MEBS6020 Sustainable Building Design

http://ibse.hk/MEBS6020/

Green Building Assessment (II)

Ir Dr. Sam C. M. Hui

Department of Mechanical Engineering

The University of Hong Kong

E-mail: cmhui@hku.hk

Jun 2025

Contents

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

HKGBC
BEAM Plus
綠建環評

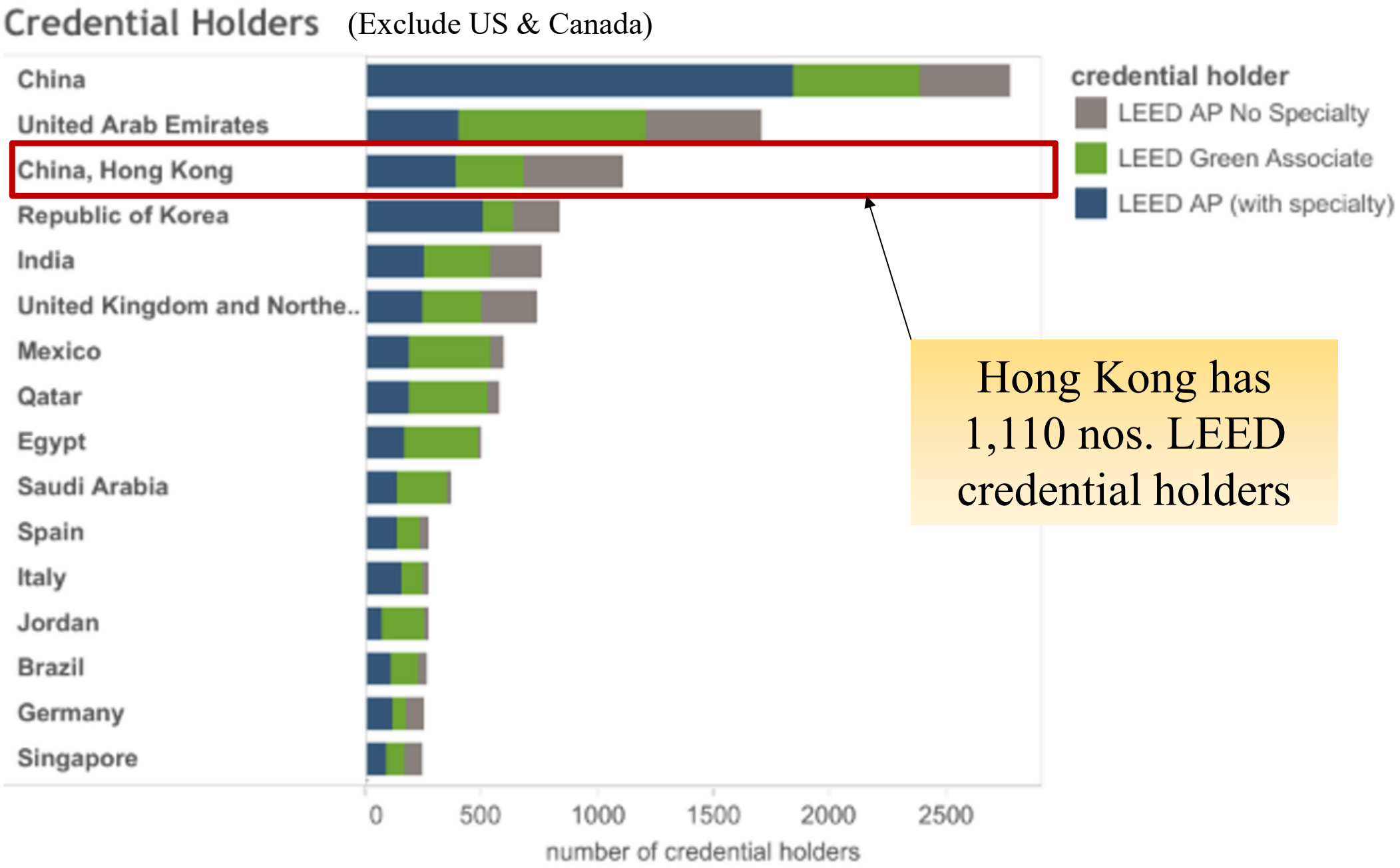
Top 10 Countries and Regions for LEED in 2024

Rank	Country/Region	Total Square Meters	Total Square Footage	Total Project Numbers
1	Chinese Mainland	25,691,198	276,537,490	1,860
2	Canada	10,070,936	108,402,545	300
3	India	8,506,012	91,557,865	370
4	South Korea	3,248,350	34,964,910	70
5	United Arab Emirates	3,226,489	34,729,600	130
6	Mexico	2,269,920	24,433,189	104
7	Hong Kong SAR	2,182,073	23,487,615	66
8	Italy	2,135,799	22,989,531	174
9	Brazil	2,088,100	22,476,099	125
10	Turkey	2,066,096	22,239,248	71

* In 2024, nearly half of the certified projects in the Chinese Mainland were from McDonald's. Also, 2024 show momentum in existing building projects.

(Source: https://www.usgbc.org/articles/top-10-countries-and-regions-leed-2024-show-momentum-existing-building-projects)

LEED professionals at a glance (2019)



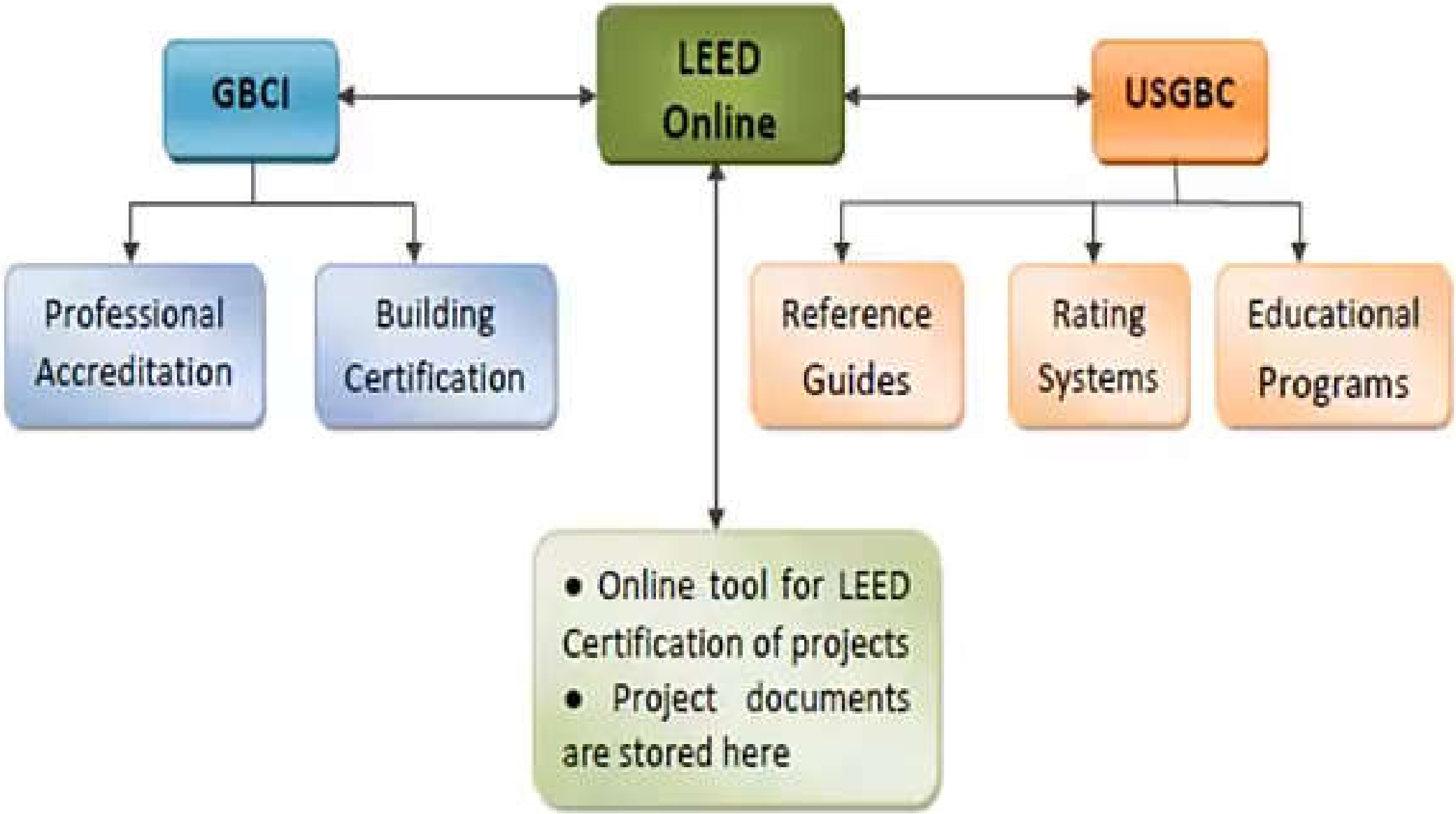
Remark: Number of credential holders in the world = 202,682; in US & Canada = 185,514

(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

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



GBCI = Green Building Certification Institute www.gbci.org
USGBC = US Green Building Council www.usgbc.org

(Source: Green Building Academy)

LEED certification

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

Tier 1

Tier 2

Tier 3

(Video: Intro To LEED Certification - GreenEDU.com (3:53) https://youtu.be/DTIZBFeF2Nc)

LEED Professional examinations

Tier I: Pass the GREEN ASSOCIATE Exam

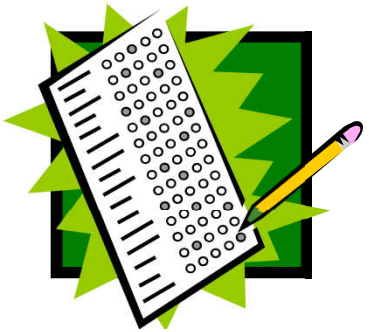
Do You Have Work Experience On a LEED Project?

