Indian Green Building Council

Greening India since 2001

Confederation of Indian Industry

IGBC Green Cities

Pilot Version

Abridged Reference Guide

November 2015

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I. Foreword from the Indian Green Building Council (IGBC)

India is witnessing tremendous growth in infrastructure and construction development. The construction industry in India is one of the largest economic activities and is growing rapidly. As the sector is growing rapidly, preserving the environment poses a host of challenges. To enable the construction industry to be environmentally sensitive, CII has established the Indian Green Building Council (IGBC). IGBC is a consensus driven not-for-profit council representing the building industry, consisting of more than 2,100 committed members. The council encourages architects, builders, developers and owners to build green to enhance the economic and environmental performance of buildings.

The Green Building Movement in India has been spearheaded by IGBC since 2001, by creating national awareness. The council's activities have enabled a market transformation with regard to green building concepts, materials and technologies.

IGBC continuously works to provide tools that facilitate the adoption of green building practices in India. The development of IGBC Green Cities Rating System is another important step in this direction.

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II. Introduction - IGBC Green Cities Rating

Cities are the engines for social and economic growth of a country. The urban sector contributes to nearly 70% of the nation's GDP. Cities have been pivotal in the creation of employment. As per 2011 census, 31% of India's total population resides in urban areas. It is estimated that by the year 2030, the urban population would rise to 42% of the total population of the country. Urbanisation will continue to create new economic opportunities as people migrate from rural areas to urban areas for better employment opportunities and standard of living.

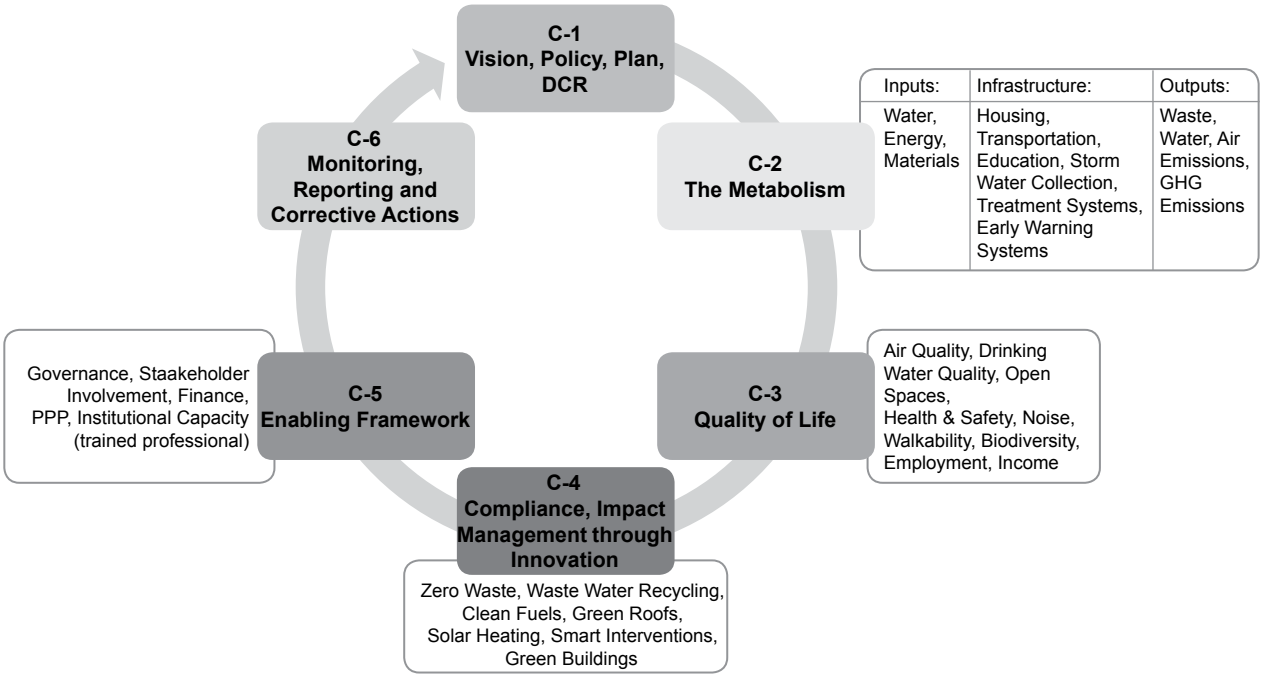
Urban areas occupy only 4% of Country's total land footprint. Rapid growth in urbanisation has placed immense pressure on existing land and other natural resources. Moreover, more technologically advanced industries, including high-end manufacturing industries, are likely to evolve around large urban areas. It is in this context, planning principles must be reframed, to be able to respond effectively to the big challenges imposed by growing urbanisation, through an approach that embraces sustainable urban development principles into city planning framework.

One of the solutions is by introducing the concept of **'Green Cities'**. Under this concept, cities are encouraged to convert environmental problems into opportunities and appropriate solutions. The Green Cities concept seeks at promoting an eco-friendly city that balances social, economic, and environmental dimensions, as well as good urban governance as its foundation. Also, one of the main concerns which needs to be stressed upon is optimal and efficient use of natural resources like water, energy and land based building. Urban Planners, Urban Designers, Architects and Engineers can work in close collaboration with local administration and communities to ensure that integrated planning and design thinking is undertaken to conceive a city based on sustainable / Green planning principles. In this context, emerging cities have the opportunity to set a strong eco-vision that can be transformed into a long-term plan from day one itself.

Against this background, Indian Green Building Council (IGBC) has launched **'IGBC Green Cities Rating'**. The rating system shall enable the development authorities and developers to apply green concepts and planning principles, so as to reduce environmental impacts that are measurable and improve the overall quality of life.

III. The Framework for Green City

The Framework for Green City provides long term vision for systematic planning, implementation and management of green cities as indicated below :



Acknowledgement : Dr Prasad Modak, Chief Sustainability Officer, IL&FS and Dean IL&FS Academy for Applied Development (IAAD)

IV. Benefits of Green Cities

❖ Efficient Land Use

Green Cities promote effective land use by encouraging land use mix and higher densities to ensure compact development. These planning concepts are gaining prime importance offering multiple benefits as mentioned below:

- Higher density and compact development
- Promote transit oriented development
- Preservation and Restoration of Water Bodies & Eco-sensitive Zones
- Offer a variety of housing typologies
- Reduces distances between home and workplaces
- Pedestrian and bicycle-friendly environments
- Enhanced community bonding in neighbourhoods

❖ Efficient Mobility

Green City increases opportunities for bicycling, pedestrian friendly network, reduction in the number of automobile trips, promoting public transportation and use of vehicles with alternative fuels. In a nutshell, efficient transportation planning enable cities to accommodate all modes of travel, including walking, bicycling and public transportation which are vital parts of reducing the carbon footprint in cities.

❖ **Efficient City Infrastructure**

Efficient use of infrastructure limits the usage of natural resources by incorporating best practices such as:

- **Water Efficiency:** Green City would result in potable water savings to the tune of 30-40% by adopting practices such as rain water harvesting, treatment & reuse of waste water, storm water management, etc.
- **Energy Efficiency:** Power generation using various renewable energy technologies and Green concepts can significantly reduce the power supply demand of the city leading to energy savings to the tune of 20-30%.
- **Solid Waste Management:** Waste management in Green Cities takes into account planning and implementation of efficient systems for collection, transportation, treatment, recycling and reuse or disposal of municipal solid waste. Green Cities aim to achieve zero waste discharge to landfill sites.

❖ **Enhanced Quality Of Life**

Reduced commuting time, accessible recreational spaces, increase in green cover, continuous environmental monitoring shall enhance the quality of life thereby making the city healthier and liveable.

