MEBS6020 Sustainable Building Design

http://ibse.hk/MEBS6020/

Green Building Assessment (II)

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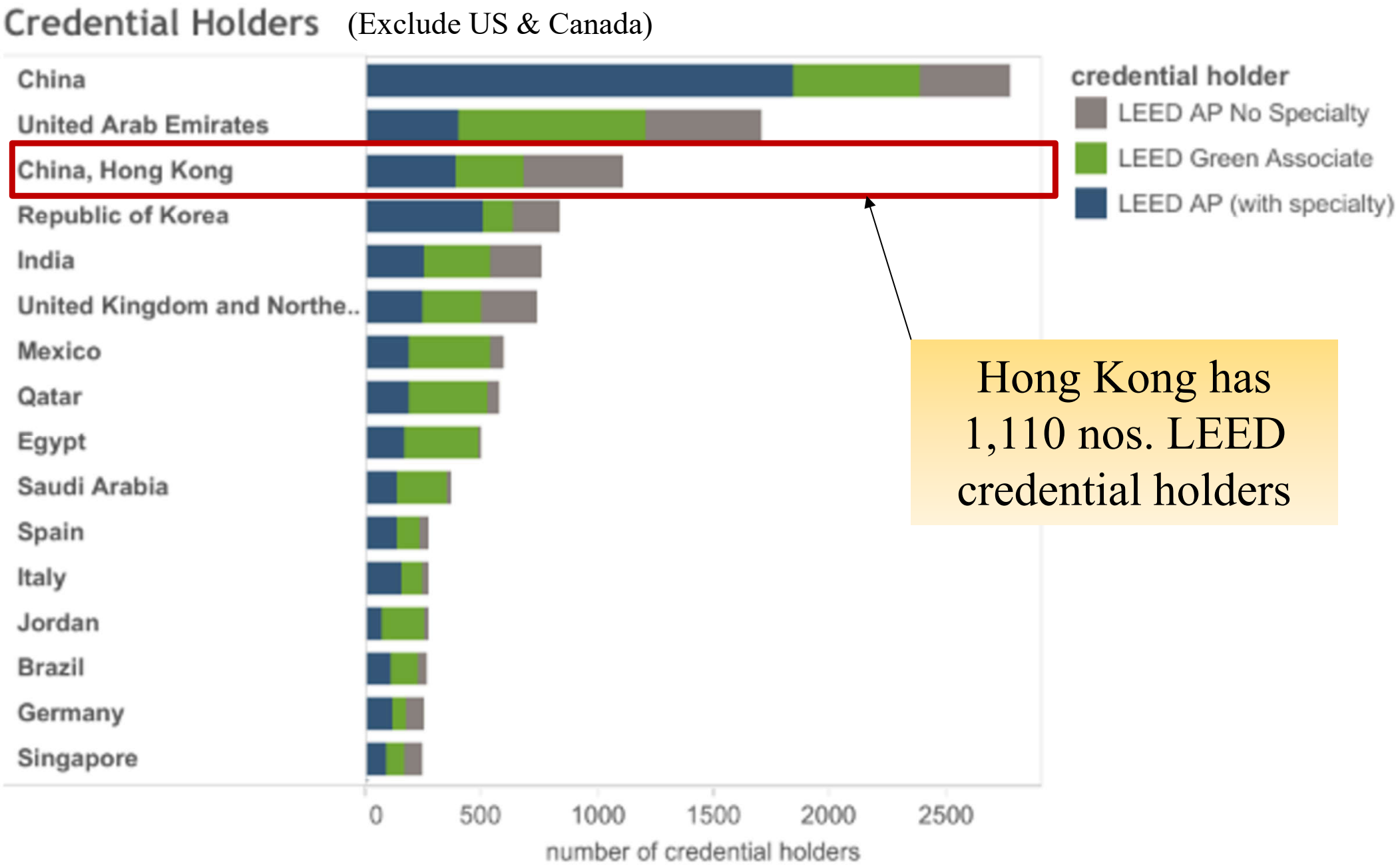
HKGBC
BEAM Plus
綠建環評

Top 10 Countries and Regions for LEED in 2022

Rank	Country	Project Count	Certified Square Feet	Certified Square Meters
1	Mainland China	1,121	180,347,421.08	16,754,839.89
2	India	323	112,717,100.08	10,471,771.39
3	Canada	248	57,499,943.21	5,341,924.69
4	Brazil	108	25,863,895.93	2,402,836.88
5	Sweden	52	24,419,164.67	2,268,616.83
6	Republic of Korea	83	23,563,512.84	2,189,124.09
7	Mexico	92	18,427,638.40	1,711,985.28
8	Spain	99	16,851,697.75	1,565,575.47
9	Italy	96	14,469,150.48	1,344,229.37
10	Philippines	24	11,456,313.70	1,064,327.40

(Source: https://www.usgbc.org/articles/top-10-countries-leed-demonstrate-green-building-truly-global-movement)

LEED professionals at a glance (2019)



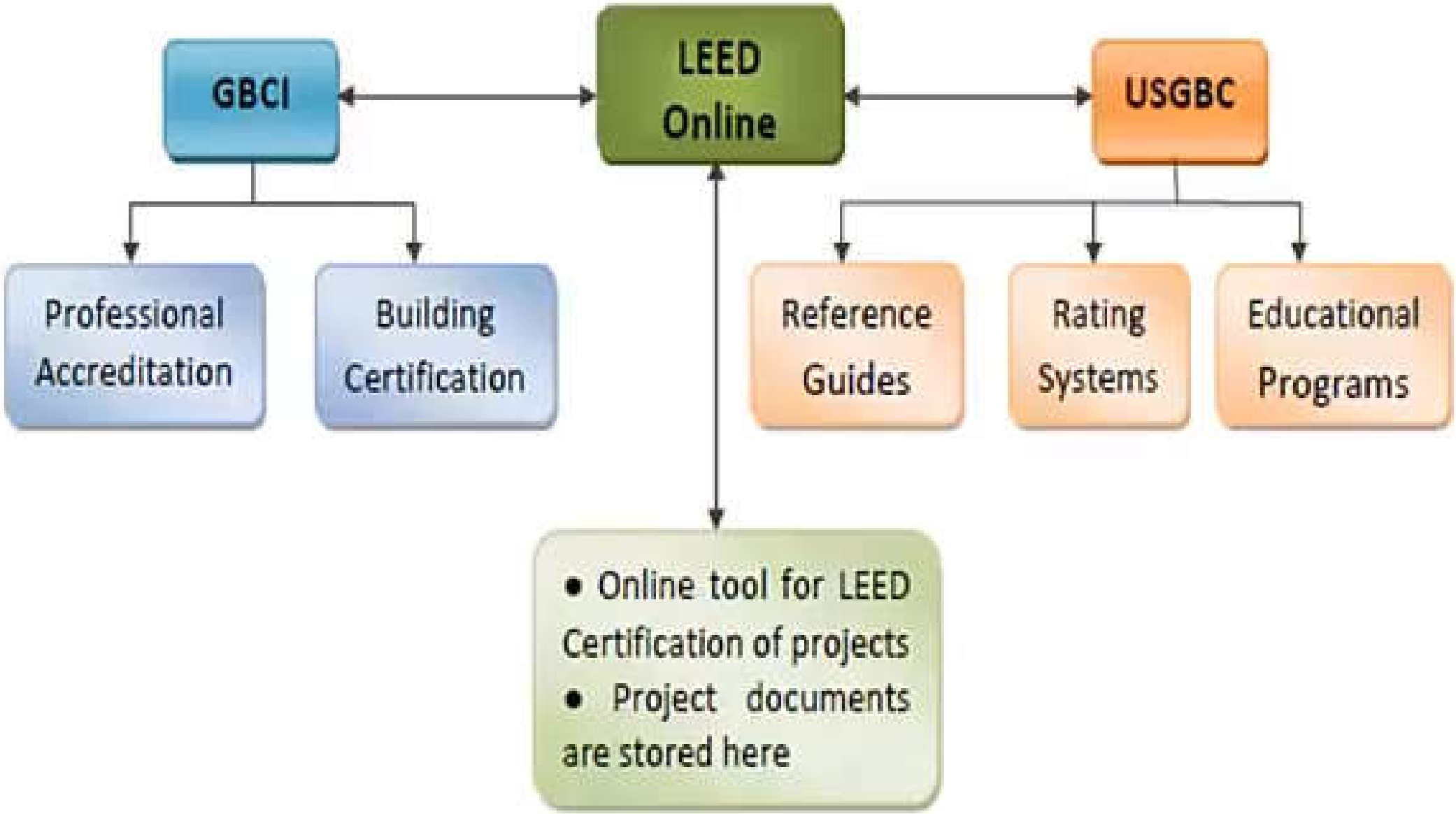
Remark: Number of credential holders in the world = 202,682; in US & Canada = 185,514

(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

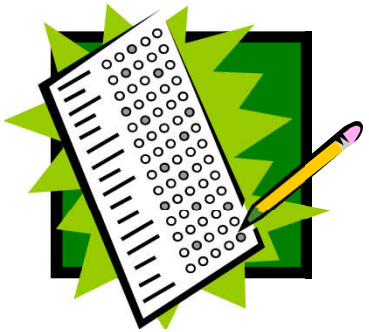
Do You Have Work Experience On a LEED Project?

