

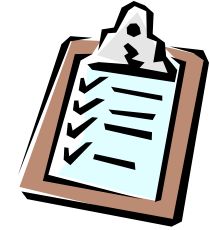


Green Building Assessment (II)



Ir Dr. Sam C. M. Hui
Department of Mechanical Engineering
The University of Hong Kong
E-mail: cmhui@hku.hk

Contents



- LEED certification
- LEED process
- LEED v4
- Key factors to consider
- Hong Kong BEAM

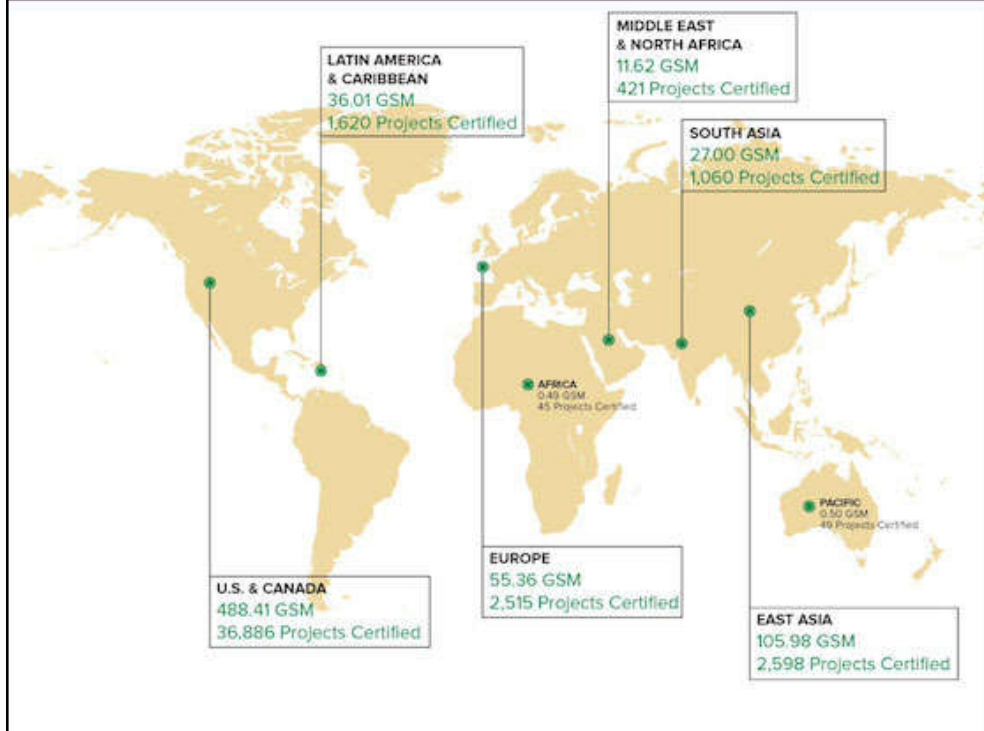


LEED registered projects in international market (2018)



TOP 10 COUNTRIES & REGIONS FOR LEED OUTSIDE THE U.S.

MEASURED IN GROSS SQUARE METERS (GSM)



THE RANKINGS

1. MAINLAND CHINA	68.83 CERTIFIED GSM	1,494 PROJECTS CERTIFIED	6. TURKEY	10.90 CERTIFIED GSM	337 PROJECTS CERTIFIED
2. CANADA	46.81 CERTIFIED GSM	3,254 PROJECTS CERTIFIED	7. GERMANY	8.47 CERTIFIED GSM	327 PROJECTS CERTIFIED
3. INDIA	24.81 CERTIFIED GSM	899 PROJECTS CERTIFIED	8. MEXICO	8.41 CERTIFIED GSM	370 PROJECTS CERTIFIED
4. BRAZIL	16.74 CERTIFIED GSM	531 PROJECTS CERTIFIED	9. CHINA, TAIWAN	7.30 CERTIFIED GSM	144 PROJECTS CERTIFIED
5. REPUBLIC OF KOREA	12.15 CERTIFIED GSM	143 PROJECTS CERTIFIED	10. SPAIN	5.81 CERTIFIED GSM	299 PROJECTS CERTIFIED
UNITED STATES	441.60 CERTIFIED GSM	33,632 PROJECTS CERTIFIED			

Gross square meters (GSM) are reported in millions. AS OF DECEMBER 2018.

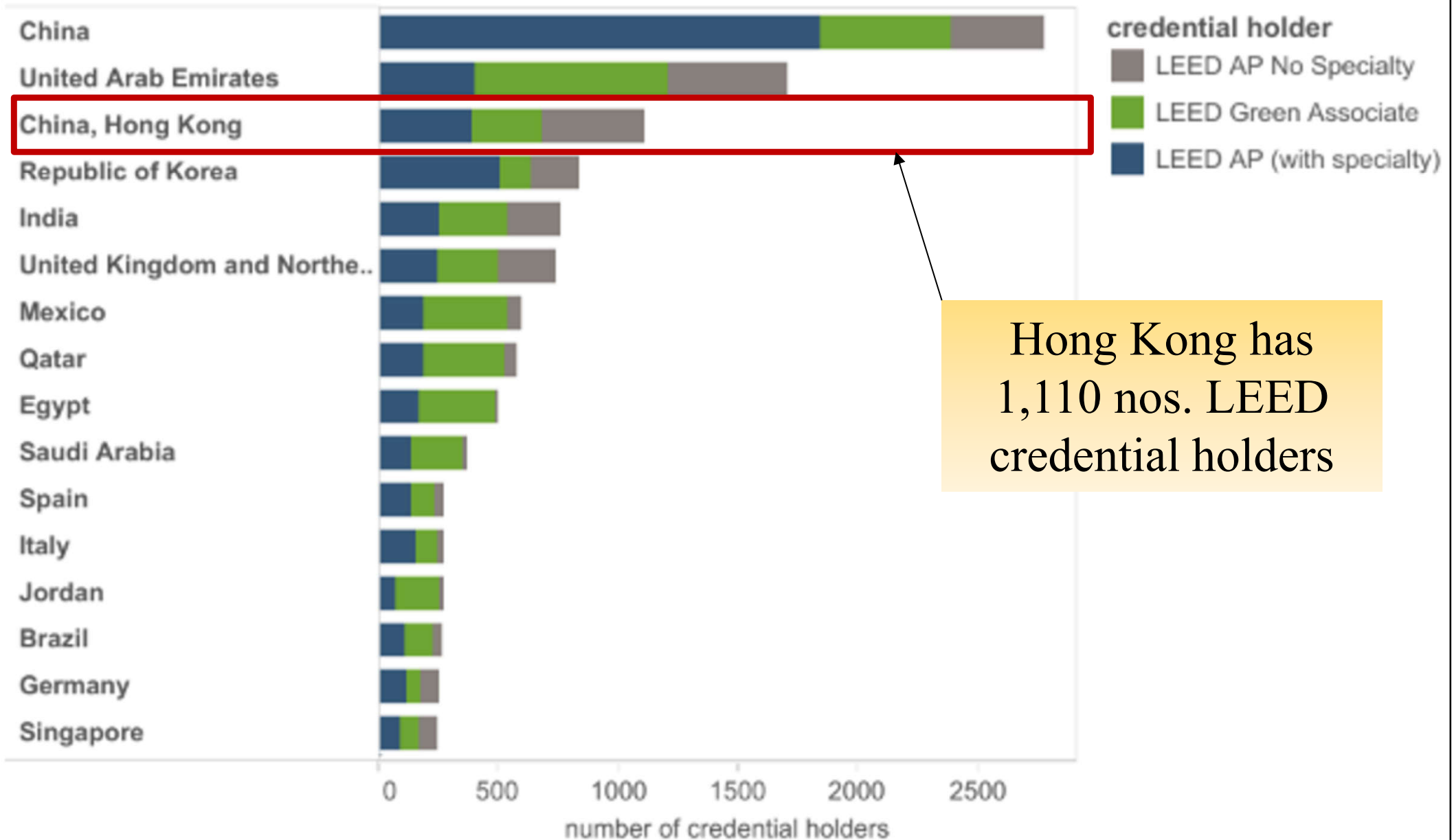


*Gross square meters are reported in millions. Data reported as of December 2018.

(Source: <https://facilityexecutive.com/2019/02/china-top-country-global-green-building/>)

LEED professionals at a glance (2019)

Credential Holders (Exclude US & Canada)



Remark: Number of credential holders in the world = 202,682; in US & Canada = 185,514

(Data source: <https://www.usgbc.org/articles/leed-professionals-glance-july-2019>)



LEED certification

- Three organizations in the LEED process:
 - USGBC: deals with outlining and establishing the LEED standards
 - GBCI: (Green Business Certification Inc) runs the LEED Accreditation programs for people and LEED Certification for buildings
 - Prometric: testing centers that administer the exams

