KICT KOREA INSTITUTE of CIVIL ENGINEERING and BUILDING TECHNOLOGY

Adoption of Green Buildings in Pakistan
to achieve Pakistan's Nationally Determined Contribution

Result and Suggestion for Pakistan Green Building

KICT
Sungmo Seo

01 Background of Project

The need for a response to the ever-accelerating climate crisis resulting from climate change and the rapid urbanization of developing countries has led to increasing interest in and expectations for building energy efficiency, as well as green building standards and regulations.

An NDC report indicates that Pakistan has set an ambitious conditional target to reduce the country's projected total emissions to 50% by 2030. To achieve this target, Pakistan has established goals to switch 60% of its energy mix to renewables and 30% of vehicles on the road to electric vehicles. It also plans to introduce a complete ban on coal imports.

However, there are still several challenges to overcome, including a lack of local expertise and skills in green buildings and the public's lack of awareness of the need for green buildings.

01 Background of Project

Pakistan is facing challenges to introduce green buildings due to the lack of awareness and limited funding, despite the country's efforts to envision carbon emission reduction as a national goal. In Pakistan, several studies have already been conducted with the support of the EU and SWITCH-Asia to develop a green building code.

However, the absence of green building standards and regulations means that the sustainability aspects are still not considered in urban development projects pursued nationwide.

This study aims to enhance public awareness of green buildings and facilitate a low-carbon transition in Pakistan through the development of a green building rating system and detailed criteria.

02 Scope and Purpose

Why is a suitable certification system needed for? Pakistan?

Available green building performance assessment systems in Pakistan

1) UN-Habitat/UNEP-10YFP/SHERPA: Guidance to Sustainable Housing
2) Green Rating for Integrated Habitat Assessment (GRIHA)
3) Leadership in Energy and Environmental Design (LEED)
4) Building Research Establishment Environmental Assessment Method (BREEAM)
5) Green Star Rating System (GSRS)
6) ISBE/SBA 2009/ SBAT 2016: Performance Assessment Criteria
7) Design Green with WB Software EDGE (Excellence in Design for Greater Efficiencies)
8) Comprehensive Assessment System for Built Environment Efficiency(CASBEE)
9) GB Rating System in EU (Zero Energy Utilization Standards)

- **Most foreign certification systems, based in colder Northern Hemisphere countries, focus on energy efficiency and require costly materials.**

- **Existing building evaluation systems are not suitable for Pakistan's hot and varied climates, necessitating the establishment of regional standards tailored to these climates**

- **Incorporating traditional eco-friendly materials and passive design techniques from Pakistan's vernacular architecture into certification standards could reduce initial cost burdens.**

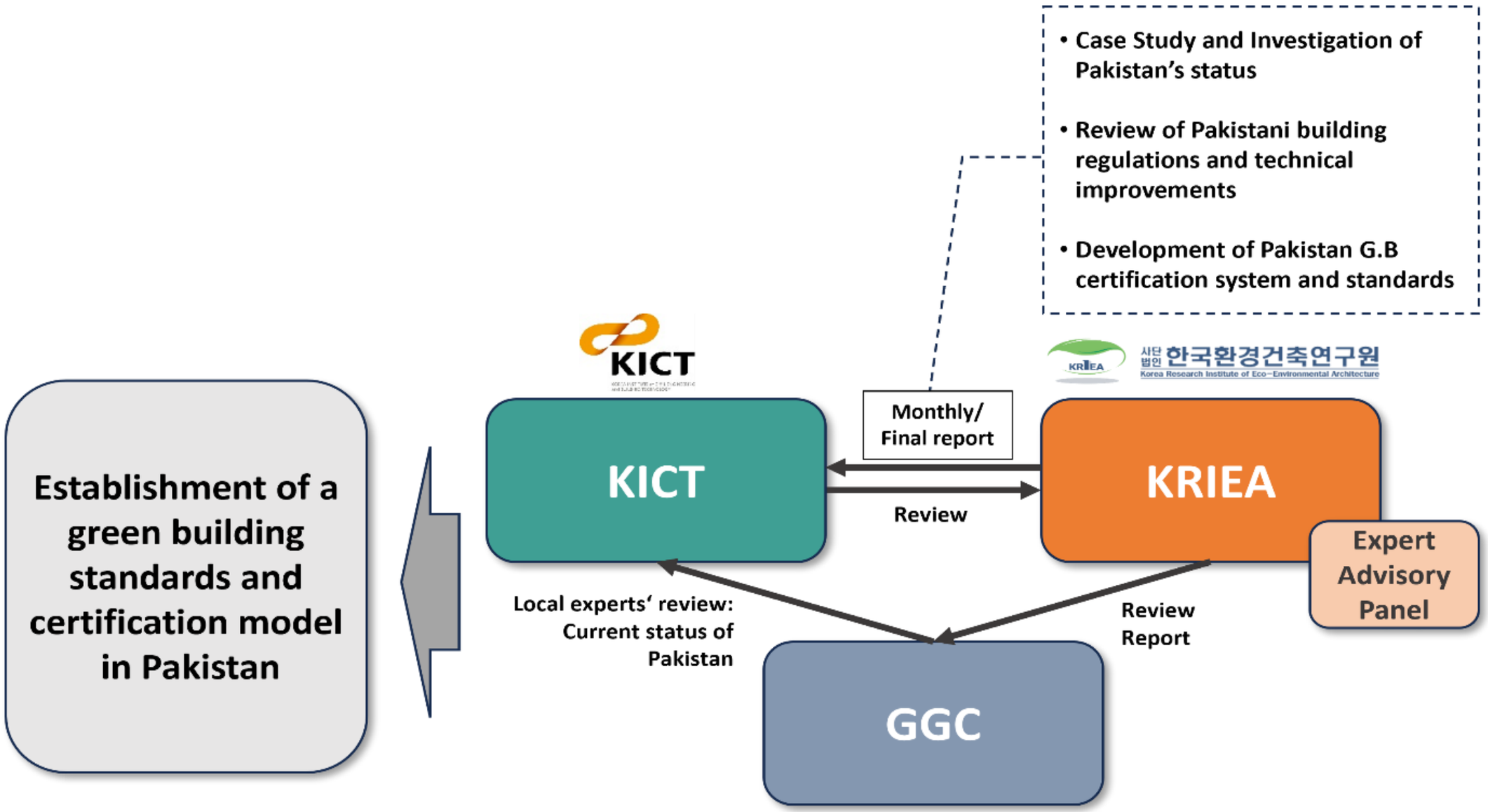
Resources: Policy Guidelines Green Building Code, Ministry of Climate Change Government of Pakistan, 2017

