



Students
Reinventing
Cities

Students Reinventing Cities

*Guidance to Design a Green and Thriving
Neighbourhood*

Contents

Introduction	3
The neighbourhood opportunity	3
Two Imperatives	4
The 10 Principles for a Green & Thriving Neighbourhood	5
1 - Complete neighbourhoods	6
2 - People-centered streets and low-carbon mobility	8
3 - Smart and connected places	10
4 - A place for everyone	12
5 - Clean construction	14
6 - Green energy and buildings	16
7 - Circular resources	18
8 - Green spaces, urban nature and climate resilience	19
9 - Sustainable living	21
10 - Green economy	22
Types of emissions and planning for low emissions	23
Types of emissions	23
Planning for low carbon outcomes	24
Prioritizing actions	25

Introduction

Students Reinventing Cities is a global competition that invites students and academics to collaborate with cities to accelerate their climate agendas.

For this initiative, participating global cities have identified small neighbourhoods, blocks or main streets they intend to revive. Together with C40, they invite multidisciplinary teams of students from around the world to imagine a pathway to decarbonize these urban areas and improve the quality of life for local communities.

Information on the structure of the competition, key timeframes, rules and submissions processes and judging criteria are outlined in the Regulations of the Competition document available online.

This document aims to provide students with guidance and advice that may support them when planning and designing their proposals.

The neighbourhood opportunity

Neighbourhoods or larger areas within a city are the main focus of this competition. Some of the key opportunities for taking climate action at a district scale are outlined below; students should consider how their solutions and designs can seek to optimize these.

Neighbourhoods hold a unique opportunity to step up ambition and take advantage of the balance between scale and agility:

- Neighbourhoods are **large enough to see additional opportunities from integration**, compared to a single system - or sector-based approach.
- Neighbourhoods are **small enough to provide an opportunity to take risks and experiment** with innovative city policies, design approaches or partnership arrangements before these are scaled up to the wider city.
- Compared to city scale, neighbourhood projects will typically **require a lower level of investment** to implement new initiatives. This provides an opportunity to **design and deliver 'proof of concept' projects, which can attract further funding**.
- Working at a neighbourhood scale provides opportunities to **involve the community in collaboration and decision making and to strengthen the needs of local communities**.

Two Imperatives

Two key imperatives underpin neighbourhood climate action: the imperative of emissions reduction and the imperative to create people-centred places that ensure quality of life for local communities. These two pillars are inextricably linked and therefore students' projects must meet both imperatives within the competition.

The Imperative of Emissions Reduction

Buildings, energy, transport and waste systems of a low emissions neighbourhood are designed, constructed and operated in a way that achieves low to zero operational and embodied emissions. Additionally, the neighbourhood promotes and drives initiatives that help reduce emissions associated with the goods and services its residents consume. See 'Types of emissions' for more details.

The Imperative to Create People-centered Places Ensuring Quality of Life for Local Communities

A low emissions neighbourhood meets the needs of its people and improves their quality of life. Its people, businesses and systems can survive, adapt and prosper regardless of the shocks, stresses or climate related impacts they experience. All residents can access goods, services, education and employment in a fair and inclusive way; whilst the urban realm provides a vibrant, safe and friendly environment for all. Many of these aspirations are common to the “**15-minute City**” model.

The 15-minute City

The 15-minute city is one where **everyone is able to meet most, if not all, of their needs within a short bike or walk from home** and where key services and amenities are easily accessible to all residents. It is a city composed of lived-in, people-friendly, 'complete' and connected neighbourhoods, green and thriving public spaces as well as communities equipped to adopt a low-emissions lifestyle. This model enables people to reconnect to their local areas, reinforcing a sense of community. It also reduces unnecessary travel across cities by creating people-centered streets, promoting health and wellbeing and boosting resilience to climate shocks; improving the overall sustainability and liveability of cities.

The 10 Principles for a Green & Thriving Neighbourhood

The Students Reinventing Cities competition seeks innovative solutions to reimagine neighbourhoods in a way that reduces emissions, promotes resilience and delivers a high quality of life.