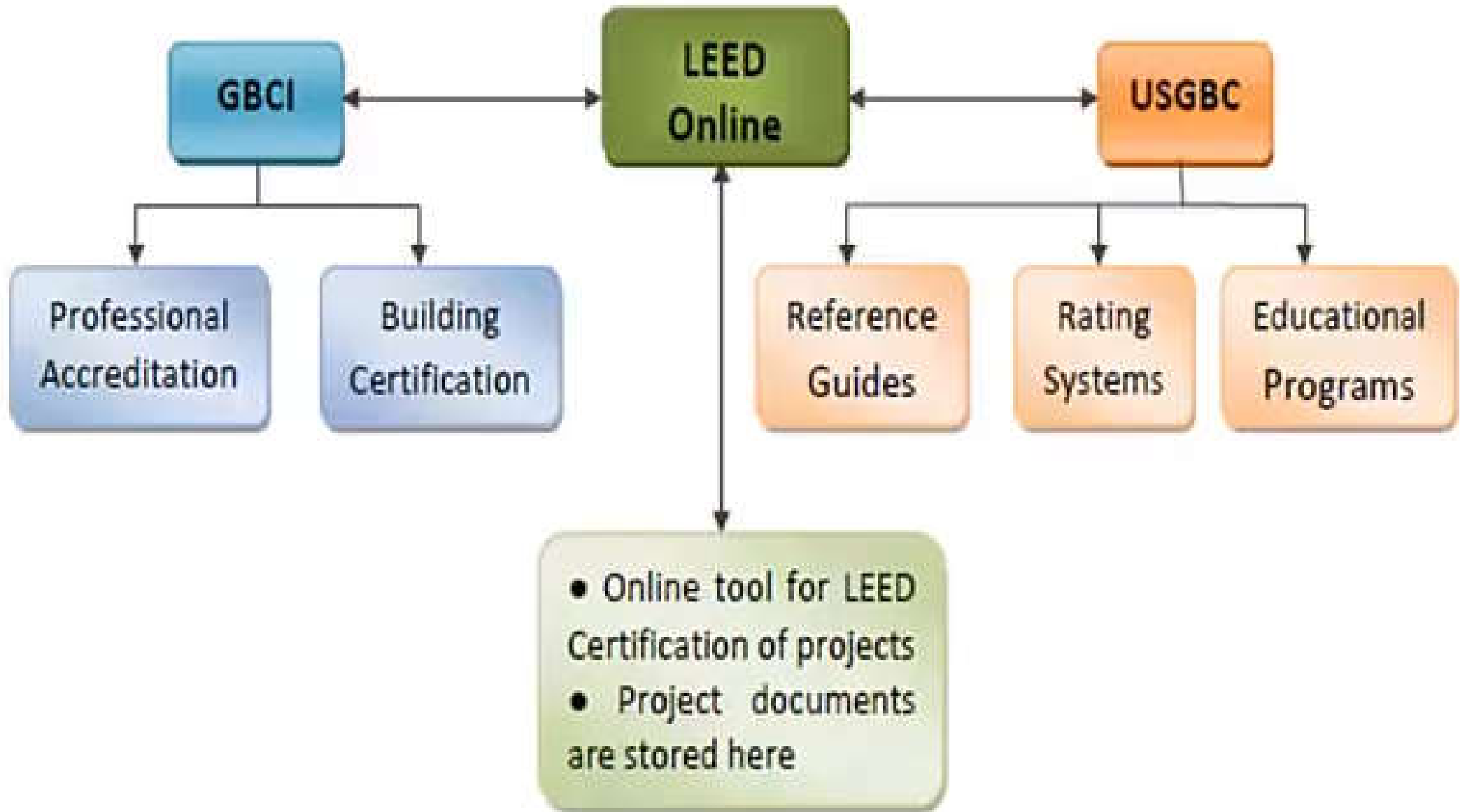


GBCI®

PROMETRIC
TEST CENTER



USGBC, GBCI and LEED Online (www.usgbc.org/leedonline)



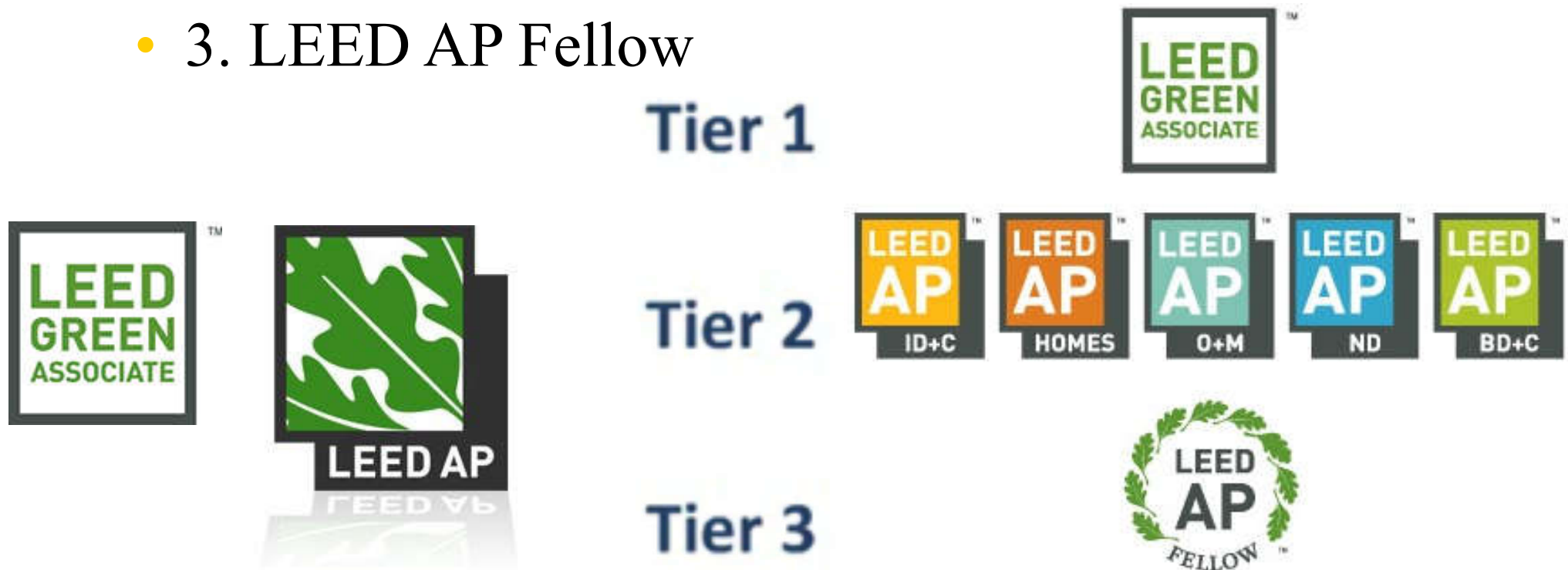
GBCI = Green Building Certification Institute www.gbc.org

USGBC = US Green Building Council www.usgbc.org

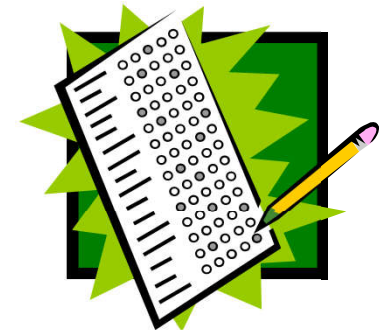
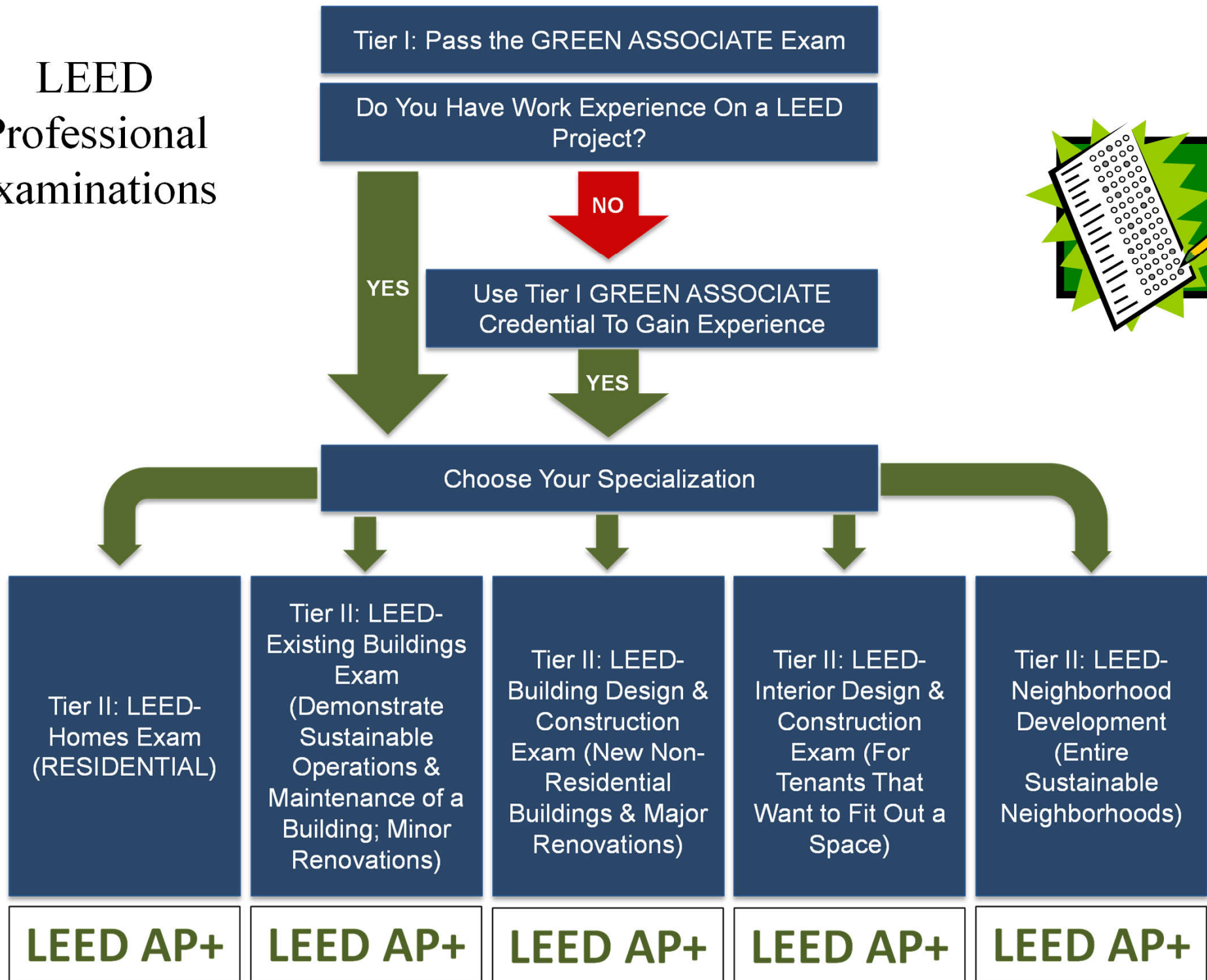


LEED certification

- LEED professionals/credentials (3 tiers)
 - 1. LEED Green Associate (GA): entry level
 - 2. LEED AP+ with specialty: advance
 - 3. LEED AP Fellow



LEED Professional examinations



LEED Green Associate exam: sample question

LEED Green Associate Examination www.prometric.com

Question 1 of 100

Time remaining: 01 : 59 : 59

Which of the following should be addressed in IAQ Management during construction? (Choose 2)

- Protection of HVAC equipment
- Pathway interruption
- Comply with ASHRAE 62.1 2007 requirements for ventilation
- Filter replacement schedule
- Specify materials with high VOC content

Previous

Mark

Next

Calculator

Review



LEED certification

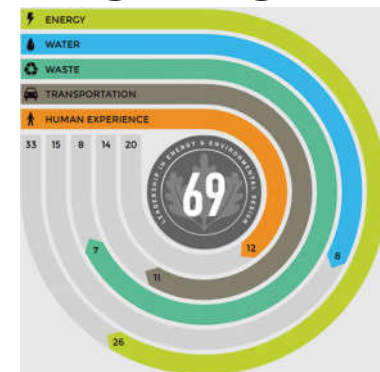
- Maintaining LEED credential
 - Continuing education (CE) required on a 2-year cycle (beginning on the exam date)
 - LEED GA: 15 CE hours biennially (3 must be LEED specific hours)
 - LEED AP: 30 CE hours biennially (6 must be LEED specific hours) as well as additional hours for additional specialties





