Reinventing Cities

Guidance to Design a Low-Carbon, Sustainable and Resilient Project

Contents

Introduction

This guidance document describes each of the 10 challenges for climate and provides questions for bidding teams to consider within their proposals for the site. It also outlines the main principles of the carbon assessment.

In the expression of interest phase, the bidding teams must explain the general approach of their project. The expression of interest submissions will therefore only have to briefly describe the proposed solutions. For this phase, it is not required to provide a carbon assessment nor to include KPIs.

In the second phase, the shortlisted teams will be encouraged to include in their final proposal an assessment of their project's carbon footprint and to provide quantitative details for the KPIs listed in this document.

The lists of questions and examples provided in this document is not exhaustive – bidding teams are encouraged to propose new and innovative methods for addressing the challenges where appropriate. These questions are to provide guidance to bidding teams. Bidding teams are not required to answer every question set out in this document; instead, they are encouraged to use these questions as a guide for their overall response.

Responding to the challenges: Even though only the first two challenges are compulsory, the bidding teams are invited to consider all challenges within their proposals. However, it is important for bidding teams to focus on the challenges that are most appropriate for the site, i.e. emphasize those which will enable the city and the local communities to catalyse change towards decarbonised, sustainable, and resilient urban development. Bidding teams will be expected to justify their prioritisation of the challenges and to provide details on how they will address each of the challenges that they have selected. Challenges 1 to 3 define the main contributors to the greenhouse gas (GHG) emissions of the project. Challenges 4 to 8 define key components that support a rapid transition towards a climate safe and sustainable city. Finally, challenges 9 and 10 define the conditions to combine environmental performances with high-quality design and community benefits, demonstrating that compact and sustainable cities come together with liveable, enjoyable, and inclusive urban development.

Local regulations and sustainability standards: Bidding teams should ensure that their proposed approaches to addressing the challenges comply with local and national building and environmental regulations, policies, and standards. Where applicable, bidding teams may demonstrate how the use of approved national or international sustainability standards from design to completion will allow the project to address the relevant challenges, for example: LEED, BREEAM, Estidama, EDGE, QualiVerde, Référentiel E+,C-, European Energy Performance of Buildings Directive, the Greenhouse Gas (GHG Protocol), ISO standards, etc.

Going beyond 'Business-As-Usual'[1]: The bidding teams will be expected to demonstrate how the proposed project performs better than a 'Business-As-Usual' approach and demonstrates exemplary standards of environmental/social/architectural practice.

[1] See the *Key Definitions and Meanings* section for more details.

Evaluation: We recognise that bidding teams may not address all 10 challenges within their project proposals[2]. Only the relevant challenges, which are chosen and addressed by the bidding teams, will be assessed as well as the carbon strategy and the two mandatory challenges.

In order to evaluate the content of project solutions to the challenges, the solutions will be assessed based on (i) their ambition and objectives in terms of carbon reduction and environmental performance; (ii) the coherence between these objectives and the proposed solutions and; (iii) the project's implementation approach. In order to evaluate the quality of the solutions, the evaluation methodology will give most credit to the projects that display consistent, comprehensive, and directly relevant evidence and justifications for their solutions. Solutions substantiated by independent sources, previous successful projects and credible calculations will be favourably evaluated, as well as projects that can be easily replicable.

[2] NB: Challenges 1 and 2 are mandatory

Challenge 1 - Energy efficiency and low-carbon energy consumption (mandatory)

Overview of the challenge: This is a mandatory challenge. The objective of this challenge is to reduce the GHG emissions and the environmental impact of energy production and consumption.

The proposed development should go beyond current 'Business-As-Usual' energy standards to demonstrate exemplary energy efficiency, clean energy usage, and strive to achieve net zero energy or 'positive energy' status[3]. The energy strategy developed by the bidding teams should strive to include the following: (i) passive design and efficient building form and fabric; (ii) energy efficient appliances/equipment; (iii) occupant control, monitoring and evaluation of energy consumption; (iv) on-site and off-site production and consumption of renewable energy; (v) energy storage; (vi) social benefits related to sustainable energy.

Energy efficiency is a high priority in the design and operation of the buildings and public spaces. This means minimizing the amount of energy a building uses for heating, cooling, hot water, lighting, ventilation, electrical services, etc. Fostering the production and use of clean energy on site is also key.

In the second phase of the competition, the shortlisted bidding teams are encouraged to provide the following KPIs for this challenge:

- Energy consumption of project in kWh/m^2/year broken down by energy source (e.g. electricity, gas, etc.) and by usage (e.g. heat, hot water, ventilation, etc.)
- Carbon footprint of the energy consumption in kgCO_2e/m^2/year (with a clear distinction made between energy consumption from activities and from normal building use).
- Share of low-carbon energy consumption in % (a distinction should be made between off-site low-carbon energy production and on-site low-carbon energy production)

Questions to consider in your response:

Energy efficient design:

1. **How will your project reduce energy consumption on site through passive design/ efficient form and fabric?**

   E.g. enhanced building fabric specification, bioclimatic design/solar/shading optimisation, optimised thermal mass, air tightness, reduced thermal bridging, maximised use of daylight, passive ventilation, passivhaus or equivalent design standards, etc.