To help guide students in developing solutions that deliver on the Two Imperatives, 10 Principles for a green and thriving neighbourhood have been developed. These aim to help students understand how the two imperatives can be achieved in practice at a neighbourhood scale.

Students should consider the design principles when developing their proposals. **Students do not have to respond to all principles**, however the information is intended to help guide students in developing their vision, defining their objectives and identifying the action plan and the concrete solutions they propose for the site. However, students should provide information on how they have responded to the design approaches, and why they have prioritized them the way they have.

Whilst all the design principles are relevant to the competition, **teams should focus on those that are most appropriate for the site**. For instance, those that will enable the city and local communities to catalyze change towards a low carbon, thriving and resilient future.

The following 10 Principles are first described, and then potential solutions and Key Performance Indicators (KPIs) are provided. **It is not compulsory for teams to incorporate these examples into submissions or calculate their solutions KPIs. They should instead be used as a guide** to encourage innovative, unprecedented and exemplary solutions to the challenges cities face.

1 - Complete neighbourhoods

Overview: The project should promote a compact, mixed-use neighbourhood model where all residents can access everything they need within a short walk or bike ride of their home. This relies on mixed-use planning from district-scale down to the building. Instead of single-purpose areas, the project should support a balanced diversity of 'human-scale' activities. It should also support the local economy and inject life into streets by encouraging active ground floors and temporary activation. Where possible, spaces should be used for multiple purposes at different times of the day or week to make the most of existing stock, minimising the need for new construction and concentrating activity in existing areas.

Key concepts and examples

Compactness and mixed-use to make local services and transport infrastructures viable

Examples of solutions:

- *Adjust planning rules and develop targeted actions to support mixed-use spaces in the same building/block, especially at ground floor level.*
- *For new developments, prioritise medium-density developments and smaller block sizes that facilitate greater interaction between residents.*

Proximity and decentralization to bring key services, amenities, and parks close to where people live

Examples of solutions:

- *Create local administration hubs that pool different services.*
- *Explore the use of micro-logistic centres.*
- *Concentrate activities on main local streets and identify an array of essential and cultural retailers to meet the needs of a given community.*

Activation of ground floors to create pleasant and safe streets to walk in and to support the local economy

Examples of solutions:

- *Adjust planning rules and develop targeted actions to activate ground floors and make streets pedestrian friendly. For instance, increase minimum ground floor heights or minimum depths that developments have to be from the street, remove on-street parking in transit oriented developments etc.*

Adaptable spaces and buildings used for multiple purposes throughout the day and week

Examples of solutions:

- *Design flexible spaces that allow several uses over the day/week. For example, restaurants serving as co-working spaces throughout the day, school yards used for weekend markets or public gardens, parks used for informal sporting events, libraries used for holding music events out of hours etc.*

Temporary activation to support a dynamic, evolving place, with a strong identity

Examples of solutions:

- Transform vacant plots to host 'meanwhile' uses such as pop-up shops, eateries, pocket gardens, sport or cultural activities, with structures being permanently redeployed at a later stage.
- Propose processes such as calls for projects or festivals that help to develop temporary activation.

Potential KPIs you may consider using to measure success:

- % of the population that are located within $\frac{1}{4}$ mile from the nearest fresh food store, healthcare facility, school, and green space etc.
- Distribution and proportion of different land uses by sqm.

2 - People-centered streets and low-carbon mobility

Overview: Walking and cycling should be the main way people get around the neighbourhood and can be encouraged through well-designed urban spaces and services. Reclaiming city spaces from private vehicles to widening sidewalks and creating cycle lanes, encouraging vegetation in the street and developing parking and repair services for bikes, are especially important to create safer and more enjoyable routes to cycle and walk. To de-incentivize the use of individual fossil fuel transport, the project should also foster the use of public transport, shared vehicles and electric and other low-emission vehicles.