LEED certification

- USGBC introduced LEED v4.1 in 2019 (Beta)
 - BD+C, ID+C, O+M, Residential, Cities and Communities, Recertification
 - LEED v4.1 emphasizes human health and integrates performance metrics powered by Arc (a new digital platform that uses data to help measure and improve sustainability performance, <https://arcskoru.com/>) to encourage ongoing tracking



LEED v4.1 integrates performance metrics using Arc digital platform

Arc Scores

Total Energy Water Waste Transportation Human Experience

— Last 12 months average

71/100



Current Arc Scores



Energy emissions breakdown

— Scope 1 — Scope 2

5.8M MTCO2e

MTCO2e

100K



Breakdown (MTCO2e)

Scope 1 20K

Scope 2 63K

Arc Improvement Scores

Last 12 months average





LEED process

- LEED project registration and certification
 - Submit online registration form (www.gbci.org)
 - Fees vary depending on project type, size
 - LEED Platinum will receive a rebate of the fees
- LEED rating system selection:
 - Building Design and Construction (BD+C)
 - Interior Design and Construction (ID+C)
 - Building Operations and Maintenance (O+M)
 - Neighborhood Development (ND)



LEED process

- **Building Design and Construction (BD+C)**
 - New Construction and Major Renovations
 - Core and Shell Development
 - Schools
 - Retails
 - Data Centers
 - Warehouses and Distribution Centers
 - Hospitality
 - Healthcare
 - Homes and Multifamily Lowrise
 - Multifamily Midrise



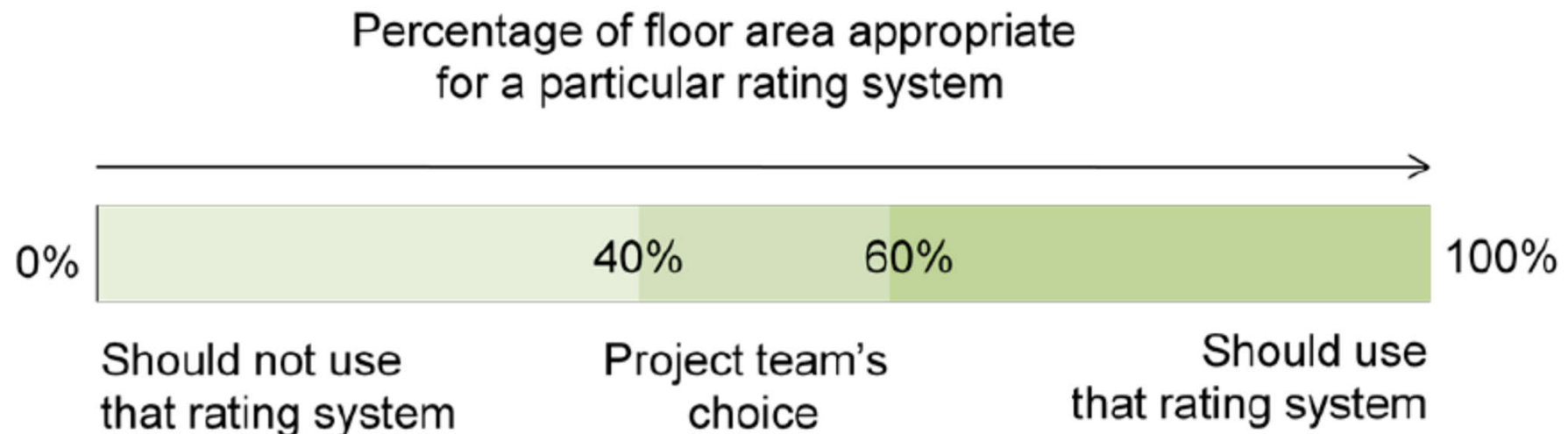
LEED process

- Interior Design and Construction (ID+C)
 - Commercial Interiors
 - Retails
 - Hospitality
- Building Operations and Maintenance (O+M)
 - Existing Buildings
 - Retails
 - Schools
 - Hospitality
 - Data Centers
 - Warehouses & Distribution Centers



LEED process

- **Neighborhood Development (ND)**
 - Plan (conceptual or master planning phases, or under construction)
 - Built Project
- Choosing between rating systems (**40/60 rule**)





LEED process

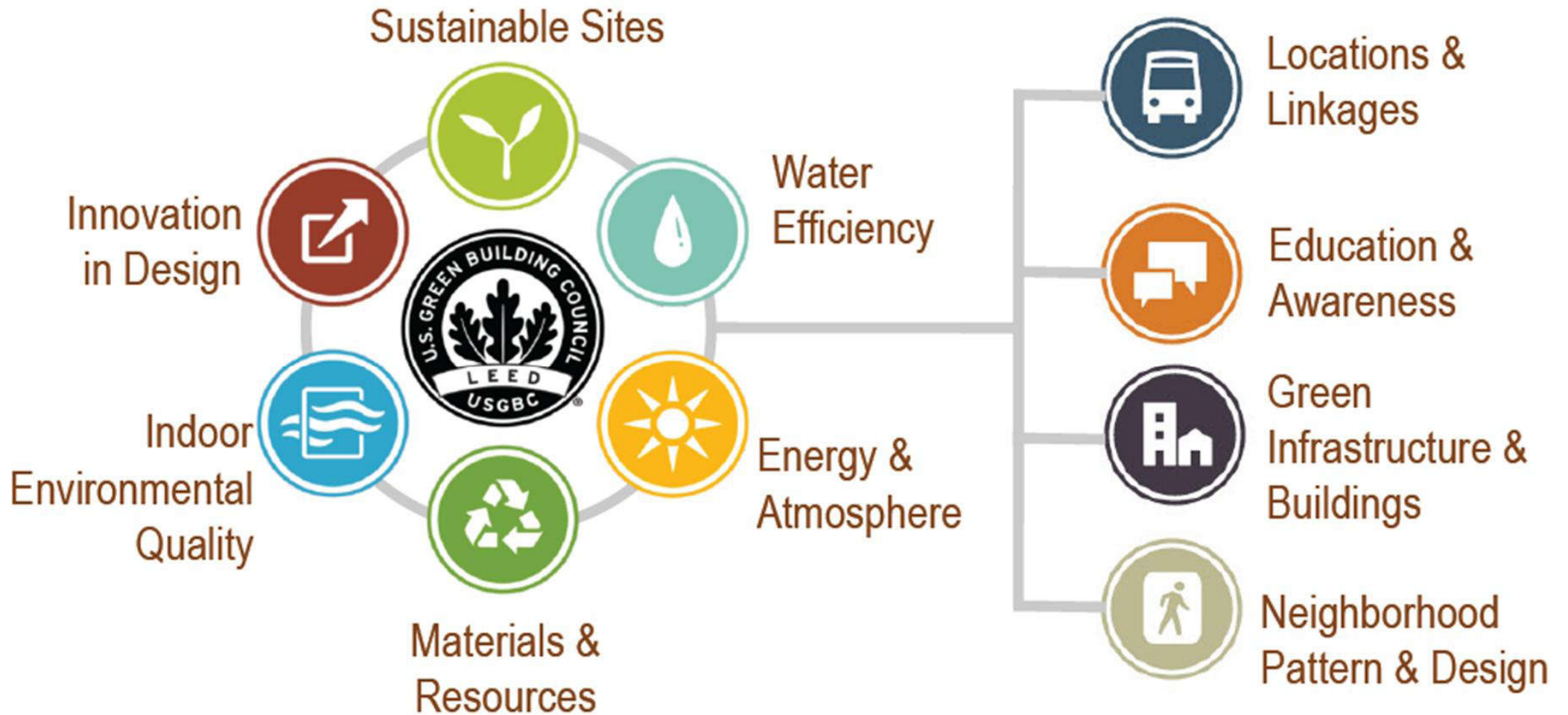
- Application process
 - The project team submits LEED letter templates and other documentation for credit review and certification
 - Decision makers: the professional responsible for submitting the templates and documentation
 - Such as LEED AP, architect, building services engineer, civil engineer, commissioning authority, facility engineer, interior designer, landscape architect
 - Two phases of submission:
 - Design phase + Construction phase



LEED process

- **Minimum program requirements (MPRs)**
 - Define minimum characteristics that a project must possess in order to be eligible for LEED
 - Must comply with Environmental Laws
 - Must be a complete, permanent building or space
 - Must use a reasonable site boundary
 - Must comply with minimum floor area requirements
 - Must comply with minimum occupancy rates
 - Must commit to sharing whole building energy and water usage data
 - Registration & certification activity must comply with reasonable timetables

LEED structure (LEED 2009 NC)





LEED process

- Credits in LEED 2009 NC:
 - Sustainable Sites (SS)
 - Water Efficiency (WE)
 - Energy and Atmosphere (EA)
 - Materials and Resources (MR)
 - Indoor Environmental Quality (IEQ)
 - Innovation in Design (ID)
 - Regional Priority (RP)



LEED basics – rating system example (LEED 2009-NC)

Category	Prerequisites	Credits	Possible points
Sustainable Sites (SS)	1	8	26
Water Efficiency (WE)	1	3	10
Energy & Atmosphere (EA)	3	6	35
Materials & Resources (MR)	1	7	14
Indoor Environmental Quality (EQ)	2	8	15
Innovation & Design Process (ID)	None	2	6
Regional Priority (RP)	None	1	4
<i>Totals:</i>	8	35	110



LEED process

- Prerequisite (New Construction)
 - SSp1: Construction activity pollution prevention
 - WEp1: Water use reduction
 - EAp1: Fundamental commissioning of building energy systems
 - EAp2: Minimum energy performance
 - EAp3: Fundamental refrigerant management
 - MRp1: Storage and collection of recyclables
 - IEQp1: Minimum IAQ performance
 - IEQp2: Environmental tobacco smoke control



LEED process

- All LEED rating systems (except LEED for homes) have 100 base points+ 6 ID+ 4RP=110 points
 - LEED for homes have 125 point scale+11ID
- LEED 2009 NC award scale:
 - Platinum 80 points and above
 - Gold 60–79 points
 - Silver 50–59 points
 - Certified 40–49 points





LEED process

- Credit weightings
 - Based on the potential environmental impacts and human benefits of each credit with respect to a set of impact categories
- Project checklist forms
 - Determine which LEED rating system and level of certification would be best suited for the project
 - Also called LEED credit Scorecard
- Credit templates and calculators
 - Access via LEEDonline (www.usgbc.org/leedonline)