[3] Positive energy status refers to a project that produces more energy than it consumes.

Energy efficient HVAC, lighting and appliances:

2. **How does your project consider energy efficiency during its occupancy and usage? Which energy efficient equipment and appliances are intended on being integrated for the following usages: (i) heating/cooling, (ii) hot water, (iii) lighting (iv) ventilation, and (v) significant other energy usage[4]?**
   a. **What type of energy is expected to be consumed per usage?**
   b. **How much energy is expected to be consumed per usage in kWh/m^2/year and kWh/year.**

      E.g. highly efficiency heating/cooling, efficient electrical appliances and mechanical equipment, advanced building controls, etc.

Clean energy usage:

3. **How will your project use clean energy?**
   a. **How does your project reduce its external energy purchases thanks to on-site consumption of installed renewable energy produced on-site? Please include capacities installed in kW.**

      E.g. consumed solar photovoltaic and solar thermal, air source/solar heat pump, biogas, combined heat and power, ground source heat pumps, (micro) hydro power, waste to energy…

   b. **What types of renewable or low-carbon energy could be produced off-site and consumed on-site? How could the site purchase this energy (e.g. Power Purchase Agreement (PPA), guarantees of origin)?**
   c. **What is the total expected renewable energy consumption in kWh and in % of total energy consumption?**
   d. **What is the expected carbon footprint for the energy consumption of your project (per usage) in kgCO_2e/m^2/year or tCO_2e/year? Please specify the carbon intensity breakdown in the appendix of your proposal.**

Energy efficient control and monitoring:

4. **How will occupants be able to control, monitor and evaluate their energy consumption?**

   E.g. use of Building Information Modelling, use of Virtual Reality tools to communicate on resource management, data collection and usage to engage with stakeholders and inform on behaviour, monitoring for installed devices, such as movement sensor lighting, connected appliances, for HVAC: use of natural ventilation when outdoor temperatures permit. Monitoring devices for future appliances, such as centralised systems for power outlets. Monitoring systems to enable charging of electric vehicle or shifting of other energy demand during off-peak/low-carbon hours, building handover material for management towards optimisation, such as training material, videos, manuals, logbooks, etc.

Energy storage:

5. **How and why is energy storage considered in your project?**

[4] If your project incorporates a retrofit, please separate out surfaces and energy units for new build and renovation.

E.g. Energy storage systems, such as batteries, instead of fossil fuel-based generators, energy storage system in place in order to increase on-site renewable energy consumption, energy storage system in order to shift energy consumption to off peak hours (including thermal mass and energy storage descriptions), etc.

Energy social benefits:

6. **How will your project create social benefits related to low-carbon design (including carbon off-setting)?**

   E.g. renewable electricity exports, such as export of photovoltaic electricity, heat exports, such as district heating, biogas production through methanization for transport systems, support given to offsetting projects in the local area in order to lower the overall carbon footprint of the project, purchase of carbon offsetting credits, etc.

Challenge 2 - Life cycle assessment and sustainable construction materials (mandatory)

Overview of the challenge: This is a mandatory challenge. The objective of this challenge is to reduce the embodied carbon of the project, which refers to the lifecycle greenhouse gas emissions that occur during the manufacture and transport of construction materials, as well as the construction process itself and end-of-life aspects of the building.

The project should prioritise building retrofits over demolishing old buildings or building new ones. And choose construction materials with lower emissions from the extraction, manufacturing, transportation, and end-of-life phase (for example, timber and low-carbon concrete). Reusing and recycling construction materials is also of great importance.

In the second phase of the competition, the shortlisted bidding teams are encouraged to provide the following KPIs for this challenge:

- Carbon footprint of the construction phase in tCO_2e or tCO_2e/m^2
- Quantity of low-carbon construction material used for building (e.g. wood or low-carbon concrete) in m^3 / m^2.

Questions to consider in your response:

Carbon assessment with Life Cycle Assessment (LCA)[5]:

1. **How has a Life Cycle Assessment approach been used in order to make low-carbon decisions in project design and materials to be used in the project? Please refer to all stages of the lifecycle and include a relevant comparison with the environmental impact of a baseline reference situation.**

    a. **Sustainable materials type/nature: How has low-carbon and ecological thinking been considered for the type of material used for your project?**

    E.g. using recycled materials/wood instead of carbon and energy intensive materials (such as virgin steel or cement).

    *Example for a comparison with a BAU situation : Use of a Cross Laminated Timber (CLT) wooden exterior façade instead of concrete; methodology used E+/C-, explanation for why using concrete is the BAU reference scenario, project lifetime of 50 years, project lifetime in accordance with local E+C- Regulation, calculation of emissions per m^2 for CLT wood 20 cm and emission factor of 105 $kgCO_2e/m^2$ (e.g. calculation 105 * 0,2 = 21 $kgCO_2e/m^2$), emission reduction over the lifetime of the project = [BAU emissions] – [Chosen solution emission]. Use of local specific regulation/methodologies, etc.*

    b. **Sustainable material origin: How does your choice of the geographic origin of your procured materials take into account low-carbon and environmental issues? As**

[5] See the *Key Definitions and Meanings* section for more details.

mentioned above, if relevant, include tCO_2e emissions related to the logistics of procured materials.

