Ministry of Climate Change
Government of Pakistan

Policy Guidelines
GREEN BUILDING CODE

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Policy Guidelines for Green Building Code

National Coordinator
Mr. Muhammad Irfan Tariq
Director General (Environment and Climate Change)
Ministry of Climate Change
Government of Pakistan

Coordinator
Mr. Jawed Ali Khan
Habitat Program Manager,
UN Habitat (Pakistan)

Contributors and Supporting Team
Members of the Expert Working Group
(Note: The List is placed at **Annex-I**)

Lead Expert & Author
Mr. Abdul Qayum
B. Arch (UET-Lhr.), M.Phil UP (Italy), MBA (AIOU), CPM (PIMS).
abdul.qayum1948@gmail.com

Disclaimer
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Policy Guidelines
GREEN BUILDING CODE

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Acknowledgment for 'Policy Guidelines on Green Building Code'

It gives me great pleasure to acknowledge on behalf of the Government of Pakistan and Ministry of Climate Change, the valuable support provided by UN Habitat, UN Environment and EU SWITCH-Asia Policy Support Programme for development of 'Policy Guidelines on Green Building Code'. The Code provides guiding principles to save water, energy and material resources in the construction and maintenance of buildings and can reduce or eliminate the adverse impacts of buildings on the environment and occupants.

Building sector is responsible for a huge share of energy, electricity, water and consumption of materials. The building sector has the largest potential for significantly reducing greenhouse gas emissions compared to other major emitting sectors at little or no cost. Green building concept, in broader terms, involves a building, which is designed, built, operated, maintained or reused with an objective to protect occupant health, improve employee productivity, use natural resources wisely and reduce the environmental impacts. In other words the green building process incorporates environmental consideration into every stage of the building construction. This process focuses on design and development efficiency, energy and waste efficiency, resources efficiency, indoor environmental quality, building-owner maintenance and the buildings overall impact on the environment.

I appreciate the hard work of the technical team of the UN Habitat led by Mr. Jawed Ali Khan, Habitat Programme Manager, UN-Habitat Pakistan and Mr. Abdul Qayyum, UN-Habitat Consultant which made it possible to successfully steer and coordinate the process with the federal and provincial governments, academia, civil society, and private sector organizations. I also like to thank members of experts working group for their active involvement and mainstreaming their contributions in the preparation of the Policy Guidelines on the Green Building Codes.

It is hoped that after the launch of these Policy Guidelines, further work will commence on priority basis.

Malik Amin Aslam
Advisor to PM on Climate Change
Ministry of Climate Change,
Government of Pakistan

Preface

Buildings are not only one of the largest contributors to resource depletion and climate change; they are also a major source of pollution. Green building have received increased attention over the past decade from both environmental experts and policymakers. While there is no single definition of "green buildings" or its related policy, the researchers and organizations tend to emphasize resource efficiency in building and reducing the impacts of buildings on human health and the environment.

In green buildings, numerous advantages and enhanced performance are accrued from their more efficient and sustainable operations, which can come from the energy efficiency, water efficiency, higher-quality outputs, and improved employee productivity. The operational cost savings and improved productivity can enhance the structure's asset value in resale or rental markets. The value of green buildings goes far beyond the value of avoided energy and water costs, to the improved productivity and enhanced marketing and promotional value for the organization.

The Guidelines, while providing an overview of how the building construction relates to sustainable development, recognize the potentials of green building which can be harnessed in developing Green Building Code under the aegis of Federal Ministry of Climate Change. The construction-process generates site-wastes impacting air and water quality; while the building-operation increases cost related to energy use, indoor air quality, water-use and wastewater disposal. It has therefore, been considered imperative that the Green Code, besides specifying technical codes, should also focus on the life-cycle performance of green buildings. To facilitate the implementation of Green Building Code, the Guidelines have also offered suggestions regarding the code's jurisdiction options; green code compliance evaluation systems; pros and cons of adopting green code; and green building financing initiatives.

These Guidelines are (i) advisory in nature and aim to incorporate in Building Code of Pakistan 1986, the green eco-friendly practices of building's design, construction & operation stages; and (ii) ensure the sustainable utilization of construction materials to save energy, conserve water, improve indoor environmental quality and lower GHG emissions. These Guidelines will neither influence the other Codes of Pakistan, nor applied as a standalone Green Building Code; and provide Ministry of Climate Change with the information they need to monitor the scope of this Code.

Foreword

Construction sector consumes a large percentage of World's total energy consumption and propels the greenhouse gas emissions. To combat these, an effective initiative in the infrastructure and construction sectors is the sustainable development through green building.

Ministry of Climate Change has taken an initiative to prepare the Policy Guidelines for developing the Green Building Code. This is the first step, reflecting the commitment of the Government of Pakistan in enhancing the awareness on sustainable buildings and participating in the international endeavor to combat the global environmental challenges such as Climate Change. UNEP along with UN-Habitat are contributing to the efforts of the Government of Pakistan enabling regulatory framework, which supports a transition towards sustainable buildings and green construction practices.

Pakistan has endorsed the Government's priority to achieve sustainability by constructing all new buildings eco-friendly. In the present guidelines, an effort has been made to identify the essential requirements, in developing a comprehensive Green Building Code to save energy, conserve water, avoid depletion of natural resources, improve indoor environmental quality, increase the productivity of buildings' occupants, and lower the emissions of greenhouse gases for reduction of Global Warming.

Green building is a practice of making structures and using processes, which are environmentally responsible and resources-efficient throughout the building's life cycle. Substantial savings can be made through integrated planning and adopting environment friendly designs, by involving the architects, engineers, city planners, contractors and clients to develop an optimal design in terms of technology, materials and energy savings. Moreover, the construction of green buildings will also support in achieving certain benefits, in line with the Sustainable Development Goals (SDG-17- 6 to 8: Technology & Innovation-satisfy Green Building Code;- lower operating costs, improved productivity, enhanced asset value).

Policy Guidelines provide information and guidance on strategic steps to prepare Green Building Code, informing how more sustainable and green buildings can be planned and built. They spell out what are green buildings and their performance criteria; along with providing a checklist on environmental standards, leading towards measuring the green performance rating of buildings. Therein, the essential elements of green codes, best practices and work methodology are also included to prepare the Green Building Code are also included.

The Green Building Code is intended to be an Overlay Code to be used with the all existing Codes, including the Building Code of Pakistan, Energy Conservation Code, Fire Safety Code and Seismic Provisions Code, and the relevant Building Regulations and standards. The guidelines have also called for recognizing the post-construction impacts on the occupants of green buildings, and focusing on the commissioning, maintenance, and operation of such buildings. In the end, a review of the current "Green Building Rating Systems" has been included to inform about evaluation tool for measuring the environmental performance of green buildings.

The finalization of Green Building Code would be crucial in creating a market demand and uptake of green building techniques and practices, focusing on the production and application of environmentally supportive construction materials and sustainable building elements. Accordingly, the "Guidelines for Procurement of Green Construction Materials", along with the "Green

Buildings Performance Indicators" would need to be developed. This is necessary to transform the old building construction practices into advance expertise of green building, and to promote the use of locally manufactured products that are non-toxic, reusable, and recyclable, wherever possible.

The Policy Guidelines is essentially an advisory document for use in preparing the Green Building Code, in order to promote the construction of sustainable green buildings to improve environmental health of occupants; to recommend such practices which do not unnecessarily increase construction costs; and which do not restrict or give preferential treatment to use the particular types of materials, products or methods of construction, except where environmental impact or sustainable green considerations require so.

I gratefully acknowledge the valuable assistance of the UN-Habitat (Pakistan) and the UNEP-SCP; and the contributions by the Consultants and Members of Experts Working Group; and also the extensive input by Lead Expert to finalize the present Policy Guidelines.

In the end, I would like to thank Malik Amin Aslam Khan, Advisor to the Prime Minister on Climate Change and Mr. Hassan Nasir Jamy, Secretary Ministry of Climate Change for their continuing guidance towards finalizing the present Guidelines.

Irfan Tariq
Director General (Environment & Climate Change)
Ministry of Climate Change
Government of Pakistan

Acknowledgement

The Policy Guidelines for Green Building Code have been developed through the outstanding collaborative efforts of the Ministry of Climate Change, the UN Environment, EU Switchasia and the UN-Habitat. The preparation of this document endorses the Government of Pakistan's commitment towards developing the sustainable green buildings, and actively participating in the international endeavor to combat the global challenges of Climate Change and Sustainable Consumption and Production.

It is hoped that these Policy Guidelines will provide all information and guidance to develop a comprehensive Green Building Code, specifying minimum performance criteria along with appropriate adoption, to achieve mandatory compliance and generate a market demand of environmentally supportive construction materials and building elements. Innovative approaches and alternative materials, designs and methods not specifically addressed in the Code can be included later, after complying with the intent of the provisions of Code.

The preparation of these Guidelines has been made possible through the valuable guidance and inputs from Mr. Irfan Tariq, Director General, Ministry of Climate Change. Ms Dechen Tsering, Director Asia and Pacific Office, UN Environment, Ms. Janet Salem, Program Officer UN Environment, Ms. Roshan Ara, Program Officer EU; Ms. Bella Evidente, Former Country Program Manager, UN-Habitat Pakistan and Mr. Laxman Perera, Human Settlements Officer, UN-Habitat, Regional Office for Asia and the Pacific.

The professional feedback from Mr. Pekka Huovila, Coordinator-10YFP Sustainable & Construction Program; Dr. Jahangir Mirza, International Expert-Constructional Materials using Wastes Canada/Professor Malaysia; Mr. Gul Najam Jamy, Expert-Energy & Environment; Mr. Zain-ul-Abedin, Architect/Urban-Planner/Ex-Dean-Architecture & Design, COMSATS-IIT University; and Engineer M. Musaib Qureshi, Registrar Pakistan Engineering Council have greatly facilitated to successfully accomplish this daunting task. Also, the comments received from various Members of Experts Working Group (see Annex-I) are highly appreciated. Last but not the least; I deeply appreciate the hard work put in by Lead Expert Mr. Abdul Qayum in developing the Policy Guidelines for Green Building Code.

I also thankfully acknowledge the constant support from Malik Amin Aslam Khan, Advisor to the Prime Minister on Climate Change and Mr. Hassan Nasir Jamy, Federal Secretary (Climate Change), in formulating the present Guidelines.

I am sure these guidelines will go a long way in greening the Building Code of Pakistan.

Jawed Ali Khan
Habitat Programme Manager
UN Habitat (Pakistan)

Glossary

Addition/Alteration: An alteration is a change in an existing building. An addition is adding a structural change in an existing building.

Builder: A person who builds, especially one who contracts for and supervises the construction or repair of buildings

Building Envelope: A building envelope is the physical separator between the conditioned and unconditioned environment of a building including the resistance to air, water, heat, light and noise transfer.

Building Works: These include site excavation, erection or re-erection of a building or making an addition and alteration in an existing building.

Built Environment: The man-made surroundings that provide a setting for human activity.

Carbon Footprint: The amount of carbon Dioxide released into the atmosphere as a result of the activities of a particular individual, organization, or community.