LEED 2009 New Construction Checklist

Sustainable Sites

26 Possible Points

<input checked="" type="checkbox"/>	Prerequisite 1	Construction Activity Pollution Prevention	Required
<input type="checkbox"/>	Credit 1	Site Selection	1
<input type="checkbox"/>	Credit 2	Development Density and Community Connectivity	5
<input type="checkbox"/>	Credit 3	Brownfield Redevelopment	1
<input type="checkbox"/>	Credit 4.1	Alternative Transportation—Public Transportation Access	6
<input type="checkbox"/>	Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1
<input type="checkbox"/>	Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3
<input type="checkbox"/>	Credit 4.4	Alternative Transportation—Parking Capacity	2
<input type="checkbox"/>	Credit 5.1	Site Development—Protect or Restore Habitat	1
<input type="checkbox"/>	Credit 5.2	Site Development—Maximize Open Space	1
<input type="checkbox"/>	Credit 6.1	Stormwater Design—Quantity Control	1
<input type="checkbox"/>	Credit 6.2	Stormwater Design—Quality Control	1
<input type="checkbox"/>	Credit 7.1	Heat Island Effect—Nonroof	1
<input type="checkbox"/>	Credit 7.2	Heat Island Effect—Roof	1
<input type="checkbox"/>	Credit 8	Light Pollution Reduction	1

Water Efficiency

10 Possible Points

<input checked="" type="checkbox"/>	Prerequisite 1	Water Use Reduction	Required
<input type="checkbox"/>	Credit 1	Water Efficient Landscaping	2-4
<input type="checkbox"/>	Credit 2	Innovative Wastewater Technologies	2
<input type="checkbox"/>	Credit 3	Water Use Reduction	2-4

(Source: USGBC)

LEED 2009 New Construction Checklist (cont'd)

Energy and Atmosphere

35 Possible Points

<input checked="" type="checkbox"/>	Prerequisite 1	Fundamental Commissioning of Building Energy Systems	Required
<input checked="" type="checkbox"/>	Prerequisite 2	Minimum Energy Performance	Required
<input checked="" type="checkbox"/>	Prerequisite 3	Fundamental Refrigerant Management	Required
<input type="checkbox"/>	Credit 1	Optimize Energy Performance	1-19
<input type="checkbox"/>	Credit 2	On-site Renewable Energy	1-7
<input type="checkbox"/>	Credit 3	Enhanced Commissioning	2
<input type="checkbox"/>	Credit 4	Enhanced Refrigerant Management	2
<input type="checkbox"/>	Credit 5	Measurement and Verification	3
<input type="checkbox"/>	Credit 6	Green Power	2

Materials and Resources

14 Possible Points

<input checked="" type="checkbox"/>	Prerequisite 1	Storage and Collection of Recyclables	Required
<input type="checkbox"/>	Credit 1.1	Building Reuse—Maintain Existing Walls, Floors and Roof	1-3
<input type="checkbox"/>	Credit 1.2	Building Reuse—Maintain Existing Interior Nonstructural Elements	1
<input type="checkbox"/>	Credit 2	Construction Waste Management	1-2
<input type="checkbox"/>	Credit 3	Materials Reuse	1-2
<input type="checkbox"/>	Credit 4	Recycled Content	1-2
<input type="checkbox"/>	Credit 5	Regional Materials	1-2
<input type="checkbox"/>	Credit 6	Rapidly Renewable Materials	1
<input type="checkbox"/>	Credit 7	Certified Wood	1

LEED 2009 New Construction Checklist (cont'd)

Indoor Environmental Quality		15 Possible Points
<input checked="" type="checkbox"/>	Prerequisite 1 Minimum Indoor Air Quality Performance	Required
<input checked="" type="checkbox"/>	Prerequisite 2 Environmental Tobacco Smoke (ETS) Control	Required
<input type="checkbox"/>	Credit 1 Outdoor Air Delivery Monitoring	1
<input type="checkbox"/>	Credit 2 Increased Ventilation	1
<input type="checkbox"/>	Credit 3.1 Construction Indoor Air Quality Management Plan—During Construction	1
<input type="checkbox"/>	Credit 3.2 Construction Indoor Air Quality Management Plan—Before Occupancy	1
<input type="checkbox"/>	Credit 4.1 Low-Emitting Materials—Adhesives and Sealants	1
<input type="checkbox"/>	Credit 4.2 Low-Emitting Materials—Paints and Coatings	1
<input type="checkbox"/>	Credit 4.3 Low-Emitting Materials—Flooring Systems	1
<input type="checkbox"/>	Credit 4.4 Low-Emitting Materials—Composite Wood and Agrifiber Products	1
<input type="checkbox"/>	Credit 5 Indoor Chemical and Pollutant Source Control	1
<input type="checkbox"/>	Credit 6.1 Controllability of Systems—Lighting	1
<input type="checkbox"/>	Credit 6.2 Controllability of Systems—Thermal Comfort	1
<input type="checkbox"/>	Credit 7.1 Thermal Comfort—Design	1
<input type="checkbox"/>	Credit 7.2 Thermal Comfort—Verification	1
<input type="checkbox"/>	Credit 8.1 Daylight and Views—Daylight	1
<input type="checkbox"/>	Credit 8.2 Daylight and Views—Views	1
Innovation in Design		6 Possible Points
<input type="checkbox"/>	Credit 1 Innovation in Design	1-5
<input type="checkbox"/>	Credit 2 LEED Accredited Professional	1
Regional Priority		4 Possible Points
<input type="checkbox"/>	Credit 1 Regional Priority	1-4

(Source: USGBC)



LEED process

- LEED Pilot Credit Library
 - <http://www.usgbc.org/leed/tools/pilot-credits>
 - To test new and revised LEED credit language, alternative compliance paths, and new or innovative green building technologies and concepts
 - LEED project teams may pursue an unlimited number of pilot credits, however points awarded is limited by the number of Innovation credits available (up to 5 for LEED 2009 projects)



LEED process

- EAp2: Minimum energy performance
 - **Intent:** Establish the minimum level of energy efficiency for the proposed building and systems
 - **Requirements:** Mandatory provisions of ASHRAE 90.1 and
 - Prescriptive requirements of 90.1 **or**
 - Performance requirements of 90.1 Section 11 (Energy Cost Budget Method) **or**
 - The requirements in the local energy code, whichever is more stringent

ASHRAE 90.1 compliance approaches

Building System

Compliance Options

Envelope

HVAC

SWH

Power

Lighting

Other

Mandatory Provisions
(required for most compliance options)

Prescriptive Option

Trade Off Option

Energy Cost Budget

Simplified

Energy Code Compliance

(Source: US Department of Energy)



LEED process

- **EAc1: Optimize energy performance**
 - **Intent:** Achieve increasing levels of energy performance above the baseline in the prerequisite standard to reduce environmental impacts associated with excessive energy use
 - **Requirements:** Awards points for improving performance rating of the design building vs. baseline building as per ASHRAE Standard 90.1 (Appendix G) [1 to 19 points]

EAc1: Optimize energy performance (Up to 19 points)

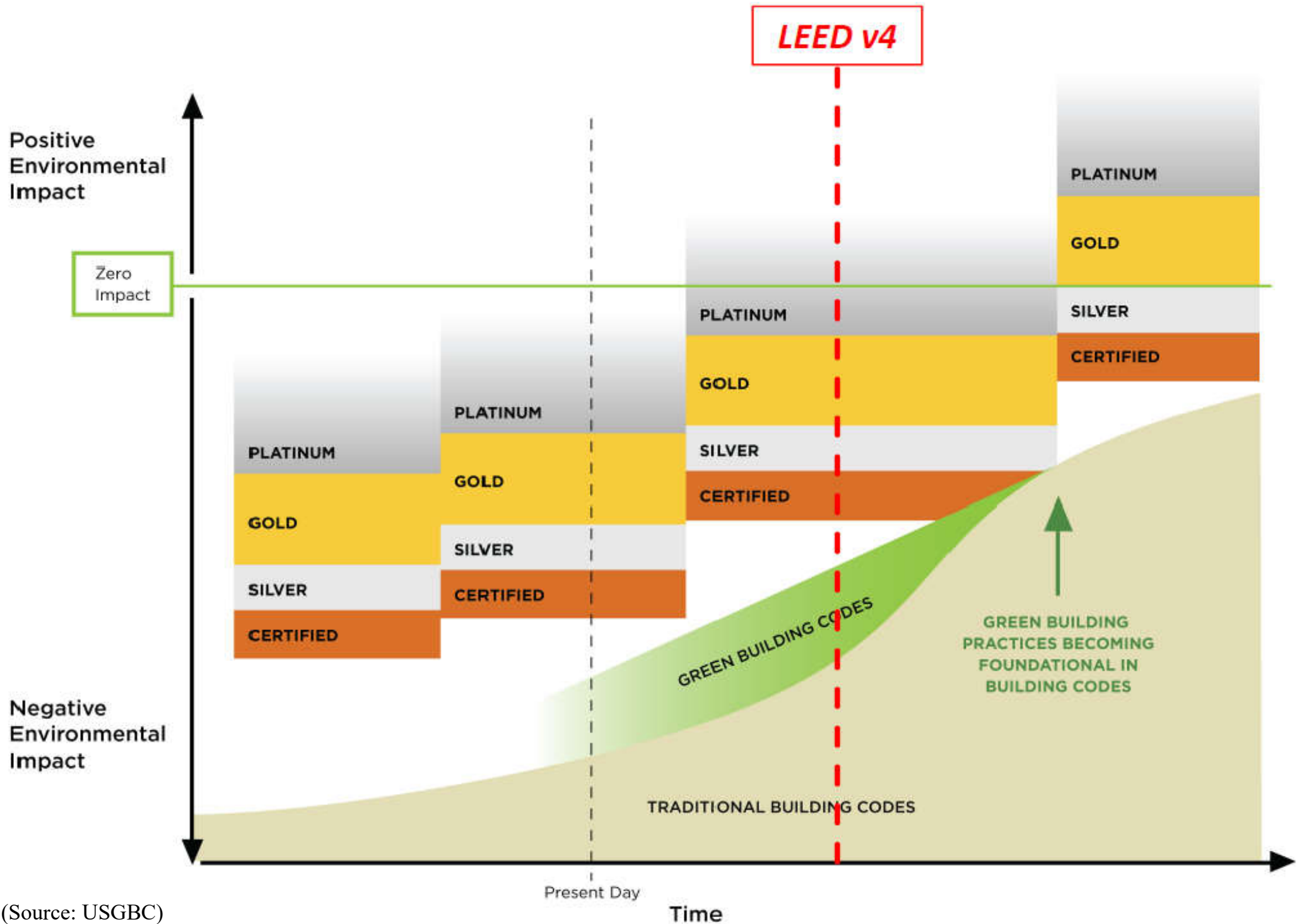
New Buildings	Existing Building Renovations	Points
12%	8%	1
14%	10%	2
16%	12%	3
18%	14%	4
20%	16%	5
22%	18%	6
24%	20%	7
26%	22%	8
28%	24%	9
30%	26%	10
32%	28%	11
34%	30%	12
36%	32%	13
38%	34%	14
40%	36%	15
42%	38%	16
44%	40%	17
46%	42%	18
48%	44%	19



