Greater Nottingham Strategic Plan:

Carbon policy support

A3: Offsetting

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Bioregional

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Glossary and acronyms

BNG	Biodiversity Net Gain. A percentage improvement in the habitat value of a site after development (compared to before development), calculated using a specific national calculation methodology (the DEFRA metric). A minimum 10% net gain at new development was made mandatory through the Environment Act 2021.
BRE	Buildings Research Establishment. The UK's building science research institution which develops and/or tests various building products, techniques, standards, and qualifications and data. Originally a UK civil service body, but now independent.
BREDEM	Buildings Research Establishment Domestic Energy Model. A methodology for estimate calculations of the energy use and fuel requirements of a home based on its characteristics. BREDEM is the basis for SAP (see elsewhere in this glossary) but BREDEM retains more flexibility by allowing the user to tailor some assumptions made in the calculations to better reflect the project.
B&NES	Bath & North East Somerset [local plan]. Cited as a recent successful precedent example of innovative and highly effective net zero carbon planning policy.
Carbon, or carbon emissions	Short for 'carbon dioxide emissions' but can also include several other gases with a climate-changing effect, that are emitted to the atmosphere from human activities (see 'GHG', below).
Carbon budget	Amount of greenhouse gas that can be emitted by an individual, organisation or geographic area. Usually set to reflect a 'fair share' of the global amount that can be emitted before reaching a level of atmospheric carbon that causes severely harmful climate change.
Carbon intensity/ carbon factors	A measure of how much carbon was emitted to produce and distribute each kWh of grid energy at a certain point in time. For electricity, this has been falling as coal-fired power stations have been phased out over years. It also varies on an hourly basis: at times of high renewable energy generation, the carbon intensity is lower than at points where gas-fired electricity dominates the generation mix.
CIBSE	Chartered Institution of Building Services Engineers.
CO_2	Carbon dioxide. Often shortened to 'carbon'.
CO_2e	Carbon dioxide equivalent. The sum of a mixture of gases, in terms of their climate-changing impact in a 100-year period expressed as the amount of CO_2 that would have the same effect. Often shortened to 'carbon'.
DESNZ	National Government Department of Energy Security and Net Zero.

Embodied carbon	Carbon that was emitted during the production, transport and assembly of a building, infrastructure, vehicle or other product, before the product is in use. As opposed to 'operational carbon' which is emitted due to energy use when operating the building / infrastructure / vehicle / other product.
EUI	Energy use intensity, a measure of how much energy a building uses per square metre of floor. Expressed in kilowatt-hours per square metre of floor space per year.
GHG	Greenhouse gas (CO_2 and several other gases: methane, nitrogen dioxide, and fluorinated refrigerant gases). Often collectively referred to as 'carbon'; see above.
GLA	Greater London Authority. Cited as a well-established example of a planning authority that has developed one type of net zero carbon buildings policy and produced implementation guidance for this.
GNSP	Greater Nottingham Strategic Plan
IAS	International aviation and shipping. One of the sectors into which carbon emissions are often categorised.
kWh	Kilowatt-hour. A unit of energy.
kWp	Kilowatt peak. A unit of energy generation capacity, typically used to describe the size of a solar panel system in terms of the maximum amount of electricity it can put out during optimal conditions.
LETI	Low Energy Transformation Initiative. A coalition of built environment professionals working to establish and achieve the energy performance needed for net zero.
LPA	Local Planning Authority
MVHR	Mechanical Ventilation with Heat Recovery
MW	Megawatt. A unit of energy generation capacity.
NPPF	National Planning Policy Framework. A central government document laying out how the planning system should function, including plan-making and decisions.
Part L	Building regulations section that sets basic legal requirements regarding buildings' energy and CO_2.

Performance gap	The difference between the amount of energy a building is predicted to use during design, versus the actual amount of energy it uses. The gap is due to poor prediction methodologies, errors in construction, and unexpected building user behaviour.
PV	Photovoltaics: solar panels that generate electricity.
PHPP	Passivhaus Planning Package – a tool to accurately predict a building's energy use. It is used to design buildings that seek Passivhaus certification but can be used without pursuing certification.
REGO	Renewable Energy Guarantee of Origin. A certificate used within the UK energy market to confirm that a unit of energy was produced from renewable sources. However, the REGO certificate is often sold separately from the unit of energy itself ('unbundled').
Regulated energy or carbon	Carbon emissions associated with energy uses that are 'regulated' by Building Regulations Part L. This covers permanent energy uses in the building, (space heating, space cooling hot water, fixed lighting, ventilation, fans, and pumps).
RIBA	Royal Institute of British Architects.
RICS	Royal Institute of Chartered Surveyors.
SAP	Standard Assessment Procedure – the national calculation method for residential buildings' energy and carbon, used to satisfy building regulations Part L. SAP is based on BREDEM model, but with fixed assumptions and thus less flexibility.
SBEM	Simplified Buildings Energy Model – the national calculation method for non-residential buildings' energy and carbon, used to satisfy building regulations Part L.
SEA	Strategic Environmental Assessment.
Sequestration	Removal and storage of carbon dioxide (or other GHGs) so that it cannot perform its harmful climate-changing role in the atmosphere. Currently only achieved by trees/plants and soil. May be achieved by technologies in future.
Space heat demand	Amount of energy needed to heat a building to a comfortable temperature. Expressed in in kilowatt-hours per square metre of floor space per year.
TER	Target Emission Rate – a limit set by Part L of building regulations on CO_2 emissions per square metre of floor, from regulated energy use in the building.
TPER	Target Primary Energy Rate – limit set by Part L of building regulations on 'primary energy' use per square metre of floor. Unlike metered energy, 'primary energy' takes into account energy lost to inefficiencies during power generation and distribution.
TFEE	Target Fabric Energy Efficiency – limit on space heat energy demand per square metre of floor, set by Part L of building regulations. Based only on fabric; not affected by building services like heating system, lighting, ventilation[i].
TM54	A method to accurately calculate buildings' energy use. Devised by CIBSE (as above).
UKGBC	UK Green Building Council.
Unregulated energy or carbon	Carbon associated with energy use in a building or development but which is not covered by Building Regulations Part L. Includes plug-in appliances, lifts, escalators, external lighting, and any other use not covered by Part L.
U-value	A measure of how much heat is transmitted through a building element, such as the walls, floor, roof, windows or doors. Lower U-values mean a greater retention of heat within the building.