02 Scope and Purpose

Boosting awareness of eco-friendly architecture and facilitating low-carbon transition in Pakistan through a green building evaluation system

- Analysis of Pakistan's architecture environments, policies, and market trends.
- Literature review of preliminary research & Investigation of successful case studies
- Strategies for green building activation and direction for evaluation models
- Development of green building evaluation systems and certification models

03 Project Structure and Progress



03 Project Structure and Progress

Stage1: Start "Pakistan CTCN Support Project"

- Commencement report
- Project Inception Meeting with Pakistan local team and experts
- Pakistan local team's first kick-off meeting

Stage2: Investigation of successful G.B Certification System in Pacific Region

- Literature review of previous research in Pakistan and Korea
- Case study of green building certification systems in Korea and Asia-Pacific countries
- Deriving possible cases and policies

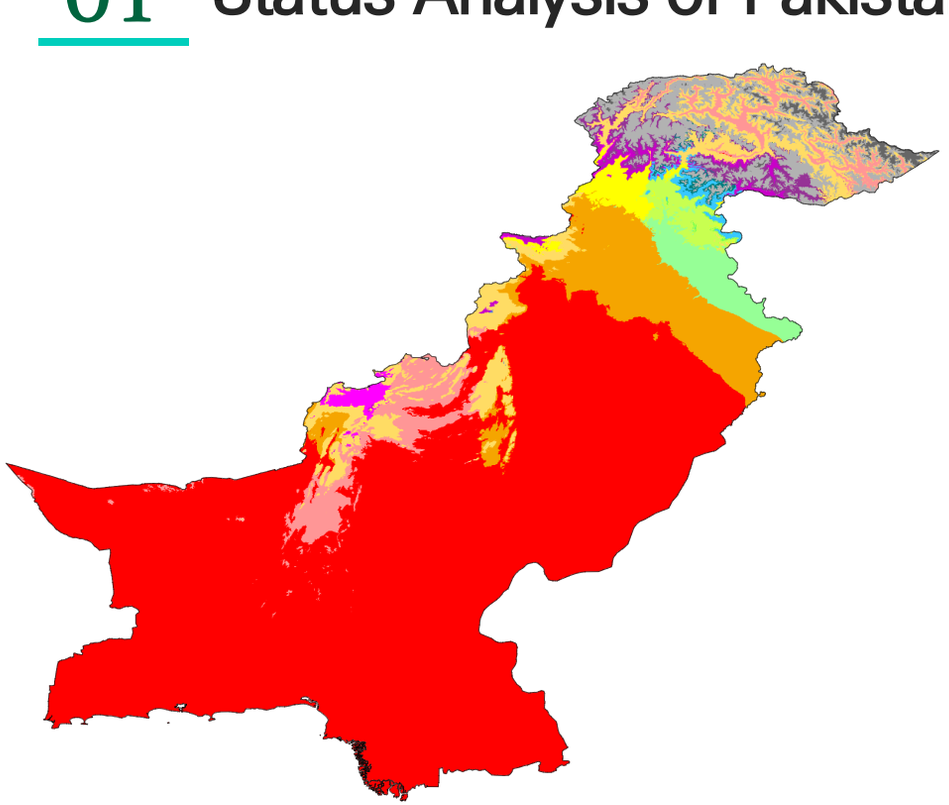
Stage3: Investigation of the current status of Pakistan's green building market, policies, etc.

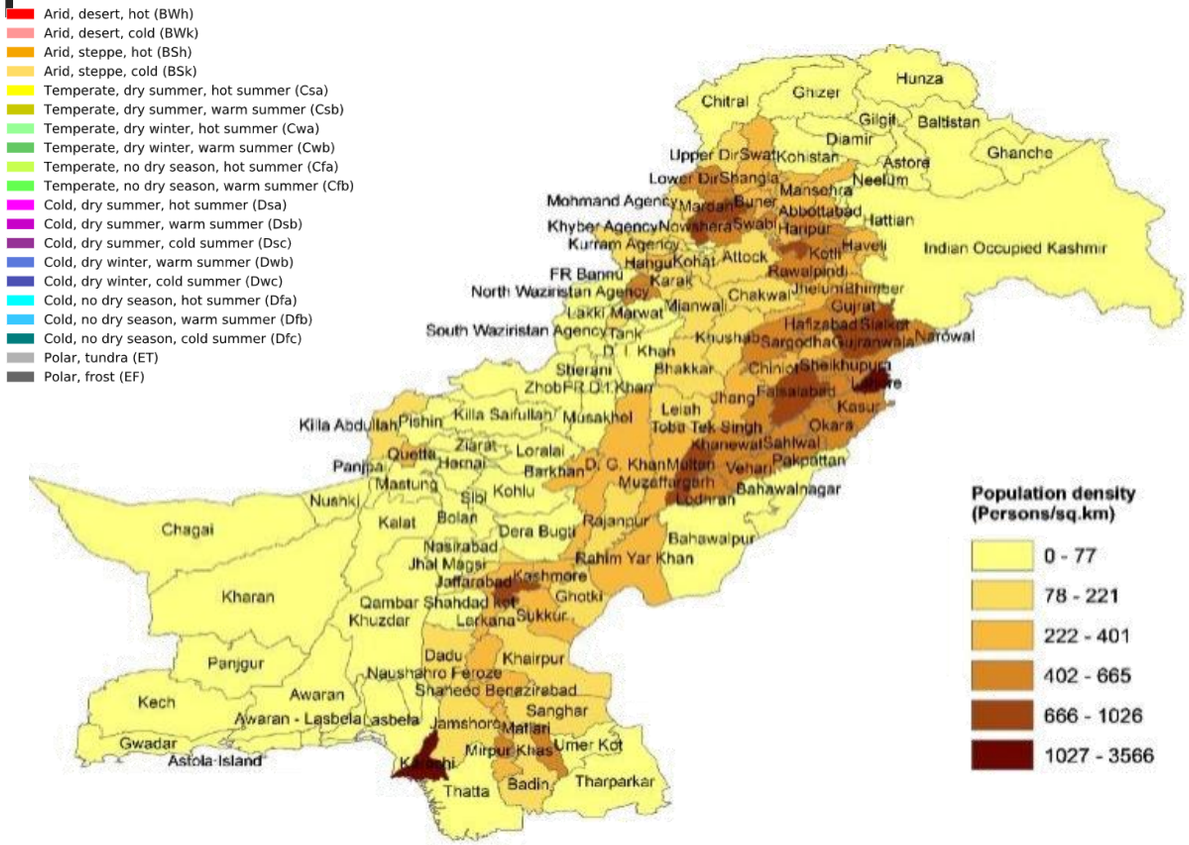
- Pakistan-related status survey
- Analysis of green building-related policies and capacity limitations
- Review report of G.B Status report wrote by Pakistan's local team, GGC