Key concepts and examples

Good street design that makes walking and cycling the mode of choice

Examples of solutions:

- *Widen sidewalks, increase street crossings, improve wayfinding, provide mid-block connections for walking and cycling etc.*
- *Create dedicated cycle lanes and provide new cycling routes or links to existing ones.*
- *Use street designs, layout and materials to promote right of way for pedestrians and cyclists.*
- *Introduce speed restrictions for cars.*

Develop services and partnerships to support pedestrians and cyclists

Examples of solutions:

- *Provide secure parking and repair services for bikes and invest in affordable bike-sharing and hire schemes.*
- *Partner with businesses to drive a transition to active work journeys, such as offering financial incentives for cyclists and pedestrians, purchasing shared (electric) bicycles and providing end of journey facilities (for e.g. showers, changing facilities and lockers).*

Implementing tactical urbanism to inspire residents

Examples of solutions:

- *Reclaim spaces temporarily from cars at weekends and during the summer for recreational, sporting or cultural activities.*
- *Foster design that supports socialising, temporary installation of street furniture, reversible painted ground signs, mobile tree planters etc.*

Reclaiming city spaces from private vehicles to improve active travel and develop new uses

Examples of solutions:

- *Develop "School Streets" which aims to introduce temporary restrictions on motorised traffic on school streets at drop-off and pick-up times.*

- *Make it less attractive and easy to drive into the city through minimizing the availability of parking.*
- *Repurpose city car park buildings for other uses such as warehouses, data centers or urban logistic hubs and transform surface parking lots into pocket parks, cycle lanes or micro-logistic hubs.*

Zero carbon shared or private vehicle infrastructure as a last resort mobility option

Examples of solutions:

- *Provide electric vehicle parking, solar powered car ports, and charging points.*
- *Introduce an electric vehicle hire scheme.*
- *Introduce low emissions zones within the neighbourhood.*

Potential KPIs you may consider using to measure success:

- Number of streetside bike parking spaces per resident.
- Km/miles of connected and segregated cycle lanes across the district.
- % of public space dedicated to pedestrian and cycling access only.

3 - Smart and connected places

Overview: Although the project should enable a local lifestyle, it is vital to strengthen physical and digital links with other parts of the city and beyond. Neighborhood scale projects provide the opportunity for creating, extending and refurbishing public transport and digital infrastructure that enhance social and economic connectivity and enable more flexible working practices. The aim is to reduce travel through advanced digital solutions and improve the ease and quality of longer trips through a sophisticated public transport system. Digital and smart approaches can also play a significant role in improving the efficiency of infrastructure solutions, for example by optimizing transport systems and energy consumption.

Key concepts and examples

An accessible and affordable public transit system for essential long-distance trips

Examples of solutions:

- Provide new links to existing transport stops and stations.
- Develop new public transport links within the neighbourhood and to larger transit hubs, taking into account small transport solutions such as electric buses.

Develop the digital infrastructure to allow more people to work remotely/flexibly

Examples of solutions:

- Provide fast and free Wi-Fi on key public transport routes and in public spaces, ensuring that broadband services are affordable for all residents.
- Remove building and planning regulatory barriers to installing infrastructure for fast broadband for existing residential buildings.

Digitalize utilities and services to reduce unnecessary trips

Examples of solutions:

- Offer technical support to local businesses as well as community and government agencies to strengthen online services and capacity and reduce the need for people to visit a physical location. For example, 'Citizen Dossier' (an online digital ID), libraries offering e-books and online renewal, 'click and collect' services for local retailers etc.

Digital and smart approaches to improve multi-modal journeys

Examples of solutions:

- Use smartphone technology to improve public transport and make it more attractive to use by ensuring easy payments.
- Provide live transport updates, communicating most efficient and low-carbon multimodal routes, and integrating with other modes such as shared micro-mobility schemes.

Potential KPIs you may consider using to measure success:

- % of housing within $\frac{1}{4}$ mile of public transit.
- % of the population who work from home at least 1 day a week.
- Access to fast and reliable broadband services, e.g. the EU Digital Agenda seeks 50% of the European population to have access to 100MB broadband speeds by 2020.

4 - A place for everyone

The project should not only aim to address the causes and impacts of GHG emissions but also raise the quality of life of local communities. It should include varied and affordable homes and amenities that cater to a wide range of needs and incomes as well as promote wellbeing and healthy living. To build more resilient communities it is key to foster connectedness. New interventions should promote an equitable distribution of the positive impacts of climate action. The involvement of the local community and stakeholders in the development of local projects is key, to engage people with their local area and support the transition to behaviour change.