Introduction

Bioregional (supported by Etude) is appointed to provide an assessment of options available within the local planning system to address climate change, to inform local plan policy development within Greater Nottingham Strategic Plan (GNSP). This work is appointed by the relevant four local planning authorities: Nottingham City, Broxtowe Borough, Gedling Borough and Rushcliffe Borough Councils. However, where of interest, this study also notes ambitions and existing or emerging policy in place at other Nottinghamshire districts or boroughs.

Local Planning Authorities (LPAs) have a legal duty to mitigate climate change (deliver carbon reductions) via the planning process[1]. National Government planning policy[2] confirms that these reductions should be in line with the Climate Change Act. The Climate Change Act includes both the 2050 goal for a net zero carbon UK, and sharply declining five-yearly carbon budgets between 2008 and 2050.

Our appointment in this effort comprises of the following workstreams (together titled 'Part A'):

A1. **Position Statement on net zero carbon** – drawing on the existing literature about the duties, powers, and precedents to address this goal through the local plan system.

A2. **Develop and evaluate a range of potential key policy approaches** available to the local plan in light of national policy changes that occurred in December 2023. Including:

   i. Report on the available range of approaches and their resourcing implications

   ii. Present on the range of approaches, for the GNSP team to select an option for the consultants to proceed to the following steps

   iii. Further identify/assemble the evidence base for the selected approach (beyond what is covered in the Position Statement), develop recommended draft policy wording, and suggest a monitoring framework.

A3. **Report on the role of offsetting** within the fulfilment of the draft policy.

This report comprises point A3.

This report initially sets out what 'offsetting' could mean and the functions it could have – subject to certain caveats – in bringing forward the goals that a local plan policy is trying to achieve with regards to net zero carbon buildings. Pros and cons of existing and potential policy mechanisms for offsetting are explored, including legal mechanisms within the planning system and certain legal tests that the approach must meet if using these. This report also includes reference to how the justification for the 'offsetting' mechanism would interact with policy recommendations that were detailed in the separate report A2iii.

Throughout this exploration, certain recommendations are made with regards to:

- When an offsetting approach should be required or permitted, as part of the route to compliance with a 'net zero carbon buildings' policy
- What conditions an offsetting mechanism must be subject to in order to be effective
- Types of projects that should or shouldn't be considered acceptable as a means to implement the offset.

This report should be read in conjunction with Task A2iii which defines the concepts of 'net zero carbon', the scope of carbon emissions for which new buildings are responsible, and the contextual carbon reduction trajectory context in line with which the local plan policy is attempting to act. This provides important background for the conditions and caveats about offsetting in this report, which form the basis for the recommendations about the use of offsetting in policy.

[1] Planning & Compulsory Purchase Act 2004, Section 19, 1(A).
[2] National Planning Policy Framework (2021), paragraph 153, footnote 53.

Overview of offsetting

The draft policy requires new builds to achieve net zero regulated carbon by applying enough PV to match regulated energy use after first hitting an energy efficiency improvement target.

Whilst it is important for an effective policy to set specific and widely achievable requirements for net zero carbon performance on-site, there may be some exceptional cases where a net zero balance cannot be achieved on site. Such exceptional circumstances could arise where buildings above 3-storeys have insufficient roof space for required solar PV outputs, or where a specific non-residential building use has a high, but justified, energy use that cannot be matched with on-site PV. In these cases, it is appropriate to have a robust and effective offsetting policy in place, to allow those unmet requirements to be delivered elsewhere.

Carbon offsetting as a concept can be defined as a reduction or removal of greenhouse gas emissions to compensate for emissions elsewhere. In the context of this study, offsetting is used as a mechanism to compensate for a shortfall in on-site performance of a development in terms of on-site *renewable energy provision* (energy offsetting).

It is vital to firstly understand that given the speed and scale of the carbon reductions required in *all* sectors in order to hit the UK's legislated carbon targets, there is very little room for underperforming sectors to have their slack picked up by other sectors. Committee on Climate Change analysis (Figure 1~~Figure 1~~) suggests that 'electricity',