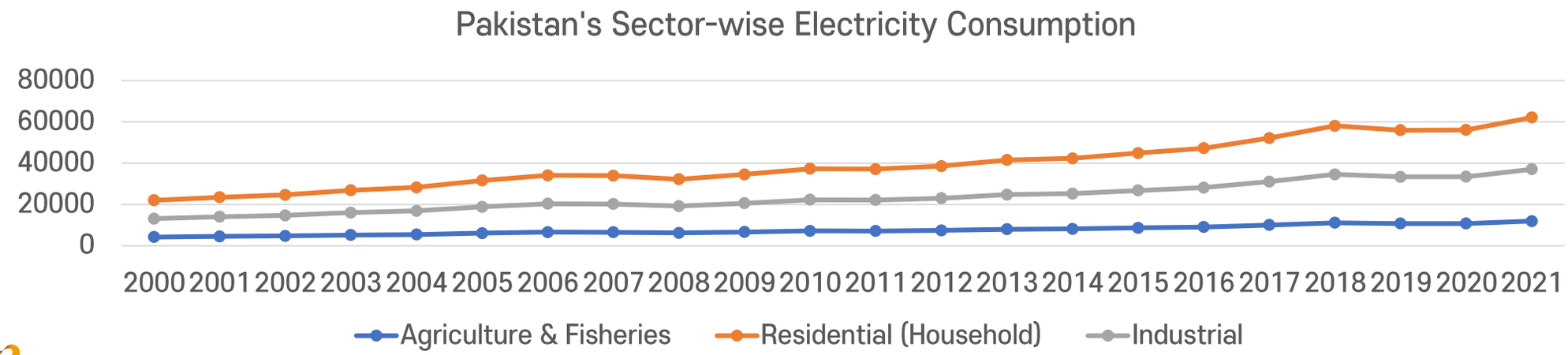
Stage4: Development of Pakistan G.B certification system and standards

- Establishment of research strategy and development direction
- Proposal of detailed green building standards and certification system

01 Status Analysis of Pakistan







01 Status Analysis of Pakistan

Envelope component	Structural component
Wall	1. Brick 2. Mud 3. Cement
Roof	1. T-iron guarder (girder) 2. Wood 3. Sarkanda/ Sirkiyan 4. Concrete
Floor	1. Mud 2. Cement 3.Tiles 4.Chips 5. Brick 6. Marble
Fenestration	Single pane with frame (wood, vinyl, fiberglass, metal like aluminium frames)

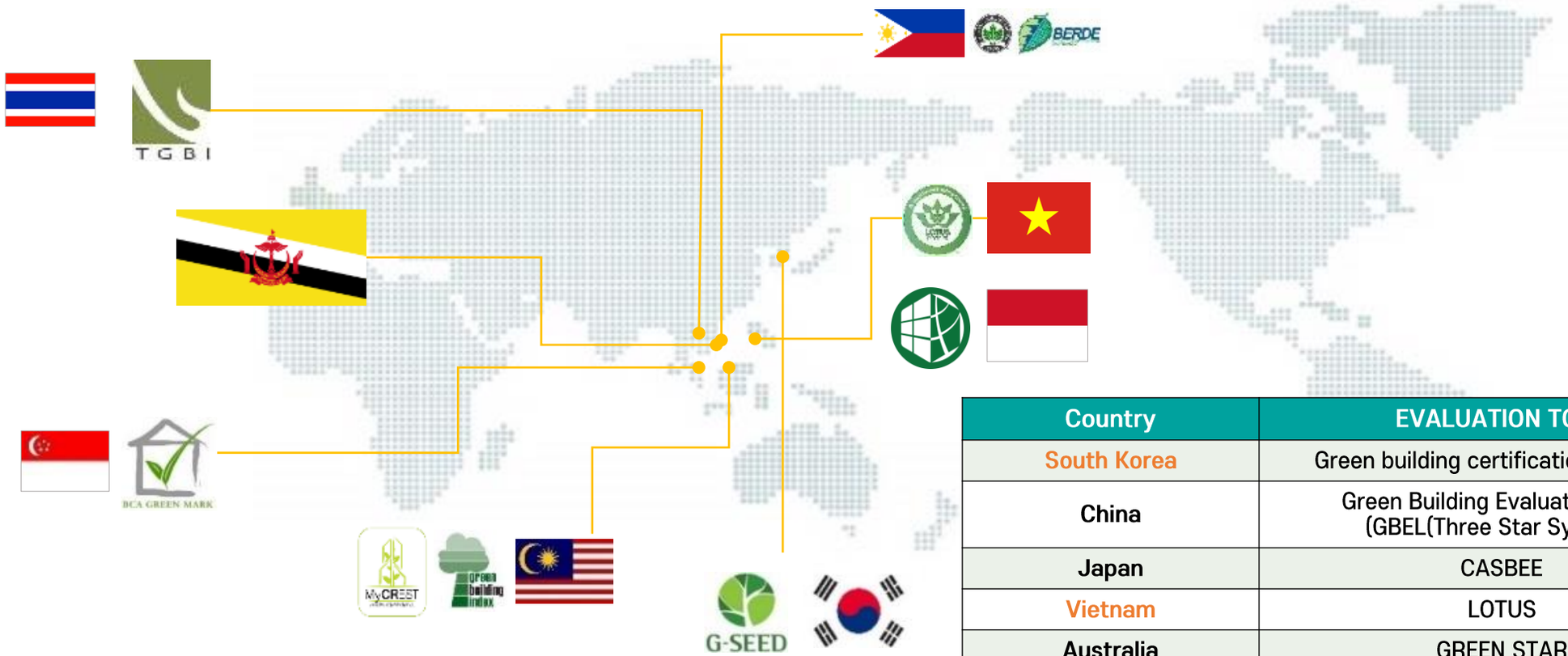
Province & District	Materials Used for Walls				
	Burnt Brick/Block	Mud Brick/Mud	Wood	Others	Total
Pakistan	79.84	15.32	1.62	3.21	100.00
Urban	95.95	2.94	0.46	0.65	100.00
Rural	69.68	23.13	2.35	4.83	100.00