V. Scope of IGBC Green Cities Rating

Projects shall meet the following criteria to qualify for IGBC Green Cities Rating:

1. **Any upcoming large scale Development (Greenfield Development or Brownfield Development or Combination) with a minimum area of 250 Ha and minimum gross population density** of 125 persons per hectare (pph).***
2. **The city shall generate employment opportunities (direct and indirect employment) for at least 20% of the total population.**
3. **The city shall have following social infrastructure facilities* :**
   a) **Education facilities**
   b) **Healthcare facilities**
   c) **Socio Cultural facilities**
   d) **Recreational facilities**
   e) **Sports Facilities**

**Source: MoUD's 'Urban and Regional Development Plans Formulation and Implementation (URDPFI) Guidelines', Volume 1, January 2015*

Notes:

- *Gross Population Density is defined as persons per unit area (in hectares) for developed area (Refer Annexure I for definition) only.*
- *In case, a large scale Development (Greenfield Development or Brownfield Development or Combination) is not able to achieve a minimum gross population density of 125 persons per hectare, the project shall provide employment opportunities for at least 30% of its residents.*

VI. IGBC Green Cities Rating – Overview and Process

IGBC Green Cities Rating addresses green features under the following categories:

- ❖ Eco-vision
- ❖ Land Use Planning & Built Environment
- ❖ Health & Well-being
- ❖ Sustainable Mobility
- ❖ Water, Energy & Infrastructure Management
- ❖ Information and Communications Technology
- ❖ Innovation in City Planning

a. Registration

Projects interested in IGBC Green Cities Rating can register with the Council. Projects can be registered on IGBC website (www.igbc.in) under 'IGBC Green Cities Rating'. The registration is the initial step which will help in establishing contact with IGBC and provide access to several resources.

b. Certification

The Project team shall be awarded certification based on master planning of the city. To achieve the IGBC Green Cities Rating, the project must satisfy all the mandatory requirements and the minimum number of credit points.

The project team is expected to provide supporting documents at preliminary and final stage of submission for all the mandatory requirements and the credits attempted.

The project needs to submit the following :

- ❖ **General information of project including :**
  - i) Project brief or Executive Summary including details such as landuse distribution table, phasing area details, key green features, institutional framework for project implementation, etc.
  - ii) Development Plan / Master Plan / Project Report highlighting the vision, demographic features, land use & transport strategies, infrastructure facilities, socio-cultural facilities etc.

iii) General drawings (in PDF format only)

- Land use plan of the city
- Phasing plans with summary of land use area break-up table
- Schematic plans of respective land uses as highlighted in the land use distribution table
- Infrastructure network plans for the city including Transportation plan, Sewerage network plan, Stormwater network plan, Water Supply Distribution network plan etc.

iv) Environmental Impact Assessment Study Report

v) Social Impact Assessment Study Report

vi) Development Contol Regulations

vii) Rendered views of city

The necessary details are mentioned in this guide, under each mandatory requirement and credit. Documentation is submitted in two phases – preliminary submission and final submission:

- The preliminary submission involves all those possible credits which are aspired by the project team. After the preliminary submission, review is done by third party assessors and review comments would be provided by IGBC within 30 working days.
- The next phase involves submission of clarifications to queries raised in the preliminary review. This review will also be provided by IGBC within 30 working days, after which the rating is awarded.

It is important to note that the mandatory requirements and credits earned at the preliminary review are only considered as expected. These mandatory requirements and credits are not awarded until the final documents are submitted, along with additional documents showing compliance to credit requirements. If there are changes in any 'expected credits' after preliminary review, these changes need to be documented and resubmitted during the final review.

Once the project is awarded Green City Rating, the project team shall submit six monthly Project Status Report and Detailed Project Report (as and when complete).

The threshold criteria for various certification levels are as under:

Points	Certification Level	Recognition
40-49	Certified	Good Practices
50-59	Silver	Best Practices
60-75	Gold	National Excellence
76-100	Platinum	Global Leadership

c. Credit Interpretation Request (CIR)

In some instances the project team can face certain challenges in applying or interpreting a mandatory requirement or a credit. It can also happen in cases where the project can opt to achieve the same intent through a different compliance route.

To resolve this, the project may use the process of 'Credit Interpretation Request' for which IGBC releases a 'ruling' to ensure that all rulings are consistent and applicable to other projects as well. The following are the steps to be followed to raise a CIR:

- Consult the Abridged Reference Guide for description of the Credit Intent and Requirements.
- Review the intent of the Mandatory requirement / Credit and self-evaluate whether the project satisfies the intent.
- Review the Credit Interpretation web page for any previous CIRs on the relevant mandatory requirement or Credit.
- If a similar ruling has not been addressed or does not answer the question sufficiently, submit a CIR. Only registered projects are eligible to post CIRs. Two CIRs are answered without levying any fee and for any CIR beyond the first two CIRs, a fee is levied.

d. Appeal

Generally mandatory requirements / credits get denied due to misinterpretation of the intent. If the project team feels that sufficient grounds exist to appeal a credit denied in the final review, the project has an option to appeal to IGBC for reassessment of denied mandatory requirements or credits. The documentation for the mandatory requirements or credits seeking appeal may be resubmitted to IGBC along with necessary fee. IGBC will take 30 working days to review such documentation. If an appeal is pursued, please note that a different review team will be assessing the appeal documentation.

e. Updates and Addenda

This is the Abridged Reference Guide of the pilot version of IGBC Green Cities Rating. As the rating system continues to improve and evolve, any updates, addenda and errata to the abridged reference guide will be made available through IGBC website. These additions will be incorporated in the next version of the rating.

VII. IGBC Green Cities Rating Checklist

Modules		Points
Eco-vision (EC)		
EC Mandatory Requirement	**Eco-vision of the city**	**Required**
Land Use Planning & Built Environment (LPB)		**18**
LPB Credit 1	Compact City Planning	5
LPB Credit 2	EWS Housing	4
LPB Credit 3	Green Buildings	2
LPB Credit 4	Urban Heat Island Mitigation	3
LPB Credit 5	Employment Opportunities	4
Health & Well-Being (HW)		**16**
HW Mandatory Requirement	**Preservation and Restoration of Water Bodies & Eco-sensitive Zones**	**Required**
HW Credit 1	Public Green & Open Spaces	5
HW Credit 2	Accessibility to Public Green & Open Spaces	5
HW Credit 3	Environmental Monitoring	1
HW Credit 4	Solid Waste Management	5
Sustainable Mobility (SM)		**15**
SM Mandatory Requirement 1	**Sustainable Mobility Plan**	**Required**
SM Mandatory Requirement 2	**Barrier-free Accessibility**	**Required**
SM Credit 1	Access to Mass Transit Facilities	5
SM Credit 2	Pedestrian Network	5
SM Credit 3	Bicycle Lane Network	5

Modules		Points
Water, Energy & Infrastructure Management (WEI)		**38**
WEI Credit 1	Water Efficiency Plan	5
WEI Credit 2	Rainwater Harvesting	5
WEI Credit 3	Waste Water Treatment & Reuse	8
WEI Credit 4	Energy Efficiency Plan	8
WEI Credit 5	Renewable Energy	8
WEI Credit 6	Integrated Utility Network	4
Information & Communications Technology (ICT)		**5**
ICT Credit 1	Information and Communications Technology (ICT) Applications	5
Innovation in City Planning (ICP)		**8**
ICP Credit 1	Innovation in City Planning	7
ICP Credit 2	Qualified IGBC AP Credentials	1
TOTAL		**100**

The threshold criteria for various certification levels are as under:

Points	Certification Level	Recognition
40-49	Certified	Good Practices
50-59	Silver	Best Practices
60-75	Gold	National Excellence
76-100	Platinum	Global Leadership

Eco-vision

EC Mandatory Requirement

Required

Eco-vision of the City

Intent:

Demonstrate the city's vision in encompassing principles of sustainability, so as to eliminate or minimise any environmental impact.

Compliance Option:

- Develop Eco-vision* of the city to ensure environmental sustainability. The Eco-vision should include measurable goals to achieve sustainability for the following aspects :
  - Land Use Planning
  - Green and Open Spaces
  - Sustainable Mobility
  - Solid Waste Management
  - Water Efficiency
  - Energy Efficiency
  - Information and Communications Technology (ICT) Integration

**The Eco-vision should reflect the city's milestones towards sustainability*

Documentation Required:

Submit extract of Policy Document or Development Plan (DP) / Master Plan (MP) / Project Report (PR) highlighting the Eco-vision of the city as well as goals for the aspects as stated above.

Land Use Planning & Built Environment

LPB Credit 1

Points: 5

Compact City Planning

Intent:

Encourage compact city planning thereby reducing the impacts arising from urban sprawl.

Compliance Option:

The gross population density* of the city shall be at least 150 persons per hectare (pph). Points for achieving higher gross population density at city level will be awarded as below:

Gross population density at city level (pph)	Points
≥ 150	1
≥ 175	2
≥ 200	3
≥ 225	4
≥ 250	5

Notes:

- **Gross Population Density is defined as persons per unit area (in hectares) for developed area (Refer Annexure I for definition) only.*
- *The project may exclude the following land uses to arrive at gross population density:*
  - *Land under Agriculture*
  - *Water bodies such as nala, tank, pond, lake, canal, river etc.*
  - *Protective areas such as Reserve Forest, Protected Forest & Sanctuaries*
  - *Other Eco-sensitive zones such as Land under Coastal Regulation Zone (CRZ), Wetlands, etc.*
  - *Special areas such as Solar and Wind Farms*

Documentation Required:

1. Submit extract of Development Plan (DP) / Master Plan (MP) / Project Report (PR) highlighting the gross population density at city level (pph).
2. Submit gross population density calculations.

