

To make sure projects have extensive knowledge of the systems and components installed in the building.

Requirements

Criteria	PR
Perform a facility audit of the building	Management Prerequisite 1

Man-1 LOTUS Certified Building

Intent

To give recognition to a building that has previously achieved LOTUS certification.

Requirements

Criteria	1 Point
The building has previously achieved LOTUS NR or LOTUS MFR Full Certification	1

Man-2 LOTUS AP

Intent

To encourage the involvement of a qualified individual to assist with the certification process

Requirements

Criteria	1 Point
Involve a LOTUS AP as a member of the project team	1

Man-3 Commissioning

Intent

To ensure all of the building's equipment is correctly installed, calibrated, optimized and is performing according to the design intent

Requirements

Criteria		4 Points
Strategy A: Commissioning		
1 point for providing commissioning for each of the following systems: <ul style="list-style-type: none">– Water-side equipment of central chiller plant– Air-side equipment of central chiller plant and/or direct air-conditioning systems– Electrical services systems– Plumbing and drainage systems		4
Strategy B: Ongoing Commissioning		
Prepare and implement an ongoing commissioning plan		1

Man-PR-2 and Man-4 Maintenance

Intent

To encourage the definition and implementation of a preventative maintenance plan by qualified personnel to ensure that the building's systems and equipment achieve optimum performance and life expectancy

Requirements

Criteria	2 Points
Produce a building operation and maintenance manual	Management Prerequisite 2
Define and implement a preventative maintenance plan of the building's major services and equipment	2

Man-5 Green Management

Intent

To encourage the implementation of a green management system and green leases.

Requirements

Criteria	2 Points
Strategy A: Green management system	
Develop and implement a green management system for the building	1
Develop and implement a green management system for the building - AND - The building is at least 50% owner-occupied	2
Strategy B: Green leases	
Sign green leases with 50% of the tenants	1

Multi-tenant buildings

Points in Strategy A can be awarded only if:

- the FM team implements the green management system in common areas and owner-occupied spaces (if any),
- the big tenants implement the green management system in their private areas, and
- tenant guidelines and training sessions are provided to other tenants to guide and encourage them to participate in the green management.

Multi-family Residential buildings

The green management system only needs to be implemented by the FM team in common areas and owner-occupied spaces (if any).

Innovation

The purpose of this category is to reward innovative strategies and initiatives, as well as exceptional performance in other LOTUS BIO credits.

There are up to 8 points available over the 2 credits, but these points are not specifically assigned to one credit or the other.

Innovation		8 bonus Points
Item	Criteria	Points
Inn-1	Exceptional Performance Enhancement	8
	Exceed significantly the credit requirements of LOTUS credits	
Inn-2	Innovative techniques / initiatives	
	Implement innovative techniques/initiatives that are outside the scope of LOTUS	

Inn-1 Exceptional Performance Enhancement

Intent

To encourage exceptional performance, and recognize projects that achieve environmental performance in excess of the current LOTUS benchmarks.

Requirements

Criteria	8 Points
Exceed significantly the credit requirements of LOTUS credits	1-8

Inn-2 Innovative Techniques/Initiatives

Intent

To promote techniques and/or initiatives that are outside of the scope of the current version of LOTUS BIO.

Requirements

Criteria	8 Points
Implement innovative techniques/initiatives that are outside the scope of LOTUS	1-8