E.g. choosing construction materials that minimize greenhouse gas emissions thanks to their local origin (reducing transport emissions), etc.

c. **Sustainable materials manufacturing: How has low-carbon and ecological thinking been considered for the manufacturing of materials used for your project? As mentioned above, if relevant, include tCO_2e emissions related to the manufacturing of materials.**

E.g. choosing construction processes that minimize greenhouse gas emissions and use a limited amount of energy in order to be produced, choosing suppliers that use biomass or waste in order to generate the energy required for production of materials, etc.

Sustainable building and infrastructure design:

1. **How does your project's infrastructure consider modularity/flexible design for future uses/extensions? If so, how?**

   E.g. enabling future adaptation of the building through improved modularity, a building space that can serve multiple purposes, ease of maintenance, opportunities for dismantling at the end of the life cycle, etc.

2. **If you have given preference to retrofits over new build for your project, please specify the surface in m^2 that is to undergo renovation and the volume in m^3 of the material (e.g. the concrete) that would otherwise have been required in the case of a new build.**

3. **Has the building or development been designed to minimize the amount of materials needed over BAU while ensuring good building performance?**

   E.g. *by designing lightweight yet well insulated building fabric, use of aerated materials, good space management to minimize required m^2 of building space, minimisation of storage space (including parking lots, equipment and appliance storage areas), etc.*

4. **How does your project reduce the generation of demolition waste at the end of its lifecycle?**

   E.g. using materials with a potential to be dismantled at the end of lifecycle for re-use, transforming discarded resources back into raw materials, limiting construction waste, recycling waste, etc.

Challenge 3 - Low-carbon mobility

Overview of the challenge: The objective of this challenge is to foster sustainable mobility options. The bidding teams should design their projects to facilitate and encourage walking, cycling, public transport, shared vehicles and electric and other low-emission vehicles and to de-incentivize the use of fossil fuel transport.

The proposed development should go beyond 'Business-As-Usual' to demonstrate exemplary standards of green mobility to reduce energy consumption related to transport as well as to contribute to clean air standards.

Questions to consider in your response:

Low-carbon transport incentives:

1. **How will the project encourage walking?**

   E.g. Greening and shade, pedestrian-centric layout, new links to existing walking routes, accessibility for users of all mobility types, accessible walkways to existing communal transport hubs, provision of outdoor seating/rest areas, provision of drinking water, financial incentives for pedestrians, etc.

2. **How will the project encourage cycling?**

   E.g. number of covered/secure cycle storage (total or per occupant), new cycle hire scheme or new link to existing scheme, showers, changing facilities and lockers, new cycle route or new link to existing cycle route, provision of drinking water, financial incentives for cyclists, etc.

3. **How will the project encourage an increased use of existing transport systems?**

   E.g. new links to existing transport stop/station, live transport updates, use of smart technology, electronic/integrated payment systems, journey planning services, financial incentives for communal transport users, etc.

4. **How will the project encourage use of electric or low-carbon vehicles?**

   E.g. number of electric vehicle parking and charging points (total or per occupant), new electric vehicle hire scheme or link to existing car hire scheme, localised solar powered car ports, financial and other incentives for electric/low-emission vehicles, emissions standards for vehicles, etc.

5. **How will your project monitor and manage an efficient usage of transport systems?**

   e.g. data collection and usage in order to keep track of mobility emissions, energy use, distance travelled, occupant usage etc., use of Virtual Reality tools to communicate with occupants on most efficient and low-carbon routes for travel, smart phone technology to engage with occupants, partnerships with companies that specialise in systems management.

Minimising overall transport emissions:

6. **How will the project minimise the use of diesel and petrol vehicles?**

E.g. no/limited parking for diesel and petrol vehicles, right of way for pedestrians and cyclists, speed restrictions, no idling policy, financial incentives for alternative transport methods, etc.

7. **How will transportation emissions be minimised during the construction phase and during occupancy (post completion)?**

   E.g. procurement planning to minimise deliveries, route optimisation, coordinating deliveries with local sites, telematic controls for construction vehicles, no idling policy, eco-driver training for operators, use of clean fleet vehicles, monitoring mileage and emissions, incentive scheme, etc

Challenge 4 - Climate resilience and adaptation

Overview of the challenge: The objective of this challenge is to develop a project that is resilient to current and future climate hazards specific to the location of the site.

Bidding teams should integrate climate resilience measures throughout the project. The project should be resilient towards climate hazards such as temperature rise, increase in intensity and frequency of winds and storms, flooding, sea level rise, droughts. This means that the project should include a climate change risk assessment, including the climate hazards that the specific site is exposed to and under which climate change scenarios/what time horizon. With this assessment as a starting point, projects should seek to implement adaptation measures. Resilience should cover two aspects: (i) Occupant resilience, such as tree planting or shaded areas to protect residents from the heat island effect. (ii) Building resilience, such as reinforced foundation in locations where strong winds could cause damage, consideration of how droughts could affect building material stability or modular design. Other examples include, water evacuation mechanisms in flood-prone areas such as with water retention basins and significant permeable areas.