LPB Credit 2

Points: 4

EWS Housing

Intent:

Encourage housing for economically weaker sections to promote inclusive living and equity

Compliance Option:

Earmark at least 15%* of total dwelling units for economically weaker sections. Points are awarded as below:

Percentage of EWS Housing Units to Total Dwelling Units	Points
≥ 15%	1
≥ 20%	2
≥ 25%	3
≥ 30%	4

(*Source: Smart City Mission Statement & Guidelines, MoUD, Govt. of India, June 2015)

Notes:

- *Projects can determine the area of EWS housing as per the local or state government guidelines. In case the local or state government guidelines do not specify the requirement, the projects may use the below definition :*

  EWS House is an all-weather single unit or a unit in a multistoried super structure having carpet area of up to 30 sq. m. with adequate basic civic services and infrastructure services like toilet, water, electricity etc. (Source: Housing for All-Urban, Scheme Guidelines 2015)

Documentation Required:

1. Submit extract of Development Plan (DP) / Master Plan (MP) / Project Report (PR) highlighting the percentage of proposed EWS housing units to the total dwelling units.
2. Submit extract of Development Control Regulations (DCR) highlighting bye-laws to promote EWS housing in the city.

LPB Credit 3

Points: 2

Green Buildings

Intent:

Encourage eco-friendly buildings to minimise negative environmental impacts due to construction activities.

Compliance Options:

Option 1:

- Incorporate mechanisms in Development Control Regulations (DCR) to encourage all types of green buildings. Mechanisms shall include green building bye-laws or incentives.

Option 2:

- In case the local / State bye-laws / Development Control Regulations (DCR) does not address the requirement, the project shall have a Policy Document encouraging development of all buildings in accordance to IGBC's approporiate Green Building rating systems for all typologies.

Notes:

- *Projects may refer to following documents for guidance:*
  - *IGBC's Green Building Rating Systems (Green Homes, Green New Buildings, Green Factory Buildings, Green Schools, Green MRTS)*
  - *National Building Code (NBC) of India 2005: PART 11 – 'Approach to Sustainability'*
  - *CII – IGBC's 'Model Building Bye-laws for Sustainable Development of Built Environment in Cities'*
- *Building typologies covered under this credit include but not limited to Residential, Commercial, Institutional, Industrial, Healthcare, Mass Rapid Transit System (MRTS) etc.*
- *Development Authorities can consider incentives such as additional FAR / FSI, fast-track approvals or any other fiscal incentives.*

Documentation Required:

1. For option 1, submit extract of Development Control Regulations (DCR) / local / State bye-laws highlighting provision of bye-laws or incentives to encourage green buildings in the city.
2. For option 2, submit extract of Policy Document highlighting provision to encourage development of all buildings in accordance to IGBC's appropriate Green Building Rating Systems for all typologies.

LPB Credit 4 **Points: 3**

Urban Heat Island Mitigation

Intent:

Mitigate urban heat islands to reduce microclimatic temperatures.

Compliance Options:

❖ **For Carriage-way and Service Roads**

➢ Provide one or combination of the following measures for at least 50% area of the carriage-way and service roads of the entire road network (arterial, sub-arterial, collector and local roads):

- Shade from tree cover
- Cool pavements*

Points are awarded as below:

Percentage of carriage-way and service roads with shade from tree cover/ cool pavements*	Points
≥ 50%	1
≥ 75%	2

Note:

- **Cool pavements are defined as reflective pavements that help lower surface temperatures and reduce the amount of heat absorbed into the pavement. The Solar Reflective Index (SRI) value of cool pavements shall be at least 29 (and not higher than 64).*

Source: Reducing Urban Heat Islands: Compendium of Strategies for Cool Pavements, U.S EPA, 2009

❖ **For exposed roof areas of all buildings (1 point)**

➢ **Option 1:**

- Incorporate provision in Development Control Regulations (DCR) to mandate use of high reflective roofing material** (or) vegetation (or) combination, to cover 100% of the exposed roof areas of all buildings.

➢ **Option 2:**

- In case the local / State bye-laws / Development Control Regulations (DCR) does not address the requirement, the project shall have a Policy Document mandating use of high reflective roofing material** (or) vegetation (or) combination, to cover 100% of the exposed roof areas of all buildings.

Note:

- ***High reflective roofing material includes light coloured china mosaic tiles, white cement tiles or any other permanent material with Solar Reflective Index (SRI) value greater than 78.*

Documentation Required:

For Carriage-way and Service Roads:

1. Submit city road network plan, typical road cross–sections and supporting calculations indicating that at least 50% of area under carriage-way & service roads of the entire road network (arterial, sub-arterial, collector and local roads) is shaded with tree cover or provided with cool pavements.
2. Submit extract of Policy Document highlighting technical details of proposed cool pavements with respective SRI values.

For exposed roof areas of all buildings:

3. For option 1, submit extract of Development Control Regulations (DCR) / local / State bye-laws highlighting provision to mandate use of high reflective roofing material (or) vegetation (or) combination, to cover 100% of the exposed roof area for all buildings.
4. For option 2, submit extract of Policy Document highlighting provision to mandate use of high reflective roofing material (or) vegetation (or) combination, to cover 100% of the exposed roof areas of all buildings.

LPB Credit 5

Points: 4

Employment Opportunities

Intent:

Create a self-sustaining city by providing sufficient employment opportunities within the city.

Compliance Options:

- Provide employment opportunities (direct and indirect employment) for at least 32.5% of the total population. Points for employment generation are awarded as below:

Employment Generation as a Percentage of the total Population	Points
≥ 32.5%	1
≥ 35%	2
≥ 37.5%	3
≥ 40%	4

Documentation Required:

1. Submit extract of Development Plan (DP) / Master Plan (MP) / Project Report (PR) highlighting employment opportunities expected to be generated by various economic activities within the city.
2. Submit calculations indicating percentage employment generation (direct and indirect employment) to the total population.

Health & Well-being

HW Mandatory Requirement 1 Required

Preservation and Restoration of Water Bodies & Eco-sensitive Zones

Intent:

Preserve and restore water bodies & eco-sensitive zones to protect the habitat, thereby maintaining ecological balance.

Compliance Options:

Provide strategies in Development Plan (DP) / Master Plan (MP) / Project Report (PR) to preserve and restore existing water bodies and eco-sensitive zones in the city.

Notes:

- *Water bodies include nala, tank, pond, lake, canal, river etc. as designated by the respective State Irrigation Department and Revenue Department.*
- *Eco-sensitive zones include wetlands, reserve forest, protected forest, sanctuaries, national parks, land under Coastal Regulation Zone (CRZ) or any other eco-sensitive zone designated by Ministry of Environment & Forests, Government of India (GoI) or State Forest Department.*

Documentation Required:

1. Submit land use plan (to scale) showing existing water bodies, inlets into the water body and eco-sensitive zones.
2. Submit extract of Development Plan (DP) / Master Plan (MP) / Project Report (PR) highlighting the following :
   - ❖ List of strategies adopted to preserve and restore existing water bodies including natural drains and channels feeding the water bodies.
   - ❖ List of strategies to preserve and restore eco-sensitive zones.
   - ❖ List of measures to prevent encroachment of water bodies including natural drains and eco-sensitive zones.

HW Credit 1

Points: 5

Public Green and Open Spaces

Intent:

Encourage public green and open spaces to enhance health, well-being and quality of life.

Compliance Options:

Dedicate at least 15% of public green / open spaces or combination to the total developed area within the city. Points are awarded as below:

Percentage of public green / open spaces to the total developed area	Points
≥ 15%	1
≥ 17.5%	2
≥ 20%	3
≥ 22.5%	4
≥ 25%	5

Notes:

- *Public green spaces include parks, botanical gardens, green spaces along water bodies such as tank, nala, pond, lake, canal, river etc.*
- *Open Spaces include playgrounds, multi-open space (maidan), sports complex etc. This shall not include area under water bodies.*
- *Projects may refer to Annexure I for guidance on definition of developed area and Annexure II for planning hierarchy of public green & open spaces.*

Documentation Required:

1. Submit land use plan (to scale) showing all public green & open spaces in the city.
2. Submit calculations indicating that at least 15% of area is under public green & open spaces.
3. Submit extract of Development Plan (DP) / Master Plan (MP) / Project Report (PR) highlighting the hierarchy of public green & open spaces (in terms of area) proposed within the city.