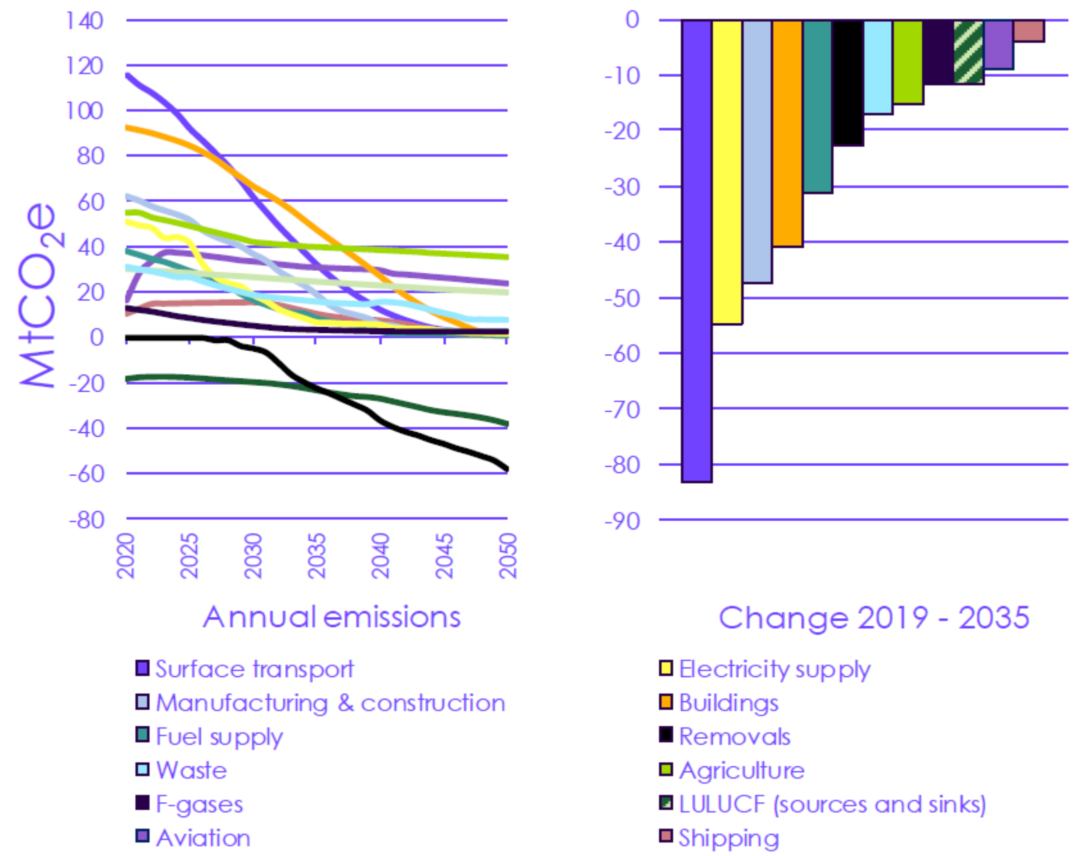

Figure 1: Sectoral emissions trajectories needed in the 'Balanced Pathway'. CCC (2020), The Sixth Carbon Budget.

'manufacturing/construction', 'buildings' and 'transport' sectors need to get close to zero carbon by circa 2040, 2045 and 2047 respectively, as the UK's capacity for carbon capture or sequestration will barely be enough to balance the emissions of sectors that cannot reach zero (agriculture, aviation, waste). The emissions relevant to the local plan – i.e. due to development – occur mainly in sectors that should get close to zero with little or no offsetting. Thus, a local plan offsetting policy may fail to drive the legislated carbon trajectory if the offset mechanism works outside the sector where the emissions occur, or if in-sector 'offsetting' is delivered via interventions that needed to happen *as well as* net zero carbon development, rather than *instead of*.

Therefore, as a concept, offsetting is problematic for a number of reasons. Most importantly, developments should be focusing on on-site measures to achieve net zero and not rely on the role of offsetting. Second, reputationally the industry is not yet audited well enough to have full trust in offsetting delivery projects. Prominent issues involved with offsetting are:

1. Trust, transparency and validity

Voluntary market credits, purchased by businesses to offset emissions through carbon reduction projects, have been shown to be of questionable effectiveness. The lack of a standardised framework for voluntary markets to provide traceable carbon reductions hinders the reputation of such measures, which creates justified public scepticism of offsetting to drive the carbon savings it sets out to achieve. Tree-planting schemes in particular are vulnerable to failure via poor land maintenance and management, jeopardising their ability to permanently deliver the promised carbon removals. Also, most market carbon credits are from overseas, thus not contributing to local or national targets.

This lack of standards brings great uncertainty about 'additionality' (that the carbon saving project wouldn't occur without the offset payment) and failure to measure rebound effects (e.g. if a fuel efficiency beneficiary spends their bill savings on other carbon-heavy goods).

For these reasons, market-based offsetting solutions should ***not*** be accepted by Greater Nottingham as an offset solution. Similarly, as explored later, tree-planting is generally unsuited to the scope of improvements the emerging local plan 'net zero' policy aims for. Projects must be selected to directly relate to what is being offset (in most cases, a shortfall in renewable energy). Consistent reporting on offset projects' validity and effectiveness increases trust and transparency.

2. Lack of innovation

The use of offsetting delays investment into technologies and skills that are vital for sectoral decarbonisation. Such investments should be made today, instead of delaying tangible action until the price of offsetting is high enough to force companies to invest. This can only be driven by financial incentives. For example, if a developer can more cheaply offset to avoid installing a heat pump, then sales of heat pumps are not driven up, installation skills remain rare, economies of scale do not develop, prices remain high, and innovation is slowed.

3. Easy route to compliance

Offsetting has for too long been used as an overly easy mechanism for policy compliance as the offset price is often cheaper than the cost of delivering on-site measures. It has been used in absence of guaranteeing strong energy efficiency. This problem is partially avoided which under the policy approach recommended for the GNSP, which requires that a 63% CO_2 reduction is achieved through energy efficiency measures regardless of the proposed level of on-site renewable energy (i.e. the 63% reduction must be achieved without any contribution from renewable energy, apart from heat pumps which are treated as an 'efficiency' feature).

Recent UKGBC Carbon Offsetting and Pricing Guidance expressed an opinion that offsetting must not become the easy route to compliance, stating that offsetting at individual asset/project level is only credible if energy use and embodied carbon limits are first achieved.