NB: All measures regarding rainwater (e.g. capture and storage, water saving, run-off, treatment) can be addressed in Challenge 6.

Questions to consider in your response:

Risk assessment:

1. **What are the main climate change hazards the neighbourhood faces / will face?**

   E.g. The assessment can take into account the five main climate change hazards cities have to face: heat waves, flooding, storms, drought, and sea level rise; but also, a broader analysis of extreme cold events, wildfires, landslides, chemical or biological hazards. It can also consider the existing infrastructures and risk management measures in the neighbourhood.

Resilient design:

2. **How is your infrastructure design adapted to local (location-specific) future climate change risks?**

   E.g. Orientation to get energy from the sun but avoid over-heating the building, analysis of the shadows in summer (especially over the pedestrian and cycling areas), natural cooling, design adapted to increased wind speeds (requires an analysis of neighbourhood morphology), foundations, raised crawl space type, light impact foundations, earth coupled, mechanisms to resist natural disaster (landslides, flooding), resilient structural design, water impacts, driving wind, temperature changes, presence of courtyard or inner garden within the building, etc.

3. **How do the façades in your project take into account the physical risks of climate change? (If relevant, include the surface in m^2 related to the protected area).**

   a. **For vertical façades:**

E.g. External removable or fixed blinds for solar protection, suitable glazing specification for daylight exposure and minimum heat gain, visual Light Transmission, UV coatings, thermal performance, seals, internal glare provision for occupants, increased peak temperatures, use of white paint or reflective materials for façades, presence of vegetated façades, presence of "photovoltaic cladding" on façade, etc.

b. **For the roof infrastructure:**

E.g. Presence of a biodiverse roof, (specify surface in m^2), for flat roofs: presence of white paint/gravel or reflective coatings, presence of a rainwater storage/buffer system, presence of an energy producing equipment, etc.

4. **Have complementary actions been taken in order to cope with other indirect climate-induced hazards?**

E.g. for wildfires or landslides depending on the city and location specific climate analysis

<u>Resilient occupancy:</u>

5. **How does your project integrate location-specific climate change adapted mechanical and electrical systems?**

a. **How has your project considered into its design future heating and cooling needs?**

b. **How has your project integrated these heating and cooling needs into the energy capacity scaling of equipment (in terms of power required)?**

E.g. for heating/cooling, ventilation, air conditioning

Protected electrical systems, raised above the possible level of flooding (transformers, electrical cabinets), provision of secondary secure supply such as generator or sufficient battery back up in the event of power outages, provision of energy efficient appliances in the case of energy poverty, etc.

6. **How does your project encourage people to adapt their behaviour in case of an extreme weather event?**

E.g. Manual solar protection (as opposed to smart solar protections), fountains in public space, presence of cool areas (tree canopy, or shadow in winter), community awareness of vulnerable people and solidarity systems.

Challenge 5 - Ecological services for the neighbourhood and green jobs

Overview of the challenge: The objective of this challenge is to use the site to develop new ecological services for the neighbourhood that will help foster sustainable lifestyle and consumption habits and reduce the environmental footprint of the city, whilst creating green jobs.

Bidding teams should consider using the site as a catalyst to leverage existing green services or to develop new urban services for the neighbourhood that help to reduce the city's environmental impact. Strategies include supply and export of clean energy, new services for waste collection, development of sustainable freight and urban logistics, creation of pooled and shared services, creation of new public parks, etc.

Bidding teams should also consider integrating methods of producing and trading goods that foster sustainable consumption habits such as encouraging local production and urban agriculture, embracing circular economy approach with 'Fab-labs', zero-waste stores and shared spaces that allow retailers and craftspeople to experiment and pool their resources.

Finally, bidding teams should consider hosting and incubating green start-up companies onsite, providing jobs in ecological sectors and stimulating green job development.

Questions to consider in your response:

Environmental benefits:

1. **What types of new green services will your project provide for the city?**

   E.g. supply and export of clean energy, sustainable waste management services, shared economy services, new or improved public space, green transport, urban agriculture, sustainability education, ecosystem services, services and stores that foster sustainable consumption habits etc.

2. **What environmental value will the new green services provide to the city?** Where possible quantify the expected impact of the new green services i.e. the reduction in tons of CO2e or landfill waste, based on examples of previous projects.

   E.g. reduced carbon emissions, reduced air pollution, reduced waste and pollution, using bio-chemical means to depollute a former industrial site, etc.

3. **How will your proposed business model sustain the expected environmental and social benefits over the long run?** Where possible provide examples of previous successful sustainable enterprise models and the quantified social and economic value of past projects.

   E.g. regular consultations and check-ups on impacts of the social return on investment

Green growth support:

1. **How will your project and final site foster innovative green start-up companies?**

E.g. provide co-working/flexible/affordable/green workspace, shared equipment/workshops/'fab-labs', start-up investment, incubator programs, networking opportunities, fast-tracked private and public procurement opportunities, etc.