Province & District	Materials Used for Roofs					
	RCC (Reinforced Cement Concrete) /RBC (Reinforced Brick Concrete)	Wood/ Bamboo	Sheet/Iron /Cement	TR Girder Roof	Others	Total
Pakistan	33.31	22.86	4.05	39.19	0.59	100.00
Urban	59.74	6.63	4.85	28.29	0.49	100.00
Rural	16.64	33.09	3.55	46.06	0.65	100.00

01 Status Analysis of Pakistan

Relevant legislation		Relevant provisions/codes	Features
Key building codes in Pakistan	Building Code of Pakistan (2021) (BCP)	Pakistan Building Energy Code (1990, 2011, 2023) → Replaced by Energy Conservation Building Code 2023 (ECBC-2023)	■ Pakistan's current building regulatory system is prescriptive or specification-based, consisting of codes and standard sets aimed at ensuring that buildings are designed, constructed, protected and maintained for the safety and comfort of the general public (primarily focusing on meeting the stringency of certain elements such as materials and equipment)[1].
		Building Code of Pakistan-Fire Safety Provisions 2016	
		Seismic Provisions of Pakistan Building Code	
Legal/institutional Improvements to Establish Green Building	Green Building Code	The functional goals and performance requirements of green buildings should reflect social expectations for building's safety and health levels.	■ Recommend to expand performance-based legal systems that are based on legislation, standards and practices, design and evaluation to the municipal level[28]. * Performance-based codes: Aimed at achieving specific outcomes, rather than meeting prescribed requirements.
	Standards and Practices	Adopted as a standalone reference document to comply with green building code requirements	
	Evaluation and Design	Tools to support the review and validation of green design	

02 Particular Focus on the Asia-Pacific Region



Country	EVALUATION TOOL
South Korea	Green building certification (G-SEED)
China	Green Building Evaluation Label (GBEL(Three Star System))
Japan	CASBEE
Vietnam	LOTUS
Australia	GREEN STAR
Hongkong	BEAM
Singapore	GREEN MARK
Taiwan	EEWH, Green building Materials certification
India	GRIHA, LEED-India
Thailand	TREES
Indonesia	GreenShip, EDGE
Philippines	BERDE
Malysia	Green Building Index(GBI) GreenRE
Brunei Darussalam	Green Unified Seal(BAGUS)

02 Particular Focus on the Asia-Pacific Region

Country	Rating Tools	Since	Applicability of mandatory GBC
Brunei Darussalam	Green Unified Seal(BAGUS)	2016	Mandatory for government buildings and voluntary for commercial buildings
Thailand	• **TEEAM, TREES(Voluntary):** The Department of Alternative Energy Development and Efficiency (DEDE) is responsible for regulations, laws and regulations on energy efficiency • **TEEAM(Thailand Energy and Environmental Assessment Methods**) :Responsible for the establishment and implementation of the evaluation system • **TREES(Thailand Energy & Environmental Sustainability Assessment)** :The assessment tool is managed by the Green Building Institute of Thailand (TGBI) and is used to further reduce energy consumption as stipulated in the Building Energy Code (BEC).	2012	Mandatory for government buildings Other green building certifications voluntary
Singapore	GreenMark	2005	BCA(Building &Construction Authority) Green Mark certification is mandatory for all new and major renovations (over 200 m2) and is required to achieve various certification levels.
Indonesia	GREENSHIP	2010	GBC Intake and Mandate for Region or Province: - Mandatory for large buildings (e.g. Bandung, Jakarta: buildings with a total area between 10000-50000m2)
Malaysia	-Green Building Index(GBI) -Malaysian Carbon Reduction and Environment Sustainability Tool (MyCREST)	2008	Mandatory system is developing. Green building certification is voluntary
Philippines	Building for Ecologically Responsive Design Excellence(BERDE)	2009	The mandatory system is in development. Green Building Certification is voluntary, has green building regulations in addition to voluntary green building assessment tools
Vietnam	LOTUS	2010	The mandatory system is in development. Green Building Certification is Voluntary