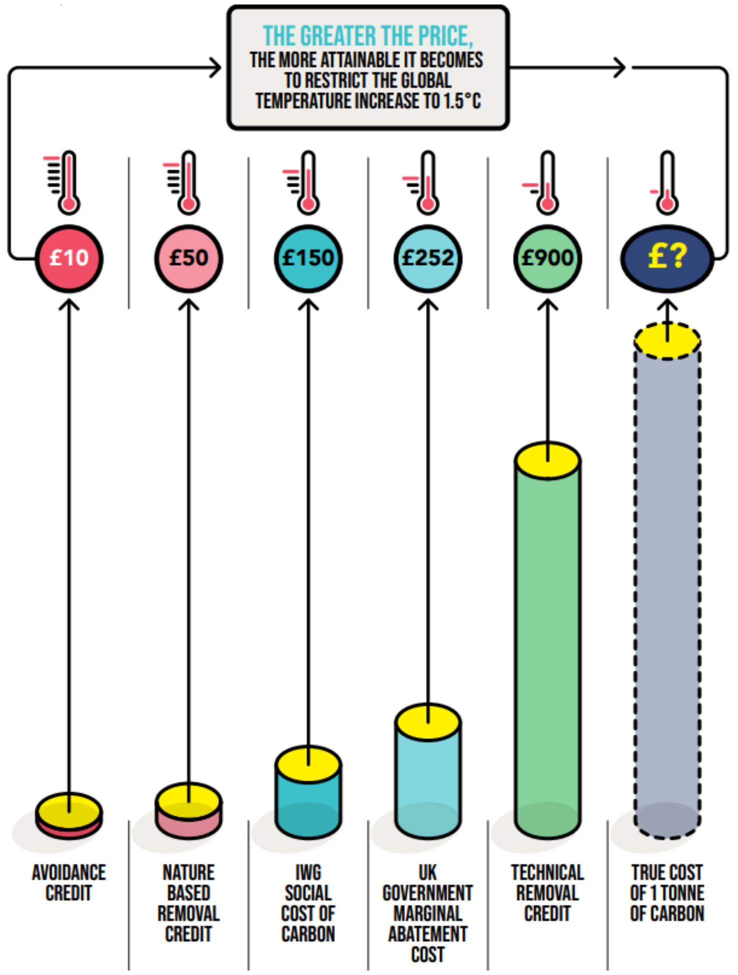

Figure 2: Various scopes of carbon pricing. Source: UKGBC, 2023.

[3] Greenhouse gases emitted due to the operation (in-use phase) of a building. Typically calculated based only on energy use because this is the cause of the vast majority of operational emissions, but some calculations may also include other sources of emissions such as refrigerant leakage from the building's heating/cooling systems.
[4] The building's energy use during its operational phase – that is, its in-use lifespan.

Greater Nottingham scope of offsetting

As explored in Task A2iii, offsetting in planning policy precedents works either in relation to **operational carbon**[3] or **operational energy**[4].

Carbon offsetting typically requires that a financial contribution is made to offset any residual operational carbon dioxide emissions that fall short of a certain % CO_2 reduction target (e.g. net zero regulated[5] emissions, or net-zero total[6] operational emissions). This is priced per tonne of carbon predicted to be emitted over a certain timeframe (typically 30 years).

Energy offsetting typically requires the developer to offset any shortfall in on-site renewable energy capacity needed to achieve an on-site net zero energy balance (the difference between the development's predicted annual energy use, and its predicted annual renewable energy generation). This is priced per kilowatt hour (kWh) of operational energy demand that is not matched by on-site renewable energy provision.

The recommended draft policy approach for operational carbon (in the separate Task A2iii report) requires offsetting through an *energy* metric, therefore carbon-based offsetting mechanisms are not considered extensively here. A carbon metric is used to assess energy efficiency and carbon emissions, but this is not included in the scope of offsetting. It is only any shortfall in on-site renewable energy generation that comprises the scope of offsetting for Greater Nottingham.

The role of energy offsetting in the context of this new build residential and non-residential local plan policy, is to enable development to maintain net-zero status in cases where an on-site energy balance is not achieved due to feasibility issues – for example where limited roof space or excessive shade prevent sufficient rooftop solar PV capacity, or where the heritage impacts of PV cannot be made acceptable. In other words, it allows a development to still be deemed policy compliant in exceptional circumstances where all on-site measures have been clearly demonstrated to the council's satisfaction. This flexibility is particularly valuable for developments that provide other climate benefits, e.g. reduced transport carbon emissions through bringing forward more of the area's development through mixed-use urban infill (the rededication of land in an urban environment to new construction) and denser/taller urban development – which help create walkable settlements that avoid the need to drive.

[5] Emissions associated with energy uses that are regulated by Building Regulations (Part L). This does not cover all the actual energy uses of a building – see Task A2iii for explanation of the energy uses that are in or out of scope for Part L regulation, and the problems associated with the calculation used for regulated emissions.
[6] Emissions associated with *all* energy uses within the building, whether these are 'regulated' or not.

Downfalls of carbon offsetting and benefits of energy offsetting

More detail comparing the relative merits of energy versus carbon offsetting approaches is given in Tasks A2iii ('Carbon offset payment' and 'Energy offsetting' sections). However, the key points are outlined in this table.

Pitfalls of carbon offsetting	Benefits of energy offsetting
Calculations reliant on potentially inaccurate carbon factors[7] relating to grid decarbonisation rates now and in the future	Agnostic to carbon intensity of the grid
Previously has been used as a routine 'easy' or 'cheaper' mechanism to achieve net zero carbon (to the detriment of design improvements), instead of a last resort	Only used a last resort option in exceptional circumstances and still requires that energy and fabric efficiency targets are met
Can be hard to measure and track against off-site carbon savings, depending on the projects delivered with the offset fund	Easy to measure and track against off-site energy generation (translating directly to savings)
Not necessarily clear exactly what the sources of residual emissions are	Easy to identify residual shortfall in on-site renewable energy generation, that must instead be delivered offsite as an offset
Difficult to guarantee that the price set will be sufficient to fund projects that achieve permanent carbon savings equal to on-site emissions	Clearer approach to setting offset price based on cost of delivering the off-site renewable energy generation

[7] A measure of how much carbon was emitted to produce and distribute a kWh of grid energy.

