How do we build sustainable cities?

question the location

promote density

use existing infra-structure

plan car-free

use digital innovation

reduce urban heat islands

reduce land use

create synergies

create green outdoor spaces

1 Use Existing Infrastructur

Existing buildings and infrastructure have an embedded cultural, social, economic and ecological value. Our cities are made up of not only buildings, but also a dense network of transport and services infrastructure. Changes to the existing transport and services infrastructure (water, electricity, communications, gas etc) is resource intensive and expensive. New neighbourhoods should be planned to use existing infrastructural networks and priority given to reuse/ retrofit existing buildings rather than new construction
S1 S2 S3 S4 S5 S6 S7

2 Reduce Land Use

Limit urban sprawl and reduce land use by designing for mixed-use, high occupancy neighbourhoods with good connectivity to public transport infrastructure. Balance densification with liveability and provide for new forms of living and working with quality communal spaces both internally and externally. In this way, the overall area of the development can be limited. S1 S2 S3 S4 S5

3 Promote Density

Dense cities and neighbourhoods are a prerequisite for the efficient use of land, resources, money and energy. In many regions of Central Europe, a density of 200% or a plot ratio of 2.0 has proven to be a good rule of thumb, which must be adapted to local conditions. Design for healthy and safe neighbourhoods with good proximity to amenities and attractive public spaces to promote activity and wellbeing.
The city of short distances emerges from diverse, mixed-use neighbourhoods which reduce private car use and promote mobility through walking, cycling and the use of public transport. Design for varying and activated streetscapes with distinctive character and neighbourhood identity. Avoid monotonous blocks of building and break up streets with active frontages, seating and smaller scaled areas.
S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12

4 Question the Location

Develop areas that are well connected to public transport and existing infrastructure, as the construction of new infrastructure is costly and energy intensive. Mobility is also an important factor as poorly connected neighbourhoods rely on commuter journeys by car. Transport represents almost a quarter of Europe's greenhouse gas emissions and is the main cause of air pollution in cities. S1 S2 S3 S4

5 Reduce Urban Heat Islands

The urban heat island effect negatively impacts city populations and is a critical factor for air quality management and public health. The main cause of urban heat islands is from the modification of land surfaces and is most noticeable during summer months when winds are weak and do not facilitate night time cooling.
Increasing tree and vegetation cover lowers surface and air temperatures by providing shade and cooling through evapotranspiration. Generous shading with trees and shrubs, the greening of facades and roofs, and the planning or preservation of ventilation axes reduce the demand for mechanical cooling and increase thermal comfort levels. Natural and artificial water surfaces also have a cooling effect. In addition, blue infrastructure increases individual well-being and contributes to the enjoyment of public spaces. S1 S2 S3 S4

www.countdown2030.ch
translation by www.architectsdeclare.com

6 Create Synergies

Design for mixed-use neighbourhoods and avoid single-use developments. A diverse mix of amenities in close proximity to each other creates vibrant, walkable neighbourhoods. In this way, commercial enterprises can be operated economically and sustainably in the long term. Land-use zoning regulations can prevent sufficient mixed-use development. Improved flexibility would allow for the development of more sustainable and resilient neighbourhoods. S1 S2

7 Plan Car-Free

Design new neighbourhoods to be car-free zones and develop mobility plans that are not reliant on car use. Streets which are congested with traffic and car parking areas demand outdoor space that could otherwise be used for public realm. When these spaces are reclaimed the city becomes a safer place and allows for improved freedom of movement and permeability. The reduction of exhaust emissions reduces pollution and improves air quality. Alternatives to individual passenger car transport are walking, cycling, public transport and car sharing models. Mobility behaviour must also be considered in relation to travel distance / frequency and balanced with opportunities to increase local area appreciation. Design for the '15-Minute Neighbourhood Principle' that ensures walkable distances to public parks, playgrounds, schools, creches, shops, culture and public transport. S1 S2 S3 S4 S5 S6 S7 S8