Code: A collection of the regulations and standards adopted by a building control authority to govern the construction of buildings.

Construction & Demolition Waste: Waste generated from construction, renovation, and demolition or deconstruction of structures. Land clearing debris including soil, vegetation and rocks are typically not considered construction and demolition waste.

Commissioning: Process by which an equipment, facility, or plant (which is installed, or is complete or near completion) is tested to verify that it is fit for intended use.

Compliance: Certification or confirmation that the doer of an action or the manufacturer or supplier of a product to meets the requirements of accepted practices, legislation, prescribed rules and regulations, specified standards, or the terms of a contract. See also conformance.

Covered Area: A covered area is the actual area covered by the building above and below the ground level. The carpet area is the area calculated from wall to wall inside the house or building. Built up area is sum of the carpet area and area covered by the thickness of walls and balconies.

Design Guidelines: Sets of recommendations towards achieving the good practice in design.

Embodied Carbon (or Grey Carbon): Carbon dioxide emitted during the manufacture, transport and construction of building materials, together with end of life emissions.

Fenestration: The arrangement, proportioning, and design of windows and doors in a building

Glazing: Transparent material (such as glass) used for windows and the action, process, or trade of fitting windows with glass.

Gray-water/Grey-water: The wastewater produced from baths and showers-clothes washers, and lavatories.

Green Building: Green building refers to both a structure and the application of processes that are environmentally responsible and resource-efficient throughout a building's life-cycle: from planning to design, construction, operation, maintenance, renovation, and demolition.

Heat Island Effect (HIE): Heat Island Effect occurs when the uncomfortable warmer temperature is experienced in the urban or developed areas compared to adjacent undeveloped areas, due to temperature rising both within and outside the buildings, because of solar energy retention on constructed surfaces. Some of the surfaces that contribute to the Heat Island Effect are paved streets, roads, sidewalks, parking lots and buildings.

Lifecycle Analysis: Life-cycle assessment is a technique to assess environmental impacts associated with all the stages of a product's life from raw material extraction through materials processing, manufacture, distribution, use, repair and maintenance, and disposal or recycling..

Model code: A model building code is a building code that is developed and maintained by a standards making organization. such code is not enforceable until a Government authority approve it through legislation.

Occupancy: Occupancy is using a part of building for living ,office work, manufacturing and processing .

Rating system: The green rating system is any kind of rating applied to certain application to achieve a specific compliance.

Regulation: A mechanism that is associated with the implementation of a legislative act passed by a legislative body.

Retrofitting: Retrofitting refers to the addition of new technology or features to older systems to include sustainable design attributes that reduces operation cost and environmental impact and increases the building resiliency.

Specifications: Used to make something as per the instruction given in a code.

Standards: Standard is a set of technical definition and guidelines used to define the quality and establishing safety criteria.

Sustainable Development: To meet the needs of present without compromising the ability of future generation to meet their own needs.

Ventilation: The process of supplying or removing air by natural or mechanical needs to or from any space.

Zero Energy Building: The buildings that combine energy efficiency and renewable energy generation to consume only as much energy as can be produced on-site through renewable resources over a specified time period.

POLICY GUIDELINES FOR GREEN BUILDING CODE

Introduction

Nowadays, the mankind is facing various challenges such as climate change, resource depletion, and environmental degradation. Unfortunately, the building and construction industry is responsible for the rise of these challenges to a large extent, mainly due to the incremental consumption of energy, water and raw materials. According to the United Nations Environment Program, the building and construction industry has become a big energy consumer that uses 40 percent of global raw materials and 40 to 50 percent of global energy*. Meanwhile, it has been proved to be a principal waste contributor accountable for the 40 percent of solid waste and greenhouse gas emissions worldwide.

Due to negative environmental impacts of the traditional construction activities and increased awareness of the world on global climate change, the green or sustainable building has attracted a worldwide attention. The terms green building, sustainable buildings, high-performance buildings, sustainable construction, green construction, and high-performance construction are inter-changeably used, with numerous definitions. A green building is not only designed to consider and reduce its lifecycle environmental impacts, but its water and energy consumption also. The green building is a term encompassing strategies, techniques, and construction products that are less resource-intensive or pollution-producing than regular construction.

Initially, the building codes and standards were originated in those developed countries, where basic construction norms and regulations such as construction worker safety, health and sanitation, minimum visual and thermal comfort are strictly complied with, and without which construction approvals are not granted. On the other hand, in the developing countries like Pakistan the building codes require compliance with certain basic codes and norms, generally prescribed as the Building Code (PBC), Energy Conservation Building Code (ECBC), Fire Safety Provisions Code (FSPBC) and Seismic Provisions in Building Code (SPBC).

Green building practices encourage innovation and integrated design to help decrease a building's impact on the indoor and outdoor environment. Whether voluntary or mandatory, the green building codes generally incorporate six essential elements pertaining to the construction and performance of buildings i.e. 1) site selection and development measures, 2) energy efficiency, 3) water conservation, 4) materials and resources efficiency, 5) indoor environmental quality, and 6) owner's building operations and maintenance processes. Also, the green building codes enable the local building control jurisdictions to guide the construction and development in eco-friendly and sustainable manner, with focus on above-told elements. The green codes are considered living documents, as the improvements in green construction practices and technology-innovations call for the revision of green code every three to five years, through a public consensus process.

The UN Habitat in collaboration with the Federal Government Ministry of Climate Change has developed the present Guidelines, in pursuance to a recommendation of the UNEP sponsored study on Sustainable Consumption and Production. The European Union Switch Asia Policy Support Program has funded the preparation of these Guidelines, aiming to update the Building Code of Pakistan 1986 by incorporating eco-friendly construction practices and sustainable utilization of

* A Global Review of Sustainable Construction Projects Finance: Polices, Practices and Resource Efforts. Ming Shan, Bon- Gang Hwang and Lei Zhun www.mdpi.com/journal/sustainablility

building materials to save energy, reduce cost, conserve water, avoid natural resources depletion, improve indoor environmental quality and lower the emission from greenhouse gases.

The Ministry of Climate Change is mandated to attend to the issues of national policies and programs related to urban development and human settlements, and implementing the recommendations of various policies, including National Climate Change Policy[1]. This Policy presents a range of socio-economic implications for town planning on two counts. One, the town planning is a process, by which the adaptation to climate change impacts is possible in urban areas. Two, it influences the level of emissions produced by human settlements after changing fuel and energy consumption patterns. To adapt to the climate change impacts, there is a need to introduce changes in town planning and building systems, as under.

a) Update town planning design principles for lower carbon footprints;

b) Utilize the potential of CDM by designing "zero emission buildings" through the "on-site renewable energy" technology;

c) Undertake hazard mapping and zoning of areas before construction;

d) Curb rural-to-urban migration, develop infrastructure and support facilities in smaller agro-based towns and periphery urban areas;

e) Ensure proper "Land Use Planning" and encourage vertical instead of horizontal expansion of urban housing projects;

f) Make installation of wastewater treatment plants an integral part of sewerage schemes;

g) Ensure that in large urban areas, industries are located in the designated areas;

h) Ensure separate collection, disposal/re-use of recyclable, composite and bio-degradable waste, preferably at source;

i) Use effectively the agriculture and industrial wastes as construction materials;

j) Ensure the rural-housing (reconstruction following flood damage), is climate resilient; &

k) Install solar water heaters mandatory in commercial and public buildings, where necessary.

The present "Policy Guidelines" are advisory in nature, aiming to incorporate in "1986 Building Code of Pakistan" the green practices for implementing during the designing, construction and operation stages of buildings. The Guidelines also envisage life-cycle financial savings for builders, through incorporating eco-friendly construction methods and practices, along with sustainable utilization of building materials to save energy, conserve water, improve indoor environmental quality, and lower emissions of greenhouse gases; as well as to create local jobs in green construction sector.

1 National Climate Change Policy, Ministry of Climate Change, Government of Pakistan (2012)

PART 1

SUSTAINABILITY THROUGH GREEN BUILDING

PART 1: SUSTAINABILITY THROUGH GREEN BUILDING

1.1 Green Building

The green building approach, unlike the conventional (non-green) building approach, aims at the designing, constructing and operating a building with minimal use of resources. Main idea behind green building is to minimize unfavorable impacts of buildings on the environment through the: lifecycle planning of a building, efficient use of resources, and environmental waste and pollution reduction. Main objectives of the green building are to:

- Minimize environmental disturbances and waste generation;
- minimize energy and other resources utilization;
- boost renewable energy us-age;
- improve human health and comfort; and
- reduce negative impacts of conventional buildings on human health/natural environment.

Green building is a practice of making structures and using processes, which are environmentally responsible and resources-efficient throughout the building's life cycle. Substantial savings can be achieved through integrated planning and adopting environment friendly designs in terms of materials and energy savings; besides, meeting the following Sustainable Development Goals[2].

SDG 7: Affordable and Clean Energy

SDG 11: Sustainable Cities and Communities

SDG 12: Responsible Consumption and Production

SDG 13: Climate Action

SDG 17: Partnership and/or Capacity Building

Given the acceleration of infrastructural development and rapid urbanization, the need for green building has spurred. Construction companies in developing countries are striving to integrate green measures into their construction plans to mitigate the impacts of future large-scale development in built environment on the natural environment and human health. Implementation of Green Code through cost effective ways and behavioral change will contribute in creating and maintaining sustainable buildings and eco-friendly cities; by saving energy, conserving water, enhancing indoor environmental quality to improve occupants' health and increase productivity, and lower GHG emission to reduce global warming. At building level, the Green Code activities will focus on following objectives[3].

- Healthy and comfortable building design, construction and renovation.
- Minimize greenhouse gas emissions from building life cycle energy use.
- Optimize resource efficient material life cycles, and efficient use of water energy resources.
- Resilience to climate change to protect occupier health and comfort.
- Optimum life-cycle cost and value and Eco-efficiency (performance, environmental impact).

2 UN-Pakistan's Challenges: Sustainable Development Goals 2015-2030
3 Rethinking Our Built Environment for a Sustainable Future, Environment Ministry, Govt. of New Zealand (2009)

To meet above objectives and implement recommendations of National Climate Change Policy, the Ministry of Climate Change has decided to launch Green Building Code for all new buildings. The Policy Guidelines aim to identify essential elements of Green Code, to suite our conditions and building regulations; while endorsing the Federal Government commitments towards global environmental challenges, and promote eco-friendly buildings' construction, as per the Vision 2025[4]. Also, considering that Pakistan is still following the "1986 Building Code", a quite aggressive approach would need to be followed to effectively adapt to the impacts of climate change, and introduce changes in the existing building codes and standards; besides the town planning policy and building regulations/byelaws (up-to local level).

1.2 Green Building and Climate Change

The climate change is about long-term changes in global climate patterns, including the global warming mainly due to emissions of carbon dioxide. Buildings affect the climate and the built environment can be part of the solution in combating climate change. By building green, we can reduce the impact our buildings have on contributing to climate change, while also building resilience into our homes and communities. Green buildings generate less greenhouse gas, because they encompasses a structure's planning, design, construction, operations and end-of-life recycling or renewal, while considering energy, water, indoor environmental quality, materials selection and location.