HW Credit 2

Points: 5

Accessibility to Public Green & Open Spaces

Intent:

Encourage easy accessibility to public green and open spaces thereby enabling such spaces to be used by majority of the population, making a city healthy and liveable.

Compliance Options:

Ensure planning interventions so that at least 40% of the total developed area is located at a distance of 400 metres from public green & open spaces. Points are awarded as below:

Percentage of developed area accessible to public green / open spaces	Points
≥ 40%	1
≥ 50%	2
≥ 60%	3
≥ 70%	4
≥ 80%	5

Notes:

- *Public green spaces include parks, botanical gardens, green spaces along water bodies such as tank, nala, pond, lake, canal, river etc.*
- *Open Spaces include playgrounds, multi-open space (maidan), sports complex etc. This shall not include area under water bodies.*
- *To arrive at the developed area (Refer Annexure I for definition) accessible to public green & open spaces, the project team can draw an offset distance of 400m from the outer edge / boundary of each public green & open space and sum-up all the areas. Projects may refer to the sample illustration provided for further guidance.*

Sample Illustration

LEGEND

Public green spaces

- Parks
- Green spaces along water bodies such as nala, pond, lake, canal, river etc.

Open Spaces

- Playgrounds
- Multi-open space (maidan)
- Sports complex

Scale: 1:10,000

Picture 1: Portion of city map indicating 400m offset distance drawn from the outer edge / boundary of each public green & open space

Documentation Required:

1. Provide land use plan (to scale) indicating an offset distance of 400m from the outer edge / boundary of each public green & open space.
2. Submit supporting calculations demonstrating that the percentage of developed area accessible to all public green & open spaces is at least 40%.

HW Credit 3

Points: 1

Environmental Monitoring

Intent:

Encourage continuous monitoring of air, water and noise levels thereby enhancing environmental quality of the city.

Compliance Options:

Provide a framework for continuous monitoring of air, water quality (surface water, ground water, storm water) and noise levels during construction and operation stage of the city. The framework shall include the following at minimum:

- Measuring parameters (pH, BOD, COD, RSPM, SPM, Ambient noise levels etc.)
- Standards for compliance (Central Pollution Control Board / State Pollution Control Board norms for air, water and noise whichever is stringent)
- Frequency of Monitoring
- Institutional Responsibilities

Documentation Required:

1. Submit extract of Development Plan (DP) / Master Plan (MP) / Project Report (PR) / Environmental Impact Assessment (EIA) Report highlighting a framework to monitor air, water quality and noise levels during construction & operation stages.
2. Submit extract of Development Plan (DP) / Master Plan (MP) / Project Report (PR) / Environmental Impact Assessment (EIA) Report highlighting strategies to mitigate adverse effects of air pollution, water and noise pollution during construction and operation stages respectively.

HW Credit 4 **Points: 5**

Solid Waste Management

Intent:

Minimise solid waste generation and promote solid waste as a potential resource thereby encouraging a clean & healthy city.

Compliance Options:

Provide an integrated solid waste management plan to efficiently manage and minimise following types of waste generated within the city :

- Domestic Waste – Wet & Dry
- Industrial Waste
- Street Sweepings
- Biomedical Waste
- E-Waste
- Construction & Demolition Waste

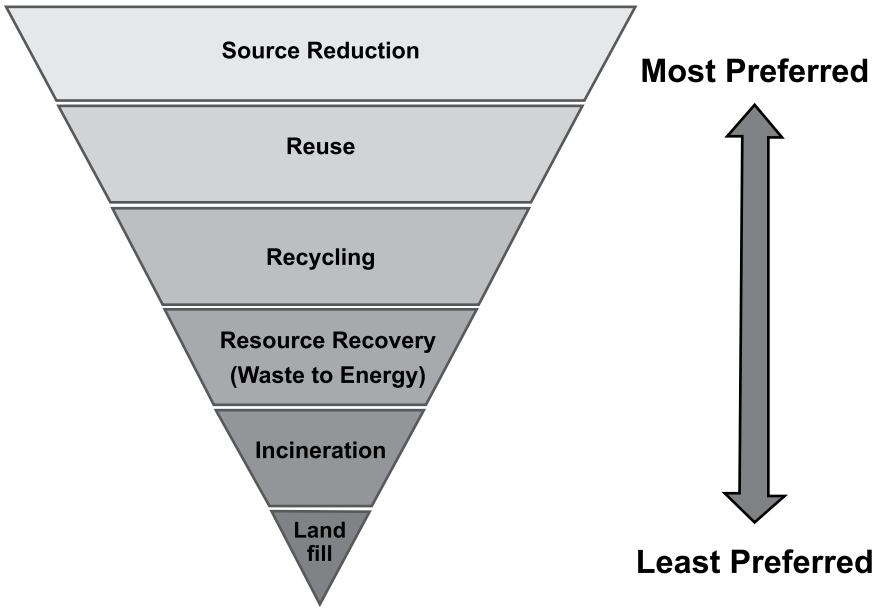
The plan shall incorporate the following benchmarks at minimum:

- Percentage segregation of waste at source : 100%
- Overall percentage recycling of waste : Minimum 60%
- Percentage waste to landfill site : Maximum 5%

Notes:

- *The projects are recommended to divert inert waste to sanitary land fill site.*
- *The Project may follow the following solid waste management hierarchy with 'Prevention' being the most preferred option and 'Disposal' being the least preferred option :*

Solid Waste Management Hierarchy



Picture 2

Documentation Required:

1. Submit extract of Development Plan (DP) / Master Plan (MP) / Project Report (PR) highlighting integrated solid waste management plan. The plan shall have strategies to minimise & efficiently manage all types of wastes mentioned in the compliance option.
2. Submit extract of Development Plan (DP) / Master Plan (MP) / Project Report (PR) showing estimated solid waste generation calculations of the city.
3. Submit schematic plan indicating the proposed location of sanitary landfill site.
4. Submit city plan indicating solid waste catchment areas along with solid waste transfer stations.

Sustainable Mobility

SM Mandatory Requirement 1 **Required**

Sustainable Mobility Plan

Intent:

Encourage sustainable mobility so as to reduce greenhouse gas emissions thereby enhancing quality of life.

Compliance Options:

Develop a Sustainable Mobility Plan that includes the following at minimum:

- ❖ Strategies to integrate land uses with transport network
- ❖ Strategies for Transit Oriented Development (TOD) along transit corridors.
- ❖ Provision for public transport systems such as Bus Rapid Transit (BRT), Light Rail Transit (LRT), Metro rail, Heavy rail etc.
- ❖ Modal split indicating proportion of public transport trips, walk trips, cycle trips and other modes of transport*
- ❖ Freight management strategies
- ❖ Strategies to encourage use of low-emitting public vehicles#

Notes:

- **Other modes of transport include 2-wheelers, 4-wheelers, para transit modes (auto rickshaw etc.)*
- *#Low-emitting public vehicles include vehicles that operate on low-emitting fuels / sources such as Compressed Natural Gas (CNG), Liquified Petroleum Gas (LPG), Biofuels, Hydrogen, Electricity, etc.*

Documentation Required:

1. Submit proposed sustainable mobility plan for the city, clearly highlighting the following:
    - ❖ Strategies to integrate land uses with transport network
    - ❖ TOD strategies along transit corridors.
    - ❖ Provision for public transport systems such as Bus Rapid Transit (BRT), Light Rail Transit (LRT), Metro rail, Heavy rail etc.
    - ❖ Modal split indicating proportion of public transport trips, walk trips, cycle trips and other modes of transport.
    - ❖ Freight management strategies
2. Submit public transport network plan (to scale) of the city.
3. Submit extract of Policy Document highlighting strategies to encourage use of low-emitting public vehicles.

SM Mandatory Requirement 2 **Required**

Barrier-free Accessibility

Intent:

Ensure that public needs of elderly and differently abled people are addressed in the city, to make the city accessible for all.

Compliance Options:

Provide 100% Barrier-free Accessibility in the following public spaces:

- ❖ Pedestrian pathways[#]
- ❖ Road crossings[#]
- ❖ Public Buildings[+]
- ❖ Public Toilets[+]
- ❖ Parks and recreational areas

Notes:

- *[#]For Pedestrian pathways and Road crossings, refer 'Street Design Guidelines', Chapter 5, Section 3, UTTIPEC, November 2010.*
- *[+]For Public Buildings^ and Public Toilets, refer 'Handbook on Barrier Free and Accessibility', CPWD, 2014.*
- *^Public Buildings means any building or portion thereof, other than a privately owned residential structure, but not limited to educational institutions, recreational facilities, religious facilities, health care facilities, entertainment facilities, mass transit facilities*, factories, office buildings and business establishments.*
- **For Mass transit facilities, refer 'Guidelines and space standard for Barrier free Built Environment for Disabled and Elderly Persons' CPWD, 1998.*

Documentation Required:

Submit extract of Policy Document highlighting strategies for provision of 100% Barrier-free accessibility in all public spaces as mentioned under compliance option.