02 Particular Focus on the Asia-Pacific Region

Country	Energy in Green Building Assessment Tool Efficiency Related Categories	Country	Energy in Green Building Assessment Tool Efficiency Related Categories
Brunei Darussalam	• Building envelope • Air conditioning systems • Building envelope - design/thermal parameters • Natural ventilation (except for parking lots) • Artificial lighting • Ventilation in the parking lot • Ventilation in common areas • Elevators and escalators • Energy-efficient practices and features	Thailand	• Minimum energy efficiency • Energy Efficiency • Renewable energy • Refrigerants in air conditioning systems that do not destroy the ozone layer
Singapore	• Building envelope – Envelope Thermal Transfer Value (ETTV) • Air conditioning systems • Building envelope - design/thermal parameters • Natural Ventilation/Mechanical Ventilation • Natural lighting • Artificial lighting • Ventilation in the parking lot • Ventilation in common areas • Elevators and escalators • Energy-efficient practices and features • Renewable energy	**Indonesia**	• Electricity submetering • OTTV Calculation • Energy Efficiency Measures • Natural lighting • Ventilation • Climate change impacts • On-site renewable energy (bonus)
Malaysia	• Minimum Energy Efficiency (EE) performance • Illuminated zones • Electricity submetering • Renewable energy • Advanced EE performance • Improved commissioning • Post-occupancy commissioning • EE Verification • Sustainable maintenance	**Republic of the Philippines**	• Detailed metering of energy • Energy-efficient lighting • Natural ventilation • On-site renewable energy generation • Improved energy efficiency • Energy-efficient building envelope
Vietnam	• Passive Design • Total building energy • Building envelope • Natural ventilation and air conditioning • Artificial lighting Energy monitoring and management		

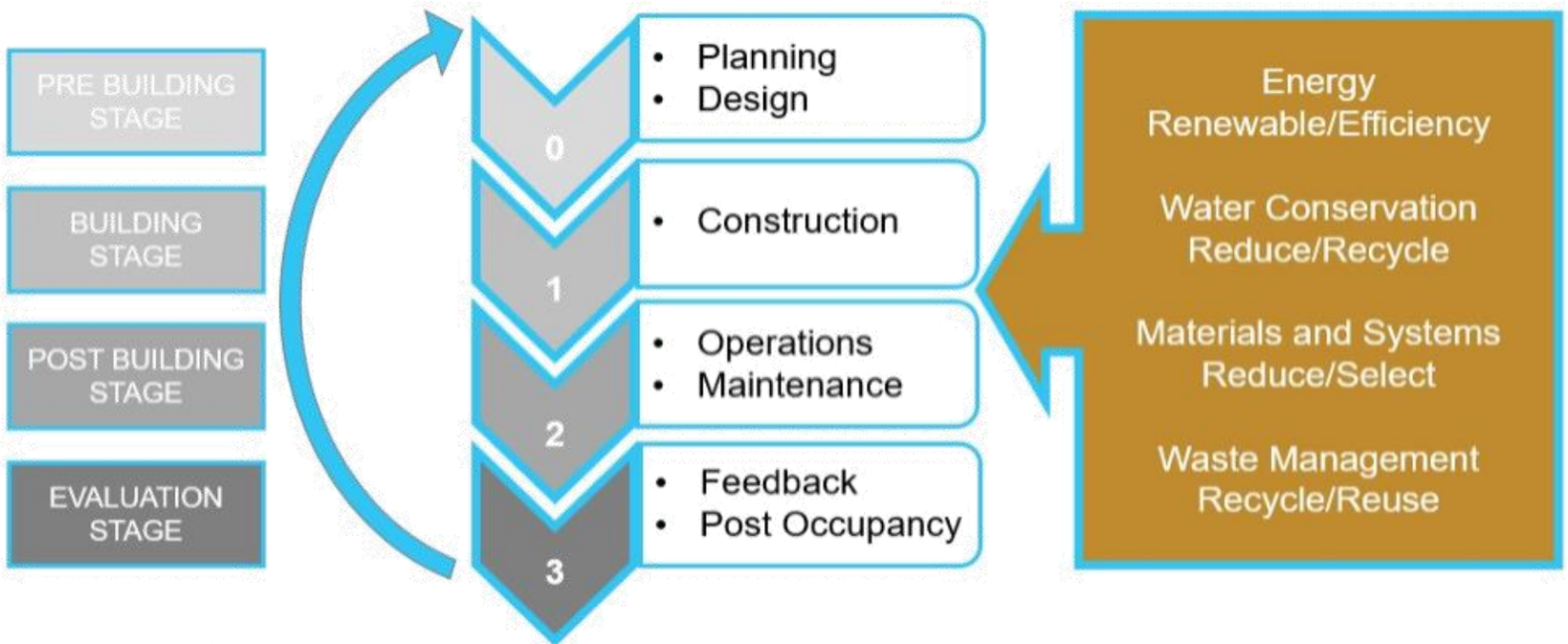
03 SWOT Analysis and Strategy

03 SWOT Analysis and Strategy

Element	Strategy
SO (Strengths-Opportunities)	Promote green building with government energy and infrastructure investment and renewable energy resources
	Establish customized green building standards
	Build the foundation for green finance
WO (Weaknesses-Opportunities)	Introduce green building materials and technical professionals
	Ease upfront investment costs
	Prevent inefficient design through the legal and institutional environment for green building
ST (Strengths-Threats)	Modernize traditional building techniques
	Leverage the huge domestic market to drive green building technology and certification scheme adoption
WT (Weaknesses-Threats)	Improve energy efficiency and tackle economic challenges by harmonizing with existing building codes
	Overcome political instability and raise public awareness
	Stimulate the construction market through a green building certification scheme

01 Suggestion of the Pakistan Green Building Certification (PGBC)

This chapter focuses on the development of green building evaluation criteria for Pakistan. To maintain consistency with international cooperation projects, the proposed framework of Switch Asia, the MoCC's "*Vision 2030 for a Green Building Code in Pakistan*" (Vision2030) and "*Policy Guidelines for Green Building Code*" in 2022 were considered and incorporated into the new framework, taking into account the findings of previous studies and compatibility with the criteria.