2. **How will your project foster the creation of green jobs and innovation in green growth?**

   E.g. fair pay and working conditions, proportion of low-skilled vs. highly skilled workers, shared economy/industrial symbiosis opportunities with local industries (i.e. use waste product from one industry as raw material for activities on site), use of smart technology/digital applications, integrated public services, etc.

Challenge 6 - Sustainable water management

Overview of the challenge: The objective of this challenge is to develop sustainable water management systems.

In order to address the impacts of water shortage or droughts, bidding teams should seek to lower water demand (e.g. low-flow fixtures and appliances, smart metering) and manage water usage sustainably (e.g. provide wastewater treatment solutions, collect rainwater). In order to address the impacts of flooding or rain/storm damage, bidding teams should include systems to evacuate water efficiently and increase permeable areas to avoid flooded areas.

Bidding teams should consider both potable and non-potable water management in the design of their project and should prioritize water saving where possible.

Consider your current and future (i.e. 2050) climate impacts on water resources for your location, in particular for expected increased rainfall and/or droughts. Describe how your project takes into account this analysis.

Please state your major sources of water consumption for your project. Indicate for each what water management measures have been used in order to save this resource.

Questions to consider in your response:

In the second phase of the competition, the shortlisted bidding teams are encouraged to provide the following KPI for this challenge:

- If water saving measures have been implemented: quantity of water saved per year in m^3 or m^3/per occupant or m^3/m^2.

Water scarcity management:

1. **In the case of water scarcity for your site, how has your project incorporated municipal water savings measures?** Please specify the projected quantity of litres saved per year (unit: litres/year). Please compare the litres of saved water, with the litres consumed directly from the municipal system.

   E.g. (i) Water efficient equipment in order to limit water usage, such as low-flow fixtures and appliances, water efficient plumbing, smart-metering solutions for users to track and adapt their water usage. (ii) Rainwater capture and storage for potable use, such as the presence of water capture and storage basins/roof reservoirs. (iii) Purple pipe system for re-use of wastewater, such as use of wastewater instead of drinking water for non-potable uses (e.g. irrigation) or wastewater recycling services for potable uses. (iv) Use of an external water source (separate from municipal system), such as water desalination plants, the use of river water, and integrated wells on-site (in the case of local water treatment for potable usage, a detailed energy and carbon assessment is required), etc.

2. **How does your project raise inhabitants' awareness about water scarcity risks and is the project for the site adaptable to droughts?**

   E.g. Soft social measures by the city on water saving, public information on water resources.

   Water plazas that turn in to recreational areas when dry, etc.

Excess water management:

3. **In the case of excess water supply, how does your project consider water evacuation management measures?**

   E.g. Run-off water infrastructure, scaling of plumbing and sewerage pipe systems to prepare for extreme rainfall conditions, sizing of gutters to prepare for extreme rainfall conditions, sustainable urban drainage (SUDs), etc.

4. **How does your project consider water storage or buffering in order to avoid flooding the city water system?**

   E.g. Water tank, water plaza, ponds, green or blue roofs, presence of green space or permeable surfaces, analysis of the neighbourhood surface water absorption, permeable roads or parks nearby, etc.

5. **How does the project raise the inhabitants' awareness of the flood risk (in case of a high probability event) and is the project for the site adaptable to flooding?**

   E.g. Soft social measures by the city on flooding events, public information on what to do in the event of a flood, etc.

   Multiple use areas depending on the water levels, elevated entrance, power production equipment elevated, etc.

Water treatment:

6. **If relevant, how does your project consider measures to depollute and treat water before sewage dispatch?**

   E.g. Presence of wastewater treatment solution that is integrated with biomass systems, drainage systems (SUDs), etc.

Challenge 7 - Sustainable waste management

Overview of the challenge: The objective of this challenge is to accelerate the transition towards a zero-waste city and to develop sustainable waste management during the project's operational phase, in order to reduce greenhouse gas emissions while providing co-benefits such as reduction in scarce resources extraction and fossil fuel consumption.

Bidding teams should consider developing services, actions and tools that help decrease solid waste generation on the site, specifically by reducing single-use and non-recyclable plastics and surplus food, and by fostering goods repairability and recyclability. Bidding teams should also consider implementing source-separated collection, specifically for food scraps and other organics.

Questions to consider in your response:

Limit the amount of waste on site, promote a circular economy approach and organise sustainable waste management (If relevant, include tCO_2e emissions related to waste management of materials)

1. **How does your project help occupants reduce waste generation?**

   E.g. supporting occupants to purchase less and to use "zero waste" goods thanks to specific suppliers,

   Support a circular economy approach through the development of Fab Labs, reparation services and education programs, etc.

2. **How does your project organise sustainable waste management during the operational phase (occupation)?**

   Eg. designing physical spaces for separated waste collection within buildings in order to manage waste effectively.

   Reducing treating the waste produced, composting, on-site anaerobic digestion, on-site gardens and vegetable patches for on-site consumption, etc.

Challenge 8 - Biodiversity, urban re-vegetation and agriculture

Overview of the challenge: The objective of this challenge is to preserve biodiversity, and to develop greenery and urban agriculture to mitigate climate risks and to foster a sustainable environment.