Green buildings and communities reduce landfill waste, enable alternative transportation use and encourage retention and creation of vegetated land areas and roofs. All of these strategies reduce the carbon footprint of buildings and occupants. If our country can change the built environment to be more energy efficient, the building sector can play a major role in reducing the following threats of climate change.

- Extreme precipitation in humid climate,
- Extreme summer heat events in tropical countries,
- Overheating of built environment,
- Exposure to heavy snow fall during cold weather, and
- Rising sea levels increasing the risk of flooding.

The Government policies on environment and climate change, while highlighting the sustainable use of natural resources, have prioritized the following goals to promote the green building.

- To reverse the involvement towards global climate change
- To enhance and improve individual human health and quality of life
- To achieve energy efficiency and restore the water resources
- To encourage sustainable and regenerative material resources cycles
- To build the greener economy through promotion of enhanced green building activities

4 Pakistan Vision 2025, Planning Commission, Government of Pakistan (2014)

1.3 Green Building is an Integrated Design Process

Incorporating a technique like water conservation or using green materials, or for that matter effective utilization of solar energy does not suffice a green building. For making a building green, a holistic view of adopting various features has to be conceptualized and incorporated for proper amalgamation, which in a way is cost-effective as well as useful to the mankind for achieving an eco-friendly comfortable lifestyle. Therefore, selecting an experienced design and construction team at the early phase of green building projects is necessary. With cost, quality and sustainable project delivery system, the "owner commitment", "project team procurement", "design integration", "contract conditions", "construction process", and "project team 1characteristics" can lead to the successful delivery of green projects.

The tasks in green building are not completed by a single action or entity but require a multidisciplinary team approach and the implementation of iterative processes during the building's design and construction. Construction opportunities here include preconstruction services, minimizing site disturbance, erosion and sedimentation control, pollution prevention, sustainable site operation, construction waste management, indoor air quality management, green materials management, and commissioning, among others. Thus, the application of an Integrated Design Process at the design, construction and O&M phases by the competent Green Building Teams, is a key for success to implement green sustainable projects; besides, promoting collaborative working among all stakeholders.

1.4 Benefits of Green Building

Application of green building technologies in building construction or renovation activities can reduce energy consumption by 30-50%, without significantly increasing the investment costs[5]. Green buildings reduce greenhouse gas emissions and provide their occupants following benefits:

- Improve indoor air quality and performance of buildings, infrastructure and sites
- Reduction of waste materials, which is sent to landfills, ponds, rivers, oceans, etc.
- Conservation of water & energy, & protection of natural resources/areas
- Inhabitants get healthier environment with increased user productivity
- Lower energy demand and its consumption in operating systems and materials
- Utilization of reusable or recyclable building products and materials
- Extension of the lifetime of products and buildings; besides, increased their asset value
- Environment friendly and disaster resilient materials to the natural cycle
- Comprehensive protection of natural area
- Promote all possible space-saving construction

These Guidelines aim to raise awareness & encourage incorporating eco-friendly sustainable materials & practices into building construction, and resources-efficiency, which are environmentally responsive and resource-efficient throughout the life cycle of green structure.

5 Mainstreaming Energy Resources Efficiency in Built Environment, UN-Habitat Experience in Africa, Accelerating Progress toward SDGs (2016)

PART 2

POLICY GUIDELINES FOR GREEN BUILDING CODE

PART 2: POLICY GUIDELINES FOR GREEN BUILDING CODE

2.1 Need of Green Building Code

The green building code, when enacted as law by the Federal Government, will address many of the society's concerns, including climate change, greenhouse gas emissions, environmental protection and public health; besides, the construction requirements for structural, seismic and fire safety; as well as the green building's energy performance including its operational and maintenance, and indoor air quality for building-occupants. A building is only built once, and the consequences of green code based construction decisions last for its lifetime. They affect not only energy, environment, resilience and safety, but also the other design objectives including cost effectiveness, functionality, accessibility, productivity and overall sustainability.

The Green Building Code while focusing on the negative impacts which environment has on the longevity and safety of buildings, will recommend such sustainable aspects of buildings which reduce the negative impacts; besides identifying minimum requirements to enhance the environmental and health performance of buildings throughout their life-cycle.

In Pakistan, the buildings are constructed using cement, sand, steel, bricks and finishing materials. Collectively, these materials during building construction, occupancy and also in demolition use a lot of energy, water and raw materials; generate waste and emit harmful atmospheric emissions. The local construction sector generally operates through a regulatory framework, but in absence of no specific guidelines or codes, addressing requirements of green construction, this sector has not been able to balance physical development and environment.

To mitigate the impacts of conventional construction on natural resources and environment, it has become necessary to develop the Green Building Code. It along with the popular eco-friendly construction standards will promote in Pakistan the use of such materials that are non-toxic, reusable and recyclable. Ministry of Climate Change, considering the absence of a clear strategy to promote green building and limited awareness of green designs and construction practices, has therefore, developed the present advisory paper i.e. the Policy Guidelines for Green Building Code. Its applicability is recommended for the both existing and new buildings, through implementing the explicit steps for effective enforcement of the green code.

In countries like Pakistan, faced with uncontrollable population growth, poverty and economic deprivation, an initiative like Green Building Code will facilitate in implementing the Government Policies on Climate Change; Sustainable Consumption and Production; Vision 2025; and to also fulfill various international commitments under the Rio+20 UN Conference on SDGs; New Urban Agenda; and the 10YFP on Sustainable Buildings and Construction.

2.2 Purpose of Green Building Code

Green Building Code will indicate requirements and standards essential to achieve eco-friendly sustainability in different elements of building, aiming to use less water, optimize energy efficiency, enhance indoor environmental quality, generate less waste, and provide healthier spaces for occupants to increase their productivity, encourage resource use efficiency, reuse the building materials (where possible), maximize positive and minimize negative environmental impacts of building construction (climate change), and reduce GHG emissions.

2.3 Pre-requisites of Green Building Code

To ensure sustainable design, construction, and environment friendly performance of buildings, the Green Building Code be customized according to local conditions of Pakistan, as under.

- **Climatic zones:** Pakistan varying climates, from very hot-dry to cold-humid; and characteristics of each differ. Green Code needs to meet the comfort requirements and type of buildings in four climatic zones, i.e. Hot-dry, Warm-humid, Cold and Composite.
- **Create a market demand and uptake of green building practices** through the nation-wide implementation of Green Building Cod, focusing on the production and application of environmentally supportive construction materials and building elements. The Green Building Code specified items and materials, including energy efficient building materials be included in the specifications and manuals of Government Public Works Documents, as well as in the Public Procurement Guidelines. This would encourage the production and use of green products and help the supply side to meet private sector demand; besides popularizing green building practices among developers and builders.
- **Transforming old building construction practices into green building expertise** is also necessary to promote the use of locally manufactured products and wastes from agriculture and industries, which are non-toxic, reusable and recyclable, wherever possible. It is therefore, necessary that the guidelines to procure green construction materials and green construction standards be developed, and widely disseminated.
- **Building typologies** must be specific, because the buildings constitute many types – offices, institutions, hotels/restaurants, shopping malls/retail markets, community buildings, banks, educational facilities, hospitals, etc. Prime energy consuming buildings are fully air-conditioned offices and hotels.
- **Residential** structures are single and multi-storied buildings. In case of multi-use buildings, the dominating occupancy be reckoned as a starting-point, wherever applicable. Upon the installation of individual metering, the energy consumption and water uses in internal-spaces should be measured separately
- **Implementation process** of Code is recommended to measure the post-construction impacts of green buildings, with focus on commissioning, maintenance & operating; and also the tools for evaluating & measuring environmental performance of green buildings.

2.4 Guiding Principles for Green Buildings Code

Green Building Code be jointly developed by Federal and Provincial Governments, along with green building developers, industry and other stakeholders, to specify minimum requirements to develop a sustainable built environment. It has to take in to account all prevalent codes and standards, including Building Code of Pakistan; Seismic Provisions Code; Building Energy Code; and Fire Safety Provisions Code (being applied at different stages in building life-cycle). It is necessary to frame Green Code based on the following Guiding Principles[6], including the circular-economy, which has gained awareness of the content and the viability of green business opportunities; and a "common language" of green standards, construction processes and measures.

6 10YFP Programme on Sustainable Buildings & Construction, Pekka Huovila, Green Building Council Finland (2017) pekka.huovila@figbc.fi/www.oneplanetnetwork.org/sustainable-buildings-and-construction.

A - Planning and Design of Green Building

(1) Optimize Site Potential: Making sustainable buildings starts with proper site selection, including consideration of reusing or rehabilitation of existing buildings. Location and orientation of a building affect local ecosystems, construction methods and energy use. Planting the greenery wherever possible on ground like planned afforestation, will support the carbon-sinks on-site. Whether designing a new building, or retrofitting an existing building, the site-design must integrate with the native flora and fauna, and control storm-water run-off to make a successful project.

(2) Employ Integrated Design in Project Preparation and Development: Develop resource-efficient site design and adopt development practices, which reduce environmental impacts and improve energy performance of green buildings (shading trees, make on-site storm-water retention features, orient houses to maximize passive solar heating and cooling). Use integrated planning and design process in all stages of project development for cost-effective adoption of Green Code, based on building's lifecycle indicators for siting, energy, water, materials and indoor air quality. For proper application of the Green Code practices, it is also necessary to launch the green building construction skill development courses; besides, creating green vocational jobs at local level.

B - Green Building Construction

(3) Optimize Building Space and Material Use: The Integrated use of materials maximizes building value, prevents pollution and conserves natural resources. Green buildings be designed and operated to use and reuse materials, as well as blending agriculture and/or industrial wastes with cement, in the productive way across their entire life cycle to minimize environmental impacts (global warming, resource depletion, ozone depleting compounds). Moreover, the green infrastructure be constructed using less cement with low water-to-cement ratio to provide durable long-lasting structures, which are more economical, save energy and reduce the GHG emission. Eco-friendly materials and products (adhesives, sealants, sealers, paints, etc.), reduce pollutant emission impacts on the residents' health and contribute to improved worker safety, at reduced costs.

(4) Building Adaptability: Green Building Code be applicable for green buildings to support multiple uses and features, by increasing their capacity for multiple uses and in multiple ways over the life of building, e.g. designing with a modular and integrated approach to materials delivery and interior systems (fixtures, ceiling systems, demountable partitions and access floors).

(5) Building Resiliency: As the built environment faces the impending effects of global climate change, the Green Building Code needs to also increase resiliency of buildings structure and envelope to continue functioning and operate under extreme conditions, such as (but not limited to) the extreme temperatures, sea level rise and natural disasters.

(6) Building Envelope Efficiency: Day-light contributes to more conducive and productive working environment. The building envelops and depth of office work-spaces in large buildings be planned such as how much floor area can be illuminated with natural light (necessary for a working environment), and where necessary to have light during day-time, through installing the solar-light panels. To minimize Urban Heat Island effect and curtail heat transfer indoor, provide shade on south-west facing windows and built-areas like covered porches, vegetative fences, or architectural

features. The Code can specify heating and cooling loads by sun-tempered design with automatic dimming and glare control; besides limiting windows on east-, south- and west-facing facades, and the overhangs on south- and west-facing windows to prevent overheating.