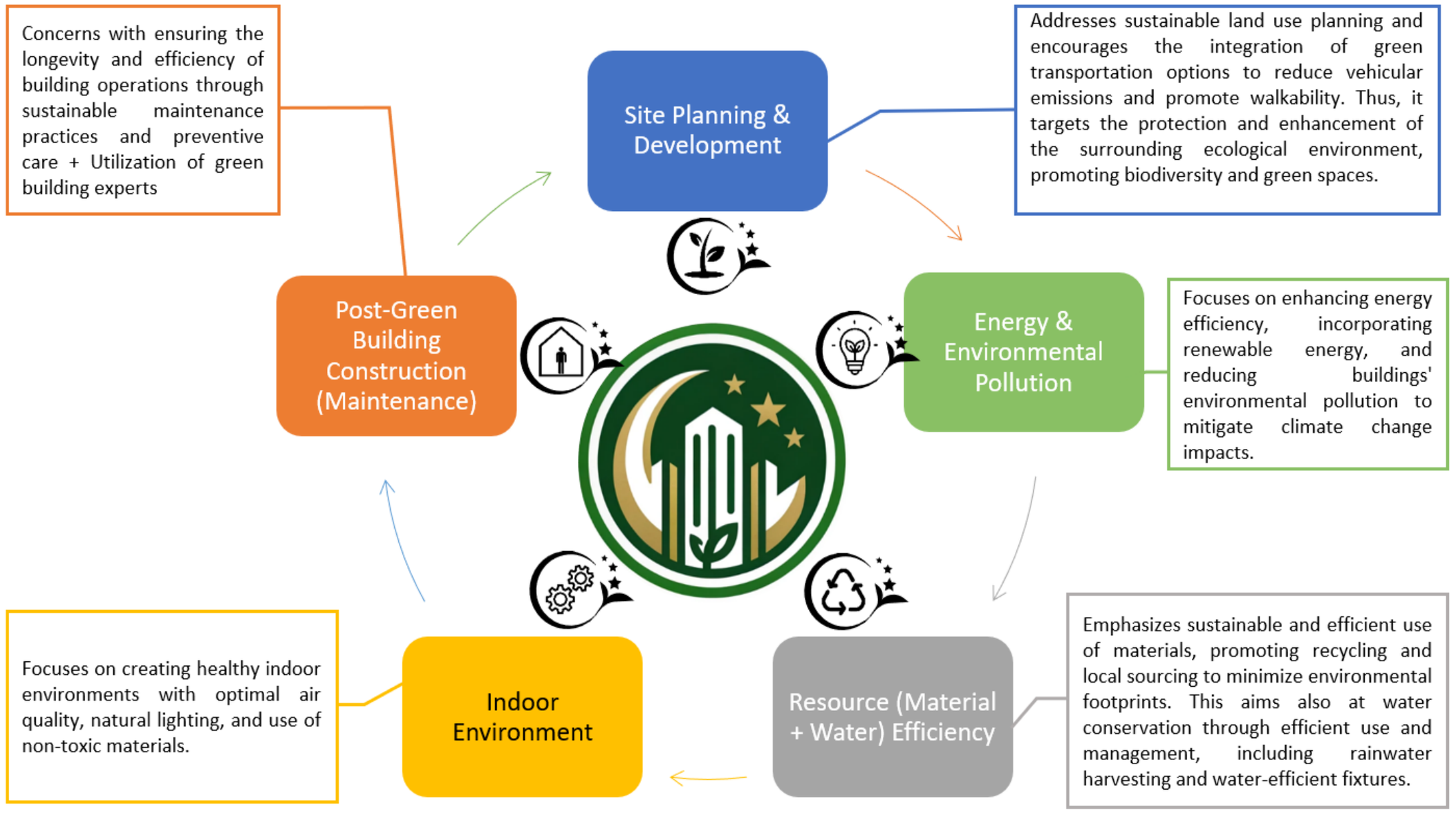
Stage of Impact Assessment in Naya Pakistan Housing Program

01 Suggestion of the Pakistan Green Building Certification (PGBC)

Suggested Components of the GBC in "Vision 2030 for a Green Building Code in Pakistan"	
Overview	Executive Summary
	General Provisions
	Green Building Strategies
A- Site Planning & Development	Site Sustainability
	Building Orientation
	Heat Island Mitigation
	Green Planning and Design
	Effective Land and Space Use
B- Green Building Construction	Building Materials Sustainability
	Building Envelope and Openings
	Natural and Controlled Ventilation
	Fire Safety
	Roof Insulation
C- Resource Efficiency	Water Efficiency
	Rainwater Harvesting
	Energy Efficiency
	Solid and Liquid Wastes Management
D- Post-Completion Green Building Actions	Environmental Pre-requisites and Assessment
	Building Inspection & Commissioning
	Green Building Code Compliance Rating
	Post-Occupation O&M Considerations
Green Building Code Compliance & Informative References	References (to be Annexed or Quoted)