Key concepts and examples

Promoting inclusivity so that everyone can access the services and spaces they need

Examples of solutions:

- *Promote innovative and alternative living arrangements that take into consideration all genders, ages and social backgrounds such as social housing, intergenerational living, student housing, cooperative and participative housing.*
- *Provide social services in the neighbourhood such as kindergarten as well as local shops for low-income households etc.*

Fostering connectedness to tackle loneliness and build more resilient communities

Examples of solutions:

- *Develop spaces dedicated to public/collective use such as shared gardens and other outdoor activities and third places such as 'Citizen kiosks' that can serve as information stands, exhibition spaces, meet-up points for volunteering, and places for community organizations to host local events.*
- *Design public spaces and provide street furniture to foster social interaction and to facilitate outdoor sports practices and leisure activities.*

Aim for equitable distribution of positive impacts from climate action

Examples of solutions:

- *Monitor the impacts of climate action to avoid unintended consequences especially on the most vulnerable population groups (for e.g. large up-front costs might pass on costs to low-income customers).*
- *Favour environmental initiatives that can be a catalyst for positive impacts such as lower energy bills, cleaner air, safer travel and more economic opportunities.*

Active community engagement programs, to engage people with their neighbourhood, respond to their needs and support the transition to behaviour change

Examples of solutions:

- *Foster participatory processes to identify the needs of the local community.*
- *Undertake stakeholder mapping, residents' roundtables, public meetings, local app or radio and other community engagement processes to engage with as many residents as possible, including the 'hard-to-reach' ones.*
- *Emphasise culture as a way to bring interest to the site through street-art, forums, exploratory walks, tactical urbanism and transitory occupation.*
- *Empower citizens on climate actions with initiatives such as training to occupants, participatory budget or climate citizen assemblies.*

Potential KPIs you may consider using to measure success:

- % of residents in affordable accommodation.
- % of residents who feel connected and supported in the neighbourhood.
- Number of participants in consultation and engagement events.

5 - Clean construction

Overview: One of the objectives of the competition is to reduce embodied carbon, which refers to emissions associated with the construction of buildings and infrastructure such as the materials, transportation, assembly, maintenance, demolition and end of life aspects. In this respect, the project should first optimize existing built assets, repurposing or retrofitting them before considering new construction. New construction should look to reduce the need for new materials through design choices by reusing materials and choosing construction materials with lower embodied emissions.

Key concepts and examples

Make the most of existing stock

Examples of solutions:

- *Repurpose and retrofit existing buildings instead of undertaking new construction.*
- *Look for opportunities to prioritise infill development to avoid underutilisation, and then consider expansions, adaptation or renovations to avoid the need to demolish and rebuild.*

Use lifecycle emissions data to inform decision-making and aim for efficient construction to minimize the needs of carbon-intensive materials

Examples of solutions:

- *Use recycled materials or low carbon materials such as wood or other bio-based instead of carbon and energy intensive materials.*
- *Choose construction materials that minimise greenhouse gas emissions thanks to their local origin (reducing transport emissions), or suppliers that use biomass or waste to generate the energy required for production of materials.*
- *Design buildings and massing in a way that optimises materials (for e.g. reduce basement levels that usually require a lot of concrete).*

Design in 'long life, loose-fit' to foster flexible use, material reuse, and disassembly

Examples of solutions:

- *Enable the future adaptation of building through improved modularity and flexible design (for e.g. offices that can be transformed into housing).*
- *Use materials with the potential to be dismantled at the end of lifecycle for re-use, transforming discarded resources back into raw materials, limiting construction waste and recycling waste.*
- *Integrate 'recycling depots' or 'circular construction hubs' where reusable construction materials can be stocked and made available for new projects.*

Minimise transportation emissions during the construction phase

Examples of solutions:

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

Potential KPIs you may consider using to measure success:

- % of buildings repurposed or retrofitted in development (compared to those that are entirely new builds).
- % of recycled materials used for construction.
- % (or quantity) of low-carbon construction materials used (e.g. wood).
- Carbon footprint of the construction phase in tCO₂e or tCO₂e/m².