C - Resource Efficiency

The livelihoods of majority of population of Pakistan are dependent on the use of natural resources including land, water and geographical biomass. In the remote mountains, arid/semi-arid and coastal areas, the dependence of local populations is almost entirely on the natural assets. The Green Code targeted-application and its sustainable-use regimes will protect the natural resources. These interventions will help in establishing market chains for green building products, and subsequent value addition to the sustainable materials and services will help in wide scale replication with the involvement of local government institutions and the communities.

(7) Protect and Conserve Water: Protecting the quality and availability of clean drinking water resources is the most critical environmental challenge for us. Pakistan has exhausted its available resources and is on the verge of becoming a water-deficit country. Since building fundamentally changes the ecological and hydrological function of non-built land, a green building should minimize impervious cover created after construction, by using water efficiently

and reusing it for on-site use. In indoors, employ strategies that in aggregate use minimal potable water, than the baseline calculated for building. In outdoor, use water efficient landscape and irrigation strategies, i.e. water reuse and recycling, and select less water consumption plants. Also, the proper selection of plumbing fixtures, equipment and fittings can minimize the end-use of domestic water; besides conserving water quality and availability.

(8) Water Efficiency provisions are an essential part of the Green Building Code. The Ministry of Climate Change has launched under the Green WASH Campaign in alignment with Pakistan Vision 2025 and Sustainable Development Goals to transform the living and working environment inside buildings by increasing access to safe water and sanitation[7]. Aim at reducing water-use in green buildings, by adapting low-cost options, and developing capacity along with safe hygiene behavior of the residents to lower the water consumption by the residents, as specified by Green Code. Dual plumbing design can be recommended to use recycled water for toilet flushing, or a gray-water system that recovers rainwater, or non-potable water for plants, and minimize wastewater generation by low-flush toilets, low-flow shower heads, etc.

(9) Minimize Embodied Carbon (grey carbon) in Buildings: Embodied carbon in construction industry is a major factor of Climate Change. As per Paris Intergovernmental Panel on Climate Change Agreement, take steps to limit the amount of CO^2 produced in construction. Take into account at design stage of building the GHG emissions produced during extraction and transportation of materials used to construct a building, the building work itself, renovations, demolition and re-use of materials. Establish inventories of used materials, including the agriculture and industrial wastes that can be re-used in new buildings. Encourage to use more environmentally friendly materials (eco-friendly cements, organic cements, cement-free concrete, use less carbon-producing materials); and also incorporating renewable resources for internal and external architectural features as per the building orientation and landscape.

7 Establishment of National WASH Cell (Project/Program Concept Paper), Ministry of Climate Change, Government of Pakistan (2017)

(10) Enhance Indoor Environmental Quality: Internal ventilation, thermal (both natural and mechanical) and moisture control of building impacts the occupants' comfort and productivity. Green Code must ensure the maximum day-lighting, appropriate ventilation, moisture control, optimize acoustic performance, avoid use of high emission materials, and provide occupants' control on light & temperature. To maintain indoor air quality, the healthy environment standards with a management plan for regular cleaning/repair of energy-efficient HVAC systems be specified.

(11) Construction Waste: Green projects need to employ eco-friendly waste management practices, i.e. waste-prevention, preservation and landfill, salvage reclaim and reuse, recycling and material recovery. During project's planning stage, identify local salvage operations which process site-related waste& recycle construction/demolition/land clearing waste.

2.5 Types of Codes

- **Prescriptive codes** provide a fast, definitive and conservative approach to code compliance. Materials and equipment must meet a certain levels of stringency, which are quantified. However, here the market innovations may not be exploited fully to satisfy the clients' requirement; even if it meets the green code specified technical limits.
- **Performance-based codes** are designed to achieve particular results, rather than meeting prescribed requirements for individual building components, or larger units (e.g. energy consumption on emission of buildings, instead of the thickness of thermal insulation).

In Pakistan, current building regulatory system is predominantly Prescriptive-, or Specification-based, and consists of a collection of codes and standards that describe how buildings should be designed, built, protected and maintained with regard to the safety and amenity of general public. Although the approach of specifying both what is required by the code and how the requirements are to be met, may be appropriate for a prescriptive-based system, it may not be appropriate for a performance-based system (where the how may be met in a number of ways). For effective implementation of the green code, a Performance-Based System based on following components is recommended to be adopted up to Local Government level.

- **Green Building Code**, which through functional objectives and performance requirements will reflect the society's expectations of the level of health and safety provided in buildings (e.g., items such as acceptable access, egress, ventilation, fire protection, electrical services, sanitary services, etc.).
- **Standards and Practices**, in separate documents, adopted by references, that describe accepted methods for complying with the requirements of the Green Code.
- **Evaluation and Design** Tools, which provide accepted methods to assist in the development, review and verification of green designs in accordance with engineering standards/practices.

2.6 Mandatory and Optional Code Provisions

To expedite the adaption of green building and assist in promoting green construction expertise up to local level in Pakistan, it is recommended to enforce Green Building Code in two phases.

- In First-phase, the application of **Mandatory Code Provisions** (pertaining to construction works and employing green materials at affordable cost) is recommended for initial five years. In this period, the remaining provisions of Code be reckoned as **Optional Code Provisions**, for application by substituting acceptable Standards.

- In 2nd Phase after the expiry of five years' period, the Optional Code Provisions will automatically become Mandatory Code Provisions for compliance at all levels.

Based on the review of various green building or construction codes and standards in different countries (Malaysia, Singapore, China)[8], it is recommended that Green Building Code be developed in three Sections, as under.

- **Mandatory Code Provisions** to include the Site development and Land use; Building Envelop Efficiency; Water and Energy Efficiency; and Construction Wastes, which will be effective from the first enactment date of Green Building Code.
- **Optional Code Provisions** may include Indoor Air Quality; Urban Heat Island; Building Commissioning; Post-occupation O&M. (to become Mandatory after grace-period expiry).
- **Outcome-based Code Provisions**, to accommodate optional provisions to meet minimum condition of Mandatory Code; and specified to meet target-use level of water and energy, and enable measurement/reporting their use via the level established for completed buildings.

2.7 Format of Green Building Code

During the designing and construction of new green buildings, or retrofitting of existing buildings, many elements need to be considered, including Code provisions, Referenced standards, Technical specifications and Building regulations. Their intended application must be mentioned in the Green Building Code, under specific group(s). The present Building Code of Pakistan was enacted in 1986 by the Federal Government, comprising the following Parts.

Building Code of Pakistan 1986"	
Preface	
Part - 1	Administration
Part - 2	Definitions
Part - 3	General Building Requirements
Part - 4	Fire Safety
Part - 5	Construction Safety Measures
Part - 6	Water Supply
Part - 7	Drainageand Sanitation
Part - 8	Gas Supply
Part - 9	Electrical System
Part - 10	Materials
Part - 11	Loads
Part - 12	Elevators/Escalators
Part - 13	HVAC System
Bibliography and Conversion Tables	

8 Adoptable, Useable & Enforceable Code – An Overview, International Green Code Council (2012) www.iccsafe.org/igcc

The Green Building Code will be finalized keeping in view the following standard pre-requisites of a code.

- The Codes be considered as a Standard, which can be adopted by the all Government authorities, organizations and bodies undertaking all types of building construction works.
- Relevant provisions of the Code can be incorporated into the business contracts.
- The Code provides a set of requirements and standards, specifying the minimum acceptable level of safety for manufactured, fabricated or constructed objects.
- The Code can be adopted as a law (i.e. it has the force of law) and its legal jurisdiction can be adopted without changing it, modify a part of Code, or developing own Code.
- The Codes are divided into different elements of building control (electrical, energy, water, sanitation, plumbing, etc.).
- The Codes be developed on three or five years cycle, and reviewed to accommodate new improvements in construction.

The scope of Green Building Code will include the green building relevant provisions as included in various building codes already enacted by the Federal Government of Pakistan, and including the following.

- Building Code of Pakistan (1986)
- Seismic Provisions Code (2007)
- Building Energy Code (2008)
- Fire Safety Provisions Code (2017)

Further guidance can be taken from the recently established Pakistan Green Building Council, which has also developed in 2016 the Draft Pakistan Green Building Guidelines[9].

It is recommended to develop the Green Building Code in three Sections.

- **Section-1:** Broad Issues Pertaining to Green Building Code
- **Section-2:** Main Building Code (Includes Mandatory and Optional provisions)
- **Section-3:** Green Code Compliance& Informative References

Following is the Section-wise List of Contents (including various green building elements, components and construction materials). This being tentative, the Final List of each Section, including the mandatory or optional code provisions, will be decided by the Experts Working Group on Green Building Code.

9 Green Building Guidelines (Draft Volume-I), Pakistan Green Building Council (2016) www.PakistanGBC.org, aqrab@pakistangbc.org

"Green Building Code"
(Proposed Contents, but not limited to these)

Section-1: Broad Issues Pertaining to Green Building Code

- Administration and Exemptions of the Green Code Provisions.
- Definitions, Abbreviations, Acronyms, Glossary
- Scope and Jurisdiction of Green Code, Building Types and Categories
- Climate and Seismic Zones and Representative Weather Data

Section-2: Main Green Building Code

A - Site Planning and Development for Green Building

Area Development and Land Use

- Plan for energy-conserving layout, with easy access to schools, work, public transportation
- Cluster buildings around green-lots. Plant trees in paved-areas to reduce Heat Island Effect
- Use recycled materials/aggregates and wastes from agriculture and industries, for paved areas for streets, sidewalks, parking lots and open green spaces
- Protect and preserve maximum natural site features/resources, water bodies & features
- Create well-connected green/quality living places, resilient to climate change and disasters

Building Envelope Efficiency - Interventions to green building envelop, as considered in "Green Building Guidelines-Sustainable Sites 2016", and including:

- Site Configuration, Buildings' Orientation, Shading Features and Plantation, etc.
- Glazing and Windows (Fenestration), Day Lighting and Indoor Comfortable Lighting
- Wall (Non-glazed Facades, external Paints) and Roof (Shape, Green Roof and Skylights)
- Glare Control, Moveable Louvers, Tinted Glass, Fenestration Surface Area Limits

B - Green Building Construction

- Green Building Materials and Products Procurement, Disclosure and Optimal Use
- Collection of Recyclables Materials, Storage and Reuse

Green Building Safety codes taken from Building Code of Pakistan (Seismic Provisions)

- Seismic Zone-wise Site Soil-Foundation Interface (Piles, Caissons)
- Foundation-to-Superstructure Connection, Retaining Walls
- Structural Framing and Pre-fabricated Construction as per Seismic and Wind Design
- Dead- and Live-Loads Distribution, Seismic Load Combination
- Flood Resistant Construction, Non-building Structures- Rigid, Supported
- Non-destructive Testing (Structural Steel, Concrete, Masonry, Electro-Mechanical, etc.)