NO

YES

Use Tier I GREEN ASSOCIATE Credential To Gain Experience

YES

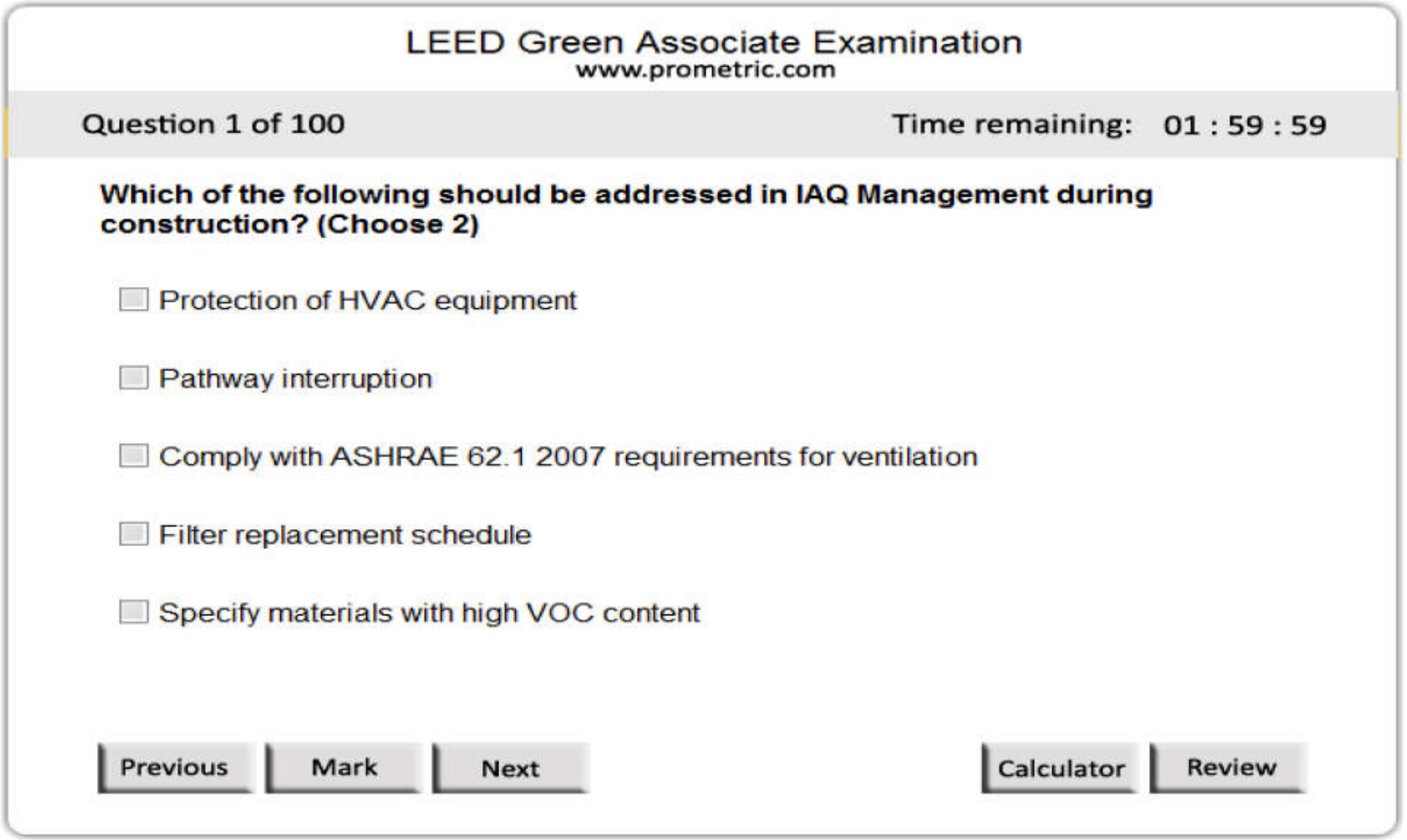


Choose Your Specialization

Tier II: LEED-Homes Exam (RESIDENTIAL)	Tier II: LEED-Existing Buildings Exam (Demonstrate Sustainable Operations & Maintenance of a Building; Minor Renovations)	Tier II: LEED-Building Design & Construction Exam (New Non-Residential Buildings & Major Renovations)	Tier II: LEED-Interior Design & Construction Exam (For Tenants That Want to Fit Out a Space)	Tier II: LEED-Neighborhood Development (Entire Sustainable Neighborhoods)
LEED AP+	LEED AP+	LEED AP+	LEED AP+	LEED AP+

(Source: www.everblueenergy.com)

LEED Green Associate exam: sample question



(Source: Green Building Academy)

LEED certification

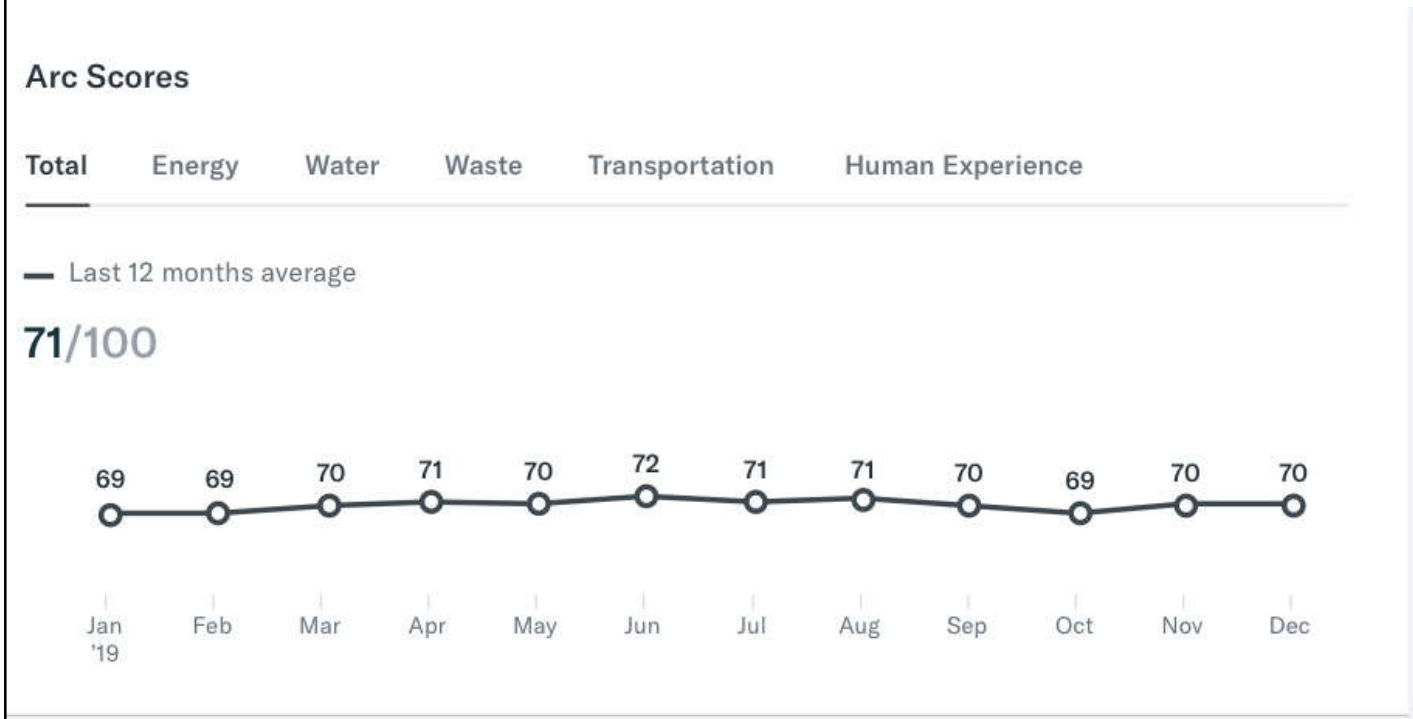
- Maintaining LEED credential
  - Continuing education (CE) required on a 2-year cycle (beginning on the exam date)
  - LEED GA: 15 CE hours biennially (3 must be LEED specific hours)
  - LEED AP: 30 CE hours biennially (6 must be LEED specific hours) as well as additional hours for additional specialties

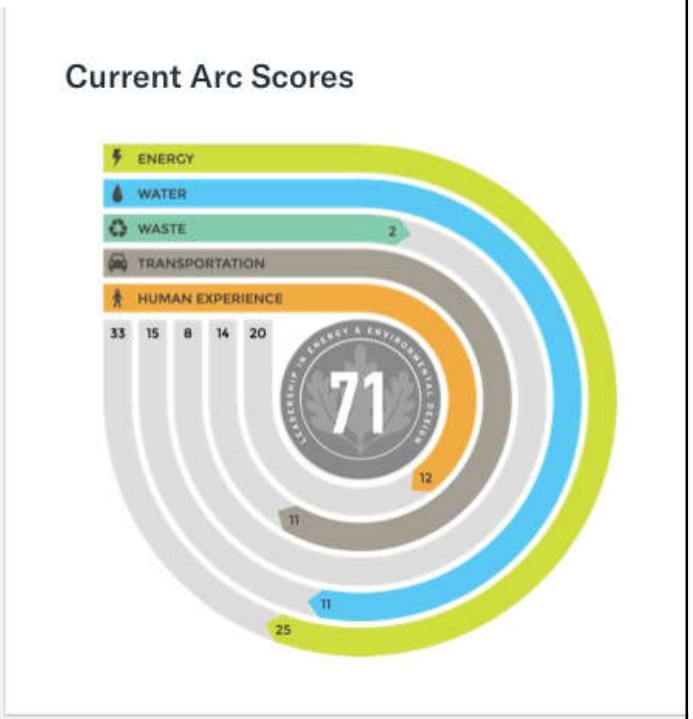
LEED certification

- USGBC introduced LEED v4.1 in 2019
  - https://www.usgbc.org/leed/v41
  - 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

(Further info: Video: What is LEED v4.1? (5:34) https://youtu.be/yzGZNL5IVfg)

LEED v4.1 integrates performance metrics using Arc digital platform





(Source: https://arcskoru.com/)