Bidding teams should consider developing green and blue infrastructure to maintain and promote urban biodiversity, to provide important ecosystem services such as pollination and climate resilience, to mitigate the heat island effect and to reduce energy needed to cool and heat buildings (e.g. eco-roofs and wall gardens). This could also include the development of local and sustainable food systems (urban agriculture) in order to decrease food miles and to raise awareness about the benefits of fresh, seasonal food and local production.

In the second phase of the competition, the shortlisted bidding teams are encouraged to provide the following KPI for this challenge:

- Surface area dedicated to planted area in m^2
- Surface area dedicated to permeable surface in m^2
- Surface area dedicated to urban agriculture (if relevant) in m^2

Questions to consider in your response:

Biodiversity protection and preservation:

1. **How will local ecological species and habitats be protected and maintained?**

   E.g. formal ecological assessment undertaken, official statement of site's ecological importance, long-term protection of endangered/mature species/nesting grounds/habitats presence of a blue/green grid at a large scale, etc.

2. **How will the site foster and improve biodiversity?**

   E.g. increase in green space, increase in waterways, increase in number of species, pollinator friendly planting, indigenous species planting, creation of/link to wildlife corridors, retention of mature species, green roofs, green walls, container planting, etc.

3. **How will the project increase citizen education and awareness on themes of nature and biodiversity?**

   E.g. visitor centres, educational programs or activities, etc.

Local agriculture:

4. **How will the site promote local food/crop production?**

E.g. land/space dedicated to food production, value-added food production activities on site (turning raw food material into a refined product), supplying on site or local communities with food products, policy for procuring locally sourced food for the site, etc.

Urban re-vegetation:

5. **What is the change in green space area of the site (%)?**

   E.g. calculate the area of green/blue space before and after the development: has the proportion increased or decreased, if so by how much? This could include green roofs, green walls, planters/containers, ponds, waterways, as well as land areas, etc.

   a. **What percentage is accessible by the public?**

      E.g. Non-accessible roof compared to a public park, etc.

   b. **What percentage is to be maintained by the public?**

      E.g. Community or shared garden compared to inhabitants' private gardens, city space compared to green areas owned by private companies, etc.

Challenge 9 - Inclusive actions, social benefits and community engagement

Overview of the challenge: The objective of this challenge is to develop inclusive services and actions to serve the needs of the local population, and to involve the local community and stakeholders in the development of the project.

Bidding teams must ensure that the project strives to serve the needs of the residents and the neighborhood where it is located. An emphasis should be placed on understanding the existing neighborhood context so that the project is responsive to major needs, challenges and issues of the local residents and businesses (both those in the formal and informal economy). Examples include developing projects that will be accessible to different parts of the population (social background, age, gender, origin, economic status, etc.), prioritizing mixed-used development, and promoting projects and activities that support citizen health and wellness.

Moreover, the bidding teams are required to involve local stakeholders and surrounding neighborhoods in the project design and future management; effective community engagement is important to ensure that the proposed project is relevant and appropriate for those living and working in the area.

Questions to consider in your response:

1. **How do you propose to engage and involve the local community in the decision-making process?**

   E.g. stakeholder mapping, methods to ensure your project planning, design and implementation is inclusive and accessible to all stakeholders: different formats of roundtables and public meetings, local app or radio, emphasis on culture as a way to bring interest to the site (through street-art, forums, workshops, etc.), events (for the launch of the project, disseminated through the timeframe of the program), exploratory walks with local stakeholders to experience and reflect upon the potential of the site collectively, transitory occupation of the site fostering the development of new uses etc.

2. **How will your engagement strategy develop through all phases of the project (construction, installation, operation, etc.)?**

   E.g. a wide set of actions for every phase of the project, including co-conception roundtables and local participation prior to the construction on site, participative building on site, set up resident management associations, providing training to occupants etc.

3. **How will your project meet the social needs of the local community?**

   E.g. creation of participatory processes (app, workshops, review of existing local research/projects etc.) that will identify needs of the local community and will adapt the solutions proposed to those needs (i.e. social and affordable housing, inclusion of services such as kindergarten, local shops, flexible use of space), etc.

4. **How will your project create spaces dedicated to public/collective use and needs?**

   E.g. shared gardens, and communal places dedicated to community use and shared services, etc.

5. **How will your project promote innovative/alternative living arrangements that take into consideration all genders, ages and social background?**

   E.g. mixed-used development, intergenerational living arrangement, social housing, student housing, cooperative and participative housing, etc.

6. **How the design of your project supports health and wellness and fosters activity and connectedness**

   E.g. design of public space, fostering sport and leisure activities, preventing and protecting from air pollution, etc.

Challenge 10 - Innovative architecture and urban design

Overview of the challenge: The objective of this challenge is to combine environmental performance with high-quality architecture and urban design.

Projects must upgrade the site while integrating into the urban environment and the wider neighbourhood in which the site is located. The bidding team should propose a unique world-class architectural approach through spatial design, building form, choice of materials, use of natural light, and artistic elements among others. This may also include activating new places such as "underutilized" spaces (e.g. rooftops or basements), developing new types of services for the inhabitants and the users of the site, designing public space to foster activity and connectedness. Besides upgrading the site itself, proposals must therefore also contribute to improving the wider precinct or neighbourhood in which it is located.