NO

YES

Use Tier I GREEN ASSOCIATE Credential To Gain Experience

YES

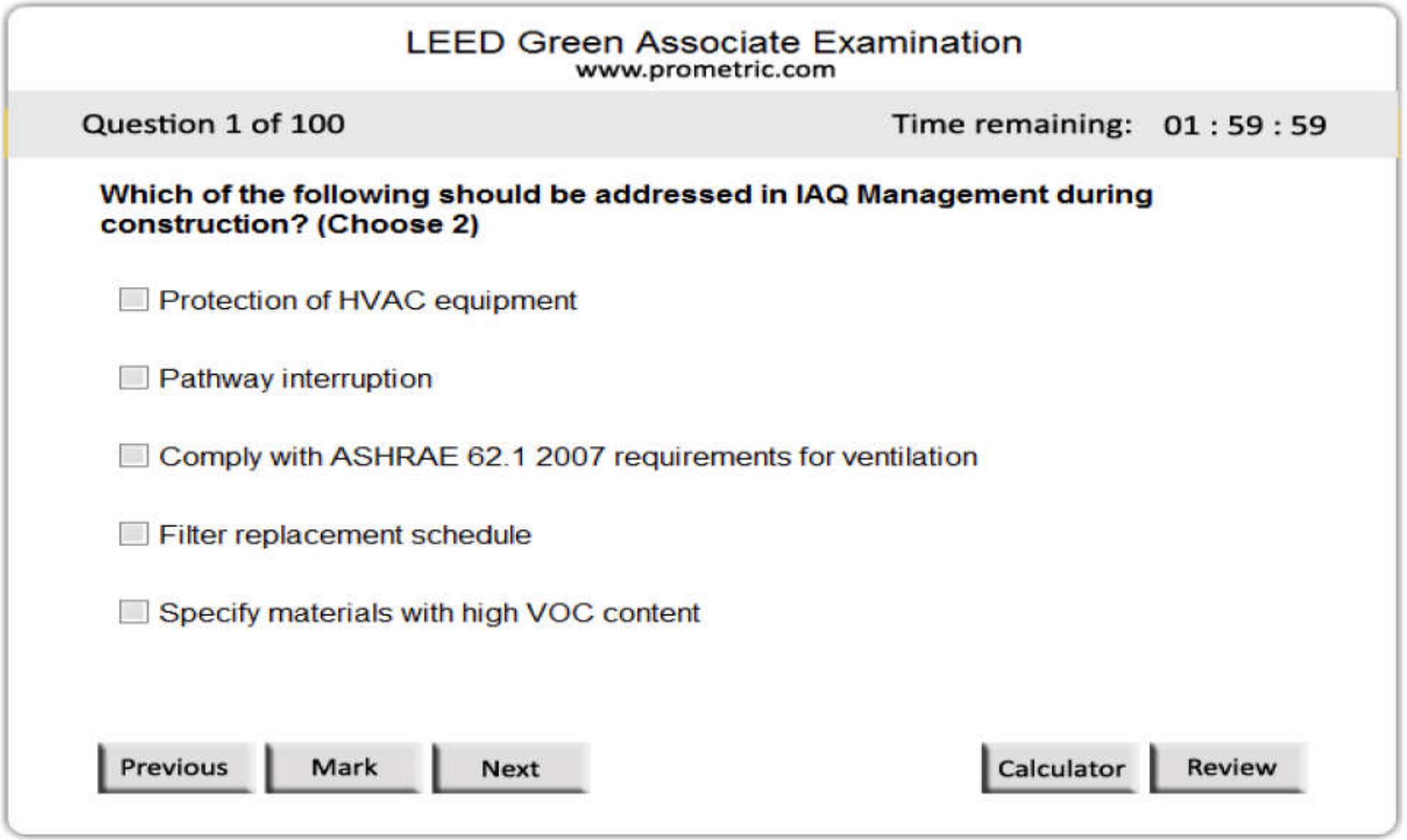


Choose Your Specialization

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

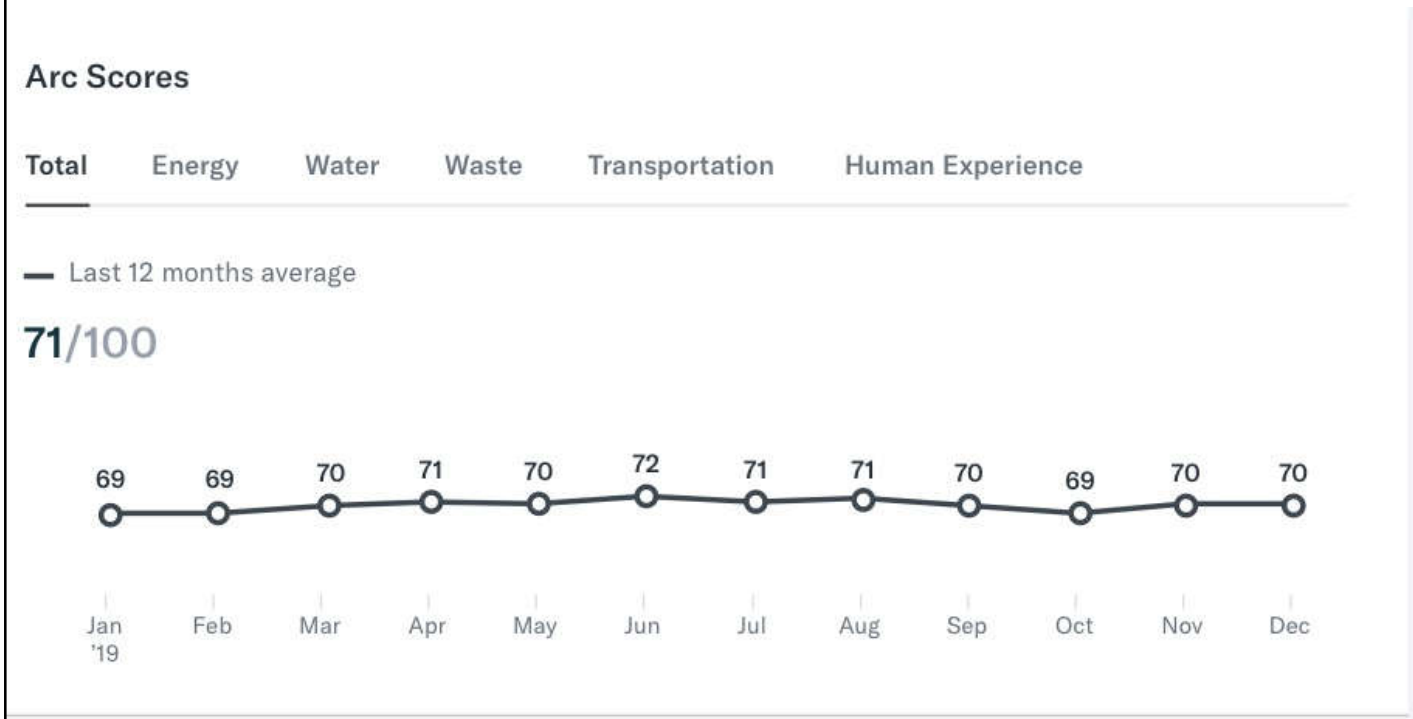
- Maintaining LEED credential
  - Continuing education (CE) required on a 2-year cycle (beginning on the exam date)
  - LEED GA: 15 CE hours biennially (3 must be LEED specific hours)
  - LEED AP: 30 CE hours biennially (6 must be LEED specific hours) as well as additional hours for additional specialties