6 - Green energy and buildings

Overview: Energy consumed by buildings can be one of the largest GHG emissions in urban neighbourhoods, alongside transport infrastructure. A low carbon neighbourhood will need to minimise building emissions by adopting passive design principles, investing in high-efficiency district-wide energy infrastructure and decarbonising energy supply.

The influence cities can have on their energy supply can be limited at a neighbourhood scale. This is often because networks are managed outside of the neighbourhood. However, looking for opportunities to produce clean energy locally - at the neighbourhood or even at the building scale - may lead to great impact. Energy efficiency is a high priority in the design and operation of neighbourhood buildings, public spaces and infrastructure. An ambitious target would be to require all new buildings within the neighbourhood to operate at net zero carbon, and to define a strategy to accelerate the retrofit of the existing buildings.

Key concepts and examples

Reduce Energy demand

Examples of solutions:

- *At a neighbourhood scale, consider how building massing, topography and orientation to the sun and wind can help reduce cooling and heating requirements.*
- *At a building scale, minimise energy demand through enhanced building fabric specification, bioclimatic design, solar shading optimisation, optimised thermal mass, optimised air tightness, reduced thermal bridging, maximised use of daylight, passive ventilation, Passivhaus or equivalent design standard, use of energy efficient HVAC, lighting and appliances etc.*

Invest in energy infrastructure

Examples of solutions:

- *Reduce losses in heat networks by ensuring all pipework is insulated. Look for opportunities to capture waste heat from sources such as chiller heat rejection or underground train extract ventilation.*
- *Invest or promote energy storage systems, such as batteries, instead of fossil fuel-based generators to help manage demand, and increase on-site renewable energy consumption.*

Decarbonise energy supply

Examples of solutions:

- *Invest in local renewable energy generation such as wind power and solar panels, or mandate installation on certain buildings.*
- *At a neighbourhood scale, design and orientate buildings to maximise solar roof exposure.*
- *Enable the selling back of excess energy to the grid.*

Potential KPIs you may consider using to measure success:

- Storage capacity (MWh).
- % of buildings incorporating Passivhaus standards.
- Carbon footprint of the energy consumption in kgCO₂e/m²/year.
- % of renewable energy consumed, by source and type e.g. solar for electricity, heating and cooling.

7 - Circular resources

Overview: Resource management, especially water and solid waste, should move from linear consumption to circular conservation and incentivise resource efficiency. Working at a neighbourhood-scale provides an opportunity for a fuller transition to a circular economy, and to scale up reuse and recycling by providing the necessary infrastructure. The smaller scale also provides the opportunity to foster partnerships between local businesses and residents to reuse materials, waste and by products.

To address the impacts of water shortage or droughts, neighbourhoods should seek to lower water demand and manage water usage sustainably.

To decrease solid waste generation, districts may reduce single-use materials and surplus food, fostering goods reparability and recyclability. They may also consider implementing source-separated collection, specifically for food waste and other organics.

Key concepts and examples

Avoid unnecessary waste to ensure natural supply is not outstripped

Examples of solutions:

- *Support occupants to purchase less and to use “zero waste” goods thanks to specific local stores.*
- *Create plastic-free areas and work with businesses to operate a mug or container reuse programme for takeaway food.*
- *Partner with schools or community centres to run repair programs for clothes or household equipment.*

Reduce resource consumption and waste production

Examples of solutions:

- *Install water efficient fixtures for public facilities and mandate or support installation in private developments.*
- *Build circularity into the spaces, buildings and infrastructure, for e.g. grey water reuse, rainwater capture.*
- *Promote on-site composting, community gardens and vegetable patches for local consumption.*

Scale up reuse and recycling to help reduce operational and embodied emissions

Examples of solutions:

- *Establish recycling spaces and material exchange sites.*
- *Design buildings in a way that enables them to be flexible and adaptable, and extend their building lives.*
- *Use planning provisions and building codes to enable re-use of wastewater for non-potable uses.*

8 - Green spaces, urban nature and climate resilience

Overview: Large-scale green spaces are essential to improve mental and physical wellbeing and to support climate resilience, biodiversity and ecosystem services such as pollination, carbon sequestration and healthy soils. The primary objective should be to provide all residents access within a 15-minute walk or bike ride to a high-quality open green space, whilst also increasing the amount of greenery throughout the neighbourhood. This helps to improve the quality of urban space but also mitigate the heat island effect and reduce the energy needed to cool and heat buildings. Productive green spaces such as urban gardens, can also help raise awareness of the benefits of fresh, seasonal food and local production.