Core principles of offsetting

Drawing together the 6 key principles outlined here will be vital to the success of responsible offsetting. Successful fulfilment of all principles is the responsibility of Greater Nottingham, and these should inform how the Councils decide to administer and manage the offset fund.

1. Equivalent emissions (or equivalent energy)	Ensure emissions reductions (or renewable energy provision) achieved through offsetting are equivalent to residual emissions (or residual energy use) on-site. If this is not made clear by the relevant offset project linked to the specific development that is offsetting, it cannot be claimed that the development is truly net zero.
2. Additionality	Be sure that the selected offset project would not have occurred anyway and the necessary share of carbon savings is assigned exclusively to the relevant development. This is paramount to the core principles of responsible offsetting. It must be certain that the project funded by offset finance is new to the pipeline, and not double-counted (e.g. no sale of REGO certificates or BNG credits to third parties).
3. Ensure permanence and minimise time-lags	Ensure that the offset project is underway prior to the initiation of operational emissions on the development site. Carbon removals must be permanent (or renewable energy generation maintained for the development's operational lifetime). Collating a pipeline of offset projects ready for delivery as soon as the offset fund is available is the key to avoid a time lag. Timing is key to the actual climate impact of CO_2.
4. Maximise co-benefits	Seek co-benefits with local communities wherever possible, alongside the primary aim of equivalent emissions reductions. An example could be improving quality of life and reducing bills by installing solar PV on low-income households, social housing or key public institutions (e.g. NHS; schools)
5. Proximity to development	Aim to delivery an offset project as close to the development as possible. GNSP may wish to require that offset projects must take place within a certain distance, and within the plan area.
6. Transparency and measurability	Produce annual reports on projects funded by offset contributions, importantly including statistics on performance.

Price estimation and recommendations

Limited potential to deliver sufficient on-site PV generation (due to space, shadow or heritage as previously noted) is likely to be the key feasibility obstacle to straightforward on-site compliance with the emerging recommended policy (giving rise to the need for offsetting), although this is not expected in the majority of cases. Therefore, to make the offset price directly relevant to the development, as required by S106 legal tests, the offset price should be based on the cost of solar PV installations off-site. We next explore how the price can be set accordingly, as a price per unit of solar PV generation (£/kWh).

Some other local plans have instead used an offsetting price expressed as £/tonneCO_2, but this is less preferred as it would rely on carbon factors and may not reflect the true cost of solar PV. Carbon intensity factors are based on grid energy generation mix (including future predictions that may not come true, coupled with a somewhat arbitrary assumption about the lifetime of the home) and are not directly linked with costs of delivering the necessary solar PV. By contrast, a £/kWh price avoids unnecessary complexity and uncertainty.

Existing prices

The Greater London Authority (GLA) and Department of Business, Energy and Industrial Strategy (BEIS) Green Book carbon prices have dictated the standard price for *carbon* offsetting since the concept was established at a local level in 2017, following a report produced by AECOM exploring a carbon offset price for the GLA. The price set was £95/tCO_2, reflecting the 'high' scenario price in the 2017 BEIS Green Book. Since then, the Green Book values have been updated, most recently in 2023. The equivalent value of £95/tCO_2 (2017) now stands at £403/tCO_2. This is largely because it is based on the 'cost of abatement' needed to reach the UK's carbon targets. Not only did the UK in 2019 raise its legally binding target to 'net zero', but many of the cheaper actions have already been implemented.

Although BEIS (now known as the Department of Net Zero and Energy Security, DESNZ) now view the £95/tCO_2 as outdated, some local authorities particularly in London still use this price and some other areas have copied London's price. An increasing number of authorities have acknowledged more recent Green Book value, which better reflects the true cost of carbon. However, even the new higher prices may not necessarily reflect the true cost of carbon and may remain an insufficient incentive to ensure on-site measures are prioritised over offsetting.

For example, the 2023 BEIS high-scenario price of £378/tCO_2 is nationally recognised and tested, yet in most cases, it is insufficient for a solar PV-based offsetting project to deliver the equivalent carbon or energy savings that should have been achieved on site. This was demonstrated for Bath & North East Somerset (B&NES) where the local cost to offset via solar PV was determined to be £652/tCO_2. B&NES however selected the 2022 Green Book value (£373/tCO_2) because the higher local price was only based on one existing solar PV project. Importantly, leading local authorities, such as Cornwall, have begun to set *energy* offset prices using appropriate metrics that can be directly compared against the cost of solar PV. Bristol City Council has also proposed embodied carbon offsetting in its Regulation 18 consultation.

The examples given below represent the range of possible offsetting prices identified, for both carbon and energy, across various precedent local plans and supporting evidence bases.