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

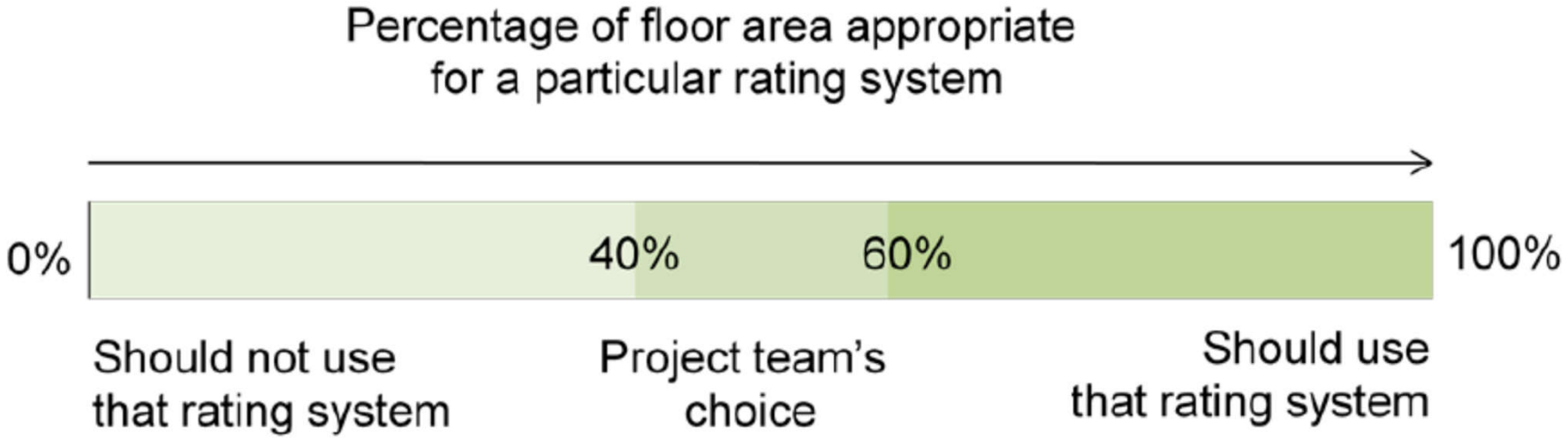
LEED process

- 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)



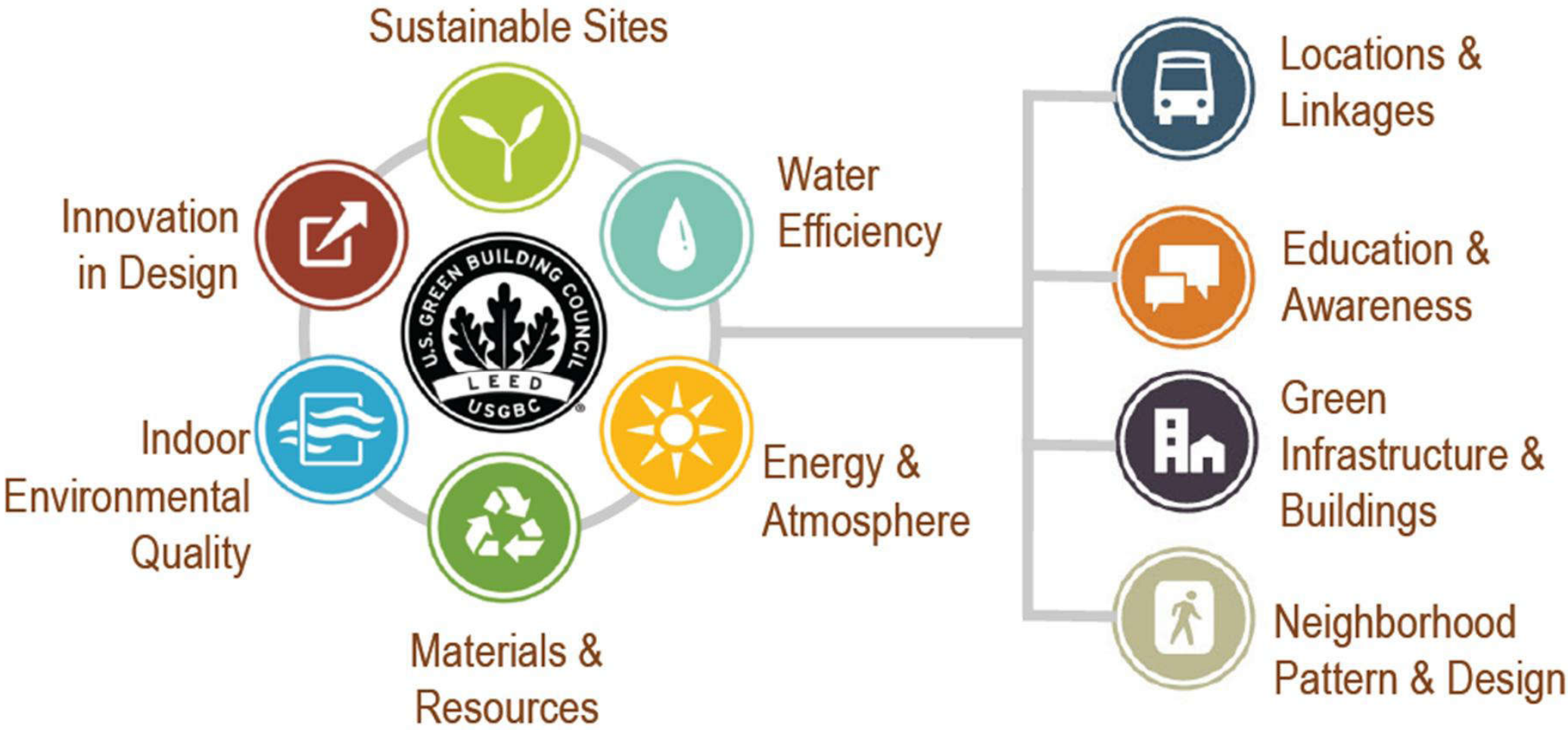
LEED process

- 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 egineer, 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)



(Source: USGBC)

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
Totals:	*8*	*35*	*110*

(Source: USGBC)

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 + 4 RP = 110 points
  - LEED for homes have 125 point scale + 11 ID
  - For LEED v5, 100 based points + 10 Project Priorities = 110 points
- 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
☑ Prerequisite 1	Construction Activity Pollution Prevention	Required
☐ Credit 1	Site Selection	1
☐ Credit 2	Development Density and Community Connectivity	5
☐ Credit 3	Brownfield Redevelopment	1
☐ Credit 4.1	Alternative Transportation—Public Transportation Access	6
☐ Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1
☐ Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3
☐ Credit 4.4	Alternative Transportation—Parking Capacity	2
☐ Credit 5.1	Site Development—Protect or Restore Habitat	1
☐ Credit 5.2	Site Development—Maximize Open Space	1
☐ Credit 6.1	Stormwater Design—Quantity Control	1
☐ Credit 6.2	Stormwater Design—Quality Control	1
☐ Credit 7.1	Heat Island Effect—Nonroof	1
☐ Credit 7.2	Heat Island Effect—Roof	1
☐ Credit 8	Light Pollution Reduction	1

Water Efficiency		10 Possible Points
☑ Prerequisite 1	Water Use Reduction	Required
☐ Credit 1	Water Efficient Landscaping	2-4
☐ Credit 2	Innovative Wastewater Technologies	2
☐ Credit 3	Water Use Reduction	2-4

(Source: USGBC)

LEED 2009 New Construction Checklist (cont'd)

Energy and Atmosphere		35 Possible Points
☑ Prerequisite 1	Fundamental Commissioning of Building Energy Systems	Required
☑ Prerequisite 2	Minimum Energy Performance	Required
☑ Prerequisite 3	Fundamental Refrigerant Management	Required
☐ Credit 1	Optimize Energy Performance	1–19
☐ Credit 2	On-site Renewable Energy	1–7
☐ Credit 3	Enhanced Commissioning	2
☐ Credit 4	Enhanced Refrigerant Management	2
☐ Credit 5	Measurement and Verification	3
☐ Credit 6	Green Power	2

Materials and Resources		14 Possible Points
☑ Prerequisite 1	Storage and Collection of Recyclables	Required
☐ Credit 1.1	Building Reuse—Maintain Existing Walls, Floors and Roof	1-3
☐ Credit 1.2	Building Reuse—Maintain Existing Interior Nonstructural Elements	1
☐ Credit 2	Construction Waste Management	1-2
☐ Credit 3	Materials Reuse	1-2
☐ Credit 4	Recycled Content	1-2
☐ Credit 5	Regional Materials	1-2
☐ Credit 6	Rapidly Renewable Materials	1
☐ Credit 7	Certified Wood	1

(Source: USGBC)

LEED 2009 New Construction Checklist (cont'd)

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

(Source: USGBC)

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

Project Checklist

LEED v4 BD+C (NC) scorecard

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

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

(Source: USGBC)

LEED v5 BD+C (NC) scorecard [Credit Category View]

LEED v5 Building Design + Construction: New Construction

Integrative Process, Planning & Assessments		1
Prereq	Climate Resilience Assessment	Required
Prereq	Social Equity Assessment	Required
Prereq	Carbon Assessment	Required
Credit	Integrative Design Process	1

Location & Transportation		15
Credit	Sensitive Land Protection	1
Credit	Equitable Development	2
Credit	Compact and Connected Development	6
Credit	Active Travel Facilities	2
Credit	Transportation Demand Management	2
Credit	Electric Vehicles	2

Sustainable Sites		11
Prereq	Minimized Site Disturbance	Required
Prereq	Resilient Site Design	Required
Credit	Protect and Restore Biodiverse Habitat	2
Credit	Accessible Open Space	1
Credit	Rainwater Management	3
Credit	Enhanced Resilient Site Design	2
Credit	Heat Island Reduction	2
Credit	Light Pollution and Bird Collision Reduction	1

Water Efficiency		9
Prereq	Water Metering and Reporting	Required
Prereq	Minimum Water Efficiency	Required
Credit	Enhanced Water Efficiency	6
Credit	Water Reuse	2
Credit	Water Metering and Leak Detection	1