SM Credit 1

Points: 5

Access to Mass Transit Facilities

Intent:

Promote easy accessibility to mass transit facilities to encourage use of public transport, thereby reducing greenhouse gas emissions.

Compliance Options:

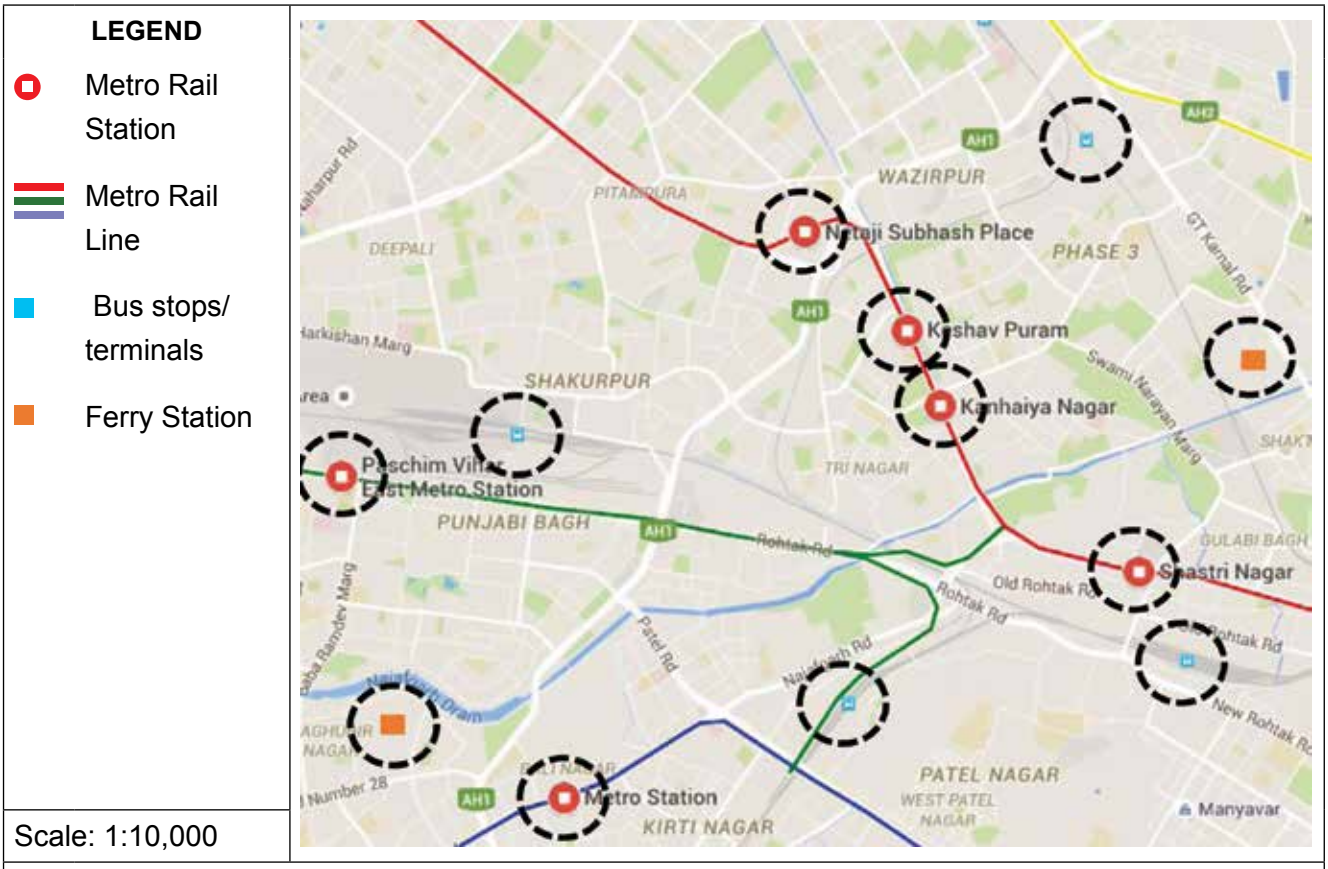
Ensure planning of mass transit facilities* such that at least 40% of the total developed area is located within a radial distance of 800 metres from mass transit facility. Points are awarded as below:

Percentage of developed area accessible to mass transit facilities*	Points
≥ 40%	1
≥ 50%	2
≥ 60%	3
≥ 70%	4
≥ 80%	5

Notes:

- **Mass transit facilities include bus stops / terminals, light rail, monorail, metro rail, heavy rail, ferry station, etc.*
- *To arrive at the cumulative developed area (Refer Annexure I for definition) accessible to mass transit facilities, the project team can draw 800m radial circles from all mass transit stations and sum up all the radial areas. Projects may refer to the sample illustration provided for further guidance.*

Sample Illustration



Picture 3: Portion of city map indicating 800m radial circles drawn from mass transit facilities

Documentation Required:

1. Submit Public transport network plan (to scale) of the city.
2. Submit land use plan (to scale) indicating 800m radial circles drawn from all mass transit facilities along with supporting calculations demonstrating that the percentage of total developed area accessible by all mass transit facilities is at least 40%.

SM Credit 2 **Points: 5**

Pedestrian Network

Intent:

Encourage comfortable walking experience by providing continuous and designated pedestrian network, thereby enhancing public safety & health.

Compliance Options:

- 100% designated pedestrian pathways for the entire road network (arterial, sub-arterial, collector and local roads) of the city. (1 point)
- Provide the following design elements / measures for the entire pedestrian network:
  - Tree shade for 100% pedestrian pathways. This shall be achieved within 5 years of plantation. (1 point)
  - Adequate street lighting to achieve appropriate lux levels# for the entire pedestrian network within the city. (1 point)
  - Dedicated space for hawkers, street furniture, tree plantation, street lighting etc. for all types of proposed roads*. (2 points)

Notes:

- *#For appropriate lux levels, projects may refer to 'Codes for Urban Roads – Volume I', Institute of Urban Transport, 2012.*
- **To prevent encroachment on pedestrian pathways, dedicated space for hawkers, street furniture, tree plantation, street lighting etc. shall be provided outside the pedestrian path with the edge being clearly defined.*

Documentation Required:

1. Submit city road network plan (to scale) indicating 100% designated pedestrian pathways.
2. Submit city road network plan, typical road cross-sections and supporting calculations indicating that 100% of area under pedestrian network is shaded with tree cover.
3. Submit typical plans & cross-sections of arterial, sub-arterial, collector and local roads clearly indicating designated pedestrian paths along with dedicated space for hawkers, street furniture, tree plantation, street lighting etc.
4. Submit extract of Policy Document highlighting provision of adequate street lighting to achieve appropriate lux levels for the entire pedestrian network within the city.

SM Credit 3

Points: 5

Bicycle Lane Network

Intent:

Encourage comfortable cycling experience by providing continuous and designated bicycle lane network, thereby promoting public safety & health

Compliance Options:

- Ensure at least 25% of the road network (arterial, sub-arterial, collector roads) has provision for designated bicycle lane network. Points are awarded as below:

Percentage of designated bicycle lane network to the total road network	Points
≥ 25%	1
≥ 50%	2

- Provide the following design elements / measures for bicycle lane network :
  - Tree shade for 100% bicycle lane network. This shall be achieved within 5 years of plantation. (1 point)
  - Bicycle parking space / stations at mass transit facilities, parks and recreational areas, commercial, institutional and residential buildings. (1 point)
  - Adequate street lighting to achieve appropriate lux levels# for the entire bicycle lane network within the city. (1 point)

Note:

- *#For appropriate lux levels, projects may refer to 'Codes for Urban Roads – Volume I', Institute of Urban Transport, 2012.*

Documentation Required:

1. Submit city road network plan (to scale) and supporting calculations indicating at least 25 % of the total road network has designated bicycle lane network.
2. Submit typical plans & cross-sections of arterial, sub-arterial & collector roads clearly indicating designated bicycle lane and supporting calculations demonstrating that 100% of area under bicycle network is shaded with tree cover
3. Submit extract of Policy Document or Development Plan (DP) / Master Plan (MP) / Project Report (PR) highlighting the following :
   - Strategies for providing bicycle parking space / stations.
   - Provision of adequate street lighting to achieve appropriate lux levels for the entire bicycle lane network.