Stage	Scope	Approach	Example	Price	Source
Operational	Energy	Offset residual on-site renewable energy	Cornwall	**£110/MWh**	SWNZH
			B&NES	**£373/tCO_2**	BEIS/DESNZ
			Delivering Net Zero (London, but not yet policy)	**£880/tCO_2**	*Delivering Net Zero*
				£1.32/kWh*	*Delivering Net Zero*
		Offset residual Total Energy Use	Bristol (draft)	**£90/MWh**	CSE
	Carbon	Offset residual CO_2 emissions to an improvement over Part L (regulated only)	Milton Keynes	**£200/tCO_2**	n/a
		Offset to zero emissions (regulated only)	GLA	**£95/tCO_2**	AECOM
Embodied Carbon	Stages A1 – A5	Offset any exceedance of a set target limit in kgCO_2e/m^2 floorspace	Bristol (draft)	**£373/tCO_2**	BEIS/DESNZ
		Offset to zero emissions	None	**n/a**	n/a
Any	Any	National carbon valuation 2023	DESNZ/BEIS	**£134, £269 or £403/tCO_2**	BEIS/DESNZ

**This price does not assume a 30-year lifetime and is instead set as an upfront price associated with the cost of delivering solar PV.*

Appropriate pricing

Energy offset prices must be based upon the cost of creating new renewable energy generation capacity, which in the vast majority of cases will be solar PV. Although not locally-specific data, solar PV costs from the Department of Energy of Net Zero and Energy Security (DESNZ) provide a reliable estimate of what the costs of solar PV installations could be in Greater Nottingham. The following costs are the mean averages from the median values for 2021/2022 and 2022/23.

Capacity band	Cost	Offset price
4 – 10 kW	£1,804/kW	£1.90/kWh
10 – 50 kW	£1,121/kW	£1.18/kWh
4 – 50 kW average	**£1,463/kW**	**£1.54/kWh**

An average of these installation capacity bands has been used because offset projects are likely to primarily consist of small-scale solar PV installations within the wider combined 4 – 50 kW band. (We note that projects over 50MW would also need national development consent[ii], therefore would be less within the local planning authority's gift to bring forward).

Making a conservative assumption[8] about the electricity generation rate for the PV system of 950 kWh/kWp, the recommended energy offset price (before admin margin) is £1.54/kWh.

With a 10% added margin for fund administration and project delivery, to cover this new administrative burden to the council(s), the total recommended offset price is **£1.69/kWh**.

The cost data from DESNZ includes a band for 0-4kW installations but this has not been included in the calculation methodology to determine the offset price. It is highly unlikely that funds collected via energy offsetting will be used for solar PV installations less than 4kW (as this would typically be an inefficient use of time and funds), therefore this band was excluded. The costs used take a two-year average to even out cost fluctuations, but future fluctuations are likely to occur reflecting market trends of solar PV technology. Therefore, it is important that GNSP review the energy offset price on an annual basis using the same methodology.

This cost metric selected here for the recommended price is agnostic to the assumed lifetime of a building, which by contrast in many precedent offsetting approaches is typically 30 years. Assumed building lifetime in other precedents has been used primarily for offsetting *carbon* emissions predicted to occur throughout building operation. Since the approach taken here is based upon the cost of solar PV to match what would otherwise have been installed on site (which itself is based on *annual generation* to match *annual demand*), it is not necessary to take into account an assumed building lifetime, because offset projects should directly fund solar PV installations to be operational at or before occupation of the development.

Example scenarios

The example scenarios given here assume a 90m^2 residential building and show the types of costs that may arise where offsetting has been found to be acceptable. For any level of offsetting to be found acceptable, it must firstly be demonstrated that on-site renewable energy capacity equates to ≥113 kWh/m$^2_{\text{building footprint}}$/year.

Regulated energy demand	**30 kWh/m²/year (example)**
On-site renewable energy generation	**30 kWh/m²/year (example)**
Is offsetting required for compliance?	**No offset required: perfect policy compliance**

Regulated energy demand	**30 kWh/m²/year (example)**
On-site renewable energy generation	**24 kWh/m²/year (example)**
Is offsetting required for compliance?	**£914: minimal offset value**

Regulated energy demand example	**30 kWh/m²/year (example)**
On-site renewable energy generation	**5 kWh/m²/year (example)**
Is offsetting required for compliance?	**£3,810: potentially excessive offset value**

To compare the third scenario offset cost of £3,810 to an existing energy offset price in Cornwall's adopted local plan, set at 9p/kWh assuming a 30-year lifetime, the equivalent offset contribution with the Cornwall price would be £6,683.

One key aspect of the energy offsetting approach, which is supplemented by requiring an on-site net-zero energy balance (regulated-only, for the current selected draft GNSP policy), is that offsetting results in no significant additional or significantly lower cost to the developer compared to delivering the improvements on-site. This is because the offset price is set based on the cost of solar PV installations, which are likely to be similar whether on- or off-site.

[8] kWp expresses the size of PV system. Actual output of a PV system in kWh per kWp depends on the average amount of annual sunshine. Global Solar Atlas estimates that in Nottingham this is 969.6kWh per kWp; this figure is better (higher) in some other parts of GNSP area but we have precautionarily rounded down so as not to overoptimistically overestimate the output of a system.

Offset fund mechanisms

S106 mechanism

Section 106 (S106) of the Town and Country Planning Act (1990) provides the power to require an applicant to enter into an agreement with the local planning authority in order for permission to be granted for a proposal that would otherwise be unacceptable. In this case, without hitting the acceptable (required) renewable energy targets to reach net zero regulated carbon, a scheme would need to pay into an offset fund ringfenced for the purpose of delivering projects that save the same amount of energy. S106 has been the mechanism used for carbon offsetting since the concept was pioneered by Milton Keynes and the GLA.

The S106 financial contribution from the developer is often negotiated. However, Greater Nottingham should take a clear stance that offsetting contributions must directly relate to the prices set (to deliver PV) and the residual shortfall in on-site renewable energy capacity.

S106 agreements are also subject to viability limitations, but the separate feasibility and costs reports show that hitting on-site targets is typically achievable (with costs for viability testing), therefore offsetting should only be necessary in exceptional circumstances (and cost similar to what it would have cost to hit the targets on-site). The expected minimal proportion of high-rise development in Greater Nottingham means that feasibility claims are likely to only rarely be valid (as only in high-rise schemes is the ratio of roof space to floor space likely to be so low as to prevent meeting the renewable energy requirement).