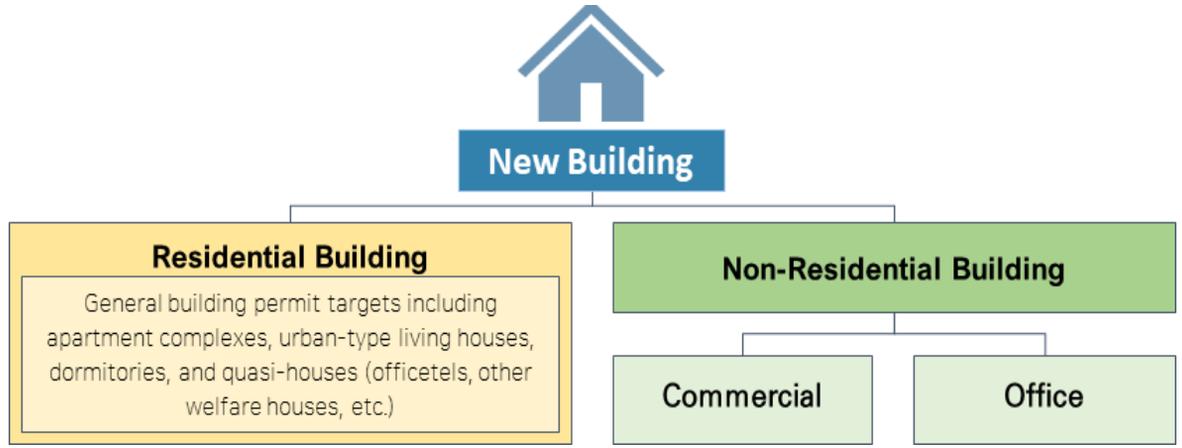
Proposed Components of the GBC Standards by KICT and KRIEA	
A- Site Planning & Development	A.1 Ecological value of existing land
	A. 2 Minimizing soil cut/fill in earthwork
	A.3 Validity of measures to prevent natural light interference
	A.4 Heat wave response and heat island effect mitigation plan
	A.5 Building connected green space axes
	A.6 Ecological area ratio
	A. 7 Accessibility to public transport and amenities
B- ENERGY & ENVIRONMENTAL POLLUTION	B.1 Building Envelop & Opening
	B.2 Prohibition of specific materials to protect ozone layers
	B.3 Use of renewable energy sources
	B.4 Lighting energy saving (non-residential)
C- Resource Efficiency	C.1 Building Material Substantiality
	C.2 Water Efficiency
	C.3 Rainwater Management
	C.4 Solid & Liquid Wastes Management
D-INDOOR ENVIRONMENTAL QUALITY	D. 1 Use of low indoor air pollutant discharging materials
	D.2 Tobacco Smoke Control
	D.3 (주) Natural lighting (residential buildings)
	D.4 Resting and refreshing area
	D.5 Natural & Controlled ventilation
E. POST-COMPLETION GREEN BUILDING ACTIONS	E.1 Environmentally-friendly space planning and management
	E.2 Construction site environment management
	E3. Operation and maintenance
	E4. Monitoring

01 Suggestion of the Pakistan Green Building Certification (PGBC)



01 Suggestion of the Pakistan Green Building Certification (PGBC)

Pakistan Green Building Code & Certification 2024				
Category				
Certification Items		Points		Evaluation Items
Objective & Evaluation Method				
Evaluation Purpose				
SDGs				
Assessment Methods				
Detailed Evaluation Criteria				
Grade				
Evaluation Scope				
Evaluation standard				
References				



Phase 1
Applied to newly built public buildings depending on size

Phase 2
Applied to newly built residential and non-residential buildings depending on size and use

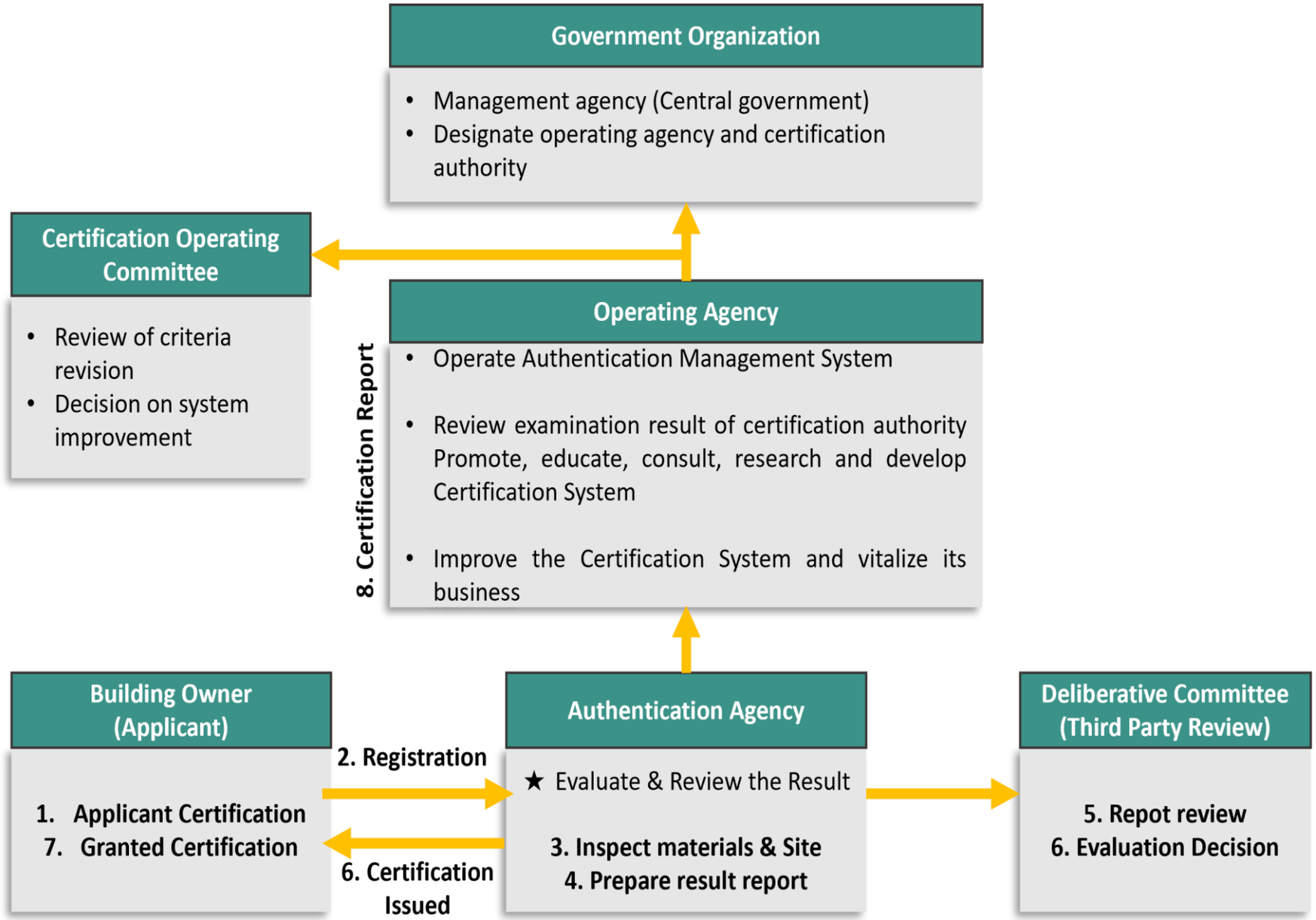
Phase 3
Size and use criteria for new buildings expanded