- **Fire Safety** codes to be taken from Building Code of Pakistan (Fire Safety Provisions)
- Fire Protection Zones and Boundaries in green buildings, Emergency Egress
- Asbestos Use (as per specified safety considerations, especially in refurbishment)
- Interior Finishes and Paints, Combustibles Partitions and Furnishing
- Fire Smoke Alarms, Safety Equipment/Extinguishers, Sprinklers Pumps, Fire Hydrants
- Fire Smoke Control, Partitions/Barriers, Building Evacuation and Fire Assembly Spots
- Electrical and Gas Fire Safety, and Communication System

C - Resource Efficiency

Water Efficiency & Gray Water Disposal

(As in Building Code of Pakistan and Green Building Guidelines-Water Efficiency)

- Water Fixtures, Water Tanks, Bulk Water Storage, Rain Water Harvesting & Collection
- Indoor Water Use Reduction& Metering
- Water Efficient Landscaping, Outdoor Water Use Reduction
- Wastewater Collection & Treatment Plants, Recycled Water, Non-desalinated Water for AC

Energy Efficiency

(From Pakistan Building Energy Code & Green Building Guidelines-Energy)

- Building Envelop Trade-Off Options viz Necessary Interventions
- Outdoor Lighting, HVAC Equipment Efficiency, CFC-free Refrigerants
- Indoor Lighting Fixtures, Systems & Smart Control Devices, & Efficiency Metering
- Solar Water Heating, Reverse Metering, Thermal Comfort, Renewable Energy Production
- Cooling Systems (Internal Cooling, Radiant Cooling, Local &Solar Absorption Cooling

Gas Supply: To be framed as advised by concerned Agency

Indoor Air Quality &Comfort (As in Pakistan Green Building Guidelines-IEQ (2016)

- Minimum and Enhanced Indoor Air Quality
- Environmental Smoke Control, Operable Windows and Daylight
- Interior Lighting and Ceiling Fans
- Chemicals Pollution and Low-emitting Materials
- Air-borne Sound Insulation/Acoustic Control
- Efficient and Passive Ventilation, Indoor Air Quality

Material Resource Conservation & Wastes (Pakistan Green Building Guidelines-Materials & Resources)

- Asbestos Containing Material (as per waste treatment & disposal/recycling criteria)
- Acoustic and Thermal Materials
- Lead and Heavy Metals Containing Materials
- Ozone Depleting Potential Materials Management
- Construction and Demolition Wastes Management/Disposal
- Recycled Waste Contents

D – Post-Completion Green Building Actions

- Commissioning and Inspection after Completion of Green Building
- Optimizing O&M of Green Building
- Eco-friendly Land-use Development

Section-3: Green Building Code Compliance and Informative References

- Checklist Forms of Planning Process to adopt Green Building Code
- Green Building Commissioning Pre-requisites and Compliance-Paths
- Optimal O&M of Green Building Checklists
- Code Compliance Forms, Worksheets, Referenced Manuals.
- Referenced Standards and Organizations (Essential part of Code as per their prescribed extent).
- Appendices (Necessary to offer optional or supplemental criteria to main Code provisions

2.8 Approaches to Develop Green Building Code

As recommended in the 'National Climate Change Policy", the "Sustainable Development Goal - 11(Sustainable cities and communities)" and the "United Nations 10YFP Program on Sustainable Buildings and Construction", all green buildings are required to achieve as soon as possible the energy efficiency, conserve environmental resources, reduce greenhouse gas emissions, and enable operation of buildings in a sustainable manner. The integration of Green Code programs in the planning, adoption and enforcement (whether voluntary or mandatory), involves many agencies in public and private sectors to incorporate in green buildings the following six elements of construction and performance.

- Site selection and development
- Energy efficiency
- Water conservation
- Materials and resources
- Indoor air quality, or environment
- Owners' building operations manuals

This means that the green building codes must be incorporated (appropriate to building type and project scope) in future buildings' design, construction and O&M processes (including new construction, renovations or alteration), and ensure environmental sustainability in all stages of building life cycle. To achieve that objective, the following approaches have been followed in other countries[10].

- **Green Code developed by National Government, separate from Green Regulations to be framed by Local Governments:** National Government utilizes all building relevant codes to make National Green Building Code. Then, Provincial Governments can independently develop Provincial Green Building Codes, for enforcing Building Regulations/Reference-Standards framed by Local Governments. They also manage green code enforcement, including inspection and green permit issuance. It is recommended to update Green Codes every five years. Australia, Canada and USA follow this system.
- **National Green Code developed by National Government, alongside Draft Building Regulations:** National regulatory system provides a degree of freedom to Provincial & Local Governments in modifying, adopting and enforcing their building regulations. In China and Indonesia, Central Government develops codes & regulations, & Local Governments may freely adopt or reject the codes or regulations; but they have little authority to modify codes.
- **Green Building Regulations specify use of Best Practices and Standards, but allow Equivalents to be decided at local level:** After enactment of Green Code, the Green Building Regulations are developed and enforced by Local Governments. These regulations allow the use of National Green Building Code or Non-local codes, standards and best practices in place of local ones. In Malaysia, local jurisdictions have developed and enforced their own standards.

Keeping in view the precedent followed in case of Building Code of Pakistan 1986, and to expedite the implementation of Green Building Code, the appropriate methodology recommended is that the Federal Ministry of Climate Change must take the responsibility to develop and enforce the Green Building Code throughout Pakistan; and the preparation of green building Regulations, Bye-laws and Standards be assigned to the Provincial Governments (Urban Units), along with the Local Governments and Development Authorities.

2.9 Methodology to Prepare Green Building Code

As discussed above, in Pakistan, presently four building codes are operative i.e. Building Code of Pakistan, Seismic Provisions Code, Building Energy Code and Fire Safety Provisions Code. In addition, various local "Building Regulations and Standards" are framed by the Local Governments including Development Authorities, Municipalities and Cantonment Boards; which determine the primary requirements for occupants' safety, health, accessibility, hazard, earthquake, fire and structural protection of buildings, in respective jurisdictions.

These Codes do not include specific Green Building Code's provisions necessary for sustainable and eco-friendly buildings design, construction and post-completion operation. The Green Building Code will be additional to the all existing building codes. However, it may supersede the existing

10 Environmentally Sustainable Library Buildings: Opportunities & Challenges for Asian Countries, Saima-Qutab, IFLA-WLIC (2016) saimaqutab83@gmail.com

Building Code of Pakistan 1986 needs to be fully revamped to develop a wholesome new Green Building Code based on above-listed Guiding Principles; and as per the following sequential Steps; and reviewing the green support provisions of other Codes of Seismic, Energy and Fire Safety.

Step One: Based on the green building objectives as identified by Ministry of Climate Change, a "Consultant" or "Subject-Specialists Team" should conduct a comprehensive evaluation of existing zoning policies & building regulations, byelaws, codes and ordinances that may impact the implementation & effectiveness of green building code; to identify the environmental hot-spots along life-cycle of building, and directly impacting to achieve Eco-friendly objectives. Also, the potential trade-offs between different resources use and their impacts on functional performance (energy efficiency, natural lighting, and water) be identified[11].

Step Two: The Consultant/Team will analyze and decide green performance objectives and codes for application in new and old buildings, throughout Pakistan, following a bottom-up approach to respond to each development stage (planning, design, construction, commissioning, occupation, O&M), with continuing emphasis on buildings' life-cycle resource efficiency. Accordingly, the green codes with measurable objectives to be developed, along with the near- and long-term milestones and a process to implement and evaluate the green code compliance.

Step Three: After formulating minimum green codes for various stages of building construction, based on life cycle resource efficiency, a consensus of Green Code Steering Committee will be taken; besides, ensuring that each proposed code is applicable at project level. Other relevant Codes of Pakistan to be checked to identify minimum codes, for including in Green Code.

Step Four: The Consultant/Team will finalize a fresh Green Building Code and submit to Ministry of Climate Change for approval/enactment. New Green Code, will replace the existing 33 years old Building Code of Pakistan; but would neither supersede, nor replace other Codes of Seismic Provisions, Building Energy and Fire Safety Provisions. To expedite the effective implementation and compliance of Green Building Code, the Ministry of Climate Change can ask the Consultant/Team, or advise the Provincial and Local Governments to prepare the following documents.

- **Green Code Implementing Guidance Manual**
- **Performance Indicators for Code's Compliance**
- **Green Materials Production & Procurement Guidelines**

To accomplish the above-mentioned tasks, the Ministry Of Climate Change may set-up an inclusive and collaborative Stakeholders Task Force, including the following.

- Federal and Provincial Governments nominated Officials
- City Development Authorities Officials (building and planning departments)
- Green Building Industry Representatives
- Builders, Contractors and Developers' Associations Members
- Architects, Construction Engineers and Urban Developers
- Utilities Representatives
- Energy or Water Conservation Specialists
- Interested Community Activists

11 Green Building Program, Los Angeles USA. zoup@planning.lacounty.gov

2.10 Time to Complete Green Building Code

As explained in Sub-Section 2.9, the four steps process is necessary for properly preparing the Green Building Code. Considering our working set-ups, all steps can be completed in one year.

Step	Period (Months)	Action by
One	02	Ministry of Climate Change & Consultant or Specialists Team
Two	03	Consultant and/or Team
Three	04	Ministry of Climate Change & Consultant/Team
Four	03	Consultant/Team
Total	12 (One Year)	

2.11 Jurisdiction of Green Building Code

Green Building Code is basically a technical document, but necessary to be adopted as a legally enforceable Code, by the Federal and Provincial Governments through their Local Governments and Building Control Authorities. Every word, term and punctuation mark of Green Code can impact the meaning and specific instruction of Code's text, as well as the intended results. This means, that for effective administration and compliance of the Code, specific provisions and regulations for various types of buildings be also developed. It is recommended that initially the construction and functional performance of following types of building activities should come under the purview of Green Building Code[12].

- **New Construction and their Systems** - Refers to site preparation and construction of entirely new structures; or new portions of existing buildings; or extension to existing structure, either occupied or unoccupied; or new systems & equipment in existing buildings.
- **Large Projects** - Green Building Code be applicable to large space projects, including, but not limited to the terminal (airport, rail, bus), commercial space (retail, malls, restaurant), office facility, parking plazas, shopping malls, community buildings, etc.
- **Interior Construction** - Fit-out or remodeling of an interior space including necessary interventions inside building envelope, like restaurant renovation, office space remodeling, airport terminal retail renovation, etc.
- **Reconstruction, Renovation, Addition, Refurbishment and Change of Use** - Green Code will also apply on existing buildings' replacement; renovation and rehabilitation of primary building systems; or multiple-coordinated portions or elements of building, being altered or improved. In case of large buildings, the Green Code may allow for incremental renovation or improvement during the change-of-use of an existing building.
- **Mixed Use Buildings** - When a building combines more than one use, each portion of the building must comply with the relevant Green Code for that particular typology, under separate compliance metering arrangements.
- **Small Projects & Utility/Service Systems** - Replacement or rehabilitation of fewer building systems, ceilings/window replacement, plumbing/HVAC, site work, electrical/electronic, etc.

12 Energy Efficiency Resource Book (NCC) Australian Building Codes Board (2016) www.abcd.gov.au

- **Housing** - All new houses to be built on plots measuring more than 05 Marla shall follow the Green Code. Already built old houses and multifamily structures up to two stories may be exempted from the purview of Code. Also, the manufactured houses (modular or system built), and buildings not using electricity, fossil fuel or water can be exempted.