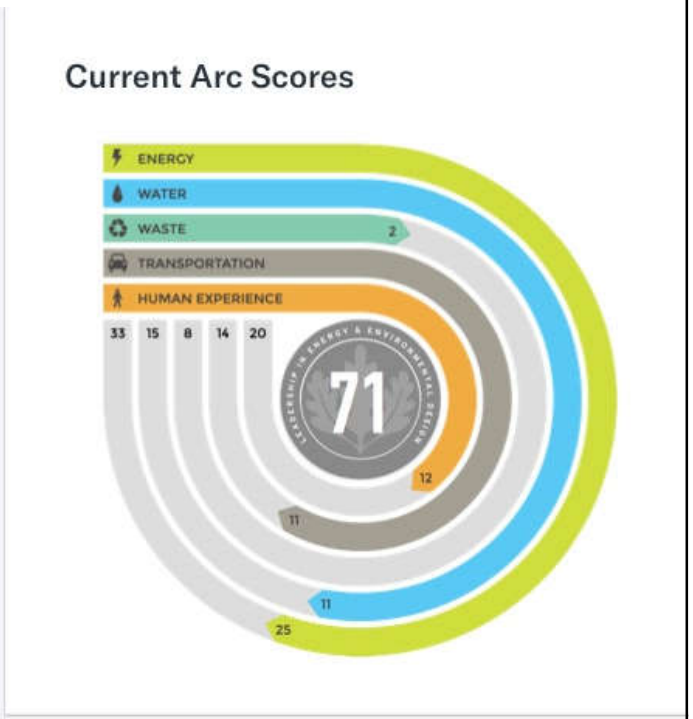
LEED certification

- 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

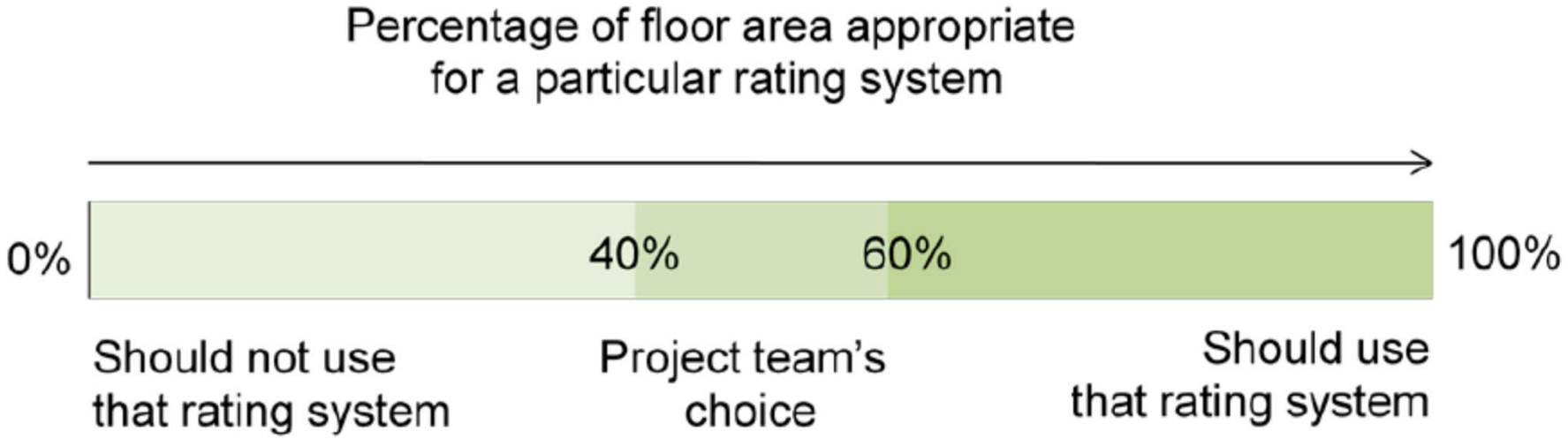
LEED process

- 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)



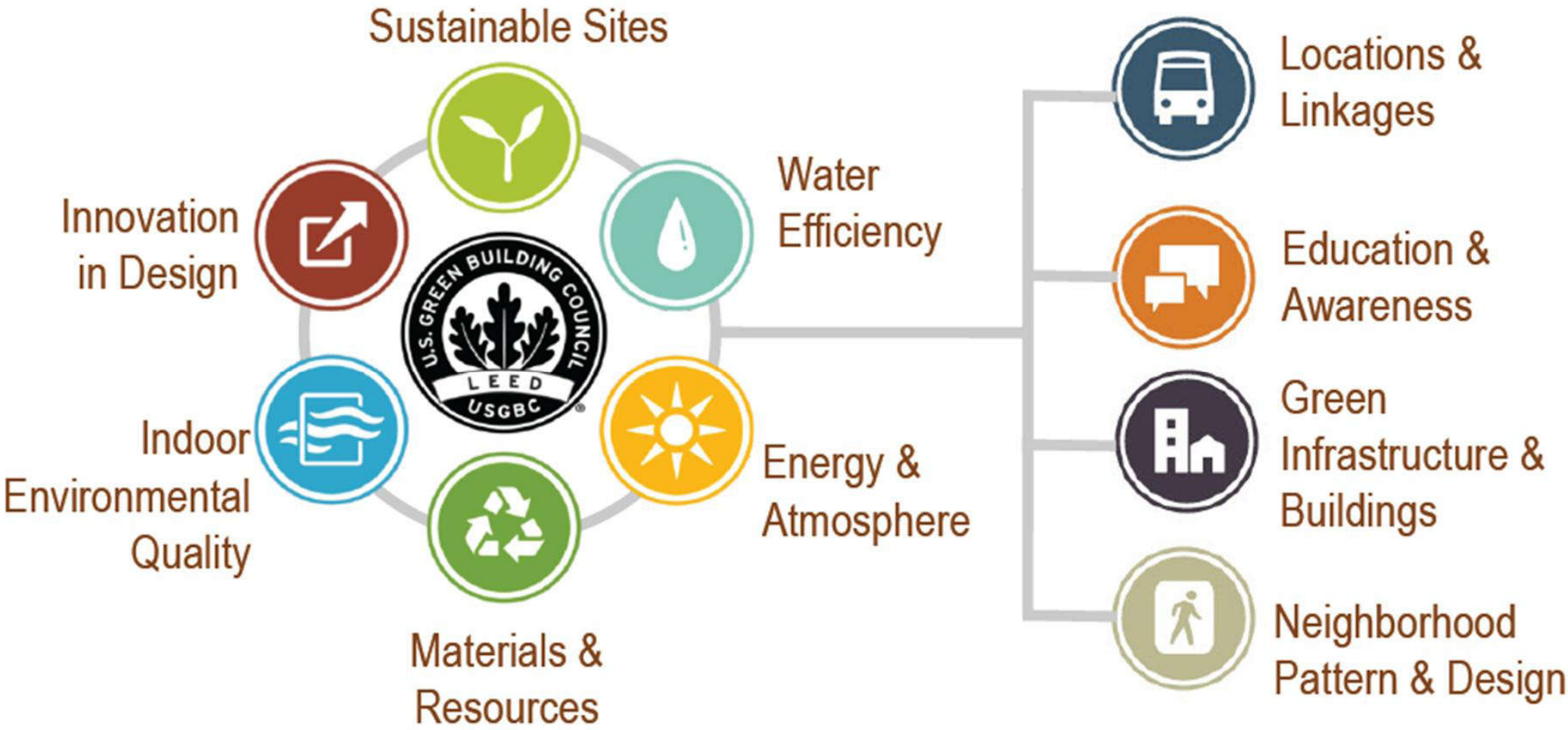
LEED process

- 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

- 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)