Phase 4
Partially applied to existing buildings depending on size and use

02 Implementation and Operation Strategy

Phase	Action	Description
1	Mobilize a task force and technical committees	Organize a task force chaired by the federal minister for climate change; technical committees start working on the GBC; assess and identify zoning policies, building codes, obstacles, etc.; analyze environmental hotspots and resource tradeoffs
2	Collect and compile criteria	Collect, organize, and compile topic-specific criteria based on preliminary reports from technical committees; criteria should be expressed both in quantitative and qualitative terms
3	Circulate a draft GBC	Circulate the draft GBC to key stakeholders; reach an agreement on proposed sections, provisions, criteria, etc.
4	Review the draft and collect feedback	The task force reviews comments and observations on the draft GBC and submits them to the MoCC; formal validation process
5	Finalize and legally approve the GBC	Finalize the green building code; approval from relevant agencies; review by the Ministry of Justice for nationwide enforcement; seismic design, energy, and fire safety codes remain as separate regulations

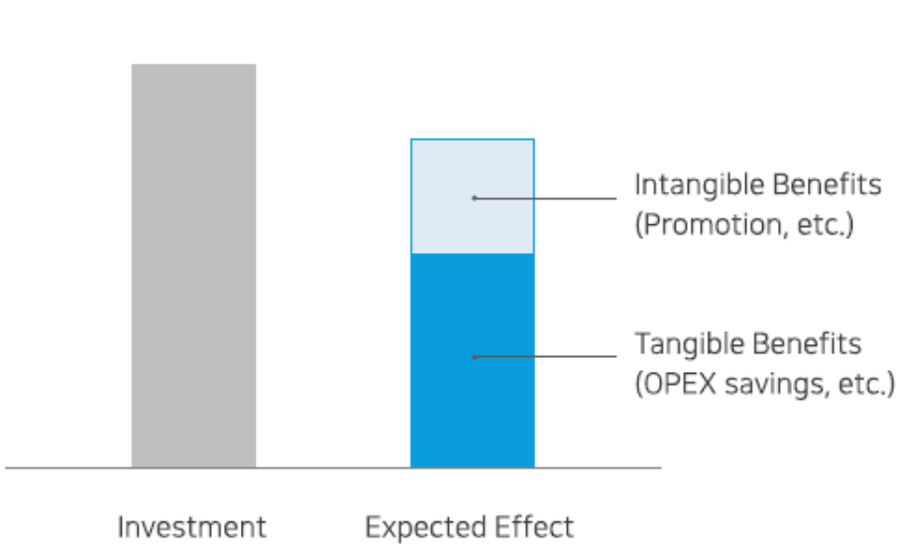
02 Implementation and Operation Strategy



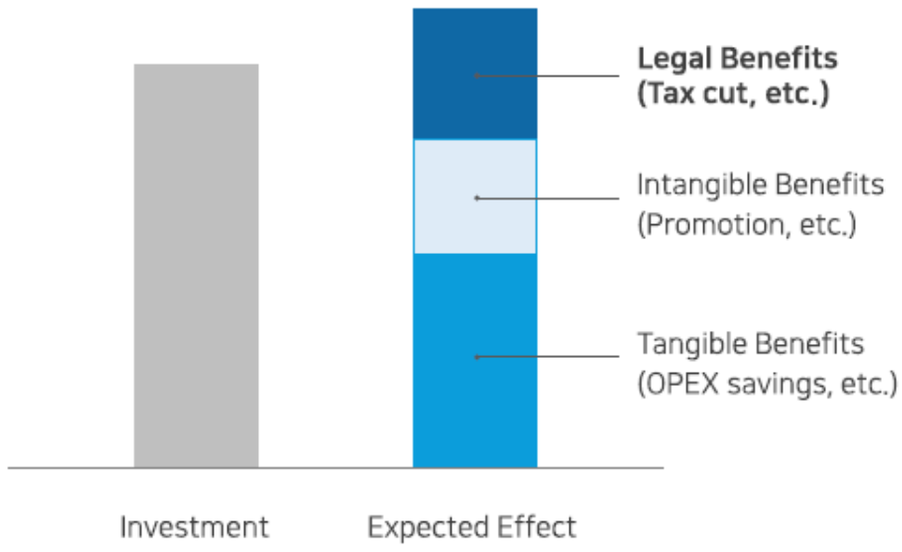
03 Incentives and Financial Support

Incentive (example)	Description
Tax exemptions or reductions	Monetary benefits for taxes related to the construction and acquisition of the building (property tax, acquisition tax, etc.)
Relaxation of building standards	Allowing for higher floor area ratios, higher building heights
Financial and institutional incentives for green building-certified contractors	Extra credit for participation in state-owned building projects Relaxation of gratuitous donation requirements for housing construction projects

Sample of Decision-Making



"This would not be cost-effective"



"This would be cost-effective"

04 Recommendations

- **Lay the foundation for industrialization by strengthening legal and policy grounds**
- **Designate an organization responsible for green building**
- **Organize public awareness campaigns**
- **Develop economic incentives in connection with international cooperation/support**
- **Develop local materials and technologies**
- **Develop a monitoring system and collect and analyze data**

Q&A

KICT
Sungmo Seo
(ssm1216@kict.re.kr)