Questions to consider in your response:

1. **How is my project integrated within the surrounding area? How does it interface with the rest of the neighbourhood?**

   E.g. respect of cultural heritage, continuity of walking and cycling routes and public space across the site itself, etc.

2. **Does my architectural project involve the use of pioneering sustainable materials or recycled materials that participate into a creative design?**

   E.g. construction materials such as sustainable wood, rocks, mud/clay bricks, or recycled materials, etc.

3. **How does my project stand out with an innovative design?**

   E.g. Use of innovative materials, bioclimatic design or smart technological tools

4. **How does my project promote cultural heritage and contribute to the attractiveness and uniqueness of the city?**

   E.g. use of technologies as part of the design, showcasing the city heritage while promoting artistic creation and contemporary design, etc.

5. **How does my project's design make best use of all available spaces or propose public space to foster outdoor activities and connectedness?**

   E.g. rooftops, basements, attics, lofts, wells, new park or public space, etc.

6. **How does my project reflect upon the adaptability of design and uses, and anticipates new lifestyles?**

   E.g. adaptable and modular floors, partition walls, shared used, anticipate new way of living working, etc.

Main principles of the carbon assessment

As each project must aspire to being zero carbon, in the second phase of the competition the shortlisted bidding teams must explain their climate change mitigation strategy and their carbon objectives. They are therefore encouraged to provide the KPIs suggested below, and to include the following aspects in order of importance:

1. The project should include a quantitative assessment of its carbon footprint. A carbon assessment is a method to account a project's total greenhouse gas emissions throughout its lifecycle: from the construction phase (including the materials used to build the project), operational phase (including the energy required to use the site), and end-of-life phase. The three first challenges defined by the competition (energy, construction materials and mobility) are the key elements to consider to reduce the carbon footprint of a project, but other components can also be considered. The exact scope of the analysis should be specified. *If you are unable to perform a detailed carbon assessment of your project, an estimate can be made based at minimum on your location, construction surface, and existing carbon data concerning energy consumption.*

   The project should strive to have **minimal emissions generated by the project** and therefore to have a minimal carbon footprint. In order to quantify this, the project should compare its carbon footprint to a Business-As-Usual (BAU) scenario carbon footprint. The bidding team should include the difference between the carbon footprint of a standard building of similar dimensions and function in the same city (the BAU) compared to the carbon footprint of the proposed project. The reduction can be made thanks to low-carbon materials or low-carbon energy sources for building usage for example. The difference between the carbon footprint of your project and of a BAU project shows that you are indeed lowering the overall carbon footprint of the new-build buildings sector. Local and national targets and standards can be used in defining the BAU situation and the appropriate emission difference.

2. In addition to minimizing its own emissions, a project may also reduce emissions outside of the site-specific scope. These are called **avoided emissions**. For example, if the project contributes to lowering the carbon footprint of neighbouring buildings by offering/selling the surplus green energy produced on site. Another example could be that the project contributes to renovating other existing neighbouring buildings or contributes to a renewable transport service that lowers emissions compared to the previous fossil-fuel based transport options for residents of the city.

   The project could also strive to reduce emissions outside of its neighbourhood. These avoided emissions can be claimed if for example the bidding team's project finances low-carbon, such as a renewable energy project that is replacing a fossil fuel electricity plant in a different country. This can take the form of the purchasing of carbon credits. Note that this solution is not recommended as bidding teams should prioritize carbon offsetting that occurs locally or is directly related to their project.

3. Finally, the project could strive to capture emissions within its neighbourhood. These are **sequestered emissions**. For example, reforestation or tree planting on site contributes to eliminating carbon from the atmosphere.

   The project could also strive to capture emissions outside of its neighbourhood. These are also sequestered emissions that are related to financing reforestation projects for example in a different country by buying carbon credits. Note that this solution is not recommended as

bidding teams should prioritize carbon offsetting that occurs locally or is directly related to their project.

Bidding teams are encouraged to strive for **carbon neutrality**. When striving towards zero carbon, the first priority is to minimize the emissions of the project, then to compensate the remaining emissions with avoided and sequestered emissions. A carbon neutral project has therefore a carbon footprint equivalent to its avoided emissions plus its sequestered emissions.

Also note that, by "carbon neutral project" we mean a project that contributes to the Paris Agreement's objective of global carbon neutrality **before the end of the century.**

In the second phase of the competition, the shortlisted bidding teams are encouraged to provide the following KPIs to define their carbon objectives:

- Carbon footprint of project in tCO_2e/m^2 / year or across the lifetime of the project (or tCO_2e /year or across the lifetime of the project)
- The objective for emission reduction compared to the carbon footprint of a BAU project in %
- Avoided emissions in tCO_2e (if relevant)
- Sequestered emissions tCO_2e (if relevant)

Please provide separately the quantitative details of 1/ the project' carbon footprint, 2/ avoided emissions and 2/ sequestered emissions.