Energy & Atmosphere		33
Prereq	Operational Carbon Projection and Decarbonization Plan	Required
Prereq	Minimum Energy Efficiency	Required
Prereq	Fundamental Commissioning	Required
Prereq	Energy Metering and Reporting	Required
Prereq	Fundamental Refrigerant Management	Required
Credit	Electrification	5
Credit	Reduce Peak Thermal Loads	5
Credit	Enhanced Energy Efficiency	10
Credit	Renewable Energy	5
Credit	Enhanced and Ongoing Commissioning	4
Credit	Grid Interactive	2
Credit	Enhanced Refrigerant Management	2

Materials & Resources		18
Prereq	Planning for Zero Waste Operations	Required
Prereq	Assess Embodied Carbon	Required
Credit	Building and Materials Reuse	3
Credit	Reduce Embodied Carbon	6
Credit	Low Emitting Materials	2
Credit	Optimized Building Products	5
Credit	Construction and Demolition Waste Diversion	2

Indoor Environmental Quality		13
Prereq	Fundamental Air Quality	Required
Prereq	No Smoking or Vehicle Idling	Required
Prereq	Building Accessibility	Required
Credit	Enhanced Air Quality	1
Credit	Occupant Experience	6
Credit	Connecting with Nature	1
Credit	Enhanced Building Accessibility	1
Credit	Resilient Spaces	2
Credit	Air Quality Testing and Monitoring	2

Project Priorities & Innovation		10
Credit	Project Priorities	9
Credit	LEED Accredited Professional	1

Total	Possible Points:	110

(Source: https://www.usgbc.org/resources/leed-v5-project-scorecards)

LEED v5 BD+C (NC) scorecard [Impact Area View]

Decarbonization

Decarbonization		New Construction
IP Prereq	Carbon Assessment	Required
IP Credit	Integrative Design Process	1
LT Credit	Compact and Connected Development	6
LT Credit	Transportation Demand Management	4
LT Credit	Electric Vehicles	2
SS Credit	Heat Island Reduction	2
WE Prereq	Minimum Water Efficiency	Required
WE Credit	Water Metering and Leak Detection	1
WE Credit	Enhanced Water Efficiency	8
EA Prereq	Operational Carbon Projection and Decarbonization Plan	Required
EA Prereq	Minimum Energy Efficiency	Required
EA Prereq	Fundamental Commissioning	Required
EA Prereq	Energy Metering and Reporting	Required
EA Prereq	Fundamental Refrigerant Management	Required
EA Credit	Electrification	5
EA Credit	Reduce Peak Thermal Loads	5
EA Credit	Enhanced Energy Efficiency	10
EA Credit	Renewable Energy	5
EA Credit	Enhanced Commissioning	4
EA Credit	Grid Interactive	2
EA Credit	Enhanced Refrigerant Management	2
MR Prereq	Planning for Zero Waste Operations	Required
MR Prereq	Quantify and Assess Embodied Carbon	Required
MR Credit	Building and Materials Reuse	3
MR Credit	Reduce Embodied Carbon	6
MR Credit	Building Product Selection and Procurement	5
MR Credit	Construction and Demolition Waste Diversion	2

Quality of Life

Quality of Life		New Construction
IP Prereq	Climate Resilience Assessment	Required
IP Prereq	Human Impact Assessment	Required
IP Credit	Integrative Design Process	1
LT Credit	Equitable Development	2
LT Credit	Compact and Connected Development	6
LT Credit	Transportation Demand Management	4
SS Credit	Accessible Outdoor Space	1
SS Credit	Enhanced Resilient Site Design	2
SS Credit	Heat Island Reduction	2
WE Credit	Water Metering and Leak Detection	1
MR Credit	Low Emitting Materials	2
MR Credit	Building Product Selection and Procurement	5
EQ Prereq	Construction Management	Required
EQ Prereq	Fundamental Air Quality	Required
EQ Prereq	No Smoking or Vehicle Idling	Required
EQ Credit	Enhanced Air Quality	1
EQ Credit	Occupant Experience	7
EQ Credit	Accessibility and Inclusion	1
EQ Credit	Resilient Spaces	2
EQ Credit	Air Quality Testing and Monitoring	2

Ecosystem Conservation & Restoration

Ecosystem Conservation and Restoration		New Construction
IP Credit	Integrative Design Process	1
LT Credit	Sensitive Land Protection	1
LT Credit	Compact and Connected Development	6
SS Prereq	Minimized Site Disturbance	Required
SS Credit	Biodiverse Habitat	2
SS Credit	Accessible Outdoor Space	1
SS Credit	Rainwater Management	3
SS Credit	Enhanced Resilient Site Design	2
SS Credit	Heat Island Reduction	2
SS Credit	Light Pollution Reduction	1
WE Prereq	Water Metering and Reporting	Required
WE Prereq	Minimum Water Efficiency	Required
WE Credit	Water Metering and Leak Detection	1
WE Credit	Enhanced Water Efficiency	8
MR Prereq	Planning for Zero Waste Operations	Required
MR Credit	Building and Materials Reuse	3
MR Credit	Building Product Selection and Procurement	5
MR Credit	Construction and Demolition Waste Diversior	2
EQ Prereq	No Smoking or Vehicle Idling	Required

(Source: https://www.usgbc.org/resources/leed-v5-project-scorecards)

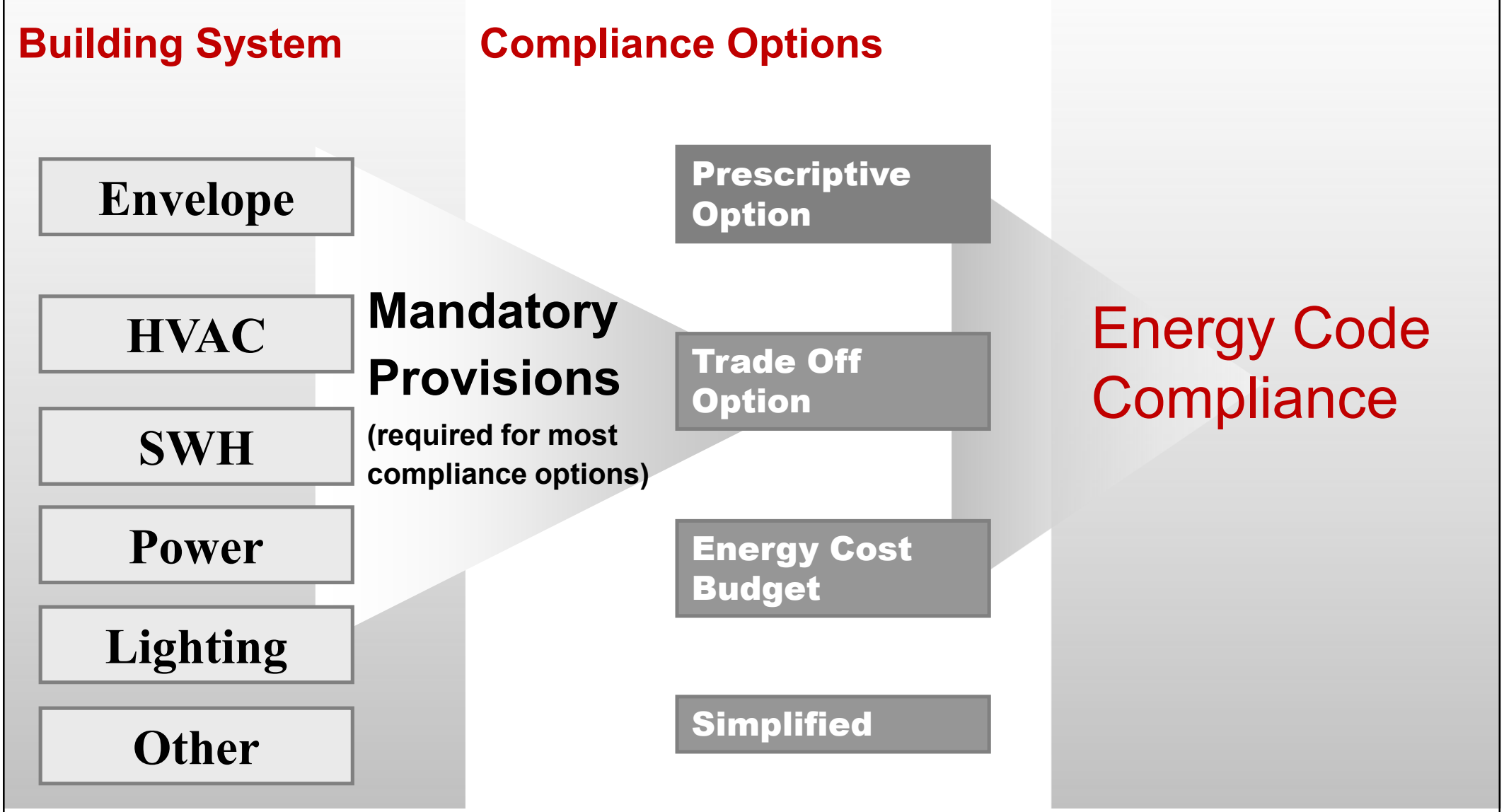
LEED process

- 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



(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]