2.12 Green Building Code Implementation Plan

To ensure the effective application of Green Code, the first important pre-requisite is that the applicability of present Policy Guidelines be assured in advance by the Government, for the both "existing Building Code of Pakistan of 1986" and also the "new Green Building Code"; besides, deciding the explicit steps to be taken for proper enforcement of Green Building Code.

Initial focus of the Governments at all levels should be on the designing and construction of new public buildings complying with mandatory green performance level. New building's contracts must include the green materials and systems' specifications and procurement methods; the services to abate hazardous materials; give preference to the reuse/recycle waste materials. This should also apply to the leasing, repairing, altering, operating and maintaining green buildings.

Effective enforcement of Green Code will be possible after imparting green building training to Building Inspectors/Code Compliance Officials; besides establishing efficient procedural-cum-scrutiny mechanisms for inspection & certification of green buildings. Initially, such inspection/certification activities can be supplemented by private Green Rating Agencies.

- **New Buildings:** Green Building Code be firstly implemented in new buildings of Federal Ministries and Provincial Departments, preferably in Islamabad and all Provincial Capitals fully complying with minimum green performance criteria for planning, designing &construction. Autonomous Public Organizations be also mandated to adopt Green Building Code in their projects. **In Private Sector**, after announcing a cut-off date and allowing to build capacity of the market structure (i.e. both skills of builders and availability of materials to meet green construction requirements), the developers/builders be required to adopt Green Building Code in all **Future Buildings** (other than residential buildings), and achieve specified Green Performance Rating Score. For Residential Buildings, a minimum criterion be separately specified; suitable to the local conditions, and meeting some easily adoptable green-score or rating criteria.
- **Existing Buildings:** Existing buildings in urban areas and also in rural areas constitute a large part of our built-environment. A different enforcement strategy is required for converting old buildings into green buildings through retrofitting. Their modernization be undertaken as a major sustainable building initiative. Such multi-phased modernization projects must aim to raise the building's sustainability level to achieve minimum green code criteria. This may include green features like: energy and water efficiency upgrades, eco-friendly construction materials, recycling of construction/demolition debris, alteration to existing buildings with sustainable features (photovoltaic & solar systems), energy saving performance (retrofit offices with energy/water conservation measures).

In order to enable the "green code compliance" evaluation and "green rating" of retrofitted old existing buildings, it is recommended that the Green Building Code to advise for the "mandatory audit of all existing buildings". This audit be conducted by an independent body in order to certify whether an existing building is fit for green code's application. The building-owner/user will pay the fee for "audit-certification".

2.13 Post-Completion Actions for Green Buildings

- **Commissioning:** Green Building Code can specify Post-Completion Action Plan to employ green commissioning practices tailored to size and type of building and its system components, so as to verify the performance of building systems and components. Such Action Plan needs to include specific requirements for proper building-completion, commissioning-steps, installations-verification and systems' performance; besides, the regular O&M. In all these phases, the adoption of MRV (Monitoring, Reporting and Verification) Approach would ensure meeting the green building objectives.
- **Optimize O&M Practices:** Green Code has to promote eco-friendly materials/products, which enable the building O&M systems to consume less water, energy and toxic chemicals (i.e. cleaners to maintain). Include Metering at design stage to track progress of reduction in energy and water use, waste generation, etc. Also, the "O&M Capacity Building Manual" be developed. The achieved preferences in-use can be validated by the Post Occupation Evaluation and On-Line Monitoring. Their results be made available to the stakeholders, in order to further test the applicability of technology applicability.
- **Land Development:** Green building process should not stop at project level. Green builders be involved in site planning and land development; to improve storm water management and preserve natural resources through careful design practices, with the help of a community accepted "Environmental Impact Assessment", to curtail the overall environmental impact.

2.14 Availability of Green Building Materials and Products

Successful green construction demands careful planning and procurement of green materials. The Green Building Code while prescribing the use of green materials to the builders and developers must facilitate in achieving the green materials efficiency, as well.

This requires the Ministry of Climate Change to arrange a nation-wide Consultation, prior to enacting the Green Building Code, of all stakeholders (including environment professionals, engineering academics, building developers and associations like Association of Builders & Developers; Contractors Association of Pakistan; Pakistan Engineering Council; Pakistan Council of Architects & Town Planners; Institute of Architects Pakistan; and the green building materials' industry including producers and suppliers). Such Inter-active Consultations will determine the practical solutions of following issues; besides reviewing various measures to stimulate the economic opportunities for green construction business along with a perpetual demand for green materials and products. In this connection, it is very important to make sure that the "import regulations" do not make it impossible for local suppliers to compete, if they can ensure the required production by relevant industry. It is also relevant to consider that how the Green Building Materials Procurement Guidelines are developed, and by whom.

A series of Inter-active Consultations or Thematic Workshops be arranged by the Ministry of Climate Change, focusing on the following essential aspects of Green Building Code.

- Building Code should enable its users to benefit from green market, by establishing a common standard ("Code Approved"), affixed on green materials and products, after such label award

to existing or new products tools and standards. This is necessary to avoid confusion in market.

- Selecting green materials/products by evaluating several characteristics (reused/recycled content, off-gassing harmful air-emission, zero toxicity, & Code-complaint industry).
- Adopting dimensional planning for material efficiency strategy, to reduce building material needed & cut construction-cost. Plan building-layout on grids to get standard-sized elements.
- Reuse and recycling of construction and demolition materials (i.e. using inert demolition materials as base-course for parking lot keeps materials out of landfills and costs less).
- Building projects documents should include the Plans for managing on-site the materials through deconstruction, demolition and construction.
- Designing with adequate space to facilitate the recycling collection and to incorporate a solid waste management program that prevents waste generation.

2.15 Green Construction Standards

All "building codes including "green codes" rely on some Reference Standards for various building elements. It is necessary that after implementing Green Building Code, the concerned stakeholders including Private Sector and Government Agencies (both Federal and Provincial) also decide about the Pakistan Green Building Standards. Various International Reference Standards for Green Building Elements and the Pakistan NEQS (National Environmental Quality Standards) can guide us in developing the Green Standards (both technical and procedural), meeting Green Code criterion and post-construction impacts on green building performance, including the commissioning, maintenance and operations[13].

The Green Standards will provide guidance on the reliable green construction methods as mandated by Green Code, along with knowhow regarding performance of construction products; and a "common technical language" based on uniform assessment standards and methods to check the performance of products. Primarily, the standards are to be implemented by manufacturers, when declaring the performance of their green products, and the users (architect, engineer, contractors), when choosing green products for use in green building works.

For successful application of Green Code, we need to adopt such Standards, which are appropriate to the local and national technologies and procedures. But, a balance is required; besides maintaining the building safety while moving forward with greener materials and equipment. Also, we need to check that the adopted Green Code and Standards are not counter-productive to local customs or culture, jobs, materials, life-cycle assessment and relevant SDGs.

In is therefore, necessary that along with the preparation of Green Building Code by Ministry of Climate Change, the concerned Federal & Provincial Line Departments & Organizations should undertake relevant research and develop specific Case Studies based on local green building practices and supporting technology to properly produce and install the green materials.

13 Developing a Green Sustainable Building Rating System, Samir R. Traboulsi (2013) Samir.traboulsi.@mail.ashrae.org

2.16 Green Building Performance Rating Systems

After the enforcement of Green Building Code, the performance monitoring of all green building projects need to be carried out, to check the compliance of Code provisions, during the construction, post-completion occupation and O&M of in-use buildings. For example, the "energy performance" in all newly constructed buildings should reach nearly zero-energy levels in a given time-period. This energy-efficiency is to be determined through the life cycle methodologies, including Life Cycle Assessment and Life Cycle Energy Analyses. Therefore, the green buildings call for the assessment of their environmental benefits through a green building certification system. The Pakistan Green Building Council has published the "Rating System Selection Guidance" in "Reference Guide of Building Design & Construction in Pakistan".

Many green building rating schemes are developed to meet the demands of developed western countries, and they generally cater for much colder climatic conditions. Some green rating systems focus on branding certain commercial developments, while the others provide tools for self-assessment and improvement, specific to their condition.

In case of Pakistan, it is also necessary that the Green Building Code be applicable for all types of old and new buildings, as discussed in the preceding Sub-Section 2.11 (Jurisdiction of Green Building Code). This requires such rating system to check the implementation of green code, which also serves as evaluation tool to measure environmental aspects of building through its life cycle.

The application of a particular rating system (which is successful in northern hemispheric countries-mostly with cold climate), cannot be adopted for our hot climate; it would require substantial revisions and modifications prior to adoption, in order to ensure its suitability for Pakistan's predominantly hot tropical conditions. Affordability in terms of cost must also be considered. Therefore, the approval of green buildings plans and code compliance rating by building control authorities need to be gradually linked to developing and obtaining a Green Performance Certification, compatible with our culture, building traditions and local climate.

Ministry of Climate Change may set-up an "Experts Committee on Green Performance Rating System" to study various rating tools and systems and recommend a system supporting the efficient implementation of Green Building Code in Pakistan. A gist of Green Performance Rating and Certification System and Tools being followed in various countries is placed at **Annex-II**. The Committee can also review the post-construction impacts on green performance and provide guidance to assess the sustainable commissioning, maintenance and operation of green buildings.

2.17 Public Awareness of Green Building Code

Besides the enforcement of Green Building Code among the green building developers and builders; the awareness of Green Code also needs to be targeted to multiple levels of professionals, investors, regulators, academia, etc. The following public awareness activities are recommended for effective enforcement of Green Building Code throughout Pakistan.

1) Promote the adoption of Green Building Code and practices, by launching a nationwide campaign on media (including both print and electronic), focusing on the adverse environmental impacts of construction-related activities.

2) Harness social media to spread key messages of green practices/eco-construction, addressing all stakeholders with focus on cost efficiency of green measures over building life cycle.

3) Work with universities to integrate green building and life cycle concepts in curriculum of town planning, architecture, engineering, and target potential planners, engineers& architects.

4) Build vocational training capacity of the green building construction and O&M workers, as well as in the areas of plumbing, installing solar panels, etc. as per the Green Building Code.

5) Prepare "Green Building Index" where targets and indicators for green buildings are devised.

6) Establish a Green Building Cadre in the public sector building institutions, as a potential job opportunity in Pakistan, where green construction and O&M expertise demand is growing.

7) Train Building Control and Inspection Officials for execution of resource-efficient green construction practices, complying with the Green Code mandatory provisions.

8) Arrange the competitions for "green building design" at university; design offices and departmental levels, along with their promotion on social media.

9) For awareness of general public, develop in national and provincial languages "General Instructions Manuals to Apply Green Code" in design/construction/O&M of green buildings.

10) Launch a series of the Federal and Provincial Governments sponsored Seminars, Workshops and Conferences on the benefits of green building and application of green code.