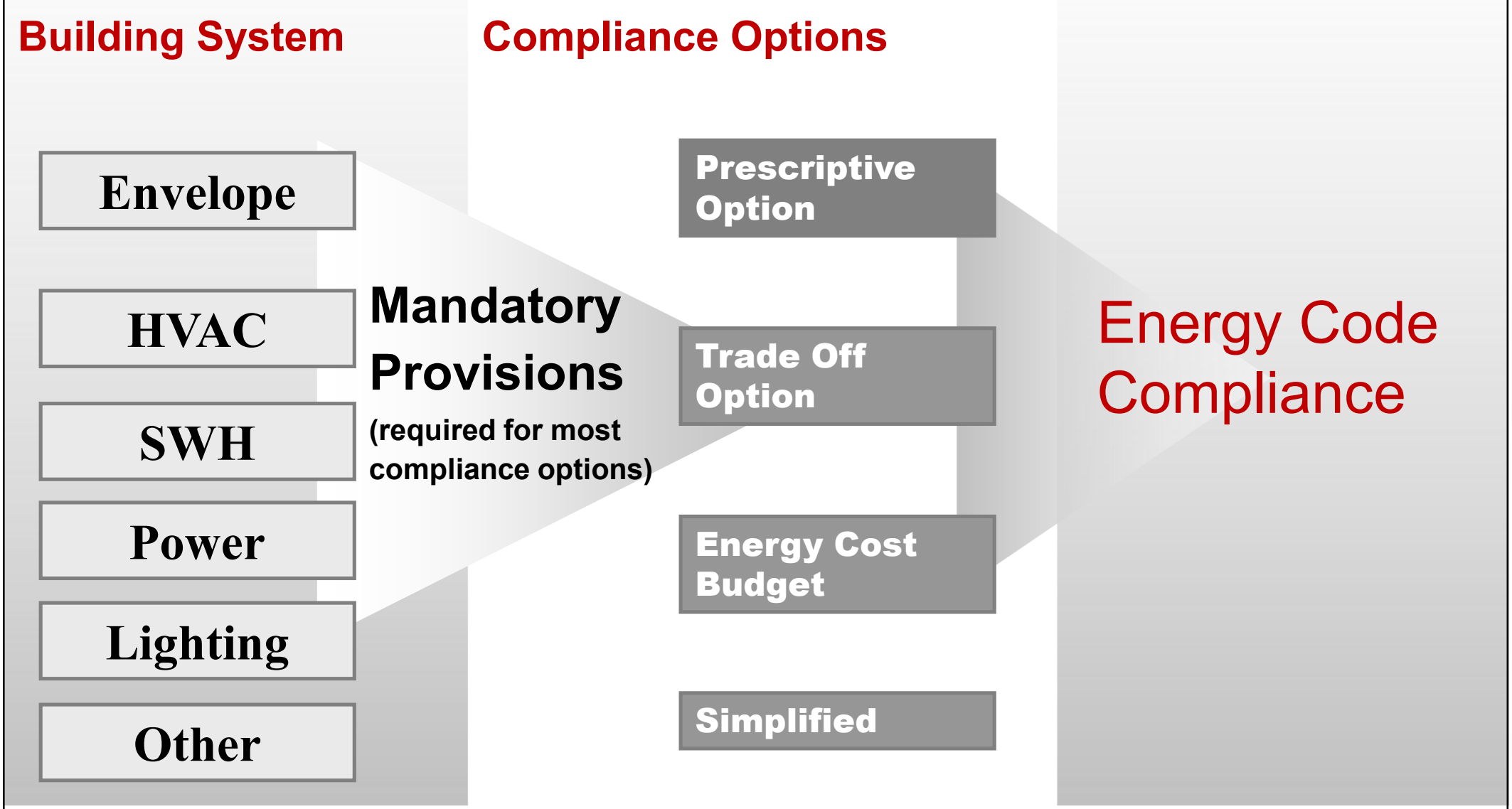
LEED process

- 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]

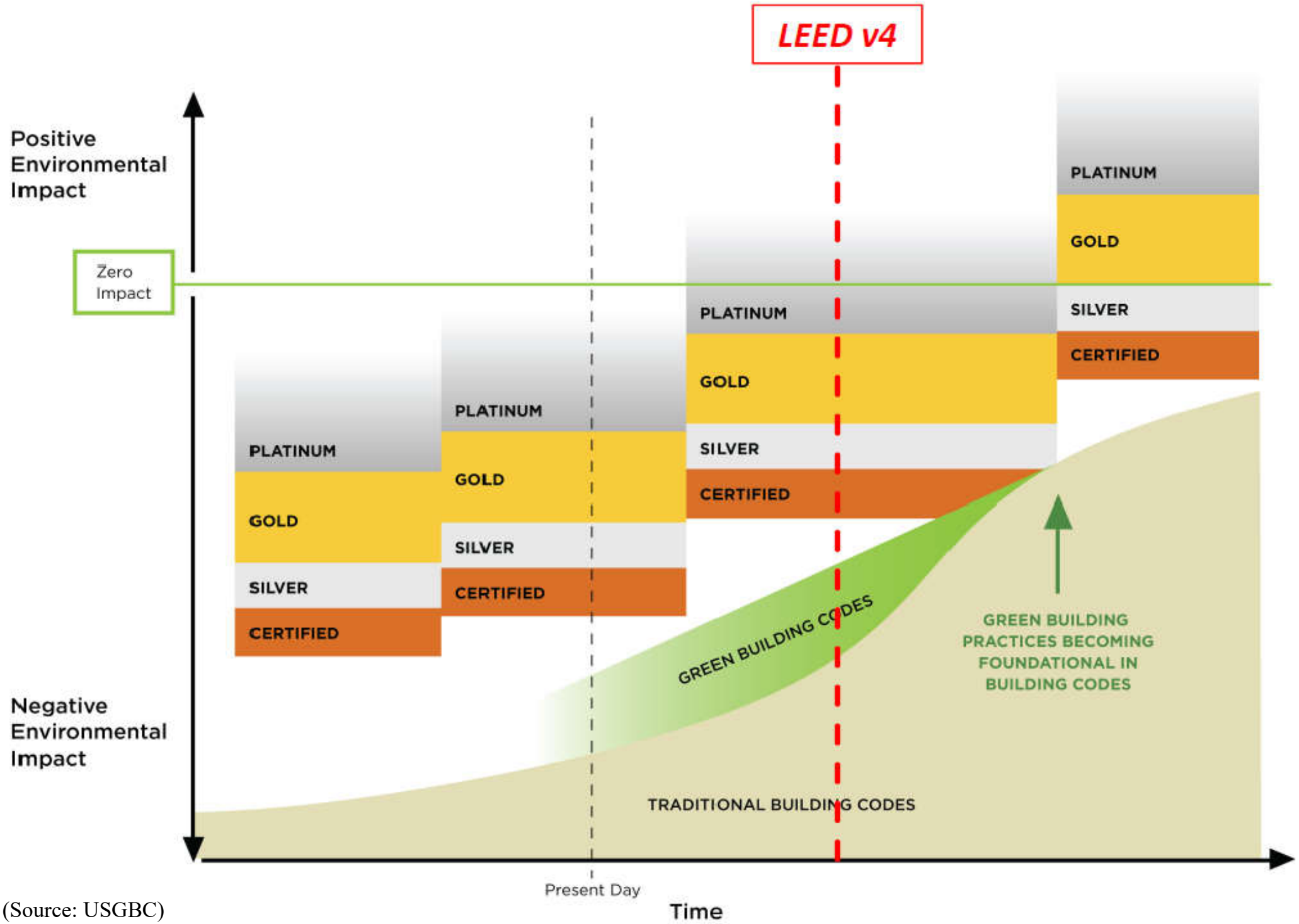
EAc1: Optimize energy performance (Up to 19 points)

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 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

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

(Source: USGBC)

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)