Water, Energy & Infrastructure Management

WEI Credit 1

Points: 5

Water Efficiency Plan

Intent:

Encourage efficient water supply and demand side management, thereby reducing potable water use.

Compliance Options:

❖ Have a policy in place to ensure that the water consumption for residential and commercial land uses do not exceed the following baseline criteria:

Land Use	Baseline
Residential (lpcd#)	150*
Commercial (lpcd#)	45*

**Source: Manual on Water Supply and Treatment (Central Public Health & Environmental Engineering Organisation (CPHEEO), MoUD*

Points are awarded as below:

Percentage reduction of residential water consumption (lpcd#) over baseline criteria	Points
10%	1
20%	2

Percentage reduction of commercial water consumption (lpcd#) over baseline criteria	Points
10%	1
20%	2

Note:

- *#lpcd: Litres per capita per day*

❖ Have a policy in place to ensure that the percentage of Non-Revenue Water (NRW) as a share of water produced shall not exceed 5% (1 point)

Documentation Required:

1. Submit extract of Development Plan (DP) / Master Plan (MP) / Project Report (PR) highlighting the water consumption considered (baseline) for residential and commercial land uses.
2. Submit extract of Policy Document or Development Plan (DP) / Master Plan (MP) / Project Report (PR) highlighting water consumption reduction targets (in terms of percentage or quantity in lpcd) for residential and commercial land uses.
3. Submit extract of Policy Document or Development Plan (DP) / Master Plan (MP) / Project Report (PR) highlighting the list of demand side management strategies identified to ensure reduction of water consumption over baseline criteria for residential and commercial land uses.
4. Submit extract of Policy Document or Development Plan (DP) / Master Plan (MP) / Project Report (PR) highlighting the list of strategies identified to ensure that the percentage of Non-Revenue Water (NRW) as a share of water produced does not exceed 5%.

WEI Credit 2

Points: 5

Rainwater Harvesting

Intent:

Harvest rainwater to enhance groundwater table and reduce municipal water demand.

Compliance Options:

City Level

- Provide a dedicated storm water drainage network for 100% storm water conveyance within the city. (1 point)
- Incorporate strategies in Development Plan (DP) / Master Plan (MP) / Project Report (PR) to harvest at least 50% storm water run-off*. The harvesting system at city level shall cater to atleast one day average rainfall** occurred in the last 30 years. Points are awarded as below:

Percentage of storm-water harvested at city level	Points
≥ 50%	1
≥ 75%	2
≥ 95%	3

Building Level# (1 point)

Option 1:

- Incorporate mechanisms in Development Control Regulations (DCR) to harvest 100% rainwater from roof areas of all buildings in the city.

Option 2:

- In case the State bye-laws / Development Control Regulations (DCR) does not address the requirement, the project shall have a Policy Document mandating 100% harvesting of rainwater from roof areas of all buildings in the city.

Notes:

- **Sources of storm water runoff generation in the city include roads, pedestrian pathways, public green & open spaces etc.*
- ***To arrive at one day average Rainfall, divide peak month rainfall occurred in each year (in last 30 years) by number of rain days in the respective month, and take the average of the thirty values obtained. Abnormal rainy days like flash floods can be excluded from calculations.*
- *#Projects shall refer Rainwater Harvesting Guidelines in Section 7.2 - Rainwater Harvesting-Surface Runoff, Part 11 - Approach to Sustainability, National Building Code (NBC) of India.*

Documentation Required:

City level

1. Submit storm water drainage network plan (to scale) highlighting storm water catchment zones in the city.
2. Extract of Development Plan (DP) / Master Plan (MP) / Project Report(PR) highlighting strategies to harvest / store atleast 50% storm water
3. Submit calculations indicating that at least 50% storm water run-off is harvested within the city
4. Extract of Development Plan (DP) / Master Plan (MP) / Project Report (PR) showing city Water Balance Table highlighting rainwater harvesting system as a potential source of water.

Building level

1. For option 1, submit extract of Development Control Regulations (DCR) / State bye-laws highlighting provisions to mandate 100% harvesting of rainwater from roof areas of all buildings in the city.
2. For option 2, submit extract of Policy Document highlighting provision to mandate 100% harvesting of rainwater from roof areas of all buildings in the city.

WEI Credit 3

Points: 8

Waste Water Treatment & Reuse

Intent:

Encourage treatment of wastewater to avoid pollution of natural water streams and reuse such treated waste water to reduce fresh water demand*.

Compliance Options:

- **Waste Water Treatment**
  - **For Residential, Commercial, Mixed use, Public & Semi-public land uses:** (1 point)
    - Provide wastewater treatment systems to treat 100% of the wastewater generated
  - **For Industrial land use:** (1 point)
    - Option 1:
      - Incorporate bye-laws in Development Control Regulations (DCR) to mandate provision of On-site Effluent Treatment Plant to treat 100% of the wastewater generated within Industrial Buildings.
    - Option 2:
      - In case the State bye-laws / Development Control Regulations (DCR) does not address the requirement, the project shall have a Policy Document mandating provision of On-site Effluent Treatment Plant to treat 100% of the wastewater generated within Industrial Buildings.
- **Reuse of Treated Waste Water#**
  - **For Residential, Commercial, Mixed use, Public & Semi-public land uses:**
    - Have a plan to reuse at least 50% treated waste water for non-potable applications**. Points are awarded as below:

Percentage of Treated Waste Water reused	Points
≥ 50%	1
≥ 75%	2
≥ 95%	3

- **For Industrial land use:**
  - Incorporate bye-laws in Development Control Regulations (DCR) / Policy Document mandating reuse of at least 50% of treated waste water. Points are awarded as below:

Percentage of Treated Waste Water reused	Points
≥ 50%	1
≥ 75%	2
≥ 95%	3

Notes:

- **Fresh water is defined as water sourced from municipal water systems or bore wells.*
- *#Recommended quality standards of treated waste water for non-potable applications are as follows- pH : 6.5-8.5, BOD (mg/l) < 5, COD (mg/l) <50, TSS (mg/l) < 5, TDS (mg/l) < 500.*
- ***Non-potable applications include but not limited to flushing, irrigation demand for green spaces, cooling tower make-up etc.*

Documentation Required:

❖ **Waste Water Treatment**

- **For Residential, Commercial, Mixed use, Public & Semi-public land uses:**
  1. Submit extract of Development Plan (DP) / Master Plan (MP) / Project Report (PR) highlighting design water balance calculations indicating 100% treatment of the wastewater generated.
  2. Provide sewage network plan (to scale) highlighting the location of sewage treatment plant.
- **For Industrial land use:**
  1. For option 1, submit extract of Development Control Regulation (DCR) highlighting bye-laws to mandate provision of On-site Effluent Treatment Plant to treat 100% waste water generated within industrial buildings.
  2. For option 2, submit extract of Policy Document highlighting provision to mandate On-site Effluent Treatment Plant to treat 100% waste water generated within Industrial Buildings.

❖ **Reuse of Treated Waste Water**

➢ **For Residential, Commercial, Mixed use, Public & Semi-public land uses:**

1. Submit extract of Development Plan (DP) / Master Plan (MP) / Project Report (PR) highlighting strategies to reuse treated waste water and water balance table highlighting the quantum of waste water reused for various applications.
2. Submit typical treated waste water network plan.

➢ **For Industrial land use:**

1. For option 1, submit extract of Development Control Regulation (DCR) highlighting byelaws to mandate reuse of at least 50% treated waste water.
2. For option 2, submit extract of Policy Document highlighting provision to mandate reuse of at least 50% treated waste water.

WEI Credit 4

Points: 8

Energy Efficiency Plan

Intent:

Enhance energy efficiency of the city, so as to reduce carbon emissions, thereby mitigating negative environmental impacts.