Regulation 122 of the Community Infrastructure Levy (CIL) Regulations and Paragraph 57 of the NPPF set out the tests that must be met for planning obligations:

Necessary to make the development acceptable in planning terms	Offsetting is required to make the development acceptable (i.e. policy compliant) only where on-site targets are not achievable, i.e. in exceptional circumstances. Without an offset mechanism in such cases, proposals would be refused even if otherwise desirable.
Directly related to the development	The proposed offsetting mechanism is directly related to the development as its role is to achieve energy and carbon measures off-site to mitigate the climate impacts of the development. Offset-funded projects would ideally also be related by proximity.
Fairly and reasonably related in scale and kind to the development	The proposed offsetting approach is related in scale and kind to the development because the payment is directly scaled to the degree to which the development falls short of the required on-site energy and carbon targets. The prices are fair in that they relate to nationally set values and the local cost of mitigation, and do not add costs to developers compared to on-site compliance (which in turn is being tested for feasibility and cost uplift).

Alternatives to S106

A potential alternative is the use of unilateral undertakings. These are a one-sided legal agreement whereby only the developer is bound by the obligation. As the council is not bound, this could create risks of not following through on delivery of the necessary projects to save the specific required amount of carbon or energy.

The Levelling Up and Regeneration Bill, at Part 4, intends to replace the current Community Infrastructure Levy and Section 106 Agreements with a new mandatory Infrastructure Levy. The Bill now has royal assent, but it appears that narrowly targeted Section 106 agreements may remain.

The Technical Consultation on the Infrastructure Levy (2023) distinguishes between ‘integral’ (on-site) infrastructure and ‘levy infrastructure’, and identified that S106 will be largely replaced by “delivery agreements”, to ensure integral infrastructure is secured. Paragraph 1.20 indicates that these ‘delivery agreements’ could be used to deliver off site mitigating infrastructure since it uses the example of ‘suitable alternative green spaces’. So, although the name implies that it seems logical that off-site carbon offsetting measures would not be included, this may not be the current thinking.

In addition, the consultation proposes at paragraph 1.36 that there should be three “routeways” available to LPAs: the core levy routeway, infrastructure in-kind routeway and S106-only routeway. This reinforces that Section 106 would still have a role but that ‘delivery agreements’ may take over some of the work of Section 106 agreement. How S106 will be able to be used in future will need to be specified by future Regulations, as would the measures that ultimately encompass ‘integral’ infrastructure secured by ‘delivery agreements’. The consultation responses are being considered, and it appears that the introduction of the new levy is intended to be on a ‘test and learn’ approach which means it will be some years away from mandatory status.

Fund administration and management

The recommended overall approach for fund management is that developers contribute into a council-run offset fund at the agreed price, per kWh. Complications are likely to arise if a central fund is held for both offsetting scopes and could hinder monitoring and reporting abilities of funds received and benefits delivered by funded projects (as one fund’s benefit should be measured in energy and the other in carbon).

Ideally, the Greater Nottingham offset fund would have a balance of £0, yet this is not entirely realistic as some development will need to use the offsetting mechanism. It is the responsibility of the Councils to determine whether a development is justified in its proposal to offset a shortfall in on-site renewable energy capacity rather than delivering this on-site.

Dedicated officers should be sufficiently upskilled to determine these decisions to ensure that offsetting is not exploited as a route to compliance.

Similarly, regardless of whether the fund is entirely council-run or involves external partners, dedicated officers should be assigned to fund administration and management to ensure there is no inertia of project funding and assignment. It is essential that this is in place to avoid unintended consequences previously occasionally seen at GLA authorities where financial contributions have gone unspent and subsequently returned to developers in some cases where funds have not been spent for five years, as required under S106.

Offsetting projects

Aside from pricing, project selection is key to efficacy of an offsetting project and should be considered at a local level. The key here is to fund projects that directly offset what was not achieved on-site, which is simply renewable energy generation. For energy offsetting, non-energy-based projects pose a high risk of mitigation not being equivalent to the development's impact and are difficult to measure and validate offset effectiveness.

Bioregional recommends that offset projects for Greater Nottingham are limited to off-site renewable energy solutions, within the GNSP area, that provide additional capacity not already in the energy pipeline. As previously noted, it will be vital that the carbon or energy benefits funded by the offsetting are not sold onward and thus 'double-counted' – for example if a solar PV farm is created with offset funding, this installation should *not* generate and sell-on REGO certificates (renewable energy guarantees of origin), as this would enable unrelated third parties to count that as 'zero carbon' energy within their own account, thus double-counting. However, if that PV paid for by the development turns out to generate *more* than annual energy demand of the development that was being offset, then REGO certificates for the *excess* energy could be sold)

An offset project that would score well against the 6 principles previously outlined could be installing solar PV on social housing in close proximity to the development. In contrast, a tree-planting scheme abroad would be less effective due to aforementioned performance risks and lack of relation to the built environment's causes of carbon emissions and energy impacts.

In any case, offset projects abroad are strongly discouraged as they do not count towards the UK's or Greater Nottingham's carbon inventory and they remove valuable capacity for the overseas country's own offsetting that may be required for hard-to-abate sectors.

Nature-based solutions (e.g. tree planting) certainly have a role to play in reducing emissions, yet they are not sufficient to deliver necessary emissions reductions within the context of the built environment, particularly due to associated permanence and measurability implications.

Small scale local schemes vs large-scale

Small-scale offset projects are likely to perform better against the principles of co-benefits and proximity to the development because there will be more opportunities for small-to-medium scale PV installations compared to a large standalone PV scheme. Additionally, a time-lag is less likely with smaller projects because they can more rapidly be set up.