LEED v4

- Changes in the LEED v4:
 - Global focus
 - SI units
 - Alternative compliance paths
 - New and more stringent prerequisites and credits
 - Online credit library
 - <http://www.usgbc.org/credits>
 - Market sector language
 - Different rating systems for different building types
 - Link with LEED ND


LEED v4: A shift in focus, deeper transformation



(Source: USGBC)

Video presentation



- LEED® v4 Certification (3:10)
 - <https://youtu.be/xHnlnXt9Td8>
 - A comprehensive update for LEED and a radical jump forward for the green building rating system
 - Major changes in LEED v4: 
 - Integrative Process
 - Location & Transportation
 - Materials & Resources (life cycle thinking, product transparency, environmental product declarations EPDs, health product declarations HPDs)
 - Other changes on Sites, Water, Energy and IEQ



LEED v4 for BD+C: New Construction and Major Renovation

Project Checklist

Project Name

Date

		Integrative Process	1
	Credit 1	Integrative Process	1

		Location and Transportation	16
	Credit 1	LEED for Neighborhood Development Location	16
	Credit 2	Sensitive Land Protection	1
	Credit 3	High Priority Site	2
	Credit 4	Surrounding Density and Diverse Uses	5
	Credit 5	Access to Quality Transit	5
	Credit 6	Bicycle Facilities	1
	Credit 7	Reduced Parking Footprint	1
	Credit 8	Green Vehicles	1

		Sustainable Sites	10
Y	Prereq 1	Construction Activity Pollution Prevention	Required
	Credit 1	Site Assessment	1
	Credit 2	Site Development--Protect or Restore Habitat	2
	Credit 3	Open Space	1
	Credit 4	Rainwater Management	3
	Credit 5	Heat Island Reduction	2
	Credit 6	Light Pollution Reduction	1

		Water Efficiency	11
Y	Prereq 1	Outdoor Water Use Reduction	Required
Y	Prereq 2	Indoor Water Use Reduction	Required
Y	Prereq 3	Building-Level Water Metering	Required
	Credit 1	Outdoor Water Use Reduction	2
	Credit 2	Indoor Water Use Reduction	6
	Credit 3	Cooling Tower Water Use	2
	Credit 4	Water Metering	1

		Energy and Atmosphere	33
Y	Prereq 1	Fundamental Commissioning and Verification	Required
Y	Prereq 2	Minimum Energy Performance	Required
Y	Prereq 3	Building-Level Energy Metering	Required
Y	Prereq 4	Fundamental Refrigerant Management	Required
	Credit 1	Enhanced Commissioning	6
	Credit 2	Optimize Energy Performance	18
	Credit 3	Advanced Energy Metering	1
	Credit 4	Demand Response	2
	Credit 5	Renewable Energy Production	3

		Energy and Atmosphere Continued	
	Credit 6	Enhanced Refrigerant Management	1
	Credit 7	Green Power and Carbon Offsets	2

		Materials and Resources	13
Y	Prereq 1	Storage and Collection of Recyclables	Required
Y	Prereq 2	Construction and Demolition Waste Management Planning	Required
	Credit 1	Building Life-Cycle Impact Reduction	5
	Credit 2	Building Product Disclosure and Optimization - Environmental Product Declarations	2
	Credit 3	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
	Credit 4	Building Product Disclosure and Optimization - Material Ingredients	2
	Credit 5	Construction and Demolition Waste Management	2

		Indoor Environmental Quality	16
Y	Prereq 1	Minimum Indoor Air Quality Performance	Required
Y	Prereq 2	Environmental Tobacco Smoke Control	Required
	Credit 1	Enhanced Indoor Air Quality Strategies	2
	Credit 2	Low-Emitting Materials	3
	Credit 3	Construction Indoor Air Quality Management Plan	1
	Credit 4	Indoor Air Quality Assessment	2
	Credit 5	Thermal Comfort	1
	Credit 6	Interior Lighting	2
	Credit 7	Daylight	3
	Credit 8	Quality Views	1
	Credit 9	Acoustic Performance	1

		Innovation	6
	Credit 1.1	Innovation	1
	Credit 1.2	Innovation	1
	Credit 1.3	Innovation	1
	Credit 1.4	Innovation	1
	Credit 1.5	Innovation	1
	Credit 2	LEED Accredited Professional	1



		Regional Priority	4
	Credit 1	Regional Priority: Specific Credit	1
	Credit 2	Regional Priority: Specific Credit	1
	Credit 3	Regional Priority: Specific Credit	1
	Credit 4	Regional Priority: Specific Credit	1

		Total	110
--	--	--------------	------------

(Source: USGBC)



Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

LEED 2009 vs. LEED v4

Category	LEED 2009	%	Category	LEED v4	%
N/A	0	0%	Integrative Design 	1	1%
Sustainable Sites	26	24%	Location & Transport 	16	15%
			Sustainable Sites	10	9%
Water Efficiency	10	9%	Water Efficiency	11	10%
Energy & Atmosphere	35	32%	Energy & Atmosphere	33	30%
Materials & Resources	14	13%	Materials & Resources	13	12%
Indoor Environmental Quality	15	14%	Indoor Environmental Quality	16	15%
Innovation	6	5%	Innovation	6	5%
Regional Priority	4	4%	Regional Priority	4	4%
Total	110			110	



LEED v4

- Integrative Process A circular icon with three interconnected nodes, representing an integrative process.
 - Requires team to analyse opportunities for water and energy savings early in design (1 pt)
 - Requires iterative energy modelling
 - Requires water budget
- Location & Transportation A circular icon with a bus, representing location and transportation.
 - Changes Sustainable Site credit points and introduce new credits, e.g.
 - Select a LEED ND certified site (1 pt)
 - Access to quality transit (5 pts)
 - Green vehicles (1 pt)



LEED v4

- Materials & Resources





- New prerequisite:
 - Construction & demolition waste management planning
- New credits:
 - Building life-cycle impact reduction (5 pts)
 - Building product disclosure and optimization – environmental product declarations (2 pts)
 - Building product disclosure and optimization – sources of raw materials (2 pts)
 - Building product disclosure and optimization – material ingredients (2 pts)

LEED v4 focuses on market transformation of the manufacturing industry







LEED v4

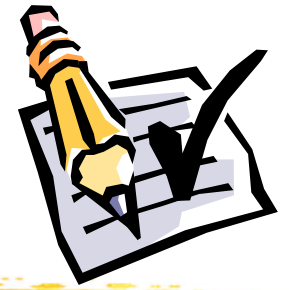
- Sustainable Sites 
 - New credits, e.g.
 - Site assessment (1 pt)
 - Rainwater management (3 pts)
- Water Efficiency 
 - New prerequisites:
 - Outdoor water use reduction
 - Building-level water metering
 - New credits:
 - Cooling tower water use (2 pts)
 - Water metering (1 pt)



LEED v4

- Energy and Atmosphere An orange circular icon with a white sunburst design inside.
 - New prerequisites:
 - Building-level energy metering
 - New credits:
 - Advanced energy metering (1 pt)
 - Demand response (2 pts)
- Indoor Environmental Quality A blue circular icon with a white soundwave design inside.
 - New credit:
 - Acoustic performance (1 pt)

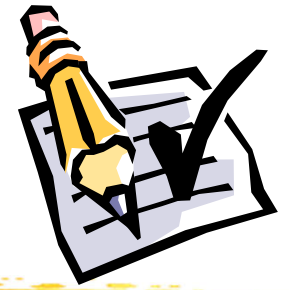
Key factors to consider




- Passive design
 - Taking advantage of the sun and wind
- Regenerative Projects
 - Support the health, generate electricity and send back to the grid. Its goal to achieve “net zero”
- The triple bottom line
 - People (Social)
 - Planet (Environmental)
 - Profit (Economic)



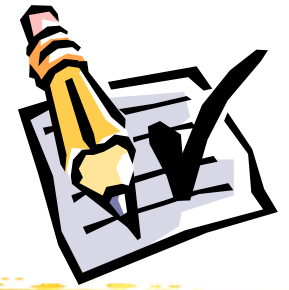
Key factors to consider



- Sustainable sites 
 - Develop only on appropriate sites
 - Provide for non-auto access
 - Preserve open space
 - Manage stormwater
 - Reduce urban heat island effect
 - Reduce light pollution of the night sky



Key factors to consider



- Water conservation

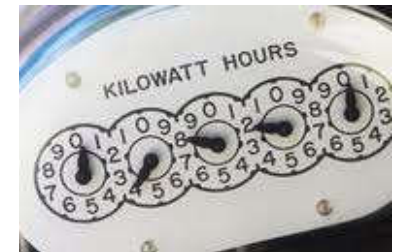


- Reduce use of potable water for irrigation and for building water use and sewage conveyance

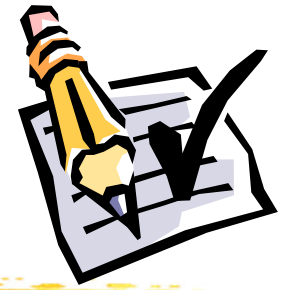
- Energy efficiency and atmosphere protection



- Reduce building energy use
- Use less harmful chemicals for refrigerants
- Generate renewable energy on-site
- Provide for ongoing energy savings
- Purchase green power for project use



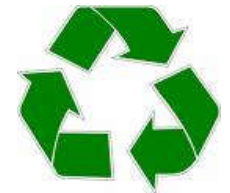
Key factors to consider



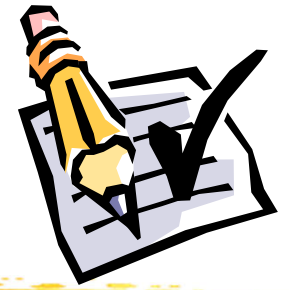
- Materials and resource conservation



- Provide for recycling
- Reuse existing buildings
- Reduce construction waste generation
- Use salvaged and recycled content materials
- Source materials regionally
- Use rapidly renewable (agricultural) materials and certified wood products



Key factors to consider



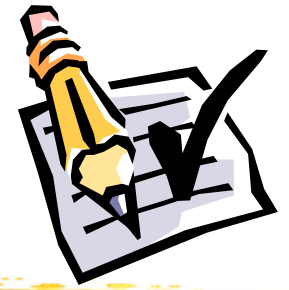
- Indoor environmental quality





- Improve indoor air quality
- Increase outside air ventilation
- Manage air quality during construction
- Use only nontoxic quality finishes, carpets, and composite wood products
- Reduce exposure to toxic chemicals during building operations
- Provide for individual comfort control
- Maintain thermal comfort standards