8 Make Cities greener

Lack of trees and vegetation cover is one of the main causes of the urban heat island effect. The built urban fabric absorbs and stores thermal energy during the day which reduces the natural night-time cooling effect.
Planting urban trees and increasing vegetation cover lowers surface and air temperatures whilst also supporting biodiversity in urban areas. S1 S2

9 Use Digital innovation

Digital tools, such as smart energy grids, production and navigation systems, already serve to simplify many processes.
They can help us conserve resources and improve sustainability through efficient planning. The Smart City has been hailed as 'the solution to all problems', however this suggests an approach rather than defined goals. Given the urgency of the climate and biodiversity crises, focus should be given to exhausting all climate change mitigation strategies through responsible design, planning and operation, rather than focusing solely on digital technologies and tools. Q_

How do we build sustainable buildings?

create biodiverse habitats

avoid demolition

build compact

interrogate services strategy

use roof surfaces

consider buildings as powerhouses

promote sufficiency

design with appropriate materials

optimise placement and orientation

www.countdown2030.ch
translation by www.architectsdeclare.com

1 Promote 'Sufficiency'

'Sufficiency' is a strategy involving the conscious, self-imposed reduction of needs or consumption. In building terms, this means creating a balance between the need for space and comfort with the requirements for privacy, indoor quality and comfort, acoustics and fit-out. Sufficiency can allow us to do more with less and optimise value whilst minimising environmental impact. Reducing the need (or consumption) within the building is a primary step in reducing both operational and embodied energy.
Evaluate the client brief and specifications in terms of use, size and number of rooms etc. to reduce energy demands. By designing for multi-functional, flexible and adaptive spaces, and providing for communal shared areas, further reductions in resource use can be realised.
Engage with Clients on the benefits of designing for sufficiency (and efficient resource use) as this often reduces the build cost. S1 S2 S3 S4 S5 S6

2 Avoid Demolition

Upgrading existing buildings for reuse should be prioritised as a more energy efficient alternative to demolition and new build, can lead to major savings in embodied carbon emissions that would arise from using new materials. Refurbishment and retrofit strategies are key aspects in the future construction of buildings in Europe and should be assessed and costed using a whole life carbon analysis. Explore creative and sympathetic opportunities to retrofit existing building stock with new interventions, showing a legibility of layers and creating diversity within the urban context.
S1 S2 S3 S4

3 Minimise Energy In Use

The energy consumed by a building in use (operational energy) represents between 40% and 65% of a building's whole life carbon and is usually the most direct environmental impact that a building has over its life cycle. Design approaches should begin with efforts to reduce the overall energy demand using passive design principles and a 'fabric first' approach (thermal performance of the building along with air tightness) before considering the introduction of renewable energy generation or mechanical systems. The lower the energy demand of the building, the easier it is to achieve net zero carbon in use.
Compact buildings generally require less energy to construct and operate. Reducing overall building size and complexity in form to achieve a low 'form factor' (ratio of external surface to internal floor area), will increase the efficiency of the building and lower the energy demand thus reducing both operational and embodied carbon.
Remove the need for basements and avoid underground parking or garages, where possible. Building below the ground, on slopes or in areas with poor soil conditions increases sub-structure requirements and the use of energy intensive materials such as concrete and steel. S1

4 Design for Material Efficiency

To design with material efficiency means using appropriate materials with suitability long life-spans in order to reduce energy and material consumption. Consider structural solutions which use less material and prioritise the simplicity and standardisation of form/grid/ materials to identify an optimum solution (with full consideration of both the horizonal and vertical elements). Prioritise the use of low embodied carbon materials where possible. S1 S2 S3