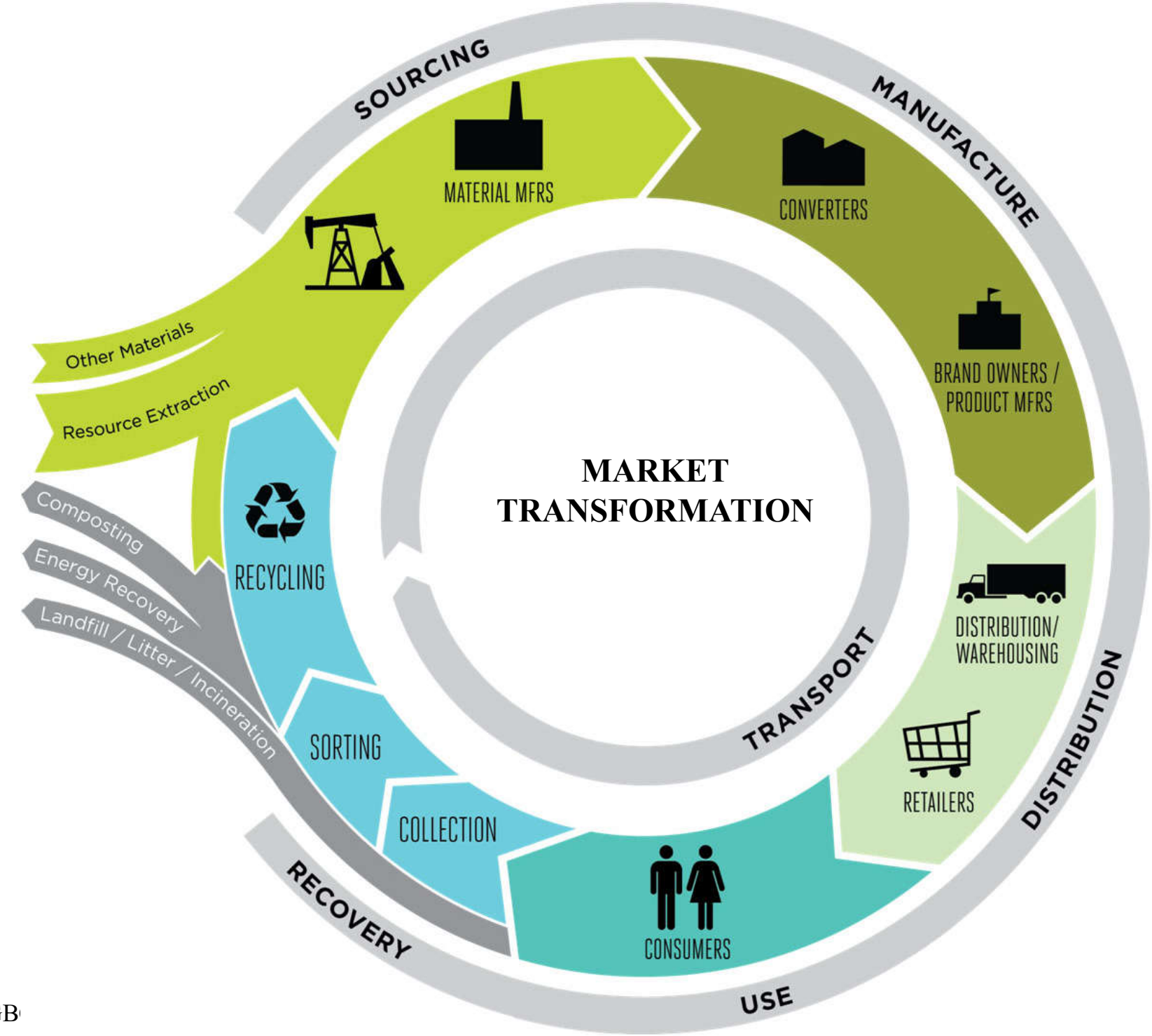
LEED v4

- 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

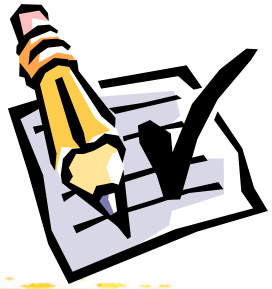
LEED v4

- 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

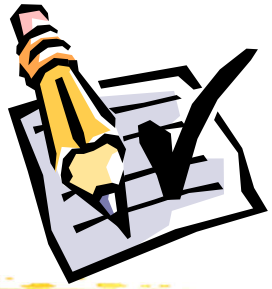
- Energy and Atmosphere
  - New prerequisites:
    - Building-level energy metering
  - New credits:
    - Advanced energy metering (1 pt)
    - Demand response (2 pts)
- Indoor Environmental Quality
  - New credit:
    - Acoustic performance (1 pt)

Key factors to consider



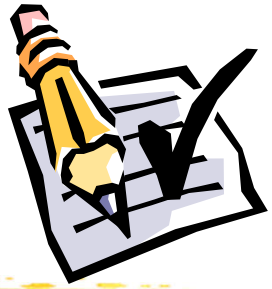
- Passive design
  - Taking advantage of the sun and wind
- Regenerative Projects
  - Support the health, generate electricity and send back to the grid. Its goal to achieve “net zero”
- The triple bottom line
  - People (Social)
  - Planet (Environmental)
  - Profit (Economic)

Key factors to consider



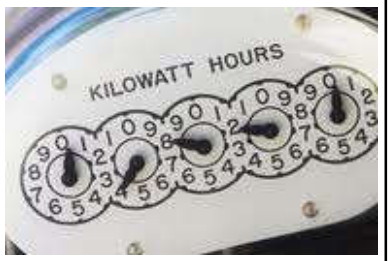
- Sustainable sites
  - Develop only on appropriate sites
  - Provide for non-auto access
  - Preserve open space
  - Manage stormwater
  - Reduce urban heat island effect
  - Reduce light pollution of the night sky

Key factors to consider

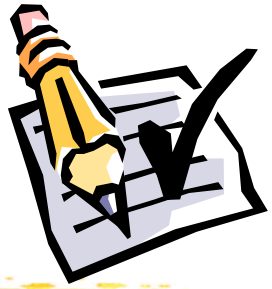


- Water conservation

  - 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

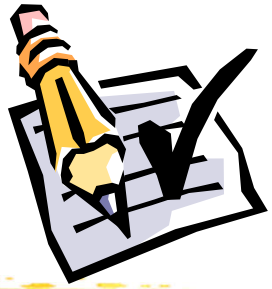


Key factors to consider



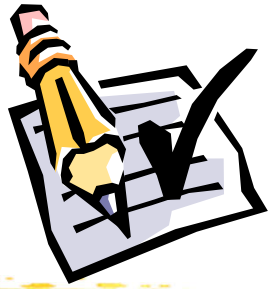
- Materials and resource conservation
  - Provide for recycling
  - Reuse existing buildings
  - Reduce construction waste generation
  - Use salvaged and recycled content materials
  - Source materials regionally
  - Use rapidly renewable (agricultural) materials and certified wood products

Key factors to consider



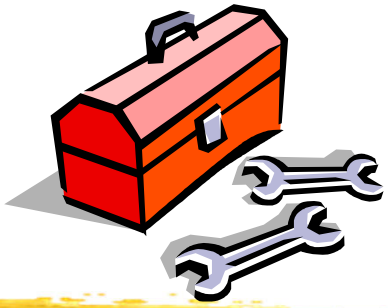
- Indoor environmental quality
  - Improve indoor air quality
  - Increase outside air ventilation
  - Manage air quality during construction
  - Use only nontoxic quality finishes, carpets, and composite wood products
  - Reduce exposure to toxic chemicals during building operations
  - Provide for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

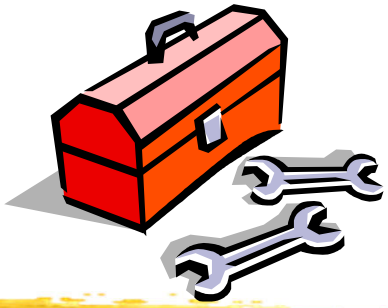


HONG KONG BUILDING ENVIRONMENTAL ASSESSMENT METHOD
香港建築環境評估法

- 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

Hong Kong BEAM



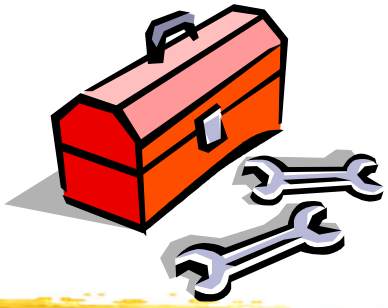
HONG KONG BUILDING ENVIRONMENTAL ASSESSMENT METHOD
香港建築環境評估法

- 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

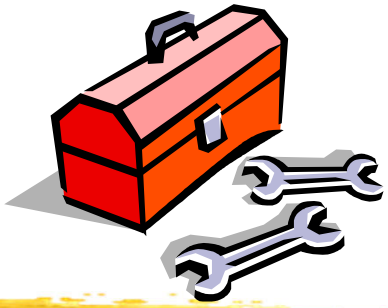
Hong Kong BEAM



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

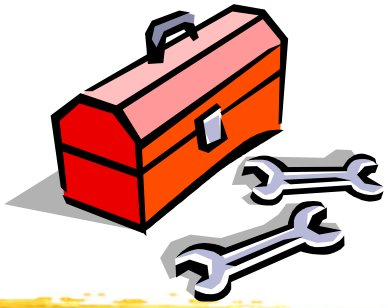


- BEAM Plus development
  - Version 2009: (Nov 2009)
    - BEAM Plus for New Buildings
    - BEAM Plus for Existing Buildings
  - Version 1.1 (Apr 2010)
    - With minor refinements
    - Introduce BEAM Professionals
  - Version 1.2 (Jul 2012)
    - Addresses issues on passive design
    - Minor amendments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

HKGBC BEAM Plus 綠建環評

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

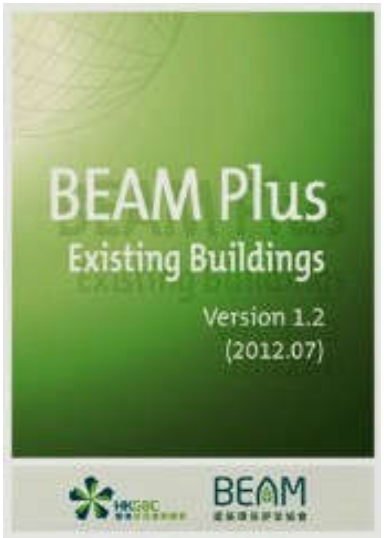
Hong Kong BEAM



- 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

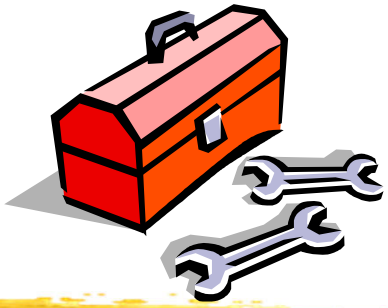
BEAM Plus v1.2 assessment criteria [credits] [weighting]