Key concepts and examples

Ensure equal access to high quality green spaces

Examples of solutions:

- *Allocate land use based on ensuring all residents can access green space within 15-minutes of their house.*
- *Invest in pocket parks to transform small unlocked neglected areas into green spaces.*
- *Match the design of green spaces to the needs of the users, for e.g. playgrounds in areas with young families, flat and closer green areas in elderly communities, sports facilities that are responsive to local cultures.*

Greening public spaces and buildings

Examples of solutions:

- *Allocate road space and footpaths for street vegetation.*
- *Introduce local bylaws to ensure all roofs, walls or public spaces over a certain size implement a green roof where buildings are structurally able.*
- *Choose native, indigenous plantings and a wide variety of flora to restore ecosystems and support biodiversity.*

Adopt nature-based solutions for climate adaptation

Examples of solutions:

- *Replace permeable surfaces with rain gardens to manage stormwater.*
- *Dedicate space to green and blue infrastructure to reduce heat waves and to minimize the need for air conditioning or other energy intensive interventions in hot climates.*
- *Use planning rules to protect ecosystem services such as the riparian edge of rivers to help with erosion, or mangroves along coastal edges to mitigate storm surges.*

Promote urban agriculture and local food/crop production

Examples of solutions:

- *Dedicate land to food production, utilising areas with productive soils.*

- *Promote value-added food production activities on site (turning raw food material into a refined product).*
- *Incentivise organic food production to reduce the use of synthetic fertilisers.*
- *Partner with local businesses and communities to supply on-site or local food products.*

Preserve biodiversity

Examples of solutions:

- *Increase green spaces and waterways.*
- *Introduce pollinator friendly planting, indigenous species planting, creation of/link to wildlife corridors, retention of mature species etc.*

Potential KPIs you may consider using to measure success:

- Number of trees planted during the project.
- % of the district surface (sqm) that is permeable.
- % of the district surface (sqm) that is dedicated to urban agriculture.
- % of residents that can access a high-quality open green space within 15 minutes (by walking or cycling).

9 - Sustainable living

Overview: The design and operation of a neighbourhood can help foster sustainable lifestyles and consumption among residents and businesses. Consumption based emissions are those that are associated with the consumption of goods and services (such as food, clothing, electronic equipment) by residents. The way streets are designed, the facilities that are provided, and the way land is allocated can reduce consumption based emissions through promoting behaviour change. For instance, making it more attractive, affordable and easier to live sustainably, whilst also increasing awareness of the importance of doing so. It is essential to consider who the interventions are benefitting to ensure a sustainable lifestyle is accessible to all.

Key concepts and examples

Integrate infrastructure and facilities that foster sustainable lifestyles

Examples of solutions:

- *Install bike storage and bike repair tools in public spaces and buildings.*
- *Integrate hubs for sharing and pooling goods such as occasionally-used equipment, stores that foster sustainable consumption habits such as zero waste stores etc.*
- *Design and integrate infrastructure to support separate waste collection and compost of organic waste, and also to facilitate sustainable freight and urban logistics.*

Encourage shared spaces and share services that foster resource pooling and circular approach

Examples of solutions:

- *Encourage shared spaces that allow retailers and craftspeople to experiment and pool their resources.*
- *Open up woodwork studios and Fab-labs for public use to minimise the need to buy equipment and to encourage DIY and reparability.*
- *Facilitate shared bikes and scooter facilities.*
- *Design public spaces with multiple uses in mind – holding public events such as flea markets, hosting mobile reuse stations for swapping items etc.*