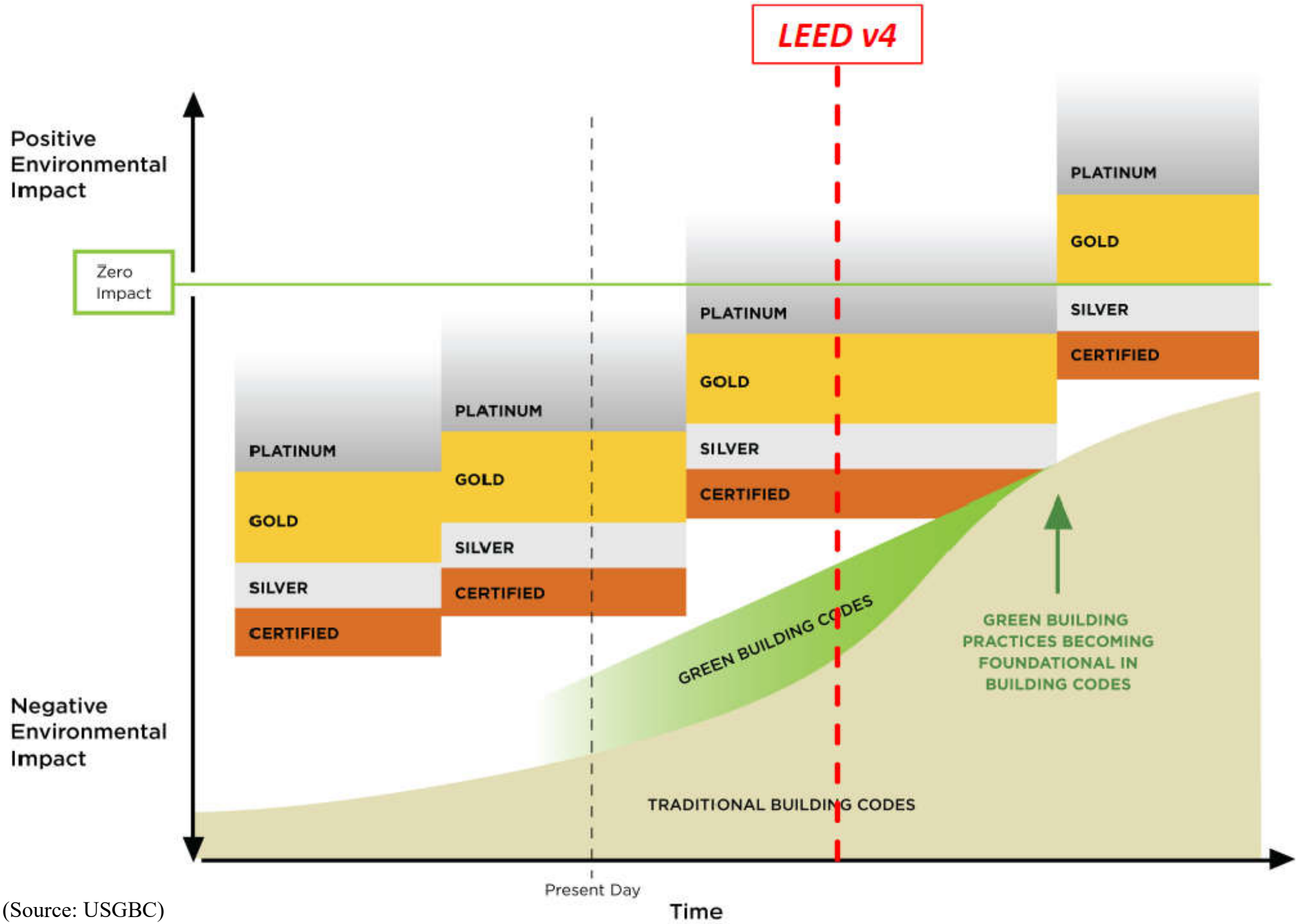
EAc1: Optimize energy performance (Up to 19 points)

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 2009 vs. LEED v4

Category	LEED 2009	%	Category	LEED v4	%
N/A	0	0%	Integrative Design NEW	1	1%
Sustainable Sites	26	24%	Location & Transport NEW	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 Quali	16	15%
Innovation	6	5%	Innovation	6	5%
Regional Priority	4	4%	Regional Priority	4	4%
Total	110			110	

(Source: Sustainable Solutions Corporation)

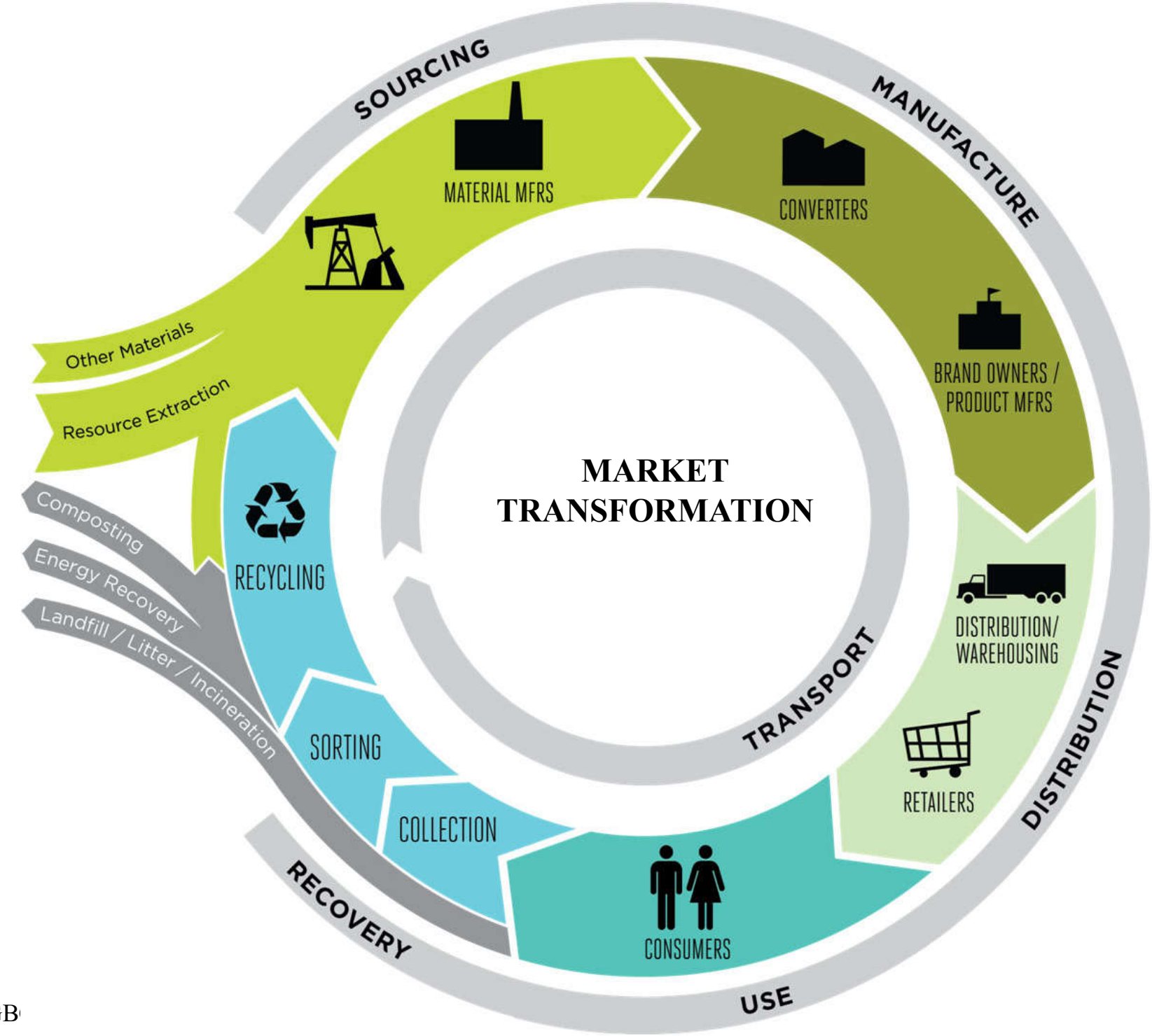
LEED v4

- 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 
  - 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



(Source: USGB

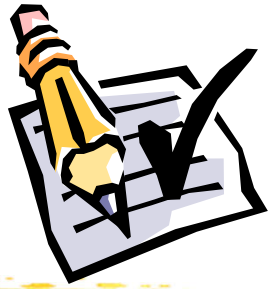
LEED v4

- 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

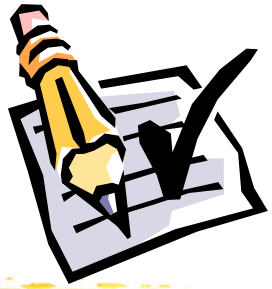
- Energy and Atmosphere
  - New prerequisites:
    - Building-level energy metering
  - New credits:
    - Advanced energy metering (1 pt)
    - Demand response (2 pts)
- Indoor Environmental Quality
  - New credit:
    - Acoustic performance (1 pt)

Key factors to consider



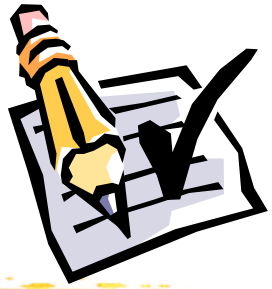
- Passive design
  - Taking advantage of the sun and wind
- Regenerative Projects
  - Support the health, generate electricity and send back to the grid. Its goal to achieve “net zero”
- The triple bottom line
  - People (Social)
  - Planet (Environmental)
  - Profit (Economic)

Key factors to consider



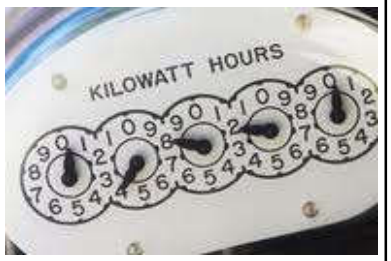
- Sustainable sites
  - Develop only on appropriate sites
  - Provide for non-auto access
  - Preserve open space
  - Manage stormwater
  - Reduce urban heat island effect
  - Reduce light pollution of the night sky

Key factors to consider

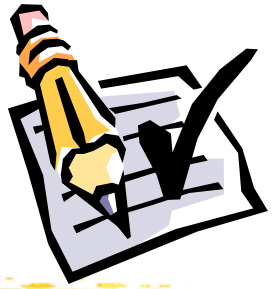


- Water conservation

  - 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

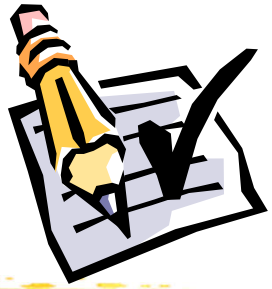


Key factors to consider



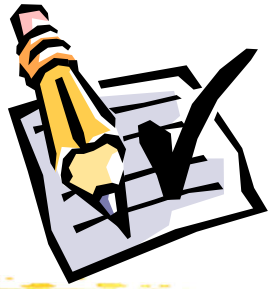
- Materials and resource conservation
  - Provide for recycling
  - Reuse existing buildings
  - Reduce construction waste generation
  - Use salvaged and recycled content materials
  - Source materials regionally
  - Use rapidly renewable (agricultural) materials and certified wood products