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)

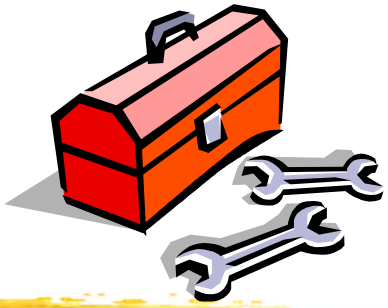
	Overall	Site Aspects	Energy Use	IEQ	Innov. & Addn.	
Platinum	75%	70%	70%	70%	3 credits	Excellent
Gold	65%	60%	60%	60%	2 credits	Very Good
Silver	55%	50%	50%	50%	1 credit	Good
Bronze	40%	40%	40%	40%	---	Above Average

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 15 May 2023)

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 15/05/2023

HKGBC BEAM Plus 綠建環評

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:

1,688

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

Figure 1. Project Type Distribution

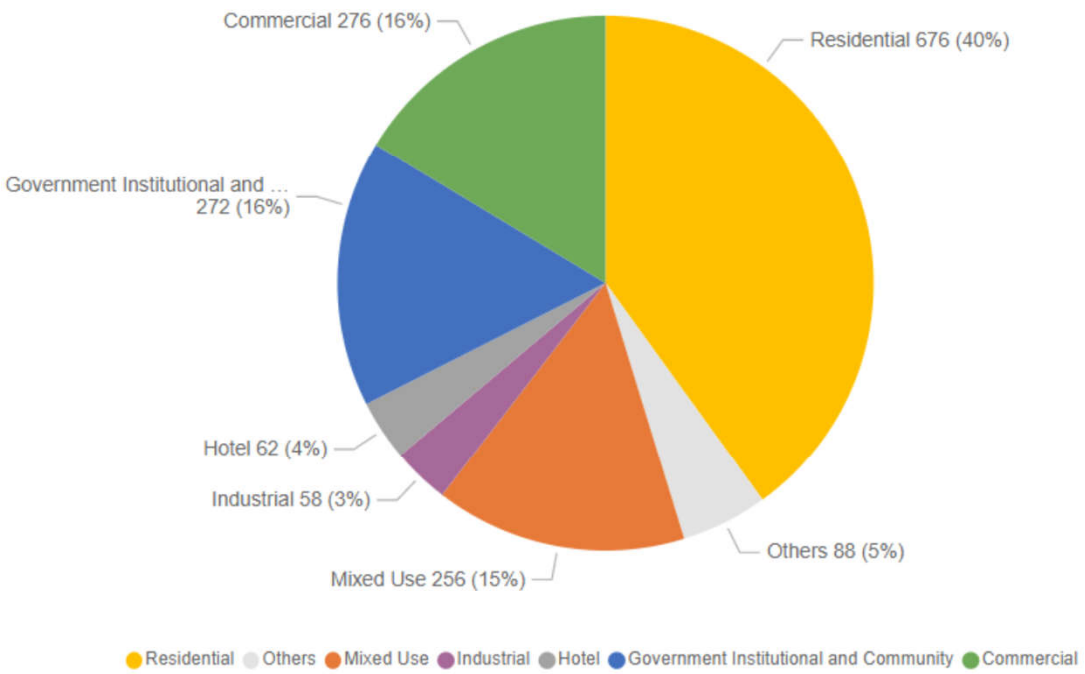
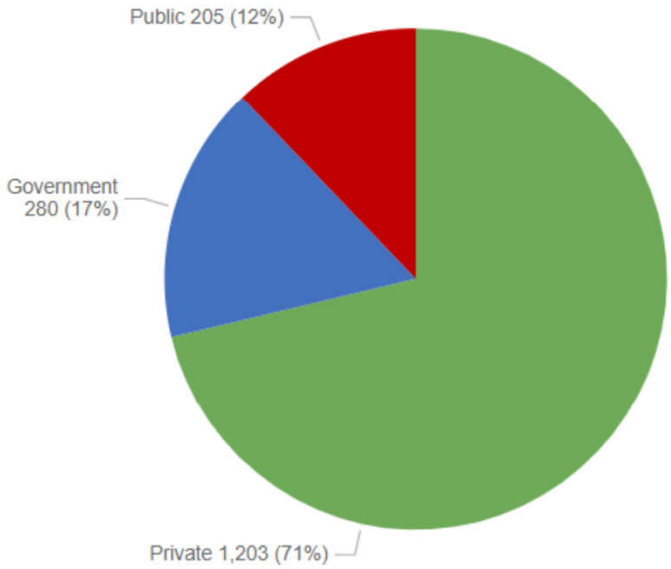


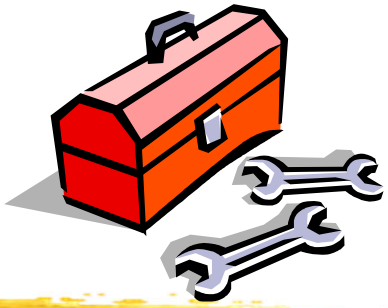
Figure 2. Owners / Developers Distribution



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

(Source: https://www.beamsociety.org.hk/en_beam_assessment_project_16.php)

Hong Kong BEAM

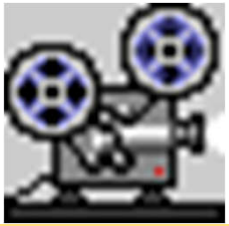


- Uptake of BEAM Plus in Hong Kong:
  - New government buildings with floor area > 10,000 m^2 will aim to obtain the second highest grade or above under BEAM Plus or LEED
  - Buildings Department has included BEAM Plus on the Practice Notes on the wholesale conversion of industrial buildings, permitting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

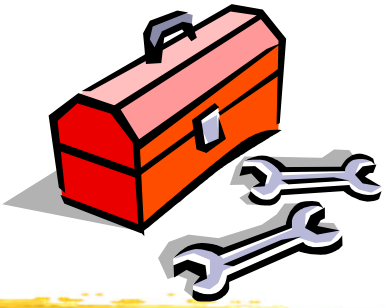
(Source: HKGBC)

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



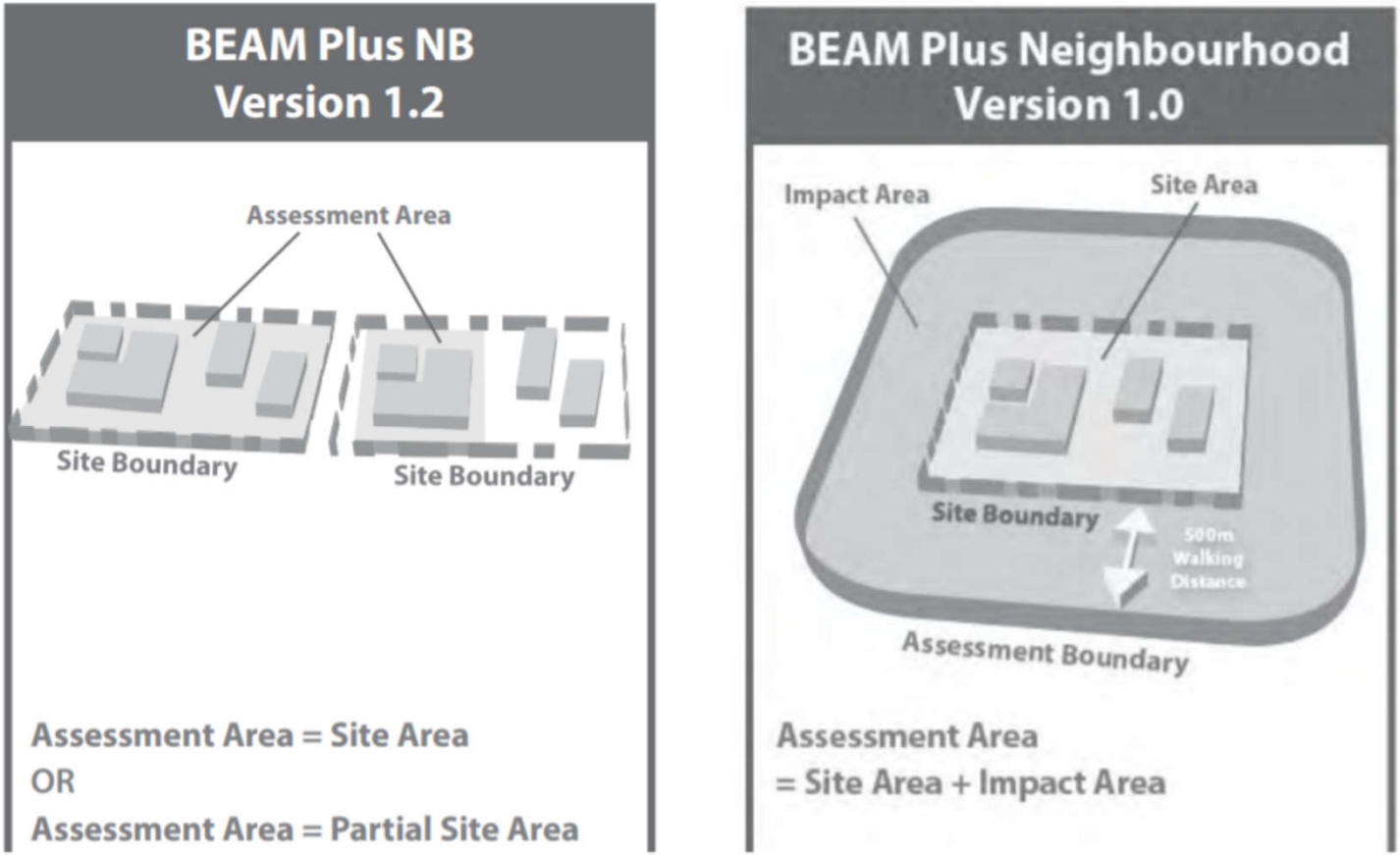
- The BEAM Plus Family
  - https://www.hkgbc.org.hk/eng/beam-plus/introduction/