5 Create Biodiverse Habitats

Biodiversity refers to the variety of all life that can be found on Earth including plants, animals, fungi and micro-organisms. 'Ecosystem services' are the goods and services that biodiversity provides and are the basis of human existence. Therefore, the creation of habitats that support biodiversity must always be taken into account when designing. Many plant and animal species are interdependent, so consider opportunities to promote a healthy and varied ecosystem rather than designing for singular species.
Climate and biodiversity mitigation principles often go hand in hand. Surfaces covered by vegetation not only enhance biodiversity but also improve air quality, sequester carbon dioxide, cool down "urban heat islands", mitigate flood risk and increase the enjoyment and health benefits of urban spaces. The general rule of thumb is: minimise sealing, maximise greening and promote rewilding. S1 S2 S3

6 Consider Buildings as 'Powerstations'

Where possible, consider buildings as mini 'powerstations' and aim for net-zero or net -positive energy buildings. Whilst carbon reductions can be addressed through good design and 'fabric first' construction, energy demands of heating/ cooling, hot water, electricity still need to be met. Maximise the use of efficient on-site energy production so that most/ all of the annual energy demands can be met by renewables (photovoltaics, heat pumps, solar/geothermal energy) before considering offset. S1

7 Optimise Placement and Orientation

The orientation of buildings and the arrangement of internal spaces have a huge impact on the operational energy requirements. Take local, climatic and geographical conditions into account when siting the building and optimise layout with consideration given to daylight, solar heat gains/ losses, shading, optimised glazing ratios and floor to ceiling heights and passive ventilation strategies. Different climatic zones can be achieved within the building depending on the function. Healthy and comfortable indoor environments are primarily the result of good design. S1 S2

8 Use Roof Surfaces

Design consideration of roof areas can allow for on-site energy generation, biodiversity enhancement and aesthetic enjoyment through landscaping strategies.
Avoid unused roof surfaces by creating opportunities for photovoltaic or solar thermal systems. Identify opportunities for green roofs to provide habitats for animals and plants and attractive outdoor surfaces to enjoy. Optimise the depth of substrate layer to support varied plant species (consider any planning or structural implications). S1 S2

9 Interrogate Services Strategy

Building services comprise the lighting, heating, cooling, ventilation and air conditioning plant. Many building services are carbon intensive, have relatively short life spans can become quickly outdated. Consideration of the building services strategy should be considered in relation to operational and embodied carbon, occupant comfort, and health and safety. Passive design principles or simpler strategies should be prioritised over complex systems to reduce overall energy load in operation and minimise maintenance requirements. S1

How Do We Build Sustainable **Buildings?**

How do we construct sustainable details?

repair instead of replace

design for animals and plants

reduce transportation distances

minimise the use of materials

design for a changing climate

use renewable energy

use low embodied carbon materials

design for circularity

use prefabrication

1 Minimise the Use of Materials

The first step in reducing embodied carbon in a building is to reduce the amount of materials. Explore the potential to reduce the building layers and use materials in a multi-functional way (e.g. exposed structure, fire compartmentation, aesthetics of raw materials etc). Minimise the use of unnecessary building finishes and linings.
Ensure that material choices are fit for purpose and have appropriate life-spans. Design for adequate thermal mass to provide for passive cooling and to mitigate the demand for mechanical air conditioning in future. S1 S2 S3

2 Use Low Embodied Carbon Materials

Choose healthy, low carbon and low toxicity materials that can be reused or recycled. Materials that are grown (timber, bamboo, hemp straw, wool etc) or extracted but not processed (unfired clay, lime, stone etc) often come with both environmental benefits and healthy impact such as breathability and improved air quality.
Choose materials with high recycled content or materials that can be recycled at end of life. Avoid materials where the recycling process is energy intensive, or involves high environmental or ecological impacts. Be mindful of coatings, adhesives, glues and finishes that can impact future recyclability and emit VOC's. Optimise glazing proportions on facades in relation to daylighting, heat gains/ losses and carbon intensity. (...) Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10