Integrate methods of sustainable production and trade of goods

Examples of solutions:

- *Encourage local food production and urban agriculture, create shared and open spaces for farmers markets, incentivise retailers and restaurants to sell/prepare sustainable and local foods, and plan for food waste hubs with storage facilities.*
- *Partner with local businesses to incentivise zero-waste or upcycling approaches and to support local production and local economy.*

10 - Green economy

Overview: A successful neighbourhood is one which can thrive environmentally, socially and economically. The project should seek to create green jobs and long-term prosperity with environmental considerations of ecosystem resilience and resource efficiency. This can be achieved by using the development process to incubate new skills and green jobs; providing spaces and infrastructure to support sustainable businesses; promoting training and upskilling opportunities, especially for young people and older workers.

Key concepts and examples

Use the development process to incubate new skills and green jobs

Examples of solutions:

- *Use planning and building codes to mandate or promote retrofit insulation, electric charging infrastructure installation, flood resilience upgrades to upskill residents and promote entrepreneurship across these skills.*
- *Work with local neighbourhood businesses to deliver training and apprenticeship opportunities.*
- *Consider providing start-up investment, incubator programs, networking opportunities, fast-tracked private and public procurement opportunities to promote the development of sustainable businesses etc.*

Provide spaces and infrastructure to support green businesses and start-up

Examples of solutions:

- *Increase connectivity and innovation and open up district-based green businesses to wider markets.*
- *Provide co-working/flexible/affordable/green workspaces, shared equipment/workshops/fab-labs, etc.*
- *Develop incubator programs, networking opportunities, fast-tracked private and public procurement opportunities, etc.*
- *Develop and strengthen digital infrastructure (fibre and Wi-Fi accessed networks, internet of things) networks to improve the efficiency of processes and reduce energy consumption.*

Potential KPIs you may consider using to measure success:

- Number of new green businesses, split by type.
- New green jobs created, split by demographic and type.
- Number of businesses and premises certified with sustainability credentials e.g. BREEAM, LEED, Plan B, SBTis.

Types of emissions and planning for low emissions

The second section of this guidance document introduces the different types of emissions students should consider when developing their designs and some guidance on how to plan and prioritize actions to deliver low carbon outcomes.

Types of emissions

Each project within this competition should aspire to reduce the emissions of the urban area. There are different ways of understanding emissions, however one way to group them is as operational, embodied and consumption emissions. Teams are expected to develop designs which reduce emissions across all three categories.

Operational emissions are those that occur throughout the lifetime of the neighbourhood. It includes emissions due to energy used in buildings, public spaces e.g. lighting and transportation, or emissions arising from processing waste. Operational emissions are measured on an annual basis. For reference, alignment with the Paris agreement would require reducing operational emissions by 50% by 2030 and to reach Net Zero by 2050.

Embodied emissions are emissions generated by any construction within the neighbourhood, including new construction and retrofits, and for both buildings and infrastructure. It encompasses the emissions caused by extraction, manufacturing, transportation and assembly of the materials but also maintenance and end of life aspects in buildings and infrastructure. Unlike operational emissions which occur continually and are measured annually, embodied emissions are one-off events. To measure embodied emissions, Life Cycle Analyses (LCA) must be required from all construction.

For reference, the C40 Clean Construction declaration requires reducing embodied emissions by at least 50% for all new buildings and major retrofits by 2030; and reducing embodied emissions by at least 50% of all infrastructure projects by 2030.

Consumption-based emissions are those that are associated with the consumption of goods and services (such as food, clothing, electronic equipment) by residents of an area. Take a pair of jeans, for example. Its climate impact includes the GHG emissions that resulted from growing and harvesting the cotton used for the fabric, the CO₂ emitted by the factory where it was stitched together, and the emissions from ships, trucks or planes that transported it to the store. Its impact also includes the emissions from heating, cooling or lighting the store the jeans were bought in and the CO₂ emitted by the end-consumer washing and drying it over its lifetime. For reference, the C40 and Arup report, [The Future of Urban Consumption in a 1.5°C World](#), notes that to avoid climate breakdown, emissions from global urban consumption must halve by 2030. For this to be achieved, it is estimated that emissions from consumption in high-income cities must decrease by two thirds within the next decade. At the

same time, rapidly developing economies need to adopt sustainable consumption patterns when growing.