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

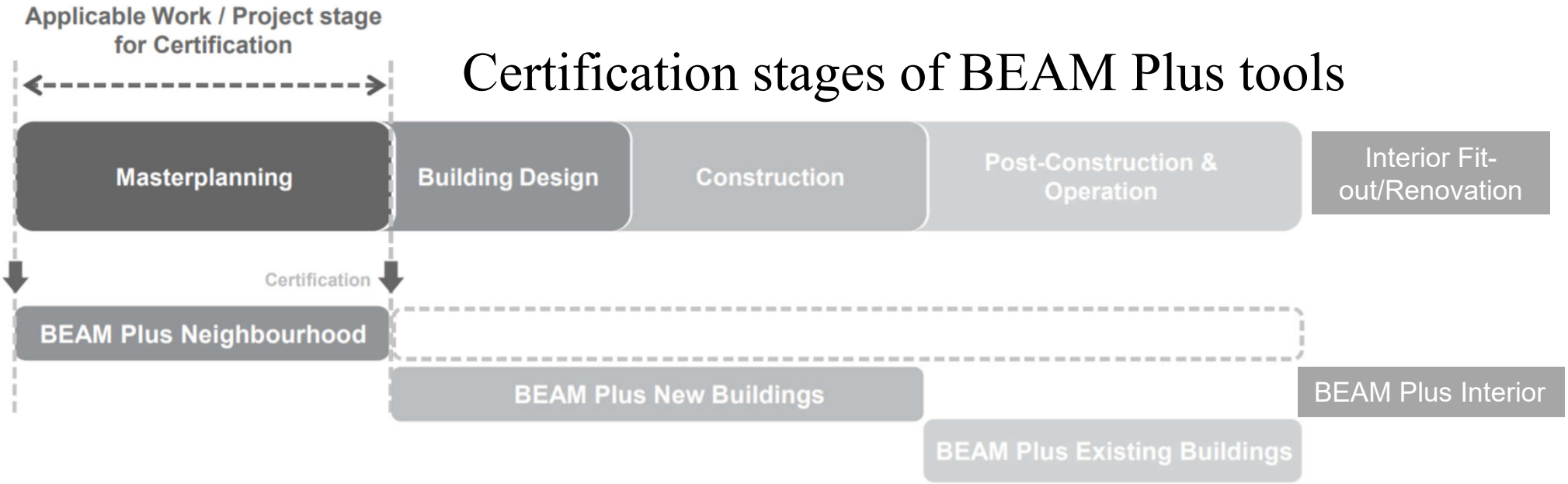
  - New Buildings (NB): New building projects and major renovation/alteration works on existing buildings

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

  - Interiors (BI): Fit-out works of premises
  - Data centres and existing schools



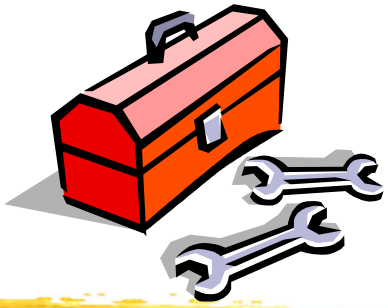
Comparison of assessment area of BEAM Plus NB and BEAM Plus Neighbourhood



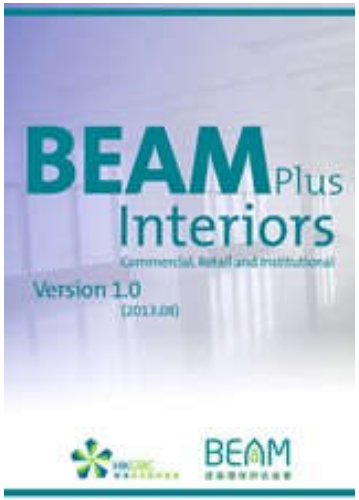
Certification stages of BEAM Plus tools

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

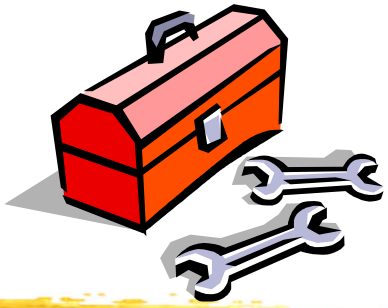
Hong Kong BEAM



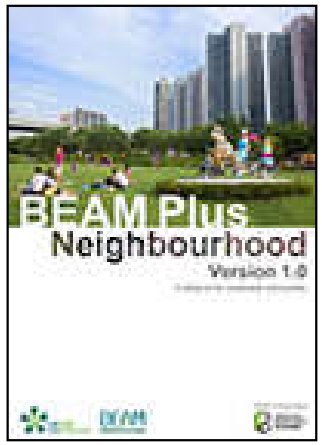
- BEAM Plus Interior (BI) (Aug 2013)
  - Used by occupants or tenants of new or existing buildings (fit-out, renovation and refurbishment)
  - Include 7 aspects:
    - Green Building Attributes (GBA) [8]
    - Management (MAN) [1p, 10]
    - Materials Aspects (MA) [3p, 26]
    - Energy Use (EU) [26]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