Key factors to consider



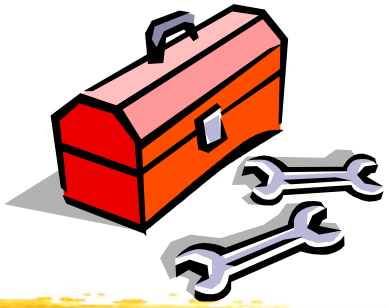
- Indoor environmental quality
  - Improve indoor air quality
  - Increase outside air ventilation
  - Manage air quality during construction
  - Use only nontoxic quality finishes, carpets, and composite wood products
  - Reduce exposure to toxic chemicals during building operations
  - Provide for 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



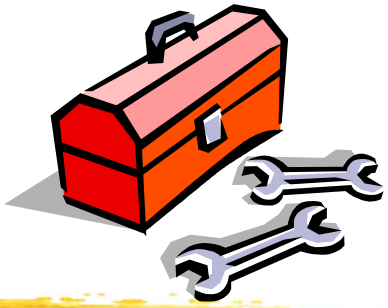
HONG KONG BUILDING ENVIRONMENTAL ASSESSMENT METHOD
香港建築環境評估法

- 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

(Source: https://www.beamsociety.org.hk/)

Hong Kong BEAM



HONG KONG BUILDING ENVIRONMENTAL ASSESSMENT METHOD
香港建築環境評估法

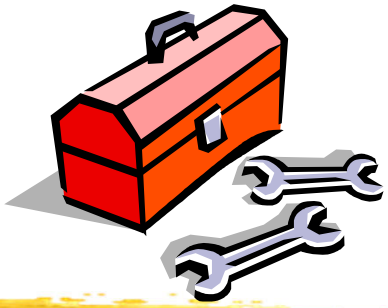
- HK-BEAM
  - Versions 2004:
    - HK-BEAM 4/04 New Buildings
    - HK-BEAM 5/04 Existing Building
  - Approach and criteria
    - Site aspects
    - Materials aspects
    - Energy use
    - Water use
    - Indoor environmental quality (IEQ)
    - Innovation & performance enhancements

BEAM Society
建築環保評估協會

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

(Source: https://www.beamsociety.org.hk/)

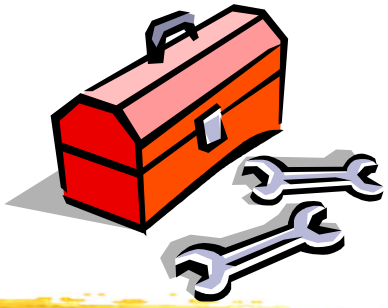
Hong Kong BEAM



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%

Hong Kong BEAM

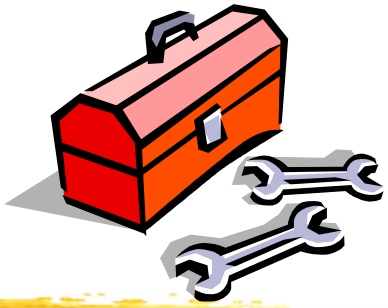


- BEAM Plus development
  - Version 2009: (Nov 2009)
    - BEAM Plus for New Buildings
    - BEAM Plus for Existing Buildings
  - Version 1.1 (Apr 2010)
    - With minor refinements
    - Introduce BEAM Professionals
  - Version 1.2 (Jul 2012)
    - Addresses issues on passive design
    - Minor amendments to other aspects
  - Version 2.0 (Sep 2019)

HKGBC BEAM Plus 綠建環評

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

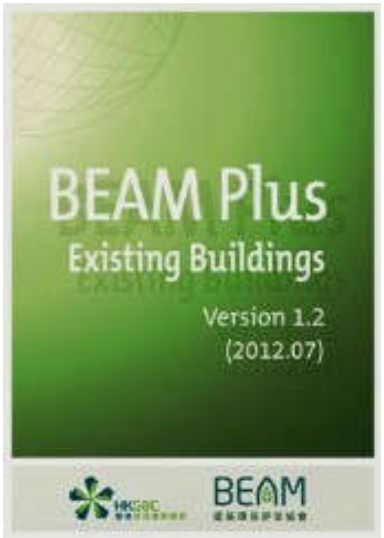
Hong Kong BEAM



- 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

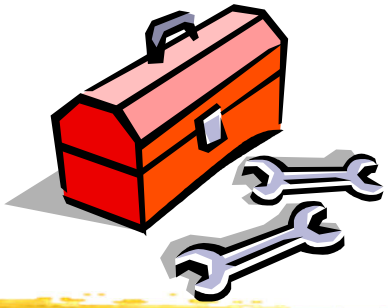
BEAM Plus v1.2 assessment criteria [credits] [weighting]

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]



(Source: https://www.hkgbc.org.hk/)

Hong Kong BEAM



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

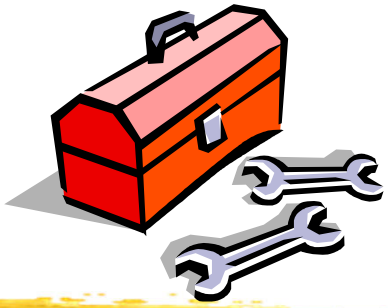
	Overall	Site Aspects	Energy Use	IEQ	Innov. & Addn.	
Platinum	75%	70%	70%	70%	3 credits	Excellent
Gold	65%	60%	60%	60%	2 credits	Very Good
Silver	55%	50%	50%	50%	1 credit	Good
Bronze	40%	40%	40%	40%	---	Above Average

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	

(Source: http://www.hkgbc.org.hk/)

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 CO_2 Emissions
    - Performance-based Building Energy Code or Appendix G of ASHRAE 90.1 (performance rating method)
  - IEQ15 Natural Lighting
    - Average daylight factor >= 2%

Require inputs from engineers or specialist consultant

Total number of BEAM plus registered NB projects (up to 16 Jun 2025)

Project Directory (List View) | Project Directory (Map View) | **NB Registered** | NB Assessed | EB Registered | EB Assessed | EB V2.0 Selective Scheme | BI Registered + Assessed | ND Registered + Assessed

Data as of 16/06/2025

BEAM Plus Project Directory and Statistics

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

Total Registered Projects: 1,850

Select all | NB V1.1 | NB V1.2 | NB V2.0

Figure 1. Project Type Distribution

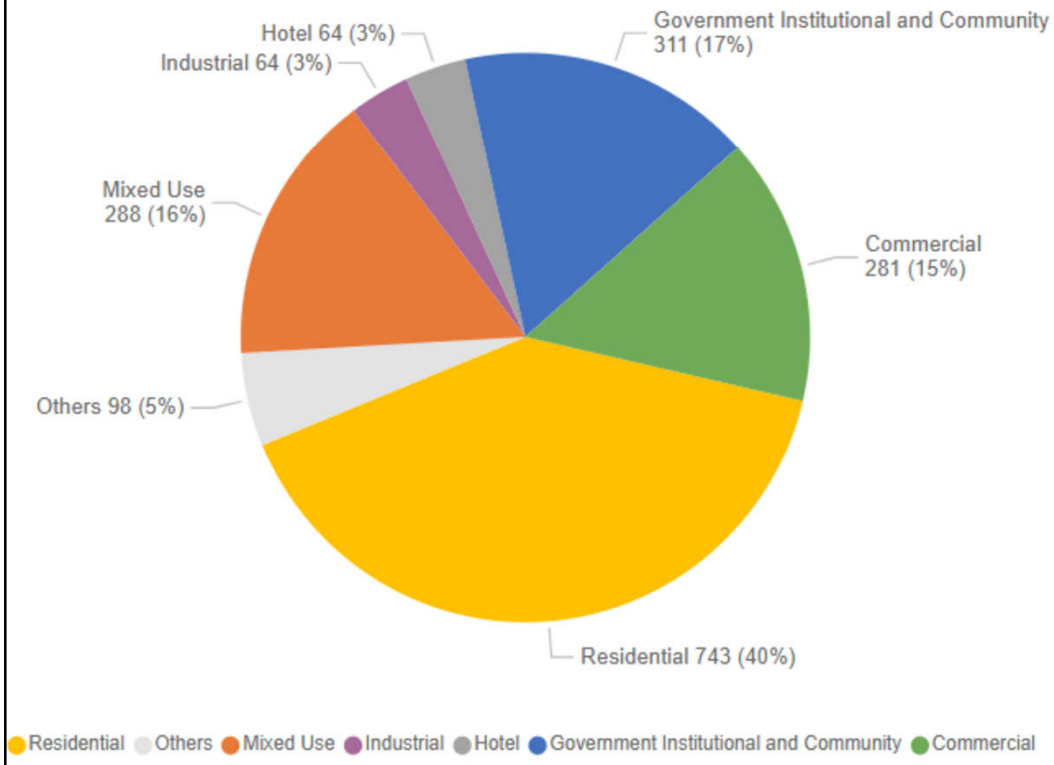
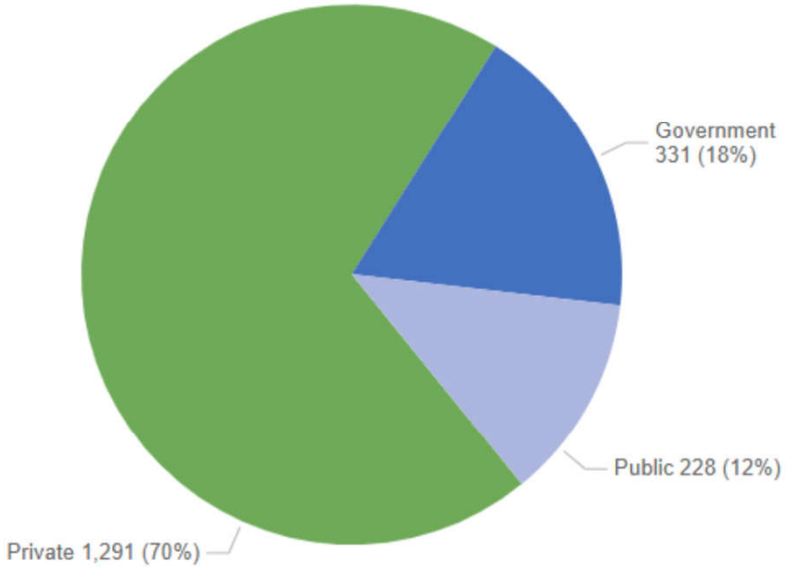