Planning for low carbon outcomes

When developing actions to reduce emissions, teams are encouraged to follow the low-carbon hierarchy. This focuses on reducing ‘at source’ carbon emissions before buying carbon credits (offsetting) to compensate for the impact of a development.

Teams should look to design and prioritise low carbon actions that place the greatest emphasis on avoiding and reducing emissions, before looking for options to convert and compensate. Teams are encouraged to describe how they have used the low-carbon hierarchy when designing and prioritising actions.

Low Carbon Hierarchy

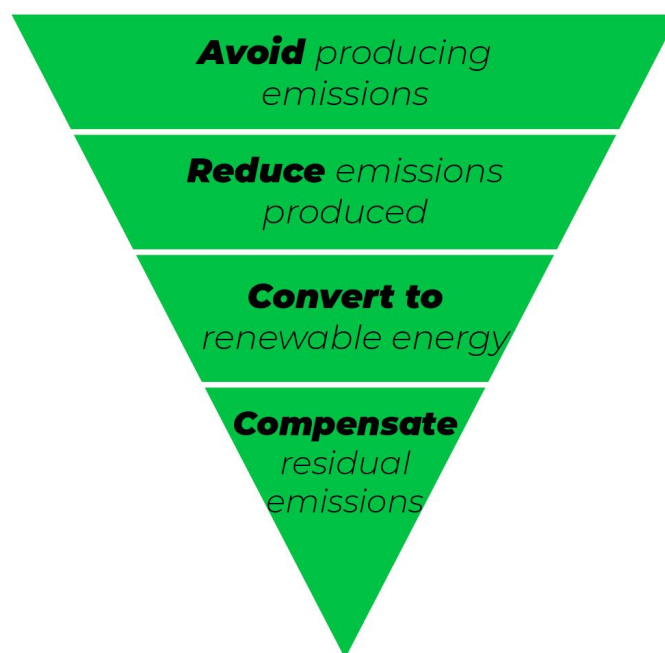


Figure 1: Emissions Reduction Hierarchy

Avoid: The first approach should be to prevent emissions from being produced in the first place. For instance, investing in cycling lanes and pedestrian infrastructure can help encourage people to cycle, rather than produce the emissions associated with cars.

Reduce: The next approach of the low emissions hierarchy is to design and develop interventions that reduce emissions produced, compared to a standard or conventional approach. An example of this may be utilising materials from decommissioned sites along with importing materials when undertaking new

construction. This will reduce the overall amount of embodied emissions.

Convert: After avoiding and reducing emissions, actions should seek to enable and promote the adoption of renewables and low carbon technologies. For instance, a city may choose to convert diesel bus fleets to hybrid or EV buses, or replace existing street lights with LEDs.

Compensate: The last approach of the low-carbon hierarchy involves investigation options to capture carbon or undertake offsetting programs to compensate for the unavoidable emissions the area produces. This is last on the hierarchy as it does not directly reduce emissions produced in the district.

Prioritizing actions

When determining the best action to take, it can help to consider and balance the impact of each action on carbon emissions, as well as wider co-benefits and tradeoffs such as liveability and climate resilience.

Teams are not expected to calculate the emissions reduced by actions, however they may wish to describe why they have chosen certain actions over another from a carbon perspective.

If you do wish to quantify the emissions reduction potential of actions, guidance provided in the [Global-Protocol for Community-Scale Greenhouse Gas Inventories](#) may be helpful. Alternatively, you could estimate the potential emissions reductions associated with choosing a certain activity over another (e.g. investing in bike parks over car parks. An online calculator such as the [Greenhouse Gas Equivalencies Calculator](#) may be able to help you quantify the emissions equivalent of these actions (e.g. emissions associated with removing 1000 cars from an area).

Linking the co-benefits of climate action to wider issues that the public are concerned about can help decision makers to prioritise decarbonization options. You may wish to describe the potential impact different actions may have on these broader outcomes such as quality of life, liveability, equitability and resilience.