2.18 Government Incentives to Implement Green Building Code

The Green Building Code must provide a common framework of green standards and practices acceptable to all Federal & Provincial public institutions, development authorities and building departments receiving budgetary funds. Future physical planning, housing and urban development programs should ensure the compliance of Green Code. To explore international support to effectively implement Green Code, align the Code's provisions with the goals/targets of WB-SDGs-11 & 17; UN-10YFP and New Urban Agenda of Habitat. Undertake the following measures at all official levels to expedite the implementation of Green Building Code.

1) Green building activities be viewed as an environment challenge and reflected within the Govt. policies/strategies of environment, renewable energy & physical planning. Public agencies must develop **"Guidelines for O&M of Public Buildings"**, to reduce plug-loads and energy-use; to do regular maintenance; monitoring based commissioning; water efficiency; recycling and waste diversion practices; etc.

2) For all government procurements and budget financed building construction works, the use of materials and products with "energy efficiency labels" be declared mandatory.

3) In all public buildings, the construction materials and waste management plans be prepared to increase the percentage of waste that must be recycled at recycling areas.

4) Maximum percentage of construction materials for public projects be the combination of used, recycled, recyclable, or indigenous materials, as per building life cycle assessment.

5) Ensure that building's interior environment is conducive to health of building occupants, and the sound transmission levels be limited in accordance with standard limits.

6) Government buildings and landscapes should utilize alternate-sources of water, wherever cost-effective. Sources may include the recycled water, rainwater harvesting, storm-water retention and other conservation measures complying with water quality standards.

7) Develop Indoor air-quality management plan to ensure Code compliance through HVAC systems & filters access for regular cleaning & repair in public buildings, especially the pollutant sources in printing/copying and janitorial rooms. Provide appropriate opening in buildings to ensure that specified interior spaces benefit from exposure to natural light.

8) Prepare water-use criteria to reduce water-use in Government green buildings by 10%, within one year from the enforcement of Green Code, and recommend the use of a Database to monitor the water-use efficiency in Government buildings and landscapes.

9) Promote green operations in Govt. buildings, using energy-saving office equipment, centralized photo-copying/printing, encourage tele-conferencing, pooling shipments & transport services, & workplace's management to minimize maintenance/repair.

2.19 Green Building Projects' Financing

Green building project financing is a broad term that refers to the economical but eco-friendly construction of green buildings; besides, raising the capital investments for such construction projects, and promoting the companies that are dedicated to support the development of a low-carbon and sustainable built environment. Various policies and practices relating to green projects financing have been developed the world over. These include the direct subsidy and creating institutions/mechanism to catalyze the investments into green projects. In 2012, the UK set up the world's first Green Investment Bank, whose primary responsibility is to support and overcome barriers to investment in green projects. Another scheme of sustainable construction project financing implemented in the UK is "Green Deal".

Since its inception at UNCHS 1972, the United Nations Environment Program has been striving to seek solutions that can balance the economic growth and environmental protection. In 1991, the United Nations One of priorities of the international assistance programs was launched to finance sustainable built environment development, and help in financing sustainable development; including the sustainable construction projects, attracting more green investments.

The Environment Program-Finance Initiative (UNEP-FI), a partnership between UNEP and over 200 leading global banks, investment funds, and insurance companies, is engaged in the constructive dialogue on the nexus between environmental protection, sustainable development, and economic development. Furthermore, another objective of UNEP-FI is to catalyze private sector investment in the area of sustainability, particularly those would be used for sustainable construction. Apart from that, UNEP-FI also launched considerable publications that discuss the framework and decision-making for sustainable construction investments.

Sustainable construction requires long-term investment and sustained financing. Given the strains on public budgets, the private capitals are needed for sustainable construction as well. The private developers, particularly real estate companies, can invest in sustainable built environment to create a positive image in term of corporate social responsibility, and gradually making such investment to bring them reasonable economic returns; because sustainable buildings are wiser investments for leasing-up faster, cheaper to operate, and attract quality tenants.

Government Grants and Tax Incentives to promote green buildings can be offered by the Government. For example, initiate a series of incentive plans, like Green Building Bond Incentive Scheme, to encourage the developers and building owners to construct green buildings; or, to appropriate the cash-subsidy to green construction projects directly; in addition to the Government grants and tax incentives; or, refunding a part of taxes derived from projects.

The Government may establish a Green Building Fund to fund the green retrofit in existing public buildings, as a large scale incentive on the part of Federal Government to develop sustainable built environment. Alternate financing action can be introducing a Green Building Upgrade and Retrofit Financing Scheme, to enable the property owners, service providers and developers to access a particular type of loan, which can be used to retrofit their buildings and finally repaid to the financers via a Government charge levied on the property.

2.20 Way Forward

Following best practices have already been adopted in various countries, and led to the successful preparation, implementation and enforcement of green building code by the local governments; besides the developers and builders.

1) **Early planning:** Plan early and have a vision. With green codes, balance energy, environment, and other societal concerns.

2) **Continuing engagement of all stakeholders to develop & implement, and in enforcement:** Involve & train all stakeholders (developers, contractors, building owners, architects, builders and green materials industry/producers). They all need to understand what the green code means and why its application in buildings is necessary. Collaboration is also important to implement the green performance rating systems.

3) **Reference to international standards reflecting best consensus solutions:** The standards used in green codes be developed using such principles, which are based on international standards (i.e. transparency, impartiality, consensus, relevance, effectiveness, coherence and interest to apply).

4) **Transparency:** An open and transparent process for the compliance of Green Building Code at all levels will help assure support as the code is implemented.

5) **Clarity and consistency facilitate all stages:** Processes should be kept simple. Streamlined permitting process is the key. Create tools, such as guides and checklists, so user knows what to do. Such tools can also help GB Code Compliance Inspectors.

6) **Engage policymakers at broader level for support:** Enforcement of green codes depends upon the GBC Compliance inspection and regular review. Regular green code

compliance inspection is essential to ensure the effective following of green codes.

7) **A focus on training and outreach:** Given that green code is a new area, a well-trained code staff is essential for its effective implementation. Education of green requirements is a must for green codes to succeed. Use of technology (webinars, online courses, can be good ways for education and training).

8) **E-Learning:** Design and disseminate quality E-Learning, interactive from short-Tutorials on Climate Change to intensive Trainings on GB Code, especially for the awareness of policy makers, senior management, and elected representatives.

9) **Public dissemination:** For nationwide dissemination, the Green Building Code be made available to the general public in national language Urdu, and later in regional languages.

Annexures

To be published in Part-I Gazette of Pakistan **Annex-I**

GOVERNMENT OF PAKISTAN
Ministry of Climate Change

Islamabad, the 18th April, 2017

NOTIFICATION

F.No.4 (1)/ 2017/GRN-BLD/(ENV). The Experts Working Group (EWG) to prepare the "Sustainable Consumption and Production (SCP) Policy Guidelines for Green Building Code" is constituted with the following composition

Director General (Env. & CC), Ministry of Climate Change, Govt. of Pakistan, (Mr. Irfan Tariq)	**Chairman**
Professional Organizations Representatives	
Representative of Pakistan Engineering Council , Islamabad	Member
Representative of the National Disaster Management Authority, Islamabad	Member
Representative of National Engineering Services Pakistan (NESPAK), Islamabad	Member
Chairman, Pakistan Council of Architects & Town Planners (PCATP), Karachi	Member
COMSATS University, Islamabad (Dr. Zain-ul-Abedin, Ex. Dean, Faculty of A&D)	Member
Representative of Green Building Council Pakistan, Lahore (Mr. Aqrab A. Rana)	Member
Mr. Gul Najam Jamy, Expert (Energy & Environment), Islamabad	Member
International Representatives	
Country Program. Manager, UN-Habitat (Pakistan), Islamabad (Ms. Bella Evidente)	Member
Coordinator, 10YFP on Sustainable Buildings & Construction, UNEP (Mr. Pekka Huovila)	Member
National Coordinator, SCP Project (Pakistan), UNEP; Islamabad (Mr. Jawed Ali Khan)	Member
Federal Government Representatives	
Chief (Physical Planning & Housing), M/o Planning, Development & Reforms, Islamabad	Member
Representative of Ministry of W&P/ENERCON, Islamabad	Member
Representative of M/o Defense/Military Lands & Cantonments Department, Rawalpindi	Member
Representative of Ministry of Housing & Works/Pak PWD; Islamabad	Member
Representative of Mayor Islamabad/Chairman CDA; Islamabad	Member
Provincial Governments Representatives	
Representative of Government of the Punjab/Urban Unit, Lahore	Member
Representative of Government of Sindh/Urban Unit, Karachi	Member
Representative of Government of Khyber Pakhtunkhwa/Urban Unit, Peshawar	Member
Representative of Government of Baluchistan/Urban Unit, Quetta	Member
Director (Urban Affairs), M/o Climate Change, Islamabad (Mr. Muhammmad Azim Khoso)	**Secretary**
Any other Member/Expert, on invitation (Mr. Fayaz Ahmed, Dy. Director-Arch, M/o Climate Change)	Member

The **Terms of Reference** of Policy Guidelines for Green Building Code are as under.

1) To integrate the SDG 12 approach of Sustainable Consumption & Production in national planning process to reduce the adverse impacts of climate change and promote sustainable development.

2) Review prevailing guidelines and building bylaws and codes for energy efficient and green buildings.

3) Development of policy guidelines for Green Building Code for Pakistan is being piloted with UN-Habitat support. These will offer recommendations to minimize construction-related waste, create environmentally sustainable buildings, reduce operational costs & promote indigenous resource-efficient building materials.

Muhammad Azim Khoso
Director (Urban Affairs)

The Manager
Printing Corporation of Pakistan Press
Karachi

Annex - II

GREEN BUILDING RATING SYSTEM

The Pakistan Green Building Council (PGBC) in their publication "Reference Guide of Building Design and Construction of Pakistan" has proposed the "Green Guideline Certification Process", based on an "Integrative Approach to Design and Construction" and "Rating System Selection Guide", generally recommended by the ANSI (American National Standards Institute) for incorporating construction and development techniques, materials and designs intended to minimize building's impact on the environment and conserve natural resources.

Green Buildings (GB) use less water, optimize energy efficiency, generate less waste and provide healthier spaces for occupants, as compared to conventional buildings. The GB operations use natural resources through reuse of building materials and resource efficiency; and provide quality indoor environment to building inhabitants. Along with enforcement of Green Code, the easy to understand "Performance Monitoring and Evaluation" of GB projects, by accredited "Green Building Inspection Agencies", is necessary to provide measurements of those performance-aspects of green buildings design, as perceived at the planning or designing stages.

- Monitor GB performance at different project stages (from design to construction, completion and occupation (by conducting satisfaction survey of clients, supply-chain and end-users; and then at the end of project focusing on re-use, recycling and disposal of waste materials).
- Indicators are comparable for their comparison with other functionally equivalent building designs at project level by clients/design teams, and also with buildings in similar projects.
- Verification of the "project monitoring and evaluation indicators" be easy and cost effective in terms of project data collection, test methods, documentation and certification.
- PM&E Indicators be public friendly and potentially useable by Federal and Provincial agencies; urban& local development authorities in setting their planning and building control requirements, and Green Procurements methods, etc.