3 Repair Instead of Replace

dentify opportunities to re-use materials in the design of the building structure, skin, services and fit-out. Also consider future re-use of the materials. Refurbish, upgrade and adapt existing buildings to minimise the amount of waste generated and new building required. Explore opportunities to use reclaimed or recovered materials and products to reduce embodied carbon. Prioritise designs and materials for maintenance and repair rather than replacement. Demonstrate to clients how problems with existing buildings, materials and products can be addressed creatively rather than replaced.
S1 S2

4 Design for Circularity

Optimise design and construction to support circular flows of energy, water, waste, materials etc. Design for flexibility, repair, reuse and/or recyclability and avoid overly complex assembles of components. Ensure that materials and systems have appropriate life-spans and all components can be easily accessed for maintenance/ repair/ replacement without compromising other building elements (structure, fit-out) Design for building in layers; specify materials that can be reused at end-of-use; opt for reversible connections; avoid composite products with inseparable materials.
Mechanically fix systems rather than adhesive fix so they can be demounted and re-used or recycled, supporting a circular economy.
werden, anstatt sie zu kleben. Da die Installationen der Haustechnik in der Regel eine sehr viel kürzere Lebenserwartung als die Konstruktion eines Gebäudes haben, ist es vorteilhaft, diese aufputz bzw. leicht zugänglich auszuführen.
Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9

www.countdown2030.ch
translation by www.architectsdeclare.com

5 Use Renewable Energy

By using renewable energy, carbon emissions are reduced. Renewable energy can be generated on-site or locally while the electricity grid is decarbonising. Ensure that heating and hot water generation is fossil fuel free and prioritise electricity as the lowest carbon solution for all buildings. S_

6 Design for a Changing Climate

Consideration should be given to how we can future-proof buildings in a changing climate and ensure they are safe, healthy and fit-for-purpose in the long term. Use passive design measures such as orientation, form factor, massing, solar-shading etc to ensure external and internal thermal comfort is maximised and to minimise overheating. Ensure the building fabric is well insulated and air-tight to minimise heating/ cooling loads or the requirement for air cooling systems which are expensive and have a high environmental impact.
Use thermal mass in exposed surfaces internally and optimise floor to ceiling heights to achieve good natural ventilation (particularly cross ventilation). Ensure that facades and external building surfaces are specified in a light or reflective colour and include shading, green roofs and facades, especially to southerly orientations. Ensure that movement joints are sufficiently sized to allow for more thermal movement. Explore opportunities to incorporate blue and green infrastructure as vegetation cover will lower surface and air temperatures by providing shade and cooling through evapotranspiration. Prioritise permeable external surfaces to mitigate flood risk. S_

Design for Animals and Plants

7 Consider designs for animals and plants too.
Biodiversity is decreasing drastically with around one million plant and animal species are threatened with extinction. 'Animal-Aided Design' (AAD) is a methodology for the integration of animals and their needs into the design and planning of open spaces. The idea of AAD is to include the presence of animals and their habitat requirements into the design process, such that they are an integral part of the design. The inclusion of the desired species is set at the beginning of a project and then serve as an inspiration for the design itself. The aim of AAD is to establish a stable population at the project site, or contribute to population growth of species with larger habitats, thus allowing for species conservation in urban areas.
Consider designs so that animals can find shelter, move freely across property lines and be protected when it rains. Consider facades that can provide nesting sites for birds and allow for 'wild areas' to help maintain biodiversity. When designing outdoor spaces, maximise the potential for green and blue infrastructure and provide permeable surfaces as much as possible. S1 S2

8 Reduce Transportation Distances

Prioritise locally sourced and manufactured materials to minimize environmental impact from transportation whilst also supporting local economies, practices and services . S_

9 Use Prefabrication

Explore principles of 'Designs for Manufacture and Assembly' (DfMA) where components are prefabricated and preassembled off-site as much as possible, thereby reducing waste and material use whilst optimising efficiency. S_

How Do We Construct Sustainable **Details?**