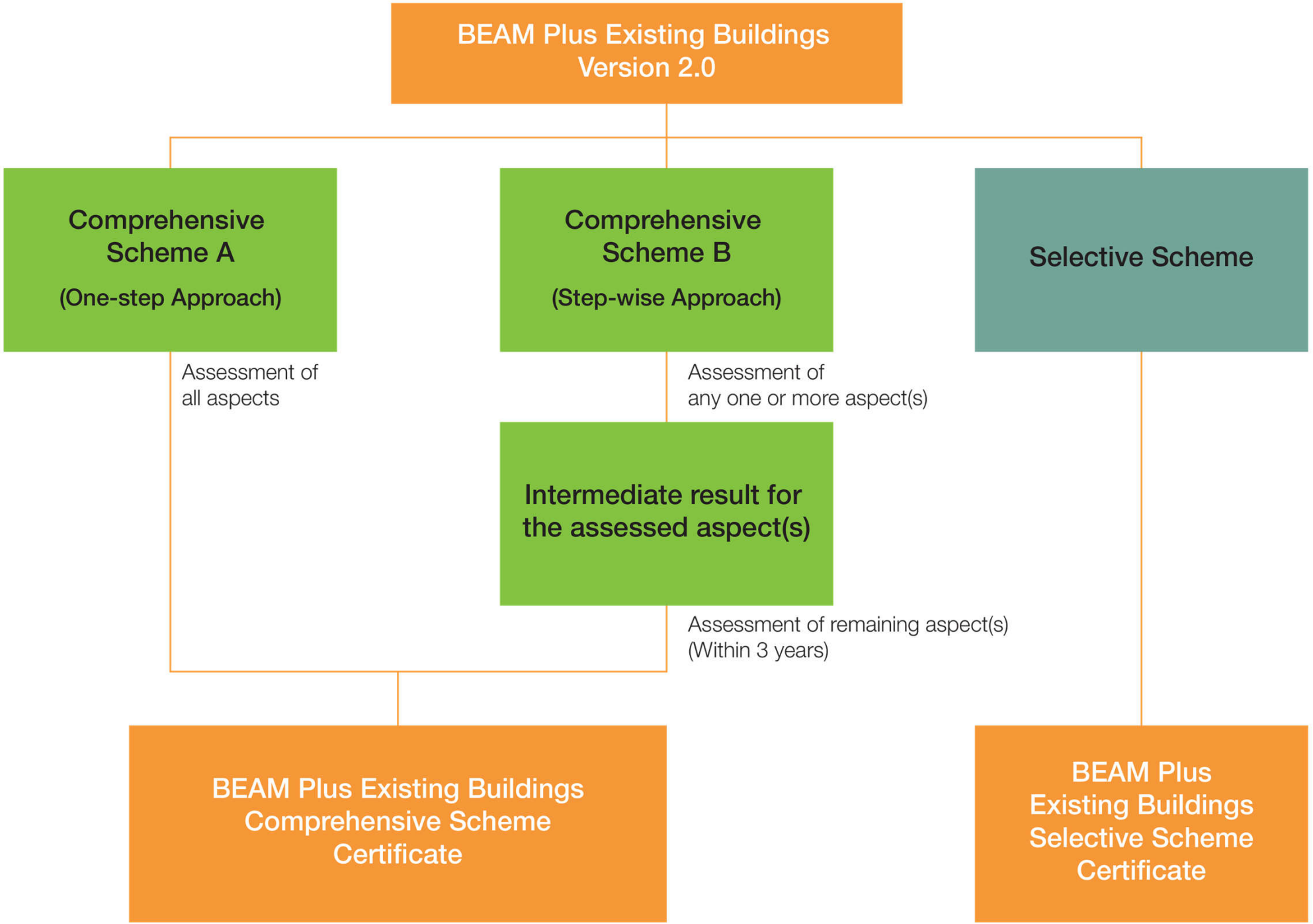
Hong Kong BEAM



- 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

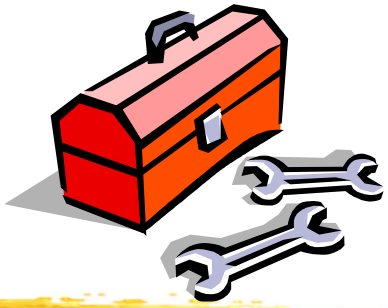


BEAM Plus Existing Buildings v.2 (2016)



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

Hong Kong BEAM



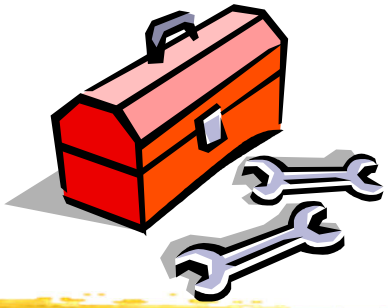
- BEAM Plus New Buildings v2.0 (05.2021)
  - More human centric & integrated design; more adaptable, certain & practicable
  - Credit performance categories:
    - Integrated Design & Construction Mgt. (IDCM) - 18%
    - Sustainable Sites (SS) - 15%
    - Materials & Waste (MW) - 9%
    - Energy Use (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

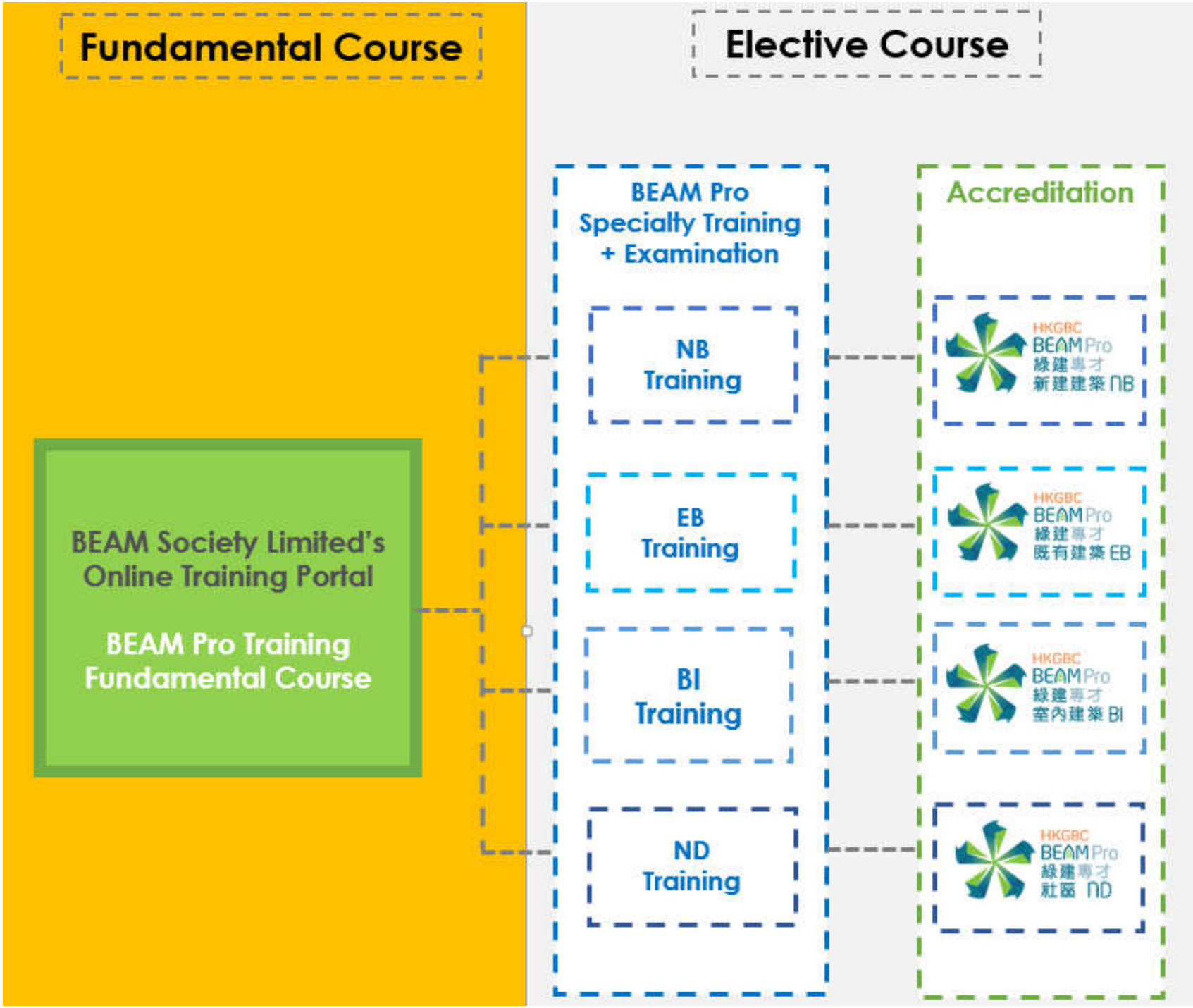
(Source: https://www.scmp.com/presented/lifestyle/topics/building-our-green-future/article/3040222/how-hong-kong-drives-strong)

Hong Kong BEAM



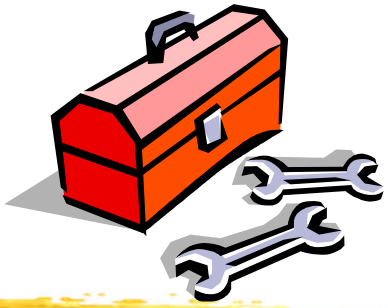
- BEAM Professionals (BEAM Pro)
  - Accredited by HK Green Building Council (HKGBC)
  - Facilitate BEAM Plus submission
- BEAM Assessors (BAS)
  - Undertake the building assessment on behalf of HKGBC
- Green Building Faculty
  - Experienced professionals to drive BEAM Plus & BEAM Professionals development 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



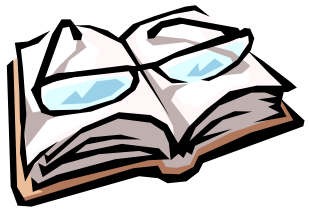
- iBEAM (Assessment Automation System)
  - Automate the assessment process ONLINE
  - Retrieve technical standards pertaining to the development of sustainable built environment
  - Project Dashboard & Credit Summary Dashboard
  - e-Forms, Credit Interpretation Request (CIR)
  - https://ibeam.hk

Beyond GREEN with iBEAM

BEAM 建築環保評估協會

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

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