Initially, the PM&E Indicators/thresholds be applicable to New Public Buildings, at planning, designing and construction stages. Then, Private Buildings (other than residential) may go for Green Performance Certification/Approval, based on some rating system. For Residential Buildings, minimum criteria may be based on Green Stars, equivalent to some GB rating system. For Existing Buildings, a different strategy is required for converting these into green buildings.

Area of GB Rating Systems and Tools is quite large. Some focus on brand commercial developments, while others provide a framework for self-assessment and improvement. Few are suitable for cold or mild climate of developed countries. Adapting a rating system, which is successful in other country, can be extremely cumbersome in Pakistan. We need a Rating System compatible with our hot climatic conditions and local expertise with limited skill of using green materials; and simple Evaluation Tools to measure GB sustainable aspects through its life cycle.

Considering that the Green Building Rating System is necessary to bring a momentum in achieving energy efficiency and sustainability in buildings in developing countries (like Pakistan), the following GB Rating Systems, Tools and Data-bases need to be reviewed, with reference to preparation and enforcement of the Green Building Code.

1) UN-Habitat/UNEP-10YFP/SHERPA: Guidance to Sustainable Housing

The SHERPA is a free sustainable design tool, developed under UN-Habitat's Cities and Climate Change Initiative, in partnership with members of Global Network of Sustainable Housing (i.e. 10-Year Framework of Programmed on Sustainable Consumption and Production Patterns (10YFP); Finland VTT Technical Research Centre of Finland; University of Cambridge; and Project-partners). It is a self-evaluation tool for the built environment to achieve sustainable housing projects aligned with the UN-Habitat New Urban Agenda and the four Sustainability Pillars: Social, Economic, Environmental and Cultural. It views the housing as a lever for sustainable development and green building. To achieve this not only "green" technologies, but also human, social and cultural factors need to be considered within and beyond the boundary of a building. It helps to identify and analyze the strengths and weaknesses of new, current, and past housing projects. It scores the user responses according to the SDGs 4, 6, 7, 11 & 17, pertaining to housing, infrastructure, basic services, food security, health, education, decent jobs, safety and natural resources. This methodology calls for a holistic view on housing impact; local capacity building; process-driven focus; ability to self-evaluate; and free and open-source development.

2) Green Rating for Integrated Habitat Assessment (GRIHA)

The UNEP in association with UN-Habitat has assisted Indian Ministry of New and Renewable Energy to develop the GRIHA. It is an indigenously developed system to rate the commercial, institutional and residential buildings emphasizing regional environmental concerns, and tuned to local climatic variations and existing practices of construction, with focus on non-air conditioned or partially air conditioned buildings. It stresses passive solar techniques for optimizing visual and thermal comfort indoors and encourages the use of refrigeration-based and energy-demanding air conditioning systems in cases of extreme thermal discomfort. Indian Green Building Council is facilitating the LEED-India to rate the buildings on environmental performance and energy efficiency during their design, construction and operation stages.

3) Leadership in Energy and Environmental Design (LEED)

LEED Green Building Rating System developed by USA Green Building Council, It includes new commercial construction and major renovation projects, existing building operation and maintenance, commercial interiors, homes, schools, neighborhoods and retail, healthcare and Labs, and education. This system provides a 3rd Party verification of green buildings. It awards the points for meeting specific performance criteria, organized into five main categories: Sustainable Sites; Water Efficiency; Energy and Atmosphere; Materials and Resources; and Indoor Environmental Quality. A sixth category, Innovation and Design Process, provides the potential for recognition of innovation. GB projects using the LEED are certified with a rating (Certified, Silver, Gold, or Platinum), determined by the total number of points attained. LEED

is a voluntary certification program, and the GB Inspector/Agency evaluates a building in eight categories of green construction: design, location, site work, water efficiency, energy efficiency, resource efficiency, indoor environment, and awareness. In our country, the Pakistan Green Building Council (HQ at Lahore) is promoting the application of LEED Certification System, and has published a Reference Guide of Building Design and Construction.

4) Building Research Establishment Environmental Assessment Method (BREEAM)

British BREEAM confirms the sustainability of buildings and large scale developments. It sets the standard for best practice in sustainable building design, construction and operation, and

considered as a comprehensive measure of a building's environmental performance. It encourages designers and clients to think about low carbon and low impact design, minimizing the energy demands created by a building, before considering energy efficiency and low carbon technologies on Life Cycle Analysis.

5) Green Star Rating System (GSRS)

Green Star is a voluntary GB rating system, launched by the Green Building Councils of Australia and South Africa. Both cover similar practices to reduce environmental impact of buildings, and apply innovations in sustainable building, while considering occupants' health, productivity and cost savings. The green star rating system covers green buildings as per their type and use (i.e. office, retail, multi-unit residential, public or education or healthcare or industrial buildings; and interiors' design& existing buildings performance). Independent assessors evaluate the GB submissions and allocate points based on implemented green measures. They score GB aspects in 09 categories (management, energy, water, indoor environment quality, transport, material, ecology, emission, innovation &land use. The scores are translated into "Green Stars", and accordingly a Certification is awarded to recognize and reward environmental leadership in GB (i.e. 45-59 is a Four-star score for "Best Practice" in sustainable design and construction; 60-74 is Five-star score signifying "Australia/SA Excellence"; and 75-100 is a Six-star score signifying "World Leadership").

6) IISBE/SBA 2009/ SBAT 2016: Performance Assessment Criteria

Sustainable Building Assessment Tool (SBAT) Framework based on the Performance Assessment Criteria IISBE/SBA 2009 was developed in South Africa and applied in some African countries. The SBAT may be used by 3rd parties to develop rating systems, which are relevant to the local conditions and building types. It serves as a rating system toolbox, based on the philosophy that: (i) a rating system must be adapted to local conditions, and (ii) to the generic building types to be assessed, before its results can become meaningful. The system is therefore designed as a generic framework, with local research-based organizations expected to define local context conditions and typical performance characteristics of the building types to be assessed, and to develop appropriate weights and performance benchmarks for these, including the regional benchmarks.

7) Design Green with WB Software EDGE (Excellence in Design for Greater Efficiencies)

To expand energy and resource efficiency, the World Bank Group through its private sector arm, the International Finance Corporation (IFC), has debuted an online tool called EDGE that allows anyone, (contractors, project managers, homeowners), to model the efficiency of a building using various options & alternative materials. It illustrates the cost savings & GHG reductions possible from choices such as efficient heating and cooling systems, natural ventilation, water-saving plumbing, & buildings materials with low environmental impact.

Such effort pays off for green building owners by lowering monthly heating, electricity & water bills while reducing their climate impact. EDGE is a building design tool; a certification system, and a global green standard platform available to architects, engineers, developers or building owners. It empowers technical solutions at early design stage to reduce operational expenses and environmental impact. EDGE methodology focus on local Climatic conditions; Building orientation, type & use; Design & specifications; to generate energy, water & embodied energy consumption for building. The EDGE Program is available for following types of green buildings.

- Homes: for both apartments and houses(area/occupancy based on income categories)
- Offices: assumptions are based on occupancy density and use-hours
- Hotels/Resorts: assumptions for area/occupancy/type of support services based on Star Rating
- Hospitals: based on type of hospital (nursing home, private/public hospital, clinic)
- Retail: based on type of retail building (department store, mall or supermarket)

8) Comprehensive Assessment System for Built Environment Efficiency (CASBEE)

Japan Green Building Council has developed a CASBEE Assessment System, focusing on internal and external spaces, divided by the site boundary. The CASBEE evaluates the negative aspects of environmental impact which go beyond the enclosed space to the outside (the public property); and improving living amenity for the building users. The CASBEE evaluation scores 2 factors i.e. the (i) Built Environment Quality improvement in living amenity for building users, within enclosed space of building (private property); and the (ii) Built Environment Load's negative aspects/impact which go beyond the enclosed space in the outside (public property). The CASBEE assessment covers the: (i) energy efficiency; (ii) resource efficiency; (iii) local environment; and (iv) the indoor environment, with reference to the Project processes (Context analysis, Project governance and management, Participation and capacity building); Territory (Water and sanitation, Solid waste, Mobility and networks, Energy, Food security and livelihoods, Social and community cohesion); Neighborhood (Planning and cultural suitability, Urban design for cultural identity and social cohesion, Urban-rural interface, Land tenure); and Household (Building design, Architectural and building techniques, Building elements, Appliance and equipment).

9) GB Rating System in EU (Zero Energy Utilization Standards)

In European Union, the measureable Indicators are applicable to all new buildings; requiring that their developers should give preference to the renewable low or zero carbon energy sources and systems (e.g. ground source heat pumps, passive solar, thermal solar, photovoltaic, wind, biomass, etc.) for the building internal space heating, domestic water heating, ventilation, lighting and other major building loads; unless it can be shown they are not cost-effective on a life-cycle cost basis. If it can be shown that low or zero carbon energy sources are not cost effective on a life-cycle cost basis for a building's base and intermittent heating loads, then a high efficiency carbon-based fuel system may be considered. Hybrid combinations of two or more energy sources should be considered as an option as some energy sources are better suited to serve intermittent loads such as ventilation; and accordingly GB Rating System parameters be applied to assess the performance of green building(s).

Annex - III

REFERENCES' INDEX

(1) National Climate Change Policy, Ministry of Climate Change, Government of Pakistan 2012 (# 5.4, Page 26)

(2) UN-Pakistan's Challenges: Sustainable Development Goals 2015-2030

(3) Rethinking Our Built Environment: Towards a Sustainable Future, Ministry of Environment, Government of New Zealand (2009)

(4) Pakistan Vision 2025, Planning Commission, Government of Pakistan (2014)

(5) Mainstreaming Energy Resources Efficiency in Built Environment, UN-Habitat Experience in Africa, Accelerating Progress toward SDGs (2016)

(6) 10YFP Programme on Sustainable Buildings and Construction, Pekka Huovila, Green Building Council Finland (2017) pekka.huovila@figbc.fi

(7) Establishment of National WASH Cell (Project/Program Concept Paper), Ministry of Climate Change, Government of Pakistan 2017. SaimaShafiq76@hotmail.com

(8) Adoptable, Useable and Enforceable Code – An Overview, International Green Code Council (2012) www.iccsafe.org/igcc

(9) Green Building Guidelines (Draft Volume-I), Pakistan Green Building Council (2016) www.PakistanGBC.org and aqrab@pakistangbc.org

(10) Environmentally Sustainable Library Buildings: Opportunities and Challenges for Asian Countries, Saima Qutab, IFLA-WLIC (2016) saimaqutab83@gmail.com

(11) Green Building Program, Los Angeles USA zoup@planning.lacounty.gov

(12). Energy Efficiency Resource Book (NCC Vol. One), Australian Building Codes Board (2016) www.abcb.gov.au

(13) Developing a Green Sustainable Building Rating System, Samir R. Traboulsi (2013) Samir.traboulsi@mail.ashrae.org

UN HABITAT
FOR A BETTER URBAN FUTURE

UN Habitat Pakistan
Level 5, Serena Business Complex
GPO Box 1980, Islamabad 44000, Pakistan
Tel - +92 51 835 7363, +92 51 835 7359
Email - mailbox@unhabitat.org.pk
www.unhabitat.org.pk