Compliance Options:

- Have a policy mechanism in place, that addresses the following energy efficiency measures: (1 point for each measure)
  - Energy Conservation Building Code (ECBC) for all building typologies with connected load ≥ 100 kW.
  - Provide at least 50% LED based street lighting for complete road and street network of the city. Points are awarded as below:

Percentage of LED based street lighting to the complete road and street network	Points
≥ 50%	1
≥ 75%	2

  - LED lighting in all public green spaces* and advertisement hoardings
  - Solar Hot Water systems for domestic water applications** to meet atleast 75% hot water requirement for residential buildings, hotels, hospitals & hostels.
  - Encourage Liquified Petroleum Gas (LPG) / Compressed Natural Gas (CNG) based fuels to meet atleast 50% hot water requirement for residential buildings, hotels, hospitals & hostels.
  - Encourage On-site Renewable Energy (RE) systems to meet atleast 5% of the annual energy requirement in commercial offices, shopping malls and hotels, which have connected load ≥ 500 kW.
  - Time of Day (TOD) tariff structure for Industrial power supply

Notes:

- **Public green spaces include parks, botanical gardens, green spaces along water bodies such as tank, nala, pond, lake, canal, river etc.*
- ***Domestic water applications include use of water for cooking, washing, bathing.*
- *Projects may refer to Annexure III for further guidance on "Indicators for Energy Efficiency"*

Source: BIS Committee on Smart Cities

Documentation Required:

1. Extract of Policy Document highlighting provision of measures mentioned in the compliance option.
2. Submit extract of Policy Document highlighting plan to provide at least 50% LED based street lighting for complete road and street network of the city.

WEI Credit 5

Points: 8

Renewable Energy

Intent:

Promote renewable energy thereby reducing the use of fossil fuels and mitigating environmental impacts.

Compliance Options:

Demonstrate that the city has plans to source at least 10%* renewable energy** to the total energy requirement of the city. Points are awarded as below:

Percentage of Renewable Energy* to total energy requirement of the city	Points
≥ 10%	1
≥ 12.5%	2
≥ 15%	3
≥ 17.5%	4
≥ 20%	5
≥ 22.5%	6
≥ 25%	7
≥ 27.5%	8

*Source: *Smart City Mission Statement & Provision, MoUD, Govt. of India, June 2015*

Note:

- ***Renewable Energy includes energy generated from Solar Photo-voltaic (PV), Wind, Biomass, Solar Thermal, Geothermal, Small Hydropower etc.*

Documentation Required:

1. Submit extract of Development Plan (DP) / Master Plan (MP) / Project Report (PR) indicating the list of strategies to source renewable energy.
2. Submit calculations indicating the percentage of Renewable Energy to total energy requirement of the city.
3. Submit schematic plan highlighting location of on-site RE applications at city level (if applicable).

WEI Credit 6

Points: 4

Integrated Utility Network

Intent:

Minimise disturbance to utilities, by providing a dedicated common utility duct so as to enhance service delivery.

Compliance Options:

Provide integrated utility network to accommodate following services, at minimum:

- Potable Water Supply
- Sewer lines
- Treated Waste Water Supply
- Power Cables
- Piped Natural Gas
- Chilled Water Supply & Return
- Pneumatic Solid Waste Collection
- Information & Communication Technology (ICT) Cables

Documentation Required:

1. Submit extract of Development Plan (DP) / Master Plan (MP) / Project Report (PR) highlighting provision for providing integrated utility network to accommodate utilities for the entire city.
2. Submit typical cross-section of integrated utility network highlighting provision of all services mentioned in the compliance option.

Information and Communications Technology (ICT)

ICT Credit 1

Points: 5

Information and Communications Technology (ICT) Applications

Intent:

Encourage use of innovative ICT applications, thereby minimizing the negative impacts on environment to improve the overall performance of the city.

Compliance Options:

- Demonstrate that the city has plans to incorporate the following ICT applications. The project team can apply for a maximum of 5 points: (1 point for each application)
  - City Central Command Centre for monitoring infrastructure facilities such as power, transport, water, waste, city surveillance, etc.
  - City dashboard System for real – time performance tracking for infrastructure facilities such as power, water, waste, transport, air quality, etc.
  - Smart Power Grid System
  - Smart Metering for water supply and district cooling (if installed) at consumer level
  - Smart Irrigation system for city landscape
  - On / off automatic controls for Street lighting
  - Automatic vehicle location and tracking
  - Real Time Travel Response
  - Any other ICT applications contributing to environmental performance of the city.

Documentation Required:

1. Submit extract of Development Plan (DP) / Master Plan (MP) / Project Report (PR) highlighting list of all ICT applications planned within the city.
2. Provide a narrative on technologies, applications and management plan.

Innovation in City Planning

ICP Credit 1

Points: 7

Innovation in City Planning

Intent:

To encourage innovation in city planning and development so as to reduce environmental impacts.

Compliance Option:

Credit 1: Innovation in City planning and development

Identify the intent of the proposed innovation credit, the proposed requirement for compliance, and the design approach used to meet the required measures.

The project may apply for any 7 innovation points for exemplary performance in following credits:

1. LPB Credit 1, ≥ 275
2. LPB Credit 2, ≥ 35%
3. LPB Credit 4, ≥ 95% for Carriage-way and Service roads
4. LPB Credit 5, ≥ 42.5%
5. HW Credit 1, ≥ 27.5%
6. HW Credit 2, ≥ 90%
7. SM Credit 1, ≥ 90%
8. SM Credit 3, ≥ 75%
9. WEI Credit 5, ≥ 30%

The projects may explore innovation points for the following green features:

10. Energy from waste, at least 5% of total power demand of the city
11. Urban Agriculture

Notes:

The project shall also meet the following criteria for achieving an Innovation point:

- *Strategy must be significantly better than standard sustainable design practices*
- *Measures must be voluntary*
- *Measures that are mandated by the local bye-laws and not addressed in the rating system are not eligible for Innovation.*

Documentation Required:

Extract of Policy Document or Development Plan (DP) / Master Plan (MP) / Project Report (PR) highlighting the provision of innovative green features mentioned in the compliance option.

ICP Credit 2

Points: 1

Qualified IGBC AP Credentials

Intent:

Support and encourage the involvement of IGBC Accredited Professional in the Green City projects, so as to integrate appropriate green planning strategies in the city.

Compliance Options:

The principal participants of the project team shall be a multi-disciplinary team. At least 3 professionals involved in planning shall have IGBC AP Credentials.

Documentation Required:

Submit copy of IGBC AP certificates of at least 3 professionals involved in planning of the city.

Annexures

Glossary

Developed area is defined as the area under following land uses:

- Residential
- Commercial
- Industrial Areas
- Public & Semi-public
- Mixed Use
- Public Green & Open Spaces
- Transportation and Communication

Brownfield: A brownfield is a parcel of real property, or a portion of the parcel, that has actual or perceived contamination and an active potential for redevelopment. Brownfields are abandoned, unused, or underused industrial and commercial properties.

(Source: Illinois Environmental Protection Agency)

Coastal Regulation Zone: The coastal stretches of seas, bays, estuaries, creeks, rivers and backwaters which are influenced by tidal action (in the landward side) upto 500 metres from the High Tide Line (HTL) and the land between the Low Tide Line (LTL) and the HTL is referred as Coastal Regulation Zone. High Tide Line means the line on the land upto which the highest water line reaches during the spring tide.

(Source: Ministry of Environment & Forest & Climate Change, GoI)

Development Control Regulations(DCR): DCR is defined as the mechanism through which entire process of urban development is regulated to achieve the objective of promoting overall benefit of the society and creating a distinct image of the city. It includes guiding the development and use of land, curbing misuse of land and promoting rational and orderly development of built environment.

(Source: Chandigarh Master Plan 2031)

E-waste: It includes discarded materials from a range of electronic devices such as computers, refrigerators, televisions, air-conditioners, personal stereo, mobile phones, etc.

Floor Area Ratio (FAR) / Floor Space Index (FSI): The ratio of the combined covered area (plinth area) of all floors to the total area of the plot.

Heat Island Effect: It refers to absorption of heat by hardscapes, such as dark, non reflective pavement and buildings, and its radiation to surrounding areas.

Greenfield: Greenfields are sites not previously developed or graded that could support open space, habitat, or agriculture.

Master Plan / Development Plan: A Master Plan or Development Plan is the long term perspective plan for guiding the sustainable planned development of the city. This document lays down the planning guidelines, policies, and development code and space requirements for various socio-economic activities supporting the city population during the plan period. It is also the basis for all infrastructure requirements.

(Source: Delhi Development Authority)

Modal Split / Modal Share: The percentage of total trips completed via a particular travel mode (walk, cycle, drive, ride, etc.)

(Source: TOD Standard V2.1, Institute for Transportation & Development Policy)

Non-Revenue Water (NRW): Non-revenue water is the difference between the volume of water put into a water distribution system and the volume that is billed to customers. NRW comprises three components: physical (or real) losses, commercial (or apparent) losses, and unbilled authorized consumption.