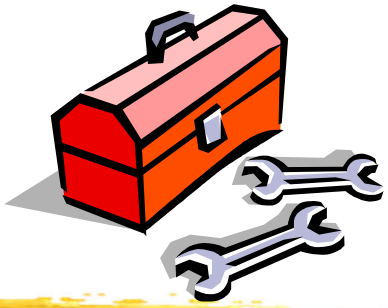
Figure 2. Owners / Developers Distribution



Public : Statutory / Subvented, NGO, Charitable Organisations
Government : e.g. ArchSD, Housing Department, etc.
Private : Company with Business Registration

(Source: https://www.beamsociety.org.hk/)

Hong Kong BEAM

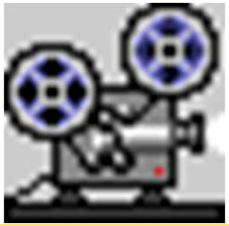


- Uptake of BEAM Plus in Hong Kong:
  - New government buildings with floor area > 10,000 m^2 will aim to obtain the second highest grade or above under BEAM Plus or LEED
  - Buildings Department has included BEAM Plus on the Practice Notes on the wholesale conversion of industrial buildings, permitting 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

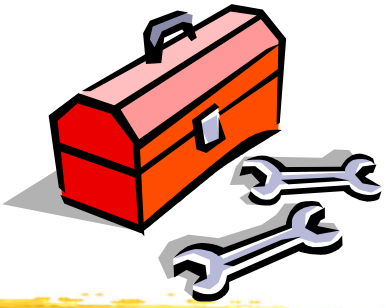
(Source: HKGBC)

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

Hong Kong BEAM



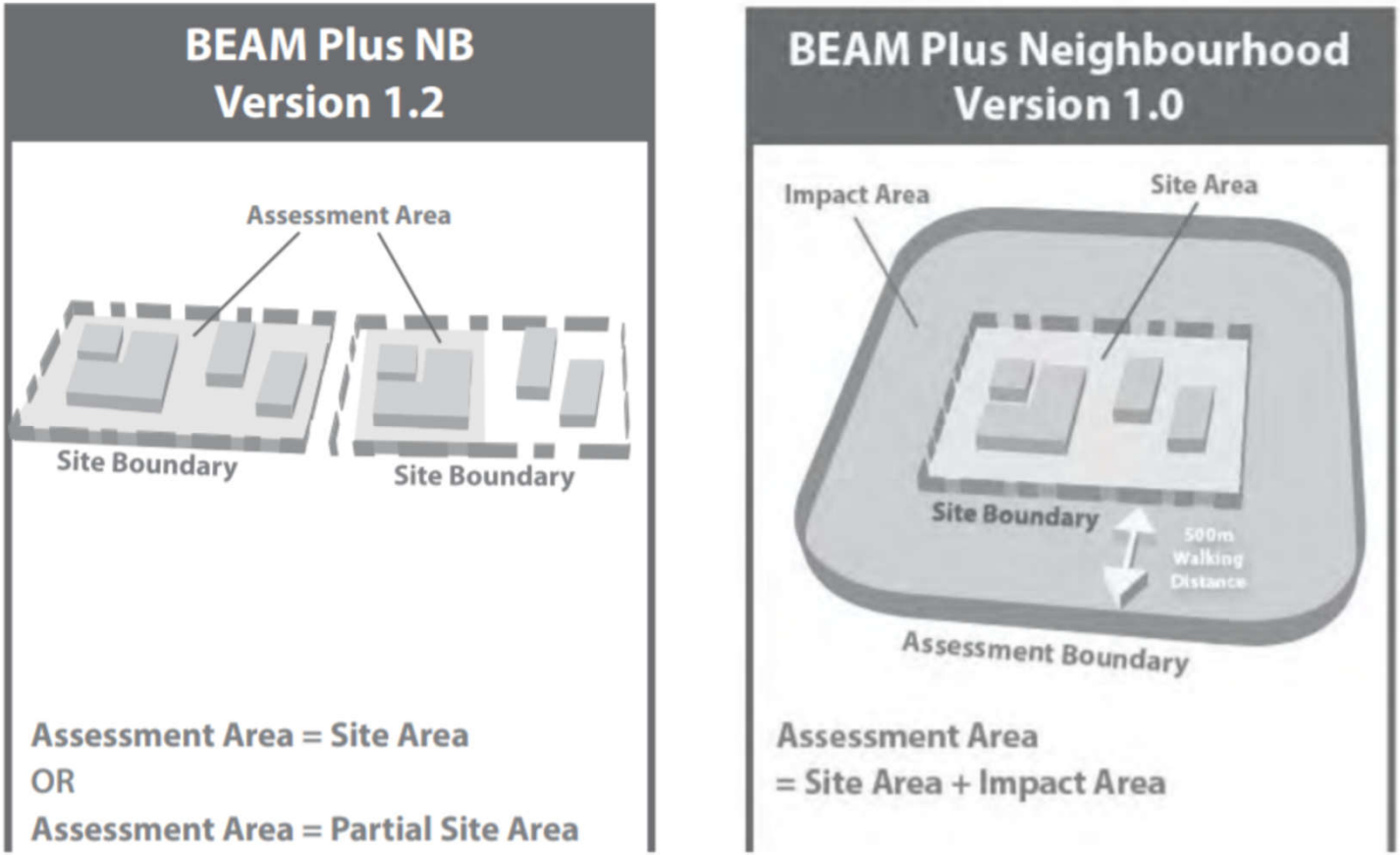
- The BEAM Plus Family
  - https://www.hkgbc.org.hk/eng/beam-plus/introduction/

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

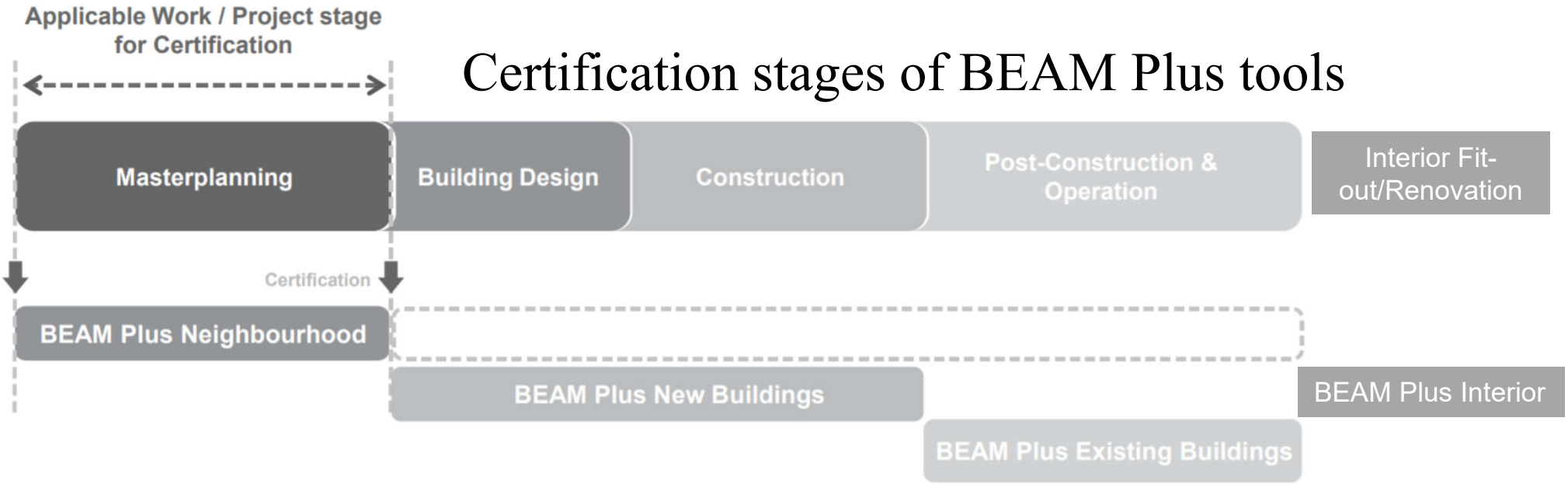
  - Existing Buildings (EB): Operation and maintenance performance of existing buildings (+ Global version)

  - Interiors (BI): Fit-out works (residential/non-residential)

  - Neighbourhood (ND): Masterplanning stage of building development projects
  - Data centres and existing schools



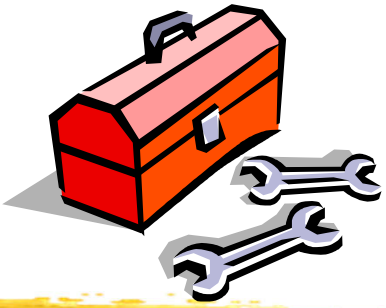
Comparison of assessment area of BEAM Plus NB and BEAM Plus Neighbourhood



Certification stages of BEAM Plus tools

(Source: https://www.beamsociety.org.hk/files/download/download-20190118113731.pdf)