Measures to be taken in order to contribute to carbon neutrality (in order of priority)	**Unit**
1. Justify that your project has a low carbon footprint	• tCO2e / m^2 / year (intensity indicator) or across the lifetime of the project • tCO2e / year (absolute indicator) or across the lifetime of the project
2. Justify that your project is avoiding emissions	• tCO2e
3. Justify that your project is capturing/sequestrating emissions	• tCO2e

Please include:

- The methodology and/or framework used to calculate the carbon footprint. If no official methodology was used please mention the estimations, calculations, assumptions and hypotheses made.
- The scope covered by the calculations (e.g. energy consumption, construction, occupant transport, logistics transport…) and any exclusion accompanied by a justification.

Key Definitions and Meanings

Greenhouse gas emissions: the terms 'greenhouse gas' (GHG), carbon and carbon dioxide emissions are often used interchangeably. For the purpose of this assessment, we consider all greenhouse gas emissions as carbon dioxide equivalent emissions (CO2e), as per the Kyoto Protocol convention.

Carbon footprint of the project refers the GHG emissions generated by the project on a yearly basis over its lifecycle (construction, operation, end-of-life).

Avoided emissions refers to the GHG emissions that a project may reduce outside of the site-specific scope

Sequestered emissions: refers to the GHG emissions that have been captured thanks to an activity such as the plantation of trees, which biologically stores carbon over their lifetime.

Zero carbon or carbon neutral: for this assessment, zero carbon or carbon neutral refers to 'net zero' greenhouse gas emissions. This means that all sources of greenhouse gas emissions are balanced by greenhouse gas emission sinks.

Carbon positive: when the sinks of greenhouse gases are greater than the release of greenhouse gas emissions, or the amount of renewable energy generated onsite is greater than the amount of energy consumed onsite, for example.

Life Cycle Assessment: An LCA is a technique to assess the potential environmental impacts associated with a product or service over the lifecycle of this product/service (from extraction of resources, until final disposal of materials). An LCA (i) compiles an inventory of relevant inputs and outputs, (ii) evaluates the potential environmental impacts of the associated inputs and outputs, (iii) interprets the results. For this carbon assessment, the LCA is based only on the environmental impact related to climate change by greenhouse gas emissions. For a building, a life cycle GHG assessment would cover the emissions from manufacturing and transporting the building materials, constructing the building, operating and maintaining the building, and disposal of any materials not reused at end-of-life.

Business-As-Usual reference situation: A BAU scenario for future patterns of activity, which assumes that there will be no significant change in people's attitudes and priorities, or no major changes in technology, economics, or policies, so that normal circumstances can be expected to continue unchanged (Source: Oxford dictionary).

Emission reduction: An emissions reduction refers to the difference between the emissions from a theoretical BAU scenario and the emissions related to the low-carbon solution proposed by the project.

All bidding teams must have in mind that the following main principles will be applicable for the detailed carbon footprint:

Transparency: bidding teams will need to ensure that their methodology for the carbon assessment is fully transparent. Bidding teams will be required to disclose all relevant methods, data sources, calculations, assumptions and uncertainties to enable the reviewers to assess the credibility of the results.

Use of recognized methods for assessing sustainability: the bidding teams should comply with nationally and locally required sustainability standards and methodologies, where applicable, for example GHG Protocol, Bilan Carbone, LEED, BREEAM, Estidama, EDGE, ISO standards, etc.

Beyond 'Business-As-Usual': for all stages of the project, the bidding teams will be expected to qualify the priorities made and demonstrate how the proposed project performs better than a 'Business-As-Usual' approach through a description of actions taken to achieve GHG reductions against prevailing norms. If possible, quantify the avoided emissions that would occur outside of the chosen site but are possible thanks to the project (for example an increase in electric mobility thanks to a new charge infrastructure or a new construction technique that will be made available publicly after the project). Special recognition will be given to projects that show innovation in greenhouse gas reductions, or those which achieve 'carbon positive' status.

Scope: Bidding teams will be expected to consider the carbon impact of the project throughout the project, quantifying greenhouse gas emissions where possible and demonstrating the proactive measures taken to reduce actual and embodied greenhouse emissions relative to common practice, at the following stages:

- Pre-construction: procurement strategy and allocation of responsibilities from contractual obligations to incentivised carbon performance approaches
- Construction: energy used during construction, embodied energy of materials etc.
- Occupation: all energy used during the operation of the building. Please use location-based emission factors for energy usage (market-based is optional).
- Expected maintenance and renovation through the lifetime of the building (e.g. solar panels, heating system, elevators, etc.)
- Transportation from people, goods and materials going to and from the building
- End-of-life: energy required for deconstruction, reuse of building materials etc.

Highlight the specific efficiency of the project, by providing a relevant key performance indicator (KPI): for example, $kgCO_{2e}$/m2, $kgCO_{2e}$/desk, $kgCO_{2e}$/specific activity, etc.

Use of carbon offsets: all projects should adhere to the energy hierarchy (see climate challenge 1), with carbon offsetting used as a last resort to account for unavoidable greenhouse gas emissions. All carbon offsetting must comply with internationally accepted carbon offset criteria, and should occur locally or be directly related to the project of the bidding teams.

Impact and replicability: special recognition will be given to projects which demonstrate a future proofing approach how innovation and deep GHG emissions reductions could be replicated beyond the selected site