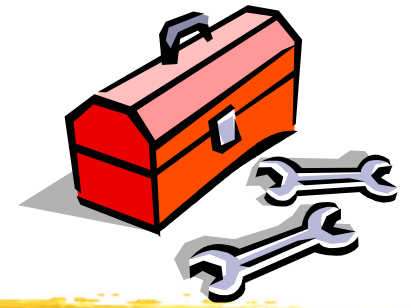


Key factors to consider



- Indoor environmental quality (cont'd) 
 - Provide daylighting and views to the outdoors
- Encourage innovation and integrated design 
 - Provide for exemplary performance above LEED standards and encourage other innovations
 - Use accredited professionals on the design team

Hong Kong BEAM



HONG KONG BUILDING ENVIRONMENTAL
ASSESSMENT METHOD

香港建築環境評估法

- HK-BEAM

- Previous versions:

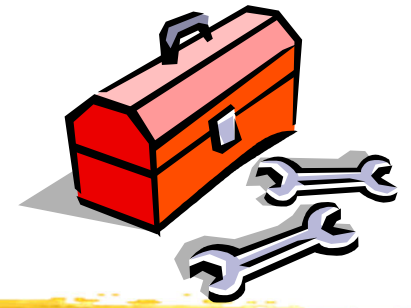
- Version 1/96R - for new office designs
- Version 2/96R - for existing office buildings
- Version 3/99 - for new residential buildings
- Hotel Building Environmental Assessment Scheme (HBEAS)

- Issues covered:

- Global issues & use of resources
- Local issues
- Indoor issues

With reference to the
early version of
BREEAM in UK

Hong Kong BEAM



- HK-BEAM



HONG KONG BUILDING ENVIRONMENTAL
ASSESSMENT METHOD

香港建築環境評估法

- Versions 2004:

- HK-BEAM 4/04 New Buildings
- HK-BEAM 5/04 Existing Building

- Approach and criteria

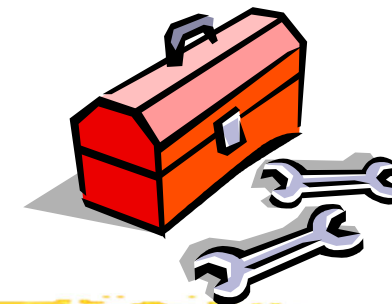
- Site aspects
- Materials aspects
- Energy use
- Water use
- Indoor environmental quality (IEQ)
- Innovation & performance enhancements



BEAM Society
建築環保評估協會

Make reference to
LEED v.1/v.2 in
USA

Hong Kong BEAM



HONG KONG BUILDING ENVIRONMENTAL
ASSESSMENT METHOD

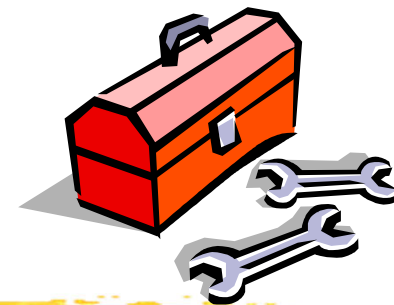
香港建築環境評估法

- HK-BEAM

- Weighting system to reflect
 - Relative importance of criteria
 - Relative areas of the spaces
- Overall assessment grade (IEQ must meet min. %)

• Platinum	75% (Excellent)	min. IEQ 65%
• Gold	65% (Very Good)	min. IEQ 55%
• Silver	55% (Good)	min. IEQ 50%
• Bronze	40% (Above average)	min. IEQ 40%
- Website: <https://www.beamsociety.org.hk/>

Hong Kong BEAM



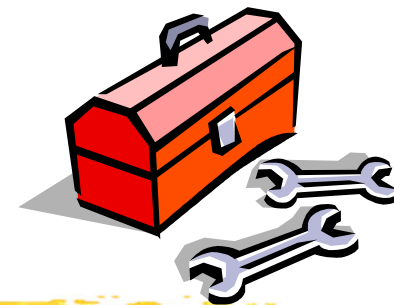
- BEAM Plus development
 - Version 2009: (Nov 2009)
 - BEAM Plus for New Buildings
 - BEAM Plus for Existing Buildings
 - Version 1.1 (Apr 2010)
 - With minor refinements
 - Introduce BEAM Professionals
 - Version 1.2 (Jul 2012)
 - Addresses issues on passive design
 - Minor amendments to other aspects
 - Starting from 1 Jan 2013, version 1.2 must be used



HKGBC
BEAM Plus
綠建環評

HK-BEAM was transformed to BEAM Plus, which is certified by HKGBC

Hong Kong BEAM



- Certification body: HKGBC

- Setting the policy
- Final appeal
- Audit to BEAM Society



- Assessment body: BEAM Society

- Technical assessment
- First appeal



- Assessment process & submission guidelines

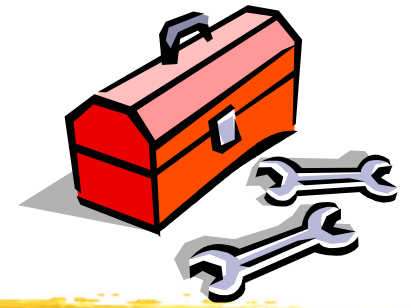
- https://www.beamsociety.org.hk/en_beam_assessment_project_1.php

BEAM Plus v1.2 assessment criteria [credits] [weighting]

New Buildings	Existing Buildings
Site aspects (SA) [22+3B] [25%]	Site aspects (SA) [18+1B] [18%]
Materials aspects (MA) [22+1B] [8%]	Materials aspects (MA) [11+2B] [12%]
Energy use (EU) [42+2B] [35%]	Energy use (EU) [39+2B] [30%]
Water use (WU) [9+1B] [12%]	Water use (WU) [7+2B] [15%]
Indoor environmental quality (IEQ) [32+3B] [20%]	Indoor environmental quality (IEQ) [30+3B] [25%]
Innovations and additions (IA) [5B+1]	Innovations and additions (IA) [5B+1]



Hong Kong BEAM



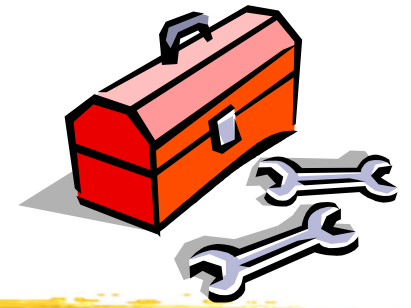
- BEAM Plus (Version 1.1 or 1.2)
 - Overall grade: (with min. for SA, EU and IEQ)

	Overall	Site Aspects	Energy Use	IEQ	Innov. & Addn.	
Platinum	75%	70%	70%	70%	3 credits	Excellent
Gold	65%	60%	60%	60%	2 credits	Very Good
Silver	55%	50%	50%	50%	1 credit	Good
Bronze	40%	40%	40%	40%	---	Above Average

Example of BEAM Plus weighting and grading

BEAM Plus for New Buildings Category	Credit Mark Earned (A)	Credit Mark Applicable (B)	% of Credit Marks Earned (C=100*A/B)	Category Weighting (D)	Weighted Category Mark (E=C*D)	Category Grade
Site Aspect	19	22	86%	0.25	22%	Platinum
Water Use	7	22	32%	0.08	3%	-
Energy Use	30	42	71%	0.35	25%	Platinum
Material Use	8	9	89%	0.12	11%	-
Indoor Environment Quality	25	32	78%	0.20	16%	Platinum
Total Weighted Category Mark					77%	
Innovation Credit Mark Earned					3	Platinum
Final BEAM Credit Mark					80%	Platinum
Overall BEAM Grade					Platinum	32

Hong Kong BEAM



- BEAM Plus technical analysis, such as:
 - SA8 Microclimate around Buildings
 - Wind effects, air ventilation assessment, air paths, building permeability, landscaping
 - SA9 Neighborhood Daylight Access
 - Vertical daylight factor, unobstructed vision area
 - EU1 Reduction of CO₂ Emissions
 - Performance-based Building Energy Code or Appendix G of ASHRAE 90.1 (performance rating method)
 - IEQ15 Natural Lighting
 - Average daylight factor $\geq 2\%$

Require
inputs from
engineers
or
specialist
consultant

Total number of BEAM plus registered NB projects (up to 17 Jun 2021)



Data as of 17/06/2021

BEAM Plus Project Directory and Statistics

Include all versions of valid and expired New Buildings Projects (NB) [V1.1, V1.2, V2.0, V2.0 Pilot]

Total Number of Registered New Buildings Projects:

1,432

Select all	NB V1.1	NB V1.2	NB V2.0	NB V2.0 Pilot
------------	---------	---------	---------	---------------

Figure 1. Project Type Distribution

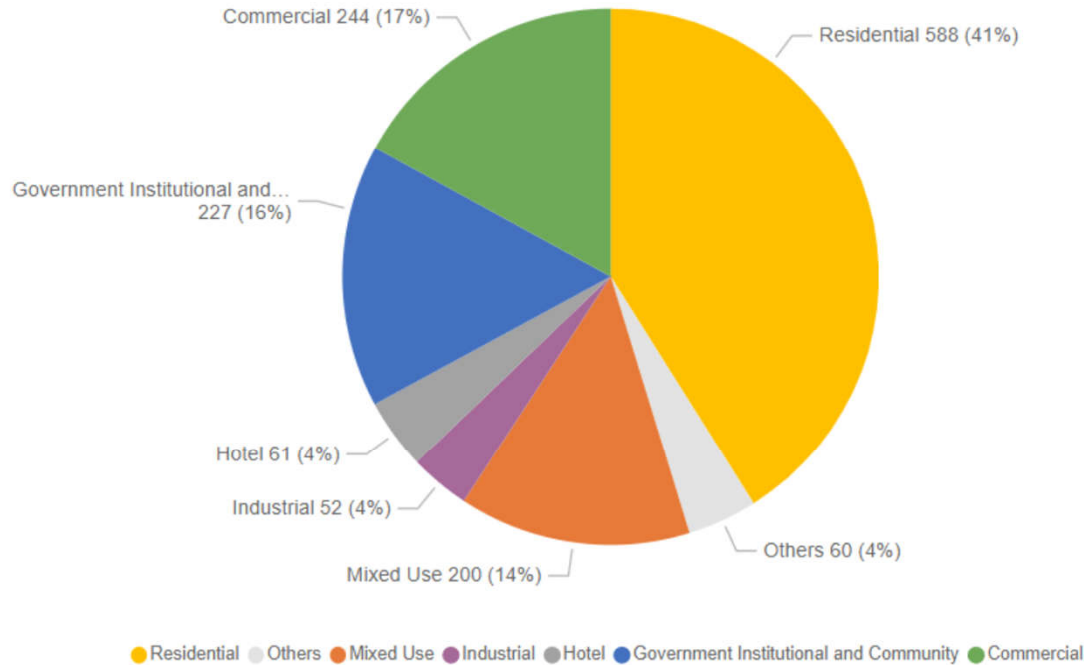
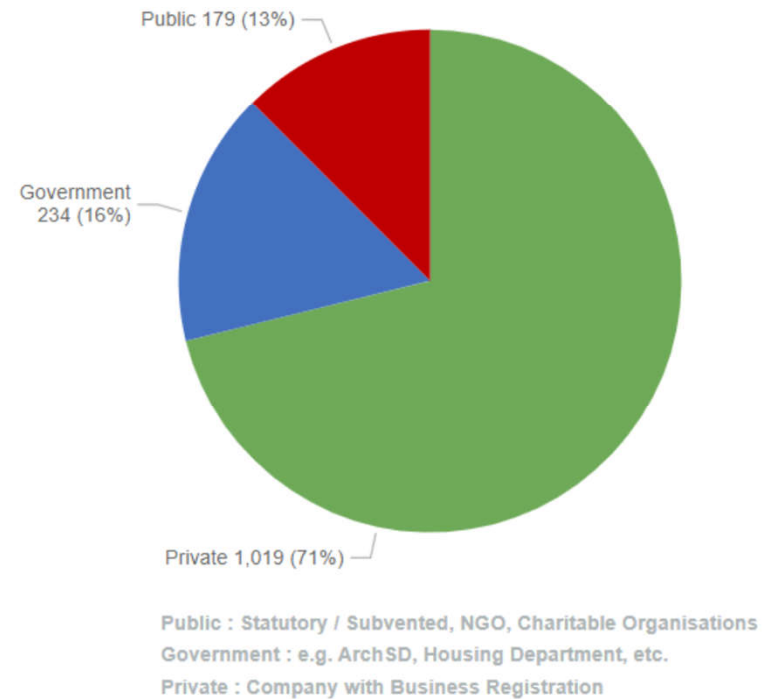
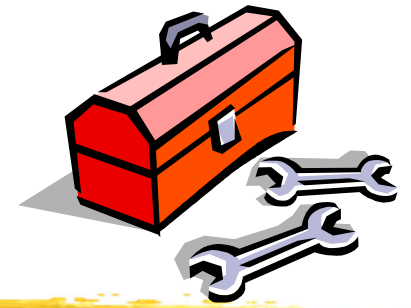