Hong Kong BEAM



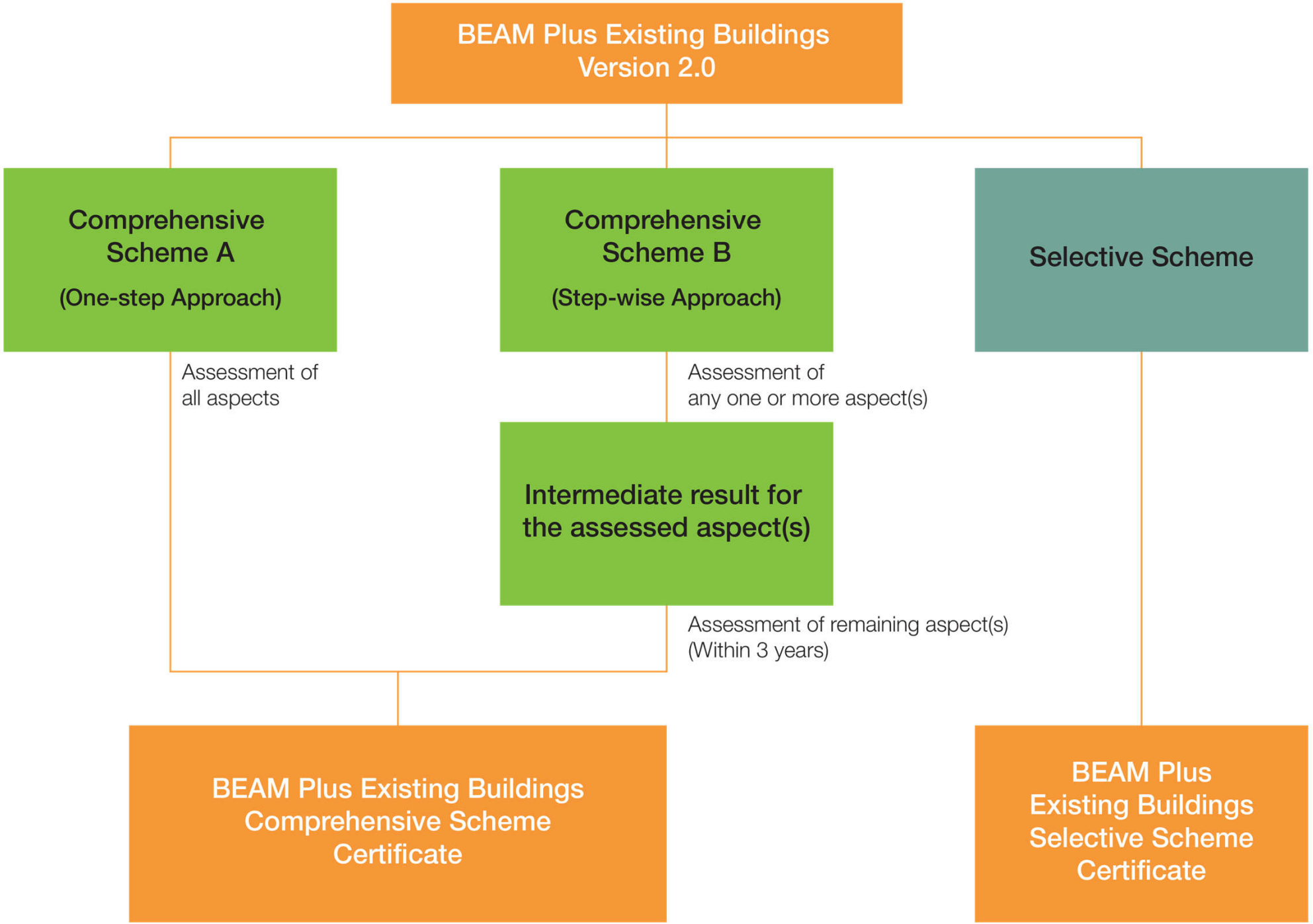
- BEAM Plus New Buildings v2.0 (05.2021)
  - More human centric & integrated design; more adaptable, certain & practicable
  - Credit performance categories:
    - Integrated Design & Construction Mgt. (IDCM) - 18%
    - Sustainable Sites (SS) - 15%
    - Materials & Waste (MW) - 9%
    - Energy Use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

(See also: https://www.hkgbc.org.hk/eng/beam-plus/beam-plus-new-buildings/)

Credit performance categories in BEAM Plus New Buildings v2.0

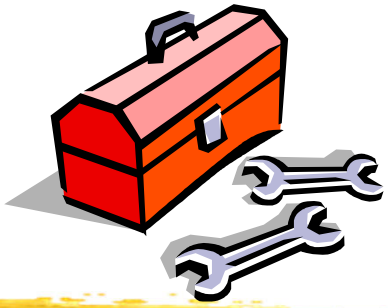
(Source: https://www.scmp.com/presented/lifestyle/topics/building-our-green-future/article/3040222/how-hong-kong-drives-strong)

BEAM Plus Existing Buildings v.2 (2016)



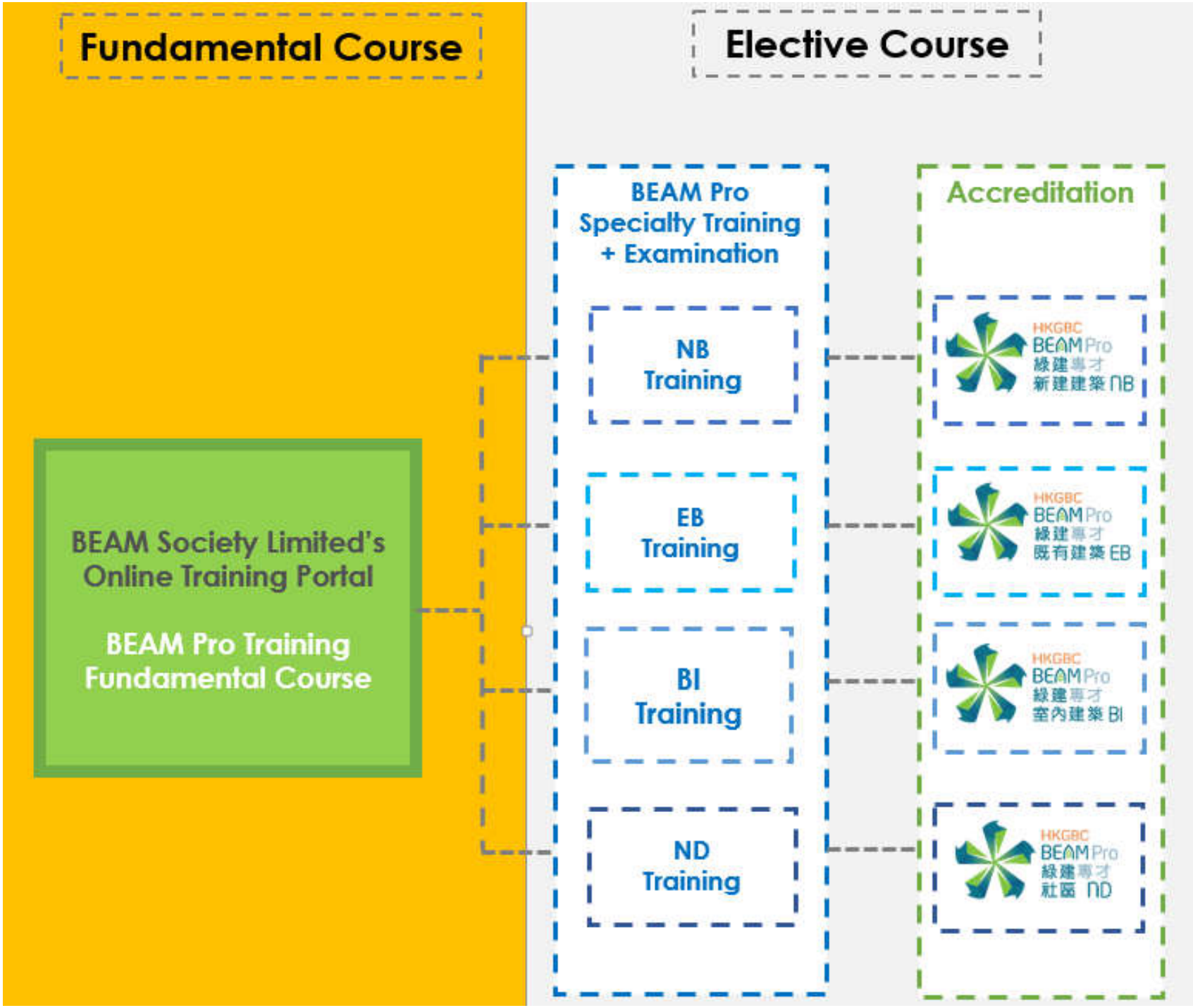
(Source: https://www.hkgbc.org.hk/eng/beam-plus/beam-plus-existing-buildings/new-options-under-eb/)

Hong Kong BEAM



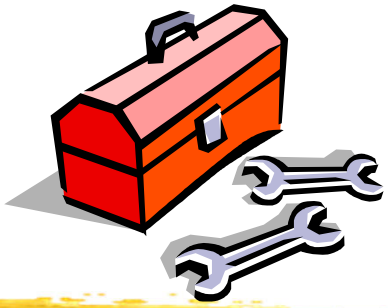
- BEAM Professionals (BEAM Pro)
  - Accredited by HK Green Building Council (HKGBC)
  - Facilitate BEAM Plus submission
- BEAM Assessors (BAS)
  - Undertake the building assessment on behalf of HKGBC
- Green Building Faculty
  - Experienced professionals to drive BEAM Plus & BEAM Professionals development and training
- BEAM Affiliate (BA)
  - Sub-professionals to support green building design, construction and operations

BEAM Professional training and examination



(Source: https://www.beamsociety.org.hk/en_professionals_1.php)

Hong Kong BEAM

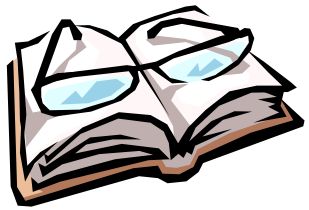


- iBEAM (Assessment Automation System)
  - Automate the assessment process ONLINE
  - Retrieve technical standards pertaining to the development of sustainable built environment
  - Project Dashboard & Credit Summary Dashboard
  - e-Forms, Credit Interpretation Request (CIR)
  - https://ibeam.hk

Beyond GREEN with iBEAM

(See also: https://www.beamsociety.org.hk/en_ibeam.php)

Further Reading



- LEED rating system
  - https://www.usgbc.org/leed
- 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