(Source: The Challenge of Reducing Non-Revenue Water (NRW) in Developing Countries How the Private Sector Can Help: A Look at Performance-Based Service Contracting, World Bank)

Solar Reflectance Index (SRI): A measure of material's ability to reject solar heat, as shown by a small temperature rise. It is defined so that a standard black (reflectance 0.05, emittance 0.90) is 0 and standard white (reflectance 0.80, emittance 0.90) is 100.Materials with highest SRI values are the coolest choices for paving.

Transit-oriented development (TOD): TOD implies high quality, thoughtful planning and design of land use and built forms to support, facilitate and prioritize not only the use of transit, but the most basic modes of transport, walking and cycling.

(Source: TOD Standard V2.1, Institute for Transportation & Development Policy)

Time of Day (TOD) / Time of Use (TOU): It is a tariff structure in which different rates are applicable for use of electricity at different time of the day. It means that cost of using 1 unit of electricity will be different in mornings, noon, evenings and nights.

Hierarchy of Public Green & Open spaces

❖ **Norms for Public Green spaces**

Category	Population served per unit	Area Requirement (Ha)
Housing Area Park	5,000	0.5
Neighbourhood park	15,000	1
Community park	1 lakh	5
District park	5 lakh	25
Sub city park	10 lakh	100

❖ **Norms for Multipurpose grounds (Open spaces)**

Category	Population served per unit	Area Requirement (Ha)
Sub city level multipurpose ground	10 lakh	8
District level multipurpose ground	5 lakh	4
Community level Multipurpose	1 lakh	2

❖ **Norms for Sports Facilities (Open spaces)**

Category	Population served per unit	Area Requirement
Residential unit play area	5,000	5,000 sq.m
Neighbourhood Play area	15,000	1.5 ha
District Sports Centre	1 lakh	8 ha
Divisional Sports Centre	10 lakh	20 ha

Source: MoUD's 'Urban and Regional Development Plans Formulation and Implementation (URDPFI) Guidelines', Volume 1, January 2015

Indicators for Energy Efficiency (Operational Stage)

❖ **Energy Use Aspects**

1. Total Residential electrical energy use per capita (kWh/year):

Total residential electrical energy use per capita shall be calculated as the total residential electrical usage of a city in kilowatt-hours (numerator) divided by the total population of the city (denominator).The result shall be expressed as the total residential electrical use per capita in kilowatt hours/year.

2. Energy Consumption of public buildings per year (kWh/m^2):

Energy consumption of public buildings shall be calculated per year as the total use of electricity at the final consumption stage by the public buildings (kWh) with in a city (numerator) divided by the total floor space of these buildings in square meters (m^2) (denominator). The result shall be expressed as the total energy consumption of public buildings per year in kilowatt-hours per square meter.

Note:

Public buildings are government owned buildings such as government offices, hospitals and schools.

3. Percentage of Energy Consumption in City Utilities as a share of the city's total energy consumption:

To cater to the needs of citizens in a city, there are multiple utilities other then Electricity Utilities that also need Electrical Power to operate and manage their respective infrastructures. The energy consumption of these infrastructures adds to the Operational cost of the city.

4. Total electrical energy use per capita (kWh/Year):

Total electrical consumption reflects the overall consumption used by the commercial, industrial and residential sectors.

Total electrical energy use per capita shall be calculated as the total electrical usage of a city in kilowatt-hours including residential and non-residential use (numerator) divided by the total population of the city (denominator). The result shall be expressed as the total electrical use per capita in kilowatt hours/year.

❖ **Consumer Services Aspects**

5. Percentage of consumers participating in utilities Demand Response Programmes in each category:

The utilities need to initiate motivational Demand Response Programmes to promote consumer participation in these programmes to help flatten the load curve as well as optimize

consumer's electricity bills. This aspect of energy management is a reflection on the overall ethos of the city's DNA.

6. Total Number of Tariff Slabs in Electrical Energy Tariff for different categories of Consumers:

"Time of Day" and "Time of Use" Tariff regime is an essential component of an efficient electricity infrastructure in a city. Multiple tariff slabs help utility to flatten their Load Curve, optimize their resources and motivate citizens to conserve the electricity as well as optimize their energy bills.

The regulatory regime needs to enable a well-balanced Tariff slabs for different categories of consumers like, residential, commercial, industrial, institutional and Infrastructure / critical infrastructure to enable optimization in electricity use in a city.

❖ **Utility Operational Aspects**

7. Percentage of electricity consumption capable of being monitored and controlled online against the total consumption of the city:

The smart metering and smart grid solution deployment is crucial imperative for a city. It helps online monitoring as well as control of citywide energy consumption to the finest granularity. Online monitoring can help in load forecasts, averting breakdowns due to overload in any particular locality, by islanding, and / or asking for more power from the grid.

Higher granularity of online monitoring of energy consumption improves the operational efficiency and resilience in the electricity infrastructure.

8. Percentage of consumers Geo-tagged against the Total no. of consumers:

The consumers of an electricity utility are provided with a smart meter for remotely monitoring their respective energy consumption. Geo – tagging these smart meters shall improve the overall operational and maintenance aspects of the utility by guiding the utility professionals with the exact location of each and every consumer.

9. Percentage of Utilization of common ICT infrastructure resources of the city:

A Unified & secure ICT infrastructure works as a backbone for all the physical infrastructure along with citizen services, administration and governance in a city.

The core requirement from the integrated ICT infrastructure is to share the data from one stakeholder to any other stakeholders ubiquitously. The other implication is on Capex and Opex of setting up & running individual ICT infrastructure across the city by each utility.

Utilization of common ICT infrastructure shall be calculated by ICT infrastructure utilized from the common ICT infrastructure of the city divided by Total ICT infrastructure needs of the utility.

❖ **Renewable Energy Aspects**

10. The percentage of total energy derived from renewable sources, as a share of the city's total energy consumption:

The promotion of renewable energy sources is a high priority for sustainable development, for reasons such as the energy security and diversification of energy supply for environmental protection.

The share of a city's total energy consumption derived from renewable sources shall be calculated as the total consumption of electricity generated from renewable sources (numerator) divided by total energy consumption (denominator).

11. Percentage of City Institutional and Industrial consumers contributing in the Renewable Energy Generation:

Mapping this aspect of renewable generation shows the sense of responsibility of the large electricity consumers in trying to reduce their individual carbon foot print along with contributing in city's renewable energy programmes.

12. Percentage of city residential population with individual Renewable Energy Generation:

Mapping this aspect of renewable energy generation shall reflect the conduciveness of the regulatory regime, as well as citizen's adoption of such initiatives by the city administration.

❖ **Energy Efficiency & Environmental Aspects**

13. Percentage of Energy Efficient Lamps and Appliances as a share of city's total lamps and appliances:

Mapping this aspect of energy efficiency shall reflect the consciousness of the citizens, as well as the regulatory regimes focus on energy efficiency.

14. Percentage of Carbon footprint of the Electricity Infrastructure as a share of City's complete infrastructure's Carbon Footprint:

An efficiently designed and deployed infrastructure tends to keep its carbon footprint to the minimum to be sustainable and environmental friendly. However, the contribution from the renewable generation within the city limits could be used to offset the carbon footprint of the infrastructure.

Source: BIS Committee on Smart Cities

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About CII
(Confederation of Indian Industry)

The Confederation of Indian Industry (CII) works to create and sustain an environment conducive to the development of India, partnering industry, Government, and civil society, through advisory and consultative processes.

CII is a non-government, not-for-profit, industry-led and industry-managed organization, playing a proactive role in India's development process. Founded in 1895, India's premier business association has over 7,900 members, from the private as well as public sectors, including SMEs and MNCs, and an indirect membership of over 2,00,000 enterprises from around 240 national and regional sectoral industry bodies.

With 66 offices, including 9 Centres of Excellence, in India, and 8 overseas offices in Australia, Bahrain, China, Egypt, France, Singapore, UK, and USA, as well as institutional partnerships with 312 counterpart organizations in 106 countries, CII serves as a reference point for Indian industry and the international business community.

About IGBC
(Indian Green Building Council)

The Indian Green Building Council (IGBC), part of Confederation on Indian Industry (CII) was formed in the year 2001. The vision of the council is 'To enable a sustainable built environment for all and facilitate India to be one of the global leaders in sustainable built environment by 2025'.

The council offers a wide array of services which include developing new green building rating programmes, certification services and green building training programmes. The council also organises Green Building Congress, its annual flagship event on green buildings.

The council is committee-based, member-driven and consensus-focused. All the stakeholders of construction industry comprising of architects, developers, product manufacturers, corporate, government, academia and nodal agencies participate in the council activities through local chapters.

For more information on Green Built Environment,
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Confederation of Indian Industry

Indian Green Building Council
Greening India since 2001

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