Figure 2. Owners / Developers Distribution



Hong Kong BEAM



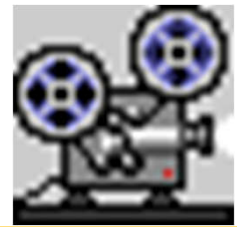
- Uptake of BEAM Plus in Hong Kong:
 - New government buildings with floor area $> 10,000 \text{ m}^2$ will aim to obtain the second highest grade or above under BEAM Plus or LEED
 - Buildings Department has included BEAM Plus on the Practice Notes on the wholesale conversion of industrial buildings, permitting the exemption of certain regulatory provisions
 - Since 2011, BEAM Plus certification is required as a prerequisite for gross floor area (GFA) concessions for certain green and amenity features
 - CLP Subsidy Scheme for BEAM Plus

<https://www.clp.com.hk/en/community-and-environment/community-funds/beam-plus>

Development of BEAM Plus in Hong Kong



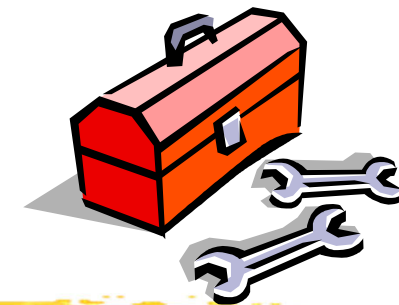
Strong link to government policy and requirements (e.g. Climate Action Plan HK2030+ and Energy Saving Plan)



Video: Green Buildings? BEAM Plus! (3:19)
<https://youtu.be/p4WszGgXfSM>

(Source: HKGBC)

Hong Kong BEAM



- The BEAM Plus Family

- <https://www.hkgbc.org.hk/eng/beam-plus/introduction/>



- Neighbourhood (ND): Masterplanning stage of building development projects



- New Buildings (NB): New building projects and major renovation/alteration works on existing buildings



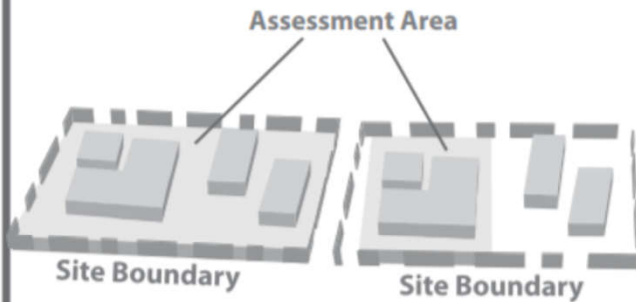
- Existing Buildings (EB): Operation and maintenance performance of existing buildings



- Interiors (BI): Fit-out works of non-domestic premises

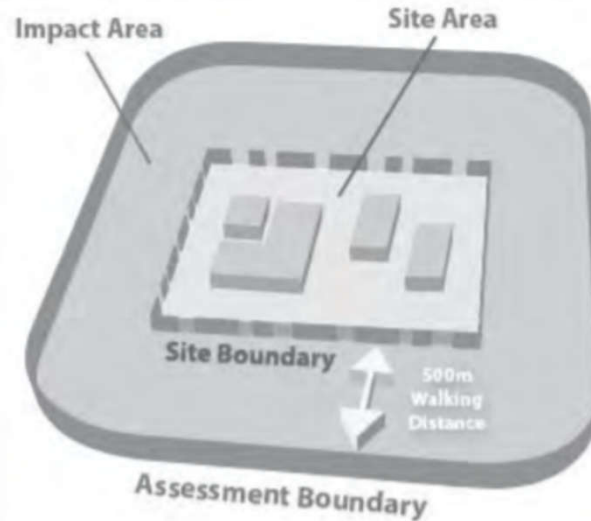
(Remark: A new BEAM Plus Data Centres is now under beta test.)

BEAM Plus NB Version 1.2



Assessment Area = Site Area
OR
Assessment Area = Partial Site Area

BEAM Plus Neighbourhood Version 1.0

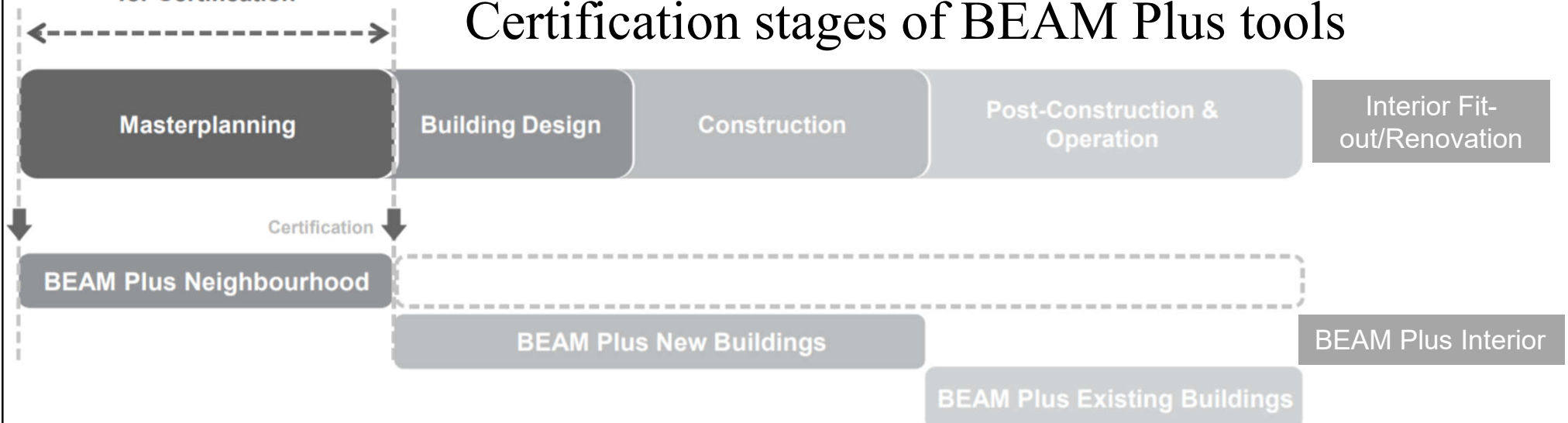


Assessment Area
= Site Area + Impact Area

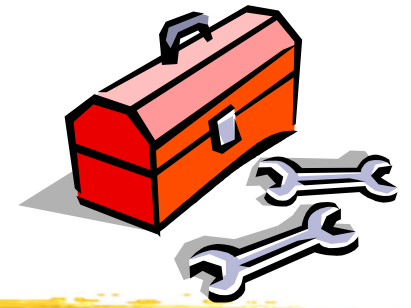
Comparison of
assessment area of
BEAM Plus NB and
BEAM
Plus Neighbourhood

Applicable Work / Project stage
for Certification

Certification stages of BEAM Plus tools



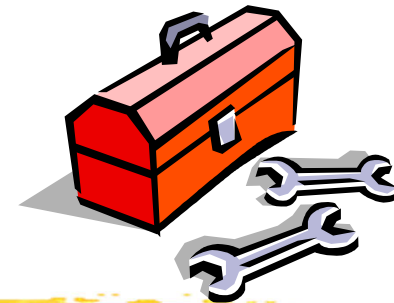
Hong Kong BEAM



- BEAM Plus Interior (Aug 2013)
 - Used by occupants or tenants of new or existing buildings (fit-out, renovation and refurbishment)
 - Include 7 aspects:
 - Green Building Attributes (GBA) [8]
 - Management (MAN) [1p, 10]
 - Materials Aspects (MA) [3p, 26]
 - Energy Use (EU) [26]
 - Water Use (WU) [6]
 - Indoor Environmental Quality (IEQ) [24]
 - Innovations (IV) [10]



