

Session two – This session will focus on a sustainable housing, challenging the young people to design a sustainable low carbon house.

In the UK, housing developments produce a lot of carbon:

- During construction it takes between 50 and 80 tonnes of CO₂ to build to build your average UK house¹.
- During use the average household in the UK emits 2.7 tonnes of CO₂ every year from heating their home¹.

To reduce carbon and increase sustainability creative solutions are needed.

Therefore, we would like the students to design a sustainable low carbon house which is connected to nature, creates a sense of community and is energy efficient.

To help give them some ideas we have given them five points/hints about what they may want to consider.

- Location – accessible, near public transport
- Outdoor spaces – Garden or shared garden? Play spaces? Allotments? Nature?
- Materials – Walls, insulation, roof, window
- Energy and water – Renewables? water catchment?
- Parking – Do you want any? Do you want bike storage? Do you want electric car points?

To support the students with this task, the teachers and volunteers will be given this support sheet with further tips and useful information.

The aim of this exercise is for the students to be creative as they will think of things we have never considered. Therefore, this sheet is not prescriptive, and the students do not need to consider or include everything on here, it just offers guidance points for you discuss with them if they get stuck.

Additionally, this sheet includes a reference list for the teachers with the resources used in the session in case they want further information about a topic.

Location

20-minute neighbourhoods² – This is a geography and planning concept which describes areas where people can meet their everyday needs within a short walk or cycle. Therefore, sustainable housing should be:

- Well connected to services and facilities e.g., schools, doctors, shops etc
- Near public transport and pedestrian links
- Near green spaces or parks – This is especially important for flats because they may not have access to a garden.

Outdoor spaces

The students may want to consider what type of outdoor space they will provide, or they could do a mixture of things. Examples with pros and cons are outlined below:

Outdoors	Pros	Cons
Private garden	<ul style="list-style-type: none"> • Own space to with what they want 	<ul style="list-style-type: none"> • Can be lonely – especially during covid19 lockdowns
Shared garden	<ul style="list-style-type: none"> • Creates community 	<ul style="list-style-type: none"> • Can cause conflicts with neighbours • Who looks after it?
Play spaces e.g., swings	<ul style="list-style-type: none"> • Encourage interaction • Increase activity 	<ul style="list-style-type: none"> • Safety • Maintenance
Allotments	<ul style="list-style-type: none"> • Access to fresh local produce • Could sell excess 	<ul style="list-style-type: none"> • Look bad when not in use
Nature e.g., bird boxes or beehives	<ul style="list-style-type: none"> • Supports animals • Could sell honey 	<ul style="list-style-type: none"> • Can be time consuming and expensive

Materials

The students should look at alternative building materials. This is likely where they can get most creative because anything goes as long as they can justify why they used it so this section is smaller than others

Some examples:

Insulation – Natural woodfibre insulation, straw bale, insulated panel construction, sheep wool

External (the main thing for external materials is it needs to withstand weather) – Timber clad

Windows/ doors – double or triple glazing, insulated window frames

Roof – green roof using Sedum or moss or blues roofs or solar panel covered roof

Energy

Renewable energy³ is crucial when making housing which is sustainable and low carbon. This can be done on a large scale (for a community) or on small scale (for an individual house or group of housing). There are examples with some advantages and disadvantages below:

Energy Resource	Advantages	Disadvantages
Large scale		
Wave generators	<ul style="list-style-type: none"> • cheap to run 	<ul style="list-style-type: none"> • Expensive to set up

	<ul style="list-style-type: none"> Scotland has a lot of coastline 	<ul style="list-style-type: none"> When waters calm production is low
Tidal generators	<ul style="list-style-type: none"> cheap to run 	<ul style="list-style-type: none"> Very expensive to set up could be hazardous to local wildlife
Hydroelectric power stations	<ul style="list-style-type: none"> cheap to run pairs well with other renewables 	<ul style="list-style-type: none"> Expensive to set up output could be affected by drought the reservoirs needed are large
Wind turbines	<ul style="list-style-type: none"> cheap to run effective 	<ul style="list-style-type: none"> Expensive to set up wind does not always blow
Small scale		
Solar panels	<ul style="list-style-type: none"> cheap to run earn money for extra electric produced 	<ul style="list-style-type: none"> Not always sunny High initial costs
Ground source heat ⁴	<ul style="list-style-type: none"> Provides cooling and heating Eligible for grants Virtually silent 	<ul style="list-style-type: none"> Cannot be used everywhere High installation costs
Air source heat	<ul style="list-style-type: none"> Easy installation Long lifespan High performance 	<ul style="list-style-type: none"> Can be noisy Supplies less heat than boilers
Biomass	<ul style="list-style-type: none"> Supports waste reduction reliable 	<ul style="list-style-type: none"> Still releases some carbon High costs

Water

There are various options when it comes to reducing flood risk, increasing water quality, and decreasing water wastage. Two examples are explored below:

Sustainable urban drainage

Aims to manage the surface water run-off by mimicing natural drainage. SUDs can also be used as play space⁵. Some SUDS techniques:

- green roofs
- permeable surfaces
- infiltration trenches filter drains and filter strips
- swales - shallow drainage channels
- detention basins, purpose built ponds and wetlands -

Rainwater collection

Rainwater collection is collecting the run-off from a structure or other impervious surface to store it for later use. Rainwater collection systems can be as simple as collecting rain in a rain barrel or as elaborate as harvesting rainwater into large reservoirs.

Rainwater collection is good for water conservation, reducing flood risk. The rainwater collection in the UK can be used for non-potable (not for drinking) use eg water your garden, toilets, and clothes washer etc.

Parking

As of 2019, transport was the largest-emitting sector of the UK economy, accounting for 27% of total UK greenhouse gas (GHG) emissions⁶. Therefore the students should consider alternatives to the petrol/diesel cars we use today. Such as:

Type	Pros	Cons
Bikes	<ul style="list-style-type: none">• Improve fitness• No emissions	<ul style="list-style-type: none">• Not good for shopping
Electric charging points	<ul style="list-style-type: none">• No emissions	<ul style="list-style-type: none">• Would increase electric bill
Shared cars	<ul style="list-style-type: none">• Less emissions	<ul style="list-style-type: none">• Could be conflict

References

1. citu (2020). What is the carbon footprint of a house? Available at: <https://citu.co.uk/citu-live/what-is-the-carbon-footprint-of-a-house> [Accessed 01/12/2021]
2. tcpa (2021) Guide: The 20 Minute Neighbourhood Available at: <https://www.tcpa.org.uk/guide-the-20-minute-neighbourhood> [Accessed 02/12/2021]
3. BBC (2021) GCSE ENERGY: Renewable energy Available at: <https://www.bbc.co.uk/bitesize/guides/z3tjcw/x/revision/2> [Accessed 19/12/2021]
4. Greenmatch (2016) pros and cons of ground source heat pumps Available at: <https://www.greenmatch.co.uk/blog/2016/01/pros-and-cons-of-ground-source-heat-pumps> [Accessed 19/12/2021]
5. Local Government Association (2021) Sustainable drainage systems Available at: <https://www.local.gov.uk/topics/severe-weather/flooding/sustainable-drainage-systems> [Accessed 19/12/2021]
6. HM Government (2021) Electric vehicles and Infrastructure Available at: <https://researchbriefings.files.parliament.uk/documents/CBP-7480/CBP-7480.pdf> [Accessed 19/12/2021]