Administrative burdens are however likely to be more prominent if multiple small-scale local projects are selected instead of one larger project. This could be challenging to manage in terms of transparency and validation, alongside operational monitoring of such projects.

A balance may be struck between small and large projects. Project selection, and assessment of local community benefits, should be a council-led decision due to political implications.

Acceptability of example projects for energy offsetting

Unacceptable projects	Acceptable projects
Existing buildings retrofit	Solar PV installations on existing buildings within Greater Nottingham (e.g. social housing, schools and low-income households)
Nature-based projects (e.g. peatland restoration, tree-planting or grassland)	
National and international offset schemes	Large standalone renewable energy generation within Greater Nottingham
Solar PV on other new buildings outside the development (unless in excess of the amount needed for that new building's own compliance with the policy)	

Regarding PV installations on other new buildings, there will rarely be scope for this project type as an offsetting intervention, because those other new buildings will already need their own roof space for their own solar PV to achieve their own required on-site net-zero energy balance. Therefore, additionality would not be achieved because PV installations on all new buildings should occur without any potential offset funding flowing between them. An exception could be if the 'other' building has more roof space than it needs for its own PV or has proven beyond reasonable doubt that it is unviable to provide its own sufficient PV (but is otherwise a necessary development), in which case it could be acceptable to use this space for further PV funded by offsetting from new buildings that don't have enough roof space.

Although solar PV installations on **existing** buildings can be acceptable to offset new builds' energy use, energy efficiency retrofitting (e.g. fabric improvements) is not. This is primarily because such projects may not ensure emissions reductions that are directly measurable and comparable with a shortfall in on-site renewable energy capacity. For example, behavioural factors can create a 'rebound effect' that partially or fully negates the energy savings of retrofit (e.g. keeping the building warmer rather than reducing heating use) which cannot be accounted for in the offset scheme. Additionally, efficiency projects would have different costs than those on which the offset payment is based. The energy offset price is based on the cost of solar PV, therefore spending this on other measures could risk a mismatch between the amount of funding available and the cost delivering the amount and type of project needed to deliver the same carbon or energy savings that solar PV would have.

Project delivery

Delivery of the two identified acceptable project types for energy offsetting can be implemented through two options:

1. Set up partnerships with local organisations such as community energy groups and social housing providers.
2. Entirely council-run fund with bidding process.

There are benefits and downfalls to both options, yet Bioregional tentatively recommends offsetting delivery through local partnerships. The key benefit of a partner-led approach is that the cost efficiency of project delivery can be significantly enhanced where the partner has mechanisms in place for swift project selection and delivery. For this benefit to be realised, the Greater Nottingham team will need to select partners on the basis of skills and experience in delivering such projects, and the right connections, with preference for those with an existing pipeline of project options. Contractual and quality assurance mechanisms must be put in place.

Offset fund management and project delivery mechanisms should be an iterative process as the balance between options and approaches is found. For example, a pilot approach for the first year could be utilised. This was the approach taken at Bath & North East Somerset Council where partnerships were sought with a community energy group and housing provider. Both partnerships would be tested throughout the first year of offset fund operation. However, the efficacy of this approach will not be known until early next year.

Through a pilot approach, which can be built upon, Greater Nottingham can learn what works most effectively and then potentially open the fund up to additional partners once mechanisms are firmly in place.

To finally reiterate, although it is essential to have offset fund management, administration and project delivery mechanisms in place, Greater Nottingham should focus all efforts on ensuring that on-site measures are truly maximised and therefore it should only become necessary to collect contributions to the offset fund in exceptional circumstances.

	Cons	Pros
Partnerships	Not directly in control of project selection; need to carefully assure additionality	Capacity not required internally at council for project identification
	Potential legal/financial implications if partners financially benefit from projects	Reduced administrative burden on council officers
	Councils not in direct control of monitoring success and efficacy of project operation	Project delivery mechanisms already in place at partner organisations [should be part of selection process]
	Political implications selecting specific partners	Faster project delivery and guaranteed local benefit
Council-run	Administrative and management burden on resource/capacity	In direct control of project selection and delivery
	Additional responsibility to deliver projects effectively	Fewer legal complications as no third parties involved in project delivery
	Lack of mechanisms to deliver projects on time and effectively	In control of monitoring and reporting; improves transparency

Summary of recommended offsetting approach

Offsetting is an important element of local plan policy to keep the policy flexible, but should be minimally used and reserved for specific cases where there are genuine constraints to achieve on-site policy requirements.

Setting a sufficient offset price to deliver the required mitigation projects is of the utmost importance to prevent the use of offsetting as a route to compliance.

The recommended offset price is directly related to the cost of solar PV and is set at **£1.69/kWh** (including the 10% margin for fund administration and project delivery). The offset price should be revised annually following the methodology set out in the 'Appropriate pricing' section, to ensure current costs of solar PV are reflected and do not become outdated.

Projects should be linked to what is being offset from the development, which in this case relates to off-site solar PV installations, although other renewable energy generation technologies are acceptable if the generation output is equal to the on-site shortfall. Projects **must** be able to deliver measurable, additional and permanent savings and should still be delivered within Greater Nottingham.

Whether Greater Nottingham decide to administer a council-run fund, or seek partnerships to deliver offset projects, or a combination of the two, it is strongly preferable that clear mechanisms to deliver projects are set up prior to the funds being received, and that such mechanisms align with the core principles of offsetting.

References

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[ii] UK Parliament House of Commons Library (February 2024), *Research briefing: Planning for Solar Farms.* https://commonslibrary.parliament.uk/research-briefings/cbp-7434/