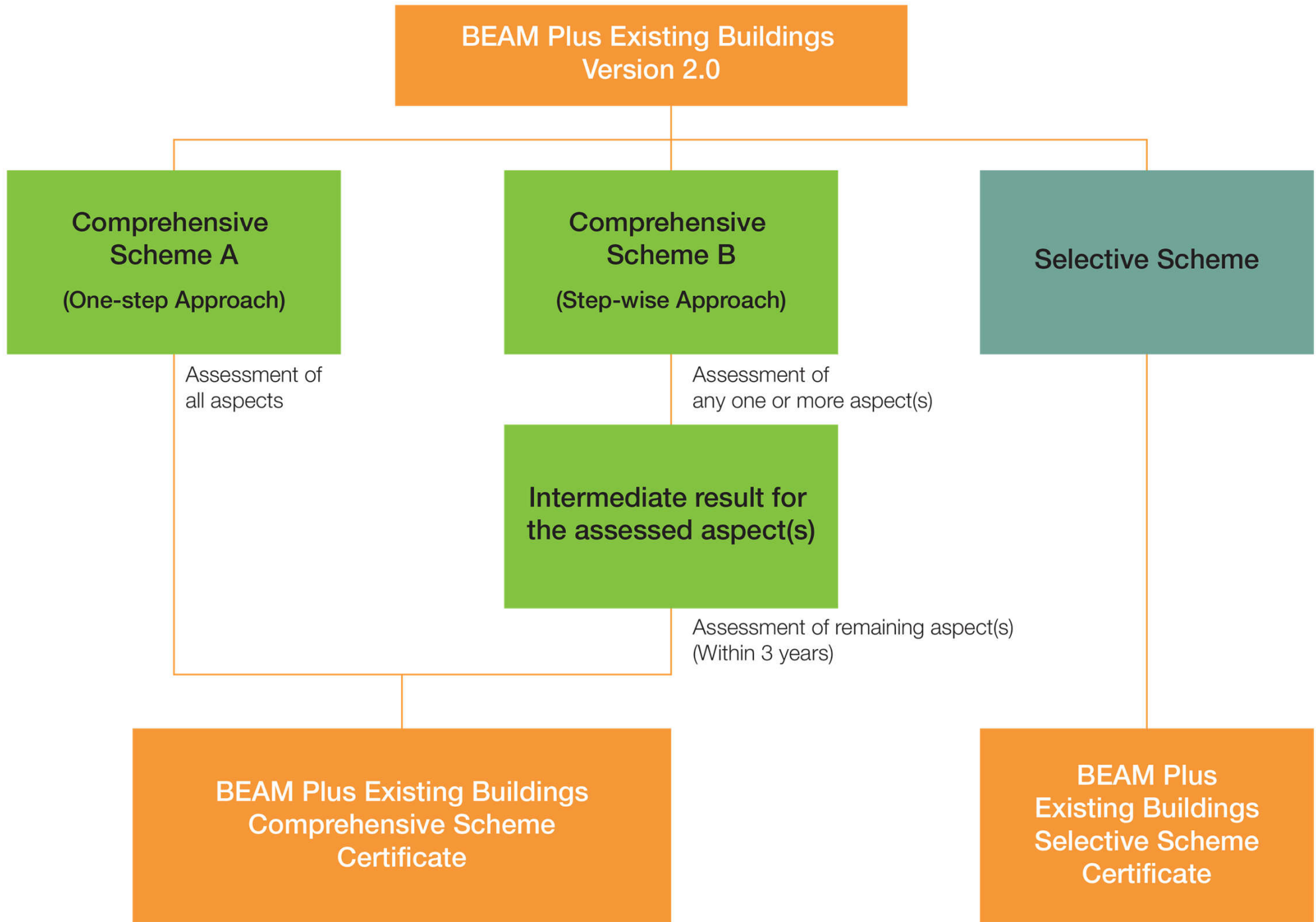
Hong Kong BEAM



- BEAM Plus Neighbourhood (2016)
 - For early inception or masterplanning stage of a development project (to assess urban & communities sustainability)
 - Emphasis on space between buildings
 - Embrace socio-economic elements
 - Be a good neighbour
 - Consider two new aspects:
 - Community Aspects
 - Outdoor environmental quality



BEAM Plus Existing Buildings v.2 (2016)



Hong Kong BEAM



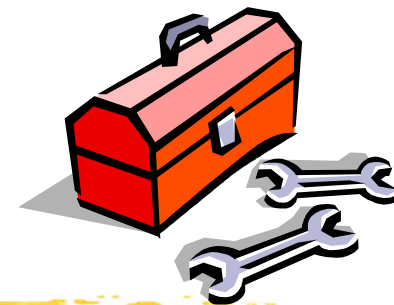
- BEAM Plus New Buildings v2.0 (05.2021)
 - More human centric & integrated design; more adaptable, certain & practicable
 - Credit performance categories:
 - Integrated Design & Construction Mgt. (IDCM) - 18%
 - Sustainable Sites (SS) - 15%
 - Materials & Waste (MW) - 9%
 - Energy Use (EU) - 29%
 - Water Use (WU) - 7%
 - Health & Wellbeing (HWB) - 22%
 - Innovations & Additions (IA) - max. 10 credits



Credit performance categories in BEAM Plus New Buildings v2.0



Hong Kong BEAM



- **BEAM Professionals (BEAM Pro)**

- Accredited by HK Green Building Council (HKGBC)
- Facilitate BEAM Plus submission

- **BEAM Assessors (BAS)**

- Undertake the building assessment on behalf of HKGBC

- **Green Building Faculty**

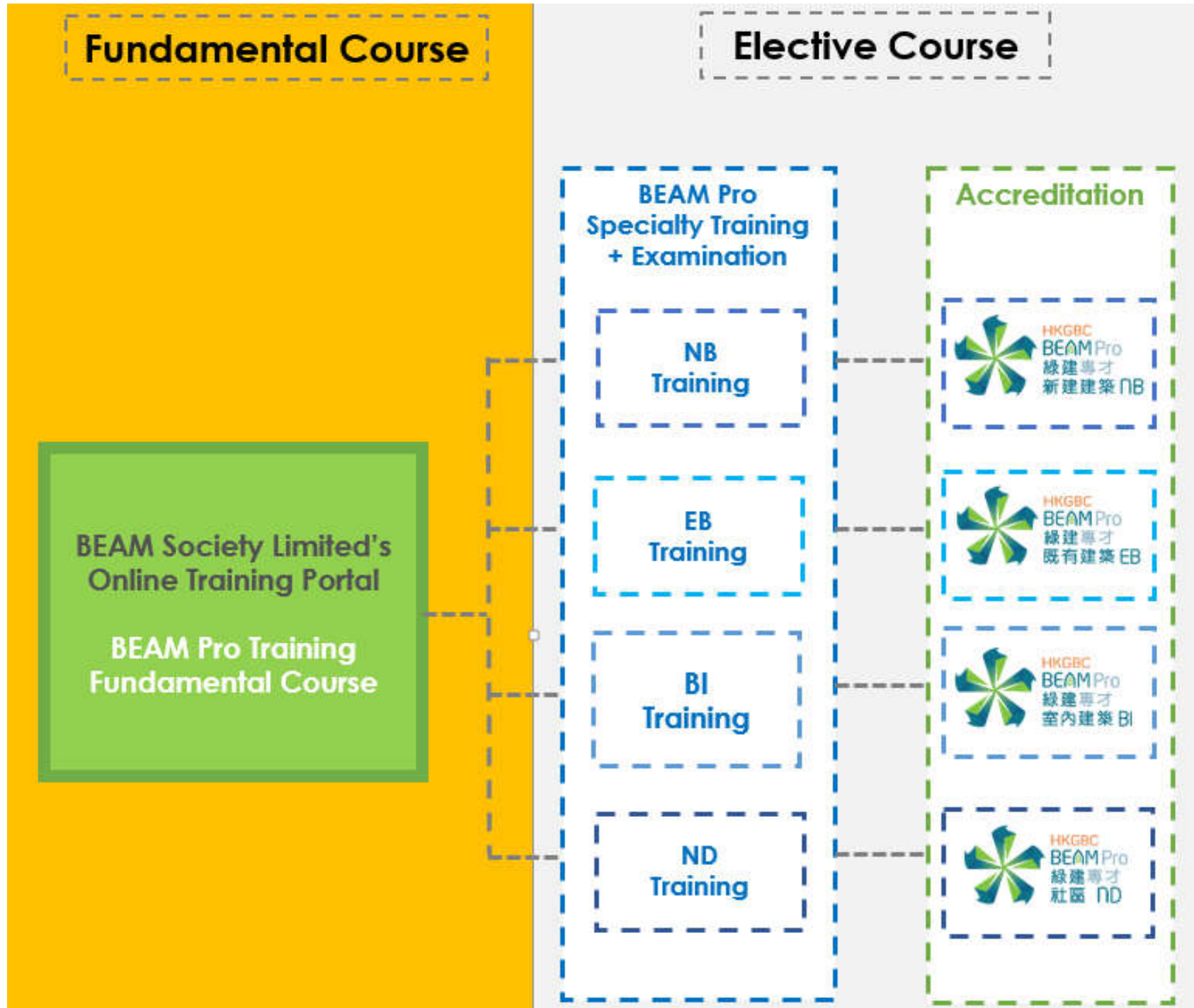
- Experienced professionals to drive BEAM Plus & BEAM Professionals development and training

- **BEAM Affiliate (BA)**

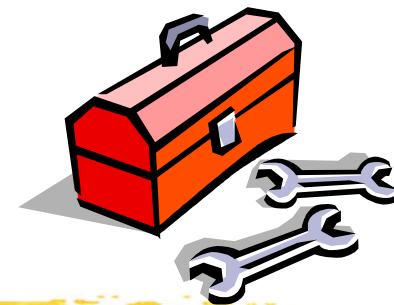
- Sub-professionals to support green building design, construction and operations



BEAM Professional training and examination



Hong Kong BEAM



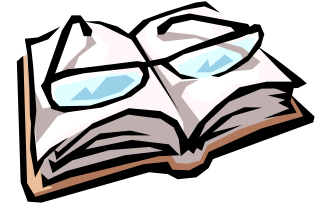
- iBEAM (Assessment Automation System)
 - Automate the assessment process ONLINE
 - Retrieve technical standards pertaining to the development of sustainable built environment
 - Project Dashboard & Credit Summary Dashboard
 - e-Forms, Credit Interpretation Request (CIR)
 - <https://ibeam.hk>



Beyond GREEN with iBEAM

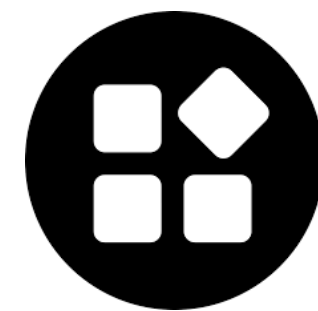


BEAM
建築環保評估協會



Further Reading

- LEED rating system
 - <https://www.usgbc.org/leed>
- LEED USGBC <http://leed.usgbc.org/>
- BEAM Plus
 - <https://www.hkgbc.org.hk/eng/beam-plus/introduction/>
- BEAM Online Training Portal
 - <https://www.beamsociety.org.hk/onlinetraining/>



Useful Tools

- USGBC Explore app (explore LEED registered and certified buildings)

- <https://apps.apple.com/us/app/usgbc-explore/id1441681908>



- BEAM Plus app (BEAM Plus related info)

- App Store <https://apps.apple.com/hk/app/beam-plus/id1257598183>

- Google Play

<https://play.google.com/store/apps/details?id=com.bsl.beamplus>

